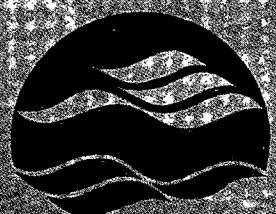
Environment Canada Environnement Canada

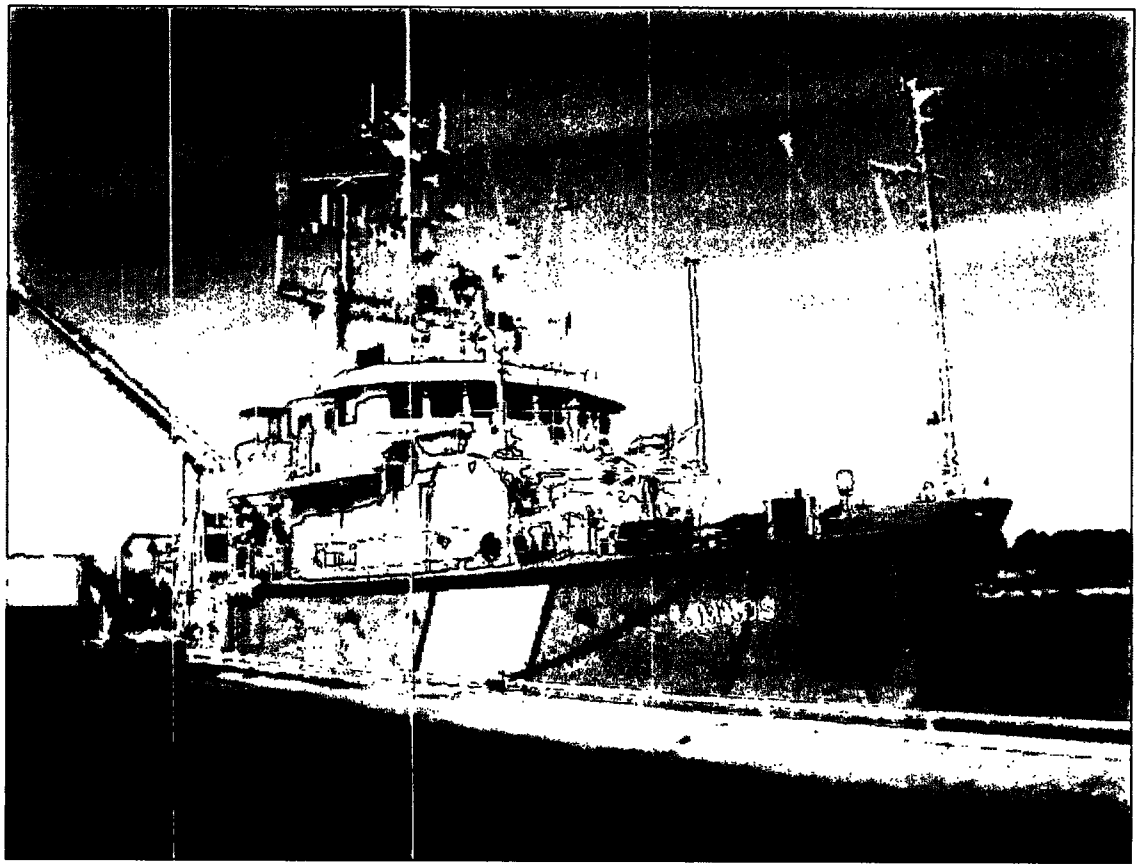
Canada



NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

2004
ANNUAL ACTIVITY SUMMARY
TECHNICAL OPERATIONS SERVICES
RESEARCH SUPPORT BRANCH
NATIONAL WATER RESEARCH INSTITUTE



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INTRODUCTION

The mandate of Technical Operations Services at the National Water Research Institute at CCIW in Burlington, Ontario is to provide logistical and technical support to the scientific community at this Institute and to various other governmental and educational groups on a national scale.

The technical staff of this service is involved in shipboard programs which are carried out from major ships on the Great Lakes and St. Lawrence River and in shore-based field projects, which puts them into field situations from coast to coast in North America, into the high Arctic and overseas. As the scientific component of this Institute embraces global environmental problems and increasingly lends its resources and expertise to third world and other countries, this service finds itself conducting field programs on other continents. This unusual opportunity - to work and gain valuable field related experience in such a varied sphere of operation, develops within the service a tremendous collective wealth of technical expertise unique to this support group.

The Diving Operations Unit is ever expanding its capacity to give scientific programs the up-to-date technological support they require underwater - the most recent advances being in digital underwater video capability, including the editing and manipulation of both analog and digital video material. Annual diver training and certification courses are also conducted to maintain a high level of competence among CCIW divers.

Rigging Shop personnel provide for the repair and maintenance of the NWRI fleet of vehicles, as well as for trailers and mechanical field gear. They also handle heavy equipment transport to field sites, operate Field Stores and when required assist as members of field parties.

This report is intended as an overview of the field activities of this group during the 2004 field season.

STAFF LIST

RESEARCH SUPPORT BRANCH

Director	P.M. Healey
Executive Assistant	K. Faulkner
Manager, Finance & Administration	J. McAvella
Administrative Assistant	P.McDevitt

TECHNICAL OPERATIONS SERVICES

Manager	M.R. Mawhinney

OPERATIONS OFFICERS

B.H. Moore	OIC, CCGS LIMNOS; Great Slave Lake, Northwest Territories
S.B. Smith	OIC, CCGS LIMNOS; OIC CCGS SHARK; Detroit River; St.Clair River, North Channel, Ontario;
D.A.D. Gilroy	Diving; OIC, CCGS LIMNOS; Marathon, Hamilton Harbour; Walpole Island, Lake Opeongo Ontario; Lake Champlain New York State, USA
B.L. Gray	Diving; OIC, CCGS LIMNOS; Walpole Island; North Channel; Hamilton Harbour, Ontario; Lake Champlain New York State, USA

MARINE TECHNOLOGISTS

T.G.D. Breedon	Diving; CCGS LIMNOS; Hamilton Harbour; Cornwall; Walpole Island, Ontario Great Slave Lake, Northwest Territories
R.J. Hess	OIC CCGS LIMNOS; Hamilton Harbour; Detroit/St. Clair Rivers; North Channel, Ontario
K.J. Hill	CCGS LIMNOS; Hamilton Harbour; Detroit/St. Clair Rivers; Ontario; Lake Champlain New York, USA
G.G. LaHaie	OIC, Turkey Lakes Watershed Site
R.D. Neureuther	CCGS LIMNOS; Hamilton Harbour; Detroit/St. Clair Rivers; North Channel, Thunder Bay, Ontario

C.H. Talbot	Groundwater Hamilton Harbour Ontario, Lake Hazen, Nunavut
E.H. Walker	CCGS LIMNOS; CCGS GULL ISLE; Detroit/St. Clair Rivers; Parry Sound, North Channel, Ontario

ASSISTANT MARINE TECHNOLOGISTS

L.M. Benner	Diving; CCGS LIMNOS; Marathon, Cornwall Ontario
B. Lalonde	CCGS LIMNOS; Hamilton Harbour; North Channel; Bay of Quinte, Ontario
T. Mamone	CCGS LIMNOS; Hamilton Harbour; Detroit River, Ontario
D.P. Walsh	CCGS LIMNOS; Turkey Lakes Watershed; Detroit River; St. Clair River, Ontario; Small Lakes Northern and Southern Ontario
C. Yanch	CCGS LIMNOS; Hamilton Harbour; Sauble River; Ontario

RIGGING UNIT

C.J. Lomas	Senior Rigger; Ship Support; Turkey Lakes Watershed, Ontario
T.C. Gilliss	Vehicle Maintenance Co-ordinator

NWRI FIELD STORES

C.J. Lomas
T.C. Gilliss

FSWEP SUMMER STUDENTS

S. Cabezas	CCGS LIMNOS; Hamilton Harbour
R. Kruger	CCSS LIMNOS; Hamilton Harbour, Turkey Lakes Watershed
K. Norlund	CCGS LIMNOS; Hamilton Harbour; Ontario
D. Paulusse	CCGS LIMNOS; Hamilton Harbour, Detroit River, Ontario
K. Tchentsov	CCGS LIMNOS; Hamilton Harbour; Ontario

YMCA INTERNS

K. Kurjancic	April 1 - August 27, CCGS LIMNOS, Hamilton Harbour, Ontario
S. Rogers	On strength October 21, Hamilton Harbour, Ontario

CCGS LIMNOS

2004 JANUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29						

MARCH 2004

SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30 Outfitting Vessel	31			

APRIL

SUN	MON	TUE	WED	THUR	FRI	SAT
				1 Outfitting Vessel	2	3
4	5 Lake Ont. Moorings Marvin DFO/DOE Piggyback	6	7	8 CCIW	9	10 CCIW
11 CCIW	12	13 Lake Erie Moorings Yerubandi	14	15	16	17 PORT Colborne
18 PORT Colborne	19 PORT Colborne	20 L Erie Surv.& WQ Richardson Charlton DFO Piggyback	21	22	23	24 Amherstburg
25 Vessel Non Operational	26	27 Vessel Non Operational	28	29	30	

MAY

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3 Lake Huron Geo Bay Surveillance DFO Piggyback	4	5	6	7 Richardson	8
9	10 Lake Huron Geo Bay Surveillance DFO Piggyback	11 DFO Piggyback	12	13 Sarnia	14 Sarnia	15 Sarnia
16 Amherstburg	17 Lake Erie Benthic Survey Richardson	18	19	20	21 PORT Colborne	22 PORT Colborne
23	24 31	25	26 Lake Erie Water Quality Charlton	27	28	29

JUNE

SUN	MON	TUE	WED	THUR	FRI	SAT
		1	2 Det River L. Erie Contaminant Survey	3 PORT Colborne	4 PORT Colborne	5 PORT Colborne
6 PORT Colborne	7	8 Lake Erie East Basin Roxann Survey Bibberhofer	9	10	11	12 PORT Colborne
13 PORT Colborne	14	15 Lake Erie East Basin Roxann Survey Bibberhofer	16	17	18	19 PORT Colborne
20 PORT Colborne	21	22 Lake Erie Water Quality Charlton	23	24	25	26 CCIW
27 CCIW	28	29 Vessel Non Operational	30			

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
				1 Vessel Non Operational	2	3 CCIW
4 CCIW	5 Lake Ontario Contaminants Muir DFO/DOE Piggyback	6	7	8	9 CCIW	10 CCIW
11 CCIW	12 Lake Erie Carbon Cycle Bourbonniere	13	14	15	16	17 PORT Colborne
18 PORT Colborne	19 Lake Erie Water Quality Charlton	20	21	22	23	24 Amherstburg
25 Amherstburg	26 Detroit River Contaminant Survey Marvin	27	28 Lake Erie Moorings Yerubandi	29	30	31 Amherstburg

AUGUST

SUN	MON	TUE	WED	THUR	FRI	SAT
1 Amherstburg	2 Amherstburg	3	4 Richardson Lake Erie Benthic Survey Moorings Yerubandi	5	6 PORT Colborne	7 PORT Colborne
8 PORT Colborne	9 Lake Erie Benthic Survey Richardson Moorings Yerubandi	10	11	12	13 PORT Colborne	14 PORT Colborne
15 PORT Colborne	16 L Erie Surv. & WQ Richardson Charlton DFO Piggyback	17	18	19	20 Sarnia	21 Sarnia
22 Sarnia	23 Detroit River Contaminant Survey Marvin	24	25	26	27	28 CCIW
29 CCIW	30 Lake Ontario	31				

SEPTEMBER

CCIW

SUN	MON	TUE	WED	THUR	FRI	SAT
			1 Taste & odour Charlton	2	3	4 CCIW
5 CCIW	6 CCIW	7	8 Vessel Non Operational	9	10	11 CCIW
12 CCIW	13	14 Lake Erie Water Quality Charlton	15	16	17	18 PORT Colborne
19 PORT Colborne	20	21 Detroit River Contaminant Survey	22	23	24 Marvin	25 Sarnia
26 Sarnia	27 Great Lakes Area's of Concern D. Milani	28	29	30		

OCTOBER

SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2 Sarnia
3 Sarnia	4	5 Lake Erie Moorings Yerubandi	6	7	8	9 Amherstburg
10 Sarnia	11 Sarnia	12 Sarnia	13 Detroit River Contaminant Survey Marvin	14	15	16 PORT Colborne
17 PORT Colborne	18	19 Lake Erie Water Quality Charlton DFO Piggyback	20	21	22	23 CCIW
24 CCIW 31 CCIW	25	26 Lake Ontario Moorings Marvin DFO/DOE Piggyback	27	28	29	30 CCIW

NOVEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
	1 Unload Vessel CCIW	2 CCIW	3 CCIW	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

DECEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

EHD OR | AEMRB | AEIRB | NON OPS | DFO/DOE Piggyback | DFO Piggyback

CCGS GULL ISLE

2004 JANUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

FEBRUARY

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29						

MARCH 2004

SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30	31			

APRIL

SUN	MON	TUE	WED	THUR	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27 Detroit R. Contaminants C. Marvin	28	29	30	

MAY

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10	11	12	13	14	15
16	17	18	19	20	21	22
23 30	24 31	25	26	27	28	29

JUNE

SUN	MON	TUE	WED	THUR	FRI	SAT
		1	2	3	4	5
6	7	8	9	10	11	12
13	14	15	16	17	18	19
20	21	22 Detroit R. C. Marvin	23 Contaminants	24	25	26
27	28	29	30			

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
				1	2	3
4	5	6	7	8	9	10
11	12	13	14	15	16	17
18	19	20	21	22	23	24
25	26	27	28	29	30	31

AUGUST

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

SEPTEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

OCTOBER

SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2
3	4	5	6	7	8	9
10	11	12	13	14	15	16
17	18	19	20	21	22	23
24 31	25 St. Clair R. McCrea	26	27	28	29	30

NOVEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	29	30				

DECEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30	31	

AEMRB

EHD - OR

SHIP PROGRAMS

GREAT LAKES AREAS OF CONCERN
AEIRB STUDY 12211, DR. L. GRAPENTINE

This study was undertaken to collect mini box cores from representative stations in the St. Clair River to verify the reference database related to assessment techniques used to include biological and chemical measures. Samples collected verify the reference database created to select key species and toxicity tests that show the most resilient predictive response for use in developing numerical biological sediment guidelines. These guidelines are in turn used to determine the need for sediment remediation based on the invertebrate fauna and bioassay responses. Work was done from the CCGS LIMNOS and from the CCGL PELICAN carried onboard the LIMNOS during the cruise, September 27 - 30, 2004.

At each station the following work was performed:

At all stations, a water sample was obtained from a depth of bottom -0.5 m from which samples were obtained for ammonia, nitrate + nitrite, total Kjeldahl nitrogen, total unfiltered phosphorus and alkalinity. All samples were stored at 4°C.

At all stations, PONAR or mini PONAR samples were collected to fill two 68 L plastic tubs. The sediment collected in the tubs was sieved using a 500µ mesh sieve and organisms removed for tissue analysis of mercury. Organisms were frozen and stored at -20°C. From every PONAR or mini PONAR collected, a scoop of sediment was set aside in a glass tray. Once the tub was filled, the sediment in the glass tray was homogenized and sampled in the following manner:

a) 125 ml was sampled for archiving in a hexane-rinsed glass bottle covered with a hexane-rinsed piece of tin foil before the lid was placed on.

b) 100 ml was sampled for particle size in a plastic pill jar.

c) 500 ml was sampled for major ions, metals, loss on ignition, total organic carbon, total nitrogen, total phosphorus and mercury in a plastic tub.

All samples were stored at 4°C.

d) 250 ml was sampled for organic contaminant analysis in a pre-cleaned amber jar.

e) 250 ml was sampled for mercury analysis in a polyethylene container.

Samples were stored at -20°C.

At all stations a picture was taken of the sediment (in tray) with sample ID and date included.
At all stations, five mini PONAR samples were obtained for bioassay experiments. Samples were placed in the bags provided and all air removed. Samples were stored at 4°C.

At station 107, triplicate samples for water and sediment chemistry were collected for Quality Assurance/Quality Control (QA/QC).

At all stations, sampled by the PELICAN, a Hydrolab was used to obtain temperature, pH, conductivity, dissolved oxygen and depth parameters.

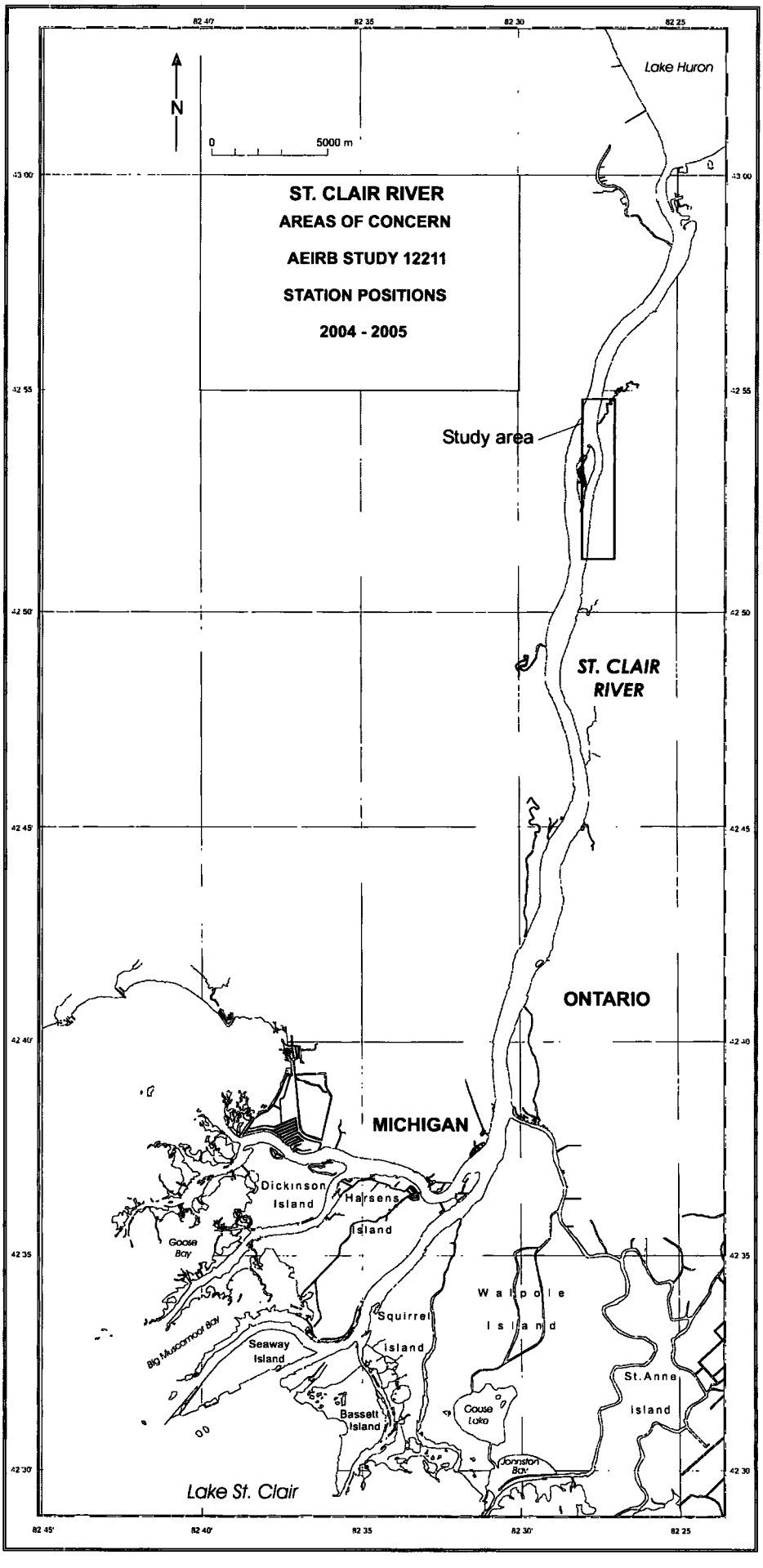
At all stations, the station position was recorded in Northings and Eastings as well as Latitude N. and Longitude W. using differential GPS.

STATION POSITIONS
AREAS OF CONCERN

ST. CLAIR RIVER
2004 - 2005

STATION NUMBER	AEIRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING ZONE 17	EASTING ZONE 17
106	6667	42° 53' 47"	82° 27' 25"	4750320	381046
107	6669*	42° 52' 18"	82° 27' 41"	4747603.3	380627.5
116	MOE 76 (8)	42° 55' 59"	82° 26' 52"	4754387	381872
117	MOE 253 (60)	42° 54' 11"	82° 27' 32"	4751087	380901
118	MOE 144 (25)	42° 54' 01"	82° 27' 29"	4750760.6	380958.8
119	MOE 80 (10)	42° 53' 38"	82° 27' 22"	4750074.3	381106.4
121	MOE 272 (25)	42° 54' 18"	82° 27' 30"	4751304.9	380950.1
122	MOE 271 (15)	42° 54' 06"	82° 27' 30"	4750921.4	380953.8
123	MOE 269 (15)	42° 53' 36"	82° 27' 22"	4749996	381115.5
124	M0E 264 (10)	42° 52' 40"	82° 27' 36"	4748263	380750
125	MOE 262 (10)	42° 54' 38"	82° 27' 24"	4751924	381099.5

* = QA/QC station


ST. CLAIR RIVER
AREAS OF CONCERN
AEIRB STUDY 12211
STATION POSITIONS
2004 - 2005
N
0
5000 m
Lake Huron
Study area
ST. CLAIR RIVER
ONTARIO
MICHIGAN
Dickinson Island
Harsens Island
Goose Bay
Big Muscamoot Bay
Seaway Island
Squirrel Island
Walpole Island
St. Anne Island
Couse Lake
Bassett Island
Johnston Bay
Lake St. Clair
82 45'
82 40'
82 35'
82 30'
82 25'
42 55'
42 50'
42 45'
42 40'
42 35'
42 30'

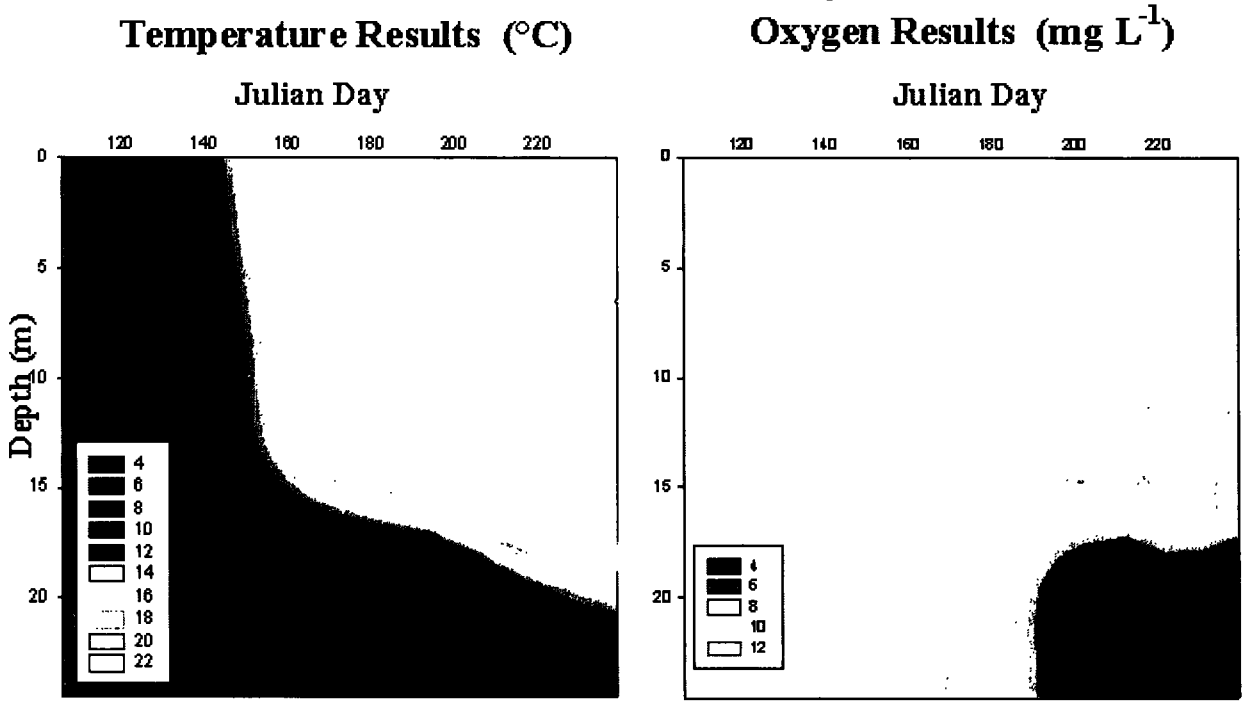
MICROBIAL ECOLOGY OF THE LAKE ERIE ECOSYSTEM
AEIRB STUDY 14150, DR. R. A. BOURBONNIERE

A group of Canadian and American researchers collaborated again this year in a broad range of experiments to investigate the chemical, biological and physical controls which influence the cycling of carbon and trace metals in the Lake Erie water column. Biological experiments included on deck incubations in flow through tanks.

Microcystis aeruginosa has been a major problem in the lakes since 1995. Studies in 2004 continued the monitoring efforts and master sites (stations 882, 357, 478, 558, 1163 and station 937) were selected for future monitoring. During this cruise, water samples were collected from 1 meter at each station for cyanobacterial abundance and microcystin concentration. Samples were collected from the generation of molecular DNA libraries to identify members of this consortium.

In recent studies more focus has been placed on the region of seasonal hypoxia that forms in the central basin of Lake Erie each summer. Commencing sometime in late July, oxygen consumption levels by microbial activity outpace oxygen production and diffusion into the hypolimnion, popularly termed the "dead zone". This annual event has drawn significant interest from researchers throughout North America as well as from lake management.

Results from Station 84, April 15th to August 26th, 2004

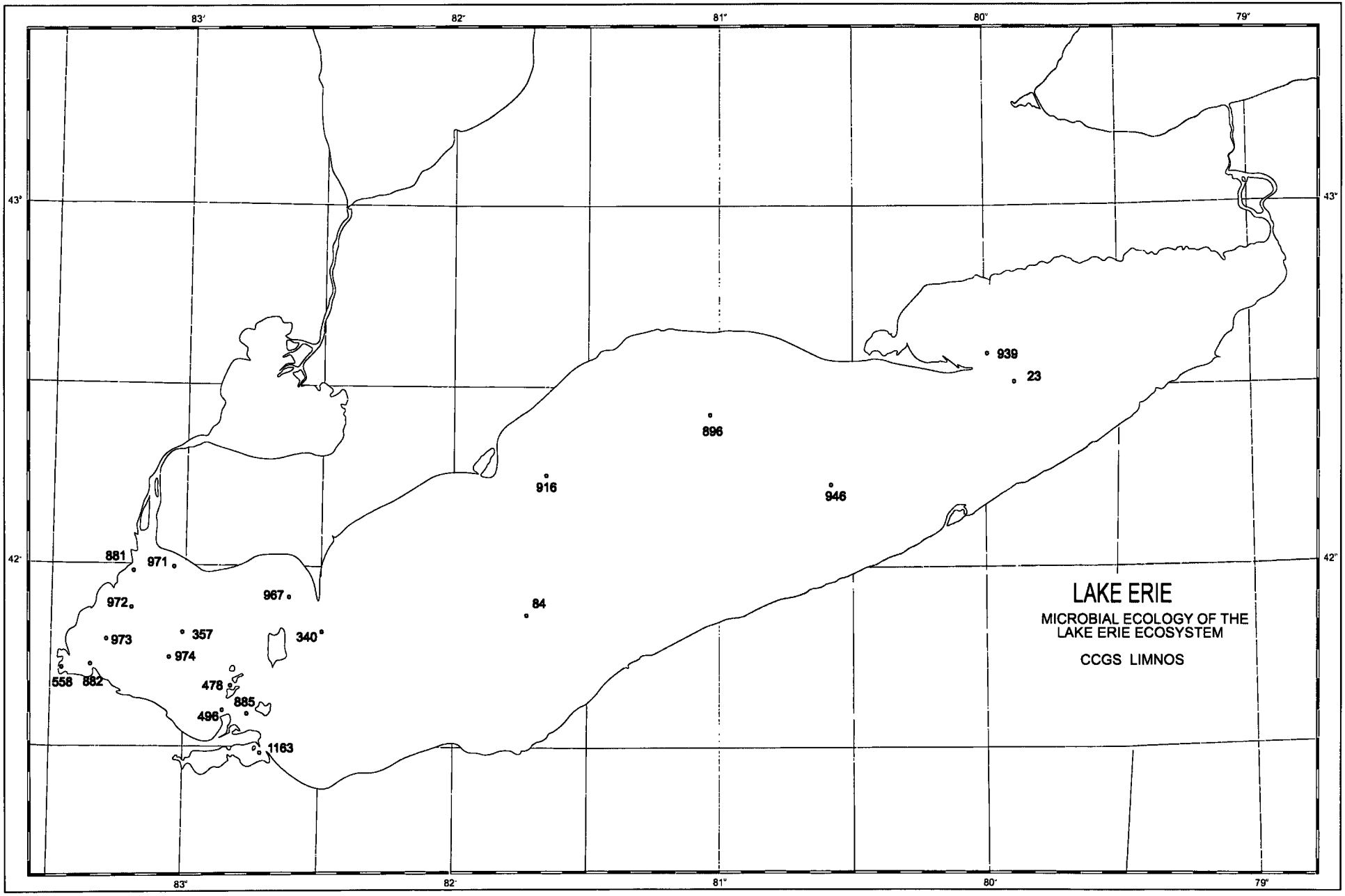


STATION POSITIONS

LAKE ERIE

2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 06"	79° 53' 24"
84	41° 56' 03"	81° 39' 35"
357	41° 48' 42"	82° 59' 01"
478 (Put in Bay)	41° 39' 33"	82° 49' 00"
558 (Maumee River)	41° 41' 56"	83° 27' 39"
882	41° 44' 01"	83° 23' 05"
885	41° 31' 12"	82° 38' 26"
937	42° 43' 00"	80° 15' 00"
966	41° 59' 00"	82° 37' 30"
967	41° 53' 30"	82° 40' 00"
969	41° 36' 30"	82° 55' 30"
971	41° 57' 00"	83° 03' 00"
972	41° 52' 00"	83° 12' 00"
973	41° 47' 30"	83° 20' 00"
974	41° 43' 31"	83° 09' 00"
1163 (Sandusky)	41° 28' 16"	82° 43' 05"


83°
82°
81°
80°
79°
43°
42°
939
23
896
916
946
881
971
967
84
972
973
357
340
974
558
882
478
885
496
1163
LAKE ERIE
MICROBIAL ECOLOGY OF THE
LAKE ERIE ECOSYSTEM
CCGS LIMNOS

ROXANN™ SEDIMENT SURVEY, LAKE ERIE EASTERN BASIN
AEMRB STUDY 12218, MR. H. BIBERHOFER

Technical Operations Services provided support to Mr. H. Biberhofer's RoxAnn™ Seabed Classification cruise on Lake Erie's Eastern Basin from June 7-11 and June 14-18, onboard the CCGS LIMNOS.

The purpose of this survey was to perform a shipboard survey using the RoxAnn™ seabed classification system for basin mapping of bottom sediment types in the Eastern Basin of Lake Erie. The cruises were used to aid in the development of a system of bottom-mapping that will provide a digital record of bottom sediment types in the Eastern Basin and nearshore areas of Lake Erie, and eventually other Great Lakes.

The CCGS LIMNOS completed a series of track lines throughout the Eastern Basin and onto the Pennsylvania Ridge, during the first week of the cruise. The lines were chosen by the Study Leader to gain the maximum amount of coverage during the time allotted. The nearshore survey lines were run into shallow depths of water deemed safe by the master of the ship. A series of lines was also run through the deeper waters of the Eastern Basin. During the second week of the cruise the LIMNOS completed the survey lines early in the week; and then a number of selected sites were chosen to groundtruth the data using mini-boxcores and shipeks. The groundtruthing was used to confirm the data collected with the RoxAnn™ System.

Additional work was completed at a number of sites during the second week for the University of Windsor, Ontario Ministry of Natural Resources and the Environment Canada joint sediment survey (ECC sites). A total of 31 ECC sites were sampled during the second week. All of Mr. Biberhofer's groundtruthing sites were chosen so that they fell on existing ECC sites, so as not to duplicate data. These samples were the last in a series of multi agency samples that saw every basin sampled with the same protocols in both nearshore and offshore areas of Lake Erie, during the summer of 2004.

WAYPOINT POSITIONS

LAKE ERIE
EAST BASIN

2004 - 2005

WAYPOINT NUMBER	LATITUDE N.	LONGITUDE W.
WP-1	42° 50' 09"	79° 15' 29"
WP-2	42° 35' 31"	80° 06' 17"
WP-3	42° 33' 24"	80° 01' 52"
WP-4	42° 48' 57"	79° 12' 22"
WP-5	42° 48' 59"	79° 08' 04"
WP-6	42° 50' 59"	78° 57' 58"
WP-7	42° 07' 42"	81° 01' 01"
WP-8	42° 04' 43"	80° 58' 34"
WP-9	42° 50' 32"	78° 54' 49"
WP-10	42° 48' 45"	78° 53' 54"
WP-11	42° 02' 27"	80° 58' 56"
WP-12	41° 59' 42"	80° 56' 05"
WP-13	42° 42' 37"	79° 03' 22"
WP-14	42° 38' 45"	79° 07' 16"
WP-15	42° 37' 00"	79° 08' 43"
WP-16	42° 03' 21"	80° 36' 17"
WP-17	42° 00' 51"	80° 34' 30"
WP-18	42° 22' 10"	79° 36' 21"
WP-19	42° 50' 24"	79° 35' 35"
WP-20	42° 50" 24"	79° 35' 34"
WP-21	42° 49' 16"	79° 31' 16"
WP-22	42° 23' 51"	79° 32' 04"
WP-23	42° 25' 29"	79° 29' 00"
WP-24	42° 25' 34"	79° 27' 34"
WP-25	42° 51' 22"	79° 26' 52"

WAYPOINT POSITIONS

LAKE ERIE
EAST BASIN

2004 - 2005

WAYPOINT NUMBER	LATITUDE N.	LONGITUDE W.
WP-26	42° 50' 13"	79° 22' 39"
WP-27	42° 28' 40"	79° 23' 12"
WP-28	42° 30' 45"	79° 20' 18"
WP-29	42° 30' 47"	79° 18' 51"
WP-30	42° 51' 23"	79° 18' 18"
WP-31	42° 51' 19"	79° 14' 04"
WP-32	42° 32' 47"	79° 14' 27"
WP-33	42° 33' 51"	79° 11' 33"
WP-34	42° 51' 09"	79° 11' 03"
WP-35	42° 51' 04"	79° 08' 04"
WP-36	42° 35' 55"	79° 08' 34"
WP-37	42° 38' 28"	79° 06' 31"
WP-38	42° 40' 12"	79° 05' 33"
WP-39	42° 49' 52"	79° 05' 13"
WP-40	42° 51' 01"	79° 03' 46"
WP-41	42° 50' 59"	79° 02' 16"
WP-42	42° 42' 21"	79° 02' 37"
WP-43	42° 43' 27"	78° 59' 47"
WP-44	42° 50' 54"	78° 59' 26"
WP-45	42° 52' 02"	78° 57' 58"
WP-46	42° 52' 01"	78° 56' 28"
WP-47	42° 44' 22"	78° 56' 46"
WP-48	42° 46' 31"	78° 53' 49"
WP-49	42° 50' 51"	78° 53' 39"
WP-50	42° 51' 58"	78° 54' 57"

WAYPOINT POSITIONS

LAKE ERIE
EAST BASIN

2004 - 2005

WAYPOINT NUMBER	LATITUDE N.	LONGITUDE W.
WP-51	42° 49' 47"	78° 58' 07"
WP-52	42° 43' 53"	78° 58' 19"
WP-53	42° 43' 24"	79° 01' 06"
WP-54	42° 50' 57"	79° 00' 51"
WP-55	42° 49' 55"	79° 03' 46"
WP-56	42° 42' 19"	79° 04' 04"
WP-57	42° 40' 13"	79° 07' 00"
WP-58	42° 48' 56"	79° 06' 44"
WP-59	42° 49' 15"	79° 31' 10"
WP-60	42° 50' 17"	79° 21' 02"
WP-61	42° 51' 58"	79° 15' 00"

STATION POSITIONS

LAKE ERIE

2004 - 2005

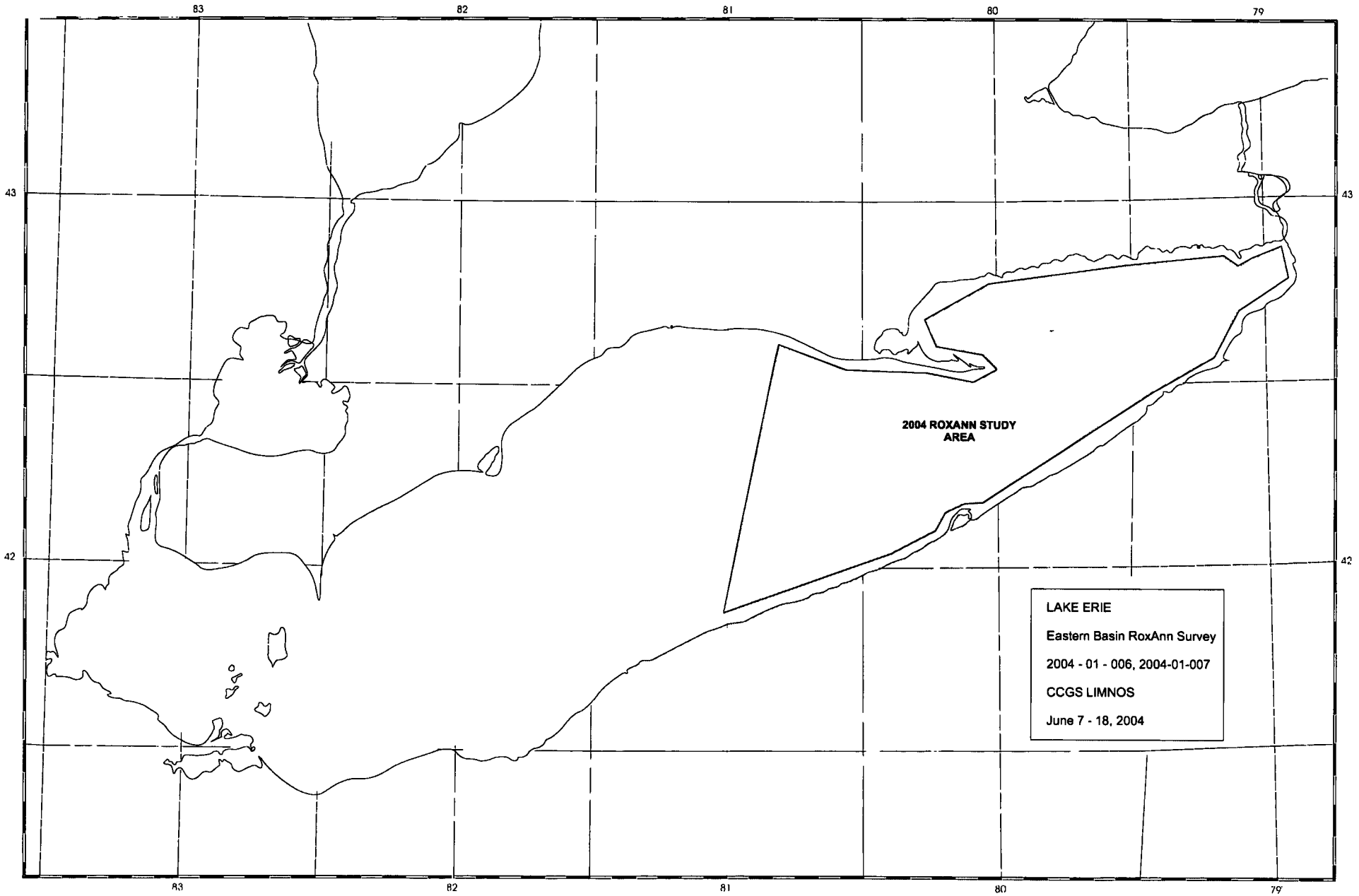
STATION NUMBER Star/U of Windsor	SECCHI DISC DEPTH/COLOUR	XMS % @ 1M	LATITUDE N.	LONGITUDE W.
981	9/7	83	42° 50' 10"	79° 14' 11"
982	9/7	83	42° 48' 48"	79° 12' 21"
983	7/12	82	42° 45' 54"	79° 12' 34"
984	9/16	85	42° 41' 55"	79° 12' 38"
985	7/6	80	42° 38' 48"	79° 12' 50"
986	4/16	75	42° 35' 29"	79° 12' 54"
987		84	42° 42' 13"	79° 16' 29"
988		84	42° 44' 40"	79° 16' 19"
989		82	42° 46' 19"	79° 20' 30"
990		85	42° 43' 08"	79° 20' 34"
991		86	42° 40' 55"	79° 20' 06"
992		85	42° 38' 55"	79° 20' 52"
993		76	42° 32' 26"	79° 20' 53"
994		85	43° 39' 22"	79° 24' 55"
995		85	42° 41' 35"	79° 24' 52"
996		84	42° 44' 45"	79° 24' 53"
997		82	42° 50' 20"	79° 24' 38"
998		78	42° 25' 26"	79° 29' 12"
999/ECC 30	7.5/11	82	42° 25' 58"	79° 31' 02"
1000/ECC 28	9/6	87	42° 37' 16"	79° 30' 15"
1028/ECC 31	9/7	85	42° 38' 50"	79° 31' 54"
1094/ECC 29	10/6	84	42° 39' 40"	79° 30' 33"
1150	7.5/6	82	42° 49' 18"	79° 32' 39"
1153	7.5/14	83	42° 49' 47"	79° 34' 07"
1154/ECC 38	9/6	84	42° 44' 11"	79° 33' 57"
1155	8.5/16	86	42° 42' 00"	79° 34' 21"
1157/ECC 32	8.5/16	84	42° 24' 30"	79° 32' 31"
1158/ECC34	5/7	78	42° 21' 18"	79° 35' 53"
1160		84	42° 43' 31"	79° 38' 40"
1161/ECC 36		88	42° 37' 28"	79° 40' 40"
1162/ECC 37		86	42° 31' 23"	79° 42' 12"

STATION POSITIONS

LAKE ERIE

2004 - 2005

STATION NUMBER Star/U of Windsor	SECCHI DISC DEPTH/COLOUR	XMS % @ 1M	LATITUDE N.	LONGITUDE W.
1166/ECC 38		82	42° 18' 31"	79° 43' 28"
1167/ECC39		84	42° 18' 34"	79° 44' 07"
1168/ECC40		79	42° 26' 33"	79° 44' 21"
1169/ECC45	7.5/13	83	42° 21' 33"	79° 47' 26"
1170	4/17	82	42° 17' 57"	79° 47' 52"
1171/ECC51	7.5/13	81	42° 16' 14"	79° 53' 14"
1172/ECC56	7/7	79	42° 13' 58"	79° 57' 21"
1174/ECC54	7/7	78	42° 17' 07"	79° 56' 31"
1175/ECC53		77	42° 42' 47"	79° 55' 02"
1176/ECC57		85	42° 28' 50"	79° 58' 29"
1177/ECC62		79	42° 14' 18"	80° 02' 31"
1178/ECC66	7/7	79	42° 35' 27"	80° 05' 18"
1179/ECC74	5/17	77	42° 39' 46"	80° 11' 51"
1180/ECC75	4.5/18	75	42° 39' 22"	80° 11' 57"
1181/ECC73	5/17	82	42° 38' 47"	80° 11' 08"
1182/ECC72	4.5/18	71	42° 38' 39"	80° 10' 20"
1183/ECC61	5/17	83	42° 31' 49"	80° 01' 48"
1184/ECC63	7/6	77	42° 15' 08"	80° 04' 32"
1185/ECC64	7/6	77	42° 12' 26"	80° 04' 40"
1186/ECC65	7/6	80	42° 11' 27"	80° 04' 46"
1187/ECC68		83	42° 25' 35"	80° 07' 22"
1189/ECC67		79	42° 31' 08"	80° 06' 30"
1190/ECC83	9.8/5	85	42° 20' 03"	80° 16' 47"


83
82
81
80
79
43
42
2004 ROXANN STUDY AREA
LAKE ERIE
Eastern Basin RoxAnn Survey
2004 - 01 - 006, 2004-01-007
CCGS LIMNOS
June 7 - 18, 2004

LAKE ERIE WATER QUALITY
AEMRB STUDY 12240, M. N. CHARLTON

This is an ongoing study to determine the effects of zebra mussels on water quality and the cause of declining fish production in Lake Erie.

A total of seven cruises were completed to support this study during the 2004 field season - April 19-23, May 25-29, June 21-25, July 19-23, August 16-20, September 13-17 and October 18-22. At each station, water samples were collected as follows: an integrated water sample from the surface to 1m above the thermocline or to 20m if the epilimnion was deeper than 20m or the water column was unstratified. Samples were taken at 2m above the bottom in instances where the sampling depth extended to the substrate. Parameters measured were: conductivity, pH, chlorophyll a, total phosphorous (filtered and unfiltered), soluble reactive phosphorous, nitrate, nitrite, particulate organic carbon, ammonia, chlorides and soluble reactive silicates. Temperature/depth, dissolved oxygen and fluorometer profiles were also obtained. Surface temperature and Secchi disk observations were made at each station.

For Dr. D. Culver of Ohio State University, at selected stations, duplicate metered 64 µ zooplankton net hauls were taken from bottom -1m to the surface and preserved in 5% sugared formalin. Phytoplankton samples were taken from an integrated water sample and preserved with 5 mls of Lugol's solution.

For the University of Waterloo, at stations 84 and 357, at each sediment trap depth, triplicate samples were collected for chlorophyll a, particulate phosphorous, particulate carbon/nitrogen, particulate silica, particulate calcium and phytoplankton.

In April, May and August, at stations 879, 882, 897(949) and 970, whole water volumes of 16L each were collected using a March pump from a depth of 1m into 4L amber bottles for neutral herbicides, acid herbicides and organophosphates for J. Struger, ECB/EHD, Ontario Region.

From April to September, on a monthly basis, at selected stations, integrated water samples were collected for T. Meilander of Kent State University. This is part of a study to determine if labile dissolved organic compounds influence phosphorus dynamics in the microbial food web relative to the grazing food chain at locations of varying trophic states. Also at these stations, an integrated water sample was collected for phytoplankton, primary production, microbial loop and ciliate analyses for Dr. M. Munawar, GLLFAS.

In April, at stations 23 (EHD #879), 84 (EHD# 880), 881, 882, 885, 887, 889, 931, 933, 935, 937, 944, 946, 949, 951, 958, 960, 963, and 357 (EHD#970) bulk water samples (16L) were collected using the PopCart at a depth of approximately 3m for neutral and acid herbicides and organophosphates. At these stations, samples were collected for

trace metals and mercury using the ISOMET sampler. Duplicate samples were taken at every fifth station.

STATION POSITIONS

LAKE ERIE

2004 - 2005

STATION NUMBER	SURVEILLANCE/ GLNPO NUMBER	LATITUDE N.	LONGITUDE W.
205		42° 20' 00"	80° 22' 00"
311		41° 35' 00"	82° 28' 00"
318		41° 40' 15"	82° 17' 00"
445		42° 48' 06"	79° 42' 00"
448		42° 17' 42"	79° 42' 48"
449		42° 46' 03"	79° 58' 15"
452		42° 35' 00"	79° 55' 18"
489		42° 10' 00"	80° 18' 00"
491		41° 51' 10"	82° 31' 26"
492		41° 50' 31"	82° 32' 25"
493		41° 49' 48"	82° 35' 00"
494		41° 42' 42"	82° 41' 54"
495		41° 38' 36"	82° 42' 48"
496		41° 34' 06"	82° 43' 12"
727		42° 49' 00"	79° 23' 00"
879	23	42° 30' 25"	79° 53' 59"
880	84	41° 56' 09"	81° 39' 16"
882		41° 45' 57"	83° 18' 34"
896	ER30	42° 25' 48"	81° 12' 18"
897	ER31	42° 15' 12"	81° 06' 24"

STATION POSITIONS

LAKE ERIE

2004 - 2005

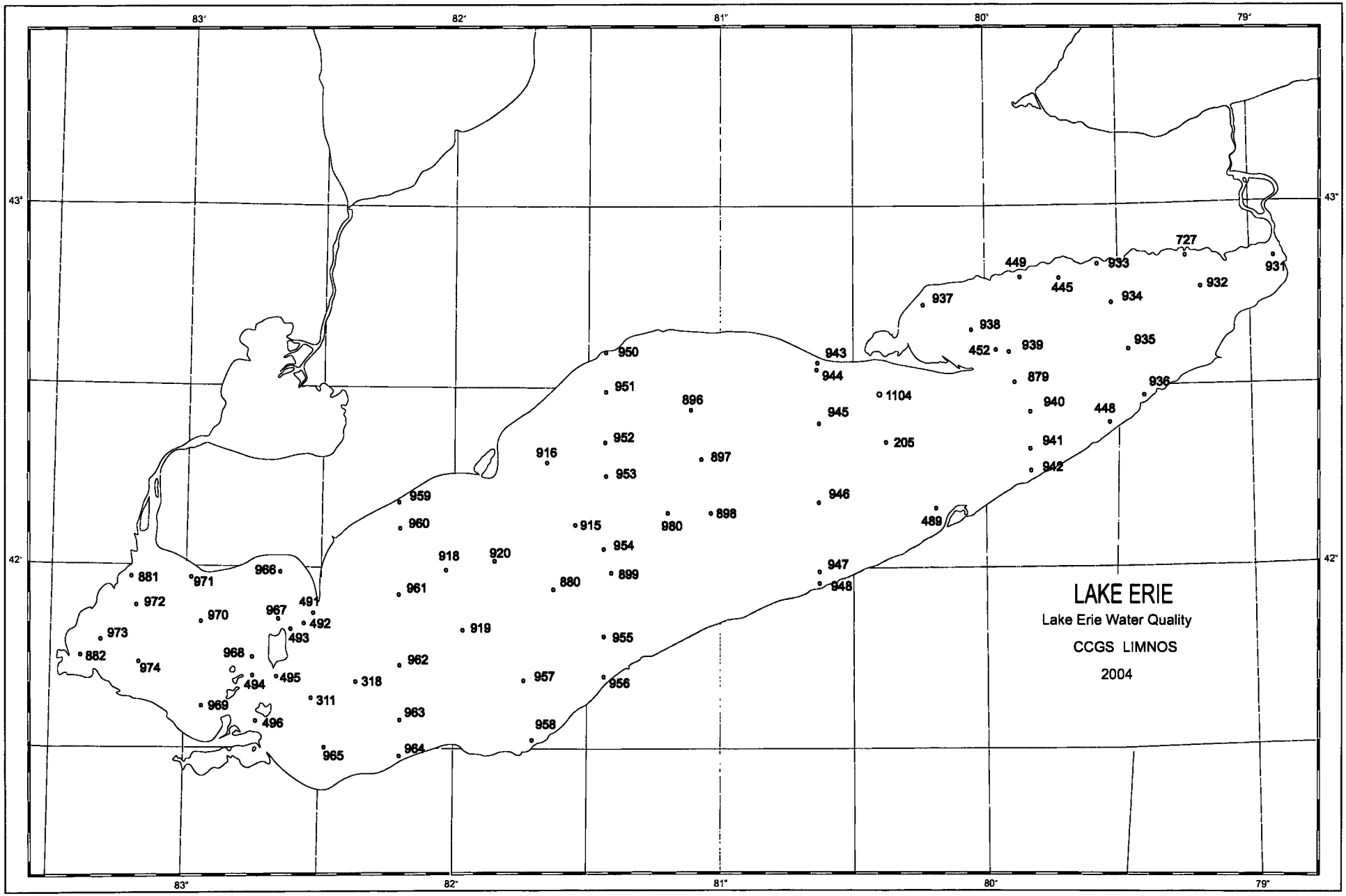
STATION NUMBER	SURVEILLANCE/ GLNPO NUMBER	LATITUDE N.	LONGITUDE W.
898	ER32	42° 04' 54"	81° 00' 42"
899	ER36	41° 56' 06"	81° 28' 42"
915	ER37	42° 06' 36"	81° 34' 30"
916	ER38	42° 16' 54"	81° 40' 18"
918	ER42	41° 57' 54"	82° 02' 30"
919	ER43	41° 47' 18"	81° 56' 42"
920	ER73	41° 58' 40"	81° 45' 25"
930	ER78	42° 07' 00"	81° 15' 00"
931		42° 51' 00"	78° 56' 30"
932		42° 47' 30"	79° 12' 30"
933	227	42° 49' 30"	79° 34' 00"
934		42° 42' 30"	79° 30' 30"
935		42° 35' 30"	79° 28' 00"
936		42° 28' 30"	79° 24' 30"
937		42° 43' 00"	80° 15' 00"
938		42° 38' 00"	80° 03' 30"
939		42° 34' 00"	79° 55' 00"
940		42° 26' 30"	79° 50' 00"
941		42° 19' 30"	79° 50' 00"
942		42° 15' 30"	79° 50' 00"
943		42° 34' 30"	80° 38' 30"
944		42° 32' 00"	80° 38' 30"
945		42° 24' 00"	80° 38' 30"
946		42° 10' 00"	80° 38' 30"
947		41° 59' 30"	80° 38' 30"
948		41° 57' 24"	80° 38' 30"
950		42° 35' 18"	81° 26' 30"
951		42° 28' 30"	81° 26' 30"

STATION POSITIONS

LAKE ERIE

2004 - 2005

STATION NUMBER	SURVEILLANCE/ GLNPO NUMBER	LATITUDE N.	LONGITUDE W.
952		42° 21' 30"	81° 26' 30"
953		42° 12' 30"	81° 26' 30"
954		42° 01' 30"	81° 26' 30"
955		41° 48' 00"	81° 26' 30"
956		41° 41' 30"	81° 26' 30"
957		41° 41' 00"	81° 44' 30"
958		41° 31' 30"	81° 42' 30"
959		42° 11' 42"	82° 11' 00"
960		42° 06' 00"	82° 11' 00"
961		41° 54' 30"	82° 11' 00"
962		41° 43' 00"	82° 11' 00"
963		41° 34' 30"	82° 11' 00"
964		41° 29' 00"	82° 11' 00"
965		41° 30' 00"	82° 30' 00"
966		41° 59' 00"	82° 37' 30"
967		41° 53' 30"	82° 40' 00"
968		41° 44' 30"	82° 44' 00"
969		41° 36' 30"	82° 55' 30"
970	357	41° 49' 30"	82° 58' 30"
971		41° 57' 00"	83° 03' 00"
972		41° 52' 00"	83° 12' 00"
973		41° 47' 30"	83° 20' 00"
974		41° 43' 30"	83° 09' 00"
1104		42° 27' 00"	80° 30' 00"


83°
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205
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942
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946
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898
489
960
915
980
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920
947
881
971
966
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880
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948
972
970
967
491
492
973
919
955
493
882
968
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LAKE ERIE
Lake Erie Water Quality
CCGS LIMNOS
2004

DETROIT RIVER CONTAMINANT STUDY
AEMRB STUDY 12246, DR. C. MARVIN

A total of five cruises were carried out onboard the CCGS LIMNOS, May 31 - June 4, July 26 - 30, August 23 - 27, September 20 - 24 and October 12 - 14. The cruises were occasionally piggybacked with the Lake Erie Zebra Mussel mooring cruises. Due to the CCGS LIMNOS not being operational two cruises were carried out on the CCGS GULL ISLE April 26 - 28 and June 21 - 25.

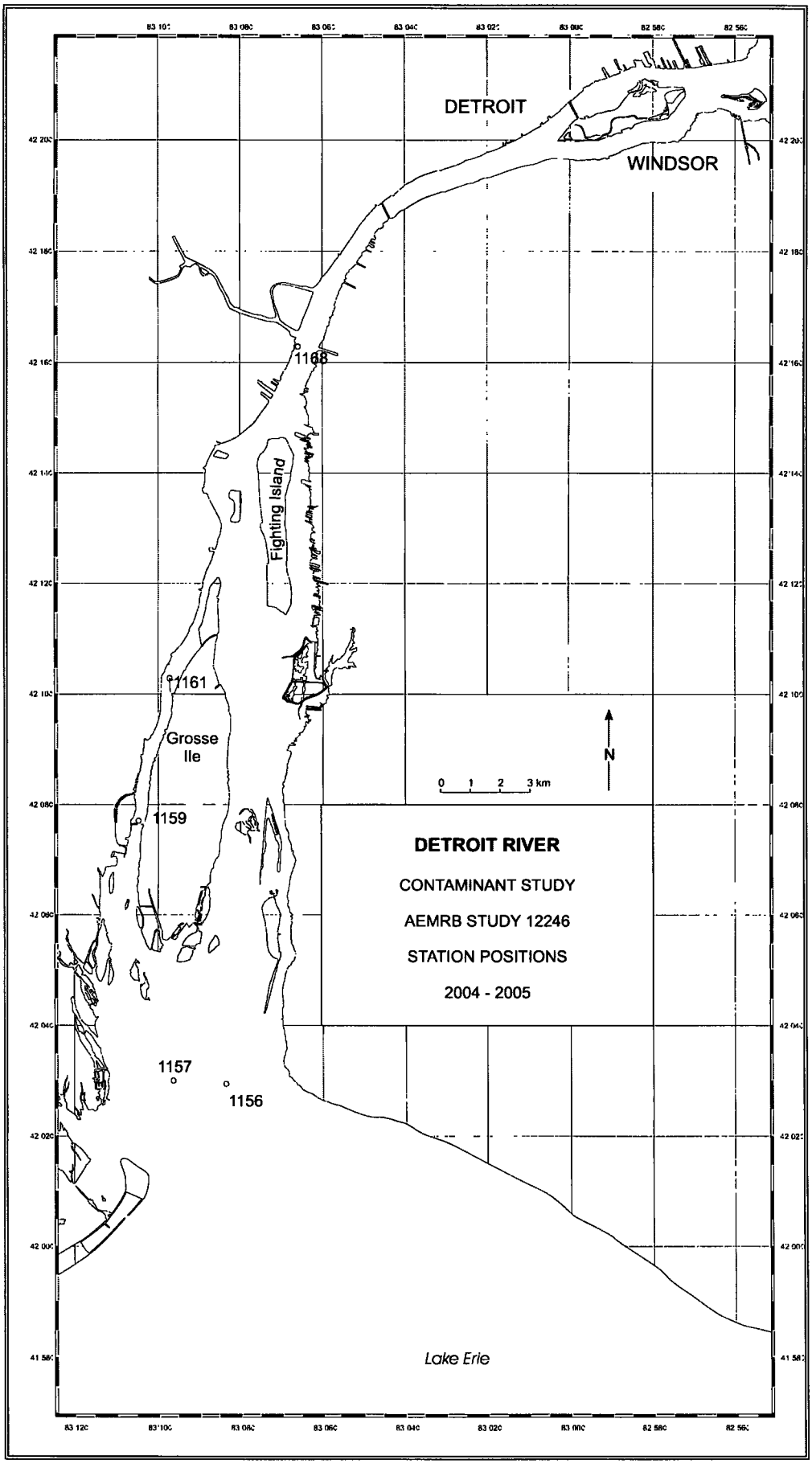
Sediment traps were installed for Dr. C. Marvin at six sites in the Detroit River, one site in Lake St. Clair, three sites in the St. Clair River and at one site in Lake Huron. Moorings were installed during the April cruise and serviced monthly as per the dates listed above.

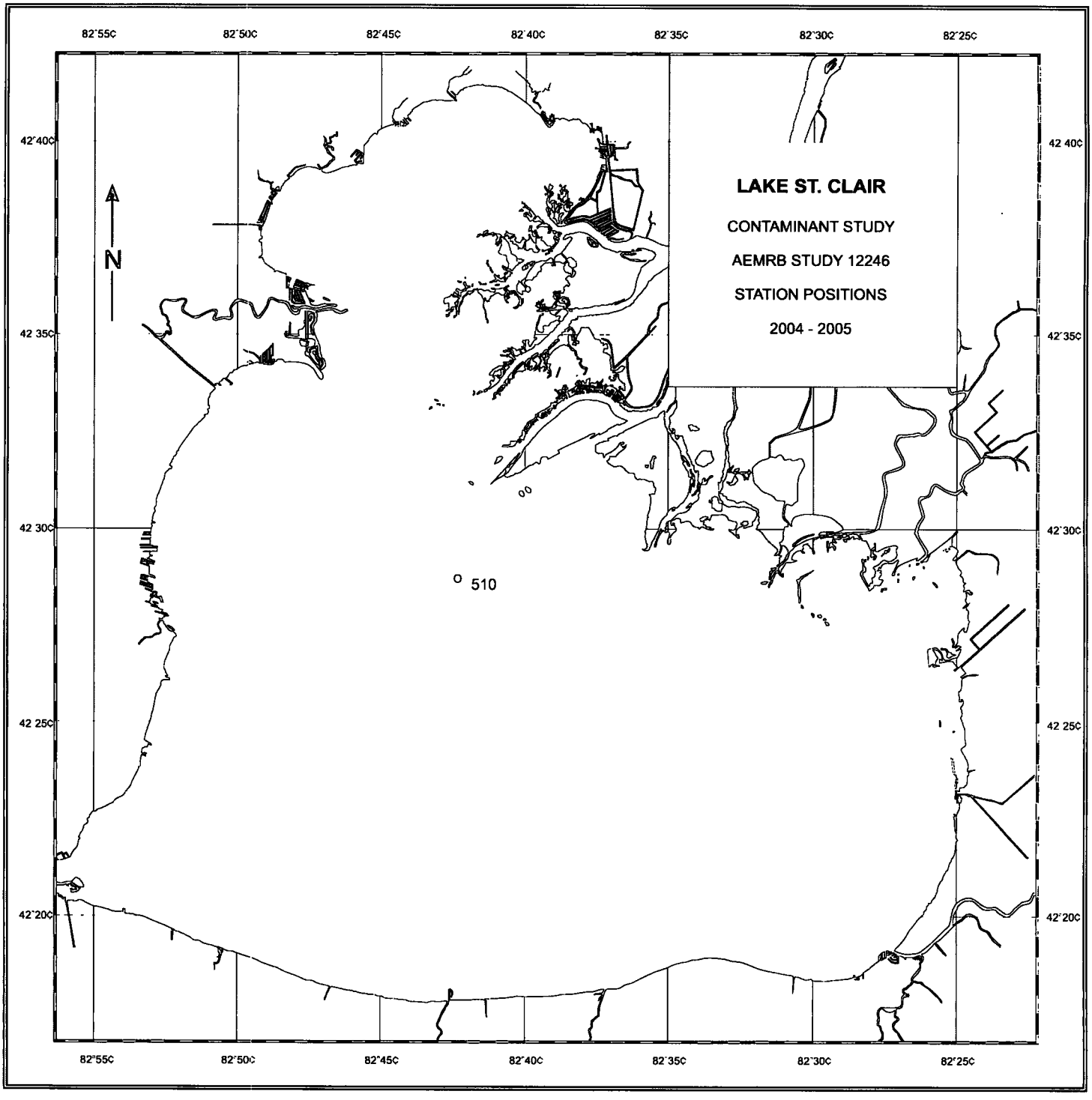
MOORING POSITIONS

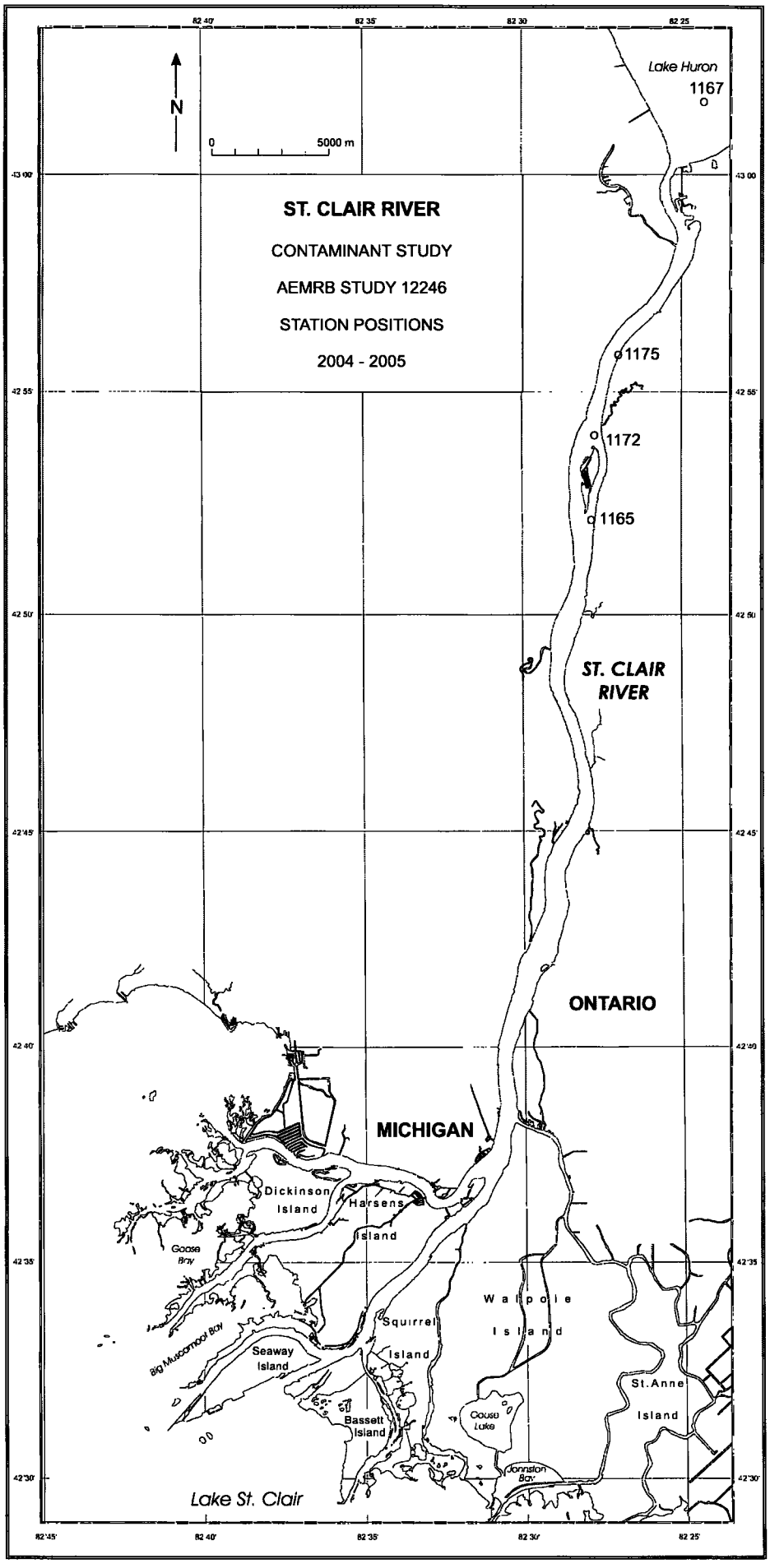
LAKE HURON
LAKE ST. CLAIR/ST. CLAIR RIVER
DETROIT RIVER

2004 - 2005

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
510	2004-04A-29A	42° 28' 41"	82° 42' 17"	ST (4.3 m)
510	2004-04A-30A	42° 28' 39"	82° 42' 16"	ST (4.3 m)
1156	2004-08A-09A	42° 02' 57"	83° 08' 12"	ST (4.4 m)
1157	2004-08A-10A	42° 02' 38"	83° 09' 35"	ST (2.9 m)
1159	2004-08A-12A	42° 07' 48"	83° 10' 32"	ST (4.4 m)
1161	2004-08A-24A	42° 10' 19"	83° 09' 51"	ST (6.7 m)
1165	2004-09A-18A	42° 51' 19"	82° 27' 54"	ST (5.1 m)
1167	2004-02A-20A	42° 02' 48"	82° 24' 43"	ST (5.1 m)
1167	2004-02A-21A	42° 02' 45"	82° 24' 48"	ST (5.3 m)
1168	2004-08A-25A	42° 16' 04"	83° 06' 41"	ST (6.8 m)
1172	2004-09A-11A	42° 53' 58"	82° 27' 33"	ST (6.8 m)
1175	2004-09A-19A	42° 55' 40"	82° 27' 05"	ST (8.5 m)


DETROIT
WINDSOR
1168
Fighting Island
1161
Grosse Ile
1159
1157
1156
Lake Erie
N
0 1 2 3 km
DETROIT RIVER
CONTAMINANT STUDY
AEMRB STUDY 12246
STATION POSITIONS
2004 - 2005


82°55C
82°50C
82°45C
82°40C
82°35C
82°30C
82°25C
42°40C
42 35C
42 30C
42 25C
42°20C
N
LAKE ST. CLAIR
CONTAMINANT STUDY
AEMRB STUDY 12246
STATION POSITIONS
2004 - 2005
510


ST. CLAIR RIVER
CONTAMINANT STUDY
AEMRB STUDY 12246
STATION POSITIONS
2004 - 2005
N
0
5000 m
Lake Huron
1167
1175
1172
1165
ST. CLAIR RIVER
ONTARIO
MICHIGAN
Dickinson Island
Harsens Island
Goose Bay
Big Muscamoot Bay
Seaway Island
Squirrel Island
Walpole Island
St.Anne Island
Bassett Island
Couse Lake
Johnston Bay
Lake St. Clair
82 40'
82 35'
82 30'
82 25'
43 00'
42 55'
42 50'
42 45'
42 40'
42 35'
42 30'

SEDIMENT TRAPS, LAKE ONTARIO
AEMRB STUDY 12246, Dr. C. MARVIN

Sediment traps have been historically installed in Lake Ontario to measure sedimentation and regeneration rates of nutrients and contaminants to relate phytoplankton response to loading changes and the effect of eutrophication on contaminant management.

At six stations near the Niagara Bar, sediment trap moorings were refurbished as winter moorings in the fall of 2004. These stations had been last been sampled in the mid 1980's. These winter sediment trap moorings were retrieved on cruise 2004 - 00 - 001, between April 5 - April 7, 2005.

A sediment trap mooring was also serviced at station 403 in Lake Ontario. This mooring was retrieved on the April cruise and re-deployed as a summer mooring for M. N. Charlton, AEMRB Study 12240. At the end of October it was retrieved again and refurbished back to a winter mooring.

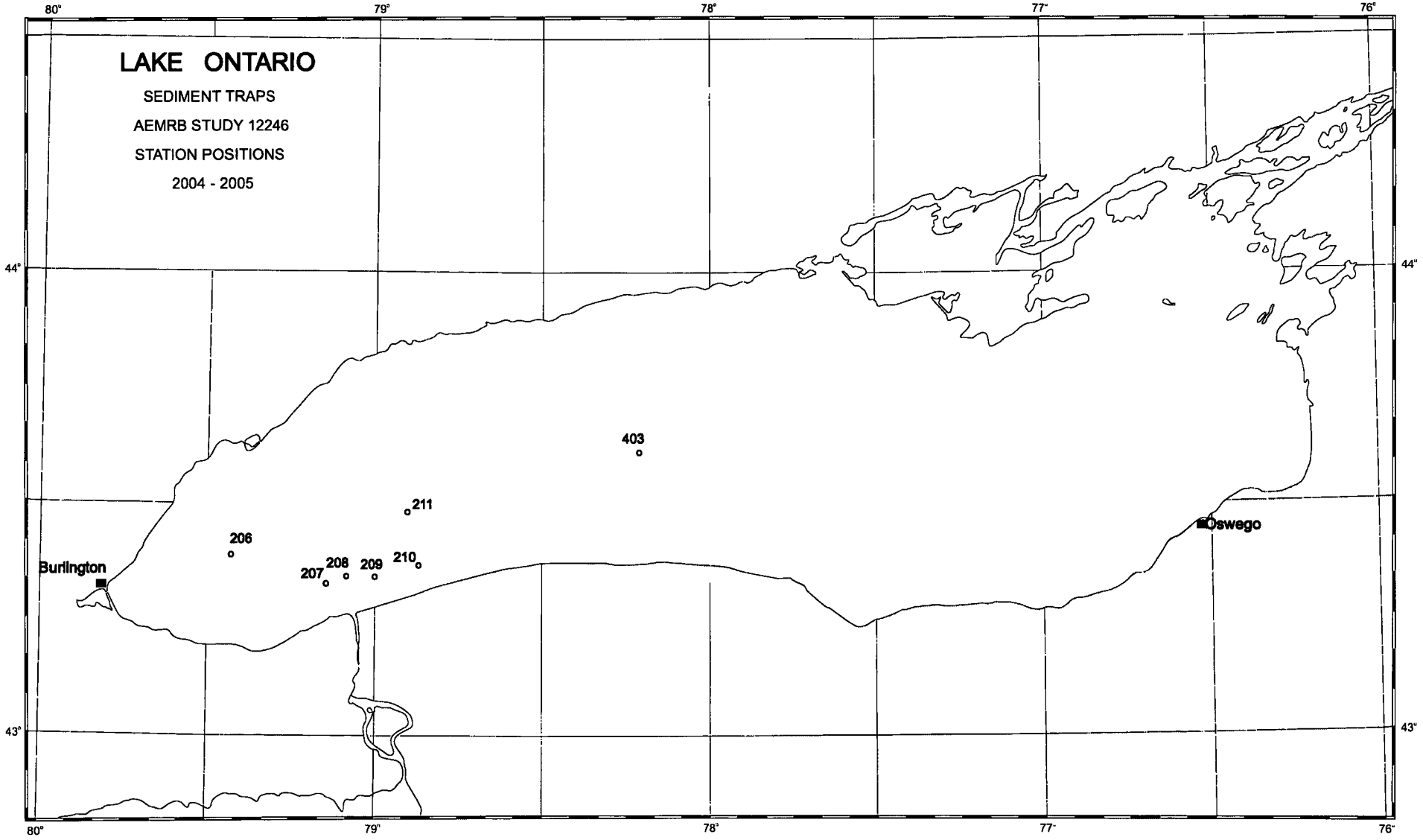
Additional tasks were completed at stations 3, 8, 13, 17, 22, 31, 33, 38, 40 and 41 for Dr. D. Muir, AEPRB. Samples were taken for contaminants, using the PopCart from a depth of 10m. Also, zooplankton and mysid net hauls were collected at station 33 for in-lab experiments for Dr. M. Arts, AEMRB and Dr. O. Johansson, GLLFAS, DFO.

MOORING POSITIONS

LAKE ONTARIO

2004-2005

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
206	2003-00A-06B	43° 24' 04"	79° 27' 17"	ST (20,60,80,97 m)
207	2003-00A-07B	43° 19' 13"	79° 09' 05"	ST (20,40,60,66 m)
208	2003-00A-08B	43° 20' 07"	79° 04' 13"	ST (20,40,60,67 m)
209	2003-00A-09B	43° 20' 28"	78° 59' 35"	ST (20,40,60,65 m)
210	2003-00A-10B	43° 21' 35"	78° 51' 58"	ST (20,40,60,65 m)
211	2003-00A-11B	43° 29' 04"	78° 54' 24"	ST (20,60,100,131 m)
403	2003-00A-01B	43° 35' 34"	78° 13' 45"	ST(27,67,107,147, 173, 181 m)
403	2004-00A-01A	43° 35' 45"	78° 13' 20"	ST(27,67,107,147, 173, 181 m)


LAKE ONTARIO
SEDIMENT TRAPS
AEMRB STUDY 12246
STATION POSITIONS
2004 - 2005
80°
79°
78°
77°
76°
44°
43°
403
211
206
208
209
210
207
Burlington
Oswego

TASTE AND ODOUR IN DRINKING WATER
AEMRB STUDY 12248, Dr. S. WATSON

The objective of this study was to determine the spatial distribution of taste and odour compounds in Lake Ontario and to provide insight into the potential for control of taste and odour problems in drinking water.

To gain a better understanding of the triggering mechanisms of taste and odour compounds in drinking water supplies, the environmental dynamics of two compounds, geosmin and 2-methylisoborneol (MIB) are being investigated in relation to the ecology of their production in Lake Ontario and the upper St. Lawrence River.

A single lakewide cruise was carried out on the CCGS LIMNOS from August 30 to September 3, 2004 to determine the spatial distribution of these compounds in Lake Ontario. Water samples were collected by Rosette sampler from depths of 1 m and bottom -3 m for geosmin and MIB analysis, chlorophyll a, total filtered phosphorus, soluble reactive phosphorus, nitrate + nitrite and POC. Integrated water samples were collected from the surface to 1 m above the top of the thermocline or to 20 m if the epilimnion was deeper than 20 m or the water column was unstratified. In instances where the sampling depth extends to the substrate, 2 m above the bottom was sampled for phytoplankton, picoplankton and bacterioplankton analysis.

At selected stations, 64μ mesh plankton net tow samples were collected from the surface for toxin analysis. Samples, 5 - 10 ml, were collected by filtering on GF/C filters and frozen.

University of Waterloo staff was also onboard to collect profiles using different fluorometers (Fast Repetion Rate Fluorometer and Spectral Fluorometer or Fluoroprobe) and light measuring instruments (LICOR and Satlantic Multispectral Radiometer). Water samples were also collected for the University of Waterloo for chlorophyll a, phytoplankton, phytoplankton absorption spectra, dissolved absorption spectra, dissolved inorganic carbon (DIC), and to conduct shipboard measurements of primary production by 14 C in a light gradient incubator.

At all stations, water was collected from a depth of 1 m for the following: for the State University of New York to validate the flow through chlorophyll, to validate the flow through phycocyanin, for molecular probes for cyano bacteria and toxin producing species and for the presence of toxins. The in-hull pump was utilized on a continuous basis to collect flow through chlorophyll, phycocyanin, temperature, dissolved oxygen, conductivity and pH measurements. Data was collected at one second intervals along with GPS positioning from the Northstar GPS in the laboratory.

STATION POSITIONS

LAKE ONTARIO

2004 - 2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 18' 48"	79° 45' 06"
3	43° 16' 07"	79° 37' 13"
5	43° 25' 30"	79° 39' 30"
8	43° 37' 23"	79° 27' 13"
9	43° 35' 13"	79° 23' 43"
12	43° 30' 11"	79° 21' 11"
15	43° 18' 56"	79° 26' 32"
22	43° 17' 49"	79° 00' 22"
28	43° 46' 29"	78° 51' 18"
29	43° 49' 48"	78° 52' 11"
33	43° 35' 47"	78° 48' 06"
34	43° 27' 40"	78° 45' 39"
35	43° 21' 34"	78° 43' 47"
46	43° 53' 06"	77° 41' 22"
48	43° 51' 38"	77° 31' 26"
55	43° 26' 39"	77° 26' 17"
61	43° 47' 12"	77° 09' 27"
71	43° 28' 37"	76° 31' 38"
75	43° 50' 36"	76° 21' 22"
77	43° 57' 24"	76° 24' 29"
78	44° 04' 59"	76° 24' 25"
79	44° 04' 29"	76° 31' 17"
80	44° 08' 29"	76° 36' 35"
81	44° 01' 00"	76° 40' 19"
82	44° 03' 59"	76° 48' 42"
83	44° 00' 00"	76° 50' 35"
84	43° 53' 14"	76° 44' 01"
86	43° 15' 20"	79° 11' 42"
88	43° 35' 15"	76° 25' 02"
89	43° 41' 53"	76° 25' 03"

STATION POSITIONS

LAKE ONTARIO

2004 - 2005

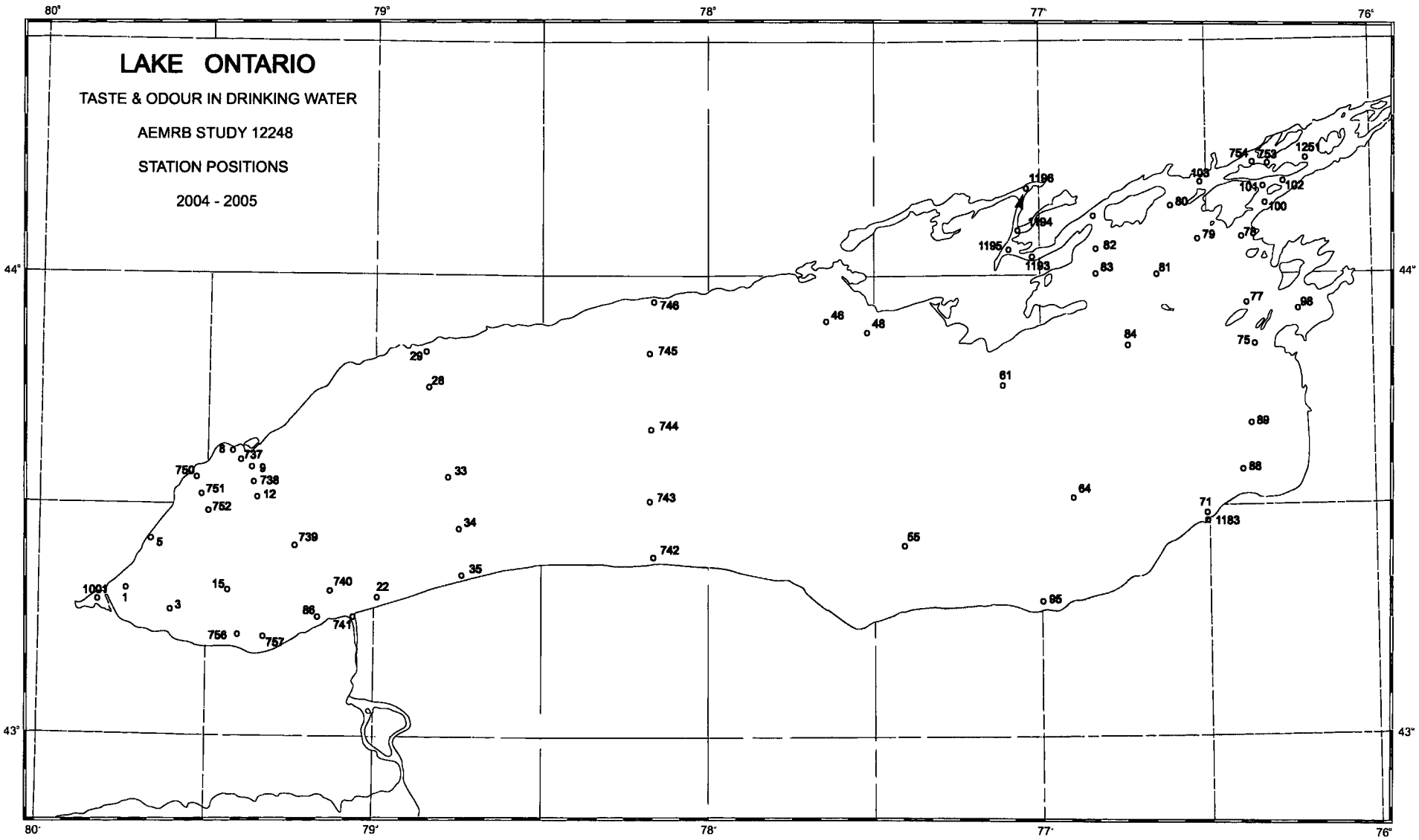
STATION NUMBER	LATITUDE N.	LONGITUDE W.
90	44° 08' 10"	76° 49' 31"
95	43° 18' 49"	76° 59' 58"
98	43° 56' 06"	76° 13' 54"
100	44° 08' 13"	76° 19' 49"
101	44° 11' 37"	76° 18' 35"
739	43° 25' 23"	79° 15' 33"
740	43° 20' 24"	79° 09' 27"
741	43° 15' 27"	79° 03' 36"
742	43° 22' 50"	78° 11' 32"
743	43° 31' 24"	78° 11' 10"
744	43° 40' 01"	78° 10' 41"
745	43° 48' 21"	78° 10' 22"
746	43° 56' 50"	78° 10' 07"
64	43° 31' 31"	76° 55' 39"
750 (LV1)	43° 33' 15"	79° 32' 08"
751	43° 37' 35"	79° 30' 12"
752 (LV3)	43° 29' 55"	79° 28' 50"
753	44° 14' 32"	76° 17' 59"
754	44° 14' 12"	76° 24' 25"
756	43° 14' 01"	79° 24' 29"
757	43° 12' 57"	79° 20' 02"
1001	43° 17' 27"	79° 50' 18"
1183 (Oswego)	43° 27' 52"	76° 30' 45"
1193 (Glenora)	44° 03' 34"	77° 05' 09"
1194 (Hay Bay)	44° 06' 24"	77° 01' 53"
1195 (Long Reach)	44° 06' 02"	77° 04' 22"
1196 (Desoronto)	44° 10' 30"	77° 02' 46"
1227	44° 14' 49"	76° 21' 17"
1228	44° 13' 33"	76° 28' 25"
1234	44° 12' 35"	76° 32' 33"

STATION POSITIONS

LAKE ONTARIO

2004 - 2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1235	44° 12' 11"	76° 30' 47"
1236	44° 12' 58"	76° 30' 53"
1237	44° 12' 34"	76° 29' 08"
1238	44° 12' 57"	76° 27' 26"
1239	44° 13' 43"	76° 27' 19"
1240	44° 13' 33"	76° 25' 48"
1241	44° 14' 11"	76° 25' 36"
1242	44° 14' 49"	76° 24' 13"
1243	44° 14' 30"	76° 21' 00"
1244	44° 14' 48"	76° 18' 04"
1245	44° 14' 41"	76° 16' 31"
1246	44° 15' 39"	76° 16' 31"
1247	44° 14' 54"	76° 15' 00"
1248	44° 15' 59"	76° 14' 51"
1249	44° 15' 05"	76° 13' 30"
1250	44° 16' 33"	76° 13' 31"
1251	44° 15' 04"	76° 11' 59"
1252	44° 17' 07"	76° 12' 28"


LAKE ONTARIO
TASTE & ODOUR IN DRINKING WATER
AEMRB STUDY 12248
STATION POSITIONS
2004 - 2005
80°
79°
78°
77°
76°
44°
43°
1196
1194
1195
1193
1251
754
753
103
101
102
100
80
79
78
82
83
81
77
98
84
75
746
745
744
743
742
741
740
739
738
737
750
751
752
756
757
758
1091
1
3
5
15
22
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48
61
64
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1183
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28

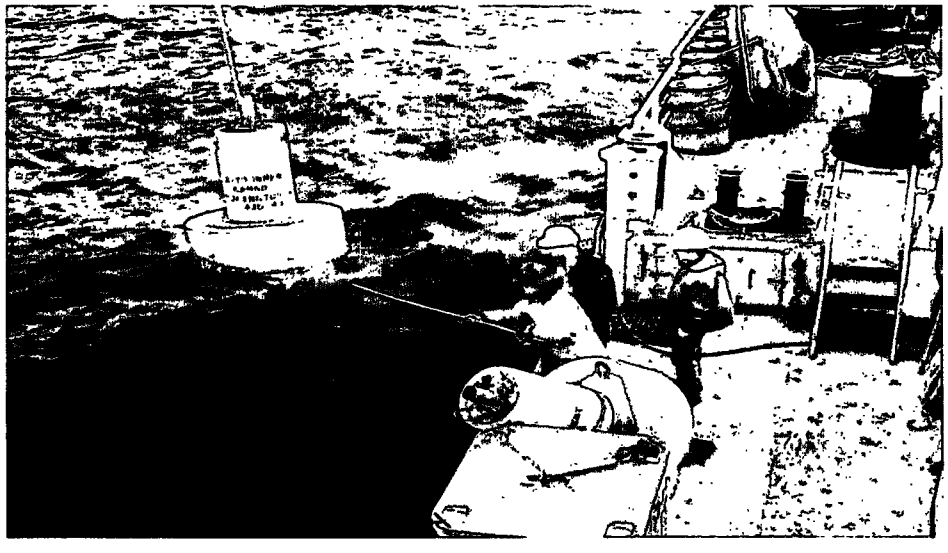
PHYSICAL MEASUREMENTS, LAKE ERIE
AEMRB STUDY 12249, Dr. R. YERUBANDI

The objective of this study was to collect intensive physical measurements in Lake Erie through the installation of meteorological, temperature and current meter moorings to provide detailed hydrodynamic and thermal observations required to assess/predict changes in water quality and aquatic ecosystem components.

All moorings were deployed on the first Lake Erie cruise, April 13 - 16, 2004, from the CCGS LIMNOS. At station 357 in the Western Basin, a meteorological buoy and YSI/Datasonde moorings were deployed. At station 84 in the Central Basin, a meteorological buoy, a thermograph mooring and two current meter moorings were deployed. At station 452 in the Eastern Basin, a meteorological buoy, a thermograph mooring and a current meter mooring were deployed. At stations 718 and 719, on the sill between the Eastern and Central Basins, and at stations 725 and 726, north and south of Pelee Island, thermograph and current meter moorings were deployed to measure the exchange between the basins. Current meter moorings were also deployed in an area west of Rondeau Park on the north shore of the lake.

Sediment trap moorings were also deployed in each basin of the lake for Dr. C. Marvin, AEMRB Study 12246.

Additional tasks were performed at stations 18, 22, 23, 30, 40, 43, 47, 54 and 84 for Dr. D. Muir, AEPRB Study 12310. Water samples were collected for filtered and unfiltered trace metals and mercury analysis, from depths selected from the EBTT trace.



MOORING POSITIONS

LAKE ERIE

2004-2005

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
84	2004-01A-04A	41° 56' 12"	81° 39' 27"	ST (18, 21 m)
	2004-01M-17A	41° 56' 05"	81° 39' 26"	Met (T-2m)
	2004-01T-18A	41° 56' 00"	81° 39' 21"	T (3, 5, 7, 9, 13, 15, 20 m) YSI (11, 23.2 m)
	2004-01C-19A	41° 56' 06"	81° 39' 44"	ADCP (23.8 m)
	2004-01C-20A	41° 56' 16"	81° 39' 41"	HYDRA (23.65 m)
357	2004-01A-06A	41° 48' 42"	82° 58' 34"	ST (9.1 m)
	2004-01M-28A	41° 48' 55"	82° 58' 59"	Met, T(2 m)
	2004-01S-29A	41° 48' 31"	82° 58' 27"	YSI, DS-4, DS-3 (9.8 m)
452	2004-01M-10A	42° 35' 00"	79° 55' 34"	MET (T-2 m)
	2004-01T-11A	42° 34' 58"	79° 55' 44"	T (3,5,7,9,12.8, 14.8,19.8,24.8, 28.8,34.8,39.8,44.8 m) XMISS(10.8,51.5 m)
	2004-01C-12A	42° 35' 09"	79° 55' 33"	ADCP (30 m)
	2004-01A-13A	42° 34' 59"	79° 55' 29"	ST(20,30,40, 50.7 m)
718	2004-01CT-14A	42° 26' 18"	80° 24' 14"	ADCP (10.9 m) T(1,3,5,7,9 m)
719	2004-01CT-15A	42° 09' 39"	80° 18' 07"	ADCP (21.1 m) T (1 m)
	2004-01T-16A	42° 09' 25"	80° 17' 57"	T(3,5,7,9,10.8, 12.8,14.8,19.8, 22.1 m)
720	2004-01C-21A	42° 12' 41"	82° 08' 19"	MAVS (10.2 m)
721	2004-01C-22A	42° 12' 23"	82° 07' 49"	MAVS (10 m)

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
722	2004-01C-23A	42° 11' 45"	82° 09' 19"	MAVS (10 m)
723	2004-01C-24A	42° 13' 04"	82° 06' 02"	MAVS (10.1 m)
724	2004-01C-25A	41° 58' 55"	82° 08' 33"	MAVS (10 m)
725	2004-01CT-26A	41° 48' 20"	82° 31' 01"	ADCP (10.9 m) T (1,3,5,7,9 m)
726	2004-01CT-27A	41° 40' 24"	82° 37' 25"	ADCP (11.0 m) T (1,3,5,7,9 m)

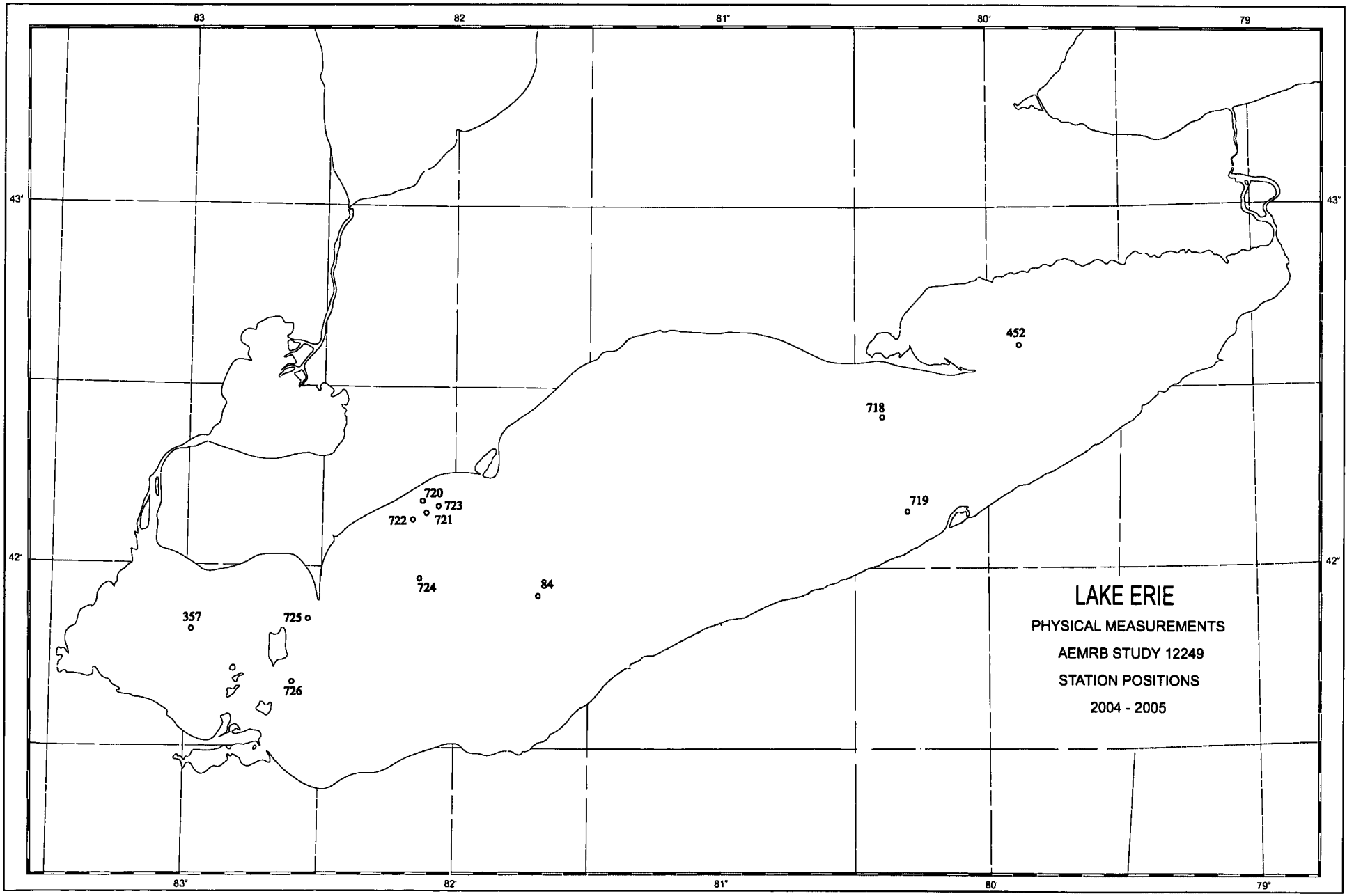
STATION POSITIONS

LAKE ERIE

METAL CYCLE

2004 - 2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
18	41° 31' 58"	81° 42' 19"
22	41° 42' 52"	82° 10' 16"
23	42° 30' 06"	79° 53' 22"
40	42° 21' 30"	81° 26' 28"
43	42° 34' 28"	80° 43' 50"
47	42° 17' 33"	80° 17' 56"
54	42° 39' 04"	79° 08' 03"
84	41° 56' 06"	81° 39' 36"


83
82
81
80
79
43
42
452
718
719
720
723
722
721
724
84
357
725
726
LAKE ERIE
PHYSICAL MEASUREMENTS
AEMRB STUDY 12249
STATION POSITIONS
2004 - 2005

MERCURY AND TRACE METALS, LAKE ONTARIO
AEPRB STUDY 12310, DR. D. MUIR

Cruise 2004 - 00 - 002 was carried out on the CCGS LIMNOS between July 05th and 08th in order to collect water samples for the determination of priority organic pollutants and to test and compare collection methodologies.

Two "enclosed" sample collection methodologies, a) and b), were used to acquire total mercury in water samples. These samples complimented similar comparisons carried out from 2001 to 2003 representing the first temporal baseline study of surface and sub-surface mercury in Lake Ontario, using clean methods.

The following sampling was carried out at stations 13, 40 and 64:

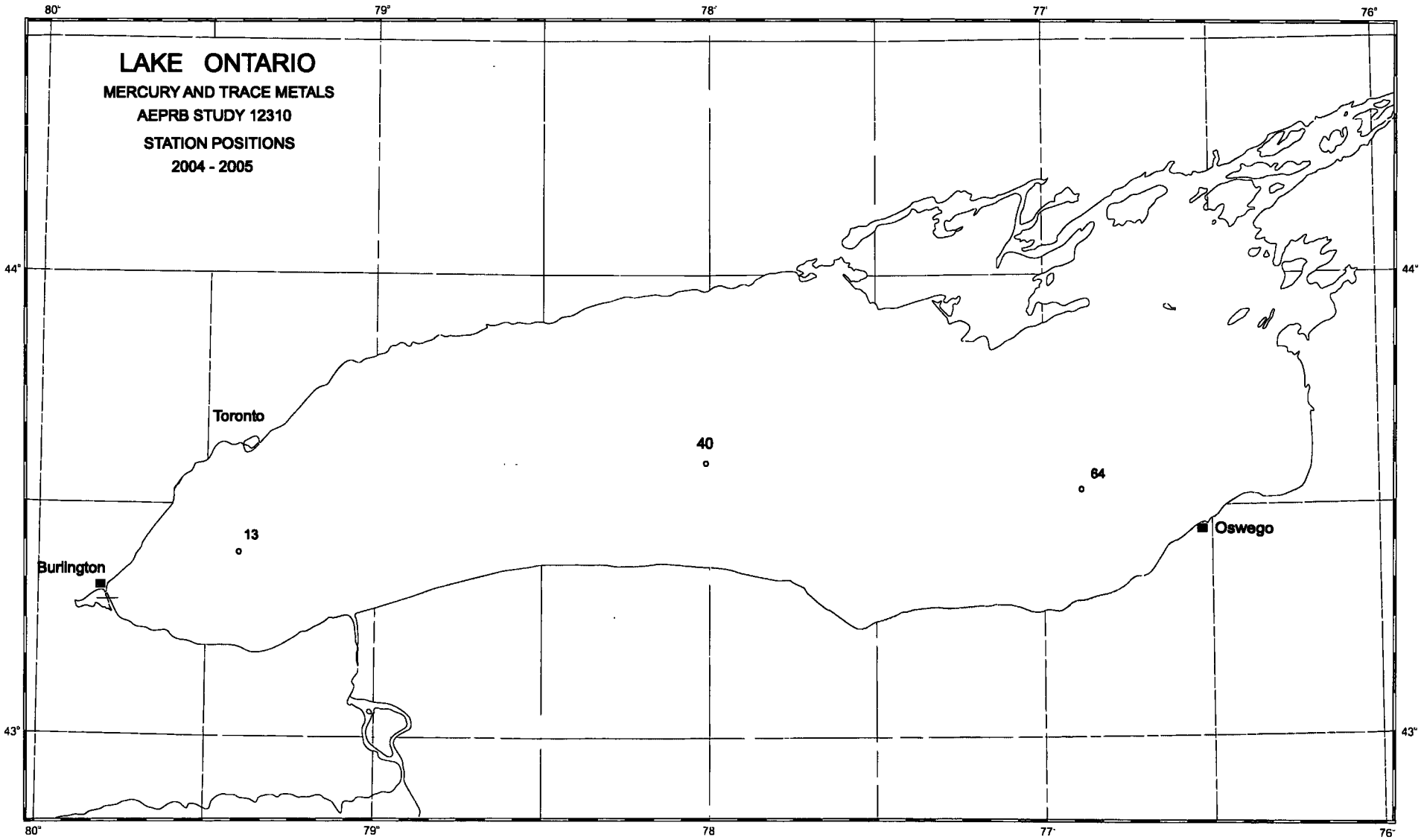
a) Infiltrex samplers were deployed from a sub-surface float temporarily moored 1 Kilometer from the working station position and;
b) Samples were collected from resin columns on the "Pop-Cart" sampler. Water was pumped from 4 m.
c) As well, water was pumped from 4 m and centrifuged in-situe through a Westfalia centrifuge for collection and analysis of suspended sediment.
d) Box-core casts were made, 10 cm cores extracted and subsectioned.

High volume air samplers were also used to collect organic contaminants while running transects between stations.

Additional tasks were also performed during this cruise. Box cores were obtained at stations 13, 40, 64 and 752 to collect Diporeia for Dr. M. Arts, AEMRB and Dr. O. Johansson, GLLFAS, DFO. At stations 403 and 752, a bottom -1m water sample and a box core were collected for Dr. S. Watson, AEMRB. The box core was sub-sampled for surficial sediment. Also at station 403, the sediment trap mooring was refurbished and water samples were taken at trap depths and filtered for Chlorophyll a and sestons. A box core was also collected and 4 cores were sub-sampled and sectioned, for Dr. C. Marvin, AEMRB.

STATION POSITIONS
LAKE ONTARIO
2004

STATION NUMBER	LATITUDE N.	LONGITUDE W.
13	43° 24' 35"	79° 25' 08"
40	43° 35' 23"	78° 00' 43"
64	43° 31' 31	76° 55' 30"


LAKE ONTARIO
MERCURY AND TRACE METALS
AEPRB STUDY 12310
STATION POSITIONS
2004 - 2005
80°
79°
78°
77°
76°
44°
43°
Toronto
40
64
13
Oswego
Burlington

RESEARCH SUPPORT BRANCH

OPEN LAKES SURVEILLANCE, LAKES ONTARIO, HURON and GEORGIAN BAY
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR
RSB STUDY 12632, B.H. MOORE

The Open Lakes Surveillance Program was designed to provide a continuing report and long-term trend information on water quality and eutrophication parameters in the Great Lakes under the Canada/U.S. Agreement as input to the Water Quality Board Annual Report to the International Joint Commission.

Three cruises were conducted - two on Lake Erie, April 19 - 23, August 16 - 20 and one on Lake Huron and Georgian Bay, May 3 - 12, 2004, to support this program. All cruises were organized and completed by Technical Operations personnel for ECB-OR and were conducted from the CCGS LIMNOS. The vessel was equipped with the usual equipment: EBT, Rosette water sampler, transmissometer, radar, Loran C, GPS positioning systems and a variety of samplers and winches used for chemical and biological sampling.

The parameters sampled during all cruises were: temperature and transmission profiles, dissolved oxygen, specific conductance, pH, chlorophyll a, particulate organic carbon, particulate nitrogen, total phosphorous filtered and unfiltered, soluble reactive phosphorous, total Kjeldahl nitrogen, alkalinity, SO_4, chloride, reactive silicate, major ions (Mg, K, Ka) as well as meteorological and Secchi disc observations.

During the April and May cruises, samples were collected from the 1-metre depth only. Sampling depths for the August cruise were:

Lake Erie

Unstratified Conditions:
- 1 metre
- 10 metres
- 25 metres
- Bottom -10 metres
- Bottom -2 metres

Stratified Conditions:
- 1 metre
- 1 metre above the knee of the thermocline
- Mid-thermocline
- 1 metre below the knee of the thermocline
- Bottom -10 metres or Mid-Hypolimnion
- Bottom -2 metres

Some of the additional tasks performed during the cruises were: In Lake Erie and Lake Huron Microbial Loop, Phytoplankton and ciliate samples were collected for Dr. M. Munawar GLLFAS. Also in Lake Huron piston cores were collected for Dr. A. Crowe AEMRB. Water samples for PFCA and PFOS concentrations for Dr. B. Scott, AEPRB and stable isotope samples were collected for the University of Western Ontario.

STATION POSITIONS

LAKE HURON

2004-2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 05' 24"	82° 23' 30"
3	43° 15' 25"	82° 02' 18"
4	43° 19' 30"	81° 47' 18"
5	43° 32' 54"	81° 44' 42"
7	43° 20' 30"	82° 30' 24"
8	43° 34' 00"	82° 29' 06"
9	43° 38' 00"	82° 13' 00"
10	43° 45' 12"	81° 46' 54"
11	43° 57' 24"	81° 47' 12"
12	43° 53' 24"	82° 03' 24"
13	43° 45' 12"	82° 34' 06"
14	43° 56' 30"	82° 40' 00"
17	44° 06' 00"	82° 52' 00"
20	44° 13' 00"	83° 05' 00"
23	44° 20' 00"	83° 18' 00"
27	44° 11' 54"	82° 30' 12"
29	44° 22' 00"	81° 50' 00"
30	44° 28' 00"	81° 27' 12"
32	44° 27' 12"	82° 20' 30"
33	44° 30' 00"	82° 50' 00"
34	44° 38' 24"	83° 13' 54"
36	45° 02' 24"	83° 22' 42"
38	44° 44' 24"	82° 03' 26"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
39	44° 39' 24"	81° 22' 42"
40	44° 53' 54"	81° 26' 12"
41	45° 05' 00"	81° 32' 12"
42	45° 13' 18"	81° 49' 12"
43	45° 00' 48"	82° 00' 30"
44	45° 01' 00"	82° 41' 06"
47	45° 15' 18"	83° 20' 48"
48	45° 16' 42"	82° 27' 06"
50	45° 32' 06"	82° 02' 42"
52	45° 39' 06"	82° 38' 54"
54	45° 31' 00"	83° 25' 00"
55	45° 25' 30"	83° 39' 06"
56	45° 31' 00"	84° 05' 00"
58	45° 52' 00"	83° 16' 00"
59	45° 46' 00"	83° 01' 42"
60	45° 54' 06"	83° 31' 06"
61	45° 45' 00"	83° 55' 00"
62	45° 40' 30"	84° 11' 12"
63	45° 42' 12"	84° 30' 42"
64	45° 48' 48"	84° 45' 18"
65	45° 50' 42"	84° 34' 00"
66	45° 51' 48"	84° 17' 42"
67	45° 56' 06"	83° 54' 00"
68	46° 02' 30"	83° 51' 12"
69	46° 04' 42"	84° 01' 42"
70	46° 08' 12"	83° 40' 18"
71	46° 14' 00"	83° 44' 48"
73	46° 11' 12"	83° 21' 18"
76	46° 00' 00"	83° 26' 00"
77	45° 58' 12"	83° 11' 54"
79	46° 07' 24"	82° 53' 09"
82	45° 56' 12"	82° 45' 30"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
83	46° 00' 00"	82° 33' 00"
84	46° 05' 30"	82° 33' 24"
87	46° 03' 40"	82° 11' 50"
88	46° 03' 20"	82° 00' 00"
89	45° 55' 00"	82° 09' 40"
94	44° 04' 10"	83° 04' 50"
95	44° 12' 45"	83° 22' 15"
96	44° 07' 35"	83° 10' 15"
97 - Saginaw Bay	44° 06' 55"	83° 31' 45"
98	43° 58' 35"	83° 34' 32"
99	43° 54' 30"	83° 44' 30"
100	43° 49' 30"	83° 49' 02"
101	43° 49' 15"	83° 37' 30"
592	45° 53' 00"	82° 09' 00"
593	45° 36' 18"	81° 53' 18"

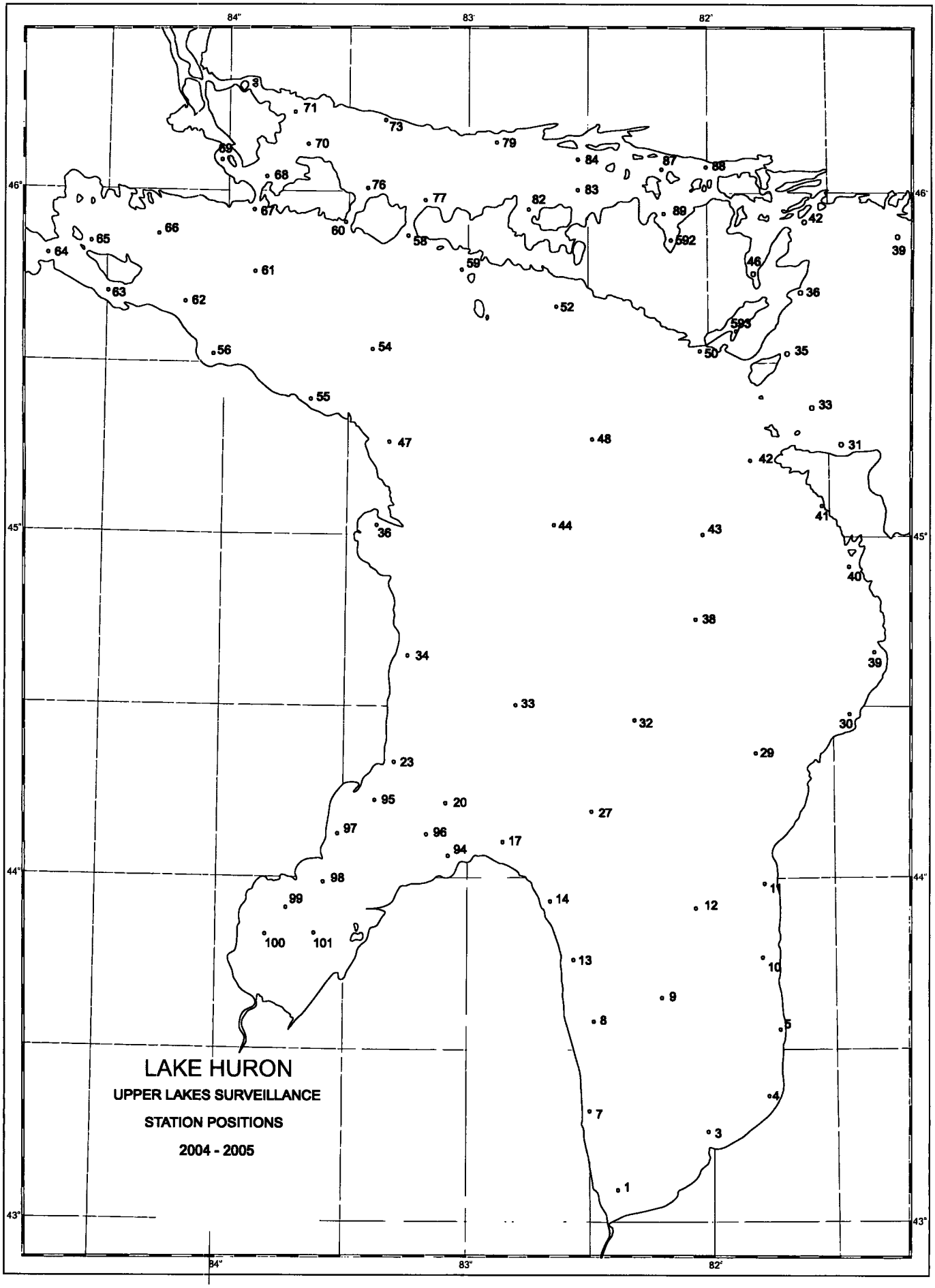
STATION POSITIONS

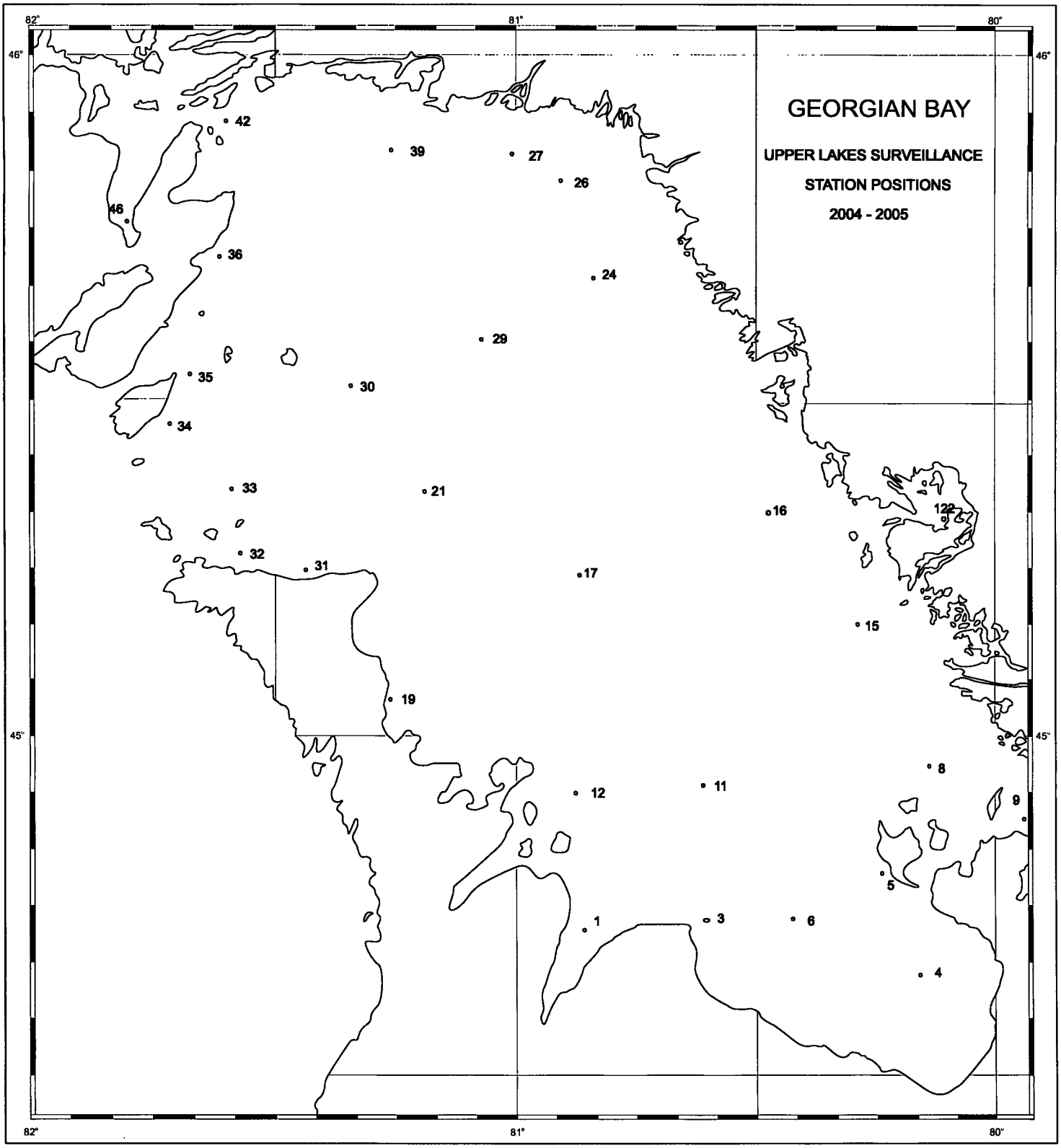
GEORGIAN BAY

2004 - 2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	44° 43' 03"	80° 51' 24"
3	44° 43' 30"	80° 37' 00"
4	44° 38' 45"	80° 10' 00"
5	44° 47' 48"	80° 14' 36"
6	44° 44' 12"	80° 26' 06"
8	44° 57' 10"	80° 08' 56"
9	44° 52' 18"	79° 58' 05"
11	44° 55' 15"	80° 36' 21"
12	44° 55' 12"	80° 52' 30"
15	45° 10' 00"	80° 17' 48"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
16	45° 21' 13"	80° 29' 12"
17	45° 14' 42"	80° 52' 30"
19	45° 04' 00"	81° 15' 14"
21	45° 21' 54"	81° 11' 24"
24	45° 40' 44"	80° 50' 20"
26	45° 50' 00"	80° 54' 00"
27	45° 52' 00"	81° 00' 00"
29	45° 35' 00"	81° 05' 00"
31	45° 14' 18"	81° 26' 24"
33	45° 22' 13"	81° 35' 06"
35	45° 31' 39"	81° 40' 10"
36	45° 42' 30"	81° 37' 12"
39	45° 52' 24"	81° 15' 30"
42	45° 54' 46"	81° 35' 42"
46	45° 45' 42"	81° 47' 41"
122	45° 19' 30"	80° 07' 00"


84°
83°
82°
46°
45°
44°
43°
LAKE HURON
UPPER LAKES SURVEILLANCE
STATION POSITIONS
2004 - 2005


GEORGIAN BAY
UPPER LAKES SURVEILLANCE
STATION POSITIONS
2004 - 2005
82°
81°
80°
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45°
42
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36
24
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LAKE ERIE COMPREHENSIVE COLLABORATIVE STUDY (ECCS)
GREAT LAKES SURVEILLANCE , STUDY 12632, V. Richardson

Of the five Great Lakes, Lake Erie has experienced the most profound changes over the last three decades; first with dramatic reductions in phosphorus loading and most recently the introduction of Dreissenid mussels and Round Gobies. These changes have and will probably continue to dramatically alter energy and nutrient flux in Lake Erie.

This summer's multi-Agency team included: University of Waterloo, DOE, University of Windsor, OMNR, USEPA-GLNPO, USGS, MOE, Heidelberg College, Pennsylvania State University, University of Toledo and NOAA-GLERL. Numerous other collaborators took part throughout the project.

Researchers combined to map out a comprehensive lake-wide survey that would allow them to quantify Dreissenid diversity, abundance and biomass across hard and soft sediment types in the three principle sub-basins of Lake Erie. Collecting agencies sampled 150 offshore and 100 near shore stations over the spring and summer of 2004. Data collected will also help to flesh out phosphorus and productivity models in Lake Erie.

The joint effort was carried out by the agencies outlined and from a number of research vessels.

This report outlines Environment Canada's efforts to complete the near shore phase of the sampling of ECCS.

Sampling was accomplished using PONARs or in the case of hard substrate, diver-airlifts.

An "abridged" Sampling Protocol was as follows:

1. Located site by first running vessel to the inshore end of a transect; when on "targeted" Longitude, ran vessel offshore until "Target" depth (2, 5 or 10m) was encountered. Record position DGPS, WGS84.
2. Recorded water quality parameters (Eric Nicholson, University of Waterloo); dissolved oxygen profile, PH, conductivity, Secchi, surface temperature as well as overall site characteristics
3. Tested bottom type with an initial PONAR grab.
4. If "soft" sediment was encountered triplicate PONARs were taken for Dreissenid and Benthic analysis and one additional grab for sediment characterization.

5. If "hard" sediment was encountered, divers entered the water and carried out triplicate airlifts from randomly chosen locations. The sampling footprint was delineated using a soft 20 cm ring and carried out using a diver airlift supplied by D. Barton, University of Waterloo. As the airlift was running, substrate within the ring was scraped clean using a wedge-shaped trowel.
6. When possible, algal samples were collected in whirl-pack bags for H. Carrick, P.S.U. The sample was acquired by transferring algae and surficial material into the whirl pack with the airlift trowel.

The ECCS field work was combined with the following collaborative studies for T. Johnson, Wheatley, Ministry of Natural Resources.

PRODUCTION OF DREISSENID MUSSELS IN LAKE ERIE

Dreissenid mussels invaded the Great Lakes ecosystem in the late 1980s and have subsequently spread into most connected waterways throughout eastern and central North America. These mussels are extremely efficient filter feeders, removing small food particles from the water column and directing it to the benthos as faeces and pseudofaeces. This benthification may be impacting the production of young fishes that rely on the same planktonic food organisms. In turn, certain benthic organisms are increasing in abundance as more energy is concentrated in their habitat. Other species (round gobies, freshwater drum and certain diving ducks) consume mussels directly as food. Species such as round goby are in turn eaten by important sport and commercial fishes and this feeding pathway may be an important vector for the movement of contaminants from sediments to higher trophic levels. Finally, dreissenids and gobies have been implicated in the recent increase in the occurrence of botulism in the lower Great Lakes. Until we know the production (recruitment and growth) of dreissenids, system modelers are unable to accurately quantify the effects these invasive organisms are having on invaded ecosystems.

We propose to use in-situ artificial substrates, sampled monthly from April to October, to monitor settlement (recruitment production), growth (biomass production), and predation (lost production) of dreissenids in west and west-central Lake Erie. The experimental plots will span dominant substrate types and 3 depth strata to support extrapolation to whole basin, or whole-lake levels. Our results will provide estimates of the amount of energy entering and leaving both zebra (near shore species) and quagga (deeper, offshore species) partitioned into the dominant sources which will enable system modelers to better define the impact of these organisms.

This proposed survey design will also enable the collection and description of other benthos inhabiting dreissenid drusses and colonies, and the accumulation of seston in and around the mussels (physical habitat alteration). Collectively, these results will supplement a major lakewide program (ECCS, 2004) to describe the distribution and abundance of dreissenids, other macro invertebrate benthos and benthic algae. Deriving production estimates in the same year as describing demographics and

standing stock of dreissenids will ensure the two metrics are closely coupled, such that future assessments will have greater confidence in the population parameters generated this year (i.e. changes related back to this sampling year). (T. Johnson, OMNR)

IN-SITU SAMPLING OF BENTHIC HABITATS IN WEST AND CENTRAL LAKE ERIE TO IDENTIFY ENVIRONMENTAL CONDITIONS CONDUCIVE TO THE PRODUCTION OF BOTULISM TOXIN

This project will attempt to assess distribution and production of dreissenids in west and central Lake Erie. Monthly samples of dreissenid drusses cultured on artificial substrates will be tested for physical and chemical attributes known to promote the proliferation of *Clostridium botulinum*, and the subsequent production of botulism toxin. *C. botulinum* is a ubiquitous microorganism found in soil and sediments of most aquatic systems. The proliferation of the bacterium occurs in a protein rich environment low in dissolved oxygen. The toxin is released into the environment after bacterial cells lyse. Many questions remain as to why the botulism outbreaks are becoming more common in Lake Erie (since 1999) and Lake Ontario (since 2002). A current, but largely untested hypothesis is that dreissenid mussels (zebra and quagga mussels) that have proliferated in these lakes create ideal microenvironments for the proliferation of the bacterium, and other biota (esp. round gobies) may serve as a vector linking the dreissenids with fish eating birds (the most prevalent victim of the botulism related die-offs).

By monitoring the water chemistry at selected sites spanning dominant substrates and different depth strata, we will assess the stability of the aqueous environment in these regions with respect to temperature, oxygen, pH, and redox potential. Botulism outbreaks tend to occur when temperatures exceed 20 C, pH occurs between 7.5 and 9, and redox potential becomes negative. Decomposition of organic matter (faeces, pseudofaeces, and seston) in the interstitial spaces of the dreissenid colonies may create adequate niches where anoxia and nutrients are abundant. Scuba divers will collect in-situ (natural, not propagated) samples of dreissenids and sediments in the vicinity of the experimental plots in the spring (May), mid-summer (July), and fall (Oct). Health Canada will perform the mouse-bioassay on samples of organic matter collected in areas where the environment should support toxin production, to test for its presence.

Throughout this study we will adopt many of the same methods as those used by an EPA funded project to explore botulism outbreaks in eastern Lake Erie. The difference between this study and EPA's, is that our focus is on describing the potential habitat related differences (substrate type and depth) that may promote the production of the botulism toxin, whereas the EPA study is trying to document the occurrence of botulism in different benthic biota. In other words they are trying to find the smoking gun, while we are looking more generally at what conditions may be most conducive to the production of the toxin. In conjunction with on-going work at the University of Guelph (Moccia) and Health Canada, these projects will provide the needed information to

configure food web models to explore energetic pathways that might explain the increasing incidence of botulism outbreaks in the Great Lakes basin. (T. Johnson, OMNR)

An abridged Sampling Protocol was as follows:

1. Sites were located using GPS by MNR crew.
2. A small inflatable boat was launched at each site to mark the desired sample tray with a float. A second tray was pulled up by hand and sampled above water, for comparative analysis.
3. The diver entered the water and followed the mooring wire to the bottom. Each test-tray was sampled in situ using an airlift system. One labeled airlift sample bag was used for each quadrant of the tray.
4. Additional samples included an algal sample in a whirl-pack bag, dreissenid sample in a whirl-pack bag and two syringes filled with interspatial water from a live clump of dreissenids.
5. While divers were collecting samples, MNR crew collected Hydrolab water quality profiles, water samples and PONAR grabs.
6. All samples were processed by MNR personnel.

2004 LAKE ERIE INSHORE SAMPLING PROGRAM

DATES	DIVE SUPPORT/BOAT	BENTHIC	BOTULISM
May 10-14	Western Basin (Keenosay, Loftus)	X	X
May 24-27	Eastern Basin (Erie Explorer)	X	
June 07-11	Cleveland - Erie (Parrot)	X	
June 21-25	Erie - Buffalo (Parrot)	X	
July 12-16	Wheatley (Loftus)		X
October 4-7	Wheatley (Keenosay)		X

Considering the scope and magnitude, the number of vessels, personnel and agencies involved, as well as time frames, it is a credit to all involved that the sampling program (inshore and offshore aboard the CCGS LIMNOS) covered off close to 100% of the proposed sites on Lake Erie.

SHORE PROGRAMS

AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH

LONG RANGE TRANSPORT OF AIRBORNE POLLUTANTS AT THE TURKEY LAKES WATERSHED
AEIRB STUDY 12333, MR.R.G. SEMKIN

The Turkey Lakes Watershed Study is an ongoing project monitoring the movements and effects of Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems of the watershed. The chemical and hydrological monitoring of the study area began in 1980 and has been supported by Technical Operations Services staff throughout this period.

The study site is located on the Canadian Shield 50 km North of Sault Ste. Marie and 25 km East of Lake Superior. The watershed consists of five small lakes from 6 ha to 52 ha in size. The area is in the very rugged, totally forested, uninhabited Algoma Highlands which receives the highest amounts of precipitation in Canada, East of the Rockies.

Technical Operations staff support consisted of one full-time technician stationed in Sault Ste. Marie. Equipment support included one full-time 4-wheel drive vehicle for transport to the study area. In addition, 9 snowmobiles and 4 all-terrain vehicles were supplied and maintained for use as transportation throughout the watershed.

A security system at the camp and a 2-way radio system were operated by TOS staff and maintained by Quattra Communications in Sault Ste. Marie. The security system has been redesigned to accommodate the numerous changes to the camp's infrastructure since 2001. The final cost to include all the buildings at the base camp is being finalized and will be shared by the Federal Government and the University of Western Ontario.

The Department of Fisheries & Oceans support consisted of six small aluminum boats and one canoe (14-16ft.). One outboard motor was also supplied and all items to make the boats safe and operational including one electric motor were supplied by TOS.

Technical Operations staff supported Aquatic Ecosystem Impacts Research Branch staff in chemical and hydrological monitoring of the watershed. Hydrological monitoring consisted of gauging and sampling seven stream locations throughout the watershed on a weekly basis. The samples were analyzed for numerous chemical parameters. Five lakes were sampled on a bi-weekly schedule for the same chemical parameters with the exception of the spring and fall when they were sampled once a week. During the winter, snow cores were collected at 14 locations on a weekly basis. Also during the

year, rain and snow volume samplers (Nipher) were measured and changed weekly. Isco samplers at three locations in the watershed are operated year round. Samples were collected every 12 hours. In addition, groundwater wells throughout the entire watershed were sampled in the late spring and early fall. This study is completed once/year and the groundwater well at CFS 47 was sampled once/month. Groundwater wells at CFS47, 50, and 50-up were sampled throughout the year and sampling was based upon precipitation events.
To supplement hydrological and chemical data, a full meteorological station and solar radiation unit were operated on a year round basis. A Met III system is in operation. This system allows data to be transferred to a disk and the data is sent electronically to CCIW. The Met III system also allows Met program changes to be made on site and the data logger storage module can be erased to provide continued use with no interruption of data collection. The system also includes a UVB and UVA sensor with continuous data recorded on the Campbell datalogger CR23X.

The Batchawana data logger site has been in operation all year. A Campbell datalogger records hourly measurements of snow temperature during the winter months and soil moisture and soil temperatures year round. The data logger is solar powered, the storage module is downloaded each month and the data is electronically sent to CCIW for processing.

Service was provided by Technical Operations Services to two Campbell data loggers, three storage modules and two solar panels.

A snow melt cave constructed at the Batchawana Lake location will once again be in service during the winter months until the end of the spring runoff period. In addition, at this same location, a bulk precipitation sampler will be serviced year round on a weekly schedule. At the cave site a large solar panel has been installed. From this solar panel one 12 volt battery will be kept charged to power a 25 watt bulb in the cave melt sampling cubicle. This bulb will be left "ON" to keep the cubicle above freezing and thus prevent the sampling line from freezing to eliminate any loss of the snow melt sample.

All maintenance and repairs to equipment, buildings and vehicles were performed by Technical Operations staff. Also, the TOS staff member on site is the representative on the TLW Joint Health & Safety Committee.

Two portable radio systems were used by personnel when working alone. A Globalstar Satellite radio has been issued by TOS to the study. This allows emergency calls to be placed from anywhere in the watershed. It will also be carried by EC employees when working alone.

Ongoing Nitrate sampling in support of John Spoelstra, University of Waterloo was continued this year by AEIRB and TOS staff at the Turkey Lakes Watershed site. This study is being done in cooperation with R. Semkin, AEIRB.

The spring melt of 2004 was a more normal melt than over the past number of years. No major temperature or precipitation events occurred and the Chippewa River again flooded its banks stranding personnel at the base camp and preventing anyone from leaving the bush. After the major part of the melt passed additional staff from CCIW were sent home and the regular staff (Roy Neureuther and Graham LaHaie) continued on with the sampling protocol. Mr. D. Walsh, TOS, assisted with the 2004 spring runoff.

The Joint Turkey Lakes Safety Committee was still functioning during 2004. The safety members include one representative each from Environment Canada, Fisheries & Oceans and Natural Resources Canada. The Safety Committee has implemented a sign-in board at the camp to be used by personnel who are working in the watershed. The board consists of a large map of the watershed with everyone's work areas posted. There are magnetic name tags which are placed on the person's work location at the beginning of the day and removed at the end of the day. This provides instant knowledge of whom and where a person is working in the watershed if immediate safety issues require locating them. This board is relocated to the garage in the winter since only a few regular staff members continue the rigorous sampling over the winter season.

No serious ATV or Skidoo accidents occurred this year. Signs have been posted to warn the public of ongoing work taking place within the watershed seven days per week and also of the potential hazards of using any structure in the watershed for their personal use. Due to the continuing problem of acquiring parts for the Alpine skidoos at the camp a new Skidoo was purchased this year which will hopefully be a good replacement for the Alpine.

This summer two staff from TOS were at the camp for two weeks completing various construction jobs. The accommodation and cookhouse trailers had skirting built around them and the mudroom attached to the cookhouse had steel siding installed. At site S1 the snow bridge was widened to 6 feet for safety and also strengthened. On Little Turkey Lake the instrument ramp was removed and disposed of at a landfill site. It was rotting and was no longer in operation.

Again over the past year various and numerous university and government personnel completed their research work within the watershed and made the base camp their residence. Dr. R. Bourbonniere and his staff made several visits to the Turkey Lakes and used both the EC accommodation and cookhouse facilities. They also borrowed equipment and ATV's to assist in completing their work. Up to ten universities and EC staff received the Canada Safety Council ATV Rider Training course from the onsite qualified EC ATV instructor.

Over the past year numerous changes and improvements to the infrastructure were completed. The old Citation accommodation trailer was destroyed, removed and disposed of at a landfill site. The mudroom which was attached to this trailer was skidded out and relocated against the cookhouse to be used for storage and drying of field gear and to be used a computer room. Running water was plumbed into the

cookhouse trailer and a small propane hot water heater was installed. Stairs to all bunkhouse rooms were constructed along with stairs to the cookhouse. A pest control company from Sault Ste Marie was contracted to begin rodent treatment in all EC trailers. The site is now on a pest control maintenance program to prevent the spread of rodents to the trailers. To complete this maintenance program a gravel berm was placed along the skirting of all trailers by EC staff to prevent rodents from getting under the trailers. The hole left behind from the removal of the Citation trailer has been filled in with gravel and leveled. This also increased the helicopter landing area.

All bridges and docks within the watershed were maintained by TOS staff.

The Met III system has been relocated into a new MSC building on the Met hill. All guy cables and hardware on the Met tower were replaced this year as a safety concern.

METEOROLOGICAL AND TEMPERATURE MOORINGS, GREAT SLAVE LAKE
AEIRB STUDY 14145, W.M. SCHERTZER

On June 6, 2004, T. Breedon and B. Moore departed from Burlington via Government vehicles 924867 and 915563 for Hay River, NWT and arrived safely in Hay River on June 11.

June 14 - 18 was spent dismantling the met buoys and packing the equipment from the container at the Coast Guard Compound for transport back to Burlington. On June 15 the land based met station was moved from the compound to its summer location at the mouth of Hay River. On June 17, 200 litres of water was collected from Hay River in support of NLET Study #12180.

June 19 - 24 was lost due to the ice conditions on Great Slave Lake making sailing impossible. The lake finally became navigable on June 25. CCG 775 sailed on June 26 and the vessel retrieved the winter moorings at stations 1 and 3. The mooring that was not retrieved on the fall trip 2003 was retrieved later the same day. There were still ice flows in the area but CCG 775 was able to navigate around them to make dragging for the mooring possible.

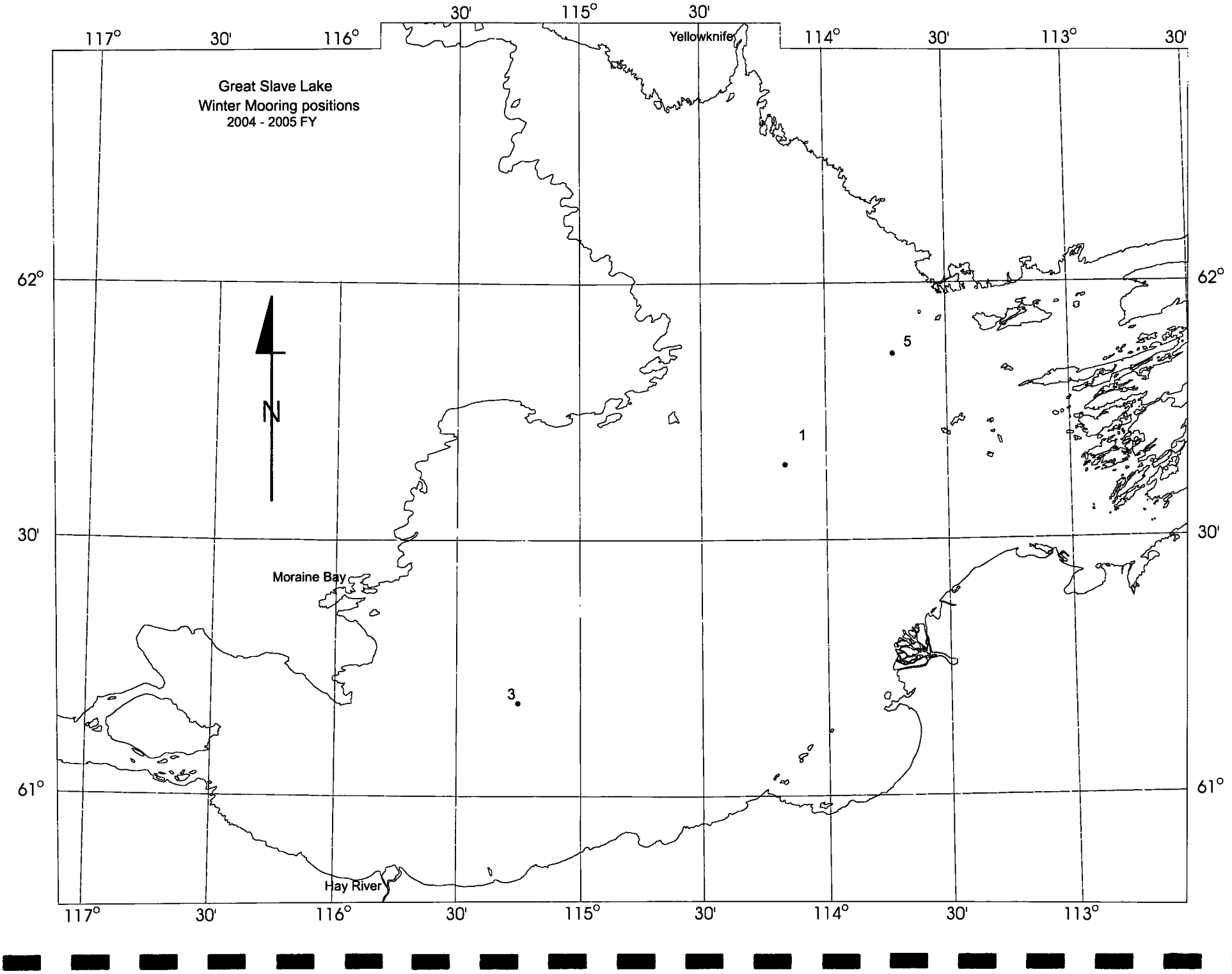
June 27 was spent unloading CCG 775 and packing the remaining equipment in the vehicles and trailers. On June 28, Mr. Breedon and Mr. Moore departed Hay River with the Government vehicles and trailers and arrived in Burlington on the evening of July 2.

The land base site remained until September 28 when it was dismantled and shipped back to Burlington. This was the termination of this study.

GREAT SLAVE LAKE
WINTER MOORING POSITIONS

2003 - 2004

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
1	2004-51T-01B	61° 38' 18"	114° 08' 54"	T (12, 14, 16, 20, 30, 50, 75 100 m)
3	2004-51T-05B	61° 10' 16"	115° 14' 00"	T (12, 14, 16, 20, 25, 30,40 40,55 m)
5	2003-51T-09A	61° 55' 26"	113° 43' 36"	T (Surf, 2.5,7.5 10,13.5,15,20 25, 30,40, 75m)


Great Slave Lake
Winter Mooring positions
2004 - 2005 FY
Yellowknife
Moraine Bay
Hay River
N
1
3
5
117°
30'
116°
115°
114°
113°
62°
61°

SAMPLING PROCEDURES, NAVIGATION AND SAFETY TRAINING NEW BRUNSWICK
AEIRB STUDY 14160, DR. J. CULP

Technical Operations Services supported Dr. Joseph Culp during the period of May 16 - May 18, 2004. There was no actual field sampling support given to this study. All the logistical provided was for training Environment Canada and University of New Brunswick staff in Fredericton, N. B. Seamanship and navigational skills were taught, including the safe operation of a jet propelled boat. This also included truck/trailer safety and boat launching procedures. The exercises were conducted in the Saint John River above Mactaquac Dam. The operation of PONAR Grabs, Van Dorn water samplers and the use of a Hydrolab were demonstrated at this time.

AUSABLE RIVER MUSSEL STUDY – GRAND BEND, ONTARIO
AEIRB STUDY 14194, J. SMITH

Technical Operations Services provided support to Janice Smith and Daryl McGoldrick of AIERB during the periods of August 3-6 and August 16-20, 2004.

The purpose of the first period, August 3-6, 2004 was to create two managed refuge sites for native freshwater mussels to mitigate impacts of the exotic zebra mussels in the delta area of Lake St. Clair. The objectives were two fold. 1) To determine the distribution and densities of native freshwater mussels, especially the Species at Risk, throughout the bays of Lake St. Clair in order to identify the best areas for mussel relocation and 2) To conduct trial relocations of native mussels from areas heavily infested with zebra mussels to the two refuge sites where their health and survival will be monitored over time. The GPS co-ordinates for the two sites selected were as follows:

SITE AREA	LATITUDE N.	LONGITUDE W.
Bass Bay	42.50287	82.55628
Pocket Bay	42.53064	82.61963

The primary survey technique was to gather the mussels in pre-determined areas by snorkeling. The mussels were sorted, counted and freed of zebra mussels and returned to their habitat. Two boats were used - a catamaran from the U.S. Geological Survey and a transport boat from the Walpole Island Resource Protection group.

The objective of the second period, August 16 - August 20 was to determine the distributions, densities and size range of freshwater mussel species, especially the Species at Risk, throughout the Ausable and Little Ausable River watersheds. Suitable sites were identified and then timed searches for all native freshwater mussels were conducted. All mussels found were identified as to their species, measured and returned to their habitat. Additional site specific data was collected at each site.

The GPS co-ordinates for the specific sites chosen are as follows:

SITE #	LATITIUDE	LONGITUDE	SITE AREA
AR-16	43.15120	81.80967	Ausable River: Syvan Bridge - HWY 7 Crossing
AR-17	43.23956	81.41228	Little Ausable River: Moorsville Drive just west of Saintsbury Line
AR-18	43.20378	81.42686	Little Ausable River: Bridge on Coursey Line NW of Lucan
AR-19	43.14557	81.54507	Ausable River: Lion's Gate Park in Ailsa Craig
AR-20	43.17823	81.45784	Little Ausable River: Lucan Conservation Area
AR-21	43.12322	81.79614	Ausable River: End of farmer's lane on Laird property
AR-22	43.07793	81.75835	Ausable River: Old abandoned campground near Rodick and River Road
AR-23	43.07295	81.71072	Ausable River: End of Island Road off HWY 12
AR-24	43.12753	81.55430	Ausable River: Sunnyview Farms on New Ontario Road
AR-25	43.07536	81.65103	Ausable River: Murray McLean farm off Springbank Road - south of bridge

The primary survey technique was to wade into the stream using chest waders and specialized viewers which permitted river bottom viewing in deeper water than otherwise possible. Mussels were collected in mesh bags and gathered in a central area. They were then identified, measured, counted and returned to suitable habitat.

DIVER CORES AND HYDROLAB RETRIEVAL, LAC PERRON AND LAC DE LA PÈPINIÉRE, QUEBEC
AEMRB STUDY 12212, F. ROSA

Technical Operations Services provided support to F. Rosa during the period of August 16 - August 20, 2004. Support consisted of two personnel, a dual wheel crew cab, a small mason boat and the necessary dive and sampling equipment to retrieve two hydrolab moorings and to obtain diver cores. Equipment was also taken to extrude some of the cores on site in a nitrogen filled glove box. A newly fabricated core incubator with the intent to maintain bottom water temperatures while doing electrochemical experiments in the field was also tested.

This research was part of a continuing collaboration between F. Rosa, AEMRB and S. Alpay (GSC-Ottawa). The overall goal of the study has been to investigate the mechanisms of post-depositional vertical metal transport in the sediment column during early diagenesis. Unfortunately, the hydrolab at Lac Perron was missing from the site and was not recovered.

LAC DE LA PÈPINIÉRE

SUPPORT TO ROXANN SURVEY - BLACK BAY, THUNDER BAY
AEMRB STUDY 12218, H. BIBERHOFER

An acoustic mapping was completed in Black Bay during May 17th-27th 2004. The objective of the study was to identify potential spawning areas for fish habitat (walleye) by conducting bottom mapping and characterization of the aquatic substrate.

Areas of concerns were identified by Mr. P. Furlong, Ministry of Natural Resources (MNR). The primary area of concern is located between Enterprise Bay and Hurkett Cove in the North West basin of Black Bay.

A survey of the areas of concerns was completed by performing transect lines and delineation of a 2 meter water depth perimeter using the RoxAnn system. Video ground truthing was completed at selected areas. No sediment sampling was conducted.

SONAR AND SEDIMENT SURVEY, ST. CLAIR RIVER
AEMRB STUDY 12218, Mr. H. Biberhofer

Technical Operation Services provided support to Mr. H. Biberhofer, AEMRB on the St. Clair River from September 22nd to September 24th, 2004. The objective of the study is to map and identify suitable habitat for freshwater mussels by conducting soundings and characterization of the aquatic substrate. The freshwater mussel population in the St. Clair River delta has been declining in recent years due to potential changes in sediment contaminant loadings. The plan was to run transects with the bottom mapping system and then ground truth via PONARs at selected locations. The primary areas of concern were Bass Bay and Pocket Bay both located southwest of Walpole Island. Sediment samples were taken at 25 sites in Bass Bay that were determined by the Study Leader on site. No sediment samples were taken in Pocket Bay due to dense weed cover in some areas and shallow water in other areas making access impossible even with the jet boat.

SUPPORT TO ROXANN SURVEY - KAM RIVER, THUNDER BAY
AEMRB STUDY 12218, H. BIBERHOFER

An acoustic mapping and sediment classification survey was completed on the Kaministikwia River (Kam River) during October 22-27, 2004. The RoxAnn acoustic sediment classification system was used in conjunction with ground-truthing. The survey's objective was to delineate substrate types in support of a Sturgeon management plan for the Kam River. The mapping extended from the mouth of the Kam River to 22 kilometres upstream, the limit of navigation for the CCGL PUFFIN. The Mission and McKellar Rivers were also mapped. Previous studies by OMNR researchers, using tagged fish have shown that there are two regions in the river that

the Sturgeon are found. The fish are mainly in the turning basin, the upstream extent of commercial ship traffic, during the spring and summer. The fish then migrate upstream several kilometres during the fall and winter. The two regions were found to have different acoustic signatures. Ground-truthing with limited video depth due to the turbid water and sediment sampling confirmed the differences in the substrates. Survey lines did not have a set spacing due to the width and shape of the river. Sounding coverage was based on the shore line structure and obstacles. Check lines were also run in a lazy "S" pattern from shore to shore intersecting in the middle of the river.

A previous survey in September, 2004 had to be suspended when a transmit module in the sounder failed after 92 km of soundings were recorded. The October survey continued the mapping effort and added another 255 km of soundings. The total run time for the vessel was 52.5 hours. Underwater video was attempted at 36 sites with varying degrees of success and sediment samples were collected at 21 sites. The samples were used for sediment classification and grain size analysis.

The Thunder Bay Coast Guard Search and Rescue Station personnel were very helpful with providing dockage, shore power and security.

RANDLE REEF CORE SAMPLES
AEMRB STUDY 12218, H. Biberhofer

Numerous TOS staff supported H. Biberhofer, AEMRB and R. Santiago, EHD-OR at the Randle Reef by collecting several dozen cores for investigation of the boundaries of the contaminated area. Sediment collection at Randle Reef was utilized with the CCGS SHARK on November 15 - 23, 24 and 29. The samples were given to Ontario Region, MOE and BBL, an American consulting firm for sub sampling and proper disposal.

ROXANN ™ SEDIMENT SURVEYS
AEMRB STUDY 12218, Mr. H. BIBERHOFER

This portion of work for Mr. Biberhofer was to do acoustic mapping of aquatic substrates in Huron Bay on the south shore of Lake Superior as research partnership between NWRI and the Keweenaw Bay Indian Community (KBIC). This data will be used by the KBIC Department of Natural Resources in their effort to develop conservation strategies. This research also contributes to priorities of the Lake Superior Lakewide Management Plan and the Great Lakes Fisheries Commission and will complement initiatives by the US Fish and Wildlife Service who are conducting additional fisheries research in the area.

For sampling purposes, Huron Bay was divided into five sampling areas, Inner Bay, Central Bay, North Shore Outer Bay, South Shore Outer Bay and Point Abbaye. Sounding lines with 50 m spacing were run on the Inner Bay and on the Central Bay. Sounding lines in the Point Abbaye area, the North Shore Outer Bay and the South

Shore of the Outer Bay were completed with 100 to 200 m spacing. The central portion of the Outer Bay was over 40 m in depth and would not give good RoxAnn results. Sampling was run inshore to the 2 m depth contour.

Video of the bottom sediment was done at locations selected by the Study Leader after reviewing the RoxAnn data collected at the end of each day. Based on a review of the video and RoxAnn data, locations were then picked to do ground truthing using a Shipek sampler. At each location, a sediment sample was obtained and a sub-sample of the sediment was taken and stored in a plastic vial for grain size analysis, a description of the sediment was done and a digital photo of the sample was taken.

A total in excess of 616 km of sounding lines were run in addition to the ground-truthing for video and sediment.

GPS positioning was done on all sounding lines as well as at all video and sediment sample sites.

COLLECTION OF BACTERIA SAMPLES FROM LAKE HURON

AEMRB STUDY 12240, M. N. CHARLTON

Technical Operations supported this study between the dates of October 04th and October 08th, 2004. The purpose of this work was to determine why bacteria levels are high on and around the beaches in the Kincardine area. Water samples taken were analyzed to determine what percentage of the bacteria present is from homeowners' septic systems, water birds, and or local farm operations. At the following stations 710, 720, 745, 758, and 778 bulk water was collected and at all stations bacteria samples were taken. At stations where bacteria samples were collected, a 500 ml plastic bottle was filled and stored at 4°C. At stations where bulk water was collected, a 4 litre plastic jug was filled. Samples were processed at the end of each day. Bacteria samples were poured onto Coli plates and placed in an incubator for 24 hours to obtain counts for fecal coliforms and ecoli. Bulk water samples were sampled for total phosphorus filtered and unfiltered, nutrients and chlorophyll a. Samples were stored at 4°C. The following is a table listing all station information.

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	DEPTH (m)
	Water Transects			
349	Point Clark	44° 04' 39"	81° 46' 20"	3.6
350		44° 04' 38"	81° 46' 09"	
497		44° 04' 36"	81° 45' 53"	3.2
498		44° 04' 30"	81° 45' 24"	0.6
439	Lurgan Beach	44° 05' 25"	81° 44' 30"	1.0
499		44° 05' 57"	81° 45' 48"	7.9
517		44° 05' 50"	81° 45' 18"	5.0
518		44° 05' 28"	81° 44' 36"	1.0
383	Bruce Beach	44° 07' 30"	81° 44' 06"	6.6
384		44° 06' 54"	81° 43' 32"	3.8
531		44° 06' 30"	81° 43' 15"	0.8
407	Poplar Beach	44° 08' 57"	81° 41' 40"	8.5
519		44° 09' 08"	81° 41' 58"	11.0
520		44° 08' 48"	81° 41' 22"	5.0
521		44° 08' 44"	81° 41' 02"	0.8
394	Station Beach	44° 11' 54"	81° 40' 03"	15.5
396		44° 10' 44"	81° 38' 51"	6.9
522		44° 10' 37"	81° 38' 36"	5.0
523		44° 10' 35"	81° 38' 33"	1.4
524		44° 10' 34"	81° 38' 31"	0.5
399	Penetangore River	44° 10' 35"	81° 38' 14"	1.9
525	Lorne Beach	44° 12' 18"	81° 37' 37"	0.8
526		44° 12' 28"	81° 38' 01"	2.0
527		44° 12' 55"	81° 38' 50"	15.0
528	Amberley Beach	44° 03' 01"	81° 44' 40"	0.6
529		44° 02' 59"	81° 45' 06"	2.0
385	Bruce Beach	44° 06' 35"	81° 42' 50"	2.0
386		44° 06' 37"	81° 43' 01"	0.5
391	Station Beach	44° 10' 42"	81° 39' 08"	9.4
392		44° 10' 37"	81° 38' 59"	7.3
393		44° 10' 33"	81° 39' 51"	5.8
394		44° 11' 06"	81° 40' 03"	15.9
395		44° 11' 27"	81° 39' 18"	12.7

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	DEPTH (m)
	Water Transects			
397	Penetangore River	44° 10' 41"	81° 38' 37"	3.2
398		44° 10' 40"	81° 39' 30"	2.4
402		44° 10' 30"	81° 38' 10"	0.0
404	Poplar Beach	44° 09' 14"	81° 42' 15"	11.8
417		44° 08' 42"	81° 41' 07"	2.5
418	Horton Pt.	44° 11' 13"	81° 39' 15"	11.9
419		44° 11' 12"	81° 38' 42"	4.7
420		44° 11' 09"	81° 38' 34"	0.5
426	South Rotary Park Beach	43° 43' 48"	81° 44' 17"	9.0
427		43° 43' 39"	81° 43' 53"	4.0
428		43° 43' 35"	81° 43' 46"	0.0
429	Rotary Park Beach	43° 43' 59"	81° 44' 09"	7.5
430		43° 44' 05"	81° 43' 41"	2.5
431		43° 44' 04"	81° 43' 38"	0.0
432		43° 44' 03"	81° 43' 36"	0.0
433		43° 44' 02"	81° 43' 34"	0.0
434		43° 44' 01"	81° 43' 32"	0.0
435	Maitland River Goderich	43° 44' 54"	81° 43' 24"	0.4
484	Station Beach	44° 10' 35"	81° 38' 31"	
485	Station Beach	44° 10' 31"	81° 38' 32"	
486	Station Beach	44° 10' 26"	81° 38' 34"	
487	Amberley Beach	44° 02' 37"	81° 44' 26"	1.2 km from beach access
488	Amberley Beach	44° 02' 50"	81° 44' 32"	0.8 km from beach access
489	Amberley Beach	44° 03' 01"	81° 44' 38"	0.4 km from beach access in line with water transect
490	Amberley Beach	44° 03' 14"	81° 44' 45"	at beach access
355	Point Clark Beach	44° 04' 26"	81° 45' 26"	south end of beach
491	Point Clark Beach	44° 04' 32"	81° 45' 18"	north end of beach
492	Point Clark Beach	44° 04' 27"	81° 45' 22"	middle of beach

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	DEPTH (m)
	Water Transects			
493	Lurgan Beach	44° 05' 26"	81° 44' 35"	west side of Pine River
494	Lurgan Beach	44° 05' 25"	81° 44' 37"	100 m south of 493 in line with water transect
495	Bruce Beach	44° 06' 28"	81° 43' 13"	in line with water transect
560	Bruce Beach	44° 06' 30"	81° 43' 10"	
561	Bruce Beach	44° 06' 24"	81° 43' 20"	
496	Poplar Beach	44° 08' 40"	81° 40' 33"	in line with water transect
554	Rotary Beach	43° 43' 54.7"	81° 43' 37"	
555	Rotary Beach	43° 43' 56.9"	81° 43' 33.6"	
556	Rotary Beach	43° 44' 01.3"	81° 43' 33.7"	
557	S of Rotary Beach	43° 43' 50.9"	81° 43' 33.7"	
558	Main Beach	43° 44' 38.4"	81° 43' 35.5"	
559	Main Beach	43° 44' 41"	81° 43' 36.4"	

STATION #	TRANSECT NAME	LATITUDE N.	LONGITUDE W.	COMMENTS
	Shoreline Transects			
351	Point Clark Beach	44° 04' 10"	81° 45' 30"	waded in water
356	Point Clark Beach	44° 04' 36"	81° 45' 20"	hole in beach
421	Main Beach Goderich	43° 44' 28"	81° 43' 31"	hole in beach
422	Main Beach Goderich	43° 44' 26"	81° 43' 33"	waded in water
423	Rotary Park Beach	43° 44' 22"	81° 43' 34"	hole in beach
425	Rotary Park Beach	43° 44' 21"	81° 43' 38"	waded in water
436	Nine Mile Creek	43° 52' 38"	81° 42' 19"	
437	Kerry's Creek	43° 57' 26"	81° 42' 11"	
438	Kintail Beach	43° 57' 50"	81° 43' 46"	waded in water
439	Pine River	43° 05' 25"	81° 44' 30"	
440	Station Beach	43° 10' 33"	81° 38' 34"	hole in beach
441	Station Beach	43° 10' 34"	81° 38' 35"	hole in beach
442	Station Beach	44° 10' 35"	81° 38' 36"	waded in water
443	Station Beach	44° 10' 36"	81° 38' 37"	hole in beach
444	Station Beach	44° 10' 37"	81° 38' 38"	hole in beach
445	Station Beach	44° 10' 38"	81° 38' 39"	waded in water
446	Station Beach	44° 10' 39"	81° 38' 40"	hole in beach
447	Station Beach	44° 10' 40"	81° 38' 41"	hole in beach
448	Station Beach	44° 10' 41"	81° 38' 42"	waded in water
449	Station Beach	44° 10' 42"	81° 38' 43"	hole in beach
450	Station Beach	44° 10' 43"	81° 38' 44"	hole in beach
451	Station Beach	44° 10' 44"	81° 38' 45"	
452	Royal Oak Creek	44° 06' 44"	81° 39' 46"	
453	South Pine River	44° 05' 24"	81° 40' 51"	
454	Clark Creek	44° 03' 19"	81° 42' 28"	
455	Point Clark Beach	44° 04' 30"	81° 45' 26"	hole in beach
456	Point Clark Beach	44° 04' 31"	81° 45' 27"	hole in beach
457	Point Clark Beach	44° 04' 32"	81° 45' 28"	waded in water
458	Point Clark Beach	44° 04' 33"	81° 45' 29"	hole in beach
459	Point Clark Beach	44° 04' 34"	81° 45' 30"	hole in beach
460A	Point Clark Beach	44° 04' 35"	81° 45' 31"	waded in water
460B	Point Clark Beach	44° 04' 36"	81° 45' 32"	hole in beach
461	Point Clark Beach	44° 04' 37"	81° 45' 33"	hole in beach
462	Point Clark Beach	44° 04' 38"	81° 45' 34"	waded in water
463	Point Clark Beach	44° 04' 39"	81° 45' 35"	hole in beach
464	Point Clark Beach	44° 04' 40"	81° 45' 36"	hole in beach
465	Point Clark Beach	44° 04' 41"	81° 45' 37"	waded in water

AQUACULTURE STUDIES IN GEORGIAN BAY AND THE NORTH CHANNEL
AEMRB STUDY 12240, M. N. CHARLTON

Technical Operations supported the Aquaculture studies throughout the 2004 field season at various sites and times for M. N. Charlton, AEMRB. Various TOS personnel were involved in five different trips to locations which had been sampled in previous years and to new locations.

The purpose of the study was to try and determine guidelines for the growing Aquaculture industry so that water quality and the bottom environment are not seriously impacted by their operations. The water and sediment sampling carried out during the trips attempted to quantify the size of any affected areas adjacent to the Aquaculture Farm sites.

The first trip of the year occurred February 9 - February 19 and was at four different Aquaculture sites on Manitoulin Island. The first site was a previously studied site at Lake Wolsey where 20 short cores were collected from under the cage sites as well as a video camera bottom survey of 27 stations and Ekman dredge samples. Seven stations the length of Lake Wolsey had water samples collected for water quality and YSI profiles were taken. The next sampling site was the decommissioned site located near Little Current. This site at the previous North Winds Fisheries has been visited for over the last five years to observe the decomposition of material left here from the Aquaculture Farm. A total of 40 holes were drilled and the bottom sediment viewed with a video camera with a penetrating rod. A few Ekman samples, water samples and two YSI profiles were also collected. The next location was a new site located in Manitowaning Bay near the village of Buzwah. A total of 16 holes were drilled at this site in a cross formation to determine the effect this farm was having on the environment. Short cores from the Ekman dredge, as well as water samples and YSI profiles were also collected. The final site of this trip was located at Robert's Bay which is in the south-east corner of South Bay. This new site had a total of 18 stations sampled in two intersecting lines for water samples, YSI profiles and benthos cores from the Ekman dredge.

The second trip occurred from March 1 - March 5 at the previously studied Depot Harbour site located in Parry Sound. A total of 19 stations located in two intersecting lines were sampled. At this deep water site, bottom fauna using an Ekman dredge to collect 10cm benthos cores, as well as camera video inspection of each site and water quality and YSI profiles at two stations were completed. M. Kullman from DFO in Winnipeg helped in the collection of extra bottom fauna samples which were then returned to Winnipeg to Dr. C. Podemski for analysis.

The third field trip of the year was a return to Lake Wolsey on Manitoulin Island to carry out similar sampling that was done in February. The seven station transect down the middle of Lake Wolsey was repeated for water quality monitoring as well as YSI profiles and a total of 36 benthos cores were collected from under the fish cages and sub-divided for return to CCIW.

The next field trip occurred in Parry Sound from July 19 – 23. A transect at 330° was sampled at 300 meter intervals from the aquaculture farm out into Parry Sound. A total of 36 sediment cores were collected, and sub-divided into 2cm sub-sections with the purpose of determining any effects on bottom fauna. Video camera work was also carried out at the Aquaculture site and at two abandoned sites in Depot Harbour and Deep Cove. A few water samples were also collected.

The final field trip of the year occurred from November 22 – 26 at the Lake Wolsey site on Manitoulin Island. A total of 33 cores were collected from under the fish cages and sub-sectioned at 2cm intervals and returned to CCIW. The seven station transect down the middle of the lake was completed and water samples collected as well as YSI profiles done at each station. A seven station transect was completed starting at the cage edge and in 16 meters of water, two short cores were collected at 5, 10, 20, 50, 100, 200 and 400 meters from the cage. These cores for bottom analysis were shipped to C. Podemski at DFO in Winnipeg.

HAMILTON HARBOUR
AEMRB STUDY 12240, M.N.CHARLTON

WATER QUALITY MONITORING, Station 1001

Monitoring of a number of water quality parameters continued in Hamilton Harbour over the 2004 field season. This data is critical in effecting appropriate, focused policy for harbour remediation. A major focus is the study of temporal trends and the response of Hamilton Harbour to nutrient loading reductions.

Weekly sampling continued at Station 1001 and was carried out over the winter months when weather permitted. This station remains the primary monitoring site for a snapshot of chlorophyll a, nutrients, total phosphorus filtered and unfiltered in the Harbour. The YSI 6600 water quality profiler provided temperature, PH, conductivity and dissolved oxygen profiles, helping to identify turnover events and harbour stratification. Secchi readings and bucket thermometer readings were also acquired.

NET HAULS

In response to concerns over the health of zooplankton in Hamilton Harbour, a brief monitoring program was undertaken in 2000 for Dr. M. Evans, AEPRB, NWRI, Saskatoon. Again in 2004, samples were collected which will provide quantitative and qualitative data on harbour populations.

FECAL COLIFORM

In response to concerns over water quality in and around Hamilton Harbour, Burlington and Hamilton beaches, a fecal coliform survey was initiated in 2000. The weekly survey

continued this field season between April and October. The survey consisted of five stations off each beach; in Hamilton Harbour (Bay Front Park), Burlington and Hamilton (north of Confederation Park).

CHARLTON PROFILING, STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1001	43° 17' 10"	79° 50' 34"

CHARLTON/EVANS, NET HAULS, STUDY 12240

STUDY	STATION	LATITUDE N.	LONGITUDE W.
HH52	1001	43° 17' 11"	79° 50' 34"
HH51	9031	43° 16' 46"	79° 52' 21"
HH53	9033	43° 17' 09"	79° 47' 34"
LO902	9056	43° 18' 33"	79° 46' 16"

CHARLTON FECAL COLIFORM, STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
Burlington Beach		
9034	43° 18' 31"	79° 47' 56"
9035	43° 18' 31"	79° 47' 55"
9036	43° 18' 32"	79° 47' 54"
9037	43° 18' 32"	79° 47' 52"
9038	43° 18' 33"	79° 47' 46"
9061	43° 18' 43"	79° 47' 59"
9062	43° 18' 43"	79° 47' 57"
9063	43° 18' 44"	79° 47' 55"
9064	43° 18' 44"	79° 47' 53"
9065	43° 18' 44"	79° 47' 48"

Hamilton Beach		
9039	43° 16' 22"	79° 46' 37"
9040	43° 16' 22"	79° 46' 36"
9041	43° 16' 23"	79° 46' 35"
9042	43° 16' 25"	79° 46' 31"
9043	43° 16' 27"	79° 46' 27"
Lax (HH – Bayfront Park)		
9044	43° 16' 18"	79° 52' 29"
9045	43° 16' 18"	79° 52' 30"
9046	43° 16' 19"	79° 52' 31"
9047	43° 16' 20"	79° 52' 33"
9048	43° 16' 24"	79° 52'38"

HAMILTON HARBOUR SEDIMENT TRAP MOORINGS
AEMRB STUDY 12246, DR. C. MARVIN

Five sediment trap moorings were placed in Hamilton Harbour and sampled on a monthly basis. The collected sediment was analysed for organic contaminants (polycyclic aromatic hydrocarbons) as well as metals.

STATION NUMBER	LATITUDE N.	LONGITUDE W.
9030	43° 18' 17"	79° 48' 57"
9031	43° 16' 50"	79° 52' 32"
9032	43° 17' 11"	79° 50' 26"
9033	43° 17' 07"	79° 47' 38"
Windermere	43° 16' 08"	79° 46' 54"

TASTE AND ODOUR,
AEMRB STUDY 12248, DR. S. WATSON

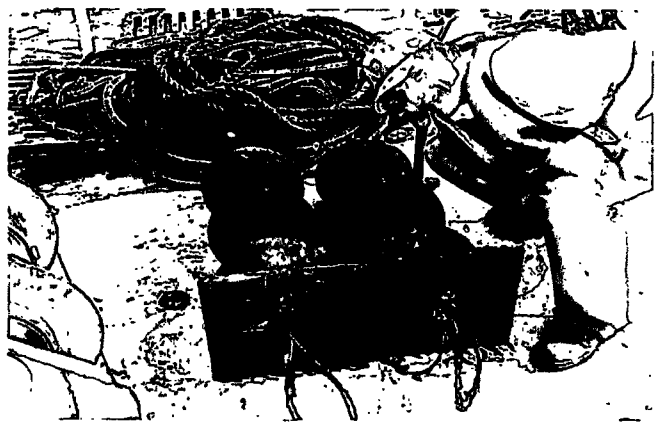
Taste and odour problems with drinking water during the late summer have led to NWRI research into the possible causes. Principal researchers include Dr. S. Watson, Dr. B. Brownlee and M.Charlton.

Two stations off shore from the Lakeview generating station in Mississauga, were sampled on a weekly basis. Samples were collected using a Van Dorn bottle from 1m

and bottom-2m for geosmin and 2-methylisoborneol (MIB) analysis, chlorophyll a, total phosphorous, soluable reactive phosphorous, nitrates and nitrites. An integrated water sample was also collected from the surface to 1m above the thermocline.

STATION NUMBER	LATITUDE N.	LONGITUDE W.
752 (LV1)	43° 29' 59"	79° 28' 46"
750 (LV3)	43° 33' 15"	79° 32' 09"

In addition to the work done in Mississauga, more study on taste and odour was done using cladaphora that grew on a series of moorings located offshore from Bronte in Lake Ontario. In April, two moorings, which consisted of tiles mounted on top of a series of floats, were established in approximately 5 meters of water. In June, these two moorings were removed and 6 new moorings established in 7,10,15,20,25, and 30 meters of water. Each of the new moorings consisted of new tiles as well as the old tiles from the first two moorings.



Cladaphora Moorings

These were removed in September, and the algae was scraped off the tiles and stored for later analysis.

First Cladaphora Moorings

STATION NUMBER	LATITUDE N.	LONGITUDE W.	DEPTH
2004-00S-28A	43° 25' 53"	79° 40' 18"	5m
2004-00S-29A	43° 28' 00"	79° 38' 09"	6m

Second Cladaphora Moorings

STATION NUMBER	LATITUDE N.	LONGITUDE W.	DEPTH
2004-00S-17A	43° 25' 23"	79° 39' 06"	30m
2004-00S-18A	43° 25' 30"	79° 39' 22"	25m
2004-00S-19A	43° 25' 37"	79° 39' 40"	20m
2004-00S-20A	43° 25' 40"	79° 39' 48"	15m
2004-00S-21A	43° 25' 49"	79° 40' 18"	10m
2004-00S-22A	43° 25' 53"	79° 40' 18"	7m

INSTRUCTIONAL TRIP TO ALBERTA MOUNTAIN PARKS
AEMRB STUDY 12248, DR. S. WATSON

Technical Operations supported AEMRB in the safety and logistics of operating a sampling program in the mountain parks around Banff, Alberta from July 12 -18, 2004. Dr. Watson is sampling six mountain lakes contained in Banff and Yoho National Parks for water quality concerns due to the heavy human traffic during the tourist season. This project is in conjunction with the University of Calgary, Parks Canada and Environment Canada. The five lakes were Lake Louise, Moraine Lake, Bow Lake, Wapati Lake, Emerald Lake and Lake O'Hara.

Training focused on safety on these cold and at times windy lakes as well as sampling techniques for integrated samples, VanDorn bottles, light meters and the set up and operation of a Hydro-lab unit. An inflatable 12 foot boat was purchased for sampling which was deemed safer than canoes. At least three sampling trips were to be carried out by two summer students from the University of Calgary. The first few independent stream temperature measurement gauges were deployed into the streams which feed these lakes.

SPACIAL SURVEY OF THE BAY OF QUINTE, ONTARIO
AEMRB STUDY 12248, DR. S. WATSON

Technical Operation Services assisted M. Burley, GLLFAS, DFO, by providing services to Dr. S. Watson, AEMRB from August 25th - 27th, 2004 in the Bay of Quinte, Ontario.

The purpose of this sampling campaign was to perform a spatial survey of the Bay of Quinte to gain a better understanding of the triggering mechanisms of taste and odour compounds. Temporal surveys were performed on a bi-weekly basis by DFO personnel.

The sampling performed at each site is summarized below and consisted of:

- Surface temperature and Secchi disk,
- Hydrolab profile,
- Integrated sample at twice the depth of the Secchi disk reading
  - 1 litre amber glass bottle for algal toxins analysis,
  - 1 x 125 ml glass bottle for algal composition preserved with Lugol's,
  - 2 x 40 mL glass VOC vials for Geosmin analysis,
  - Volume of water filtered for Chlorophyll a,
  - Volume of water filtered for Neurotoxin,
- Grab sample at 0.5 meter depth
  - 1 litre amber glass bottle for algal toxins analysis,
  - 1 x 125 ml glass bottle for algal composition preserved with Lugol's,
  - 2 x 40 mL glass VOC vials for Geosmin analysis,
  - Volume of water filtered for Chlorophyll a,
  - Volume of water filtered for Neurotoxin,
- Benthic sampling (PONAR),
- Zooplankton net hauls

TABLE 1

Station	Latitude	Longitude	Secchi m	Surf. temp. (°C)
Trenton (T)	44° 05.310'	77° 33.480'	1.75	21.6
T1	44° 05.864'	77° 31.476'	1.75	21.5
T2	44° 06.646'	77° 29.461'	1.75	21.5
T3	44° 07.260'	77° 27.426'	1.5	
Belleville (B)	44° 09.220'	77° 20.733'	1.5	21.7
B1	44° 09.004'	77° 18.399'	1.5	21.7
B1A			1.25	
B2	44° 09.017'	77° 15.318'	1.25	21.5
B3	44° 08.872'	77° 13.484'	1.75	21.3
B4	44° 09.065'	77° 11.051'	1.5	21.6
B5	44° 09.397'	77° 08.769'	1.75	21.7
B6	44° 09.926'	77° 06.454'	2.25	20.7
B7	44° 10.786'	77° 04.332'	1.75	22.0
Napanee (N)	44° 10.808'	77° 02.384'	1.5	21.8
N1A	44° 10.740'	77° 03.703'	1.5	21.9
N1	44° 09.530'	77° 03.107'	1.5	22.0
N2	44° 08.144'	77° 03.815'	1.5	21.9
N3	44° 06.807'	77° 04.470'	1.5	21.7

Station	Latitude	Longitude	Secchi m	Surf. temp. (°C)
Hay Bay (HB)	44° 05.640'	77° 04.290'	1.5	21.7
HBA (sed)	44° 06.245'	77° 03.378'	1.5	22.5
HBA1	44° 06.201'	77° 03.289'	1.25	21.9
HBA2	44° 06.369'	77° 01.907'	1.25	
HB1	44° 04.306'	77° 04.956'	1.5	21.2
HB2	44° 03.056'	77° 04.957'	1.75	21.1
Glenora (GL)	44° 02.796'	77° 01.267'	2.25	21.1
GLA (sed)	44° 02.588'	77° 03.679'	2.0	21.6
Picton Harbour (PH)	44° 00.833'	77° 07.996'	2.0	22.0

THERMOGRAPH MOORING, BAY OF QUINTE, ONTARIO
AEMRB STUDY 12248, DR. S. WATSON and AEMRB STUDY 12249, DR. R. YERUBANDI

Technical Operation Services (TOS) provided support to Dr. S. Watson and Dr. R. Yerubandi for the deployment of a mooring on June 7th and 8th 2004, and for the retrieval of this mooring on October 26th and 27th, 2004.

The U-shaped mooring equipped with temperature loggers was deployed in 5 meters of water. Given that the water is approximately .9m above datum, the mooring was deployed closer to shore than originally anticipated.

The retrieval of this mooring was completed without incident however the groundline was caught on a temperature logger about mid water column depth. There were also a considerable amount of zebra mussels attached to the entire mooring including the groundline, the up and down line and the surface buoy.

Upon return to Burlington all instrumentation from the mooring was returned to Engineering Services, RSB.

Location of Station

Latitude	Longitude	Northing	Easting Zone 17
44° 09' 43.9"	077° 13' 14.5"	4896836.2	802182.5

SUPPORT TO LAKE ONTARIO ADCP SAMPLING
AEMRB STUDY 12249, DR. R. YERUBANDI

The purpose of the trip conducted on August 12 & 13, 2004, was to measure a very high resolution temperature profile with Brian May's microstructure profiler (SCAMP) to estimate the turbulence in the water column. Simultaneous ADCP profiles were obtained to get an idea of the nature of current shear in the upper water column. This study is part of the physical processes study of taste and odour research sponsored by Ontario Water Works Research Consortium.

The CCGL WAGTAIL was used as a sampling platform for sites LV1, LV2 and LV3. The sites were approximately 45 km away and took an hour of travel time. At station LV2, ADCP data logging as well as five SCAMP profiles and two transmissometer/fluorometer casts were taken. On the way to station LV3, ADCP data was continuously collected until the water depth exceeded the equipments capabilities. At station LV3, ADCP (using satellite tracking), SCAMP and transmissometer/fluorometer profiles were taken. The water currents were very strong on the surface which created eddies around the spar buoy. The weather cooperated for the day and the field party returned to CCIW.

The following day the Wagtail was once again taken to the sampling sites. LV2 was sampled using the ADCP, SCAMP and transmission/fluorometer profiler. Only the SCAMP was used at site LV3 due to weather conditions. For station LV1, ADCP data logging and SCAMP profiles were taken. Due to time restrictions and an ill crew the field party headed back to CCIW in the early afternoon.

STATION POSITIONS

STATION	LATITUDE N	LONGITUDE W
LV1	43° 33' 53"	79° 31' 01"
LV2	43° 33' 36"	79° 30' 07"
LV3	43° 29' 55"	79° 28' 58"

GROUNDWATER REMEDIATION PROJECT
AEMRB STUDY 12263, 12266, DR. C. PTACEK

Technical Operations staff supported the GRP, AEMRB, throughout the year at CCIW, Smithville, Clarkson and the Royal Botanical Gardens in Hamilton.

In Burlington, safety inspections and maintenance have been performed on the hydraulic testing, utility and drill rig trailers. Provincial well records (new format) have been completed and submitted for all wells installed last year at the Royal Botanical Gardens (RBG) and Moose Factory. R. Neureuther, RSB has received his Assistant Well Technician licence from the Ministry of Environment.

At Clarkson on February 2 and February 11, 2004, 20 litres of water was obtained from the lower fracture zone of BH28 for P. Grande, AEMRB. Also at Clarkson along with regular maintenance of the site and packers, 10 centimetres spaced constant head tests were performed over the zone of interest in Boreholes 01, 29 and 30. This is being done to monitor the results of the of the Bio-barrier experiment for Dr. N. Ross.

At Smithville a video cassette recording of BH 57 was obtained using the downhole camera from the top of casing to the blockage at the rock/casing interface. This was for M. Smithson, Ministry of Environment at the request of G. Bickerton, AEMRB.

At the RBG in Hamilton well tags have been installed on all wells and samplers installed in 2003 as required by provincial regulation 903. Pump tests have been performed on wells CP06, 07, 08, 16, 22, 23, 24 and 25. Monthly water levels of all wells have been obtained throughout the year for Dr. C. Ptacek.

TERRAVIEW AND WILLOWFIELD PONDS - NORTH TORONTO, ONTARIO
AEMRB STUDY 12440, DR. J. MARSALEK

Technical Operations provided support to Dr. J. Marsalek during the period of July 6 & 7, 2004. Support consisted of two TOS personnel, the "Sea Nymph" (flat bottom boat), a vehicle with trailer hitch, a Brown's corer, mini PONAR, hydrolab and additional miscellaneous equipment. Cores were extracted and water and sediment samples collected and returned to CCIW.

NORTH TORONTO, CLIFFORD AND ETOBICOKE SEWAGE TREATMENT PLANTS,
AEMRB STUDY 12440, DR. J. MARSALEK

Technical Operations supported Dr. J. Marsalek during the period of May 3, 7, 10, 26, June 9-11, 15 & 16, 2004. Support consisted of one TOS person, a vehicle with trailer hitch and miscellaneous equipment required to supplement already supplied tools and equipment. Process monitoring trailers and equipment were set up, electrical conduit

was laid and barrels of combined sewer overflow (CSO) water were transported back to CCIW after rain events.

URBAN RUNOFF, TORONTO, ONTARIO
AEMRB STUDY 12440, DR. J. MARSALEK

Technical Operation Services (TOS) provided support to Dr. J. Marsalek, AEMRB on August 24, September 14, September 23, October 7 and November 10, 2004. The Department of Transportation and the Department of Water and Wastewater, City of Toronto, were testing two types of street sweepers in a PM10 performance review and were interested in the potential for these new high-efficiency models to reduce the toxicity of urban runoff.

For the purposes of this study, a single test location was selected on Markham Road. One type of sweeper (Sweeper A) cleaned the curb lane in one direction (e.g. northbound) and another type of sweeper (Sweeper B) cleaned the curb lane in the other direction (southbound). Sampling only occurred under dry field conditions, at least five days after a rain event of significant magnitude.

Vacuuming and Sweeping

Dry samples were collected from small test sections of the "dry" sampling area. These test sections were 20 m in length along the curb and the full width of one traffic lane (4 m). The street dust samples were collected using a powerful industrial vacuum cleaner. The samples were analyzed for particulate size, PAH's, metals and nutrients. The fine dust remaining on the surface of the 3 µm pleated filter was vacuumed into a 1 L flask filled with 500 mL of distilled water and analyzed for particulate size.

Simulating a Rainfall Washoff Event

Sections of the test area were washed off using municipal tap water and standard garden watering equipment. The water and road dust that collected at the curb ran down towards the catch basin. The grate was temporarily removed and a PVC insert was used to collect the entire portion of the runoff which entered the catch basin. The Data sonde 4 measured the following parameters; temperature, pH, conductivity and dissolved oxygen. Samples for toxicity, PAH's, total and dissolved metals and nutrients were collected.

Samples Collected

Date	Sweeper A (northbound)				Sweeper B (southbound)			
	Swept		*Unswept*		*Swept*		*Unswept*	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
August 24	X	X	X	X		X		
September 14		X		X	X	X	X	X
September 23	X	X	X	X		X		X
October 7		X		X	X	X	X	X
November 10	X	X	X	X		X		X

Washing the road and collecting the contaminants

Sweeper "B"

CHARACTERIZATION OF PHYSICAL, MICROBIAL AND GEOCHEMICAL LINKAGES IN SEDIMENT ARCHITECTURE AND CONTAMINANT BEHAVIOUR IN HAMILTON HARBOUR BED SEDIMENTS

AEMRB STUDY 12450, DR. I. DROPPO

Understanding the contaminant behaviour in complex urban settings such as Hamilton Harbour, requires integrated, highly resolved spatial and temporal examination of the physical, biological and geochemical linkages involved in the processes controlling contaminant flux in and out of bed sediments. Such an understanding is a prerequisite to the development of effective mitigative strategies for contaminated water sources. The physical nature and relative stability of those sedimentary environments are a fundamental factor influencing contaminant behaviour. Biological activity can influence both the physical architecture of sedimentary environments, e.g. biostabilization, as well as the key drivers for contaminant fluxes such as geochemical conditions, mineral formation and/or dissolution and rates of reactions.

Using a combined suite of techniques spanning molecular biology to microscale geochemistry to gross scale sedimentology, this proposal seeks to characterize inorganic and organic contaminant retention, mobility and fluxes in surficial sediments at key sites within Hamilton Harbour at highly resolved spatial and temporal scales. Further, laboratory investigation building on in situ survey results will seek to elucidate the mechanisms involved and the potential role of microbial activity in both contaminant behaviour and sediment stabilization.

The objectives of this study were to:

1. Map the spatial distribution, abundance and fluxes of both heavy metals and PAH contaminants in bed sediment, suspended sediment and overlying water column compartments over diel and seasonal timescales;
2. Characterize the structural integrity of the bed sediments;
3. Identify the relative importance of microbial processes in sediment stability and contaminant flux; and
4. Identify the microbial strains involved in key biostabilization and geochemical contaminant flux processes at select sites within Hamilton Harbour.

Integration of both field and laboratory study will permit identification of key processes occurring in natural environments, and determination of the important controls and outcomes of those processes under well characterized and constrained laboratory conditions providing both physical and biogeochemical architectural characterization of contaminant behaviour in Hamilton Harbour. The proposed research was carried out by a multi-disciplinary team consisting of university and federal scientists, and will provide novel insight into the biogeochemical and physical controls on dynamic metal and PAH contaminant fluxes in contaminated sedimentary systems. These results will advance our understanding of the biological mediation of sediment stability as well as

provide a comprehensive integrated understanding of both metal and PAH contaminant dynamics at the sediment water interface in aquatic systems. Further, the proposed research will provide key information required to modify existing bed sediment erosion models to incorporate biostabilization processes. The research outcome will be relevant to a wide range of industries, municipalities, and governmental agencies, and will benefit the sustainable development of water resources.

TOS provided support in 2004 over a number of weeks at two sites in Hamilton Harbour. The field dates were as follows:

1. May 11th through May 13th
2. June 14th through June 18th
3. July 06th through July 09th, July 19th
4. August 16th through August 20th
5. September 20th through September 24th

Sampling for Drs. I. Droppo, AEMRB, B. Krishnappan, AEIRB and L. Warren, McMaster University included the following:

- Diver Benthos cores
- Water "Floc" cores taken just above the sediment-water interface
- "Krishnappan" Diver cores
- "Droppo" Biofilm slide samples taken just above the sediment-water interface
- Centrifuge sample of approximately 1300 liters
- A series of microscope slides, secured to a stick was also installed just above the sediment at each site to collect suspended sediment
- Peepers
- Sediment traps
- "Krishnappan" Rotating flume sample (platforms prepared by Engineering Services, Research Support Branch)

Over the course of sampling dates the majority of work was done off the Goose III, however a number of small boats were used as dive platforms and shuttle vessels to and from shore.

When weather permitted daily sampling was carried out in two phases; early morning and late afternoon, to identify diurnal fluctuations.

STATION POSITIONS

HAMILTON HARBOUR

2004 - 2005

STATION	LATITUDE	LONGITUDE
NST (north side of Carroll's Point)	43° 16' 57"	79° 53' 02"
DOFASCO (Windemere Arm, Off Dominion Foundries slip)	43° 16' 30"	79° 47' 37"

URBAN WATER MANAGEMENT PROJECT
AEMRB STUDY 14181, DR. A. CROWE

Technical Operations provided support to Dr. A. Crowe, AEMRB at Point Pelee National Park with monthly monitoring of water levels of the marsh and wells at the Park gate, North-west Beach and Camp Henry cross-sections.

In October of this year the western shoreline was profiled at the three well cross sections from the most westerly well into the lake.

This is being done as part of a continuing study of the groundwater at the Park.

GROUNDWATER SAMPLES FROM AMBERLEY BEACH, LAKE HURON
AEMRB STUDY 14181,DR. A. CROWE

Technical Operations supported this study during the period of October 4th and October. 27th. The purpose of this work was to determine why bacteria levels are high on and around the beaches in the Kincardine area. Water samples were analyzed to determine what percentage of bacteria present is from homeowners' septic systems, water birds, and or local farm operations. Groundwater samples were taken at Amberley Beach on two transects originating from a cottager's property line down to the lake's edge. Approximately 9 or 10 holes were drilled down to the water table using a shovel and post hole digger. Water and sediment samples were taken from each sample hole and also a sample was taken from a landowner's septic tank. The landowner which allowed us access to his property and right-of-way to the beach was chosen due to him being

co-operative with this preliminary survey. Shoreline profiles were completed using the mean water level of the lake as a starting elevation.

AMBERLEY BEACH SHORELINE PROFILE AT #86545
AMBERLEY BEACH ROAD
October 27, 2004

Location	Elevation	Distance (m)	Remarks
1	175.444	40	in lake
2	175.586	37.5	in lake
3	175.756	34.9	in lake
4	175.929	34.6	beach edge
5	176.176	32	water line, N44° 02' 38.2" W81°44' 26.7"
6	176.554	28	
7	176.906	25	
8	177.417	21.5	
9	177.852	17	
10	178.094	14	
11	178.337	11	
12	178.289	8	
13	178.366	6	opposite post, N44° 02' 38.4" W81° 44' 25.6"
14	178.56	3.5	
15	178.747	1.5	
16	178.92	0	on sand in front of step
17	178.993	0	SW corner top of step
Lake	176.11		lake elevation at Goderich Oct. 28/04
Nail	178.494		nail in south side of post

AMBERLEY BEACH SHORELINE PROFILE AT PUBLIC ACCESS BETWEEN # 86617 & #86621 AMBERLEY BEACH ROAD OCTOBER 27, 2004

Location	Elevation	Distance (m)	Remarks
1	175.327	49	in lake
2	175.5	46.6	in lake
3	175.733	44.6	in lake, beach edge
4	175.92	44.3	in lake
5	176.104	42	water line, N44° 02' 49" W81°44' 31.4"
6	176.44	39	
7	176.739	35	
8	177.01	32.4	
9	177.571	29	
10	178.002	24.4	edge of grass, N44° 02' 49.3" W81°44' 30.6"
11	178.628	18	
12	179.434	11	
13	179.847	6	
14	180.062	2.5	
15	180.137	0	east of telephone pole N44° 02' 49.5" W81°44' 29.5", 26.93m
Lake	176.11		lake elevation at Goderich Oct. 28/04
nail	180.476		nail in north side of telephone pole on south side of path

ATMOSPHERIC CONTAMINANTS IMPACTS PROJECT
AEPRB STUDY 12310, DR. D. MUIR

Technical Operations staff provided support to Dr. D. Muir, AEPRB by obtaining water samples and depth soundings of Lake Hazen in Quttinirpaaq National Park, Nunavut. This is a joint multi-year project with the University of Innsbruck, Austria and Parks Canada which began in 2003 and is investigating concentrations of contaminants in Arctic Char and monitoring contaminants at Lake Hazen on Ellesmere Island.

Water quality samples were obtained and XAD columns were ran from Blister Creek, Skeleton Creek and three stations on the Lake Hazen.

Water Filtering at Lake Hazen

Water and XAD column sampling stations:

Lake station #1 (centre of lake) – lake depth 265 meters
N 81°49'27", W 70°43'46.9"
Lake station #2 (SW end) – lake depth 62.2 meters
N 81°43'46.9", W 72°08'24.0"
Lake station #3 (NE end) – lake depth 123 meters
N 81°54'20.1", W 69°27'59.7"
Skeleton Creek (same location as last year) - N 81°49'49.8", W 71°19'47.6"
Blister Creek (near mouth) - N 81°48'29.6", W 71°32'17.9"

A bathymetric survey of the lake was also undertaken in an attempt to find the deeper parts of the lake and to develop a bathymetric map. Previously only a few soundings with visual locations were known. One hundred and seventy-two spot soundings were obtained through 1.7 meters of ice using a Lowrance LCX-15MT GPS/sounder and a dual frequency 200/50 kHz pole mounted transducer. These positions were then entered into a spreadsheet and a rough bathymetric map was produced.

Otolith, liver and muscle samples were obtained from five Arctic Char which were caught by Parks staff angling near the entrance to Ruggles River. These samples were kept frozen and delivered to X. Wang, AEPRB.

Flight logistics on Parks Canada chartered flight to and from Lake Hazen, along with accommodation at Resolute Bay, tents, sleeping cots, ice auger and various other field equipment were provided by the Polar Continental Shelf Project PCSP, NRCan. Parks Canada personnel at Quttinirpaaq National Park were very helpful and provided snowmobiles with sleds and the use of the kitchen weather haven while at Lake Hazen. Accommodation was in tents at the Hazen Camp.

ONTARIO WIDE SAMPLING OF LAKES FOR PESTICIDE ANALYSES
AEPRB STUDY 12310, DR. D. MUIR

May 5, 2004 began the continuation of the three year study to determine the spatial and temporal trends of currently used pesticides in surface waters and precipitation. This project would encompass ten lakes (see list) that have been chosen throughout Ontario ranging from north to south. The project, headed by Dr. Muir, examined approximately 45 target analytes. These have been selected based on the criteria's of Pesticide Management Regulatory Act priorities, semi-volatile properties, long range transport potential, as well as previous reports of Canadian surface water and precipitation.

There were three field trips scheduled for this project for each of the primary spraying months of May, June and July. However, it was decided that the lakes in the southern region were to be sampled preseason so an additional trip was scheduled for early May. The sampling that took place at the selected lakes included 1000L of centrifuged water @ 6L /min (at specified sites), zooplankton net hauls, water quality samples, Hydrolab profiles and 20L water samples filtered through a GFF filter from depths determined from the Hydrolab. The filtered water that was collected was spiked with d5-Atrazine then pumped through a resin column to extract the analyates. These columns were labeled and kept on ice. The water samples that were collected for water quality included Chlorophyll, TN unfiltered, TN filtered, TP filtered, TP unfiltered and CHN. These were processed during the extraction procedure and then stored according to established procedures for the specific sample. Two wet-only precipitation samplers were also installed at two locations. These locations included the Dorset Research Centre, and the Turkey Lakes Watershed Project exclusively. These samplers had been fitted with a resin column that would allow the precipitation collected to run through by gravity. After running through the column the water was collected in a reservoir to determine the amount that had been filtered. These samplers were refurbished during each of the field trips with the results recorded.

The southern area lakes were sampled using a small 14ft aluminum boat with a 8.0 horsepower motor due to the horsepower restriction rule in effect on Bells Lake. An inflatable Zodiac boat was used during centrifuging at Bells Lake whereby the centrifuge and generator was set up in the Zodiac then towed behind the small boat. This method was stable and a definite asset given the sampling and space situation. Lake Wawanaosh had a restriction on gas powered engines; therefore an electric motor was used to complete the sampling.

For the trips to the central/northern region, a P-boat was utilized for sampling as an all in one boat. The deck space and cabin was effective for setting up a portable lab able to run the samples. The sampling that was performed at the Turkey Lakes (northern) was completed using on site equipment. Boats, electric motors, ATV's and the lab were a definite asset that allowed for the sampling to be completed and processed effectively.

During the length of the project, sampling methodologies and positions were kept consistent during each of the field trips. After completing a total analysis of the results, it will be decided if this study will continue with as many sampling dates, or whether it will become less intensive.

Lake and Location	Position (WGS 84)
Turnbull Lake Ayr, ON	43° 16.023 80° 25.028
Lake Wawanosh Lucknow, ON	43° 52.964 81° 29.452
Bells Lake North Durham, ON	44° 19.384 80° 44.179
Plastic Lake Dorset, ON	45° 10.866 78° 49.231
Lake Opeongo Algonquin Park, ON	45° 41.059 78° 22.382
Wavy Lake Sudbury, ON	46° 17.918 81° 05.866
Windy Lake Sudbury, ON	46° 36.427 81° 27.281
Flack Lake Mississagi Provincial Park, ON	46° 35.527 82° 47.068
Batchawana Lake Turkeys Lakes Project, ON	47° 03.825 84° 23.508
Big Turkey Lake Turkey Lakes Project, ON	47° 02.913 84° 25.325

FISH BIOASSAY
AEPRB STUDY 12345, DR. J. PARROT

Once again this year, water (2 x 200L barrels), were collected on a weekly basis from 20 Mile Creek at Jordan Station. In addition water was also collected from the Red Hill Creek downstream from the Hamilton STP, Hamilton Harbour near the Burlington STP, as well as at two sites along the Grand River in Brantford. The first site was upstream from the Brantford water intake and the second was downstream from the Brantford STP.

Fat Head minnows are being raised in the water and researchers are studying the effect the water may have on fish reproduction. Studies will determine if the fish are able to reproduce and if the fry are deformed in any way.

FISH COLLECTION FROM AREA'S OF CONCERN, BAY OF QUINTE, CORNWALL, NIAGARA RIVER
AEPRB STUDY 12460, DR. SCOTT BROWN, DR. JIM SHERRY, DR. MARK McMASTER

Technical Operations supported this project between the dates of Sep. 06 - Nov.10, 2004. Areas of Concern (AOC's) have been established for the Great Lakes Basin and are found near populated centers with industries, mills and/or refineries on the shores of the Great Lakes and their rivers. Each Area of Concern has developed a Remedial Action Plan that guides restoration and protection efforts. All Remedial Action Plans must proceed through three stages. Stage One is to determine the severity and underlying causes of environmental degradation that make the location an Area of Concern. An Area could be degraded for a variety of reasons, such as excess nutrients in the water, bacteria or chemical contaminants in the environment, or loss of fish and wildlife habitat. Stage Two is to identify goals and recommend actions that will lead to the restoration and protection of ecosystem health. Stage Three is to implement recommended actions and measure progress of restoration and protection efforts in the Area of Concern to ensure the local goals have been met. The areas in this study are now in stage three and are being reassessed to determine how the reproductive health of the fish has been affected. Some of the outcomes from this research will assist in the possible delisting of the identified sites.

A Muskie that surfaced during the electro fishing sampling

The sampling that took place was completed using a recently purchased electro fishing boat. The boat sends an electric current into the water which stuns the fish momentarily allowing them to be collected for sampling. For this study two fish species, one a bottom feeder and the other a column feeder were selected for sampling. The Brown Bullhead and Yellow Perch were selected as the target species due to the high populations of each at the selected sites. Ideally, 20 mature males and 20 mature females of each species are sacrificed, dissected and analyzed for reproductive health indicators.

The sampling that occurred at each of the sites was intense due to the protocol that required the fish to be sampled within two hours of being caught. This required a mobile lab that was set up in a Haul Mark trailer in an assembly line arrangement. The fish would be processed as it moved down the line for specific protocols. In total 1089 fish were sampled from the ten selected sites.

Bay of Quinte Sites
-Trenton
-Deseronto
-Belleville

Niagara River Sites
-Queenston
-Black Creek
-Point Abino (reference site)

St. Lawrence (Cornwall)
-Raisin River
-Cornwall
-Morrisburg(reference site)

Lake Ontario (reference site)
-Prince Edwards Bay

NATIONAL LABORATORY FOR ENVIRONMENTAL TESTING

INTERLABORATORY QUALITY ASSURANCE PROGRAM, WESTERN AND NORTHERN CANADA

NLET STUDY12180, H. ALKEMA

As part of an ongoing interlaboratory proficiency testing program, large volume water samples were collected at four sites. These sites were; Bow River at Bow Park, Fire station 10, 1711 - 20th Street, Calgary, Alberta, Athabasca River at the Weldwood Bridge, Hinton, Alberta and the last site was at the Hay River winter crossing in Hay River, NWT. These samples will be used to provide performance evaluation check samples and standards given to agencies such as the Canadian Association for Environmental Analytical Laboratories (CAEAL), MITE-RN, GEMS and other associated agencies. NLET also conducts specific Interlaboratory Quality Assurance Studies which are designed, prepared and distributed, on a cost recovery basis, to several hundred environmental laboratories in Canada and around the world. The studies cover lake and river water, precipitation, and sediments for both inorganic and organic constituents and they define the parameter-specific performance of laboratories for long-term environmental monitoring and surveillance programs.

BUILDING AND PROPERTY TECHNICAL SERVICES

ANNUAL MAINTENANCE OF THE NWRI WAVES TOWER
BPTS STUDY 12702, S. PETTIT

The NWRI Waves Tower is situated in Lake Ontario, 1.1 km off Van Wagners Beach in 12 m of water. It has been utilized over the past 28 years as a platform for a variety of studies; ranging from atmospheric, weather and climate to the study of hydrodynamic processes; wave and sediment dynamics. The facility is supported by shore power (575 V, 60 A, 3Ø60Hz) and has the ability to house weather sensitive electronics on its 100 m^2 upper deck. As such, it has been utilized by Institute staff as well as various outside agencies as a unique platform on a large water body.

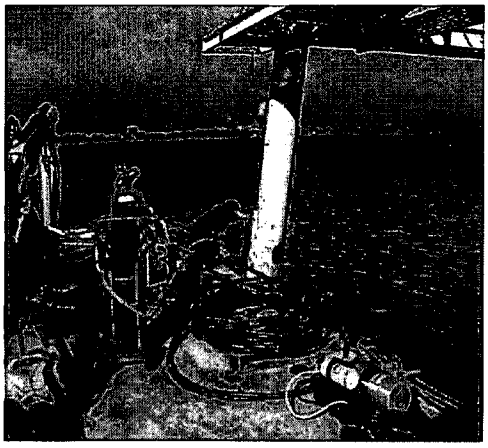
Yearly the structure is inspected for integrity of welded joints, as well as the surface integrity of the (4) support columns, with particular emphasis on the air/water interface. Overall the structure's integrity was found to be sound in 2004. However, the epoxy coating between the low and high water marks has been largely removed by wave and ice scouring. Work was carried out by TOS divers between August and November 2004, to address this problem. Approximately 200 person/hours spread over 15 days has been expended to date, with 90% of the work completed.

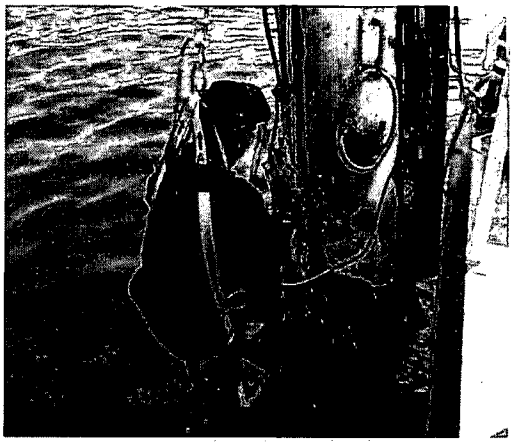
After a preliminary assessment, the work was carried out in 3 phases;

- Initially zebra mussels and Cladophora were removed from pilings using a pressure washer and/or wire brushes.
- Then any extraneous hardware, brackets or outstanding welds were removed using a cutting torch (above-water) and hydraulic grinding or cutting wheels (under-water). This phase proved to be the bulk of the job from a time stand point, as well as being the most physically demanding for the divers and support staff.
- Finally a heavy wrap, impregnated with a rust inhibition compound, was applied to the pilings, followed by heavy gauge PVC sheathing. This sheathing was overlapped and bolted in place and provided coverage 5 feet above the water and approximately 10 feet below the air/water interface. (DENSO North America, Inc.)

Additional work was carried out on the south-east leg to accommodate the 3-phase power cables running up this leg. The existing channel covering was cut off by W. Wong, ES, and a new section of channel, fabricated by the Engineering shop was installed. This 16 foot section was deployed to cover the cables and was held in place using stainless "bandit" over the PVC sheathing. "Tygon" tubing was utilized to cushion the bandit and protect the PVC. Unfortunately at some phase of the work, continuity was lost in 1 of the 3 armoured power cables. It is assumed that a break in the cable, under the "armour" has occurred somewhere. At this time only 2-phase power is available on the structure, rendering the HIAB crane inoperable. Although unfortunate, this can be worked around if or when heavy equipment is needed on the site.

During much of the diving operations, TOS staff were also present carrying out the yearly upkeep, maintenance and painting of the above-water sections of the tower.





WORKING ON THE WAVE TOWER LEGS

RESEARCH SUPPORT BRANCH

SUPPORT TO ONTARIO REGION, DETROIT AND ST. CLAIR RIVER, ONTARIO
OUTSIDE AGENCY STUDY 12631, B. McCREA

This continuing study is looking at upstream and downstream contaminants in the Detroit and St. Clair Rivers in support of the Remedial Action Plans (RAPs). The parameters/contaminants of concern are: Nutrients, Major Ions, Metals, Mercury, Organochlorine Pesticides (DDT), Poly Chlorinated Biphenyls (PCB's), Dioxin and Furan. Emerging Contaminants are: Polychlorinated Alkanes, Polychlorinated Naphtalenes, Polybrominated Diphenyl Ethers, and Nonylphenols. Seven surveys were completed on the Detroit River and five on the St Clair River throughout the year.

Locations of Stations

Location	Latitude	Longitude	Northing	Easting	Field ID
Flemming Channel	42° 21' 10"	82° 55' 58"	4690743	340811	1120
Trenton Channel	42° 06' 28"	83° 10' 53"	4664046	319643	2210
Amherstburg Channel	42° 04' 42"	83° 07' 09"	4660647	324707	2240
Lake St. Clair	42° 21' 54"	83° 53' 53"	4692045	343702	4000
Livingstone Channel	42° 06' 26"	83° 08' 35"	4663913	322802	2215
Sugar Island	42° 05' 32"	83° 08' 48"	4662230	322468	2220
Lake Huron	43° 00' 33"	82° 24' 54"	4762793	384689	5000
Robert's Landing	42° 39' 47"	82° 30' 48"	4724498	375989	5110
Port Lambton	42° 39' 01"	82° 30' 28"	4723347	376412	5140

Infiltrex and Water Samples

Two infiltrex sampling units were deployed at each location, secured to a fast water buoy or a navigational aid. Water samples were collected and analyzed for the following parameters; Nutrients, Major Ions, Dissolved Organic Compound, Total Phosphorus, Metals, Mercury and Total Suspended Solids. The mercury sample was obtained by using the Isomet sampler.

Field Preparation

Technical Operation Services staff were involved in all pre and post field sample preparation.

VEHICLE SUMMARY - 2004 FIELD SEASON
RSB STUDY 12631 S.B. SMITH

The field season was extremely busy again this year. Mechanical repair time on any vehicle was very minimal.

Vehicle support was utilized for several different operational functions. These operational functions range from the transportation of various types of scientific samples and equipment, as well as the movement of personnel to and from common and remote field sites and for ship board operations.

A.R.I. Canada, "Automotive Rentals Incorporated", are still handling the procurement of all the vehicle fleet repairs and billing. A.R.I. is responsible for the upkeep and maintenance of all vehicle records such as mileage, fuel consumption, incidentals, repair costs, etc and for the payment of all associated repair costs. Records are still kept internally by Technical Operations Services. Vehicle mileage is sent to A.R.I. on a monthly basis. This company remains to be a very efficient and satisfying organization to deal with. It has cut down considerably on the amount of time and effort spent on doing monthly paper work for each vehicle in the fleet.

As usual the Institute saw the replacement of some aging vehicles in the fleet. The vehicle replacements are two dual wheel crew cabs and an extended cab 4x4 pick up truck.

The extensive geographical area covered this field season ranged from locations in the Northwest Territories, New Brunswick, Nova Scotia, Quebec, and Ontario. Some U.S destinations covered were various locations through out the states of New York, Michigan, Illinois, and Georgia.

From April 1, 2004 to present the NWRI fleet has traveled a combined mileage of 466553 km, a slight increase from 2003.

COMMON USER SUPPORT
RSB STUDY 12631, S.B. SMITH

Field stores are operated for use of the staff within the National Water Research Institute. Staff from other government departments and organizations such as Ontario Region, CWS, Fisheries & Oceans and outside agencies, such as Provincial and Municipal government

departments and universities also use the stores facility when arrangements are made with the Manager, Technical Operations Services and approval is granted by the Director General of NWRI.

Field stores is set up to issue Project Chiefs and Study Leaders with a variety of equipment such as: safety clothing, sediment and water samplers, surveying instruments, laboratory supplies, cameras, vehicles, etc. On return, items are inspected for damage, repaired if necessary and re-issued. Repairs are made in house or at local facilities. From January 1, 2004 to present there have been over 275 requisitions filled, with over 1500 items being issued for use in the field. The request for support from field stores is very high, particularly in the busy field season.

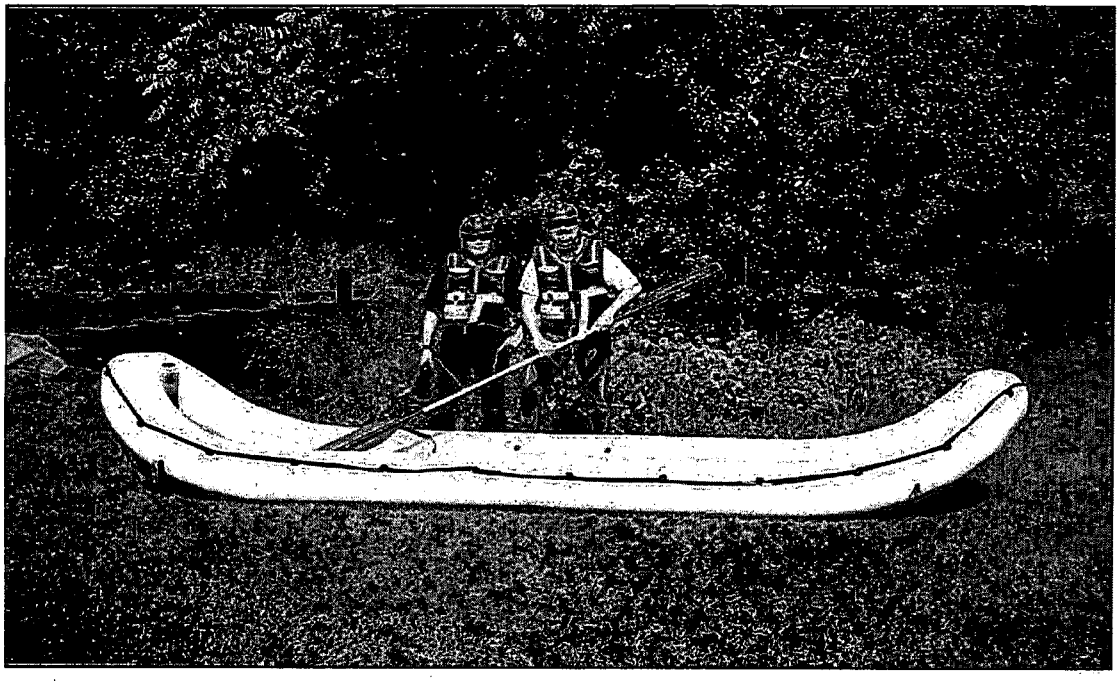
Passenger vehicles are scheduled and issued through field stores. At present time the fleet consists of, 3 station wagons, 1 sedan, 1 mini van, 8 full size vans, 5 crew cabs, 4 extended cab 4x4 pick up trucks and a variety of other specialized vehicles. Vehicle scheduling involves an average of 150 computer entries per month. The demand for vehicles seems to have hit, and stayed at a consistently high level through out the year. It seems that the field season is no longer the sole busiest time of the year for vehicle requests, which has been an on going trend for the past few years. The 407 ETR usages to date are at 382 trips for the 2004 field season, up from 329 in 2003.

BASIC SWIFT AND OPEN WATER RESCUE COURSE, ELORA GORGE
RSB STUDY 12633, D. GILROY

In July of this year, D. Gilroy and R. Neureuther attended a Level 1 Swift and Open Water River Rescue Course, taught by the Advanced Rescue Techniques School of Canada at the Elora Gorge. The purpose of the training was to evaluate the course.

During the two full days of the course, a lot of material was covered by the two instructors. On land practice and discussion led right into practical hands-on in water work on the river. The first day was set aside to familiarize the participants with the equipment and the river morphology. A few swift water swimming basics were also run through on the first day, as well as buoyant heaving line (throw bag) practice. The second day concentrated on rescue techniques from shore, along with aggressive in water swimming and recovery techniques, and boat and board rescues.

The course was excellent in terms of theory and practical work, and would be a very valuable course for anyone working around rivers or swift water. Some of the techniques learned in the course may be instituted into future or existing THA's related to rivers and swift water.



GETTING READY FOR THE WATER!

UNDERWATER/DIVING OPERATIONS
RSB STUDY 12634, B. GRAY

The Diving Operations Unit of Technical Operations Services, provides national and international support to a number of scientific studies. Support includes diver certification and training, inspections, installations and retrieval of hardware, sample collection, underwater video and still photography, equipment demonstrations/trials and search and recovery. The Diving Operations Unit supports 10 divers out of NWRI, Burlington. A total of 698 hours (accident free) were logged in support of 15 scientific programs this field season.

Collecting Zebra Mussels using the Airlift System

The Diving Operations Unit has a complete inventory of scientific diving and dive support equipment, as well as the logistical expertise to tackle the most difficult underwater operations.

The TOS Dive Studio/Library has the capability to edit raw video and still footage for scientific presentations or publications.

TOS also operates and maintains MURV, a remotely operated underwater vehicle. MURV is capable of a variety of underwater jobs, but is primarily tasked for deep water and long duration video recording.

Projects have included wreck mapping, sonar surveys, documentation of geological formations, recovery of scientific equipment, search and rescue, as well as live educational documentaries.

This season saw MURV pressed into service on Lake Erie for ADCP recovery operations. Unfortunately MURV's underwater housing experienced flooding and operations off the CCGS Limnos had to be shortened. The dive unit was able to recover the instrument at a later date, off a smaller vessel, the Parrot. Quick work by divers, as well as the outstanding electronic support of Engineering Services (ES) had MURV operational again, in record time.

This field season marked the second year divers were able, as a group, to travel to Tobermory and undergo a week of intensive training. Experienced staff took part in refresher training, while new divers were introduced to an array of equipment, gear, safety training and protocol. The group worked closely with Parks Canada staff as well as The Tobermory Hyperbaric Clinic on emergency response exercises.

Partnership initiatives with Parks Canada, underwater archeology unit (Ottawa), continue, with joint studies underway on equipment, training and administration.
Staff has hosted the Interdepartmental Dive Officers meetings for the last two years. This group presently drives the Interdepartmental Diving Directive for Environment and Parks Canada.

Projects supported during 2004-05 included:

STUDY #		STUDY TITLE
12240	M. Charlton, AEMRB	Lake Ontario, Hamilton Harbour
12212	F. Rosa, AEMRB	Rouyn/Noranda, Hamilton Harbour
12243	M. Skafel, AEMRB	Hamilton Harbour, Lake Ontario
12245	R. Yerubandi, AEMRB	Hamilton Harbour, Lake Erie
12246	C. Marvin, AEMRB	St. Clair River
12218	H. Biberhofer, AEMRB	Hamilton Harbour, Marathon, Cornwall
12212	I. Droppo, AEMRB	Hamilton Harbour
14173	J. Smith, AEIRB	Mussels, Walpole Island, Lake St. Clair
12242	K. Krishnappan, AEIRB	Hamilton Harbour, Marathon
12632	V. Richardson, ECB/EHD, OR	Lake Erie

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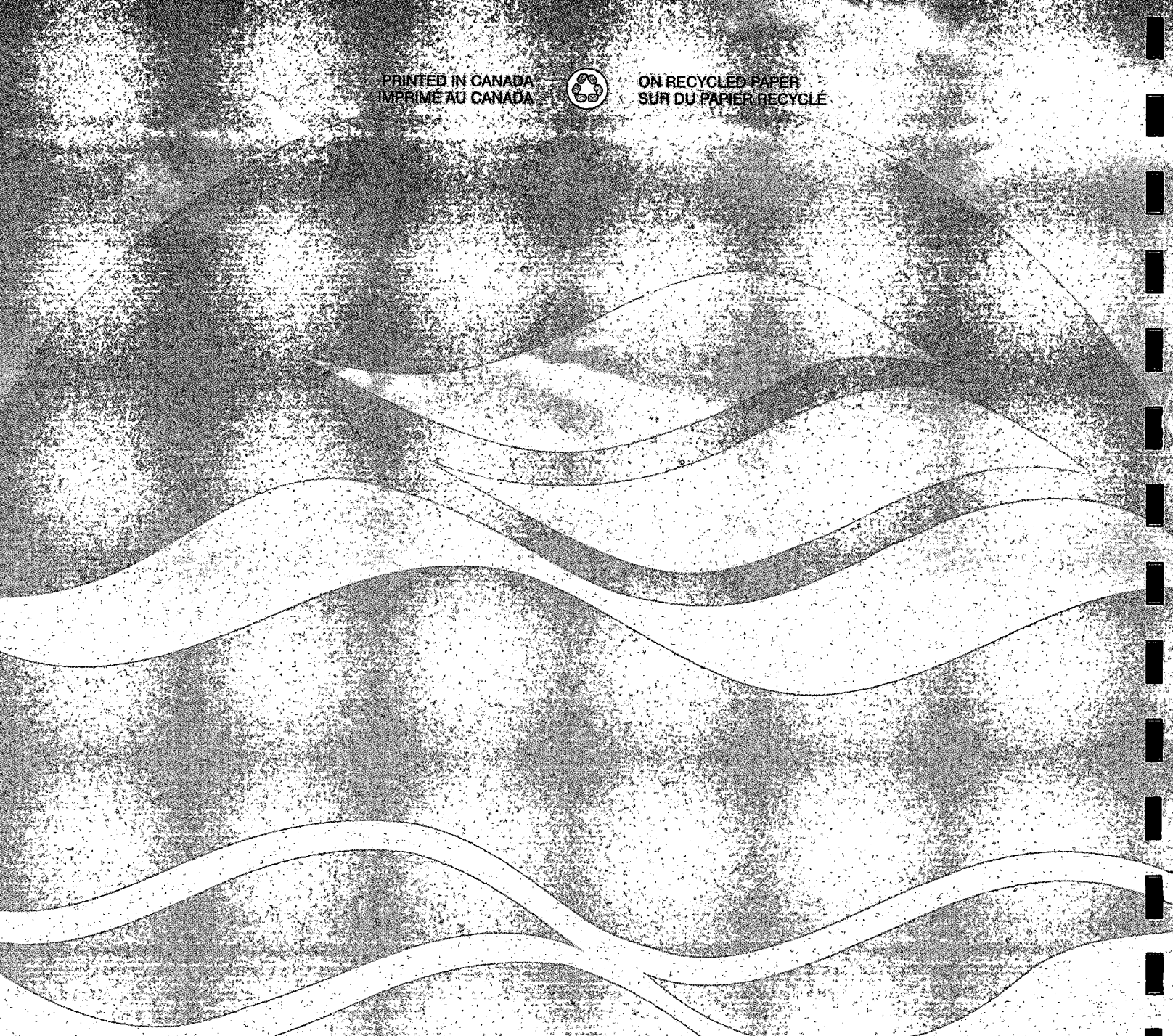

National Water Research Institute
Environment Canada
Canada Centre for Inland Waters
P.O. Box 5050
867 Lakeshore Road
Burlington, Ontario
L7R 4A6 Canada

National Hydrology Research Centre
11 Innovation Boulevard
Saskatoon, Saskatchewan
S7N 3H5 Canada

NATIONAL WATER RESEARCH INSTITUTE
INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

Institut national de recherche sur les eaux
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Case postale 5050
867, chemin Lakeshore
Burlington, Ontario
L7R 4A6 Canada

Centre national de recherche en hydrologie
11, boul. Innovation
Saskatoon, Saskatchewan
S7N 3H5 Canada

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