RESEARCH AND TECHNOLOGY BRANCH

INVENTORY OF RESEARCH AND DEVELOPMENT PROJECTS 1989

Environment Ontario
Jim Bradley, Minister

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RESEARCH AND TECHNOLOGY BRANCH

ENVIRONMENTAL RESEARCH PROGRAM

INVENTORY OF RESEARCH AND DEVELOPMENT PROJECTS 1989

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1989

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INTRODUCTION

The Ontario Ministry of the Environment, Research and Technology Branch publishes the Inventory of Research and Development Projects annually in order to ensure the dissemination of research findings to the environmental scientific community. This document reflects the Ministry's commitment to environmental research through effective allocation of resources in a manner consistent with Ministry policies and priorities.

The inventory presents summaries of research projects funded by the Ministry and being conducted in 1989. It includes research grants and contracts to universities, consultants and other external research institutions and agencies, as well as internal research projects. The summaries are reported according to the sponsoring committee, Branch or Region.

- Research Advisory Committee
- Air Resources Branch
- Hazardous Contaminants Coordination Branch
- Laboratory Services Branch
- Waste Management Branch
- Water Resources Branch
- Regions
- Ontario Pesticides Advisory Committee

The views and ideas expressed in the project summaries are those of the principal investigator and do not necessarily reflect the position of the Ministry of the Environment, nor does the mention of trade names or commercial products constitute endorsement or recommendation for use. Budgetary projections reflect only originally approved budgetary allocations.

Further information pertaining to the projects may be obtained by contacting the principal investigator or liaison officer involved. Information about the Ministry's Research Management Process may be obtained by contacting:

Research and Technology Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West, 9th Floor
Toronto, Ontario
M4V 1P5

Telephone: (416) 323-4574

RESEARCH ADVISORY COMMITTEE

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RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X	
INTERNAL	Grant	Unsolicited	

PROJECT TITLE: Trace Organic Contaminant Removal From Drinking Water

PROJECT NO: 99C
START DATE: Mid-85

SHORT TITLE: Drinking Water

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. John Hilton
MacLaren Plansearch

LIAISON OFFICER (name, location, telephone no.): K. Roberts
Water Resources Branch
323-4881

OBJECTIVE(S): 1. To assess the effectiveness of both optimized conventional drinking water treatment and activated carbon adsorption (add-on contactor mode) for the removal of trace organic contaminants.
2. To determine process operational parameters for both systems.

PROJECT DESCRIPTION: Since the project was begun in mid-1985, a number of activities have been ongoing leading to the Phase I report. These are:
1. Selection of target compounds for both the conventional and GAC evaluation phases of the study.
2. Development of analytical methodology to measure target compounds to the low parts per trillion (PPT) level.
3. Development of the detailed experimental plan to monitor performance and minimize analytical requirements.
4. Design of the database management system and statistical data evalution methodology.

Work is completed on the aspect of:
1. Bench scale testing to optimize coagulant and coagulant aid dosages to achieve maximum organics removal.
2. Pilot equipment set-up and characterization testing of the target compound dosing system and the possibility of adsorption of these compounds on the pilot plant equipment.

The conventional treatment evaluation of Phase II is completed and the Activated Carbon portion of the work is still to be carried out.

BUDGET AND RESOURCES:	Year: (* current)	4	5*	6	TOTAL
	Cost: ($000's):				940.9
	Work Years:				

Budget Source: RAC

KEYWORDS: drinking water, trace organics, removal effectiveness, conventional and carbon adsorption treatment

OUTPUT (papers, presentations, reports): Paper presented at Technology Transfer Conference, 1986

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Progress/Status under review.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	
INTERNAL	Grant	Unsolicited X	

PROJECT TITLE: Mutagenicity Testing of Leachates From Waste Disposal Sites

PROJECT NO: 103C
START DATE: 09/84

SHORT TITLE: Mutagenicity Testing/Leachates

PRINCIPAL INVESTIGATOR AND AFFILIATION: G.H. Thomas, D.K. Smith and A.J. Horton
Ontario Research Foundation

LIAISON OFFICER (name, location, telephone no.): D. Rokosh
Water Resources Branch
235-5787

OBJECTIVE(S): To develop methods based on the Ames Salmonella Mutagenicity Assay to detect potentially harmful contamination of groundwater supplies by genotoxic substances leached from landfill sites.

PROJECT DESCRIPTION: A selection of chemical compounds (suspected/known mutagens) exhibiting different functional group features and representing a wide range of polarity in order to develop and validate methods for the collection of organic extract concentrates from both groundwater and site matrix materials. The extracts must be suitable for use in the Ames bioassay systems. The demonstration of the application of the methodology for the collection or organic concentrates of groundwater and site matrix materials from a representative area within a selected landfill site. The various extracts will be evaluated for mutagenic activity. By comparison of the mutagenicity found in the matrix extracts, it may be possible to develop an index of leachability for mutagenic material that can be related to the mutagenicity found in the associated groundwater.

BUDGET AND RESOURCES:	Year: (* current)	4	5	6*	TOTAL
	Cost: ($000's):				300.0
	Work Years:				

Budget Source: RAC

KEYWORDS: mutagenicity, concentration methods, Ames Test, groundwater

OUTPUT (papers, presentations, reports): Paper presented at Technology Transfer Conference, 1986, paper Technology Transfer 1987 (BPI), progress report 1988

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Research completed; awaiting final report. $116,000 outstanding balance.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Municipal Solid Waste-Feasibility of Gasification with Plasma ARC

PROJECT NO: 234C
START DATE: 03/86

SHORT TITLE: Gasification with Plasma ARC

PRINCIPAL INVESTIGATOR AND AFFILIATION: A. Tsangaris & G. Carter
Resorption Canada Ltd.

LIAISON OFFICER (name, location, telephone no.): G. Donnelly
Waste Management Branch
323-5130

OBJECTIVE(S): To demonstrate the operational and environmental benefits of plasma arc gasification of municipal solid waste (MSW) and its potential acceptability in Waste Management.

PROJECT DESCRIPTION: Resorption Canada Limited (RCL), OBOE Engineering Ltd and Ontario Hydro propose a feasibility study to conduct experimentation with MSW within the RCL plasma arc research facility to demonstrate the salient operational and environmental characteristics of such a process. The existing RCL plasma research facility is presently capable of gasification of MSW, however, it would require the optimization of some of its equipment plus the addition of some other equipment in order to permit the total operation results which would be required. The work schedule has been organized into two stages, stage 1 to determine the Higher Heating Value (HHV) of the product gas and the total process heat balance, and Stage 2 to determine the environmental acceptability of the process and the subsequent combustion of the product gas. Stage 2 has now commenced and is expected to be complete by October 31, 1989.

BUDGET AND RESOURCES: Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	25.0	25.0	50.0	75.0
Work Years:	1.2	0.5		1.7

Budget Source: RAC

KEYWORDS: solid wastes, municipal waste, gasification, plasma ARC

OUTPUT (papers, presentations, reports): Paper presented at the Technology Transfer Conference, 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Ontario Hydro

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X	
INTERNAL	Grant	Unsolicited	

PROJECT TITLE: Sediment Transport Study

PROJECT NO: 256C
START DATE: 06/86

SHORT TITLE: Sediment Transport

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. R.F. Holloran
Beak Consultants Ltd.

LIAISON OFFICER (name, location, telephone no.): B. Kohli
Water Resources Branch
323-4961

OBJECTIVE(S): To predict longshore and across-shore suspended and bedload transport rates for varying sediment particle sizes under a range of known environmental conditions (spatial and temporal varying current, waves and bathymetry). This will permit assessment of the short-term and long-term fates of contaminated sediment particles from sources such as rivers, STP and lakefilling.

PROJECT DESCRIPTION: To conduct a thorough literature search, select a suitable model that can achieve the objectives of study. To design and conduct a 2-month preliminary field program and collect data for model input. An interactive computer model for IBM PC to be installed on Great Lakes computer facilities. The use of this model will enhance our capabilities in assessing fates of contaminated sediments and complement the ongoing investigations into the suspended sediment inputs and in-place pollutants.

BUDGET AND RESOURCES:	Year: (* current)	4*	5	6	TOTAL
	Cost: ($000's):				97.7
	Work Years:				

Budget Source: RAC

KEYWORDS: contaminated sediment, bedload, suspended, transport, prediction, fate assessment

OUTPUT (papers, presentations, reports): Final Report

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: The project has been delayed due to lake storms during the experiment. Expected completion date is March, 1989.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Identification of Long-Range Aerosol Sources at the Dorset Environmental Station

PROJECT NO: 272G
START DATE: 03/87

SHORT TITLE: Long Range Aerosols

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. J. Drake
Geography Department
McMaster University

LIAISON OFFICER (name, location, telephone no.): N. Reid
Air Resources Branch
965-1634

OBJECTIVE(S):

To employ various methods in medium and high flux Neutron Activation Analysis to help elucidate regional sources of air pollution.

PROJECT DESCRIPTION:

Several techniques in neutron activation including thermal, epithermal and prompt-gamma analysis will be developed specifically to identify metal content in aerosols.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):				74.4
Work Years:				

Budget Source: RAC

KEYWORDS: neutron activation, aerosols, metal content

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Study of Some Factors Contributing to the Abundance and Persistence of Green Filament Algal Mats in Acidic Lakes

PROJECT NO: 282G
START DATE: 09/86

SHORT TITLE: Algal Mats in Acidic Lakes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Pamela Stokes
University of Toronto

LIAISON OFFICER (name, location, telephone no.): M. Jackson
Water Resources Branch
235-5812

OBJECTIVE(S): To provide an explanation for the occurrence and persistence of algal mats in acidified lakes (pH 5.5) and to provide an explanation for the lack of accumulation and persistence of the mats in otherwise comparable habitats in less acidic lakes.

PROJECT DESCRIPTION:

Selection of sample sites in two acidic lakes: initial examination of the algal mat community to determine its composition and to evaluate sampling methodology; investigation of the invertebrate fauna of algal mats for presence and activity of grazers.

BUDGET AND RESOURCES: Year: (* current)	1	2	3	4*	TOTAL
Cost: ($000's):	12.5	57.2	NIL	20.1	89.8
Work Years:	0.4	1.1		0.6	2.1

Budget Source: RAC

KEYWORDS: algal mats, acidic lakes, grazers

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Prediction of Rate of Oxygen Depletion in Recreational, Urbanized and Agricultural Lakes

PROJECT NO: 294C
START DATE: 11/86

SHORT TITLE: Oxygen Depletion in Lakes

PRINCIPAL INVESTIGATOR AND AFFILIATION: W.J. Snodgrass
Beak Consultants

LIAISON OFFICER (name, location, telephone no.): B. Neary
Water Resources Branch
766-2418

OBJECTIVE(S):
- To relate the oxygen cycle to inputs of nutrients and dissolved organic carbon.
- To relate the model to fisheries potential data (if available).
- To test the model upon the Muskoka-Haliburton-Kawartha lakes, and recreational lakes subjected to agricultural/urban influences.

PROJECT DESCRIPTION:

- A model will be developed to relate oxygen consumption to inputs of nutrients and dissolved organic carbon.
- Laboratory measurements will be made to aid model calibration; particular measurements anticipated are sediment oxygen demand.
- The model's limitations will be assessed statistically.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	20.0	39.9	4.4	64.3
	Work Years:				

Budget Source: RAC

KEYWORDS: eutrophication, dissolved oxygen, land use

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Slow Sand Filtration for Production of Drinking Water in Small Northern Communities

PROJECT NO: 296C
START DATE: 11/86

SHORT TITLE: Slow Sand Filtration

PRINCIPAL INVESTIGATOR AND AFFILIATION: W.J. Hargrave, P. Eng.
Gore & Storrie Limited

LIAISON OFFICER (name, location, telephone no.): J. Dart
Water Resources Brnach
323-4876

OBJECTIVE(S): To investigate the design, operation and maintenance of slow sand filtration for the treatment of drinking water in small northern communities.

PROJECT DESCRIPTION:

1. To assemble design, operation, maintenance and cost information on slow sand filtration.
2. To evaluate simple chemical dosing systems, the potential colour removal, and to propose pilot test programs.

Successful completion of the study will provide information on design and operation of slow sand filtration systems.

BUDGET AND RESOURCES:	Year: (* current)	4*	5	6	TOTAL
	Cost: ($000's):				150.0
	Work Years:				1.7

Budget Source: RAC

KEYWORDS: slow sand filtration, design, operation, maintenance cost, chemical dosing, colour removal

OUTPUT (papers, presentations, reports): Paper presented at the Technology Transfer Conference 1987.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Clay/Leachate Compatibility Study
Hydraulic Conductivity of Ottawa-Carleton "Leda" Clay Barrier Soils Permeated with Domestic Waste Leachate

PROJECT NO: 299C
START DATE: 03/87

SHORT TITLE: Domestic Leachates

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. R.M. Quigley, Director of Geotechnical Research Centre University of Western Ontario

LIAISON OFFICER (name, location, telephone no.): R. Dunn MOE (SE Region) (613) 521-3450

OBJECTIVE(S): To assess the compatibility of four Leda Clay samples (from the Ottawa-Carleton region) with typical domestic waste leachate. The work would be used as input for environmental hearings associated with selection of future landfill sites on leda clay. The work was requested by MacLaren Engineers at the request of the Ontario Ministry of the Environment.

PROJECT DESCRIPTION:

Four "typical" Leda clay samples would be supplied by Golder Associates (Ottawa) under the supervision of MacLaren Engineers. These samples would be subjected to permeation by domestic waste leachate to assess any changes in hydraulic conductivity. Extensive chemical analyses of both the influent and effluent liquids would indicate any retardation of selected soluble species.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	TOTAL
	Cost: ($000's):				25.0
	Work Years:				0.4

Budget Source: RAC

KEYWORDS: Ottawa-Carleton Leda Clays, hydraulic conductivity, permeation, domestic leachate, soluble chemical retardation

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Report submitted to Liaison Officer on August 2, 1988 for Review.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: An Intrinsic Chemically Selective Lipid-Based Wave Guide Organic Vapour Sensor

PROJECT NO: 300PL
START DATE: 02/87

SHORT TITLE: Organic Vapour Sensor

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. U.J. Krull, Department of Chemistry, Erindale College University of Toronto

LIAISON OFFICER (name, location, telephone no.): J. DeBrou Air Resources Branch 965-4081

OBJECTIVE(S): To prepare and study a novel integral optical sensor consisting of a chemically selective fluorescent lipid biomembrane which acts as a light guide. This system will be developed with the capability of being portable or remote, and will be able to provide sensitive long term detection of organic species of environmental significance.

PROJECT DESCRIPTION:

A lipid membrane prepared as a multilayer of mono layer lipid films would be used as an optical wave guide using the principle of total internal reflection. The lipid matrix would be modified to contain an organic receptor, which would alter membrane physical chemistry as a result of selective binding. The alterations would be repored by fluorophores sensitive to membrane or receptor structure. This system would be inherently sensitive due to the sensitivity of fluorophore response, and the fact that the fluorescent signal would originate within the wave guide.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	11.5	11.5	11.5	34.5
Work Years:				4.1

Budget Source: RAC

KEYWORDS: organic vapour sensors, lipid membranes, wave guide, sensors

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Establishing Vegetation on Erosion-Prone Landfill Slopes in Ontario

PROJECT NO: 307C
START DATE: 02/87

SHORT TITLE: Vegetation on Landfill Slopes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Thomas W. Hilditch
Company Biologist
Gartner Lee Associates Ltd.

LIAISON OFFICER (name, location, telephone no.): D. McLaughlin
Air Resources Branch
965-4516

OBJECTIVE(S):
To research, test and compile in an understandable and usable form the information and techniques necessary to remediate surface erosion problems through proper vegetation management at landfills across Ontario.

PROJECT DESCRIPTION: The first year of study will include:
- MOE District Abatement Officer Contact and Questionnaires.
- Contact with Revegetation experts in Canada and the United States
- Computer-based Literature Search and Review.
- On-Site Investigation of Selected Landfills Across Ontario.

In year two, experimental test plots using the best available plant species, site treatments and plenty of techniques will be established on 12 representative landfills across Ontario. The third year of study will be devoted to the monitoring and analysis of test plot results and the creation of the Landfill Revegetation Manual.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	49.3	83.1	62.4	194.8
Work Years:	0.4	0.9	0.7	2.0

Budget Source: RAC

KEYWORDS: landfill, erosion, vegetation, remedial actions

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): Various municiple and private landfill operators/owners.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Enhanced Sanitary Landfill: A Demonstration Trial

PROJECT NO: 308C
START DATE: 04/87

SHORT TITLE: Enhanced Sanitary Landfill

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. B. Laughlin, B. Forrestal and P. Laughton, Ontario Research Foundation

LIAISON OFFICER (name, location, telephone no.): A. Oda, Waste Management Branch, 323-5129

OBJECTIVE(S):

The overall objective of the proposed study is to demonstrate the efficiency of an enhanced landfill concept to permit rapid stabilization and increased capacity for municipal solid waste landfill sites.

PROJECT DESCRIPTION:

A pilot scale anaerobic digester will be designed and installed to operate on leachate which is currently being collected at the Britannia Road Sanitary Landfill in Mississauga. The steady state operation phase will include leachate characterization, pilot plant specification and installation, acclimation, steady state operation and date analysis.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				195.0
	Work Years:				

Budget Source: RAC

KEYWORDS: leachate treatment, anaerobic digestion, gas production pilot study

OUTPUT (papers, presentations, reports): Technology Transfer Conference (1987); International Energy Agency Workshop; MSW to Energy, Fitzwilliam College, Cambridge, U.K. (June 1988)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Scale Model Studies and Development of Prediction Procedures for Heavy Gas Dispersion in Complex Terrain

PROJECT NO: 310C
START DATE: 07/87

SHORT TITLE: Gas Dispersion Model

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. P.A. Irwin
Rown, Williams, Davies & Irwin Inc.

LIAISON OFFICER (name, location, telephone no.): P. Misra
Air Resources Branch
235-5768

OBJECTIVE(S): To develop a practical model for predicting the dispersion of dense gases that will make appropriate allowances for the effects of surrounding buildings and topography and that incorporates a methodology for predicting peak concentrations.

PROJECT DESCRIPTION: The studies would be in two phases. Phase I consists of a Literature Review, Theorectical Studies, Wind Tunnel Tests and Computer Program Development for cases involving uniform arrays of obstacles such as buildings. Phase II will extend the studies to non-uniform arrays of obstacles and will also look at the effects of ground slopes, ditches, berms, etc. Since the full range of all possible terrain conditions cannot possibly be covered, a part of the studies will be to evalute the uncertainties in the predictions to arrive at rational safety factors to use in conjunction with the predictions.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	102.0	118.0	59.0	279.0
	Work Years:	0.8	1.0		1.8

Budget Source: RAC

KEYWORDS: heavy gas, dispersion, complex terrain

OUTPUT (papers, presentations, reports): Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X | Contract | Solicited
INTERNAL | Grant X | Unsolicited X

PROJECT TITLE: Physical and Chemical Processes Affecting Long-Range Transport of Air Pollutants and Acid Rain

PROJECT NO: 313G
START DATE: 08/87

SHORT TITLE: Processes Affecting LRTAP

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. Han-Ru Cho
Department of Physics
University of Toronto

LIAISON OFFICER (name, location, telephone no.):

R. Bloxam
Air Resources Branch
235-5772

OBJECTIVE(S): To gain better understanding of chemical, physical and dynamic processes in the earth's atmosphere affecting long-range transport of air pollutants and acid rain.

PROJECT DESCRIPTION:

Some basic problems in chemical, physical and dynamic processes important to the modelling of long-range transport and acid rain will be studied. Emphasis will be placed on mesoscale atmospheric processes, and the possibility of incorporating them into long-range transport models.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	74.2	106.6	110.8	291.6
Work Years:	2.2	2.8	2.8	7.8

Budget Source: RAC

KEYWORDS: Long-range transport, air pollutants, acid rain, chemical and physical processes, Eulerian modelling

OUTPUT (papers, presentations, reports): Several presentations at Technology Transfer Conference, many Journal Papers and Reports.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Atmospheric Trace Gas Measurements Using a Tunable Diode Laser Absorption Spectrometer

PROJECT NO: 314G
START DATE: 04/87

SHORT TITLE: Tunable Diode Laser Spectrometer

PRINCIPAL INVESTIGATOR AND AFFILIATION: Drs. D.R. Hastie and H.I. Schiff, Faculty of Science, York University

LIAISON OFFICER (name, location, telephone no.): Dr. M. Lusis, Air Resources Branch, 965-1634

OBJECTIVE(S): To make measurements of atmospheric trace gas concentrations to aid in the understanding of the chemistry of both ozone and acid formation. The data will be directly applicable for evaluation of Eulerian models (RADM, and ADOM). The proposed measurements will be part of the Eulerian model evaluation study jointly sponsored by MOE, AES and USEPA.

PROJECT DESCRIPTION:

The bulk of the measurement program will be related to the Eulerian Model Field Evaluation Study. For this the TDLAS will be located at the Ministry's site at Dorset for a total of four two-month periods so as to cover the four seasons within two years. The instrument will be capable of measuring the concentrations of two species simultaneously, the exact species to be measured will be selected in conjunction with Ministry personnel. The instrument should be available for other Ministry special projects as required.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	346.3	137.7	127.5	611.5
Work Years:				

Budget Source: RAC

KEYWORDS: Atmospheric tracegases, ozone, acid, Eulerian models, Tunable diode laser spectrophotomer

OUTPUT (papers, presentations, reports): Progress report papers at TTC 88 and 89; also, two reports "Summary of the York Data Obtained at Dorset as Part of the EMEFS Study, Summer 1988", and "Progress Report on Atmosphere Trace Gas Measurements Using a TDLAS" both dated April, 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
Atmospheric Environment Services - Environment Canada, and US-EPA

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Quantitative Structure-Activity Relationships for Organic Compounds and Their Mixture

PROJECT NO: 317G
START DATE: 04/87

SHORT TITLE: QSAR for Organics

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. George W. Ozburn and L. McCarty
Department of Biology
Lakehead University

LIAISON OFFICER (name, location, telephone no.): N. Bazinet
Water Resources Branch
323-4929

OBJECTIVE(S): To enhance and refine QSAR techniques employing the organic chemical toxicity database at Lakehead University. To develop physiologically and environmentally realistic toxicity models using Lakehead and literature data.

PROJECT DESCRIPTION: Use the organic chemical database of Lakehead University's ATRG in conjuction with literature information to: (1) Refine and expand relationships between molecular descriptors, acute and chronic aquatic toxicity test results, and bioconcentration; (2) Investigate biological and environmental factors which may influence the accurate determination of the above relationships and examine methods of compensation and correction; (3) Study data and relationships and develop simple one-compartment first-order kinetics models for the prediction of toxicant body burdens and the time course of toxicant action; (4) Examine the possibility of using more sophisticated modelling techniques to improve predictive capabilities and incorporate provisions for mixtures of toxicants as well as accounting for certain biological and environmental factors which may influence the outcome.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	43.3	51.7	40.0	134.9
Work Years:	0.7	1.0	0.3	2.0

Budget Source: RAC

KEYWORDS: organic compounds, quantitative structure-activity relationship, toxicity, physiological and environmental toxicity models

OUTPUT (papers, presentations, reports): Technoloy Transfer 1987, Technology Transfer 1988. Paper presented at International Conference on Environmental Bioassay Techniques and Their Application. (Continued on next page).

EXTERNAL PARTICIPATION (ministries, governments, agencies):
University of Waterloo

COMMENTS: Several Publications are expected from this research.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

OUTPUT (pagers, presentations, reports);

McCarty, L.S., G.W. Ozburn, A.D. Smith, A. Blarath, D. Orr and P.G. Dixon, 1989. Hypothesis formulation and testing is aquatic bioassays: a deterministic model approach. Hydrobiologia (In Press).

Smith, A.D., A. Blarath, C. Mallard, D. Orr, K. Smith, J.A. Sutton, J. Vaikmanick, L.S. McCarty & G.W. Ozburn, 1989. The Acute and Chronic Toxicity of 10 Chlorinated Organic Compounds to the American Flagfish Jordanella flowdae (Goode and Bean). Archives of Environmental Contaminants and Toxicology (submitted for approval).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: An Examination of the Chronic Toxicity of Thyocyanate to Freshwater Fish for the Development of a Water Quality Criterion

PROJECT NO: 320G
START DATE: 04/87

SHORT TITLE: Thyocyanate

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D. George Dixon
Assistant Professor
Department of Biology
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): C. Neville
Water Resources Branch
235-5799

OBJECTIVE(S): To obtain sufficient data on the chronic toxicity of thiocyanate to fish to establish a water quality criterion. To examine the toxicity of short-term pulse exposure of SCN- to fish. To apply the lab derived biochemical and histological indicators of SCN- impact to fish in the White River system.

PROJECT DESCRIPTION: The objectives will be met by four experiments. First, groups of rainbow trout will be continously exposed to sublethal concentrations of SCN- for 16 weeks. Toxicity will be assessed in terms of growth, thyroid metabolism and SCN- Kinetics in blood plasma. The second experiment will determine the effects of continuous exposure to SCN-, over one life cylce, on the reproductive capacity of fathead minnow. Experiment three will pulse-expose rainbow trout for 2 h to varying concentrations of SCN-, after which they will be reared for 6 weeks. Toxicity will be assessed as in experiment one to facilitate comparison. All results will be analysed to determine no effect levels. Finally, we will assess the health of white sucker populations in lakes of the White River System of Ontario receiving SCN- effluent. Assessment will be made in terms of age-size, reproduction, histopathology and thyroid metabolism.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	35.0	36.8	39.9	111.7
Work Years:	2.0	2.0	2.0	6.0

Budget Source: RAC

KEYWORDS: thiocyanate, chronic toxicity, fish, criterion development, lab/field

OUTPUT (papers, presentations, reports): Poster presentation, SETAC '89 (Toronto, October 29 - November 3)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: The Effects of Agricultural Drainage on Sediment and Water Quality Loadings

PROJECT NO: 321G
START DATE: 04/87

SHORT TITLE: Effects of Drainage

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. W. Edgar Watt
Dept. of Civil Engineering
Queen's University

LIAISON OFFICER (name, location, telephone no.):

Dr. L. Logan
Water Resources Branch
323-4989

OBJECTIVE(S):
To develop, calibrate and verify a model to simulate the effects of agricultural land use and drainage on the sediment and water quality loadings to receiving streams. To provide guidance on the use of the model to evaluate potential management strategies.

PROJECT DESCRIPTION:

This study involves (i) the development, calibration and testing of a physically-based model for predicting sediment and water quality/loadings to receiving waters from agricultural lands; (ii) instrumentation of fields and sub-basins in an agricultural basin; (iii) associated field studies and (iv) applications of the model to assessment of hypothetical management practices affecting water quality.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	31.0	30.0	29.0	90.0
Work Years:	1.0	1.2	1.2	3.4

Budget Source: RAC

KEYWORDS: pollutant loadings, drainage, agricultural land predictive model

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: The Mobility and Persistence of Selected Organic Solute in Anaerobic Groundwaters and Possible In Situ Remediation Measures

PROJECT NO: 330G
START DATE: 04/87

SHORT TITLE: Organic Solute in Anaerobic Groundwater

PRINCIPAL INVESTIGATOR AND AFFILIATION: Drs. J.F. Barker and J.A. Cherry
Institute for Groundwater Research
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): M. Goodwin
Waste Management Branch
323-5217

OBJECTIVE(S):
1. To define the fate and persistence of selected organic solutes in anaerobic groundwater.
2. To evaluate remediation.
3. To establish a field test site.

PROJECT DESCRIPTION:

A segment of an anaerobic, shallow aquifer will be instrumented and a series of natural-gradient injection experiments will be conducted to evaluate the natural fate and persistence of selected organic contaminants. In addition, methods will be developed in the lab to enhance the transformation of these organics in-situ under the anaerobic field conditions and the methods will be evaluated by natural-gradient injection experiments where the remedial additions are included in the injection.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	122.5	128.4	128.0	378.9
Work Years:	3.4	3.8	3.8	11.0

Budget Source: RAC

KEYWORDS: groundwater, organic solutes, fate and persistence, remediation, anaerobic

OUTPUT (papers, presentations, reports):

Progress Report Year I, Progress Report Year II

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out byinvestigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract	Solicited
INTERNAL		Grant X	Unsolicited X

PROJECT TITLE: Slow Rate Infiltration Land Treatment and Recirculation of Landfill Leachate in Ontario

PROJECT NO: 333G
START DATE: 04/87

SHORT TITLE: Recirculation of Leachates

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. R.A. McBride
Land Resource Science
University of Guelph

LIAISON OFFICER (name, location, telephone no.):
A. Oda
Waste Management Branch
323-5129

OBJECTIVE(S):
1. To evaluate slow rate infiltration land treatment of leachate in forest/agricultural areas.
2. To evaluate recirculation of leachate as partial treatment.

PROJECT DESCRIPTION:

This is a three-year research study which will achieve the above objectives through the establishment of pilot-scale installations and the implementation of perturbation experiments at four sites across Ontario. Intensive characterization and monitoring of the more important biotic and abiotic ecosystem components will be carried out. Landfill recirculation will also be investigated as a means of pretreatment prior to slow rate infiltration land application, by lessening both leachate volume and strength.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	171.2	147.8	128.4	447.4
Work Years:	6	6	6	

Budget Source: RAC

KEYWORDS: leachate treatment, land application, recirculation, soil infiltration, irrigation (spray, trickle, sub-surface), effects on vegetation

OUTPUT (papers. presentations, reports):
Paper presented at the Technology Transfer Conference 1987 & 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract		Solicited
INTERNAL	Grant X		Unsolicited X

PROJECT TITLE: Behaviour, Detection and Control of Hazardous Immiscible Liquid Movement in Soil

PROJECT NO: 334G
START DATE: 04/87

SHORT TITLE: Immiscible Liquid Movement in Soil

PRINCIPAL INVESTIGATOR AND AFFILIATION: Drs. G.J. Farquar and E.A. McBean, Dept. of Civil Engineering, U. of Waterloo

LIAISON OFFICER (name, location, telephone no.): L. Ficzere
Waste Management Branch
323-5186

OBJECTIVE(S):
To conduct laboratory scale experiments to study the movement, retention and control of hazardous immiscible liquids (HIL) in soil.

PROJECT DESCRIPTION: Experiments will involve the addition of different HIL to soil under various ranges of loading conditions in both 1-D vertical columns and 2-D flow cells on a laboratory scale. Measurements will be made to detect and to quantify the rate of movement and the retention in the soil as the HIL displace soil water both saturated and unsaturated conditions. Previously-developed, innovative methods for detecting HIL and for quantifying relative permeability and capillary pressure in variably-saturated conditions, will be used. Experiments will be carried out to extend the use of the thermal conductivity (TC) detection probe for large scale, field use. The thermistor, the power supply, the pulse time, the connections and the telethermometer will be redesigned and tested to modify the probe from its successful laboratory configuration to a field scale. A series of experiments will be done to test the effectiveness of groundwater pumping, solvent addition and air stripping in the removal of HIL from soil. Similar tests involving gas extraction and air injection will be done to assess the efficiency of these methods to control hazardous vapours in soil.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	56.4	56.4	59.9	172.7
Work Years:				

Budget Source:

KEYWORDS: immiscible, liquid, soil, permeability, capillary pressure, thermistor, telethermometer, groundwater, vapours, movement

OUTPUT (papers, presentations, reports): Technical papers presented at the 1987 and 1988 MOE Technology Transfer Conference.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Development of the Backfill and Construction Application Guidelines - Phase II

PROJECT NO: 336C
START DATE: 04/87

SHORT TITLE: Inert Fill Guidelines

PRINCIPAL INVESTIGATOR AND AFFILIATION:
G. Zukovs
Division Manager
CANVIRO Consultants Ltd.

LIAISON OFFICER (name, location, telephone no.):
R. Dalrymple
Waste Management Branch
323-5211

OBJECTIVE(S):
To identify Ontario sites where industrial waste has been/is being used as backfill, to carry out a comprehensive study of the impact; to assess changes with time; to assess draft guidelines developed in Phase I.

PROJECT DESCRIPTION:

Phase II work will primarily involve detailed bulk quality characterization and leachate testing of backfill material from selected sites, as well as site hydrogeologic investigations and the uses of these data in the criteria assessment exercise. In addition, changes to the Phase I work as per previous discussions will also be included in the Phase II work.

BUDGET AND RESOURCES:	Year: (* current)	1 87-88	2* 88-89	3	TOTAL
	Cost: ($000's):	21.9	173.1		195.0
	Work Years:	1.0	1.0		

Budget Source: RAC

KEYWORDS: inert fill guidelines, landfill testing, quality evaluation

OUTPUT (papers, presentations, reports): MOE Guideline on Inert Fill

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: In Situ Determination of Fecal Indicator Bacteria Survival in Agriculturally Impacted Watersheds

PROJECT NO: 344G
START DATE: 11/87

SHORT TITLE: Watershed Indicator Bacteria

PRINCIPAL INVESTIGATOR AND AFFILIATION: M. Walters
Lake Simcoe Conservation Authority

LIAISON OFFICER (name, location, telephone no.): W. Lammers
Water Resources Branch
424-3000

OBJECTIVE(S): 1. To document and investigate the seasonal variations in bottom sediments and water columns, including the environmental factors that may influence bacterial survival.
2. To provide bacterial survival data required to develop a transport model and to assess the contribution of individual inputs from agricultural sources on beaches.

PROJECT DESCRIPTION: Development of hydrologic transport model to establish the potential boundaries and impact of a source(s) on beach areas. The identification of sources that affect the water quality of beach areas is required for successful targeting of remedial efforts. Successful completion of this study will provide the Lake Simcoe Region and Metro Toronto and Region Conservation Authorities with the bacterial survival information required for input into pollution transport models and the completion of pollution control plans.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	61.0	67.5	25.5	154.0
	Work Years:				

Budget Source: RAC

KEYWORDS: bacteria, survival, transport, source contributions

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract X	Solicited
INTERNAL X	Grant	Unsolicited X

PROJECT TITLE: Development of Ambient Air Monitoring Methodologies for Dioxins and Furans

PROJECT NO: 346C
START DATE: 11/87

SHORT TITLE: Dioxin/Air Monitoring

PRINCIPAL INVESTIGATOR AND AFFILIATION: Wellington Environmental Inc.

LIAISON OFFICER (name, location, telephone no.): T. Dann
Environment Canada

OBJECTIVE(S): (1) To validate and document designs for filtration/sorbent hi-volume sampling and analysis of dioxins and furans in ambient air filter and PUF samples. (2) To utilize the developed method for obtaining dioxins and furans data at selected locations and use the data to establish QA/AC procedures for air sampling and analysis.

PROJECT DESCRIPTION: (1) To review current activities including data bases. (2) To evaluate air sampling and analysis procedures and carry out related intercomparison study. (3) To discuss the developed technologies at a special workshop and apply them to specific areas. (4) To identify qualified laboratories capable of performing future work and their certification.

This study is jointly funded by Ontario, B.C., Alberta and Environment Canada. Successful completion of the research will provide the proponents with a state-of-the-art technology on dioxin and furans in air.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	TOTAL
	Cost: ($000's):	30.0	to be determined		
	Work Years:				

Budget Source: RAC/CCREM

KEYWORDS: Filtration/sorbent, QA/QC procedures, dioxins, furans

OUTPUT (papers, presentations, reports):
Paper presented at the Symposium on Measurement of Toxic and Related Air Pollutants, North Carolina,1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Joint funding by CCREM Research Advisory Committee and provinces of BC, Alberta with Environment Canada.

COMMENTS: Budgets for Years 2 and 3 to be determined on completion of Year 1.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Determination of Source-Receptor Links by Size-Specific Multielemental Inorganic Component Determination and Modelling

PROJECT NO: 347G
START DATE: 11/87

SHORT TITLE: Inorganic Compounds/Receptor Modelling

PRINCIPAL INVESTIGATOR AND AFFILIATION: R.E. Jervis
University of Toronto

LIAISON OFFICER (name, location, telephone no.): P. Steer
Air Resources Branch
965-4081

OBJECTIVE(S): It is proposed to do sufficient repeat sampling at selected locations and analyze for 20-25 trace elements to permit source profiles to be established and receptor modelling to be performed. If particle size-sorting is necessary, it is particularly important for analytical methods to be sensitive in the microgram range and lower for each filter and fraction.

PROJECT DESCRIPTION:

Study of the MOE Sault Ste. Marie filters by neutron activation for purpose of revealing particularly steel and iron works contribution. In Toronto, do more on sampling in vicinity of refuse/waste incinerators. Identify sets of key marker elements and attempt particle size measurements as input to modified receptor modelling. Compare chemical mass balance (CEB), TTFA and APCA receptor approaches using the data sets obtained.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	33.6	32.9	26.8	93.3
	Work Years:				

Budget Source: RAC

KEYWORDS: neutron activation, receptor modelling, source apportionment

OUTPUT (papers, presentations, reports):

See attached.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

Master's of Applied Science Theses

1. Zhijun, Kang, 1988. A Study of Aerosol Characterization and Source Apportionment at Ontario Sites Using Receptor Modelling.

2. Chan, Albert C. 1989. The Assessment of Ambient Particulates By Multielement Radioanalytical and Receptor Modelling Techniques.

Report

1. Jervis, R.E., Z-J Kang and A.C. Chan. Multicomponent Factor Analysis of INAA, IPAA and XRF Aerosol Data For Assessing the Health Significance of Incinerator and Industrial Sources.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Relationship of Sugar Maple Decline and Corresponding Chemical Changes in Sap Composition (Carbohydrates and Trace Elements)

PROJECT NO: 352G
START DATE: 11/87

SHORT TITLE: Sugar Maple Decline

PRINCIPAL INVESTIGATOR AND AFFILIATION: D.N. Roy
University of Toronto

LIAISON OFFICER (name, location, telephone no.): W. McIlveen
Air Resources Branch
965-4516

OBJECTIVE(S): (A) To investigate organic and trace elemental composition of sap from healthy trees (DI 10.0) to establish the base-line information. (DI = decline index). (B) To compare the results with the sap exudates from low (DI - 18-30), medium (DI - 31-50) and highly (DI 51) declined trees. (C) To establish the chemical index (CI) of maple decline in selected sites in Ontario. (D) To compare the chemical data (CI) with the external indexing system (DI) of MOE and IES group. (E) To relate CI to known indices of climatic, site, atmospheric, and biological variables (which are either already observed or are in the process of being consolidated) in a cause-effect manner.

PROJECT DESCRIPTION: This proposal addresses the possible relationship of sugar maple decline and consequent chemical changes in sap composition, which might correlate with the degree of decline. Ten maple trees (5 healthy and 5 declining) are selected from several sites across the NE-SW gradient of Ontario. Sap exudates will be collected from these trees at various intervals during the spring. Detailed analyses of carbohydates and trace elements will be performed using High Pressure Chromatographic and Instrumental Neutron Activation techniques, respectively. After establishing the base-line of chemical composition of sap from healthy trees, a system of chemical indexing the decline will be devised as a possible "early warning system".

BUDGET AND RESOURCES: Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	19.9	19.3	15.2	54.4
Work Years:				

Budget Source: RAC

KEYWORDS: sugar maple, decline index (DI), chemical index (CI), indices relationship

OUTPUT (papers, presentations, reports):
Annual Report September 1988. Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Lake Water Quality Monitoring Based on Remotely Sensed Data: Phase II

PROJECT NO: 354G
START DATE: 11/87

SHORT TITLE: Water Quality/Remote Sensing

PRINCIPAL INVESTIGATOR AND AFFILIATION: J. Roger Pitblado
Laurentian University

LIAISON OFFICER (name, location, telephone no.): W. Keller
MOE (NE Region)
(705) 675-4501

OBJECTIVE(S): The long term aim is to aid in the establishment of a lake water quality monitoring program for Ontario based on the principles and techniques of remote sensing. This is envisaged as a primary inventorying and monitoring program in which relatively rapid, general assessments of the surface water resources of the Province or parts of the Province would be made. The immediate aim of this project is to characterize/map/classify the lakes (in terms of general trophic state as well as descriminating between acidified and non-acidified lakes) of three major areas on the Precambrian Shield using remotely sensed data.

PROJECT DESCRIPTION: Associations between lake surface water parameters and spectral reflectance data from the Landsat TM sensor are to be derived for all lakes in three regions of Ontario: a) a 140,000 sq.km. area of Northeastern Ontario, centred on Gogama; b) a 40,000 sq.km. area, centred on Dorset-Haliburton; and c) a 40,000 sq.km. area in Northwestern Ontario to be selected in consultation with the MOE. Lake water parameters, such as DOC and Secchi depth, will be estimated for these lakes using regression approaches; lake classifications, with an emphasis on general trophic status, will be derived from the optical features of the lakes as measured by satellite reflectances by employing some standard image analysis techniques in conjunction with multivariate statistical procedures.

BUDGET AND RESOURCES: Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	49.0	40.0	34.0	123.0
Work Years:				

Budget Source: RAC

KEYWORDS: landsat, thematic mapper, acidification, trophic status

OUTPUT (papers, presentations, reports): Presentation at Technology Transfer Conference. Paper in Operational Geographer (in press.)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of a Hydrologic Model to Predict the Environmental Fate of De-icing Salts

PROJECT NO: 356G
START DATE: 02/88

SHORT TITLE: Hydrologic Model/De-icing Salts

PRINCIPAL INVESTIGATOR AND AFFILIATION: K.W.F. Howard
University of Toronto

LIAISON OFFICER (name, location, telephone no.): P. Beck
Water Resources Branch
323-4890

OBJECTIVE(S): To develop a hydrologic salt and water balance model that will predict, on a catchment scale, the long-term environmental fate of many tens of thousands of tonnes of road de-icing chemicals applied annually to Ontario's highways, streets, paths and sidewalks. Essential features of this model include as follows: 1) It will be based on sound hydrologic principles and incorporate recent developments in our understanding of overland and shallow sub-surface contaminant flow processes (including mixing and ion exchange); 2) It will consider application of both NaCl and $CaCl_2$ and be concerned with the fate of Na and Ca, as well as Cl; 3) It will be developed for a specific catchment(s), but will be sufficiently versatile and flexible for use in other catchments; 4) It will predict long-term chemical changes of water quality in groundwaters, lakes and rivers; 5) It will be developed for ease of use with the eventual user in mind.

PROJECT DESCRIPTION: The study is phased over 3 years and, while primarily desk-oriented, will involve elements of field and laboratory investigation. Primary elements include: a) acquisition and critical assessment of all available and existing methodologies for catchment salt balance calculations; b) development of salt/water balance catchment model incorporting both new and existing technologies; c) selection of a catchment suitable for model testing and calibration; d) acquisition of baseline data pertinent to selected study catchment(s); e) acquisition of additional input data through field and laboratory study; f) testing and calibration of the new model; g) preparation of the final report.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	31.9	33.4	33.4	98.7
Work Years: 3				

Budget Source: RAC

KEYWORDS: de-icing salts, environmental fate, hydrologic salt and water balance model

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Planned presentation to 1989 Technology Transfer Conference.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Determining the Integrity of Solidified Wastes by Large Scale Leach Columns Under Environmental and Controlled Conditions

PROJECT NO: 362G
START DATE: 09/87

SHORT TITLE: Solidified Wastes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D.W. Kirk
University of Toronto

LIAISON OFFICER (name, location, telephone no.): M.B. Fielding
Waste Management Branch

OBJECTIVE(S): To evaluate the leachability and determine the impact of municipal refuse interaction of solid industrial waste (steel flue gas dust) with various solid waste/municipal waste combinations. The primary goal of the study is to quantify the rate of release and mobility of metal and organic species from the large column experimental test cells. The secondary goal is to predict the long term natural leaching of solid wastes.

PROJECT DESCRIPTION:
There are 16 experimental test cells that have been designed and put into operation on the roof of the University of Toronto Chemical Engineering building. These cells have operated year round over two winter periods without failure. The columns represent simulated municipal refuse landfill operations with various combinations of solid industrial waste and municipal refuse under both controlled and atmospheric conditions. There are 33 parameters that are routinely measured and collated. The test cells are approaching anaerobic conditions.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	51.0	46.6	48.9	146.5
	Work Years:	1.5	1.5	1.5	4.5

Budget Source: RAC

KEYWORDS: solid industrial waste, rate of release, municipal refuse landfill operations

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Digital Image Analysis of Particles in a Turbulent Wind

PROJECT NO: 372G
START DATE: 11/87

SHORT TITLE: Airborne Particulates/Image Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: J.F. Keffer
University of Toronto

LIAISON OFFICER (name, location, telephone no.): G. Diamond
Air Resources Branch
965-4081

OBJECTIVE(S):
- To create a comprehensive data-base comprising particle-trajectory and turbulent wind statistics and to correlate these statistics via regression analysis.
- To develop and implement a random-flight Lagrangian model for predicting particle-trajectory statistics.

PROJECT DESCRIPTION:
- a wind-tunnel investigation of the turbulent-wind erosion of mono-dispersed and poly-dispersed particulate matter will be carried out for a wide variety of controlled profiles and surface conditions.
- a novel state-of-the-art flow-visualization/digital-image analysis technique will be used to determine particle-trajectory characteristics.
- Hot-wire anemometry and statistical signal-analysis methods will be used to determine the turbulent-wind characteristics.
- The particle-trajectory information will be correlated with the turbulent-wind statistics via multiple-regression analysis.
- An environmental Lagrangian particle-trajectory model will be developed and calibrated with measured particle-trajectory data.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):				140.2
	Work Years:				

Budget Source: RAC

KEYWORDS: digital image analysis, particle trajectory, turbulent wind statistics, wind tunnel, correlation, lagrangian model

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Development of Monitoring Methods for Odorous Organics in Ambient Air

PROJECT NO: 373C
START DATE: 11/87

SHORT TITLE: Ambient Air/Monitoring Methods

PRINCIPAL INVESTIGATOR AND AFFILIATION: Cecilia Chan
Mann Testing Lab. Ltd.

LIAISON OFFICER (name, location, telephone no.): P. Steer
Air Resources Branch
965-4081

OBJECTIVE(S): To develop a complete sampling and analytical protocol for the low level determination and quantification of 4 classes of odourous compounds. The specific objects are:
- to review available analytical methods for the sampling and analysis of the odorous organics in ambient air;
- to assess possible problems associated with the application of these methods under actual field conditions;
- to design and develop a suitable sampling and analytical protocol for each class of odorous compounds;
- to thoroughly evaluate the methods under both laboratory and field conditions.

PROJECT DESCRIPTION: To develop a unique method for each compound class that will give prompt results with a high degree of accuracy. A number of techniques will be investigated, including: in-situ derivatization on impregnated sorbents; adsorption/thermal desorption; collection and reaction with a reagent in an absorber; and other preconcentration techniques. The projects will be divided into 4 distinct phases, each pertaining to the development/evaluation of a specific class of compounds. The total time frame for each compound class will be about 6 months and a final report will be submitted to the MOE for review and approval.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):	103.3	67.5		185.0
	Work Years:				

Budget Source: RAC

KEYWORDS: ambient air, odourous, organics, sampling, analysis

OUTPUT (papers, presentations, reports): one for the class "Aliphetic Aminies", one for Carbonyl Compounds

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: To Evaluate Beach Use Benefits Related to Water Quality Improvements

PROJECT NO: 374C
START DATE: 11/87

SHORT TITLE: Water Quality/Beach Use Benefits

PRINCIPAL INVESTIGATOR AND AFFILIATION: M. Fortin
Ecologistics Limited

LIAISON OFFICER (name, location, telephone no.): L. Coplan
Policy and Planning Branch
323-4420

OBJECTIVE(S): To develop an evaluation procedure to forecast potential benefits of proposed beach water quality rehabilitation measures. The study objectives are to:
- monitor beach use and beach attributes (including water quality) over time at several sites;
- complete a user survey;
- develop, verify and compare contingent valuation and travel cost models for beach recreation; and
- incorporate model results into a beach use planning tool to evaluate water quality improvements.

PROJECT DESCRIPTION: The study will involve season-long (June to August) monitoring of environmental conditions and beach use as well as beach user surveys. Collected data will be used to estimate alternative beach-use valuation models (travel cost and contingent value) incorporating water quality. Model results will then be used to develop a planning tool for estimation of changes in beach use levels and associated benefits arising from water quality improvements.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):				79.1
Work Years:				

Budget Source: RAC

KEYWORDS: beach use model, water quality, user survey, benefit forcasting

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Solid Phase Extraction of PAH's from Drinking Water and Analysis of Chlorophenols and Phenoxy-acid Herbicides in Water

PROJECT NO: 376G
START DATE: 11/87

SHORT TITLE: Drinking Water/Hydrocarbon Removal

PRINCIPAL INVESTIGATOR AND AFFILIATION: B. Craig
Paracel Laboratories Ltd.

LIAISON OFFICER (name, location, telephone no.): D. Hall
Laboratory Services Branch
235-5910

OBJECTIVE(S): (1) To determine the feasibility of using Solid Phase Extraction (SPE) in the analysis of polynuclear aromatic hydrocarbons (PAH's) in water. (2) To complete the work conducted previously as a feasibility study on the solid phase extraction of chlorophenols and phenoxy-acids so that this methodology may be adopted as a routine procedure by the Ministry and to improve the derivatization and clean-up procedures for these compounds.

PROJECT DESCRIPTION: The feasibility study of solid phase extraction of PAH's will include:
- an in-depth critical review of the literature;
- selection of the best solid phase;
- selection of the best supplier;
- determination of the stability of lots;
- investigation of methods to reduce interferences;
- determination of recoveries;
- application to real samples; and
- determination of the stability of adsorbates.

The project on analysis of chlorophenols and phenoxy-acid herbicides involves fine-tuning the existing methodology for the solid phase extraction of chlorophenols and phenoxy-acid herbicides from water. This work will decrease the levels of interferences in these samples and examine the parameters that affect the reproducibility and accuracy of the methodology. Also, a variety of derivitization procedures for the characterization of these compounds will be studied.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):				100.0
	Work Years:				

Budget Source: RAC

KEYWORDS: solid phase extraction, water, polynuclear aromatic hydrocarbons (PAH's), chlorophenols, phenoxy-acid herbicides, method optimization

OUTPUT (papers, presentations, reports): Papers presented at the Technology Transfer Conferences 1987-1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Applications of Gas Phase Ion Chemistry to Problems in the Chemical Ionization Mass Spectrometric Analysis of Trace Organics

PROJECT NO: 377G
START DATE: 10/87

SHORT TITLE: Trace Organics/Mass Spect. Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. T.B. McMahon
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): E.J. Reiner
Laboratory Services Branch
235-5903

OBJECTIVE(S):

- To investigate ion-molecule reactions of potential CI reagent ions with compounds of environmental interest
- To develop new more sensitive, selective CI methods.

PROJECT DESCRIPTION:

A general survey of gas phase ion molecule reactions involving trace organic chemicals present as environmental contaminants will be conducted. Potential CI methods will be devised and tested.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				45.0
	Work Years:				2.1

Budget Source: RAC

KEYWORDS: gas phase ion chemistry, mass spectrometric analysis, trace organics

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Development of an Optimum System for the Application and Regeneration of Powdered Activated Carbon in Water Treatment Plants

PROJECT NO: 379C
START DATE: 11/87

SHORT TITLE: Water Treatment/Powdered Activated Carbon

PRINCIPAL INVESTIGATOR AND AFFILIATION: A. Benedek
Zenon Environmental Inc.

LIAISON OFFICER (name, location, telephone no.): J. Dart
Water Resources Branch
323-4876

OBJECTIVE(S):
(1) To develop process design criteria for application of powdered activated carbon (PAC) in drinking water treatment for the removal of toxic organic contaminants. (2) To develop an optimized PAC contacting system, and carry out field tests. (3) To develop a conceptual plan for Southwestern Ontario water plants for the application and assess the potential of regenerating PAC in an environmentally acceptable and convenient mode of operation.

PROJECT DESCRIPTION: The proposed two-phase study will develop process design criteria for removal of toxic organic contaminants from drinking water, by application and regeneration of PAC. Laboratory bench-scale studies will be implemented to identify and optimize the most promising system and a pilot-scale study will be carried out utilizing the developed process. Based on these results, design criteria, a technical and economic assessment, as well as an approach to implementation in Southwestern Ontario will be developed.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				370.0
	Work Years:				
Budget Source:					

KEYWORDS: powdered activated charcoal, toxic organics removal, drinking water, field tests, regeneration, conceptual planning

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Regeneration aspects de-emphasized except for stressing floc-free carbon separation suitable for regeneration.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: The Carbon and Sulfur Cycle in Shallow, Unconfined Aquifer Systems

PROJECT NO: 382G
START DATE: 11/87

SHORT TITLE: Groundwater/Carbon and Sulfur Cycle

PRINCIPAL INVESTIGATOR AND AFFILIATION: R.W. Gillham
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): W. Blackport
West Central Region
521-7703

OBJECTIVE(S): To gain a better insight into the role of organic carbon, both dissolved and solid, in redox processes that occur in shallow groundwater systems. The role and fluxes of carbon in two shallow unconfined aquifer systems near Alliston and Rodney will be assessed in light of sulfate reduction and denitrification processes that occur.

PROJECT DESCRIPTION:

Groundwater monitoring equipment will be installed in two unconfined sandy aquifers. Stratigraphy and soil profiles will be interpreted from coring of the aquifers. Comprehensive geochemical and isotopic sampling of the groundwater will be performed over one year to assess seasonal variations in recharge, fluxes of sulfur and carbon, and water chemistry.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				68.5
	Work Years:				

Budget Source: RAC

KEYWORDS: shallow groundwater system, carbon and sulphur cycle, redox processes

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: The Origin and Distribution of Methane in the Alliston Sand Aquifer

PROJECT NO: 383G
START DATE: 11/87

SHORT TITLE: Groundwater/Alliston Sand Aquifer

PRINCIPAL INVESTIGATOR AND AFFILIATION: J.F. Barker
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): W. Blackport
West Central Region
521-7703

OBJECTIVE(S):

To identify both the origin of methane in the Alliston sand aquifer and the goechemical and hydrogeological factors controlling its distribution.

PROJECT DESCRIPTION:
Existing data will be reviewed and additional groundwaters will be collected. These will be analyzed for the distribution of carbon between the organic, inorganic and methane components and for the carbon and hydrogen isotope distributions. The mode of origin of the methane will be interpreted and the factors controlling the distribution of methane will be identified. If possible, management practices will be identified which could minimize the current water quality problems caused by methane in the Alliston and other aquifers.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):				63.2
	Work Years:				

Budget Source: RAC

KEYWORDS: methane, groundwater, origin, distribution controlling factors

OUTPUT (papers, presentations, reports): TTC Conference

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Hamilton Air: Chemical Composition and Genotoxic Activity of Respirable Particulate and Organic Varpours

PROJECT NO: 386G
START DATE: 01/88

SHORT TITLE: Air Quality/Hamilton

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D. Macalla
McMaster University

LIAISON OFFICER (name, location, telephone no.): D. Corr
West Central Region
521-7705

OBJECTIVE(S): Determine what levels of airborne mutagenicity can be detected on respirable particles in the Hamilton airshed as a function of season and meteorological conditions. Determine if a simple mammalian index of genotoxic hazard can be developed using a post labelling technique which permits the quantitation of DNA adducts formed with activated carcinogens. Determine what chemical classes contribute to the mutagenicity of Hamilton air. Determine how total airborne mutagenicity related to the air quality index.

PROJECT DESCRIPTION: Preparation of reference sample by extraction of air particulate samples collected by D. Pengelly, et al. Fractionation of reference sample and characterization of fractions for mutagenicity in the Ames/Salmonella assay. Testing of mutagenic PAH fractions for DNA adduct formation using the ^{32}P-postlabelling assay with bacteria and/or rabbit tracheal cells. Chromatographic analysis of PAH fractions derived from reference sample. Designation of tracers for source apportionment. Initial collections of respirable air particulate samples from three locations in Hamilton.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				130.0
	Work Years:				2.8

Budget Source: RAC

KEYWORDS: airborne mutagenicity, respirable particles, air quality index, AMEs test, rabbit tracheal cells

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Partial Support of a Collection of Algal, Microbial and Plant Cell Cultures

PROJECT NO: 387G
START DATE: 02/88

SHORT TITLE: Algal, Microbial and Plant Cell

PRINCIPAL INVESTIGATOR AND AFFILIATION: P. Stokes
University of Toronto

LIAISON OFFICER (name, location, telephone no.): K. Nicholls
Water Resources Branch
235-5810

OBJECTIVE(S): To develop and maintain a research collection of microorganisms (algae, cyanobacteria, selected bacteria) and higher plant cells which will be used extensively in research on environmental science, environmental engineering, algal physiology and ecology and plant biotechnology (including algae and higher plants). To provide a resource centre for plasmid vectors and plasmid-borne clone banks constructed from photosynthetic organisms and gene-specific cloned DNA to be used as probes. To create and implement an information network for researchers to provide computer access to this collection and link with other culture collections.

PROJECT DESCRIPTION: The University of Toronto Culture Collection is a facility of the Institute for Environmental Studies and the Department of Botany and was initiated in late 1986 with a one-year grant from the Ontario Ministry of Colleges and Universities Excellence Fund. At present, about 150 isolates of algae and cyanobacteria are being cultured, including 30 isolates from acidified, organically or metal polluted waters. We anticipate that at full capacity the UTCC will be maintaining about 1000 isolates. As far as possible the cultures will be maintained in axenic condition and in defined media, as is required for most research applications. The Ministry of the Environment will have access to this culture collection.

BUDGET AND RESOURCES: Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	12.0	12.0	12.0	36.0
Work Years:				

Budget Source: RAC

KEYWORDS: culture collection, algae, cyanobacteria, bacteria, higher plant cells, plosmids, environmental research, ENA probes

OUTPUT (papers, presentations, reports): Progress Report March 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X | Contract X | Solicited X
INTERNAL | Grant | Unsolicited

PROJECT TITLE: Sampling of Biomedical Waste Incinerators
PROJECT NO: 388C
START DATE: 02/88

SHORT TITLE: Waste Incineration/Biomedical Waste Incinerators

PRINCIPAL INVESTIGATOR AND AFFILIATION: Shekar Viswanathan, Clayton Environmental Consultants

LIAISON OFFICER (name, location, telephone no.): V. Ozvacic, Air Resources Branch, 965-5776

OBJECTIVE(S): Perform stack sampling at ten biomedical waste incinerators. Using separate sampling trains, collect stack samples for the following analyses: a) particulates, trace metals and hydrogen chloride, b) trace organic species - PAHs, PCDDs, PCDFs, PCBs, chlorobenzenes, and chlorophenols, c) volatile organic species such as chloroform, benzene ethylene chloride, d) bacteria, spores and viruses. Record quantities and classifications of wastes and observe incinerator operations during sampling. Weight the ash residue after each batch incineration and prepare a representative sample of this ash for chemical and other analyses and a leachate study. Transport all samples to the Ministry's laboratories. Provide a comprehensive report after completion of this study (including two preliminary reports).

PROJECT DESCRIPTION: The compounds of interest will be determined by employing techniques consistent with the following documents: A method of Measure Emissions of Particulate Matter, Metals and Hydrogen Chloride from Stationary Sources, Environmental Protection service (April, 1985); ASME Protocol Sampling for the Determination of PCDDs, PCDFs, PAHs, PCBs, Chlorobenzenes, and Chlorophenols; Protocol for the collection and analysis of Volatile POHCs using VOST - EPA report 600-8-84-007, (March, 1984); Method 5 Stack Sampling Program for the Determination of Bacteria, Spores and Viruses. In addition, the incinerator operations will be recorded during each sampling period. A preliminary test will be carried out to obtain data for nozzle sizing and derivation of isokinetic sampling parameters. A total of three tests will be conducted on each site for compounds of interest under normal operating conditions.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	150.0	250.0		400.0
Work Years:				

Budget Source: ARB/RAC

KEYWORDS:

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Funding Schedule FY 87/88 $150,000 ARB
FY 88/89 $250,000 RAC

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X INTERNAL	Contract X Grant	Solicited Unsolicited X

PROJECT TITLE: Modelling Higher Moments of the Concentraton Probability Distribution (Concentration Fluctuations)

PROJECT NO: 389C
START DATE: 08/89

SHORT TITLE: Concentration Fluctuations Modelling

PRINCIPAL INVESTIGATOR AND AFFILIATION: E. Alp
Concord Scientific Corp.

LIAISON OFFICER (name, location, telephone no.): P.K. Misra
Air Resources Branch
235-5768

OBJECTIVE(S):

Development of a state-of-the-art model for estimating concentration fluctuation (second moment).

PROJECT DESCRIPTION:

Literature review of available models and data, implementation of (a) selected model(s) and testing against data; fundamental development work for enhancing the capabilities of the model, investigation of incorporation into the regulatory framework.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	25.0	45.0		70.0
	Work Years:				

Budget Source: RAC

KEYWORDS: concentration fluctuation model, concentration probability distribution

OUTPUT (papers, presentations, reports): Presentation at the Ministry's Technology Transfer Conference, reports and possibly paper.

EXTERNAL PARTICIPATION (ministries, governments, agencies): No direct involvement by other agencies except that some data are coming from the Alberta Energy Research and Conservation Board.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Mutagenicity Studies and Risk Estimation of Complex Mixtures of Organic Airborne Contaminants

PROJECT NO: 390G
START DATE: 01/88

SHORT TITLE: Mutagenicity/Risk Estimation

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D.M. Logan
York University

LIAISON OFFICER (name, location, telephone no.): M. Salamone
Water Resources Branch
235-5790

OBJECTIVE(S):
Test nine airborne mutagens in four mutagenicity assays. Measure toxicity singly and mutagenicity both singly and in defined combinations. Using these data, to develop a process by which one can predict the biological response to complex atmospheric mixtures of pollutants.

PROJECT DESCRIPTION:

Pure samples of the 9 individual compounds will be tested for toxicity and classified regarding mutagenic potency into four categories, inactive, weakly active, moderately and strongly mutagenic. Synergistic or inhibitory effects will be determined on a range of pairwise combinations of pollutants representing the three different groups, ie., PAHs promutagens, nitro-PAHs and halogenated hydrocarbons. The first year will use primarily the Ames and micronucleus assays.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				100.0
	Work Years:				2.23

Budget Source: RAC

KEYWORDS: airborne mutagens, toxicity, biological response, risk estimation

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: ACPOP - Aqueous Organic Pollutant Mineralizer

PROJECT NO: 391C
START DATE: 05/88

SHORT TITLE: Aqueous Organic Pollutant Mineralizer

PRINCIPAL INVESTIGATOR AND AFFILIATION: M. Robertson
Nutech Energy Systems Inc.

LIAISON OFFICER (name, location, telephone no.): O. Meresz
Laboratory Services Branch
235-5762

OBJECTIVE(S): Prime objective is to produce a fixed anatase mineralizer capable of treating solutions with 10 ppm organics with a destruction efficiency of 95% at an operating cost of 0.04¢/litre.
Secondary objectives are to generate a systematic body of chemical and engineering data needed to develop the mineralizer, develop an anatase coating with a specific area of $50m^2/gm$, develop an anatase coating with high affinity for organic molecules in the absence of light, to further identify market niches for the mineralizer, and to evaluate the economics of different mineralizer applications.

PROJECT DESCRIPTION: Present technologies for the removal of low level organics from water are unable to destroy stable organic pollutants. However, Nutech's ACPOP mineralizer is able to convert organics to carbon dioxide and water. To accomplish this, contaminated water is passed through a support matrix to which photoactive titanium dioxide (anatase) has been covalently bonded. The matrix is simultaneously exposed to ultraviolet light in the range of 340-370 nm.

This process, which has been successful in bench-scale testing of the prototype, represents an exciting breakthrough in destruction of organics in a variety of matrices, and has a number of practical applications if it proves to be successful in the pilot scale study.

BUDGET AND RESOURCES: Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	300.0	50.0		350.0
Work Years:				

Budget Source: RAC

KEYWORDS: photochemical mineralization, trace organics, destruction indilute aqueous solutions

OUTPUT (papers, presentations, reports): Presentation at the MOE Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Co-Funded by NRC-IRAP program, Funding $655,000

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: A Study of Geochemical Modification of Groundwater Discharging Into Surface Waters From an Industrial Disposal Site

PROJECT NO: 392G
START DATE: 04/88

SHORT TITLE: Groundwater/Industrial Disposal Site

PRINCIPAL INVESTIGATOR AND AFFILIATION: D.R. Lee
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): W. Wager
Sarnia Regional Office
(519) 336-4030

OBJECTIVE(S): The first objective is to determine changes in major ion chemistry during groundwater discharge at a major offshore discharge area in the St. Mary's River near a slag disposal site. The long-term objective is to develop and exercise new methods for assessing the impact of offshore contaminant plumes by providing quantitative data on solute transport and model predictions for a range of geochemical conditions in discharge zones.

PROJECT DESCRIPTION: The proposed work is a study of groundwater as a source of non-point pollution to surface water. It is now possible to locate offshore zones of groundwater and contaminant discharge using a weighted probe containing temperature and electrical conductance sensors. The probe has been used successfully at both Cape Cod and Sault Ste. Marie. Thus, for the first time it is possible to quantify the geochemical changes that occur during the final metres of groundwater flow into surface waters. At the proposed study site the groundwater has been massively modified by leachate from an adjacent slag dump. Qualitative observation and chemical theory both support the fact that large chemical changes will occur in groundwater discharge environments. However, there has been little quantitative work in this subject. The topic is pertinent because without consideration of this goechemical interface it will not be possible to predict solute fluxes from zones of onshore groundwater contamination to contiguous surface waters.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	16.8	12.3		29.1
Work Years:				

Budget Source: RAC

KEYWORDS: geochemical, contaminant plumes, conductance, leachates, fluxes

OUTPUT (papers, presentations, reports): Progress Report March 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Measuring Groundwater Velocity and Hydrodynamic Dispersion in a Single Fracture in Fractured Shale

PROJECT NO: 393G
START DATE: 04/88

SHORT TITLE: Groundwater/Hydrodynamics, Shale

PRINCIPAL INVESTIGATOR AND AFFILIATION: J.A. Cherry
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): M. Goodwin
Waste Management Branch
323-5217

OBJECTIVE(S): To investigate the relation between the fracture aperture width, 2b, determined from hydraulic tests and tracer experiments, and compare to the true aperture. Develop different field measurement techniques and evaluate for accuracy in predicting groundwater velocity. Determine the relation between the aperture density distribution and hydrodynamic dispersion. To determine whether a stochastic approach will be required to account for macroscopic hydrodynamic dispersion at the local field scale.

PROJECT DESCRIPTION: The University of Waterloo, in a study funded by the Ontario Ministry of the Environment, has located and characterized a high-permeability fracture zone in a low-permeability fractured shale. High-permeability zones such as these are common near ground surface in the shales of southern Ontario and can provide important pathways for contaminant migration. Recent evidence from the University of Waterloo study and other work has suggested that there is considerable uncertainty in the accuracy of predictions of groundwater velocity along such fracture planes. To investigate this, the University proposes to characterize the fracture zone at the Waterloo study site in considerably more detail and with a view to developing new hydraulic and tracer testing techniques for more accurately determining the parameters necessary for predicting groundwater velocity. To assess the newly developed and existing techniques, velocity predictions based on the results of the site characterization will be compared to the results of a natural gradient tracer experiment in which the actual groundwater velocity will be measured. In addition, physical inspection of the fracture plane surfaces will be undertaken to aid in the comparison of results. As a result of the findings, the University hopes to provide recommendations or guidelines for the use of hydraulic testing techniques in fractured shale.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):	40.0	40.0	40.0	120.0
	Work Years:				

Budget Source: RAC

KEYWORDS: groundwater velocity, fracture planes, improved measurement, prediction

OUTPUT (papers, presentations, reports): Progress Report June 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Fish Waste Production - Rainbow Trout Culture

PROJECT NO: 394G
START DATE: 04/88

SHORT TITLE: Fish Waste Production

PRINCIPAL INVESTIGATOR AND AFFILIATION: P.S. Chisholm
University of Guelph

LIAISON OFFICER (name, location, telephone no.): A. McLarty
West-Central Region
333-0234

OBJECTIVE(S): Year 1: To develop a preliminary model to estimate waste production from rainbow trout culture facilities, in relation to fish growth. Year 2: Test the preliminary waste production model based upon sampling of wastes produced by actual fish populations at selected growth stages.

PROJECT DESCRIPTION: Waste production from rainbow trout culture will be modelled for a range in fish mass 2 grams (initial mass) < mass (t) < 350 grams (finished mass). Modelling will be based upon fish growth in relation to temperature, corresponding intake of feed of known composition, related digestibility and excretion ratios. Dissolved, suspended and settled waste streams will be modelled and described in terms of concentration of settleable and suspended solids, settleable and suspended phosphorus, dissolved phosphorus, settleable and suspended nitrogen, dissolved nitrogen, ammonia. Nitrogenous and carbonaceous oxygen demands will be estimated for dissolved, suspended and settled waste streams. Model estimates, related fish growth, feed conversion, digestibility and excretion parameters will be tested in relation to measured waste production from fish samples maintained in an experimental environment representative of a well managed fish rearing operation. Waste production at four fish growth stages will be monitored in dissolved suspended and settled waste streams. Reconciliation of modelled and measured waste streams will be based upon independent results reported in the literature and known ranges in the waste production parameters incorporated in the model.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	11.4	11.5		22.9
Work Years:				

Budget Source: RAC

KEYWORDS: aquaculture, rainbow trout, waste production, model, solids

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Tillage and Event Based Soil and Phosphorus Loss

PROJECT NO: 396G
START DATE: 04/88

SHORT TITLE: Soil/Tillage Systems

PRINCIPAL INVESTIGATOR AND AFFILIATION: R. Kachanoski
University of Guelph

LIAISON OFFICER (name, location, telephone no.): D. Draper
Water Resources Branch
323-4988

OBJECTIVE(S): To determine the effect of tillage systems (conventional, minimum, no-till) on phosphorus/soil loss and associated enrichment ratios for three representative soils (sandy, silt and clay loam). To determine seasonal variation in phosphorus and soil losses on different landscape positions with simulated rainfall. To determine annual phosphorus and soil losses from soil landscapes for natural precipitation events. To establish linkages between plot scale and landscape scale phosphorus and soil loss data for different tillage systems.

PROJECT DESCRIPTION: A study is proposed to obtain information on the seasonal variation of sediment and phosphorus loss for different tillages, landscape positions, and soil type combinations using rainfall simulation and natural precipitation events. The project will make use of existing tillage treatments and soil information being collected in the provincial Tillage-2000 program. Three tillage systems (conventional, minimum, and no-till) will be monitored on sand, silt, and clay loam soils. Two rainfall intensities will be simulated. The project will compare seasonal changes in sediment and P loss data from the microplots to an average annual value being estimated for the sites using cesium-137 as a natural tracer. The study will establish linkages between plot scale and landscape scale phosphorus and sediment loss data which can be used in an event based sediment transport model.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):	67.5	67.5	67.5	202.5
	Work Years:				

Budget Source: RAC

KEYWORDS: tillage systems, landscape positions, precipitation, phosphorus/soil loss

OUTPUT (papers, presentations, reports): Progress Report August 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Progress is monitored by the Canada-Ontario Agreement Non-point Source Committee.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: An Integral Model Study of the Airborne Chemical Contaminants from Chemical Plants and Research Buildings: Their Detection, Identification and a Proposed Method for Their Elimination

PROJECT NO: 400G
START DATE: 04/88

SHORT TITLE: Airborne Contaminants/Model Study

PRINCIPAL INVESTIGATOR AND AFFILIATION: C. Depew, Queen's University

LIAISON OFFICER (name, location, telephone no.): R. Chapman, Air Resources Branch, 965-4081

OBJECTIVE(S): To establish an integral model on a total study of some airborne contaminants originated from typical chemical plants and laboratories in Ontario. The model will select two typical classes of air pollutants: nitrogen oxides (inorganics) and substituted aromatic and polyaromatic hydrocarbons (organic). The overall model study involves the establishment of sampling and detection procedures, and the development of a new method for the elimination of the contaminants from air.

PROJECT DESCRIPTION: Document and review of existing sampling/detection technologies; defining procedures for air sampling from the exhaust air originating from the Queen's University research buildings. Experimental set-up of a time-averaged dual laser-fluorescence spectrometrical measurement technique for simultaneous measurement of nitrogen oxides and selected polyaromatic and substituted aromatic hydrocarbons. Proposal and design of a microwave-filtering device/technique for the removal/elimination of airborne contaminants from air samples collected and defined by previous studies.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	33.1	33.1	37.8	104.0
Years:	2.0	2.0		4.0

Budget Source: RAC

KEYWORDS: chemical buildings, airborne contaminants, air filters, microwave catalyzed destruction

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Atmospheric Measurements of Natural Hydrocarbons Using Gas Chromatograph/Mass Spectrometry

PROJECT NO: 401G
START DATE: 04/88

SHORT TITLE: Hydrocarbons/Atmospheric Measurements

PRINCIPAL INVESTIGATOR AND AFFILIATION: H. Niki
York University

LIAISON OFFICER (name, location, telephone no.): M. Sage
Air Resources Branch
965-4081

OBJECTIVE(S): To measure, using gas chromatography/mass spectrometry, a number of key volatile organic species, particularly biogenic hydrocarbons in the oxidant/acid rain problem to be compared against model predictions and also to gain a better understanding of atmospheric chemistry in a Canadian setting, as part of the Eulerian Model Evaluation Study.

PROJECT DESCRIPTION: The proposal measurement program will be related to the CIRAC-endorsed Canadian Atmospheric Chemistry Study as part of the Eulerian Model evaluation Field Study. Air samples collected at the Ministry's site at Dorset and other appropriate forested areas will be analyzed by GC/MS in the laboratory mainly for natural hydrocarbons such as isoprene and terpenes. An important component of this program is a critical evaluation and improvement of existing sample collection and handling techniques employed for GC/MS based identification and quantification of these labile compounds.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):	120.0	68.2	68.2	256.4
	Work Years:				

Budget Source: RAC

KEYWORDS: hydrocarbons, volatile organics, atmospheric measurement, natural organics

OUTPUT (papers, presentations, reports):
Progress Report May 1989, Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of Standards for Safe Gas Composition Limits and of a System to Shorten the De-energization (Outage) of Electrostatic Precipitators in Cement Plants During Explosive Conditions

PROJECT NO: 402G
START DATE: 04/88

SHORT TITLE: Gas Composition Limits

PRINCIPAL INVESTIGATOR AND AFFILIATION: I. Inculet, University of Western Ontario

LIAISON OFFICER (name, location, telephone no.): J. Manuel, London Regional Office, (519) 661-2200

OBJECTIVE(S):
Development of Standards for Safe Gas Composition Limits and of a System to Eliminate or Shorten the De-energization (Outage) of Electrostatic Precipitators in Cement Plants During Explosive Conditions.

PROJECT DESCRIPTION: Analysis of composition of the gases which enter the electrostatic precipitators installed in two representative cement plants in Ontario as chosen by the Ontario Ministry of the Environment. Tests to determine the minimum ignition energy levels for the above gas mixtures. Tests to investigate the effects of the dust loadings on the minimum ignition energy levels. Tests to determine the time characteristics of pre-spark discharge currents in selected CO/H_2 mixtures. Development of an electronic system for channeling the sparking outside the electrostatic precipitators installed in cement plants.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	35.5	26.0		61.5
Work Years:				

Budget Source: RAC

KEYWORDS: stack gas, explosive conditions, precipitation outage, ignition energy levels.

OUTPUT (papers, presentations, reports): Technology Transfer Conference presentation November '89, Final Report Spring 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies): University of Western Ontario, (+two cement manufacturing plants).

COMMENTS: Research results may assist cement plants in reducing the number and duration of electrostatic precipitation outages.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Determination of the Dose-Responses for Tissue Contamination and Growth of Vegetable Crops Exposed to Chronic Levels of Organic Environmental Contaminants Originating from Industrial Processes

PROJECT NO: 405G
START DATE: 04/88

SHORT TITLE: Organic Contaminants/Dose-Response Study

PRINCIPAL INVESTIGATOR AND AFFILIATION: D. Ormrod
University of Guelph

LIAISON OFFICER (name, location, telephone no.): D. Harper
Air Resources Branch
456-2504

OBJECTIVE(S): To establish bioaccumulation of trichloromethane and phenol through foliar exposure at concentration ranges including ambient standards using radish, lettuce and tomato. To establish bioaccumulation of trichloromethane and phenol through contamination of the root zone at a range of concentrations including ambient standards using radish, lettuce and tomato. To assess the relative importance of foliar and root exposures to bioaccumulation of these compounds in plant tissue, and establish partitioning indices as well as dose-response relationships between the two pathways of exposure and tissue accumulation. To assess the phytotoxicity of these compounds by root, foliar, and root and foliar exposure. Phytotoxicity will be evaluated by determining dose-response relationships between growth parameters and contaminant concentrations applied to the growing medium.

PROJECT DESCRIPTION: The current emphasis on evaluating the environmental hazard of various phytoaccumulation and phytotoxicity exists for a few compounds and a small variety of plants, it is insufficient data to thoroughly predict the impact of industrial contamination on human dietary ingestion, and on growth processes of the plants themselves. Uptake by plants may occur via two pathways, foliar and root; the pathway may influence the eventual concentration of contaminants in edible portions, or the growth effects on different plant parts. The predominant pathway will depend on the medium which is contaminated, although in many situations both soil and air will be part of plant exposure. There is a need for an integrated study which evaluates the effects of chronic concentrations of several contaminants on three vegetable groups (root vegetables, leafy vegetables and fruit vegetables), by comparing the roles of the pathway of exposure on phytoaccumulation in various plant parts, injury and growth suppression. This research will lead to a better understanding of how industrial contaminants are partitioned in the terrestrial environment, leading to better human and eco-risk assessment.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				46.4
	Work Years:				

Budget Source: RAC

KEYWORDS: bioaccumulation, radish, lettuce, tomato, foliar, root zone, partitioning indices, dose-response, phytotoxicity

OUTPUT (papers, presentations, reports): Progress Report March 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: An Investigation of Vibration Isolation in a House for Reduction of Train Vibration

PROJECT NO: 407C
START DATE: 04/88

SHORT TITLE: House Isolation/Train Vibration

PRINCIPAL INVESTIGATOR AND AFFILIATION:

J. Rainer
National Research Council
Canada

LIAISON OFFICER (name, location, telephone no.):

V. Schroter
Land Use Planning Section
323-4463

OBJECTIVE(S): To determine the characteristics of ground vibrations from trains at two locations.

To determine the effectiveness of a given vibration method in reducing train-induced vibrations in a test house.

PROJECT DESCRIPTION:

This proposal is in 3 parts. Each part is self-contained; however, the parts complement each other, so that a comprehensive investigation into train vibration effects on houses will emerge. Part I consists of evaluating transducer mounting techniques in the ground so that reliable measurements can be assured. Part II characterizes the ground vibrations from trains at 2 locations, and Part III evaluates the effectiveness of a vibration isolation method in a test house.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	20.7	52.7		73.4
Work Years:				

Budget Source: RAC

KEYWORDS:

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract X	Solicited
INTERNAL X	Grant	Unsolicited X

PROJECT TITLE: Landfill Monitoring Protocol Development for Ontario

PROJECT NO: 410C
START DATE: 04/88

SHORT TITLE: Protocol Development

PRINCIPAL INVESTIGATOR AND AFFILIATION: Hans Mooij
Waste Management Branch
(previously with - H. Mooij & Associated Ltd.)

LIAISON OFFICER (name, location, telephone no.): G. Hughes
Waste Management Branch
323-5216

OBJECTIVE(S): To develop practicable recommendations to the Ministry of the Environment, based on expert concensus positions and documented present practices and procedures, for the development of landfill leachate and groundwater quality monitoring protocols and procedures.

PROJECT DESCRIPTION: The Ministry of the Environment has developed draft guidelines on monitoring landfills. These guidelines specify monitoring objectives and performance rather than methodology. The research project will document current monitoring practices in Ontario and other jurisdictions. This will be the basis of a background document which will serve as the subject for a round-table discussion between selected experts in the field of landfill monitoring in order to develop consensus positions on all aspects of monitoring program protocols, procedures and practices. Particular attention will be paid to the merits of establishing guidelines that specify acceptable and required monitoring methodology.

This research approach will be assessed with respect to its applicability in the development of other Ministry guidelines.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):				21.6
Work Years:				

Budget Source: RAC

KEYWORDS: landfill leachate, groundwater, monitoring procedures recommendations, expert concensus

OUTPUT (papers, presentations, reports): Progress Report 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: As H. Mooij is now on staff, it is planned to complete the work in house.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Glassification and Leachability of Hazardous Waste Residues

PROJECT NO: 411C
START DATE: 04/88

SHORT TITLE: Glassifiction

PRINCIPAL INVESTIGATOR AND AFFILIATION: K.B. Harvey
Atomic Energy Research Laboratories

LIAISON OFFICER (name, location, telephone no.): G. Castonguay
Waste Management Branch
323-5214

OBJECTIVE(S): To make a first estimate of the value of immobilizing hazardous waste materials and residues in a silicate glass matrix. If the resulting concentrations or rates of release into simulated groundwaters are significantly reduced when compared with conventional methods for immobilization, this could form the basis for the development of low- or controlled-release waste forms, and of novel means for the treatment and disposal of hazardous wastes.

PROJECT DESCRIPTION: A simulated hazardous waste residue will be immobilized in a soda-lime silicate glass under conditions that will simulate several waste types, and immobilization routes. Complete chemical analyses of the starting materials and of the completed waste forms will be made in order to determine the effect of different treatment routes on any loss of volatile metals.
Release from the waste forms into water or simulated leachate will be measured both by the standard leachate extraction procedure, and by an extended dynamic test, at 20 to 25°C, and at 10°C to simulate an average year-round ground temperature. Release from the waste forms will be followed both by chemical analysis of the leachants, and by the addition of radioactive tracers.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	15.0	31.0	15.8	61.8
Work Years:	1.0	1.0	1.0	3.0

Budget Source: RAC

KEYWORDS: hazardous wastes, groundwater, immobilization, glassification, leachability

OUTPUT (papers, presentations, reports): pending, until completion of project Interim Report August 1988, Interim Report August 1988, Interim Report February 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Chlorinated and Nonchlorinated Organics Storage Studies

PROJECT NO: 412C
START DATE: 04/88

SHORT TITLE: Organic Storage Studies

PRINCIPAL INVESTIGATOR AND AFFILIATION: Neaves
Enviroclean

LIAISON OFFICER (name, location, telephone no.): Patrick W. Crozier
Laboratory Services Branch
235-5910

OBJECTIVE(S): The main objective of the proposed study is to provide the ministry with a manual documenting the maximum storage times and conditions for which organic samples may be kept before analytical results become invalid. The project should include: Conducting a comprehensive literature review of the stability of organic compounds during storage of environmental samples, contacting other agencies such as the United States Environmental Protection Agency, Environment Canada, Canada Centre For Inland Waters, and Academic Researchers, to obtain unpublished and internal reports on the stability of organics in stored samples. Recommending storage times/ conditions for organics monitored by MOE in various matrices including water, effluents, soils/sediments, air, vegetation and biota. Identifying areas in which additional research on the storage times and conditions for organic substances is needed.

PROJECT DESCRIPTION: Phase I - Literature Review - In this phase of the project a comprehensive and critical literature review of published stability/ storage studies for organic compounds currently monitored by Ministry of the Environment organic analyses sections would be undertaken. Agencies such as the United States Environmental Protection Agency (USEPA), Environment Canada, Canadian Centre for Inland Waters (CCIW), and others identified by MOE staff should be contacted for unpublished/internal reports as well as the normal search procedures. Due to the enormous scope of the literature review, further discussion of priorities with ministry staff will be necessary. The effect of storage conditions, storage time, and matrix on compound degradation (or in some cases compound production) should be highlighted.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	47.0	17.0		64.0
Work Years:				

Budget Source: RAC

KEYWORDS: organics, storage, water, effluents, air, soils, vegetation, biota

OUTPUT (papers, presentations, reports): 3 phase manual expected as a final report and a presentation at 1989 MOE Technology Transfer Conference.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Solid Phase Extraction of Triazines and Organophosphorus Compounds from Water

PROJECT NO: 413C
START DATE: 04/88

SHORT TITLE: Phase Extraction/Phosphorus Compound

PRINCIPAL INVESTIGATOR AND AFFILIATION: W.G. Craig
Paracel Laboratories Ltd.

LIAISON OFFICER (name, location, telephone no.): D. Hall
Laboratory Services Branch
235-5910

OBJECTIVE(S): To determine if the use of solid phase extraction for the extraction of triazines and organophosphorus compounds is an appropriate analytical procedure, and

Identify which parameters, if any, of the methodology need to be studied further, or optimized, before its adoption as a routine analytical technique.

PROJECT DESCRIPTION: The possibility of using the technique of solid phase extraction will be examined for the analysis of triazine and organophosphorus compounds in water. This feasibility study will include an in-depth examination of methods to enhance recoveries and reduce interferences, as well as examining the reproducibility of the technique. Parameters to be studied include: selection of the best solid phase and eluting solvent, selection of the best supplier, determination of the stability of lots, various methods to reduce interferences, the consistency of recoveries, application to real samples, and the time stability of adsorbates.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	50.0	2.5		52.5
Work Years:				

Budget Source: RAC

KEYWORDS: solid phase extraction, water, triazine, organophosphates method optimization

OUTPUT (papers, presentations, reports): RAC Final Report & Technology Transfer Conference

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: This project is currently in the final states.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Flow Injection Sample Introduction for Inductively Coupled Plasma Atomic Emission and Mass Spectrometry

PROJECT NO: 414G
START DATE: 04/88

SHORT TITLE: FIA for ICP

PRINCIPAL INVESTIGATOR AND AFFILIATION: Eric D. Salin
McGill University

LIAISON OFFICER (name, location, telephone no.): Dr. J.F. Hopper
Laboratory Services Branch
235-5834

OBJECTIVE(S): To generate a sample introduction system for trace level determinations with the following characteristics: 1) Detection limit improvements of at least a factor of 100. 2) Reduction or elimination of matrix effects. 3) Sample throughputs of 30 to 60 per hour. 4) A chemical methodology suitable to a variety of sample types.
Secondary objectives: 1) Automation of sample input using the direct sample insertion device for icp-aes and icp-ms. 2) Feedback from the instrument (or controller) to the sample introduction system so as to provide for intelligent modification of the experiment by either changing the chemistry (select different flow injection system parameters) or handling technique (e.g. standard additions or matrix matching) when justified by "expert" computer analysis of the data. 3) Component speciation.

PROJECT DESCRIPTION: A high performance sample introduction system based on flow injection techniques will be developed for inductively coupled plasma atomic emission and mass spectrometry. The system should provide detection limit improvement factors of 100 to 10,000 for atomic emission using direct insertion and from 100 to 1,000 for mass spectrometry using direct insertion. The detection limit improvements should be even more dramatic in cases where the matrix causes drastic degradation in detection limits. The flow injection procedure should minimize matrix effects thereby enhancing accuracy. Precisions of approximately 1% are expected.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	46.5	46.5	39.5	132.5
Work Years:				

Budget Source: RAC

KEYWORDS: ICP, flow injection, ultra-trace, elemental analysis

OUTPUT (papers, presentations, reports):
Progress Report 1988. Progress Report June 1989.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Wildlife Toxicology Fund Projects

PROJECT NO: 417G
START DATE: 04/88

SHORT TITLE: Wildlife Toxicology

PRINCIPAL INVESTIGATOR AND AFFILIATION: Monte Hummel
World Wildlife Fund Canada

LIAISON OFFICER (name, location, telephone no.): J. Pagel
Research & Technology Branch
323-4576

OBJECTIVE(S): Wildlife Toxicology Fund (WTF) was established on June 4, 1985 through a Memorandum of Understanding between Environment Canada and World Wildlife Fund Canada. Its purpose is to provide high quality scientific information that can be directly applied to the protection of Wildlife in Canada from irreversible harm caused by toxic chemicals in the environment, and to enhance and develop private sector expertise, and to act as stimulus for the joint funding of research projects. The objective of this proposal is to contribute $50,000 per year for up to three years to the World Wildlife Fund to fund on a cost shared basis, projects which have been recommended for approval and cost sharing by WWF.

PROJECT DESCRIPTION: The research priorities of TWF include: Effects of agricultural and/or forestry chemicals on wildlife, effects of toxic industrial pollutants on wildlife, monitoring the success of measures taken to mitigate the effects mentioned in the above two priorities, developing and implementing techniques that use wildlife as indicators of toxic chemicals in the environment, examining environmental pathways by which toxic substances may affect wildlife. Proposals which meet the research priorities of the WTF and are recommended by the RAC will be circulated to the Research Advisory Board of WTF. If approval is obtained from both committees, and if matching funds are in place, a specified amount of MOE's contribution will be released for the project.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	50.0	50.0	50.0	150.0
Work Years:				
Budget Source:				

KEYWORDS:

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Environmental Valuation Research

PROJECT NO: 418G
START DATE: 04/88

SHORT TITLE: Environmental Research

PRINCIPAL INVESTIGATOR AND AFFILIATION: J. Knetsch
Simon Fraser University

LIAISON OFFICER (name, location, telephone no.): O. Salamon
Policy & Planning Branch
323-4561

OBJECTIVE(S): To improve the basis for economic valuation of environmental changes; to investigate assessment and policy implications of the recent findings of large disparities between willingness-to-pay and compensation-demanded measures of economic values; to study preference and choice behaviour of people with respect to alternative environmental polices; to examine various legal sanctions; and to further examine the development and use of economic experiments for research in these areas.

PROJECT DESCRIPTION: The research will be carried out in a continuing series of individual experimental and survey studies, conducted in part in Ontario. The results of earlier studies will be used to design later empirical efforts, which will take full advantage of the large degree of complimentarity among the individual studies. While the Principal Investigator will be responsible for the research, including studies in Ontario, it is anticipated that the Research Assistant and other colleagues will actively participate in expanding the research program.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):	24.9	24.5	26.0	75.4
	Work Years:				

Budget Source:

KEYWORDS: benefit valuation, measuring, non-pecuniary values, willingness-to-pay, compensation-demanded

OUTPUT (papers, presentations, reports): Presentation at 1988 Technology Transfer Conference; Article accepted by The American Economic Review (forthcoming): "The Endowment Effect and Evidence of Non-Reversible Indifference Curves"

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Adaptation of Water Preconcentration Techniques Developed for PCDD Analysis to Other Target Organic Pollutants

PROJECT NO: 420G
START DATE: 04/88

SHORT TITLE: PCDD Analysis/Preconcentrations Techniques

PRINCIPAL INVESTIGATOR AND AFFILIATION: B. Hollebone, Carleton University

LIAISON OFFICER (name, location, telephone no.): D. Hall, Laboratory Services Branch, 235-5910

OBJECTIVE(S): The ability to preconcentrate large volumes of treated or natural waters in the field for accurate dioxin analysis will be extended to the quantification of other classes of toxic organics in these waters. Three refinements of current technology are required: 1) Characterization of the filter capacity, retention of organics, interferences and elution behaviour of filter cartridges. 2) Capacities, interferences and elution recoveries from XAD resins selected for retention of target organics. 3) Optimization of filter-resin combinations in sampler operation or retention and separation of organics in either the solid or aqueous phases of natural water.

PROJECT DESCRIPTION: The ppq dioxin sampler will be adapted to preconcentrate representative PAH and chlorinated pollutants in natural waters. This requires characterization of radial filters, adsorbate resins and total sample performance to determine recoveries and interferences for each compound type. Radial filters will be assessed for total filter capacity, the retention of varying particle size, the retention of spiked organics, the efficiency of elution and the presence of interferences. Similarly, the retention, recovery and the role of interferences for hydrophobic organics on XAD resins will be assessed. Sampler protocol will then be tested in a small scale mockup of the sampler and verified in a new sampler built to duplicate the one delivered earlier to MOE. The recoveries will be determined by the optimized workup and elution procedures and by GC/MSD identification and quantification. All work will be done in distilled water, distilled water doped with illite clay and treated water.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	116.0	70.0		186.0
Work Years:				

Budget Source: RAC

KEYWORDS: sampler, organics, CDD/CDF, resin, filters, adsorbents

OUTPUT (papers, presentations, reports): Technology Transfer Conference and RAC Final Report

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Recycling of Textile Dyebath Effluents PROJECT NO: 421G
START DATE: 06/88

SHORT TITLE: Textile Dyebath Effluents

PRINCIPAL INVESTIGATOR AND AFFILIATION: Anne Wilcock
University of Guelph

LIAISON OFFICER (name, location, telephone no.): J. Smart
Waste Management Branch
323-5113

OBJECTIVE(S): To test the efficiency of a new, commercially available electrochemical cell in the purification of environmentally hazardous textile dyebath effluents. These effluents contain expensive dyes and other chemicals that, if they can be precipitated from the effluent and reused, represent a substantial economic saving. The colourless supernatant will be tested for biological toxicity and for potential industrial recyling so that manufacturers will have the option of safely discharging the treated effluent to sewers or recycling it in industrial applications.

PROJECT DESCRIPTION: To simulate the recycling of industrial dyebath effluent, an equeous solution containing one of three common disperse dyes and a biphenyl carrier will be electrochemically separated into dye, carrier and water. The purity and potency of the recovered dyes and carriers will be tested by application to a polyester fabric. The water will be tested for toxicity by fish bioassay, and for reuse potential. The elctrochemical separation system will then be tested in actual industrial conditions using disperse and other classes of dyes.

BUDGET AND RESOURCES:	Year: (*current)	1	2*	3	TOTAL
	Cost: ($000's):	18.9	17.6	13.4	49.9
	Work Years:				

Budget Source: RAC

KEYWORDS: recycling, re-use, textile dye, toxicity

OUTPUT (papers, presentations, reports): Report

EXTERNAL PARTICIPATION (ministries, governments, agencies): None

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Development of a Method for the Analysis of Brominated Dibenzo-p-dioxins (BDD) and Brominated Dibenzofurans (BDF) in Environmental Samples by GC/MS

PROJECT NO: 422C
START DATE: 06/88

SHORT TITLE: BDD and BDF Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: R.E. Clement
Laboratory Services Branch

LIAISON OFFICER (name, location, telephone no.): D. Schellenberg
Laboratory Services Branch
235-5890

OBJECTIVE(S): The contractor will: Gather and review all available international information regarding the toxicities of BDD/BDF and mixed C/BDD and C/BDF. Gather and review all available international information regarding the sources and environmental occurrence of these compounds. Gather and review all available international information regarding analytical methodologies in use for the detection and quantification of these compounds. Provide a list of current commercial supplies of analytical standards for these compounds.

PROJECT DESCRIPTION: The Contractor will perform a comprehensive search and review of the technical literature and other sources of published and unpublished information pertaining to the toxicities, environmental occurrence and analysis of BCC/BDF and mixed C/BDD and C/BDF. The Contractor's proposal must include details of the search strategy to be employed, which should include computerized searching of chemical abstracts, keywords to be used, names of databases to be searched, use of NTIS reports and Citation Index, manual journal searches and personal contact with leading international researchers.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				23.0
	Work Years:				

Budget Source: RAC

KEYWORDS: brominated dibenzo-p-dioxins (BDD) and Dibenzofurans (BDF), literature review, toxicities, sources, environment, analytical methods of detection/quantitation, suppliers

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Chemical Exposure Pathways in Ontario PROJECT NO: 423G
START DATE: 07/88

SHORT TITLE: Chemical Exposure Pathways

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D. MacKay
University of Toronto

LIAISON OFFICER (name, location, telephone no.): J. Smith
Hazardous Contaminant Branch
323-5113

OBJECTIVE(S): (1) Establish correspondence between output of environmental model and prevailing concentrations in Ontario. (2) Establish a range of air inhalation and water and food consumption rates for a typical family in Southern Ontario. (3) Develop correlations between concentrations in the environment and those in vegetation, fruit, meat, and dairy products. (4) Quantify human exposure through ambient air, food, and water. (5) Extend assessment to estimation of human physiological fate to chemicals through further development of existing pharmacokinetic model. (6) Validation of the set of models.

PROJECT DESCRIPTION: A multi-media fugacity based environmental model estimates prevailing concentrations in various media such as air, water, soil, sediment, and fish has been developed and validated for a number of chemicals in Southern Ontario. Concepts of this model will be extended to assess exposure to these and additional chemicals by a typical Southern Ontario family through air inhalation and food and water consumption, as well as human physiological distribution and body burden. To quantify these exposures, it will be necessary to (i) establish a range of typical food consumption rates, (ii) develop expressions to correlate concentrations in soil, air, and water with those in vegetation, fruit, meat, and dairy products, and (iii) refine and apply our recently developed pharmocokinetic model. Predicted exposures and body burdens will be compared with those known to cause toxic effects in order to assess their severity.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	49.5	43.5	43.5	136.5
Work Years:				

Budget Source: HCCB

KEYWORDS: air, inhalation, fugacity, water, soil, sediment, fish

OUTPUT (papers, presentations, reports): (See attached).

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

OUTPUT (papers, presentations, reports):

In Press:

S. Paterson, D. Mackay "Modelling the distribution of organic chemicals in plants", proceedings of Intermedia Pollutant Transport: Modeling and Field Measurements, UCLA. Aug. 23-26, 1988.

S. Paterson, D. Mackay "A Model illustrating the environmental fate, exposure and human uptake of persistent organic chemicals", Ecological Modelling (in press 1989).

Submitted:

D. Mackay, S. Paterson "Evaluating the regional multimedia fate of organic chemicals: A level III fugacity model", Environ. Sci. Technol.

S. Paterson, D. Mackay, "Review of Evaluative models of environmental fate and human exposure", Reviews in Environmental Toxicology (invited paper).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Monitoring Exposure and Effects of Organic Substances in the Huron-Erie Corridor

PROJECT NO: 424G
START DATE: 08/88

SHORT TITLE: Organic Substances/Huron-Erie Corridor

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. P. Hebert
Great Lakes Institute
University of Windsor

LIAISON OFFICER (name, location, telephone no.): A. Hayton
Water Resources Branch
235-5800

OBJECTIVE(S): There are five interactive subprojects: (1) To establish protocols for a statistically sound network of biomonitoring stations in the Huron-Erie corridor. (2) To determine foodweb exposure routes (water or in-place pollutants). (3) To calibrate organisms of both the benthic and pelagic food chains in order to determine water and sediment concentrations. (4) To determine if bioaccumulation or bioconcentration regulates residue levels in sport fish. (5) To establish vertebrate monitors to assess the impact of contaminants in the Huron-Erie corridor.

PROJECT DESCRIPTION: 5 sites will be set up along the Huron-Erie corridor to investigate temporal and spatial hetrogeneity of contaminants in various media. Three times during the year food web transfers and community structure will be determined at three of the sites. Two benthic organisms will be calibrated to determine influence of sediment uptake. The MOE sport fish data base will be computerized. Impact studies initiated with collection and testing of natural populations. Spatial redundancy corrected by rejecting sites with no significant spatial variability. First foodwebs constructed. Breeding of both brown bullhead and bluntnose minnow populations will be initiated for mutagenicity studies.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	200.0	200.0	200.0	600.0
Work Years:	7.0	7.0	7.0	21.0

Budget Source: Environmental Services Division

KEYWORDS: contaminant-monitoring, Huron-Erie Corridor, toxicokenetics, biomonitoring, food-chain

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Monitoring and Evaluation of Landfill Cover Lysimeters

PROJECT NO: 425C
START DATE: 10/88

SHORT TITLE: Landfill Lysimeter Monitoring

PRINCIPAL INVESTIGATOR AND AFFILIATION: K.J. McKague
Ecologistics Limited

LIAISON OFFICER (name, location, telephone no.): C.A. Bostock
Waste Management Branch
323-5218

OBJECTIVE(S):
To continue uninterrrupted monitoring of the existing six (6) lysimeters located at the Britannia Road Landfill site with an outlook to confirming the viewpoint that they are operational and will continue to function through the fall, winter and spring.

PROJECT DESCRIPTION:

Modifications to an initial lysimeter design have been made to the point where it is believed that the lysimeters are now functioning as intended. It is proposed that data collection and analysis continue in order to test the performance of the modified lysimeters through the four climatic seasons.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				15.0
	Work Years:				0.21

Budget Source: Waste Management Branch

KEYWORDS: modified lysimeters, Britannia Road Landfill, monitoring, performance evaluation

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: An Evaluation of Methods to Determine the Impact of Residential Wood Burning on Ambient Air Quality

PROJECT NO: 426C
START DATE: 05/89

SHORT TITLE: Air Quality Impacts of Wood Burning

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. C.S. Davis
Concord Scientific Corporation

LIAISON OFFICER (name, location, telephone no.): Mr. R.R. Potvin
Northeastern Region
(705) 675-4501

OBJECTIVE(S):

The objective of this study is to compile and update in-depth information evaluating methods to determine the impact of residential wood burning on ambient air quality.

PROJECT DESCRIPTION:
The contractor will undertake an in-depth literature search to compile and update information currently available on methods to determine the impact of residential wood burning on outdoor air quality.
This literature search will document these air quality problems with respect to special studies that were undertaken, analytical/sampling methods used and/or developed (with emphasis on the tracer elements/compounds used to delineate the contributions of wood burning emissions from other combustion sources). In addition, control strategies adopted by regulatory agencies to mitigate the problems should be included.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	34.4			34.4
	Work Years: 1				

Budget Source: RAC

KEYWORDS: air quality, impacts, woodburing

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Project to be completed in September 1989.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Behavioural Ecology of the Eastern Subterranean Termite in Ontario as a Basis for Control

PROJECT NO: 427G
START DATE: 04/89

SHORT TITLE: Termite Behavioural Technology

PRINCIPAL INVESTIGATOR AND AFFILIATION: J.K. Grace
University of Toronto

LIAISON OFFICER (name, location, telephone no.): Mr. G. Cutten
H.C.C.B.
323-5117

OBJECTIVE(S): To describe the population demographics and foraging ecology of the eastern subterranean termite, Reticulitermes flavipes (Kollar), in southern Ontario by a systematic examination of colony growth and development, foraging patterns, intercolony interactions, chemically-mediated interactions with vegetation and fungi, and the effect of microclimate on colony development and foraging activities.

PROJECT DESCRIPTION: Select, establish and map field sites. Develop wood extraction, fungal isolation, and bioassay techniques; and establish dye conditions for mark-recapture. Begin mark-recapture study, periodic field collections with evaluation of colony composition, microclimate measurements, and extraction/bioassay of insects, wood and fungi.
Complete seasonal mark-recapture study, continue field collections with evaluation of colony composition, and microclimate measurements. HPLC and GC separation of biologically active fractions from trees, associated fungi, and insects eliciting agonistic responses.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	30.0	99.1	65.6	194.7
	Work Years: 3				

Budget Source: RAC

KEYWORDS: behaviour ecology, termites, control

OUTPUT (papers, presentations, reports): (See attached)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

OUTPUT (papers, presentations, reports):

Grace, J.K., & A. Abdallay. 1989. Evaluation of the dye marker Sudan Red 7B with Reticulitermes flavipes (Isoptera: Rhinotermitidae). Sociobiology 15:71-77.

In press:

Grace, J.K. Northern subterranean termites. Pest Management.

Grace, J.K. A modified trap technique for monitoring Reticulitermes subterranean termite populations (Isoptera: Rhinotermitidae). Pan-Pac. Entomol.

Grace, J.K. Habituation in termite orientation response to fungal semiochemicals. Sociobiology.

Grace, J.K., A. Abdallay, & K.R. Farr. Eastern suberranean termite foraging territories and populations in Toronto. Can. Entomol.

Grace, J.K., & G.M. Cutten. Public perceptions of termite control practices in several Ontario (Canada) municipalities. J. Environ. Management.

Grace, J.K. & A. Abdallay. A short-term dye for marking eastern subterranean termites (Isoptera, Rhinotermitidae). J. Appl. Entomol.

Grace, J.K. Oral toxicity of barium metaborate to the eastern subterranean termite (Isoptera: Rhinotermitidae). J. Entomol. Sci.

Hoelmer, K.A., & J.K. Grace. Citrus blackfly. In Eradication of Exotic Pests: Analysis with Case Histories (D.L. Dahlsten, R. Garcia, & H. Lorraine, eds.). Yale University Press, New Haven.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Assessment of the Current Waste Management Practices on Farm Operations in Perth County, Ontario

PROJECT NO: 428G
START DATE: 04/89

SHORT TITLE: Waste Management on Farm Operations, Perth County

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Murray Haight
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): Mr. M.M. Blackie
Southwestern Region
(519) 661-1710

OBJECTIVE(S): (1) To identify the nature of wastes generated, the quantities and existing disposal practices. (2) To estimate the potential environmental impacts as a result of the waste management practices identified. (3) To survey the opinion of farm operators regarding alternatives to current waste management practices. (4) To provide a basis for the assessment of wastes from farms in other parts of Ontario. (5) To prepare a final report of the study.

PROJECT DESCRIPTION: In the face of increasing awareness and effort to manage industrial and municipal wastes (eg. MISA program) and household wastes (eg. implementation of curbside blue-box program and special waste collections), the opportunity exists to begin to address farm generated wastes. At present agricultural wastes such as pesticides and empty containers, waste fertilizer material, wastes from farm machinery, household and yard wastes are exempt from Part V of the EPA and Reg. 309. Whatever management strategies are developed, if they are to be successful, they must rely upon a) information about the nature and extent of the problem, and b) involvement of the participants in terms of willingness to participate and suggestions for practical alternatives. The proposed research will seek to begin to address these fundamental issues by completing a random survey of farms in Perth County. Results obtained from this investigation are expected to be useful for future waste management decision-making.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	3.0			3.0
Work Years: 1				

Budget Source: RAC

KEYWORDS: waste management, farms disposal

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Carcinogenicity Testing of Industrial Effluents Using a Rainbow Trout Assay

PROJECT NO: 429G
START DATE: 05/89

SHORT TITLE: Carcinogenicity Testing/Industrial Effluents

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. C.D. Metcalfe
Trent University

LIAISON OFFICER (name, location, telephone no.): Dr. Ian Smith
Water Resources Branch
235-5789

OBJECTIVE(S): To develop a carcinogenicity assay using fish which can be used for monitoring of industrial effluents for carcinogenic activity. To fractionate extracts of carcinogenic effluents in order to identify classes of compound which warrant routine monitoring under MISA.

PROJECT DESCRIPTION: To develop techniques for the preparation and fractionation of effluent extracts, using known compounds (e.g. PAH's, PCB's, organohalides, chlorobenzenes, chloroacetones) spiked into simulated effluent matrices. To test combined trout embryo/trout adult exposure protocols using known carcinogens to determine whether tumors can be developed in a short (6 mo.) period. To prepare extracts from representative industrial effluent (e.g. chlorination- stage pulp and paper effluent, coking plant effluent), and to test these extracts for carcinogenicity using the rainbow trout assay protocols developed in year 1. To characterize the organic contaminant concentration of these extracts by analyzing (gas chromatography) for priority organic pollutants. To fractionate the effluents extract giving a positive response in the trout assay using column chromatography, and we will test these fractions for carcinogenicity using the rainbow trout bioassay. We will also analyze the various fractions for priority organic pollutants in order to chemically characterize the extract fractions.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	42.9	42.9	42.9	128.7
	Work Years: 3				

Budget Source: RAC

KEYWORDS: waste water management, carcinogenicity testing, rainbow trout assay, mutagenicity testing, effluent

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Partial funding led to reduction in project scope. Approved by Liaison Officer June 27, 1989.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of an Expert System for Automated Analysis of Metals

PROJECT NO: 432G
START DATE: 04/89

SHORT TITLE: Development of ACexpert

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. M.J. Stillman
University of Western Ontario

LIAISON OFFICER (name, location, telephone no.): Dr. J.C. Hipfner
Laboratory Services Branch
235-5856

OBJECTIVE(S):
1) To develop a demo Expert System to fully control an AA for metal analysis; 2) To develop a generic Expert System to monitor and model quality control procedures used for data analysis; 3) Investigate use of an Expert System for technical personnel training.

PROJECT DESCRIPTION: ACexpert is a very large expert system that comprises a number of interacting modules. Each module is itself a sophisticated expert system that carries out a specific task. ACexpert provides the link between the operation of these individual expert systems, the user, and the hardware that is used to complete the analysis. ACcontrol is the module that carries out all real-time instrument control functions, it includes an extensive CRT user interface and an expert system-based QC program. The other modules involve expert system and data base management techniques. The base modules for ACexpert will be completed, following the design established during 1987. Further work on the modules that comprise the many expert systems in ACexpert will take place. The full system will begin to take shape, and the demonstration AAS unit will become available for real-time testing.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	74.4	26.4	50.4	151.2
	Work Years: 3				

Budget Source: RAC

KEYWORDS: expert system, AA, metal analysis

OUTPUT (papers, presentations, reports): (See attached)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: This project is a continuation of that started under project #326PL.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

OUTPUT (papers, presentations, reports):

Conference Papers:

1. "Development of ACexpert. 1. Design of an Expert System for Automated Metal Analysis by Atomic Absorption Spectroscopy", by WR Browett, TA Cox and MJ Stillman.

2. "Development of ACexpert. 2. Implementation of an Expert System for Automated Metal Analysis by Atomic Absorption Spectroscopy", by MJ Stillman, TA Cox and WR Browett.

3. "Development of Robotic Sample Handling and Introduction into an Atomic Absorption Spectrometer", Timothy D.A. Cox, William R. Browett, and Martin J. Stillman, Department of Chemistry, University of Western Ontario, London, Ontario N6A 5B7.

4. "Development of an Expert System for Quality Control Monitoring of Metal Analysis Using Atomic Absorption Spectroscopy", William R. Browett, Timothy D.A. Cox, and Martin J. Stillman, Department of Chemistry, University of Western Ontario, London, Ontario, N6A 5B7.

5. "ACanalyst: A real-time advisor for AAS control and analysis", WR Browett, TA Cox, and MJ Stillman.

Published Papers:

1. "Development of ACexpert. 1. Design of an Expert System for Automated Metal Analysis by Atomic Absorption Spectroscopy", William R. Browett, Timothy A. Cox and Martin J. Stillman, Department of Chemistry, University of Western Ontario, London, Ontario N6A 5B7.

2. "Expert system shells in analytical chemistry. The design of ACexpert: Automation of metal ion determination using AAS", submitted to Progress in Analytical Chemistry.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of Multivariate Analysis Procedures for Ontario Air Quality Data

PROJECT NO: 433G
START DATE: 05/89

SHORT TITLE: Multivariate Analysis of Air Quality

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. P.K. Hopke
Clarkson University

LIAISON OFFICER (name, location, telephone no.): Dr. N. Reid
Air Resources Branch
965-1634

OBJECTIVE(S): To complete the development of three-mode factor analysis to provide simultaneous temporal-spatial analysis of multisite air quality data. To compare the use of the Potential Source Contribution Function (PSCF) for source identification of the acidic components of collected airborne particle samples with the results previously obtained for acidic precipitation. To examine the use of unsupervised pattern recognition methods as well as several other eigenvector methods to identify the interrelationships between the particle or precipitation composition variables and their relationship to the meteorological regimes that existed when the samples were taken.

PROJECT DESCRIPTION: The Air Resources Branch has a number of on-going air quality monitoring programs that produce large multivariate data sets. The availability of state-of-the-art multivariate statistical analysis methods that will permit the maximum amount of useful information to be extracted from these data can aid the development and implementation of air quality management plans to maintain or improve the air quality in Ontario. This project combines the development of new methods that will provide improved analysis of the data and the testing of existing methods as to their utility to providing useful information from the air quality data that are available.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	18.8	19.8	20.6	59.2
	Work Years: 3				

Budget Source: RAC (in U.S. funds)

KEYWORDS: multivariate analysis, air quality data, Ontario, analysis procedure, acidic precipitation

OUTPUT (papers, presentations, reports):
Paper presented at the Technology Transfer Conference 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Investigations Into the Analysis of Hydride-Forming Elements

PROJECT NO: 434G
START DATE: 5/89

SHORT TITLE: Hydride Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. I. Brindle
Brock University

LIAISON OFFICER (name, location, telephone no.): Dr. J.C. Hipfner
Laboratory Services Branch
235-5856

OBJECTIVE(S): 1) The simultaneous analysis of the maximum number of hydride-forming elements with the lowest possible detection limit (of the order of 10-100 ppt). 2) Application of the above method to air filters. 3) Transferrability of the hydride method to a continuous hydride generator for potential application as an interface to ICP-AES and ICP-MS. 4) Development of a preconcentration method for hydride-forming elements for potential application to surface waters and rain.

PROJECT DESCRIPTION: The development of methods for the analysis of hydride-forming elements will be useful in acid rain studies and in studies related to toxic hydride-forming elements. Methods for the analysis of germanium and tin, developed during the first year of this study, by hydride generation will be applied to the analysis of these elements in air filters. Extension of the hydride method to the analysis of arsenic and antimony will continue. The hydride-generation/interference reduction method for the analysis of selenium and tellurium will be investigated and attempts will be made to apply this to air filters. Optimum conditions will be determined for the simultaneous analysis of hydride-forming elements. Continuous hydride generation will be investigated with a view to interfacing the hydride system to either ICP-AES or ICP-MS systems. Methods for preconcentration of hydride-forming elements from surface water or rain will be developed.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):		46.8	44.8	135.9
	Work Years: 3				

Budget Source: RAC

KEYWORDS: analysis, hydride-forming elements, interferences, suppression

OUTPUT (papers, presentations, reports): (See attached)

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Year 1 of project funded in 87/88 for $44,300 under Proj. #360G

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

OUTPUT (papers, presentations, reports):

Ian D. Brindle and Xiao-chun Le, "D.C. Plasma Atomic Emission Spectrometry in Geochemical Applications" (Review), Geoscience Canada, Accepted for publication, June 19, 1989.

Ian D. Brindle and Xiao-chun Le, "Reduction of Interferences in the Determination of Germanium by Generation of Hydride and Atomic Emission Spectrometry", Analytica Chimica Acta, accepted for publication, June 30, 1989.

Ian D. Brindle and Xiao-chun Le, "Application of Signal Enhancement by Easily Ionized Elements in Hydride Generation Direct Current Plasma Atomic Emission Spectrometric Determination of Arsenic, Antimony, Germanium, Tin, and Lead", Analytical Chemistry, 1989, 61,1175-1178.

Ian D. Brindle, Xiao-chun Le and Xing-fang Li, "Determination of Traces of Germanium by Hydride Generation - D.C. Plasma Atomic Emission Spectrometry. Interference Reduction by L-Cystine and L-Cysteine," Journal of Analytical Atomic Spectrometry, 1989, Journal of Analytical Atomic Spectrometry, 4,227-232.

Ian D. Brindle and Xiao-chun Le, "Determination of Traces of Tin by Hydride Generation - D.C. Plasma Atomic Emission Spectrometry. Interference Reduction by L-Cystine," 1988, The Analyst (London), 113,1377-1381.

Charles Boampong, Ian D. Brindle, Xiao-chun Le, Lav Pidwerbesky, and Claudio Ceccarelli-Ponzoni, "Interference Reduction by L-Cystine in the Determination of Arsenic by Hydride Generation," 1988, Analytical Chemistry, 60, 1185-1188.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract		Solicited
INTERNAL	Grant	X	Unsolicited X

PROJECT TITLE: Genetic Differences Between Damaged and Healthy Sugar Maple Throughout Ontario

PROJECT NO: 435G
START DATE: 4/89

SHORT TITLE: Genetics of Sugar Maple Decline

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. P. Knowles
Lakehead University

LIAISON OFFICER (name, location, telephone no.): Dr. W.D. McIlveen
Air Resources Branch
965-4516

OBJECTIVE(S):

To determine whether relatively healthy sugar maple trees are genetically different from adjacent damaged trees within the same stand using isozyme characterization of bud tissue and multivariate statistical analysis.

PROJECT DESCRIPTION: The decline of sugar maple in eastern North America has been receiving increasing attention in both the public and scientific arenas during the last decade, due in part, to its potential association with air pollution. To study the genetic component underlying damaged sugar maple stands and damaged individual trees using isozyme analyses. Bud tissue will be sampled from 50 trees in each stand and electrophoresed using the methodology established for a publication presently in press (Can. J. For. Res.) focusing on sugar maple genetics in northwestern Ontario. The association between damage and genetic structure will be assessed by comparing the MOE records for decline ratings with the genetic structure on an individual and stand basis. The result may be the delineation of a more pollution resistant genotype in sugar maple.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	21.2			21.2
	Work Years: 1				

Budget Source: RAC

KEYWORDS: Sugar maple trees, Ont. genetics, decline

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Long Term Effects of SO_2 and Aerosols on Children with Asthma

PROJECT NO: 436G
START DATE: 05/89

SHORT TITLE: SO_2 in Children with Asthma

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. L.D. Pengelly
McMaster University

LIAISON OFFICER (name, location, telephone no.): Dr. G. Diamond
Air Resources Branch
965-4081

OBJECTIVE(S): To evaluate the hypothesis that chronic low-level exposure to air pollution* is associated with the severity of asthma in children.

*(sulphur dioxide, SO_2; total suspended particulate, TSP; and the fine fraction less than 3.3 micrometers aerodynamic diameter of suspended particles, FF)

PROJECT DESCRIPTION: Asthma in young people is becoming a significant public health problem in Canada. In the last ten years there has been a dramatic increase in both the rate of hospitalization for asthma, and asthma mortality. Recent analysis of data from studies conducted in Hamilton have indicated an association between chronic exposure to low levels of SO_2 and an increase in the severity of airway obstruction in asthmaic children. In order to strengthen these observations, these data will be examined with cross-sectional analyses of three more data collection periods obtained at subsequent intervals, and as well to examine the longer-term consequences of expsoure to air pollution by a longitudinal analysis of the five sets of data collected over an eight-year period. The observations, and the further work proposed are of major importance, when viewed in the context of the "acid rain" problem.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	46.2			46.2
	Work Years: 1				

Budget Source: RAC

KEYWORDS: SO_2, aerosols, children, asthma, health effects

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Modelling Municipal Water Systems for Demand Management

PROJECT NO: 437G
START DATE: 09/89

SHORT TITLE: Water Systems Management

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J.E. Robinson
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): Mr. G. Zegarac
Policy & Planning Branch
323-4578

OBJECTIVE(S): It is proposed to develop a computer model that will enable policies for water demand management to be evaluated. Such policies will include economic incentive policy instruments such as water rate structure, water rate level and wastewater surcharges. The model will be designed so that comparisons can be made between the cost effectiveness of demand management approaches to the supply management approach. The model will be useful for forecasting water prices, timing of supply system expansions, etc.

PROJECT DESCRIPTION: The Master Water Supply Study completed for the Regional Municipality of Waterloo in 1987 contains recommendations for structural water supply development which will result in substantial increases of the real cost of water. The study presumed that there will be structural changes in wastewater treatment to enable the full development of the water supply from river withdrawals. The study did not consider the implications to higher price on demand for water or the implications for expansion of wastewater treatment plants. It is proposed to develop a computer model integrating water supply and wastewater treatment for the use of municipal water managers which will be useful in evaluating such studies and for evaluating strategies for demand management, which may prove useful in delaying or avoiding expensive structural developments.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	34.0	18.6		52.6
Work Years: 2				

Budget Source: RAC

KEYWORDS: municipal water systems, demand management, water supply, water conservation, cost-effectiveness

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	
INTERNAL	Grant	Unsolicited X	

PROJECT TITLE: Geoflow Meter, Application to Measuring Gas Flow in Soil

PROJECT NO: 438C
START DATE: 4/89

SHORT TITLE: GEOFLO

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. M.J. Pullen
Marshall Macklin Monaghan Limited

LIAISON OFFICER (name, location, telephone no.): Dr. C.A. Bostock
Waste Management Branch
323-5218

OBJECTIVE(S): The objective is to determine the applicability of the Geoflow Meter and Probe to measure directly the flux of soil gases away from landfill sites. If successful, this would give a method of estimating gas volume migration away from a site. At present only concentration of combustible gas can be measured.

PROJECT DESCRIPTION:

The Geoflow Meter and Probe was designed and has been proven to give a direct measure of groundwater flux. A large bench test would be conducted to confirm the accuracy and precision of the device for flux and direction of subsurface gas movement. If the bench test is successful, the probe would be installed at a landfill site to test the probe and meter under field conditions.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	56.6			56.6
	Work Years: 1				

Budget Source: Waste Management Branch

KEYWORDS: Geoflow meter, gas, soil, waste management, landfill

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	
INTERNAL	Grant	Unsolicited X	

PROJECT TITLE: Field Demonstration of Membrane Technology for Treatment of Landfill Leachate

PROJECT NO: 439C
START DATE: 4/89

SHORT TITLE: Leachate Treatment - Membrane Processes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. R.P. Canning
Zenon Environmental Inc.

LIAISON OFFICER (name, location, telephone no.): Mr. A. Oda
Waste Management Branch
323-5129

OBJECTIVE(S):
a) to demonstrate leachate treatment by means of membrane-based processes
b) to design, and construct a portable pilot-scale membrane system and operate the system as treatment process at Muskoka Lakes Landfill Site
c) to assess technical and economic feasibility of this process and make recommendation as for applications at other sites

PROJECT DESCRIPTION:

A pilot-scale membrane treatment system complete with feed and monitoring equipment will be operated on-site to treat leachate at Muskoka Lakes Landfill Site for at least two months. Field results will be evaluated and presented with recommendations in a final report.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	130.0			130.0
	Work Years: 1				

Budget Source: RAC

KEYWORDS: leachate treatment, field demonstration, contaminant removal; inorganic and organic, ultrafiltration, reverse osmosis, process evaluation, costs

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): A representative from Environment Canada on the Technical Steering Committee

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	
INTERNAL	Grant	Unsolicited X	

PROJECT TITLE: Quantifying Infiltration Through Municipal Solid Waste Landfill Covers

PROJECT NO: 440C
START DATE: 7/89

SHORT TITLE: Landfill Cover Infiltration

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. K.J.G. McKague
Ecologistics Limited

LIAISON OFFICER (name, location, telephone no.): Dr. C.A. Bostock
Waste Management Branch
323-5218

OBJECTIVE(S): 1) Install lysimeters in landfill covers possessing distinct differences in the cover's soil texture. 2) Accumulate data on landfill cover infiltration for the soil textures considered through rainfall simulation and continued monitoring of the installations. 3) Modify an existing U.S. - Environmental Protection Agency landfill cover water budget/leachate generation model to facilitate its use under Ontario conditions. 4) Evaluate the usefulness of the modified model for predicting cover infiltration rates.

PROJECT DESCRIPTION: A fifteen (15) month study will further investigate infiltration through landfill covers. On the assumption that existing prototypes are producing satisfactory results and only minor modifications are required, additional lysimeters will be installed on landfill caps having extremes in soil textural characteristics. To increase the infiltration database, rainfall simulation will be carried out. An existing model will be modified and tested to determine its usefulness in predicting infiltration rates.

BUDGET AND RESOURCES:

Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	97.9	24.0		121.9

Work Years: 2

Budget Source: RAC

KEYWORDS: Solid waste, landfill covers, infiltration

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract	X	Solicited	
INTERNAL		Grant		Unsolicited	X

PROJECT TITLE: In Situ Biodegradation of Chlorinated Solvents as a Remedial Technology for Contaminated Groundwater

PROJECT NO: 441C
START DATE: 7/89

SHORT TITLE: In Situ Biodegradation of Solvents

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D. Major
Beak Consultants Ltd.

LIAISON OFFICER (name, location, telephone no.): Mr. P. Beck
Water Resources Branch
323-4890

OBJECTIVE(S):
To determine factors and processes governing in situ transformation and degradation of tetrachloroethylene in the groundwater at a chemical transfer facility, thereby furthering understanding of microbial processes at spill sites.

PROJECT DESCRIPTION:

This study will involve conducting field and laboratory experiments to determine what factors and processes are governing the in situ transformation and degradation of tetrachloroethylene (PCE) in the groundwater at a chemical transfer facility. Available data suggest that PCE is being degraded biologically by the indigenous micro-organisms to less chlorinated intermediates which are in turn mineralized to CO_2.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	40.0	40.0		80.0
	Work Years: 2				

Budget Source: RAC, U.S. and Industry

KEYWORDS: Chlorinated solvents, contaminated groundwater

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): Environment Canada, General Electric, AT&T, C-1-6, Celenese.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Ecology and Control of the Biofouler, Dreissena polymorpha, (Bivalvia: Dreissenidae), New to the Great Lakes

PROJECT NO: 443G
START DATE: 05/89

SHORT TITLE: Ecology and Control of Zebra Mussels

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. G.L. Mackie
University of Guelph

LIAISON OFFICER (name, location, telephone no.): Mr. P. Kauss
Water Resources Branch
323-4952

OBJECTIVE(S): (1) To determine life history characteristics of the Lake St. Clair population of Dreissena polymorpha. (2) To determine the age and growth rate of individuals and of the population in Lake St. Clair and the extent of its distribution and growth rates in the Great Lakes. (3) To determine the potential impact of the zebra mussel on native species of unionid mussels in Lake St. Clair and some of its major tributaries.

PROJECT DESCRIPTION: A major biofouler and nuisance organism, Dreissena polymorpha (Bivalvia: Dreissenidae) was discovered in the Great Lakes this past fall. It is new to North America and nothing is known about its population dynamics and impact on other organisms, especially Bivalvia, in the Great Lakes, or indeed in any North American surface waters. Studies are described to determine the life history characteristics of D. polymorpha. commonly called the zebra mussel, in Lake St. Clair, its present growth rate and population age structure and its distribution in the Great Lakes and its potential impact on native species of unionid mussels endemic to Lake St. Clair and its major tributaries. The information on life history and distribution will be used to recommend to municipalities and industries measures to avoid infestations in domestic and industrial intake pipelines. The study is a pre-requisite to a proposal submitted to the Wildlife Toxicology Fund for controlling infestations of the zebra mussel in the Great Lakes.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	31.5	29.9	25.1	86.5
Work Years: 3				

Budget Source: RAC

KEYWORDS: dreissena, polymorpha, biofouler

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Groundwater Impact From Large Septic Systems for Sewage Disposal in Ontario

PROJECT NO: 444G
START DATE: 05/89

SHORT TITLE: Large Septic Systems

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J.A. Cherry
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): Mr. M. Goodwin
Waste Management Branch
323-5217

OBJECTIVE(S): To better understand contaminant attenuation processes in large septic systems and develop a method to predict the extent of aquifer contamination new large septic systems.

PROJECT DESCRIPTION: About 20% of households in Ontario use septic systems, thus such systems represent the largest volumetric source of groundwater contamination, yet the magnitude of their impact is not known in Ontario, or elsewhere where septic system usage is also high. Previous studies by us during the past two years have shown that a single domestic septic system can produce an extremely large zone of contamination for non-reactive contaminants such as Na^+ and NO_3, but that biodegradable contaminants such as organics may be largely attenuated in the unsaturated zone above the water table below the tile field. Large volume septic systems however, may produce chemically different contaminant plumes due to higher dose rates resulting in reduced effluent residence time in the unsaturated zone. This study will: 1) investigate groundwater quality around two large septic systems in Ontario, 2) evaluate by field studies the effectiveness of alternative designs and/or effluent loading rates for minimizing groundwater contamination, 3) use mathematical models to evaluate on a more generic basis the implications with respect to groundwater protection of alternative septic system designs for achieving more favourable effluent loading rates, and therefore better effluent attenuation.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	65.0	65.0	65.0	195.0
Work Years: 3				

Budget Source: RAC

KEYWORDS: groundwater impact, septic system effluents, contamination sewage disposal

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Regional Low Flow Analysis for the Central and Southeastern Regions of Ontario

PROJECT NO: 445C
START DATE:

SHORT TITLE: Regionalization/Low Flow Characteristics

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. H.S. Belore
Cumming-Cockburn Limited

LIAISON OFFICER (name, location, telephone no.): Dr. L. Logan
Water Resources Branch
323-4989

OBJECTIVE(S): (1) To test available methodologies for predicting low flows in the Central and Southeastern regions. To identify suitable techniques for application and required research/refinements. (2) Develop an appropriate data base including additional parameters such as evaporation, groundwater fluctuations (well records), etc. (3) Refine multivariate analysis techniques for predicting low flows. (4) Research to develop alternative computerbased graphical low flow regional techniques.

PROJECT DESCRIPTION: Many industrial and municipal dischargers are limited to specific concentrations of effluent based upon the extreme value low flow with various recurrence intervals for the receiving waters (needed for MISA program implementation). These extreme values are easily determined from historic data for gauged streams. However, ungauged streams are more commonly the receiving water and presently few estimation techniques are available. Therefore, this study will test available techniques from a previous study for the Southwestern/West Central regions and apply them to the Central and Southeastern regions. Then those preliminary techniques will be enhanced and new techniques will be investigated and tested to provide methods for estimating extreme value low flows for ungauged sites in Central and Southwestern Ontario.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	52.5			52.5
Work Years: 1				

Budget Source: RAC

KEYWORDS: groundwater, Central and Southeastern Ontario

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X Contract Solicited
INTERNAL Grant X Unsolicited X

PROJECT TITLE: Solid Supported Reactions: The Chemical Basis for Development of Automation

PROJECT NO: 446G
START DATE: 05/89

SHORT TITLE: Solid Supported Reactions

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J. Rosenfeld
McMaster University

LIAISON OFFICER (name, location, telephone no.): Dr. D. Hall
Laboratory Services Branch
235-5910

OBJECTIVE(S): (1) Optimize techniques to separate chlorophenoxy acetic acid PFB-esters from those of background carboxylic acids. (2) Determine the largest volume for simultaneous extraction/derivatizations from water. (3) Establish procedures for determination at the 100 pg/ml concentrations. (4) Evaluate reproducibility of detection limits and linearity of response with concentrations. (5) Validate results.

PROJECT DESCRIPTION: Solid supported reactions have been used to simplify manual methods and develop automated methods of analysis. We have investigated such techniques for the direct extractions and purification of herbicides and chlorophenols from water. Problems on the separation of pollutants from normal constituents have been studied and the determinants of the separation have been identified. The proposed work focusses on optimizing the conditions developed to date; specifically the use of higher temperatures and increased volumes will be investigated as a means of improving sensitivity and specificity. Other environmental problems will be investigated; specifically determination of fatty and resin acids from pulpmill effluents.

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	40.0			40.0
Work Years: 1				

Budget Source: RAC

KEYWORDS: automation, XAD-2, adsorbents

OUTPUT (papers, presentations, reports): Technology Transfer Conference and Final Report for RAC.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Verification Studies of a Bioconcentration-based Model for Predicting Pulse-exposure Toxicity of Organic Contaminants to Fish

PROJECT NO: 447G
START DATE: 05/89

SHORT TITLE: Pulse-exposure Toxicity to Fish

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D.G. Dixon
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): Dr. C. Neville
Water Resources Branch
235-5799

OBJECTIVE(S): The primary objective of this research is to test the capability of the existing model to predict the acute and sublethal toxicity of organic contaminants to fish across a wide range of pulse-exposure regimes. The ultimate objective of this work is to develop a scientific basis for developing water quality guidelines which are sensitive to pulse and fluctuating toxicant exposures. More specific objectives includes: examination of the relationship between toxicant body burdens and biological response (true dose-response) and examination of body size as a modifying factor of toxicokinetics and pulse-exposure toxicity.

PROJECT DESCRIPTION: Water quality guidelines based on mean exposure concentration have been shown to be inconsistent in protecting aquatic life exposed to toxicant pulses. Development of a bioconcentration-based model to predict pulse-exposure toxicity based on the toxicant body burden should overcome this problem. Initial model testing successfully predicted the lethality of single and multiple PCP pulse-exposure to larval fathead minnows. Further verification studies will include: 1) Pulse-exposure lethality tests with two additional organic contaminants, 2) Examination of body size as a modifier of the toxicokinetics of three contaminants and its effects on pulse-exposure toxicity, 3) The sublethal toxicity of pulse-versus continuous exposure of one contaminant using a 32-d fathead minnow growth test, 4) Development of a QSAR based model to examine general concepts predicting non-equilibrium toxicity.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	40.2			40.2
Work Years: 1				

Budget Source: RAC

KEYWORDS: organic contaminants, modelling, pulse, exposure, toxicity

OUTPUT (papers, presentations, reports): Poster presentation, SETAC '89 (Toronto, October-November).

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Bias Due to Sampling Groundwater and Surface Water for Trace Organic Contaminants

PROJECT NO: 449G
START DATE: 06/89

SHORT TITLE: Sampling Bias for Organics

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. James F. Barker
University of Waterloo

LIAISON OFFICER (name, location, telephone no.): Mr. P. Beck
Water Resources Branch
323-4890

OBJECTIVE(S): (1) To evaluate the bias introduced by various practical sampling systems when sampling volatile organics and dissolved gases from gas-charged waters. (2) To improve the above sampling systems where possible to minimize sampling bias. (3) To evaluate the bias introduced by sorption of hydrophobic organics (PCB's and PAH's, for example) by monitoring well and sampling materials, specifically nylon, teflon (R), rigid PVC and polyethylene. (4) To develop a scientifically valid method to predict the sorptive loss of various hydrophobic organics onto various materials encountered in sampling surface and groundwater.

PROJECT DESCRIPTION: This project evaluates two critical sources of bias when sampling waters for organic compounds and fixed gases such as methane: (1) volatilization, and (2) sorption of hydrophobic organics onto well casing and/or sampling materials. Previous research has indicated the magnitude of losses for certain volatile, moderately hydrophobic organics. The proposed research will address a few key remaining concerns. Some novel evaluation methodologies have been established, that will hopefully predict the magnitude of organic contaminant sorption onto contacted materials, based on the hydrophobicity of the organic, the material and the contact time. Research into the loss of volatile organics and fixed gases will focus on the most volatile compounds in gas-charged waters - a poorly documented situation with a high potential for loss of volatile contaminants. Evaluation and improvements for volatile organic sampling will result. These results will be valuable for all those involved in collecting aqueous samples for regulatory and research studies of organic contaminants and dissolved gases in waters.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	46.7			46.7
Work Years: 1				

Budget Source: WRB, WMB, LSB

KEYWORDS: groundwater, surface water, trace organic contaminants

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): None

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Standardized Rearing Materials and Procedures for Hexagenia, a Benthic Bioassay Organism

PROJECT NO: 450G
START DATE: 05/89

SHORT TITLE: Hexagenia Rearing Materials and Procedures

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Jan J.H. Ciborowski
University of Windsor

LIAISON OFFICER (name, location, telephone no.): Ms. T. Lomas
Water Resources Branch
323-4930

OBJECTIVE(S): Collection and cold-storage maintenance of genetically homogeneous Hexagenia egg stocks for distribution to laboratories on request. Synthesis of a standard aquatic sediment and diet from commercially available materials suitable for quickly rearing contaminant-free benthic aquatic invertebrates. Comparison of larval Hexagnia growth on natural (MOE bioassay control site) sediment with synthetic sediment. Assessment of factors contributing to variation in Hexagenia growth and body size. Assessment of influence of sediment-bound organichlorine contaminants on substrate preference, survival, development and bioaccumulation of Hexagenia larvae. Expansion of sediment/diet protocols to scales suitable for mass-culture of rapidly-growing contaminant-free bioassay test organisms.

PROJECT DESCRIPTION: Realization of the importance of sediment-bound contaminants to transfer and retention papameters in aquatic systems has stimulated development of diverse research techniques. However, these techniques (toxicokinetics studies, bioassay procedures, field biomonitoring) suffer from lack of standardization in control sediments and availability of test animals. We will develop a synthetic sediment suitable for rapid growth of Hexagenia, a widely-used bioassay and biomonitor organism, for use in sediment-bioassay trials and ecotoxicological studies. We will also develop rapid culture techniques for rearing contaminat-free organisms and determine methods of minimizing interindividual variations in development; factors that reduce the power to detect effects in bioassay and toxicokinetic studies. Additionally, we will maintain egg stocks from a single population and make material available to other laboratories to assist in maximizing comparability of ecotoxicological research.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	22.8	25.5		48.3
	Work Years: 2				

Budget Source: RAC

KEYWORDS: Hexagenia, benthic bioassay organisms

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Testin Atmospheric Dispersion Model Performance and Developing Codes to Include Deposition Into the Model

PROJECT NO: 451C
START DATE: 08/89

SHORT TITLE: Modelling of Dry and Wet Deposition

PRINCIPAL INVESTIGATOR AND AFFILIATION: Ms. Elizabeth Robertson
Chalk River Nuclear Laboratories

LIAISON OFFICER (name, location, telephone no.): Dr. P.K. Misra
Air Resources Branch
235-5768

OBJECTIVE(S): The objectives of this proposal are: (a) to subject the regulatory Model 308 to the same validation tests using the monitoring data from Sudbury as were applied to the Chalk River dispersion model, (b) if the required meteorological input data to run the Model 308 is available, to use the monitoring data at Chalk River to also validate the model, (c) to add to the Chalk River dispersion code appropriate routines to predict longterm mean dry deposition and wash out to plume constitutents from the Sudbury stacks, and (d) to use all relevant and available monitoring data from the Sudbury area to validate or otherwise extend the model developed under (c) above.

PROJECT DESCRIPTION: This proposal has two objectives that are logical extensions of work currently being funded by the Ministry of the Environment of Ontario. The first objective is to test the Ministry of the Environment regulatory model 308 against the same data base and using the experience gained in the previous contract, i.e. evaluating the performance of the Chalk River Dispersion Code using test data from Sudbury. The second objective is to develop submodels so that depositional processes can be included in the Chalk River dispersion code. The submodels will be tested against monitoring data for sulphates and heavy metals collected in the Sudbury area.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	22.0			22.0
	Work Years: 1				

Budget Source: RAC

KEYWORDS: plume modelling, regulation 308, model evaluation, deposition

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Multispectral Remote Sensing Techniques for Past, Present and Future Mapping of Chlorophyll

PROJECT NO: 452C
START DATE: 08/89

SHORT TITLE: Chlorophyll Remote Sensing

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. Arunas R. Kalinauskas
Moniteq Limited

LIAISON OFFICER (name, location, telephone no.): Dr. N. Hutchinson
Water Resources Branch
(705) 766-2412

OBJECTIVE(S): 1) Simulate landsat MSS and Landsat TM data using Programmable Multispectral Imager (PMI) data and correlate the simulated Landsat data with OME chlorophyll samples collected near simultaneously with the imagery. This correlation can then be used for historical, present and future derivations of chlorophyll concentrations from the Landsat series of satellites.

PROJECT DESCRIPTION: Landsat TM and MSS data will be simulated from archived PMI data which was collected co-incident with OME chlorophyll and water quality sampling in the Lake of the Woods. MONITEQ will develop a methodology, to correlate the simulated Landsat imagery with the chlorophyll sampling for use in mapping past, present and future chlorophyll sampes from Landsat imagery. A second methodology will be developed to create and test an optimized spectral bandset for remote chlorophyll mapping. Again the candidate bandsets for evaluation will be synthesized from the archived PMI data. The optimized chlorophyll mapping bandset will be available for use in state of the art remote sensors for airborne mapping of chlorophyll.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	41.9			41.9
	Work Years: 1				

Budget Source: RAC

KEYWORDS: multispectral remote sensing, chlorophyll, mapping, water quality

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): OMNR - Lake of the Woods Fisheries Assessment Unit, Ontario Centre for Remote Sensing, Advice and transportation.

COMMENTS: This is a research component of a WRB project to investigate factors responsible for increased frequency and intensity of algal blooms in Lake of the Woods, Ontario.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X Contract Solicited
INTERNAL Grant X Unsolicited X

PROJECT TITLE: New Methods for Rapid Sample Digestion PROJECT NO: 453G
START DATE: 08/89

SHORT TITLE: Rapid Sample Digestion

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Eric D. Salin
McGill University

LIAISON OFFICER (name, location, telephone no.): Dr. J.F. Hopper
Laboratory Services Branch
235-5834

OBJECTIVE(S):
The objective is to develop a system which will process batches of samples. The process involves microwave digestion of the samples while they are in a tube. The results should be a system which digests samples much faster and with minimal hazard.

PROJECT DESCRIPTION:

The development of an automated flowing stream microwave digestion is proposed based on the grantee's preliminary work described at the 1988 MOE Technology Transfer Conference.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	20.0	20.0		40.0
	Work Years: 2				

Budget Source:

KEYWORDS: microwave digestion

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Standard Reference Materials For Trace Organic Analysis of Aqueous Environmental Samples

PROJECT NO: 454C
START DATE: 07/89

SHORT TITLE: Standard Reference Materials for Trace Organic Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. J.A. Coburn
Zenon Environmental Inc.

LIAISON OFFICER (name, location, telephone no.): Dr. D. Hall
Laboratory Services Branch
235-5910

OBJECTIVE(S): To conduct a comprehensive critical literature review of the preparation of standard aqueous solutions of highly hydrophobic materials, such as dioxins, organochlorine pesticides and polychlorinated biphenyls. Submit a copy of this review to the Drinking Water Organics Section.
To prepare a number of generator columns for these hydrophobics, calibrate them and deliver these columns with appropriate certificates to the Drinking Water Organics Section.

PROJECT DESCRIPTION: A comprehensive and critical literature review of published solubility data for selected classes of environmentally hazardous hydrophobics of low solubilities. The various methods for the preparation of standard aqueous solutions of these materials, including stable isotope labelled compounds should be reviewed as well.
To include computerized searching of Chemical Abstracts, data bases, NTIS reports, manual journal searches and personal contacts with other workers in related areas.
1) Dioxins, 2) PCB's, 3) Organochlorine Pesticides

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	28.0	16.0		44.0

Work Years: 2

Budget Source: RAC

KEYWORDS: Aqueous environmental samples, standard reference materials, Trace Organic analysis, SRM, PCB, dioxins, Generator columns.

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: This project has just started.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Avian Pest Dispersal Mechanisms for Horticultural Crops

PROJECT NO: 455C
START DATE: 08/89

SHORT TITLE: Avian Pest Dispersal/Horticultural Crops

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. F. Ingratta
O.M.A.F.
H.R.I.O. Complex

LIAISON OFFICER (name, location, telephone no.): Mr. P. Joseph
Approvals Branch
440-3586

OBJECTIVE(S): To prepare a set of guidelines for the management of avian disturbance procedures in the agricultural community which will result in reduced bird feeding or damage to fruit crops. Methods must be effective and in compliance with legal environmental guidelines of nearby receptors.

PROJECT DESCRIPTION: A detailed review of the existing world literature as it pertains to the prevention and control of bird predation and/or interference is to be conducted. The final report is to emphasize bird control systems for sweet cherries, blueberries and grape crops. All references as to whether resident or migratory birds are being treated and the species involved are to be documented. Acoustic, non-acoustic and biological methods are to be reviewed and their relative effectiveness with all appropriate statistical analyses included. The problem of using acoustic devices in mixed urban-agricultural areas will be addressed. Recommendations for bird control management systems are to be formulated to comply with existing environmental regulations.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	14.5			14.5
	Work Years: 1				

Budget Source: West Central Region, OMAF, RAC

KEYWORDS: Avian pests, dispersal mechanisms, horticultural crops

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Review in progress.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X | Contract X | Solicited
INTERNAL | Grant | Unsolicited X

PROJECT TITLE: Retractable Absorbents for Environmental Clean-Up

PROJECT NO: 456C
START DATE: 07/89

SHORT TITLE: Absorbents for Water Treatment

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Anthony E. Redpath
Ecoplastics Ltd.

LIAISON OFFICER (name, location, telephone no.): Dr. Otto Meresz
Laboratory Services Branch
235-5762

OBJECTIVE(S): Samples of the absorbent and working models of a highly innovative underwater retrieval mechanism have been extensively evaluated on pilot scale, in a test chamber simulating a contaminated river site. The objective of this study is to confirm and quantify the performance of both the absorbent and the delivery system of choice under actual field conditions.

PROJECT DESCRIPTION: This program involves six activity phases: (1) The manufacturing of the absorbent beads, building on the information gianed to date on pilot scale production runs; (2) The manufacturing of the casing mats and retrieval mechanism to be used in the field trials; (3) The field testing of the absorbent and the delivery system using the assistance and cooperation of Ministry personnel and other relevant parties; (4) The evaluation of the absorbents used in the field trials in order to determine amounts of solvent removed from the river bed; (5) The development of other novel crosslinked polymers for absorption of other chemicals; (6) Full data analysis and compilation of the results, and proposed use of both the absorbent material and the delivery system in other spill situations.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	97.3			97.3
	Work Years:				

Budget Source: WRB, LSB, RAC

KEYWORDS: Retractable absorbents, water treatment

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: An Assessment of Landuse Impact on the Microclimate of the Fonthill Kame

PROJECT NO: 457G
START DATE: 08/89

SHORT TITLE: Microclimate Assessment of the Fonthill Kame

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Tony B. Shaw, Brock University

LIAISON OFFICER (name, location, telephone no.): Dr. D. Yap, Air Resources Branch (235-5773)

OBJECTIVE(S): Two criteria are suggested for assessing any likely modification to the Fonthill Kame's microclimate: any topographic change, particularly slope changes, which will result in (a) a decrease of nocturnal minimum temperature by 1°C below the threshold values as specified for tender fruit crops and (b) a reduction in wind seed below ^{1} m/sec under radiation frost conditions (Shaw et al, 1988). Accordingly, the principal objective of this study is to provide a detailed assessment of the Kame's microclimate in terms of its spatial variations in temperature, noting in particular evidence of the depth and rate of cold-air drainage on a variety of slopes under radiation frost conditions. Apart from providing the necessary information on the microclimate variations on the Kame, which to date are poorly understood, this aspect of the study could identify specific areas of the Kame where the application of numerical modelling studies will have a reasonable change of showing significant results.

PROJECT DESCRIPTION: The Fonthill Kame, located in the Town of Pelham, is the most important tender fruit area above the Niagara Escarpment. The combination of a favourable climate and well-drained sandy loam soils permits the successful cultivation of tender fruits along with other fruit crops. The steep slopes of the Kame, projecting above the surrounding flat plain, facilitate the drainage of cold air under radiation frost conditions. The microclimate of the Fonthill Kame is to a large extend related to its topography. It is argued by some that structural changes to the topography of the Kame will modify this microclimate. The chief concern is that cold-air drainage on which the production of tender fruits depends could be altered significantly on those slopes which may support aggregate extraction. A modified climate could impact adversely on tender fruit crops on the Kame itself with possible consequences for areas contiguous to the Kame. This study therefore, will attempt to assess the impact of aggregate extractive use on the microclimate of the Fonthill Kame.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	16.5	14.0		30.5
	Work Years: 2				

Budget Source: RAC

KEYWORDS: modelling, microclimates, Fonthill Kame, Landuse Impact

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Survey of Community Acceptance of Air Conditioner Noise

PROJECT NO: 458G
START DATE: 07/89

SHORT TITLE: Air Conditioner Noise

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. W.J. Heeley
HRAI Technical Services Division

LIAISON OFFICER (name, location, telephone no.): Mr. Phil Joseph
Approvals Branch

OBJECTIVE(S):
1. Identify the acceptability of sound level of a neighbour's air conditioner or heat pump in an environment when every household has an air conditioner; and
2. Identify the community response of the above, when only some residences have air conditioners.

PROJECT DESCRIPTION:
- The project consists of a noise survey and a sociological survey of about 500 single family dwellings.
- The social survey and noise measurements of the air conditioners be made by summer students or short term contract employees.
- The social survey is to be designed and evaluated by a consultant.
- The project administration will be done by HRAI; coordination by the Ministry of the Environment.
- The consultant is to be hired by HRAI, based on an agreed budget and specification.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	10.0			10.0
Work Years:	1			

Budget Source: Approvals Branch, RAC, Some Municipalities

KEYWORDS: central air conditioning and heat pump noise, community acceptance

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Survey now in progress. Considerable use made of Section 38 and Student Programs.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Review of Established Regulatory Policies Using Genotoxicity Tests, Current Capability, and Recommendations For Future Development

PROJECT NO: 459C
START DATE: 07/89

SHORT TITLE: Regulatory Policies, Genotoxicity Tests

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. E.R. Nestman
CANTOX Inc.

LIAISON OFFICER (name, location, telephone no.): Dr. M. Salamone
Water Resources Branch
235-5790

OBJECTIVE(S): Review and assess the usage of mutagenicity and genotoxicity test procedures by various regulatory bodies, with specific emphasis on the existing mandate of MOE. To address: current use of genotoxicity testing by governmental and regulatory jurisdictions nationally and internationally; critical review of the applicability of such tests for environmental decision making: compilation of an Index of short-term genotoxicity tests for regulatory decision making; summary of existing MOE testing capabilities; recommendations for future developments and estimates of associated costs for maintaining and developing further testing capabilities in MOE programs; development of an implementation plan of genotoxicity testing in the area of environmental management.

PROJECT DESCRIPTION: Several areas of concern will be dealt with in this study, pertaining to the usage of genotoxicity testing in regulatory situations internationally, and also more specifically with respect to the MOE. The report will be organized into three broad segments: (i) current approaches (internationally and within the Ministry) to genotoxicity testing as a regulatory tool; (ii) identification and assessment of the potential tests available for use; and (iii) a critical review of structures discussed in (i) in light of information summarized in (ii), with recommendations and implementation procedures for future consideration.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	48.0			48.0
	Work Years:	1			

Budget Source: Evenly shared between ARB, WRB, LSB & HCCB

KEYWORDS: regulatory policies, genotoxicity tests, current capability, future development

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

AIR RESOURCES BRANCH PROJECTS

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RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Flouride Criteria Studies

PROJECT NO: ARB
START DATE: 11/85

SHORT TITLE: Fluoride Criteria

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Mr. R.D. Jones
Phytotoxicology Section
Controlled Environment
Library, Brampton
456-2504

LIAISON OFFICER (name, location, telephone no.): D.S. Harper
Air Resources Branch
456-2505

OBJECTIVE(S): To conduct a series of controlled environment exposures to evaluate the current (proposed) 24 gaseous fluoride criteria in air, with respect to injury to vegetation.

PROJECT DESCRIPTION: Various species of plants with known sensitivity to gaseous fluoride are being exposed to fluoride concentrations at and above 1ppb (v/v) (0.86ug/l) for 24 hours. Injuries resulting from these exposures are rated and the plant tissue evaluated including: Manitoba maple, plum, gladiolus, apricot, tulip, wild grape and white pine. On completion, the validity of the 24-hour criterion (1ppb) will be assessed.

BUDGET AND RESOURCES:	Year: (* current)	4	5*	6	TOTAL
	Cost: ($000's):				98.0
	Work Years:				1.75

Budget Source:

KEYWORDS: Fluoride, controlled exposure, vegetation

OUTPUT (papers, presentations, reports): The results will be published in a Ministry report and possibly in a referred Journal.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None

COMMENTS: Report pending end of fiscal year

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Eulerian Model Evaluation Field Study PROJECT NO: ARB
START DATE: 06/88

SHORT TITLE: Eulerian Model

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. N. Reid
Air Resources Branch
880 Bay Street
Toronto, 965-1634

LIAISON OFFICER (name, location, telephone no.): Dr. M. Lusis
Air Resources Branch

OBJECTIVE(S): To collect special atmospheric chemistry measurements on acid-rain-related compounds, for evaluation of Eulerian long-range transport studies.

PROJECT DESCRIPTION: Measurements of sulphur and nitrogen oxides in air and precipitation, and related compounds, are made in Dorset and a number of other sites.

BUDGET AND RESOURCES: Year: (* current)	1*	2 *	3	TOTAL
Cost: ($000's):				220.0
Work Years:				3.0

Budget Source: ARB

KEYWORDS: Acid rain, atmospheric chemistry

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): USEPA, EPRI, Environment Canada

COMMENTS: Report pending end of fiscal year.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Method Development for PAH's in Ambient Air

PROJECT NO: 298PL
START DATE: 03/86

SHORT TITLE: PAH's in Ambient Air

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. G. Diamond
Air Resources Branch
880 Bay Street
Toronto, 965-4081

LIAISON OFFICER (name, location, telephone no.): Dr. M. Lusis
Air Resources Branch

OBJECTIVE(S): To develop a method for accurate sampling of airborne PAH compounds on a routine basis.

PROJECT DESCRIPTION: This is a joint ARB-LSB-Regional Offices project. Various methods are being evaluated by both laboratory and field testing, with a view to possible interferences, accuracy and precision.

BUDGET AND RESOURCES: Year: (* current)	4*	5	6	TOTAL
Cost: ($000's):				30.0
Work Years:				0.5

Budget Source: ARB Internal

KEYWORDS: PAH, ambient air

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Mechod Development for Volatile Organics in Ambient Air

PROJECT NO: ARB
START DATE: 03/82

SHORT TITLE: VOC Development

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Mr. P. Steer
Air Resources Branch
880 Bay Street
Toronto, 965-4081

LIAISON OFFICER (name, location, telephone no.): W. Chan
Air Resources Branch

OBJECTIVE(S): To develop a method for accurate sampling of volatile organic compounds on a routine basis.

PROJECT DESCRIPTION: This is a joint ARB-LSB-Regional Offices project. The use of ambient cartridges and other sampling approaches is being evaluated by both laboratory and field testing, with a view to possible interferences, accuracy and precision.

BUDGET AND RESOURCES: Year: (* current)	1	2	3	TOTAL
Cost: ($000's):				50.0
Work Years:				0.5

Budget Source: ARB

KEYWORDS: Volatile toxic organic compounds

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Analysis of Volatile Organics in Air PROJECT NO: ARB
START DATE:

SHORT TITLE: Airborne Volatile Organics

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. R. Chapman & Mr. M. Sage
Air Resources Branch
880 Bay Street
Toronto, 965-4081

LIAISON OFFICER (name, location, telephone no.): Dr. M. Lusis
Air Resources Branch

OBJECTIVE(S): Positive identification and quantitation of trace organic compounds (polar and non polar) in the range of C_2 - C_{12} in air. Sampling, standards. analysis, etc.

PROJECT DESCRIPTION: Methods of sampling (canisters, cartridges) preservation, analysis (GC; GC²; GC/MS; GC/MI FTIR, etc.), positive identification and standards for analysis.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	TOTAL
	Cost: ($000's):				1,050.0
	Work Years:				

Budget Source: ARB

KEYWORDS: Volatile organic compounds, trace organics, air analysis

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): Lab Services Branch

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: TAGA 3000 and 6000

PROJECT NO: ARB
START DATE:

SHORT TITLE: Trace Organic Monitoring

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Mr. G. DeBrou
Air Resources Branch
880 Bay Street
Toronto,

LIAISON OFFICER (name, location, telephone no.): Dr. M. Lusis
Air Resources Branch

OBJECTIVE(S): To develop methods of monitoring of trace organics in air, soil, etc. by CI/MS; CI/MS/MS; GC/CI MS/MS, etc.

PROJECT DESCRIPTION: Investigate the ion chemistry of trace organics, formation of a library, computerized operation and other techniques associated with the operation of CI/MS; MS/MS and GC/MS/MS.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	TOTAL
	Cost: ($000's):				1,350.0
	Work Years:				

Budget Source: ARB

KEYWORDS: MS/MS, Tandem mass spec, ion chemistry, CI/MS

OUTPUT (papers, presentations, reports): Several Technology Transfer Conference and other similar conferences. See G. DeBrou for details.

EXTERNAL PARTICIPATION (ministries, governments, agencies): LSB, SCIEX, etc.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

HAZARDOUS CONTAMINANTS COORDINATION BRANCH PROJECTS

TABLE OF CONTENTS

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Persistance, Leaching and Bio-availability of Inorganic and Pentachlorophenol Wood Perservatives

PROJECT NO: PO#A04809
START DATE: 01/88

SHORT TITLE: Wood Perservatives

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. K. Solomon
Canadian Centre for Toxicology

LIAISON OFFICER (name, location, telephone no.): G. Cutten
Hazardous Contaminants Branch
323-5117

OBJECTIVE(S): Study the potential human exposure and ecological importance of the potential dislodgeability of residues of PCP and inorganic preservatives.

PROJECT DESCRIPTION: The project will cover several priorities:
1. Leaching from treated lumber into water of inorganics and effect of acid precipitation on leaching into water.
2. Leaching of PCP from treated wood and movement in soil.
3. Aquatic toxicology of leachates and individual components.
4. Human bystander exposure to PCP leachates.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	10.2	32.5	34.4	77.1
Work Years:				

Budget Source: Hazardous Contaminants Branch

KEYWORDS: wood preservatives, inorganic, PCP, pentachlorophenol, bystander exposure

OUTPUT (papers, presentations, reports): Interim Report July, 1988
Interim Report April, 1989

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: This project has also initiated research projects through CCT funded by Canadian Electrical Assocaition and Ontario Hydro Re: PCP and CCA use in utility poles.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Chemical Exposure Pathways in Ontario PROJECT NO: 1-10-88
START DATE:

SHORT TITLE: Chemical Exposure Pathways in Ontario

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Donald Mackay
University of Toronto

LIAISON OFFICER (name, location, telephone no.): Bryan Leece
Hazardous Contaminants Branch
323-5113

OBJECTIVE(S):
1. Establish correspondence between output of environmental model and prevailing concentrations in Ontario
2. establish a range of air inhalation and water and food consumption rates for a typical family in southern Ontario.
3. Develop correlations between concentations in the environment and those in vegetation, fruit, meat, and dairy products.
4. Quantify human exposure through ambient air, food, and water.
5. Extend assessment to estimation of human physiological fate of chemicals through further development of existing pharmacokinetic model.
6. Validation of the set of models.

PROJECT DESCRIPTION: A multi-media fugacity based environmental model which estimates prevailing concentrations in various media such as air, water, soil, sediment, and fish has been developed and validated for a number of chemicals in souther Ontario. Concepts of this model will be extended to assess exposure to these and additional chemicals by a typical southern Ontario family through air inhalation and food and water consumption, as well as human physiological distribution and body burden. To quantify these exposures, it will be necessary to:

(i) establish a range of typical food consumption rates,
(ii) develop expressions to correlate concentrations in soil, air and water with those in vegetation, fruit, meat, and dairy products and
(iii) refine and apply our recently developed pharmocokinetic model.

Predicted exposures and body burdens will be compared with those known to cause toxic effects in order to assess their severity.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):	49.5	43.8	43.5	136.5
	Work Years:				

Budget Source:

KEYWORDS: pathways, modelling, human exposure

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Exposure Studies in the Use of Pesticides in the Home Garden and for Landscape Pest Control

PROJECT NO:
START DATE:

SHORT TITLE: Use of Pesticides - Home Garden/Landscape

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. K. Solomon, Canadian Centre for Toxicology

LIAISON OFFICER (name, location, telephone no.): J. Onderdonk/J. Lucas, Hazardous Contaminants Branch, 323-5099/323-5111

OBJECTIVE(S): Contractor will address exposure of professional applicators, homeowners and bystanders.

PROJECT DESCRIPTION: Pesticide exposure studies under field conditions will be carried out to define professional applicator, homeowners, bystander exposure and to define means to reduce exposure.

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	13.057	103.242	99.782	216.081
Work Years:	2.5	2.5	2.5	7.5

KEYWORDS: exposure studies on pesticides

OUTPUT (papers, presentations, reports): progress reports, final report, scientific papers.

EXTERNAL PARTICIPATION (ministries, governments, agencies): peer review by Health and Welfare Canada.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

LABORATORY SERVICES BRANCH PROJECTS

TABLE OF CONTENTS

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Development of Method for the Analysis of OC, CB, and PCBs (MISA test groups 22, 24, and 27) in Municipal Sewage Sludge

PROJECT NO: TO-I-89-01
START DATE: 89/05/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Method - Sludge Analysis (OC, CB, PCBs)

PRINCIPAL INVESTIGATOR AND AFFLILIATION :
Lab Services Branch

G.Ladwig / R.Lega
TO Section
125 Resources Rd
Rexdale, Ontario
416-235-5982

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop method for the analysis of OC, CB, and PCBs in municipal sludge.

PROJECT DESCRIPTION : The project involves the following:
1) Establish a suitable cleanup procedure, e.g. NP, RP, GPC chromatography.
2) Establish extraction procedure (Liquid-Liquid or Solid Phase Extraction).
3) Set up GC/MS instrumental conditions for the analysis.
4) Establish recovery, MDLs and QC data as required by LSB-MOE.
5) Write method report.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	25.00			25.00
	Work Years:	0.70			0.70

Budget Source: LSB

KEYWORDS: OC, CB, PCBs, Analysis, Municipal Sewage Sludge

OUTPUT (papers,presentations,reports): MOE method, scientific presentation/ publication

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This method is required for MISA-STP analysis.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL
Contract / Grant
Solicited / Unsolicited

PROJECT TITLE: Development of Method for the Analysis of Volatile Organic Compounds (MISA test groups 16,17,18) in Municipal Sewage Sludge

PROJECT NO: TO-I-89-02
START DATE: 89/05/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Method - Sludge Analysis (Volatile organics)

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch

B.Gutteridge/J.Osborne
TO Section
125 Resources Rd
Rexdale, Ontario
416-235-6001

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop method for the analysis of volatile organic compounds in municipal sludge.

PROJECT DESCRIPTION :
The project involves the following:
1)Evaluation and purchase of an appropriate instrument.
2)Determination and optimization of purge and trap conditions for volatile organics in various municipal sludges.
3)Establish recovery, MDLs, and QC data as required by LSB-MOE.
4)Write method report.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	60.00			60.00
Work Years:	0.50			0.50

Budget Source: LSB

KEYWORDS: Volatile Organics, Analysis, Municipal Sewage Sludge

OUTPUT (papers,presentations,reports): MOE method, scientific presentation/ publication

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: The method is required for MISA-STP analysis.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Development of Method for the Analysis of Base/Neutral and Phenolic Compounds in (MISA Test Groups 19, 20) Municipal Sewage Sludge

PROJECT NO: TO-I-89-03
START DATE: 89/05/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Method - Sludge Analysis (Base/Neutral and Phenolics)

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Section Branch

A.Alfieri / M.MeConnen
TO Section
125 Resources Road
Rexdale, Ont
416-235-6001

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop method for the analysis of base/neutral and phenolic compounds in municipal sludge.

PROJECT DESCRIPTION : The project involves the following:
1)Establish a suitable cleanup procedure, e.g. elution pattern on florasil/ alumina column, GPC, PP.
2)The application of existing in-situ acetylation procedure to various municipal sludges with solid content 0-1%, 1-30% and >30%.
3)Establish recovery, MDLs and QC data as required by LSB-MOE.
4)Write method report.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	95.00			95.00
Work Years:	1.00			1.00

Budget Source: LSB

KEYWORDS: Base, Neutral, and Phenolic Organics, Analysis, Municipal Sludge

OUTPUT (papers,presentations,reports): MOE method, scientific presentation/ publication.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: The method is required for MISA-STP analysis.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Routine Method for the Analysis of Resin and Fatty Acids in Sediments

PROJECT NO: TO-I-89-04
START DATE: 89/09/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Resin and Fatty Acids in Sediments

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Roczanna Lega
Lab Services Branch
TO Section
125 Resources Road
Rexdale, Ontario
416-235-5756

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To provide a routine method for the analysis of resin and fatty acids in sediments, targeting parameters required for MISA Pulp and Paper analysis.

PROJECT DESCRIPTION : A routine method for the required parameters has been investigated for wastewater/water matrices, and is presently being used at MOE. This method will be adapted to analyze sediment matrices.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	25.00			25.00
Work Years:	0.50			0.50

Budget Source: LSB

KEYWORDS: Resin Fatty Acids/Sediments/Pulp and Paper.

OUTPUT (papers,presentations,reports): MOE method, paper to be published.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Broad Range Screening Method for Phenol Speciation/Chlorinated Guaicols in Sediments

PROJECT NO: TO-I-89-05
START DATE: 89/12/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Phenolics Analysis in Sediments

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Roczanna Lega
Lab Services Branch
TO Section
125 Resources Road
Rexdale, Ontario
416-235-5756

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop an analytical method for the analysis of a broad range of phenols, catechols and guaicols in a sediment matrix.

PROJECT DESCRIPTION : A simultaneous insitu-acetylation of phenolic compounds and extraction of phenolic acetates method has been developed for wastewater/ aqueous samples. This method will be reviewed with the view to adapt the method for sediments, using either gas chromatography or mass spectrometry as the detection system.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	25.00			25.00
	Work Years:	0.50			0.50

Budget Source: LSB

KEYWORDS: Phenols, Guaicols, Catechols, Sediments

OUTPUT (papers,presentations,reports): MOE method. Paper to be published.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Method Development for VOST & VOL Cartridges

PROJECT NO: TO-I-89-06
START DATE: 89/01/01
COMPLETION DATE: 91/01/01

SHORT TITLE: Analysis of VOST Cartridges

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Louis Au
Lab Services Branch
TO Section
125 Resources Road
Rexdale, Ontario
416-235-6000

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop an analytical method for VOST samples.

PROJECT DESCRIPTION : Method to use GC/MSD and thermal desorption to analyse VOST type cartridge and ambient air samples. Hazardous compouds analysed are hydrocarbons and chlorinated hydrocarbons (boiling point between 50 & -150 degrees celcius).

BUDGET AND RESOURCES: Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	40.00	22.00		62.00
Work Years:	1.00	0.50		1.50

Budget Source: LSB

KEYWORDS: VOST, VOL, Cartridges, Chlorinated, Hydrocarbons

OUTPUT (papers,presentations,reports): Paper/presentation in conjunction with ARB.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Development of Method for Analysis of Chlorophenols, PCB, PAH, & CB in Stack Samples

PROJECT NO: TO-I-89-07
START DATE: 87/11/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Stack Analysis

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Renee Luniewski
Lab Services Branch
TO Section
125 Resources Road
Rexdale, Ontario
416-235-6000

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: 1)To develop a methodology that would be suitable for the organics CB/PCB/PAH/CP, as well as Dioxins.
2)To develop a methodology that would minimize the dilution factors of each sample.

PROJECT DESCRIPTION : To study elution and derivitizaion techniques for general stack sample analysis.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):	5.00	40.00	33.00	78.00
	Work Years:	0.10	1.00	0.80	1.90

Budget Source: LSB

KEYWORDS: Stack

OUTPUT (papers,presentations,reports): MOE method updates.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Development of a Computer Algorithm for the Automated Identification of PCB Aroclors

PROJECT NO: TO-I-89-08
START DATE: 89/01/09
COMPLETION DATE: 90/03/31

SHORT TITLE: Automated PCB Aroclor Identification

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch

Gerry Ladwig/John Bodnar
TO Section
125 Resources Road
Rexdale, Ontario
416-235-5982

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To tailor in-house available computer algorithms (SIMCA, TNN) for the statistical recognition of PCB Aroclor profiles on an HP-1000 mini-computer.

PROJECT DESCRIPTION : The project will consist of maximizing existing gas chromatograhic method(s) for the separation of PCBs, followed by the manipulation of the computer algorithm for the recognition of individual PCB Aroclors. Mixtures, in particilar 1254/1260 will finally be tested by this program.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	18.00			18.00
	Work Years:	0.50			0.50

Budget Source: LSB

KEYWORDS: PCB, Aroclor type, Computer Recognition, Algorithum

OUTPUT (papers,presentations,reports):

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Evaluation of Novel Tracer Compounds for the Detection of Underground Leaks in Fuel Tanks

PROJECT NO: TO-I-89-09
START DATE: 89/01/01
COMPLETION DATE: 91/01/01

SHORT TITLE: Tracer Compound Analysis

PRINCIPAL INVESTIGATOR AND AFFLILIATION : J. Osborne
Lab Services Branch
TO Section
125 Resources Road
Rexdale, Ontario
416-235-5759

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: 1)Method evaluation.
2)Implementation for routine operations.
3)Provision of accurate QA/QC data.

PROJECT DESCRIPTION : The method will entail the addition of individual tracer compounds (4) to suspected leaking underground fuel tanks and subsequent analysis by element selective gas chromatographic systems of associated groundwater supplies.

BUDGET AND RESOURCES:

Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	50.00			50.00
Work Years:	0.50	0.50		1.00

Budget Source: LSB

KEYWORDS: Leaking Tank, Tracer Analysis

OUTPUT (papers,presentations,reports): Presentation at RAC Technology Transfer Conference, Paper

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: The proposal technology will be able to identify which of any combination of 4 fuel tanks is the source(s) of groundwater contamination.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Development of Method for the Analysis of Phenols, Herbicide Acids and Base/ Neutral Compounds in Municipal Sewage

PROJECT NO: TO-I-89-10
START DATE: 89/05/01
COMPLETION DATE: 90/03/31

SHORT TITLE: Sludge Analysis (Phenols, Herbicide Acids and Base/Neutral Compounds)

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch

G.Ladwig / R.lega
TO Section
125 Resources Road
Rexdale, ontario
416-235-5982

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop method for the analysis of phenols, herbicide acids and base neutral compounds in municipal sludge.

PROJECT DESCRIPTION :
The project involves the following:
1.Establish a suitable clean-up procedure eg. NP,RP, GPC chromatography.
2.Establish extraction procedure (Liquid-liquid or solid phase extraction).
3.Set up instrumental conditions for analysis.
4.Establish recovery, MDLs, QC data as required by LSB-MOE.
5.Write method report.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	25.00			25.00
Work Years:	0.70			0.70

Budget Source: LSB

KEYWORDS: Phenols, Herbicide Acids, Base/Neutral Organics, Analysis

OUTPUT (papers,presentations,reports): MOE method, scientific presentation/ publication

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: The method is required for MISA-STP analysis.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL E | Contract C - | Solicited S
INTERNAL | Grant | Unsolicited

PROJECT TITLE: Investigation of the Analytical Capabilities of the ICP/MS with Emphasis on Environmental Analysis.

PROJECT NO: ITC-E-87-02
START DATE: 87/01/01
COMPLETION DATE: 90/01/31

SHORT TITLE: ICP/MS Analytical Develpoment

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Dr. B. McNutt
McMaster University
Department of Geology
Hamilton, Ontario

416-525-9140

LIAISON OFFICER (name,location,telephone): George Kanert
Lab Services Branch
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5848

OBJECTIVES: To investigate the analytical capabilities of the ICP/MS with emphasis on environment analysis.

PROJECT DESCRIPTION : Various aspects of the instrumentation will be investigated and developed. Project items include optimization of analytical conditions using simplex techniques, investigation of negative ion capability for determination of negative ions (sulfur and halogens) and application to tracer analysis and source allocation in precipitation samples; and optical, ICP/MS interface to determine added elements.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):	55.83	59.28	34.89	150.00
Work Years:	0.00	0.00	0.00	0.00

Budget Source: LSB

KEYWORDS: ICP/MS, ICP/OES, Optimization

OUTPUT (papers,presentations,reports): Final report, presentation, possible scientific publications, extended analytical capabilties.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This study is part of the Laboratory/University Joint Research Venture Program. Research is of interest to WRB and ARB.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL E Contract C Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Source Identification of Air Borne Particulates of Environmental Concern Using Surface and Microchemical Techniques

PROJECT NO: ITC-E-88-02
START DATE: 88/08/17
COMPLETION DATE: 91/08/28

SHORT TITLE: Source Identification of Air Particulates

PRINCIPAL INVESTIGATOR AND AFFLILIATION : University of Western Ont
Dr. Ronald R. Martin
Department of Chemistry
London, Ontario

519-679-2111

LIAISON OFFICER (name,location,telephone): Lab Services Branch
Dr. J. Hipfner/R. Moody
ITC Section
125 Rexdale, Ontario
Rexdale, Ontario
416-235-5856

OBJECTIVES: To develop a series of instrumental tests which may be used to identify specific sources of airborne particulates. The environmental toxicity will also be assessed.

PROJECT DESCRIPTION : Project will provide MOE with an expanded capability for identification of air particulates relating to sources; has application toward complaint investigations and long range air transport of particulates. University of Western Ontario will be utilizing the resources of the Surface Science Centre which received funding recently by the Ontario Government as a Centre of Excellence. The work will be done by an MSc student who will work closely with LSB staff.

BUDGET AND RESOURCES: Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	8.61	42.89	37.35	107.90
Work Years:				

Budget Source: LSB

KEYWORDS: Air Borne Particulates, Characterization

OUTPUT (papers,presentations,reports): Report

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This project is part of the Lab/University Joint Research Venture Program.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL E | Contract C | Solicited S
INTERNAL | Grant | Unsolicited

PROJECT TITLE: Development of Methods for the Analysis of Alkyl Lead, Tin and Mercury Compounds in Effluent, Surfaces and Groundwater

PROJECT NO: ITC-E-89-01
START DATE: 89/04/01
COMPLETION DATE: 90/03/30

SHORT TITLE: Organometallics

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Enviro-Tech
Mark Powell
General Delivery
Honeywood, Ontario
L0N 1H0
519-925-3108

LIAISON OFFICER (name,location,telephone): Lab services Branch
George Kanert
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5848

OBJECTIVES: To develop a method for the measurement of alkyl lead, tin and mercury species such as tetraethyl lead, butyl tin and methyl mercury in water or liquid effluent samples.

PROJECT DESCRIPTION : GC-AAS techniques will be used to develop a method for the routine analysis of tetraethyl, trimethyl, and other alkyl Pb species, and then applied to alkyl and butyl tins if possible. More sensitive techniques will be surveyed and investigated experimentally. A survey of methods for methyl mercury will be conducted.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	65.00			65.00
Work Years:	1.00			1.00

Budget Source: LSB

KEYWORDS: Organometallics, GC-AAS, Speciation

OUTPUT (papers,presentations,reports): Routine analytical methods, internal report(s), possible scientific paper.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Method development for alkyl Pb is required for MISA regulations. Other organometallic speciation work is in support of special studies by WRB (eg. Dorset).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Ultratrace Metal Analysis by ICP-MS Using Column Preconcentration

PROJECT NO: ITC-I-88-01
START DATE: 88/11/10
COMPLETION DATE: 89/12/31

SHORT TITLE: IC-ICP/MS

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch
F. Hopper / J. Hipfner
ITC Section 125
125 Resources Rd
Rexdale, Ont
416-235-5834

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop and optimize an IC-ICP/MS for select trace elements and to use preconcentration with IC-ICP/MS to reduce detection limits.

PROJECT DESCRIPTION : An ion chromatograph will be coupled to an IC-ICP/MS instrument, and the system optimized for Pb, Cd, and Cu. The column will be used to preconcentrate these and possibly other trace metals, for subsequent measurement by ICP/MS.

BUDGET AND RESOURCES:

Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	16.00	25.00		41.00
Work Years:	0.20	0.20		0.40

Budget Source: LSB

KEYWORDS: ICP/MS, IC, IC-ICP/MS, Preconcentration, Water Analysis

OUTPUT (papers,presentations,reports): Scientific paper, and possible new routine analytical method.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Research in support of WRB Dorset program.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract - Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Flow Injection Analysis System For ICP/MS

PROJECT NO: ITC-I-88-15
START DATE: 88/04/01
COMPLETION DATE: 89/11/30

SHORT TITLE: Flow Injection for ICP/MS

PRINCIPAL INVESTIGATOR AND AFFLILIATION : F. Hopper
Lab Services Branch
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5834

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop and evaluate a flow injection system for the Sciex Elan ICP/MS.

PROJECT DESCRIPTION : A flow injection system will be developed for use with the Sciex Elan ICP/MS. This sample introduction system will reduce matrix effects and expand the sensitivity and dynamic range of the instrument.

BUDGET AND RESOURCES: Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	30.00	23.00		53.00
Work Years:	0.30	0.20		0.50

Budget Source: LSB

KEYWORDS: Flow Injection Analysis , ICP/MS

OUTPUT (papers,presentations,reports): Paper for presentation.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: The increased sensitivity will be of use in LRTAP studies and to ARB and WRB for surveys and tracer studies.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Flow Injection Analysis System for ICP/OES

PROJECT NO: ITC-I-88-16
START DATE: 88/04/01
COMPLETION DATE: 90/01/01

SHORT TITLE: Flow Injection Analysis - ICP/OES

PRINCIPAL INVESTIGATOR AND AFFLILIATION : F. Hopper / F. Mo
Lab Service Branch
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5834

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To develop and evaluate a flow injection system for the JY48 Spectrometer.

PROJECT DESCRIPTION : A flow injection system will be added to the JY48 spectrometer and interfaced to the instrument controller. Expected benefits include increased sample throughput, automatic sample introduction, reduced operator time, and automatic dilution of over-range samples.

BUDGET AND RESOURCES: Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):	10.00	23.00		33.00
Work Years:	0.05	0.20		0.25

Budget Source: LSB

KEYWORDS: Flow Injection Analysis, ICP/OES

OUTPUT (papers,presentations,reports): Internal report, paper for publication or presentation.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This system will decrease the per sample analysis time while simultaneously expanding the dynamic range of the instrument by 1-2 orders of magnitude. This system will provide improved analytical support for current WRB sampling programs.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL
Contract / Grant
Solicited / Unsolicited

PROJECT TITLE: The Application of ICP/MS for the Analysis of Metals in Surface Waters

PROJECT NO: ITC-I-89-01
START DATE: 89/07/01
COMPLETION DATE: 89/12/31

SHORT TITLE: ICP/MS Surface Waters

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch

F. Hopper / E. Quan
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5834

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To assess the feasibility of using ICP/MS for the analysis of surface water samples on a routine basis.

PROJECT DESCRIPTION : Data from previous analysis of routine surface water samples submitted to MOE will be summarized. Experiments will be carried out to determine the limitations of ICP/MS for these samples. A tentative method using matrix matching, internal standards, and appropriate instrument settings will be devised and tested. Sample screening and data routing procedures will be implemented as necessary.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	30.00			30.00
Work Years:	0.50			0.50

Budget Source: LSB

KEYWORDS: ICP/MS, Water Analysis

OUTPUT (papers,presentations,reports): Internal report, and possible presentations and scientific papers. Potential new analytical methods.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Research in support of WRB programs.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL E / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Investigation and Development of Supercritical Fluid Extraction of Trace Organics from Environmental Matrices

PROJECT NO: TO-E-87-01
START DATE: 88/03/01
COMPLETION DATE: 90/03/01

SHORT TITLE: Supercritical Fluid Extraction

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Carleton University
Dr. Kruus / Dr. Wightman
Department of Chemistry
Ottawa, Ontario
K1S 5B6
613-788-3841

LIAISON OFFICER (name,location,telephone): Lab Services Branch
Dr. Ijaz Ahmad
TO Section
125 Resources Road
Rexdale, Ontario
416-235-5757

OBJECTIVES: To investigate the application of supercritical fluid extraction techniques for the selective extraction of various classes of organic compounds e.g. PAHs, phenols, from environmental solids.

PROJECT DESCRIPTION : MOE supplied supercritical fluid extraction unit to the project investigators. The project will represent the PH.D. work of Mr. Burk. The project will span 2-3 years and is intended to review, develop and provide an SFE technique for application in environmental analysis of volatile and non-volatile organics in soils, sediments and possibly vegetation and biota. To expand current areas of analysis for volatile or low extractability compounds.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):	61.50	24.50	28.50	114.50
Work Years:				

Budget Source: LSB

KEYWORDS: Supercritical Fluid Extraction

OUTPUT (papers,presentations,reports): PH.D. thesis, presentation on new research area, technology transfer presentation.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This project is part of the Lab/University Joint Research Venture Program.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

:XTERNAL Contract Solicited
:NTERNAL Grant Unsolicited

'ROJECT TITLE: Method Improvements for the .nalysis of Nitrogen and Phosphorous in 'egetation, Soil, and Sediment.

PROJECT NO: ITC-I-89-02
START DATE: 89/09/01
COMPLETION DATE: 90/03/30

;HORT TITLE: N & P Method Development

?RINCIPAL INVESTIGATOR AND AFFLILIATION : Elizabeth Pastorek
Lab Services Branch
ITC Section
125 Resources Road
Rexdale, Ontario
416-235-5845

LIAISON OFFICER (name,location,telephone):

)BJECTIVES: To develop a method for N and P analysis that will be more efficient and increase throughput, while maintaining or improving precision and accuracy of the determination.

PROJECT DESCRIPTION : A literature search will be carried out to determine what methods are available. An evaluation will be made of preparation methods and analytical techniques. If necessary new equipment will be brought in for testing. Finally, an intercomparison will be carried out with the present system.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	60.00			60.00
	Work Years:	0.60			0.60

Budget Source: LSB

KEYWORDS: Nitrogen, Phosphorus, Vegetation, Soil

)UTPUT (papers,presentations,reports): Internal Method Report

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This research will provide improved analytical support for current ARB and WRB sampling programs.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL E Contract C Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Development of an Automated HPLC System for the Extraction and Determination of Multiresidues from Water Samples

PROJECT NO: DWO-E-88-01
START DATE: 88/06/05
COMPLETION DATE: 91/06/07

SHORT TITLE: Automated HPLC System for Multiresidues

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Dr. I. Brindle/Dr. Chiba
Brock University
Department of Chemistry
St. Catherines, Ontario
L2S 3A1
416-688-5550

LIAISON OFFICER (name,location,telephone): Dr. David Hall
Lab Services Branch
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5856

OBJECTIVES: To develop an automated High Pressure Liquid Chromatographic (HPLC) System method to replace the use of liquid/liquid extraction and improve the automation of solid phase extraction techniques for the analysis of organochlorine, carbonate, triazine and organophosphate compounds in water.

PROJECT DESCRIPTION : The project is intended to develop a HPLC to directly concentrate and separate various groups of organic parameters for analysis of surface waters. Such a system would eliminate the need for laborious extraction and concentration steps. The major groups which would be investigated include organochlorine pesticides and triazine herbicides. The work will be done by an MSc student who will work closely with LSB staff.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):	67.97	59.67	26.81	154.45
	Work Years:				

Budget Source: LSB

KEYWORDS: HPLC, Multiresidues

OUTPUT (papers,presentations,reports): Report

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: This project is part of the Lab/University Joint Research Venture Program.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Stability Study of Chlorinated Dibenzo-p-dioxins and Dibenzofurans in Fish During Storage

PROJECT NO: DWO-I-87-03
START DATE: 87/01/01
COMPLETION DATE: 90/07/30

SHORT TITLE: Dioxins/Furans in Stored Fish Samples

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Dr. R. E. Clement
Lab Services Branch
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5896

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To determine the effect of freezer storage time on analytical results.

PROJECT DESCRIPTION : Up to two years or more can elapse before ground fish samples are analyzed. This study is needed to determine whether the analytical results obtained are consistent over this time period.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):	21.00	10.00	10.00	41.00
Work Years:	0.50	0.20	0.20	0.90

Budget Source: LSB

KEYWORDS: Fish, Storage, Dioxin

OUTPUT (papers,presentations,reports): Paper

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Work is required to support Water Resources Branch - Fish Contaminants Program. Samples have been stored for three years. Extracted samples will be analyzed by April, 1990. Report to be completed by July, 1990.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Identification of Unknown Organic Contaminants by High Resolution Mass Spectrometry (HRMS)

PROJECT NO: DWO-I-87-12
START DATE: 87/03/01
COMPLETION DATE: 90/04/30

SHORT TITLE: Unknown Organic Contaminants - HRMS

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch
Dr. Eric Reiner
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5903

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To identify unknown organic environmental contaminants using high resolution mass spectrometric techniques.

PROJECT DESCRIPTION : Use advanced instrumentation (ZAB-2F) to identify organic environmental contaminants not analyzable by conventional low resolution mass spectrometric techniques. Advanced mass spectrometric techniques including high resolution MS (accurate mass determinations), Mass spectrometry-Mass spectrometry (MS-MS), linked scanning and Mass Analyzed Ion Kinetic Spectrum (MIKES) will be employed.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):	48.00	30.00	40.00	118.00
Work Years:	1.00	0.50	0.50	2.00

Budget Source: LSB

KEYWORDS: Compound Identification, High Resolution, Mass Spectrometry

OUTPUT (papers,presentations,reports): One presentation has been given at the Technology Transfer Conference.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: HRMS full scans, accurate mass (elemental composition) determination, linked scans and MIKES have been used to identify unknowns by GC/MS.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Investigation of the Use of MS/MS for Rapid Dioxin/Furan Determination

PROJECT NO: DWO-I-88-01
START DATE: 88/04/01
COMPLETION DATE: 90/04/30

SHORT TITLE: MS/MS for Rapid Dioxin/Furan Determination

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Dr. Eric Reiner
Lab Services Branch
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5903

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To achieve more rapid dioxin/furan determinations in complex samples using the instrumental technique of tandem mass spectrometry (MS-MS), by requiring reduced cleanup.

PROJECT DESCRIPTION : Complex sample types such as fish, pulp and paper sludges and others will be extracted and brought to various degrees of cleanup. By analyzing these samples by MS-MS and comparing results with those of fully cleaned-up samples, the degree of cleanup required will be determined. Standard methods for reduced clean-up, rapid determination of CDDs/CDFs in samples will be developed.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):	40.00	35.00		75.00
	Work Years:	0.60	0.60		1.20

Budget Source: LSB

KEYWORDS: Dioxins, Furans, MS-MS, Reduced cleanup

OUTPUT (papers,presentations,reports): Reports, journal papers.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Development of Methodology for Analysis of 2,3,7,8-Substituted Dioxins/Furans in Fish.

PROJECT NO: DWO-I-89-01
START DATE: 89/04/01
COMPLETION DATE: 90/04/01

SHORT TITLE: Fish Toxic Congener Analysis.

PRINCIPAL INVESTIGATOR AND AFFLILIATION :
Lab Services Branch

Tom Thompson
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5890

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: Develop and validate a method for definitive analysis of the 17 dioxins/furans that have chlorine substituted at the 2,3,7,8 - positions.

PROJECT DESCRIPTION : HPLC will be used to separate cleaned-up fish extracts into several fractions. Various fractions will be individually analysed by using GC-MS.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	60.00			60.00
Work Years:	1.00			1.00

Budget Source: LSB

KEYWORDS: Dioxins, Furans, Toxic Congeners, HPLC, Cleanup

OUTPUT (papers,presentations,reports): Method write up.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Work is needed to support HCB multi-media dioxin guidelines.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL Contract Solicited
INTERNAL Grant Unsolicited

PROJECT TITLE: Accuracy and Reproducibility of Compound Identification by GC-MS (Round-Robin Study)

PROJECT NO: DWO-I-89-02
START DATE: 89/10/01
COMPLETION DATE: 90/04/01

SHORT TITLE: GC-MS Characterization Round Robin

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Ms. Colleen Tashiro
Lab Services Branch
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5895

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To investigate the accuracy and reproducibility of organic compound identification in complex environmental samples.

PROJECT DESCRIPTION : Two or three sample types will be selected and extracted. Extracts will be spiked with a few compounds to ensure principle compound classes are present. Aliquots of extracts will be submitted to select laboratories for characterization analysis.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	25.00			25.00
	Work Years:	0.20			0.20

Budget Source: LSB

KEYWORDS: Round-Robin, GC-MS, Organic Characterization

OUTPUT (papers,presentations,reports): Journal

EXTERNAL PARTICIPATION (ministries,governments,agencies): Private analytical laboratories, Academic laboratories

COMMENTS:

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL — Contract — Solicited
INTERNAL — Grant — Unsolicited

PROJECT TITLE: Validation Studies of Automated Preconcentration Water Sampler (APS) for Dioxin/ Furans.

PROJECT NO: DWO-I-89-03
START DATE: 89/06/01
COMPLETION DATE: 89/09/01

SHORT TITLE: APS Validation for PCDD/PCDF

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Dr.R.Clement/R.Hunsinger
LSB/WRB
125 Resources Road/
1 St.Clair Ave. W
Toronto, Ontario
416-235-5896

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To validate the use of the APS for sampling parts-per-quadrilion levels of dioxins/furans in drinking water.

PROJECT DESCRIPTION : Samples of "dioxin water" will be generated. Split samples will then be analyzed by using the APS and our normal MOE method (1/1 extraction). The results from several replicates will be compared. The APS will also be used to sample a water treatment plant.

BUDGET AND RESOURCES:	Year: (* current)	1 *	2	3	TOTAL
	Cost: ($000's):	20.00			20.00
	Work Years:	0.30			0.30

Budget Source: LSB

KEYWORDS: Sampling Methods, Dioxins, Furans, Automated, Drinking Water

OUTPUT (papers,presentations,reports): Journal Publication

EXTERNAL PARTICIPATION (ministries,governments,agencies): None

COMMENTS: The APS sampler was developed previously through RAC grants to Prof. Hollebone of Carleton University. WRB is also a budget source.

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL / INTERNAL — Contract / Grant — Solicited / Unsolicited

PROJECT TITLE: Investigation of Formation of Dioxins/Furans in Prescribed Burns

PROJECT NO: DWO-I-89-04
START DATE: 88/07/07
COMPLETION DATE: 89/12/01

SHORT TITLE: Dioxins in Format Fires

PRINCIPAL INVESTIGATOR AND AFFLILIATION : Lab Services Branch

Colleen Tashiro
DWO Section
125 Resources Road
Rexdale, Ontario
416-235-5895

LIAISON OFFICER (name,location,telephone):

OBJECTIVES: To determine whether forest fires are a source to the environment of dioxins/furans.

PROJECT DESCRIPTION : During prescribed burns carried out in Northern Ontario LSB staff will sample before/after air/soil. ARB staff will perform soil sampling.

BUDGET AND RESOURCES: Year: (* current)	1 *	2	3	TOTAL
Cost: ($000's):	30.00			30.00
Work Years:	0.30			0.30

Budget Source: LSB

KEYWORDS: Dioxins, Furans, Prescribed Burns, Background Levels

OUTPUT (papers,presentations,reports): Journal Publications.

EXTERNAL PARTICIPATION (ministries,governments,agencies):

COMMENTS: Forest fires are potentially a large source of dioxins/furans to the environment. This work is needed to assess this potential source.

WASTE MANAGEMENT BRANCH PROJECTS

TABLE OF CONTENTS

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract		Solicited	
INTERNAL		Grant	X	Unsolicited	X

PROJECT TITLE: Demonstration of Proprietary Ultrafilter and Zero Discharge Rinsing on Recovery of Metal Finishing Wastes

PROJECT NO: IR-04-50
START DATE: 06/88

SHORT TITLE: Recovery of Metal Finishing Wastes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Waste Management Consultants
Wayne McLellan

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To demonstrate effectiveness of equipment in metal recovery from wastes and treatment to allow in-plant re-use of wastes.

PROJECT DESCRIPTION: Equipment to be run on-site at several varied metal finishing companies.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				6.5
	Work Years:				0.5

Budget Source: Waste Management Branch - Industrial 4Rs Program

KEYWORDS: Demonstration; zero-discharge; ultrafilter.

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract		Solicited	
INTERNAL		Grant	X	Unsolicited	X

PROJECT TITLE: Recovery and Reuse of Phenol in Plastic Making Processes

PROJECT NO: IR-04-85
START DATE: 07/88

SHORT TITLE: Phenol in Plastics

PRINCIPAL INVESTIGATOR AND AFFILIATION: Zenon Environmental for Durez Limited

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To investigate methods of reducing phenol use, and recovery of waste phenol for re-use in plastic manufacture.

PROJECT DESCRIPTION: Literature review of phenol recovery processes - application of information to plant situation.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				20
	Work Years:				0.5

Budget Source: Waste Management Branch Industrial 4Rs Program.

KEYWORDS: Phenol, Recovery from Wastewater, Re-use

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract		Solicited	
INTERNAL		Grant	X	Unsolicited	X

PROJECT TITLE: Evaluation of Thermal Screw Press in Multi Waste Recovery and Recycle

PROJECT NO: IR-04-78
START DATE: 07/88

SHORT TITLE: Thermal Screw Press

PRINCIPAL INVESTIGATOR AND AFFILIATION: Adam Boschieter
Spider Recycling

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To evaluate and demonstrate the thermal screw press in recovering and recycling different industrial wastes.

PROJECT DESCRIPTION: Wood, paper, wallboard, roofing tiles, rubber tires and other wastes will be treated to demonstrate the technical and economic viability of the process in recycling the wastes.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				134
	Work Years:				0.5

Budget Source: Waste Management Branch Industrial 4Rs Program.

KEYWORDS: Screw Press - Waste Recycle.

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract		Solicited	
INTERNAL		Grant	X	Unsolicited	X

PROJECT TITLE: Recovery of Tin and Steel From Used Cans

PROJECT NO: IR-04-81
START DATE: 07/88

SHORT TITLE: Tin and Steel Recovery

PRINCIPAL INVESTIGATOR AND AFFILIATION: E. D. Rogers
Metal Recovery Ind. Inc.

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To determine means of segregating and preparing cans for integration into tin and steel recovery process.

PROJECT DESCRIPTION: Segregation, classification and cleaning used cans to render them suitable for treatment in existing process to recover tin and steel.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				48
	Work Years:				

Budget Source: Waste Management Branch - Industrial 4Rs Program.

KEYWORDS: Tin, Steel, Cans, Recycling

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract		Solicited	
INTERNAL		Grant	X	Unsolicited	X

PROJECT TITLE: Use of Whey Wastes In Manufacture of High Grade Protein and Lactose

PROJECT NO: IR-04-20
START DATE: 07/88

SHORT TITLE: Whey Wastes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Protose Separations Inc.
Alan Jones

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To investigate the manufacture of high grade protein and lactose from whey wastes at pilot scale.

PROJECT DESCRIPTION: Production of protein and lactose from whey wastes using continuous moving bed ion exchange technology.

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				488
	Work Years:				0.5

Budget Source: Waste Management Branch - Industrial 4Rs Program.

KEYWORDS: Whey waste; protein; lactose; ion exchange.

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract	Solicited
INTERNAL		Grant X	Unsolicited X

PROJECT TITLE: Evaluation of Zero Discharge Technology For Tannery Operations

PROJECT NO: IR-04-75
START DATE: 06/88

SHORT TITLE: Zero Discharge Technology

PRINCIPAL INVESTIGATOR AND AFFILIATION: G. Rupke Associates
Gerry Rupke

LIAISON OFFICER (name, location, telephone no.): John Smart
Waste Management Branch
323-5179

OBJECTIVE(S): To evaluate state-of-the-art equipment and processes for minimization or elimination of tannery wastes by recycling and re-use of wastes.

PROJECT DESCRIPTION: Review of latest tannery processes and equipment for waste recovery - application of findings to actual case.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				16.7
	Work Years:				

Budget Source: Waste Management Branch - Industrial 4Rs Program.

KEYWORDS: Tannery, waste recycle

OUTPUT (papers, presentations, reports): Report.

EXTERNAL PARTICIPATION (ministries, governments, agencies): None.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: A Guide for the Evaluation of Long-Term Leachability of Solidified Wastes

PROJECT NO: 339-RR
START DATE: 11/87

SHORT TITLE: Long-term leachability of solidified wastes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. P. Coté
W.T.C.
Environment Canada

LIAISON OFFICER (name, location, telephone no.): R. Khettry
Waste Management Branch
323-5226

OBJECTIVE(S): Guidance for selection of leaching test method based on expected leaching scenario. Protection of groundwater quality.

PROJECT DESCRIPTION: Data collection, development of database, review of leaching tests, review of waste form properties, review of field conditions and investigations methods, development of generic long-term leaching scenarios, development of leaching evaluation procedure.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				140.0
	Work Years:				3.5

Budget Source: WMB (MOE) $35,000 Remainder from USEPA, Env. Canada

KEYWORDS: (Long term) leachability, solidified wastes

OUTPUT (papers, presentations, reports): Leachability - Test procedure, waste form properties, leachability evaluation protocol, database of documents

EXTERNAL PARTICIPATION (ministries, governments, agencies): USEPA, Env. Canada (WTC)

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X | Contract X | Solicited X
INTERNAL | Grant | Unsolicited

PROJECT TITLE: Development of a Laboratory Qualification Standard (Code) for Laboratories Analyzing Industrial Wastes

PROJECT NO: PO#A94386
START DATE: 08/86

SHORT TITLE: Laboratory Qualification Code

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Canadian Standards Assc.
Mr. Jim Dixon
178 Rexdale Boulevard
Rexdale, Ontario
M9W 1R3

LIAISON OFFICER (name, location, telephone no.): Steven Radcliffe,
Waste Management Branch
323-5188

OBJECTIVE(S): To develop a qualification standard for laboratories analyzing industrial wastes required by Ontario Regulation 309. The standard is to be developed by a consensus approach and must be capable of being used with any subsequent certification programs that the Ministry may wish to proceed with at a future date.

PROJECT DESCRIPTION: The qualification standard should be developed by a consultative process involving regulatory agencies, industry, testing agencies and other interested parties. It will need to address items such as minimum staff requirements, administrative and technical requirements of laboratories performing tests on industrial wastes.

BUDGET AND RESOURCES:	Year: (* current)	4	5	6*	TOTAL
	Cost: ($000's):				41.5
	Work Years:				2.25

Budget Source: Waste Management Branch

KEYWORDS: Laboratory, Qualification Code, Industrial Wastes.

OUTPUT (papers, presentations, reports): CSA Standard Z201

EXTERNAL PARTICIPATION (ministries, governments, agencies): Technical committee which is developing the code by consensus, includes representatives from regulatory authorities, industry, academia, testing agencies and other interested parties.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited X
INTERNAL	Grant	Unsolicited

PROJECT TITLE: Wood Waste Inventory of Secondary Industries in Ontario

PROJECT NO: PO#A05580
START DATE: 08/88

SHORT TITLE: Wood Waste Inventory

PRINCIPAL INVESTIGATOR AND AFFILIATION: MacLaren Engineering
D. Hickman

LIAISON OFFICER (name, location, telephone no.): D. Sparling
Waste Management Branch
323-5152

OBJECTIVE(S): To develop an inventory of wood residues in Southern Ontario and to identify opportunities to utilize wood waste.

PROJECT DESCRIPTION: An inventory of Southern Ontario wood residues will be developed and proposals for utilization of wood wastes will be made.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				51.0
	Work Years:				0.4

Budget Source: Ministry of the Environment - 75%, Ministry of Energy - 25%

KEYWORDS: Wood Waste Inventory

OUTPUT (papers, presentations, reports): Final Report, Data Base

EXTERNAL PARTICIPATION (ministries, governments, agencies): Ministry of Energy, municipalities, industry

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

WATER RESOURCES BRANCH PROJECTS

TABLE OF CONTENTS

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Lake of the Woods Assessment

PROJECT NO: WRB
START DATE: 06/86

SHORT TITLE: Algal Assessment

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Bernie Neary
Dorset Research Centre
(705) 766-2418

LIAISON OFFICER (name, location, telephone no.):

Bernie Neary/Neil Hutchinson
Dorset Research Centre
(705) 766-2418

OBJECTIVE(S):
To assess the cause of the apparent increase in algal biomass in the northern part of Lake of the Woods in recent years by using remote sensing and field surveys.

PROJECT DESCRIPTION:

Remotely sensed digital data are being assessed for utility in quantifying changes in surface algal biomass in Lake of the Woods and other inland lakes. Historical data on inflow, lake level, nutrients and algal density are being used to infer possible reasons for increased algal biomass

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	4 *	TOTAL
	Cost: ($000's):	38	88	15	77	218
	Work Years:	0.3	0.3	0.2	0.4	1.2

Budget Source: Water Resources Branch

KEYWORDS: Algae, nutrients, remote sensing

OUTPUT (papers, presentations, reports):
"Remote Sensing of Chlorophyll: Lake of the Woods Case Study". Presentation to International Association Great Lakes Research Conference, Hamilton, Ontario, May 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
MNR - Lake of the Woods Fisheries Assessment Unit
Moniteq Limited - Remote Sensing RAC Contract 452C

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Control of Blue-green Algae Problems in Southern Ontario Lakes and Reservoirs

PROJECT NO: WRB
START DATE: 1987

SHORT TITLE: Blue-green algae control

PRINCIPAL INVESTIGATOR AND AFFILIATION: K. Nicholls/H. Vandermeulen
Aquatic Biology Section
235-5810, 235-6046

LIAISON OFFICER (name, location, telephone no.):

OBJECTIVE(S): To evaluate methods of eliminating blue-green algal blooms using biomanipulation, physical and chemical treatment of whole lakes and reservoirs.

PROJECT DESCRIPTION: A variety of lake management techniques are being evaluated for their ability to control blue-green algae growth in several lakes and reservoirs in southern Ontario. These include nitrate, fertilization , calcium carbonate treatment, aeration/destratification and hypolimnetic aeration.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	130	130	130	390
	Work Years:	1.5	2.5	2.5	6.5

Budget Source: Water Resources Branch, Inland Lakes Programme

KEYWORDS: Blue-green algae, lake treatment

OUTPUT (papers, presentations, reports): Reports, seminars, conferences, journal papers.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
Ministry of Natural Resources
Conservation Authorities

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OFAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Inferred pH/alkalinity History of Acid Sensitive Lakes Using Algal Remains ("fossils") Preserved in Lake Sediments

PROJECT NO: WRB
START DATE:

SHORT TITLE: Paleolimnology of lake acidification

PRINCIPAL INVESTIGATOR AND AFFILIATION: K. Nicholls
Water Resources Branch
235-5810

LIAISON OFFICER (name, location, telephone no.):

OBJECTIVE(S): To determine the rate of change of alkalinity/pH in selected lakes over the past 100 years.

PROJECT DESCRIPTION: Calibration equations using three groups of organisms (diatoms, silica-scaled chrysophytes and chrysophyte cysts) have been developed for 50 Ontario lakes. These are now being applied to the down-core history of 8 lakes to determine the acidification rate.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3	TOTAL
	Cost: ($000's):	30.0	30.0	30.0	90.0
	Work Years:	1.0	1.0	1.0	

Budget Source: APIOS

KEYWORDS: Acidification, paleolimnology, sediments, algae

OUTPUT (papers, presentations, reports): Reports, seminars, conferences, journal papers.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
Queen's University, private sector consultants

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract X	Solicited
INTERNAL		Grant	Unsolicited X

PROJECT TITLE: Biosorption, Bioaccumulation and Food Chain Transfer of Organic Chemicals

PROJECT NO: WRB
START DATE:

SHORT TITLE: Biosorption - food chain transfer

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D. MacKay, U. of Toronto
Dr. F.A.P.C. Gobas, U. of Windsor
Great Lakes Inst.

LIAISON OFFICER (name, location, telephone no.): Gary Johnson, MOE
Water Resources
Great Lakes Section
416-323-4947

OBJECTIVE(S): To review state-of the-art research with respect to biosorption and bioaccumulation in order to enhance predictive food chain modelling.

PROJECT DESCRIPTION: The project will utilize currently available information in order to predict the extent to which organic chemicals present in the water column, partition into fish by gill or food uptake, and are transferred by food chain accumulation to higher trophic level organisms.

BUDGET AND RESOURCES: Year: (* current)	1	2	3	TOTAL
Cost: ($000's):	17.5			17.5
Work Years:	1.0			1.0

Budget Source: Water Resources Branch, Great Lakes

KEYWORDS: Biosorption, bioaccumulation, food chain, organic contaminants

OUTPUT (papers, presentations, reports): A report/manual and user-friendly computer program outlining simple methods to measure and calculate partition coefficients and fish bioaccumulation factors.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
See principal investigators above.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract	X	Solicited	
INTERNAL	X	Grant		Unsolicited	X

PROJECT TITLE: Model Development-Food Chain

PROJECT NO: WRB87-05
START DATE: 07/86

SHORT TITLE: Food Chain Transfer

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J.A. McCorquodale
University of Windsor

LIAISON OFFICER (name, location, telephone no.): Peter Nettleton (323-4964)
MOE - Water Resources Branch
Great Lakes Section

OBJECTIVE(S): To enhance the existing food chain sub-model for incorporation into the "WASTOX" Contaminant Fate Model.

PROJECT DESCRIPTION: Studies conducted on two MISA Pilot Sites (St. Mary's and St. Clair Rivers) have collected extensive ecosystem data. Development of the food chain sub-model will provide a more realistic and accurate representation of the ecosystem, as compared with previous methods. This will enable specific data needs to be identified as well as strengthen the fate and transport models used.

BUDGET AND RESOURCES:	Year: (* current)	4*	5	6	TOTAL
	Cost: ($000's):				45.0
	Work Years:				1.0

Budget Source: Water Resources Branch, Great Lakes

KEYWORDS: Food chain model, fate and transport model

OUTPUT (papers, presentations, reports): Model simulation reports and scientific papers.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Contract budget is supplemented by $50.0K of work perfrmed by Water Resources Branch.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL		Contract	Solicited
INTERNAL	X	Grant	Unsolicited

PROJECT TITLE: Large Lake Surveys (Inland Lakes)

PROJECT NO: WRB
START DATE: 06/86

SHORT TITLE: Lake Monitoring

PRINCIPAL INVESTIGATOR AND AFFILIATION: Bernie Neary
Research Centre
705-766-2418

LIAISON OFFICER (name, location, telephone no.):
Bernie Neary/Neil Hutchinson

OBJECTIVE(S): (1) To survey large inland lakes (Lakes Muskoka, Joseph, Rosseau, Lake of Bays, Lake Nipissing) to assess water quality problems

PROJECT DESCRIPTION: Ten to fifteen stations per lake mostly situated in bays will be sampled monthly. Samples will be taken from the epi-, meta- and hypolimnion for major ions. In addition, euphotic zone plankton hauls will be done and temperature and oxygen profiles will be constructed.

BUDGET AND RESOURCES: Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	62.0	60.0	65.0	187.0
Work Years:	0.5	0.2	0.3	1.0

Budget Source: Water Resources Branch

KEYWORDS: water quality, nutrient, enrichment acid sensitivity

OUTPUT (papers, presentations, reports): "Muskoka Lakes Report: A Report of the 1986 Water Chemistry Survey"
Water quality management plans for the affected lakes

EXTERNAL PARTICIPATION (ministries, governments, agencies):
MOE Central Region

COMMENTS:
A complementary project is being conducted by the Aquatic Biology Section Water Resources Branch

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL		Contract	Solicited
INTERNAL	X	Grant	Unsolicited

PROJECT TITLE: Huntsville Basin Contaminant Assessment Project (Inland Lakes)

PROJECT NO: WRB
START DATE: 04/86

SHORT TITLE: Mercury in Lakes

PRINCIPAL INVESTIGATOR AND AFFILIATION: Bernie Neary/Greg Mierle Dorset Research Centre 705-766-2418

LIAISON OFFICER (name, location, telephone no.):

OBJECTIVE(S): (1) To determine the cause and extent of severe mercury contamination of fish populations in the lakes surrounding Huntsville. 2) To assess the geographical extent of contaminated fish populations, and to determine the relative concentration of mercury in streams feeding into contaminated lakes.

PROJECT DESCRIPTION: The possibility of industrial or natural geological sources of mercury are now unlikely, but will be further examined through an enhanced sediment coring programme. An analysis of the food chain structure of the lakes will be undertaken, along with estimates of unusual microbial mobilization of mercury.

BUDGET AND RESOURCES: Year: (* current)	1	2	3 *	TOTAL
Cost: ($000's):	160.0	100.0	150.0	410.0
Work Years:	0.6	1.4	1.3	3.3

Budget Source: Water Resources Branch

KEYWORDS: mercury contamination

OUTPUT (papers, presentations, reports):
Water quality management plan(s) for the contaminated lakes.

EXTERNAL PARTICIPATION (ministries, governments, agencies):
MOE Central Region, MNR Algonquin Region, DFO Winnipeg

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL		Contract	Solicited
INTERNAL	X	Grant	Unsolicited

PROJECT TITLE: Rice-Sturgeon Lakes Nutrient Budget Study (Inland Lakes)

PROJECT NO: WRB
START DATE: 06/86

SHORT TITLE: Nutrient Budget

PRINCIPAL INVESTIGATOR AND AFFILIATION: Bernie Neary
Research Centre
705-766-2418

LIAISON OFFICER (name, location, telephone no.):
Bernie Neary/Neil Hutchinson

OBJECTIVE(S): (1) To construct nutrient budgets for Rice and Sturgeon Lakes.
2) To estimate the impact of potential increases in nutrient loads from the Peterborough and Lindsay STP's and other sources on lake water quality.

PROJECT DESCRIPTION: Major tributaries of both lakes will be sampled for water quality, and will have water quality measurements performed. Nutrient loads from the atmosphere will be determined from the existing ARB deposition network. In-lake sampling of water will provide estimates of in-lake cycling and nutrient variability. The response of algae and macrophyte communities will be assessed by dosing nutrients or manipulating predator/prey ratios in lake enclosures

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	TOTAL
Cost: ($000's):	125.0	125.0	119.0	369.0
Work Years:	1.1	1.4	1.8	4.3

Budget Source: Water Resources Branch

KEYWORDS: nutrient, budget, water quality, algae, macrophyte

OUTPUT (papers, presentations, reports): Nutrient Budget Studies in Rice and Nutrient management plans for the two lakes Sturgeon Lakes Final Report

EXTERNAL PARTICIPATION (ministries, governments, agencies):
MOE Central Region, MNR, Parks Canada

COMMENTS: The final year of the project will be devoted to data analysis and report preparation.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	X	Contract	X	Solicited	
INTERNAL		Grant		Unsolicited	

PROJECT TITLE: Literature Review - Acute Toxicity in Munisipal Sewage Effluent

PROJECT NO: WRB87-09
START DATE:

SHORT TITLE: Toxicity Review

PRINCIPAL INVESTIGATOR AND AFFILIATION: G. Craig
Beak Consultants Ltd

LIAISON OFFICER (name, location, telephone no.): H. Monteith,
Water Resources Branch
323-4901

OBJECTIVE(S): (1) To estimate the magnitude of acute toxicity problems in municipal STP effluent.
2) To determine the most prevalent chemical parameters causing acute toxicity to aquatic organisms.

PROJECT DESCRIPTION: Acute toxicity test data developed in the past in Ontario STP's were assembled to determine objectives 1 and 2. U.S. EPA data are also being reviewed for toxicity caused by metals.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				40.0
	Work Years:				

Budget Source: Water Resources Branch

KEYWORDS: municipal sewage effluent, toxicity

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Awaiting for Management Committee's approval to publish final report.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Stripping of Volatile Organic Contaminants - Pilot Scale Study

PROJECT NO: WRB87-02
START DATE: 09/89

SHORT TITLE: Air Stripping Model

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. Henryk Melcer
Environment Canada
Wastewater Technology Center

LIAISON OFFICER (name, location, telephone no.): H. Monteith,
Water Resoures Branch
323-4901

OBJECTIVE(S): (1) To determine the operational factors affecting the stripping of volatile organics during sewage treatment.
2) Optimize treatment process to minimize the stripping of volatile organics.

PROJECT DESCRIPTION: The effect of process design and operation on the stripping of volatile organics will be evaluated at a pilot scale plant. A mathematical model to describe the stripping phenomena will be developed/verified. Parallel studies will then be carried out at pilot and full-scale plants to address 'scale up' effects.

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	165.0			165.0
Work Years:				

Budget Source: Water Resources Branch

KEYWORDS: volatile organic contaminants, air stripping

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Pilot-scale studies completed in summer of 1988. Parallel pilot and full-scale studies are scheduled for late summer and early fall.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: In-situ UV Disinfections of Bathing Beach Water

PROJECT NO: WRB87-09-03
START DATE: 01/86

SHORT TITLE: UV Disinfection

PRINCIPAL INVESTIGATOR AND AFFILIATION: D. Pearson
Upper Thames Conservation Authority

LIAISON OFFICER (name, location, telephone no.): Dale Henry
Water Resouces Branch
323-4975

OBJECTIVE(S): (1) To investigate the feasibility and design/operating requirements to improve bathing beach bacterial water quality through the use of recirculation and in-situ UV disinfection process.

PROJECT DESCRIPTION: A full scale containment, recirculation, and UV disinfection process was constructed and evaluated at the Fenshaw Park Beach, in London, Ontario

BUDGET AND RESOURCES:	Year: (* current)	4*	5	6	TOTAL
	Cost: ($000's):				300.0
	Work Years:				

Budget Sources: Water Resources Branch

KEYWORDS: UV disinfection, bathing beaches, water quality

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Construction of the full-scale system was completed and is being evaluated in 1988. A report will be produced in 1989.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE:
Stripping of Volatile Organics During Sewage Treatment - at Full Scale STP's

PROJECT NO: WRB87-08
START DATE:

SHORT TITLE: Air Stripping

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Henryk Melcer
Environment Canada
Wastewater Technology Center

LIAISON OFFICER (name, location, telephone no.): Hugh Monteith
Water Resources Branch
323-4901

OBJECTIVE(S): To investigate the significance of air stripping as a means of removing volatile organics during sewage treatment.

PROJECT DESCRIPTION: Composite samples of liquid sewage and off-gas were collected at the aerated grit chamber and aeration tanks (for biological treatment). Samples were analysed for the presence of volatile organics. This study was carried out at four full-scale STP's in conjunction with the 40 STPs study.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):				210.0
	Work Years:				

Budget Sources: Water Resources Branch

KEYWORDS: air stripping, volatile organics, sewage treatment

OUTPUT (papers, presentations, reports):
Nutrient management plans for the two lakes

1) Collection of Volatile Organics Emitted from Activated Sludge Systems by W.K. Bedford, J. Bell and H. Melcer, Paper presented at 23rd Canadian Symp. on Water Pollution Research, Canada Centre For Inland Waters, Burlington, Ontario, Feb. 18, 1988.

2) Emissions of Volatile Organics from Aerated Channels and Tanks by J. Bell and H. Melcer, paper presented at 1988 Joint Annual Conference of Pollution Control Association of Ontario and Air Pollution Control Association (Ontario SEction), Kingston, Ontario, April 17-19, 1988.

3) Stripping of Volatile Organic Compounds at Full-Scale Municipal Wastewater Treatment Plants by J.P. Bell, H. Melcer, I. Osinga and H.D. Monteith. Paper accepted for presentation at 1988 Water Pollution Control Federation Annual Conference, Dallas Texas, Oct. 3-6, 1988.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: Report to be published as MOE report in early fall.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Anaerobic Treatment for BOD and Toxicity Reduction in Pulp and Paper Wastewaters

PROJECT NO: WRB
START DATE: 1987

SHORT TITLE: Anaerobic Treatment

PRINCIPAL INVESTIGATOR AND AFFILIATION: G. Sherbin
Ontario Region
Environment Canada

LIAISON OFFICER (name, location, telephone no.): E.W. Turner
Water Resources Branch
323-2671

OBJECTIVE(S): To provide data on the best available technology economically achievable for the pulp and paper sector, which will be used in the development of the Effluent Limits regulation.

PROJECT DESCRIPTION: Effluents from thermal-mechanical pulping and kraft mills will be characterized. Bench and pilot scale anaerobic tratability testing will be done on these effluents; the resulting reduction in contamination and toxicity of the treated effluents will be analyzed. The next phase will include optimization of process parameters leading to, eventually, a mill site demonstration. Cost data on treatment processes will be collected.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	352.0	239.0	142.0	733.0
	Work Years:				

Budget Source: 50% Environment Canada/50% MISA

KEYWORDS: pulp, paper, Effluent Limits regulation, thermal-mechanical, kraft mills

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): Environment Canada

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract	Solicited
INTERNAL X	Grant	Unsolicited

PROJECT TITLE: Federal AOX Survey of Ontario Kraft Mill Effluents

PROJECT NO: WRB
START DATE: 07/88

SHORT TITLE: Kraft Mill Effluents

PRINCIPAL INVESTIGATOR AND AFFILIATION:

G. Sherbin
Ontario Region
Environment Canada

LIAISON OFFICER (name, location, telephone no.): E.W. Turner
Water Resources Branch
323-2671

OBJECTIVE(S): To provide baseline data for the concentration of Adsorbable Organically-Bound Halogen (AOX) in the final effluents from Ontario kraft mills. This data will be used to develop MISA regulations.

PROJECT DESCRIPTION: Kraft mill effluents from various stages in the manufacturing process will be sampled and analyzed for AOX. From the data, generation of AOX and their reduction through the effluent treatment process in the mill will be quantified. Along with AOX, several specific chlorinated organics in the chlorophenol and chloroguaiacol groups will also be quantified. As well, pertinent volatile organic compounds will also be quantified. As a start, two methods of AOX analysis will be compared (neutron activation and combustion/coulombetric titration).

BUDGET AND RESOURCES:	Year: (* current)	1	2 *	3	TOTAL
	Cost: ($000's):				60.0
	Work Years:				

Budget Source: 50% Environment Canada/50% MISA

KEYWORDS: Adsorbable Organically-Bound Halogen, kraft mills, chlorophenol, chloroguaiacol

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

REGIONAL PROJECTS

TABLE OF CONTENTS

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	X
INTERNAL	Grant	Unsolicited	

PROJECT TITLE: To Map the Distribution and Determine the Species Composition and Biomass of Macrophytes in the Bay of Quinte

PROJECT NO: REQ#156832
START DATE: 15 Apr 88

SHORT TITLE: Macrophytes in the Bay of Quinte

PRINCIPAL INVESTIGATOR AND AFFILIATION: Limnos Limited
Private Consultant

LIAISON OFFICER (name, location, telephone no.): Jeff Overton
Aquatic Biology Section
Water Resources Branch
125 Resources Road, Rexdale
235-5803

OBJECTIVE(S):

1) Duplicate historic Project Quinte transcets measuring macrophyte beds.
2) Use LORAN navigation to determine precise location and an echo sounder to produce an accurate measurement of plant density and plant height within the water column.
3) Develop new transcets to better identify macrophyte distribution.
4) Compute macrophyte biomass and percent contribution of each species.
5) Compare sampling methods as to cost, accuracy, benefits and processes.

PROJECT DESCRIPTION:

The project was to duplicate the historic transcets plus add transcets parallel to the historic markers using conventional sampling of macrophytes and LORAN/sonar mapping. The results were to be correlated for accuracy. Timing of the field work was to coincide with the period of maximum biomass production and before vegetation die-off (approximately mid July). Total biomass, percent contribution of each species and percent cover were to be derived. Lastly, a cost-benefit analysis of the best methodology was to be completed.

BUDGET AND RESOURCES:	Year: (* current)	1	2*	3	TOTAL
	Cost: ($000's):				20
	Work Years:				0.50

Budget Source: Bay of Quinte Remedial Action Plan

KEYWORDS: Bay of Quinte, biomass, Project Quinte, macrophytes, species, LORAN

OUTPUT (papers, presentations, reports): Report

EXTERNAL PARTICIPATION (ministries, governments, agencies): None

COMMENTS: This work will help to design the "monitoring-surveillance" program of the Bay of Quinte Remedial Action Plan.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited	X
INTERNAL	Grant	Unsolicited	

PROJECT TITLE: Feasibility of Re-establishing Aquatic Macrophytes in the Bay of Quinte

PROJECT NO: PO#A01850
START DATE: 22 Dec 87

SHORT TITLE: Macrophyte Re-establishment

PRINCIPAL INVESTIGATOR AND AFFILIATION: A.D. Revill Associates Ltd.
Box 905, Belleville

LIAISON OFFICER (name, location, telephone no.): Mr. Glenn Owen
Regional Biologist
MOE-Southeast Region
Kingston District Office,
(613) 549-4000

OBJECTIVE(S):

1) Determine the factors influencing the loss, re-establishment and growth of aquatic vegetation in the Bay.
2) Trial establishment of several different species of aquatic plants to measure plant survival under changing conditions.
3) Determine whether large scale planting of aquatic vegetation in the Bay is feasible.

PROJECT DESCRIPTION:

The project was intended to examine the macrophyte beds in various locations around the Bay, determine which factors were influencing or restricting plant growth, and undertake an experimental transplanting of plants from areas rich in plant biomass/diversity to areas devoid or limited in plant life. The results would indicate the feasibility of large-scale transplanting and identify locations for possible future transplant work.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):				15.055
	Work Years:				

Budget Source: Bay of Quinte Remedial Action Plan

KEYWORDS: macrophyte, aquatic plant, growth, re-establishment, Bay of Quinte

OUTPUT (papers, presentations, reports):
Report - Due November 1988

EXTERNAL PARTICIPATION (ministries, governments, agencies):
Dr. Adele Crowder, Queen's University, Kingston

COMMENTS: Phosphorus release from the Bay of Quinte is recognized as an increasingly important component of the eutrophication problem in the Bay. This work was undertaken as one option in controlling sediment disturbances and, thus, resuspension.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract X	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: A Survey of the Macrophytes in the Bay of Quinte

PROJECT NO: PO#A04512
START DATE: 15 May 88

SHORT TITLE: Macrophyte mapping of the Bay of Quinte littoral zone

PRINCIPAL INVESTIGATOR AND AFFILIATION:

Dr. Adele Crowder
Biology Department
Queen's University and member of Project Quinte

LIAISON OFFICER (name, location, telephone no.):

Fred Stride
Surface Water Technician
MOE-Southeast Region
Kingston District Office,
(613) 549-4000

OBJECTIVE(S):

1) Survey (map and speciation) of emergent and subemergent aquatic plants in the Bay of Quinte littoral zone.
2) Compare survey findings to other measurable parameters of water quality in an effort to estimate recent water quality and ecosystem changes.
3) Compare findings to historical biomass and species data to record recent changes in macrophyte beds in the littoral zone.

PROJECT DESCRIPTION:

Project Quinte has a number of transcets for its routine water quality monitoring program. Emergent and subemergent aquatic plants in the littoral zone will be sampled along the historical transcets lines three times. Estimations of plant biomass will be constructed. As well, the different species of plants will be identified. These results will be compared, to historical data, and recent changes in water quality, as measured by the extent and types of macrophyte beds, will be determined.

BUDGET AND RESOURCES:

Year: (* current)	1	2 *	3	TOTAL
Cost: ($000's):				7
Work Years:				0.5

Budget Source: Bay of Quinte Remedial Action Plan (RAP)

KEYWORDS: macrophyte, littoral zone, biomass, speciation, mapping, Bay of Quinte

OUTPUT (papers, presentations, reports):

Report (to be completed by October 31, 1988), paper

EXTERNAL PARTICIPATION (ministries, governments, agencies):

Royal Military College - Kingston (divers-samplers)

COMMENTS: Loss of wetlands (both emergent and subemergent) continues to be a problem in the Bay of Quinte. Historically, diverse macrophyte communities were lost, via competition, to milfoil and, later, algae. Re-establishment of macrophytes may indicate an improved or healthy ecosystem. This work will measure the recent changes as an indicator of overall water quality.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract N/A	Solicited
INTERNAL X	Grant	Unsolicited X

PROJECT TITLE: A Graphical Analysis of Treated and Raw Water Bacteriological Results for the Southeastern Region of Ontario, 1987

PROJECT NO: SEREG
START DATE: 10/87

SHORT TITLE: Treated and Raw Water Bacteriological Analysis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Art Ley
Microbiological Scientist,
MOE - Southeastern Region

LIAISON OFFICER (name, location, telephone no.): Dr. Art Ley
Laboratory Services
MOE Southeastern Region
Kingston - (613) 549-4000

OBJECTIVE(S):

1) Analysis of all communal supplies of water within the Southeastern Region for bacteriological quality.
2) Graphical representation of step 1 to illustrate trends and changes in treated water quality, and to determine whether a deterioration in raw water quality intake translates into a deterioration of finished water.

PROJECT DESCRIPTION:

Bacteriological results for treated water were observed for percentage of monthly samples having safe, poor or unsafe quality in terms of total coliforms (TC). Bacteriological results for raw water were graphed as the number of indicator bacteria per 100 mL of sample. Findings from each test were compared and graphically illustrated to show trends and changes in treated/raw water quality. A detailed interpretation of each graph was provided.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3*	TOTAL
	Cost: ($000's):	all funding from internal budget			
	Work Years:	0.25	0.25		0.50

Budget Source: Technical Support Unit, Laboratory Services

KEYWORDS: treated water, bacteriological, raw water, water quality

OUTPUT (papers, presentations, reports): Report (title as above)

EXTERNAL PARTICIPATION (ministries, governments, agencies): None

COMMENTS: Funding from existing laboratory services budget.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract N/A	Solicited
INTERNAL	Grant	Unsolicited X

PROJECT TITLE: Trace Metals and Phosphorus Speciation Studies of the Sedimets of the Bay of Quinte, Lake Ontario

PROJECT NO: SEREG
START DATE: 10/87

SHORT TITLE: Trace Metals in Bay of Quinte Sediments

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Gary VanLoon
Chemistry Department
Queen's University

LIAISON OFFICER (name, location, telephone no.): Murray German, Chief
Water Resources Assessment
Southeast Region
Kingston District Office,
(613) 549-4000

OBJECTIVE(S):

1) To provide information on the distribution of arsenic, copper, cobalt, nickel, lead, zinc and phosphorus among the components of the Bay sediment.
2) Additional information to determine the process of phosphorus release from the sediments.
3) Understanding of each element's affect on biological productivity of the Bay.

PROJECT DESCRIPTION:

Sediment core samples were to be collected from sites which reflect: 1) different types of sedimentary deposits (clay, organic oversand, organic) and, 2) different man-use on-shore impacting on local water quality. Other parameters sampled include: 1. pH, Eh and DO of the interphase water and pore water, 2. sediment description, 3. sediment particle size, 4. organic matter content of the sediments, 5. inorganic C and $CaCo_3$ contents of the sediments, and 6. sediment abundance of the fractions and predict metal mobility across the sediment solution interface under defined environmental conditions.

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):	no direct funds; rather, manpower, expertise, equipment and supplies			
	Work Years:	0.25(0.1)+	0.5(0.1)+		

Budget Source: Technical Support Unit, Surface Water Section
Southeast Region, Kingston

+denotes MOE staff time

KEYWORDS: trace metals, phosphorus, Bay of Quinte, sediments

OUTPUT (papers, presentations, reports): Report (prepared for Project Quinte and Quinte RAP) (to be completed by October 1988)

EXTERNAL PARTICIPATION (ministries, governments, agencies): Project Quinte - Bay of Quinte Remedial Action Plan - Queen's University, King.

COMMENTS: MOE - Technical Support, Southeast Region funding of this project is provided in the form of manpower, equipment and supplies. No direct funds are provided.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL	Contract N/A	Solicited
INTERNAL X	Grant	Unsolicited X

PROJECT TITLE: Chromogenic Reagent for E. coli

PROJECT NO: 295 PL
START DATE: 1987

SHORT TITLE: E. coli test

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Wolfe & Dr. Bowers
Chemistry Department
Queen's University

LIAISON OFFICER (name, location, telephone no.): Dr. Art Ley
Microbiological Scientist
MOE Southeastern Region
Kingston - (613) 549-4000

OBJECTIVE(S):

To develop a method for enumerating E. coli.

PROJECT DESCRIPTION:
To synthesize and verify the utility and specificity for E. coli of indoxyl B-d-glucuronidase (IBDG).

BUDGET AND RESOURCES:	Year: (* current)	1	2	3 *	TOTAL
	Cost: ($000's):	internal	0		
	Work Years:	0.5	0		

Budget Source: No current budget allocated

KEYWORDS: E. coli

OUTPUT (papers, presentations, reports):
Report
Publication (Can. J. Microbiology, June 88)
Patent
Poster Presentation

EXTERNAL PARTICIPATION (ministries, governments, agencies): Queen's University

COMMENTS: Queen's University had RAC funding in 1987 to develop the E. coli testing procedure.
Current status - The research component of the project has been completed. Marketing research for application is presently underway by private firm.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

ONTARIO PESTICIDES ADVISORY COMMITTEE PROJECTS

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RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Relative Sensitivity to Bacillus Thuringiensis of Non-target Caterpillers Potentially Serving as Food for Young Grouse Chicks

PROJECT NO: OPAC 89-01
START DATE: 04/89

SHORT TITLE: Sensitivity to Bacillus Thuringiensis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Kevin N. Barber
Sault College of Applied Arts & Tech.
Sault Ste. Marie, Ontario
(705) 949-9461

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): In 1988 lepidopterous fauna was collected from low bush blueberry with Sweep nets; Insects were reared to adult for identification and culture for 1989 bioassays. Comparisons were made with stomach contents of grouse chicks ('82, '85). In 1989: 1. Establish and supplement laboratory cultures of the most abundant and species of caterpillars feeding on V. angustifolium.
2. Establish greenhouse production of V. angustifolium for foliage production.
3. Determine the relative sensitivity to B.t. of the most abundant and important species.
4. Produce a field discrimination key to at least the most abundant and important species of caterpillars on V. angustifolium.
5. Describe the basic phenologies and life histories of the most abundant and important species.

PROJECT DESCRIPTION: 1. Field collections will be made with minimal damage to specimens, and lab cutures will be reared on standard artificial diets where possible. 2. Wild blueberry plants will be transplanted to the greenhouse for rearing of insects not amenable to artificial diet and for bioassay trials. 3. Depending on success of 1 and 2, bioassay techniques will be used to determine relative sensitivities of caterpillers to B.t. 4. A dichotomous key will be drafted to assist field identification. 5. Phenolgy and life history information will be compiled from existing literature and this research.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3•	TOTAL
Cost: ($000's):	10.8	15.4	14.7	26.2
Work Years:	0.5	0.85	0.85	1.35

Budget Source: OPAC

KEYWORDS: Bacillus thuringiensis, environmental impact, non-target Lepidoptera

OUTPUT (papers, presentations, reports): OPAC Seminar, Publication

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding: ca $85,000 for Forestry Canada salaries and O&M support investigator and cooperators.

COMMENTS: •Not approved, only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Impact of Bacillus Thuringiensis on Chicks of Spruce Grouse, Non-target Insects, and Small Birds and Mammals

PROJECT NO: OPAC 89-02
START DATE: 04/89

SHORT TITLE: Impact of Bacillus Thuringiensis

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J.F. Bendell
University of Toronto
(416) 978-2403

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): 1. Determine the foods of chicks of Spruce Grouse up to 3 weeks of age by direct observation and collecting them. 2. Test the hypotheses: (i) The application of B.t. at operational levels does not affect the abundance of insects of low vegetation and the forest floor, especially larval Lepidoptera. (ii) Larvae Lepidoptera are not needed for the growth and survival of chicks of Spruce Grouse. (iii) Other birds, especially the White-Throated Sparrow, and small mammals, especially the Masked Shrew are not affected by the application of B.t. at operational levels.

PROJECT DESCRIPTION: Observe 6 plots (2.3 ha ea.) 3 treated with B.t. vs. 3 controls. Census insects of low vegetation with sweep nets (1X/wk May-August). Census ground dwelling insects by pitfalls. Food taken by chicks will be by direct observation. The main focus is to compare food habits, behaviour, growth and survival in sprayed and unsprayed plots. Hens and whole broods will be captured and penned.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3•	TOTAL
Cost: ($000's):	14.45	26.67	26.67	14.45
Work Years:	1.66	1.66	1.66	1.66

Budget Source: OPAC

KEYWORDS: Bacillus thuringiensis, impact on non-targets: insects, mammals, Spruce Grouse

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies): No outside funding, but related to OPAC grant to Dr. K.N. Barber. Involves 1 MScF for next 3 years. Second half of 1989 requested funding (i.e. 14.5) will be funded by WWF.

COMMENTS: •Not approved, proposed by researcher only.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of Gypsy Moth Nuclear Polyhedrosis Virus as a Microbial Insecticide for Use in Canada

PROJECT NO: OPAC 89-03
START DATE: 04/89

SHORT TITLE: Gypsy Moth Nuclear Polyhedrosis Virus

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. J.C. Cunningham and Mr. William J. Kaupp
Sault College of Applied Arts & Tech. Sault Ste. Marie, Ont. (705) 949-9461
Canadian Forestry Service Forest Pest Management Institute Sault Ste. Marie, Ont.

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris OPAC (416) 323-4447

OBJECTIVE(S): Efficacy trials were proposed in 1988 to enable the nuclear polyhedrosis virus to be registered in Canada under the trade name Disparvirus, to:
1) determine dose of NPV providing consistent control (baseline data is now for double dose 1.25 x 10^{12} pIB/ha)
2) improve methodology of assessing spray applications, and
3) study epizootiology of naturally occurring NPV in gypsy moth populations and attempt to accurately predict when populations will collapse.

1989: 1) determine NPV dosage which is an improvement on cost/benefit over B.t. i.e. lower dose, lower volume, single application.
2) compare FPMI formulation (Disparvirus) with Calliope formulation (Lymantrin)
3) assess feasibility of reducing application volume by 4.
4) continue epizootiological studies with naturally occurring and artificially disseminated NPV.

PROJECT DESCRIPTION:
1. a) Spray 3 plots (10 ha ea) with 2 applications of 4 x 10^{11} pIB/ha 3-4 days apart in volume of 10 L/ha; b) Spray 3 plots (40 ha) each as above in 2.5 L/ha.
2. Spray 3 plots (10 ha ea) with Lymantrin at 10 L/ha and compare to FPMI (1a); 3 plots are control. Several assessments will be used to determine impact; egg mass counts; larvae counts; pupae counts; larvae examinations; defoliation estimates.
3. Refer 1(b).
4. Study will continue on the load of PIBs or leaf surfaces throughout the larval feeding period.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3•	TOTAL
Cost: ($000's):	11.0	13.8	18.24	24.8
Work Years:	2.6	2.25	2.25	4.85

Budget Source: OPAC

KEYWORDS: nuclear polyhedrosis virus, gypsy moth, biocontrol

OUTPUT (papers, presentations, reports): OPAC Seminar

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •Not approved; proposed by researcher only.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Reducing the Rates of Glyphosate to Control Broad-leafed Trees in Conifer Plantations

PROJECT NO: OPAC 89-05
START DATE: 04/89

SHORT TITLE: Reducing Rates of Glyphosate

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. G. Hofstra & Dr. R.A. Fletcher
Dept. of Environmental Biology
University of Guelph
(519) 824-4120 ext. 2737, 2678

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):
1) Determine the effect of low rates of glyphosate on visual injury and growth of various broadleaf trees.
2) Determine the effect of low levels of glyphosate on white spruce and jack pine.
3) Establish a strategy for conifer release.
4) Continue field measurements sprayed 1987 and 1988.

PROJECT DESCRIPTION:
1989: 1. Continue with species treated and monitored in 1988 and add species such as raspberry and largetooth poplar. Spray 1/4, 1/8 or 1/16th of field rate either June, July or August. Treatment will be spread over 2 years.
2. Spray field hardy seedlings at 4 week intervals starting early June. On all plants, injury assessment (chlorophyll content, growth and leaf fluorescence) and cuticle thickness will be monitored.
1991: Results will be analysed and strategy developed.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3•	4•	TOTAL
Cost: ($000's):	11.5	15.3	19.8	20.10	26.8
Work Years:	1.0	1.0			2.0

Budget Source: OPAC

KEYWORDS: glyphosate, reduced rates, woody species, conifer release

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies): There are no other sources of funding. Includes 2 yr. M.Sc. student (now started) plus 1 yr. Ph.D. (starting yr. 3).

COMMENTS: •Not approved; proposed by researcher only.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Effectiveness of the Granulosis Virus in Management of the Codling Moth in Apple Orchards and its Environmental Impact

PROJECT NO: OPAC-89-06
START DATE: 04/89

SHORT TITLE: Effectiveness of Granulosis Virus

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. R.P. Jaques, Agriculture Canada, Research Station, (519) 738-2251 and Dr. J.E. Laing, Dept. of Environ. Biology, University of Guelph, (519) 824-4120

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris, OPAC (416) 323-4447

OBJECTIVE(S): A French produced formulation of granulosis virus and one developed in West Germany are being considered for commercial production. This study is to provide data on the effect of the granulosis virus on nontarget species in apple orchards; sunlight greatly affects the stability of the virus; further studies are required to identify material to enhance its efficacy potential.

1989: 1. Conduct efficacy trials in the laboratory.
2. Conduct a) nontarget
b) & impact in i) small plots and ii) commercial orchards.
3. Evaluate materials to protect virus against inactivation by sunlight.
4. Assemble data to support registration.

1990, 1991 continuation of the above.

PROJECT DESCRIPTION:

1. Improve the method for bioassay of virus activity; refine method of residue activity; refine method of residue activity determination; use bioassay to determine sunlight and uv on the virus.
2. Plots (4 rows x 10 trees x 2 cultivars) will be treated with 2 x 10^{13} VIB/ha x 3 applications per moth generation x 2 generations. Moths will be monitored by pheremone traps. Apple damage will be monitored in sites and at harvest: site on University of Guelph Campus. 2a) The use of growers' fields (.5-5 ha) will depend on approval of sale of crop or acceptance of lss of crop. 2b) At the U. of G., Stone Road orchard, non targets will be ennumerated following tree limb shaking. Bands on trees will catch codling moth larvae.
3. Investigate skim milk (proteinceous material) as an adjuvant to screen UV light. 4. Compile the above research to support a federal research permit and ultimately federal registration.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3•	TOTAL
Cost: ($000's):	8.3	21.4	22.1	8.3
Work Years:	0.3	0.9	0.9	0.3

Budget Source: OPAC

KEYWORDS: codling moth, nontarget impact, efficacy, granulosis virus

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •Not approved, only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Evaluation of Alternate Methods of Pest Control for the Home Garden

PROJECT NO: OPAC 89-07
START DATE: 04/89

SHORT TITLE: Alternate Methods of Pest Control

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D.G.R. McLeod et al
c/o University of Western Ontario
(519) 679-4452)

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): In 1987, 1988, research was conducted to assess the effectiveness of an insect predator Aleochara bilineata for control of root maggot in home gardens, in onion sets, bunching onions, cabbages and radishes. Cabbage maggot, but not onion maggot was controlled, but at a cost of $7.50/wk/garden. In 1989 work will proceed on the use of light weight frabric floating row covers, the effect of mass trapping crucifer pests and the use of Aleochara bilineata.

PROJECT DESCRIPTION:
1989: 1. 28 gardens will be subgrouped into 4: i) control ii) Aleochara bilineata iii) mass trapping of crucifer pests iv) hay plots covered spun bonded polyester. Damage assessments will be conducted on onions and radishes.
2. 3 potato plots will be used to test the effectiveness of spun bonded polyester row cover.
3. 6 garden plots at the London Research Centre will be tested using i) ii) and iii) as above; iv) will be treated with home garden insecticide v) Kimberly row cover vi) Agronet row cover. Damage assessments will be conducted on onion and radish.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	4•	TOTAL
Cost: ($000's):	14.7	17.2	18.7	18.288	50.6
Work Years:	0.75	2.0	0.7	0.7	3.45

Budget Source: OPAC

KEYWORDS: biocontrol, home garden, root maggots, Aleochara bilineata, polyester row covres

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •Not approved, only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Improving the Biological Control Potential for Gypsy Moth in Ontario Through the Introduction of New Species and Strains of Parasitoids Based on Their Susceptibility to Hyperparasitism

PROJECT NO: OPAC-89-08
START DATE: 04/89

SHORT TITLE: Improving Biological Control Potential

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. V.G. Nealis
Great Lakes Forestry Centre
Sault Ste. Marie, Ontario
(705) 949-9461
and
Dr. S.M. Smith
Dept. of Biology
University of Waterloo
(705) 949-9461

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): 1. To assess the impact of hyperparasitism on field populations of the gypsy moth parasitoid, Cotesia melanoscela. 2. To maintain colonies of the biological control candidates and the principal hyperparasitoids for experimental trials. 3. To examine the relative susceptibility of new biological control candidates to hyperparasitism in order to assess their likely effectiveness for biological control in Ontario.

PROJECT DESCRIPTION:
1. (a) Investigate temporal and spatial characteristics and impact of hyperparasitism in c.m. populations: extensively sample for density of field populations. (b) Examine relative susceptibility of c.m. strains to hyperparasitism: check phenomenum under natural conditions.
2. Maintain colonies of principal hyperparsitoids, 2 strains of C. melanoscela and gypsy moth for field and lab experiments; introduce new wild strains from field when available.
3. Examine relative susceptibility of new biological control candidates with methods developed in 1988.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3•	TOTAL
Cost: ($000's):	12.50	13.0	13.0	25.5
Work Years:	0.67	0.61	0.61	1.28

Budget Source: OPAC

KEYWORDS: gypsy moth, biological control, Cotesia melanoscela

OUTPUT (papers, presentations, reports): OPAC Seminar 1990, publications

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding = $63,000

COMMENTS: •Not approved; only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Comparative Behaviour of Pesticides with Respect to Worker Safety. 1. Re-entry Intervals. 2. Dislodgeable Residues; Pesticide Exposure to Integrated Pest Management (IPM) Scouts from Treated Fields

PROJECT NO: OPAC 89-09
START DATE: 04/89

SHORT TITLE: Compartive Behavious of Pesticides

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. B. Ripley & G. Ritcey
OMAF Dept. of Environ. Bio.
(519) 823-8800 University of Guelph
Ext. 4835

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):
1. To identify level of residues on foliage from 9 pesticides at typical re-entry trials:
   (a) determine dislodgeable residues for 5 insecticides and 4 fungicides applied to apple leaves will be analyzed over 7 timings (day 0-3).
   (b) foliage samples will be examined for total and dislodgeable residues.
2. Analyse patches from IPM scouts entering fields (muck vegetables and apple orchards) at various timings for a screen of pesticde residues (Numberous analytical procedures); look at cholinesterase levels of IPM scouts working in the Bradford Marsh area.

PROJECT DESCRIPTION:
1. (a) 4 reps x 7 timings (1,3,5,24,48,96 hrs post treatment) x 4 analytical methods = 112 analyses.
   (b) 4 reps x 6 timings (days 0.1,2,3,7 and 10) x 2 parameters x 4 analytical methods = 192 analyses.
2. (a) Analyse approximately 250 samples of patches from IPM scouts in muck vegetable crops.
   (b) Analyse 220 samples of patches from IPM scouts in apple orchards.
   (c) Analyse cholinesterase levels in IPM scouts from muck vegetable crops.

BUDGET AND RESOURCES:

Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	9.5	14.3		23.8
Work Years:	0.8	1.12		1.92

Budget Source: OPAC

KEYWORDS: re-entry, worker exposure, dislodgeable residues

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Funding approved from Food Systems 2002 for related projects (but not duplicated).

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: New Technology for Insecticide Placement to Control Soil Insects in Row Crops

PROJECT NO: OPAC 89-10
START DATE: 04/89

SHORT TITLE: Insecticide Placement

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. A.W. Schaafsma
Lecturer, Insect & Disease Control
Ridgetown College of Agricultural Tech.
Ridgetown, Ont. (519) 674-5456 Ext.226

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): Develop a modified approach to corn rootworm control to reduce insecticide amounts by 75% by better timing and placement. Continue from recent Ohio research findings. Over 3 years:
1. evaluate rate and placement of insecticides applied manually by point injection;
2. design, develop, and modify point injection applicators;
3. test prototype injection equipment for commercial utility.

PROJECT DESCRIPTION:
1989: 1.a) Construct manually operated injector (syringe style) to apply liquid insecticide at "layby".
b) Conduct small plot injection evaluation (50 treatments; evaluate by root damage ratings).
2. Design and construct point injection equipment, through RCAT engineering department for commercial scale applications.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3•	TOTAL
Cost: ($000's):	6.0	6.0	6.0	6.0
Work Years:	0.37	0.37	0.37	0.37

Budget Source: OPAC

KEYWORDS: western corn rootworm, layby soil injection, equipment design

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •proposed by researcher but not approved. Remainder of funding to come from Food System 2002.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Impact of Natural Enemies on Populations of Colorado Potato Beetles in Potatoes

PROJECT NO: OPAC 89-11
START DATE: 04/89

SHORT TITLE: Natural Enemies of Colorado Potato Beetles

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. M.K. Sears
Dept. of Environmental Biology
University of Guelph
Guelph, Ont. N1G 2W1

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):
1. To record the effect of all natural enemies on populations of CPB in small field plots and create a life table of the mortality factors.
2. To develop rearing procedures for C. maculata P. maculiventris, and P. bioculatus.
3. To determine the effect of C. maculata, P. maculiventris, and P. bioculatus on populations of CPB in field cages and small field plots.
4. To determine the effects of B.t. tenebrionis on the survival, prey feeding, fecundity of C. maculata and P. maculiventris.

PROJECT DESCRIPTION:
1. Monitor 2 plots, 1 adjacent to a wooded area. Collect population data and stage specific mortality estimates in 1989, 1990.
2. Rear predators on CPB eggs and larvae, aphids, pollen and plant material. Rear C. maculata, P. maculiventris, P. bioculatus separately.
3. Eggs and larval of CPB will be added to field cages, as needed. Survival, functional response and fecundity of predators will be noted. Larger plots will be sampled each week; 50 plants examined.
4. a) Individual insects of C. maculata, P. maculiventris, and P. bioculatus will be caged with B.t. tenebrionis foliage containing CPB eggs or larvae. Cages will be held at temperature; survival, feeding notes, fecundity of predator and CPB will be recorded daily.
   b) Small plots will be treated with B.t. tenebrionis commercial formulations and predators added. Survival, functional response and fecundity will be noted. Some plots will be treated weekly; some bi-weekly.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3•	TOTAL
Cost: ($000's):	11.7	20.187	21.038	11.7
Work Years:	1.5	1.5	1.5	1.5

Budget Source: OPAC

KEYWORDS: Colorado potato beetle, natural predators, Bacillus thuringiens tenebrionis

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •Not approved; only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Potential for Using Egg Parasitoids Such as Trichogramma for Biological Control of Forest Tent Caterpillar

PROJECT NO: OPAC 89-12
START DATE: 04/89

SHORT TITLE: Potential for Using Egg Parasitoids

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Sandra M. Smith
Faculty of Forestry
University of Toronto
(416) 978-5482

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): The purpose of this research is to investigate and assess the potential for using egg parasitoids such as Trichogramma to prevent or suppress epidemic populations of forest tent caterpillar. This will be accomplished through field and laboratory studies designed to:
1) determine FTC egg availability.
2) examine Trichogramma species complex and distribution.
3) assess temporal acceptibility of FTC eggs to parasitism by Tricogramma.

PROJECT DESCRIPTION:
1) a) In 1989 as in 1988, branches mid to upper crown will be examined for FTC egg masses
   b) In 1988 a gazebo was placed around a tree and pupae were interjected to observe emergence and oviposition; Modifications in 1989 are designed to reduce high parasitism on the pupal stage.
   c) To determine direct oviposition, 50 young aspens will be monitored.
   Other measurements taken in 1988 will be repeated in 1989.
2. Using SAS and correlation analysis, egg mass information will be related to basic forest characteristics.
3. Eggs of FTC will be provided by FPMI, Sault Ste. Marie for cage predation studied at U. of T.; it may be necessary to compare FTC egg masses with and without the spumaline layer.

BUDGET AND RESOURCES: Year: (* current)	1	2*	3	TOTAL
Cost: ($000's):	9.049	9.6		18.65
Work Years:	1.5	1.5		3.0

Budget Source: OPAC

KEYWORDS: parasitoids, Trichogramma, Forest Tent Caterpillar

OUTPUT (papers, presentations, reports): OPAC Seminar 1990, Canadian Entomoligist 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding = approximately $25,000.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Evaluation of Muscovy Ducks as Adjuncts to Sanitation for Control of the House Fly, Musca domesticus L.

PROJECT NO: OPAC 89-13
START DATE: 04/89

SHORT TITLE: Evaluation of Muscovy Ducks

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. G.A. Surgeoner
Dept. of Environmental Biology
University of Guelph
(519) 824-4120 Ext. 3966

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):

PROJECT DESCRIPTION:
1. In dairy operation (calf room) and swine operation, Muscovy ducks will be used to control flies. As well in the dairy, 4 pens of pregnant cows will be used : 2 with ducks and 2 controls.
2. At a beef feedlot cow/duck interaction and duck territorial behaviour (when unconfined) wil be monitored.
3. At local horse stables, ducks will be released and monitored for producer acceptance.
4. Compare efficacy of males vs. females (4 cages), counting flies remaining at 1 hr., 2 hrs., and 4 hrs.

Video photography will be used at several facilities.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3	4	5*	TOTAL
Cost: ($000's):	6.957	7.826	17.5	17.99	21.8	72.07
Work Years:	0.3	0.3	1.3	1.2	1.3	4.4

Budget Source:

KEYWORDS: resistant house flies, sanitation control, Muscovy ducks

OUTPUT (papers, presentations, reports): Presentation for annual OPAC symposium. Paper planned for J. Econ. Entomology and article for Milk Marketing Board's Newsletter.

EXTERNAL PARTICIPATION (ministries, governments, agencies): No outside funding.

COMMENTS: Year 1988 introduced Muscovy ducks. This project elaborates on this research. This project will continue support for a graduate student.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Integrated Weed Management for White Beans (Phaseolus vulgaris)

PROJECT NO: OPAC 89-14
START DATE: 04/89

SHORT TITLE: Integrated Wee Management

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Clarence J. Swanton
Crop Science Department
University of Guelph, Guelph
(519) 824-4120 Ext. 2512

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): Lack of weed control in white beans can result in yield losses of up to 70%. Work in 1986 and 1987 showed that total pesticide use could be reduced by as much as 60% by selective placement of herbicide in bands. Along with cultivation Practices, cost savings to average grower may be $30-85 per hectare. Work in 1988 dealt with weed control on 3 unlicenced cultivars: OAC Gryphon, OAC Sprint and OAC 87-2, planted in wide, medium and narrow rows. Work in 1989: 1) Evaluate cultivar, row spacing and seed rate on weed density. 2) Determine relationship weed density and bean yield. 3) Develop an economic threshold model for post emergence weed control in white beans.

PROJECT DESCRIPTION:
1. Assess new cultivars in field trials at 2 locations, to see whether they compete with conventional cultivars.
2. Assess crop losses in field trials with different weed pressures: RW and LQ will be planted at 1,2,4,8 and 16/sq m. 2 sites.
3. Data from Obj. 2 will be used to develop a practical on-farm economic model: 2 way table.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	4•	5•	TOTAL
Cost: ($000's):	13.9	12.2	15.9	15.86	15.86	41.0
Work Years:	0.5	0.4	0.8	0.8	0.8	1.7

Budget Source: OPAC

KEYWORDS: integrated weed management, white beans, post emergent herbicides

OUTPUT (papers, presentations, reports):

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding = $2,500.00

COMMENTS: •Not approved, only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Development of a Coloured Trap to Detect and Monitor the Spruce Cone Maggot in Black Spruce Seed Orchards

PROJECT NO: OPAC 89-15
START DATE: 04/89

SHORT TITLE: Black Spruce Seed Orchards

PRINCIPAL INVESTIGATOR AND AFFILIATION:
Dr. S.M. Smith
Faculty of Forestry
University of Toronto
(416) 978-5482

and

J.J. Turgeon
Forest Pest Management Inst.
P.O. Box 490
Sault Ste. Marie, Ont.
(705) 949-9461

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
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(416) 323-4447

OBJECTIVE(S): In preliminary screen tests conducted in 1988, colour traps were shown to hold promise as spruce adult samplers. In 1989 research is proposed to be conducted at Lake Bonner Tree Improvement Centre near Kapuskasking. Experimental design follows results obtained for European larch cone maggot, where traps are located parallel to the ground.

PROJECT DESCRIPTION: 1. Test 10 colours (letraset sheets with stickem) at ground level for attraction of adults. Traps will be placed in apart ca. 30 cm above ground along lines; colour position to be selected using randomized complete block design; 3 reps (lines) will be tested at 2 plantations, cleaned, changed and randomized every week for 5 weeks. 2. Screen to identify position of trap that is effective in attracting flies before egg laying. In 1 plantation efficacy of ground traps will be compared with identical reps at 75 cm above ground: 3 lines of each.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3	TOTAL
Cost: ($000's):	12.0	12.6		12.0
Work Years:	0.54	0.54		0.54

Budget Source: OPAC

KEYWORDS: spruce cone maggot, black spruce, population monitoring

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding : base Forestry Canada (FPMI) of ca $10,000.

COMMENTS: •Not approved, only proposed by researcher.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Biological Control of Grey Mold in Strawberries

PROJECT NO: OPAC 89-16
START DATE: 04/89

SHORT TITLE: Grey Mold in Strawberries

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J.C. Sutton
Dept. of Environmental Biology
University of Guelph, Guelph
(519) 824-4120 Ext. 3938

LIAISON OFFICER (name, location, telephone no.):Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): In 1987-88, 80 potential natural biocontrol organisms for grey mold on strawberries were isolated; these included yeasts, mycelial fungi and bacteria. Each suppressed B. cinerea on the flowers and fruit but none on the leaves. In 1989-90 it is proposed to continue work from 1988-89 to examine the effectiveness of these organisms for B.c biocontrol, examine the effect of simple nutrients on natural and applied biocontrol agents, examine the role of weather on biocontrol, examine optimum timing and integrate biocontrol with chemical control. Research is expected to continue for 2 more years.

PROJECT DESCRIPTION:
1. evaluate control agents: growth chambers, field.
2. study nutrient effects: glucose, fructose, sucrose.
3. study weather effects: field plots using data loggers and weather sensors
4. study timing of biocontrol agents and/or nutrients.
5. integrate biocontrol and fungicides: establish the sensitivity of biocontrol agents to Bravo and Cyprex, used in April for leaf spot.

BUDGET AND RESOURCES:

Year: (* current)	1	2	3*	4•	TOTAL
Cost: ($000's):	13.2	17.5	19.0	19.7	49.7
Work Years:	0.5	0.8	0.8		2.1

Budget Source: OPAC

KEYWORDS: Biocontrol, Strawberries, Grey Mold, Botrytis cinerea

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: •Proposed only by researcher, not approved.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL ≡	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Soil Solarization for Control of Root Rots in Ontario Forest Nurseries

PROJECT NO: OPAC 89-17
START DATE: 04/89

SHORT TITLE: Soil Solarization

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. J. Juzwik & Mr. J. Saunders
Pest Management Section
Ministry of Natural Resources
Sault Ste. Marie, Ont.

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): The objectives of the proposed trials are to determine the effect of soil solarization:
1) Populations of Cylindrocladium floridanum in nursery soil the season following treatment and on disease incidence in white spruce transplanted into the trial area, and on:
2) Populations of Fusarium, Cylindrocarpon, and Rhizoctonia in nursery soil before and after treatment. (Note: Disease incidence would be monitored during the subsequent year after seeding with white pine).

PROJECT DESCRIPTION:
1. Population of C. floridanum in 1988 plots (St. Williams Nursery) will be assessed May and July 1989; 10 soil cores will be collected from each plot. Fungi populations from 0-10 and 10-20 cm depths and subjected to analysis of covariance. White pine will be transplanted into plots early July and disease incidence assessed in transplants early October. Fungal isolations will be attempted from affected root systems collected from all seedlings in subplots.
2. 20 plots (3 m X 3 X m) will be arranged random block; 10 will be covered with 2-mil plastic for solar heating and remains in place until mid-August. Soil samples will be taken mid-June (pre) and August (post). Data loggers will measure soil temperature at 2 depths every 2 hours over 50 days. Soil moisture tension will be determined by moisture content of collected soils and curve. Soil samples pre and post will be assessed for distribution of fungi (2 depths).

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	8.0			8.0
Work Years:	0.1			0.1

Budget Source: OPAC

KEYWORDS: root rots, soil sterilization, Ontario forest

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources of funding = $24,000.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Control of Mosquito Larvae by Bacterial Toxins: Search for an Algal Vector

PROJECT NO: OPAC 89-18
START DATE: 04/89

SHORT TITLE: Mosquito Larvae

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. D.J. Kushner (978-5759) Dr. D. Williams (284-3221) Dr. P.M. Stokes (978-6526) Dr. J. Coleman (978-2339) University of Toronto

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris OPAC - (416) 323-4447

OBJECTIVE(S): Overall objectives: To identify speces of algae which should serve as practical vectors of bacterial toxins to mosquito larvae.

1. To carry out an initial field survey of occurrence of algae in mosquito habitats.
2. To set up mosquito feeding stations in 3 or more sites each at 1-2 locations in Ontario to collect eggs from same for subsequent laboratory study of larval feeding behaviour.
3. To study population changes in naturally-occurring and introduced algal species and to determine accompanying changes in mosquito larval populations.
4. To study growth and survival under field conditions of introduced strains of cyanobacteria (blue-green algae) susceptible to insertion of genetic markers, especially those that determine bacterial toxins, and their ingestion by mosquito larvae.
5. To determine algal intake by feeding mosquito larvae through analysis of gut contents.

PROJECT DESCRIPTION: 2 locations are Scarborough (Toronto), Guelph. Algal succession and survival will be studied. Artificial ponds will be set up in open field and deep woodland. Make initial survey of natural pools for choice of some of algae to be used in artifical habitats. 2 ponds per site will contain only natural algae.

- In the lab, mosquito larvae will be fed on pure and mixed algal cultures. Feeding preference will be determined by gut analysis.
- Changes in algal populations will be monitored through weekly collections.
- Special interest will be given to survival of cyanobacterial cultures, samples will be plated at intervals onto agar.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	18.0			18.0
Work Years:	1.4			1.4

Budget Source: OPAC

KEYWORDS: cyanobacteria, mosquito feeding behaviour

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: No other sources of funding.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: The Biological Impact of Agricultural Runoff in Streams: the Effects of Nutrient Contaminant Interactions on Attached Algae

PROJECT NO: OPAC 89-19
START DATE: 04/89

SHORT TITLE: Biological Impact of Agricultural Runoff in Streams

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. Kristin E. Day
Rivers Research Branch
National Water Research Institute
Burlington, Ontario (416) 336-4659

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):
1. To develop the methodology to determine the effects of pesticides on attached algae found growing in aquatic ecosystems adjacent to agricultural land.
2. To determine the effects of various levels of nutrients (N,P) on the toxicity of the herbicides, atrazine and metalochlor, to attached algal communities.

PROJECT DESCRIPTION:
1. Artificial substrates (2 types) will be naturally cultured through placement in Southern Ontario river for 2-3 weeks. These will be removed and placed in artificial stream tanks in a lab, under similar simulated conditions and acclimatized for 3 days.
2. A multi-factorial dose response experiment will be conducted utilizing 3 levels of nutrients, atrazine, metolachlor, and atrzine/metolachlor plus controls, to determine synergism, antagonism, or additivity. Nutrient and pesticide levels in water will be analysed by the National Water Quality Laboratory, Burlington.

BUDGET AND RESOURCES:

Year: (* current)	1*	2•	3	TOTAL
Cost: ($000's):	18.0	27.0		18.0
Work Years:	1.0			1.0

Budget Source: OPAC

KEYWORDS: pesticide runoff, impact on attached periphyton, conventional vs. conservation tillage

OUTPUT (papers, presentations, reports): OPAC Seminar 1990

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: No other funding indicated. Environment Canada National Water Quality Laboratory to analyse for pesticides.
•Proposed only by researcher, not approved.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Impact of Algal Fibrils on Fate and Bioavailability of a Pyrethroid Insecticide to Non-Target Aquatic Organisms

PROJECT NO: OPAC 89-20
START DATE: 04/89

SHORT TITLE: Impact of Algal Fibrils

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. N.K. Kaushik
Dept. of Environmental Biology
University of Guelph
Guelph, Ontario
(519) 824-4120 Ext. 2147

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
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OBJECTIVE(S): To investigate the role of algal fibrils in bioavailability of insecticides to non-target organisms in water.

Objectives of the Proposal:

1. To investigate interactions between dissolved organic matter (DOM) and insecticides (methoxychlor and fenvalerate) in terms of their bioavailability to Daphnia magna.
2. To test bioavailability of selected pesticides (fenvalerate, methoxychlor, atrazine metolachlor and chlorosulfuron) in the presence of different concentrations of fibrils of known algal origin.

PROJECT DESCRIPTION:

1. Bioassays will be carried out using Daphnia magna and varying DOM concentrations. After preliminary tests, 14C fenvalerate will be used.
2. 1989: Algal fibrils (Anabaena cylindrica) will be cultured in the lab. 1989/90: Impact of fibrils on bioavailability of selected pesticides will be assessed through bioassay tests using D. magna (fenvalerate, methoxychlor). Labelled substances will be used for atrazine, metolachlor and chlorsulfuron.

BUDGET AND RESOURCES: Year: (* current)	1*	2•	3	TOTAL
Cost: ($000's):	14.5	15.0		14.5
Work Years:	1.0	1.0		1.0

Budget Source: OPAC

KEYWORDS: Anabaena cylindrica, algal fibrils, pesticide bioavailability

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS: M.Sc. student is involved. No other sources of funding are identified.

•Proposed only by researcher, not approved.

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Mating Disruption as an Alternative Management Strategy for the Gypsy Moth

PROJECT NO: OPAC 89-21
START DATE: 04/89

SHORT TITLE: Mating Disruption

PRINCIPAL INVESTIGATOR AND AFFILIATION: Amy Luciani
IPMCC
Box 70, Tweed, Ontario
(416) 227-5562

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S):
1. Test the efficacy of non-chemical alternatives (Luretape GM, scraping and destroying egg masses and burlap trapping) in Southern Ontarion in urban/ suburban and rural forest environment.
2. Evaluate the suitability, practicality and economics of non-chemical alternatives.

PROJECT DESCRIPTION:
1. Evaluate 3 non-chemical alternatives: 4 treatment, each replicated 3x.
   Evaluate effect) i) # of males caught in pheromone traps in treated vs by comparison controls
   ii) % incidence of mating, examining sperm in female moths
   iii) change in egg mass densities by Modified Kaladar Plot Method
   iv) level of branch defoliation. Pts iii) and iv) will also be used to evaluate scraping and burlap trapping.

1b. Establish plots on cottage lots, Crow Lake to compare burlap trapping, ground spraying, Luretape, and scraping of egg masses. Assess time required, cost and efficacy (change in egg mass densities, levels of defoliation).

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	15.0			15.0
Work Years:	0.5			0.5

Budget Source: OPAC

KEYWORDS: gypsy moth, mating disruption

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies): Other sources for funding = $5,000.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X | Contract | Solicited X
INTERNAL | Grant X | Unsolicited

PROJECT TITLE: Update of Reviews on Amitrole and Dichloroaniline Herbicides

PROJECT NO: OPAC 89-22
START DATE: 09/89

SHORT TITLE: Reviews on Amitrole

PRINCIPAL INVESTIGATOR AND AFFILIATION: Dr. K.R. Solomon
Dept. of Environmental Biology
University of Guelph

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
OPAC
(416) 323-4447

OBJECTIVE(S): Update two reports written in 1985 under OPAC research grants. These two reports were literature reviews, which are now out of date.

PROJECT DESCRIPTION: Review recent literature published on each of these herbicides and update the two reports for the Pesticides Advisory Committee.

BUDGET AND RESOURCES:	Year: (* current)	1*	2	3	TOTAL
	Cost: ($000's):	2.4			2.4
	Work Years:	0.15			0.15

Budget Source: OPAC

KEYWORDS: amitrole, dichloroaniline, literature review

OUTPUT (papers, presentations, reports): OPAC Seminar

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Studies on the Dissipation of Residues of Fusilade (fluazifop butyl) in Mineral Soils

PROJECT NO: OPAC 89-23
START DATE: 04/89

SHORT TITLE: Dissipation of Residues of Fusilade

PRINCIPAL INVESTIGATOR AND AFFILIATION: Mr. B. Stephen Clegg and G. Ritcey
OMAF
Dept. of Environmental Biol.
University of Guelph

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris
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OBJECTIVE(S):
1. Sample soil 2 depths at 12 intervals over 1 year, treated at 2 rates.
2. Address residue persistence on potatoes.
3. Identify exposure levels to scouts.
Study to be conducted at Cambridge Research Centre. Analyses to be conducted at OMAF Pesticide Laboratory in Guelph.

PROJECT DESCRIPTION: One objective of this study is to supply information regarding the dissipation of Fusilade on mineral soil will be sampled at 2 depths at established intervals for a period of one year with residues of fluazifop being determined in each, following application of Fusilade at 0.5 or 1.0 kg ai/ha. Dissipation of Fusilade on potatoes will also be monitored and residues of Fluazifop will be determined for samples taken at regular intervals up to and including harvested potatoes. Exposure of scouts to fusilade will be examined by analysis of gloves and coveralls worn by scouts entering the fields at specific intervals following application. This will enable proper re-entry times to be determined.

BUDGET AND RESOURCES: Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	14.0			14.0
Work Years:	0.5			0.5

Budget Source: OPAC

KEYWORDS: tebuthiuron, southern Ontario, environmental fate, soil residues

OUTPUT (papers, presentations, reports): OPAC Seminar 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies): No other sources of funding are identified.

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).

RESEARCH AND TECHNOLOGY INVENTORY: 1989

EXTERNAL X	Contract	Solicited
INTERNAL	Grant X	Unsolicited X

PROJECT TITLE: Weed Population Mapping Used to Control Herbicide Application Rate in Fields of Conservation-Tillage Corn

PROJECT NO: OPAC 89-24
START DATE: 09/89

SHORT TITLE:

PRINCIPAL INVESTIGATOR AND AFFILIATION: Ralph B. Brown, School of Engineering, University of Guelph, (519) 824-4120 x3922 and G.W. Anderson, Dept. of Crop Science, University of Guelph, x3395

LIAISON OFFICER (name, location, telephone no.): Dr. C.D. Fowle&Dr. C.R. Harris, OPAC, (416) 323-4447

OBJECTIVE(S):
1. Establish technique to map perennial weeds in fields quickly and inexpensively.
2. Store maps in tractor on board computer.
3. Utilize direct injector sprayer to custom spray perennial weed patches in his fields. The main objective of this proposal is #1.

PROJECT DESCRIPTION:
(a) 89-90: Conduct comprehensive literature search and invetigate possible experimental procedues from existing photo data bank.
(b) 90-91: Select field sites and develop experimental procedure. Conduct 1st year aerial photography, ground truth and comparative assessment.
(c) 91-92: Conduct second year aerial photography, ground truth and comparaive assessment.

BUDGET AND RESOURCES:

Year: (* current)	1*	2	3	TOTAL
Cost: ($000's):	8.0	23.68	20.15	8.0
Work Years:	0.75	1.5	1.5	0.75

Budget Source: OPAC

KEYWORDS:

OUTPUT (papers, presentations, reports): OPAC Seminar January 1990; final report on literature search by March 31, 1990.

EXTERNAL PARTICIPATION (ministries, governments, agencies):

COMMENTS:

NOTE: "External" refers to projects carried out by investigators outside the Ministry. Please indicate budget source by organization (e.g., RAC, OPAC, Branch, etc.).