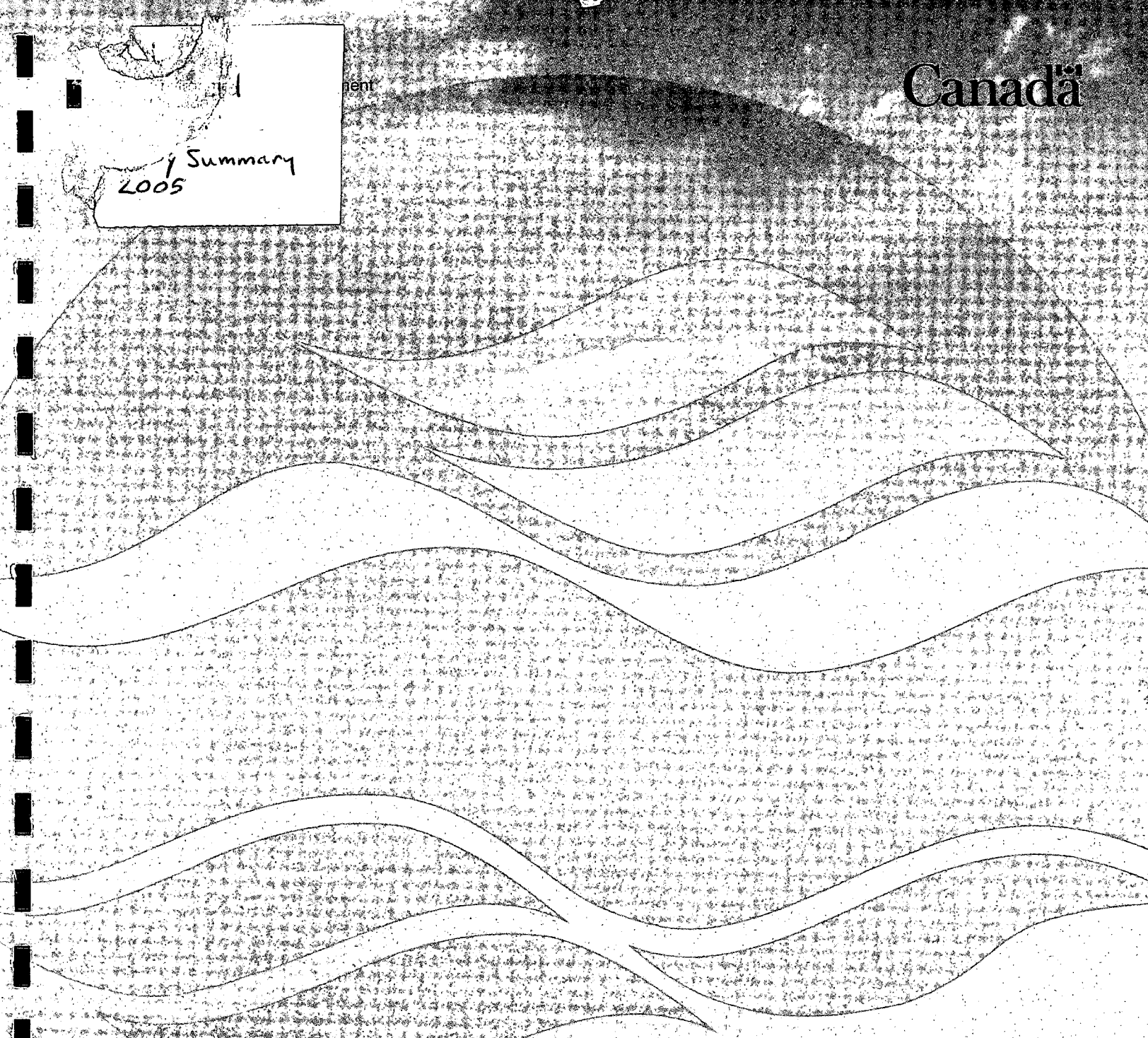
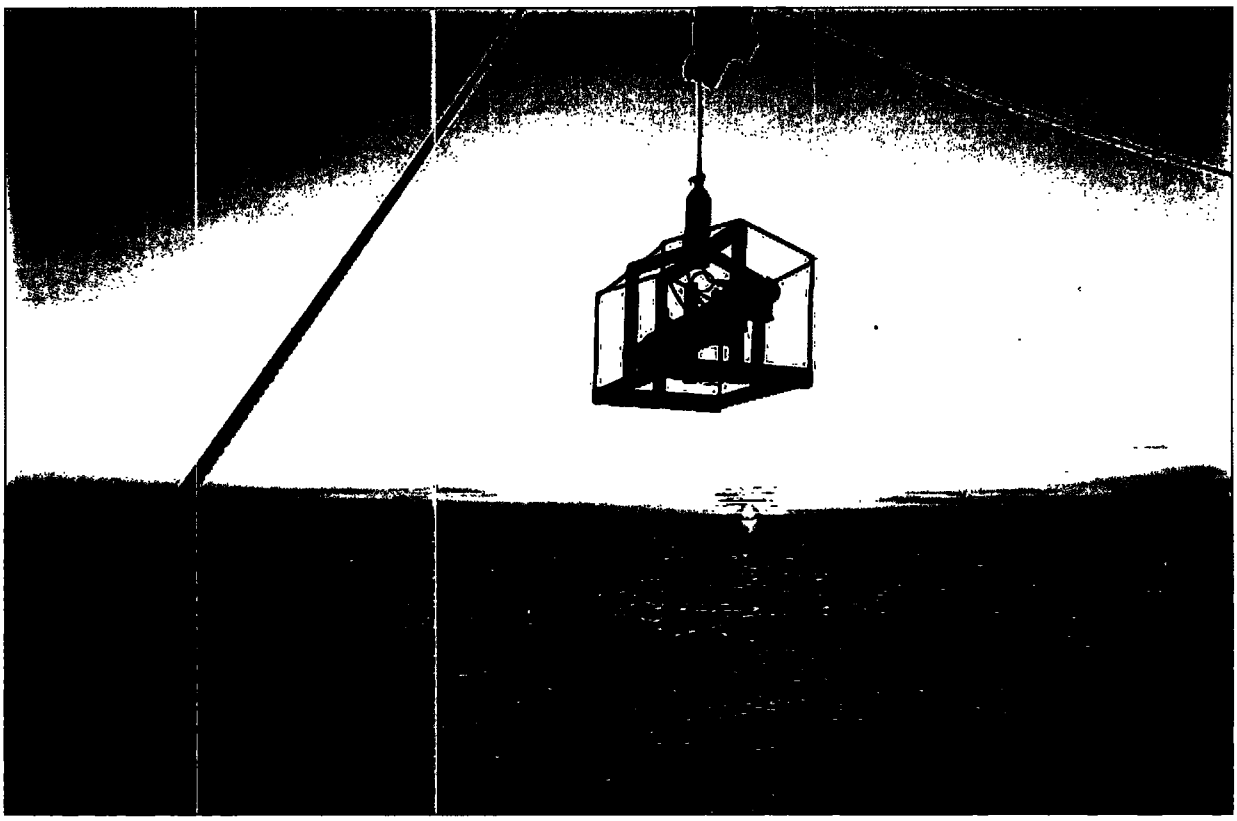
Summary
2005

Canada



NATIONAL WATER RESEARCH INSTITUTE
INSTITUT NATIONAL DE RECHERCHE SUR LES EAUX

2005
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 2005 field season.

STAFF LIST

RESEARCH SUPPORT BRANCH

Director	P.M. Healey
Executive Assistant	K. Faulkner
Manager, Finance & Administration	J. McAvella – until June 29, 2005
Manager, Finance & Administration	C. Perry – as of June 30, 2005
Administrative Assistant	P. McDevitt

TECHNICAL OPERATIONS SERVICES

Manager

M.R. Mawhinney – until June 24, 2005

OPERATIONS OFFICERS

B.H. Moore

OIC, CCGS LIMNOS –
until February 16, 2005

S.B. Smith	OIC, CCGS LIMNOS; OIC, CCGS SHARK; Detroit River; St. Clair River, North Channel, Ontario; Street Sweeping, Toronto, Ontario
D.A.D. Gilroy	Diving; OIC, CCGS LIMNOS
B.L. Gray	Diving; OIC, CCGS LIMNOS; Isle Royale, U.S.A.
T.G.D. Breedon	-appointed April 5, 2005 Diving; OIC, CCGS LIMNOS; Hamilton Harbour; Lake Ontario

MARINE TECHNOLOGISTS

T.G.D. Breedon	-until April 2, 2005 Diving; CCGS LIMNOS; Hamilton Harbour
R.J. Hess	OIC, CCGS LIMNOS; Cranberry Lake, New Jersey, U.S.A.
K.J. Hill	CCGS LIMNOS; Lake Ontario
G.G. LaHaie	OIC, Turkey Lakes Watershed Site
R.D. Neureuther	CCGS LIMNOS; Drilling; Ottawa; Lake Ontario; Amberley Beaches; Street Sweeping, Toronto; Black Bay
C.H. Talbot	CCGS LIMNOS; Drilling; Groundwater; Point Pelee; Royal Botanical Gardens; Kincardine; Lake Hazen; Hamilton Harbour
E.H. Walker	CCGS LIMNOS; Parry Sound; North Channel; Ottawa; Amberley Beach; Wheatley; Restoule; Street Sweeping, Toronto

ASSISTANT MARINE TECHNOLOGISTS

L.M. Benner	Diving; CCGS LIMNOS; North Channel; Trenton; Lake Ontario tributaries; Amberley & Tiny Beaches
B. Lalonde	CCGS LIMNOS; North Channel; Bay Of Quinte; North West Territories; Trenton; St. Clair; Ottawa; Turkey Lakes Watershed; Nottasawaga; Lake Erie tributaries; Black Bay; Street Sweeping, Toronto; Surveying
T. Mamone	CCGS LIMNOS; Cranberry Lake, New Jersey, U.S.A; Hamilton Harbour; Prairies; North Channel; South-Western Ontario
D.P. Walsh	CCGS LIMNOS; Isle Royale, U.S.A; Devon Island; Electrofishing; Quebec; Lake Erie tributaries; Trenton
C. Yanch	CCGS LIMNOS; Prairies; Ottawa; Street Sweeping, Toronto

MARINE TECHNICIAN

A. Morden	-appointed June 20, 2005 CCGS LIMNOS; Hamilton Harbour; Lake Ontario; North Channel; Tiny Beaches; Turkey Lakes Watershed

RIGGING UNIT

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

NWRI FIELD STORES

C.J. Lomas

T.C. Gilliss

FSWEP SUMMER STUDENTS

A. Jacobs	CCGS LIMNOS; Hamilton Harbour
M. Mordue	CCGS LIMNOS; Hamilton Harbour
T. Morris	CCGS LIMNOS; Hamilton Harbour
K. Norlund	CCGS LIMNOS; Hamilton Harbour

YMCA INTERNS

S. Rogers	-placement ended July 22, 2005 CCGS LIMNOS; Hamilton Harbour
D. Kirkley	-placement started November 1, 2005 Hamilton Harbour

C.C.G.S. LIMNOS

2005 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 / 30	24 / 31	25	26	27	28	29

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					

MARCH 2005

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 DRYDOCK - HEDDLE MARINE	30	31		

APRIL

SUN	MON	TUE	WED	THUR	FRI	SAT
					1 CCIW	2 CCIW
3 CCIW	CCIW	5 LAKE ONTARIO MOORINGS MARVIN-AEMRB	6	7 CCIW	8 CCIW	9 CCIW
10 CCIW	11	12 LAKE ONTARIO SURVEILLANCE DOVE - ONT. REG.	13	14	15	16 CCIW
17 CCIW	18	19 LAKE ERIE MOORINGS YERUBANDI - AEMRB	20	21	22	23 SARNIA
24 SARNIA	25	26 DETROIT RIVER CORRIDOR MOORINGS MARVIN - AEMRB	27	28	29	30 PORT. COLB.

MAY

SUN	MON	TUE	WED	THUR	FRI	SAT
1 PORT. COLB.	2	3 LAKE ERIE G.R.I.P. SURVEY CHARLTON/BUKATA/WATSON - AEMRB	4	5	6	7 CCIW
8 CCIW	9 CCIW	10	11 DRYDOCK - HEDDLE MARINE	12	13	14
15	16 DRYDOCK - HEDDLE MARINE	17	18	19 CCIW	20 CCIW CANAL	21 LAKE ERIE TRANSIT
22	23	24 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	25	26	27	28
29	30 L. SUPERIOR SURV. - DOVE . DFO SCIENCE COLLAB.	31				

JUNE

SUN	MON	TUE	WED	THUR	FRI	SAT
			1	2 L. SUPERIOR SURV. - DOVE . DFO SCIENCE COLLAB.	3	4
5	6 L. SUPERIOR SURV. - DOVE . DFO SCIENCE COLLAB.	7	8 MILANI - AEIRB THUNDER BAY, AOC			
12	13 MILANI - AEIRB	14 THUNDER BAY, AOC	15	16	17	18 SSM
19 SSM	20	21 LAKE HURON/GEORGIAN BAY CHARLTON- AEMRB	22	23	24	25 ABURG
26 ABURG	27	28 VESSEL NON-OPERATIONAL	29	30		ABURG

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
					1	2
3 ABURG	4	5 LAKE ERIE MOORINGS YERUBANDI - AEMRB	6	7	8	9 PORT. COLB.
10 PORT. COLB.	LAKE ERIE CARBON CYCLE STUDY BOURBONNIERE -AEIRB					16 PORT. COLB.
17 PORT. COLB.	18	19 LAKE ERIE G.R.I.P. SURVEY CHARLTON/BUKATA/WATSON - AEMRB	20	21	22	23 ABURG
24 ABURG / SARNIA 31	25	26 DETROIT RIVER CORRIDOR MOORINGS MARVIN - AEMRB	27	28	29	30 SARNIA

AUGUST

SUN	MON	TUE	WED	THUR	FRI	SAT
SARNIA	1	2 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	3	4	5	6
7	8	9 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	10	11	12	13
14	15	16 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	17	18	19	20 ABURG
21 ABURG	LAKE ERIE CARBON CYCLE STUDY BOURBONNIERE -AEIRB					27 CCIW
28 CCIW	29	30 LAKE ONTARIO TASTE AND ODOUR CHARLTON/WATSON - AEMRB	31			CCIW

SEPTEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
CCIW		LAKE ONTARIO TASTE AND ODOUR CHARLTON/WATSON - AEMRB		1	2	3 CCIW
4 CCIW	5	6 VESSEL NON-OPERATIONAL	7	8	9	10 CCIW
11 CCIW	12	13 VESSEL NON-OPERATIONAL	14	15	16	17 CCIW
18 CCIW	19	20 LAKE ERIE G.R.I.P. SURVEY CHARLTON/BUKATA/WATSON - AEMRB	21	22	23	24 SARNIA
25 SARNIA	26	27 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	28	29	30	

OCTOBER

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	4	5	6	7	8
9	10 LAKE SUPERIOR SURVEILLANCE - DOVE - ONT. REG. DFO SCIENCE COLLABORATION	11	12	13	14	15 SARNIA
16 SARNIA	17	18 LAKE ERIE MOORINGS YERUBANDI - AEMRB	19	20	21	22 CCIW
23 CCIW / 30	31	25 UNLOADING OF VESSEL	26	27	28	29 CCIW

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

AQUATIC ECOSYSTEMS MANAGEMENT BRANCH

ECOSYSTEMS HEALTH DIVISION ONTARIO REGION

VESSEL NON-OPERATIONAL CANADIAN COAST GUARD

AQUATIC ECOSYSTEMS IMPACT BRANCH

DFO SCIENCE COLLABORATION

VESSEL OUTFITTING/UNLOADING & VESSEL TRANSIT

MAY 24, 2005
D.GILROY

SHIP PROGRAMS

LAKE ERIE CARBON CYCLE STUDY
AEIRB Study 14150, R. Bourbonniere

This work consisted of 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.

Microcystis aeruginosa has been a major problem in the lakes since 1995. Studies in 2005 continued the monitoring efforts utilizing master sites (Sandusky Basin, station 882 and station 357). During these two cruises, July 11 - 17 and August 22 - 26, samples were collected from the generation of molecular DNA libraries to identify members of this consortium.

Samples were taken as part of this project to satisfy needs for two ongoing studies:

Carbon Dynamics in Lake Erie: Samples were collected throughout the central and western basin of Lake Erie to look at carbon production and transformation mechanisms. Biomass of primary producers (inferred from chlorophyll a), system biogeochemistry (dissolved and particulate P, biologically associated P, NO2, NH4, DIC and DOC were all assessed. Samples were collected for the genomic analysis of microbial community structure as well as to ascertain the genetic potential of the microbial community with respect to the bioprocessing of anthropogenics during oxic and hypoxic conditions. Samples were also collected in collaboration with the Twiss research group to look at the potential remobilization of bioactive metals during hypoxia in the Lake Erie dead zone.

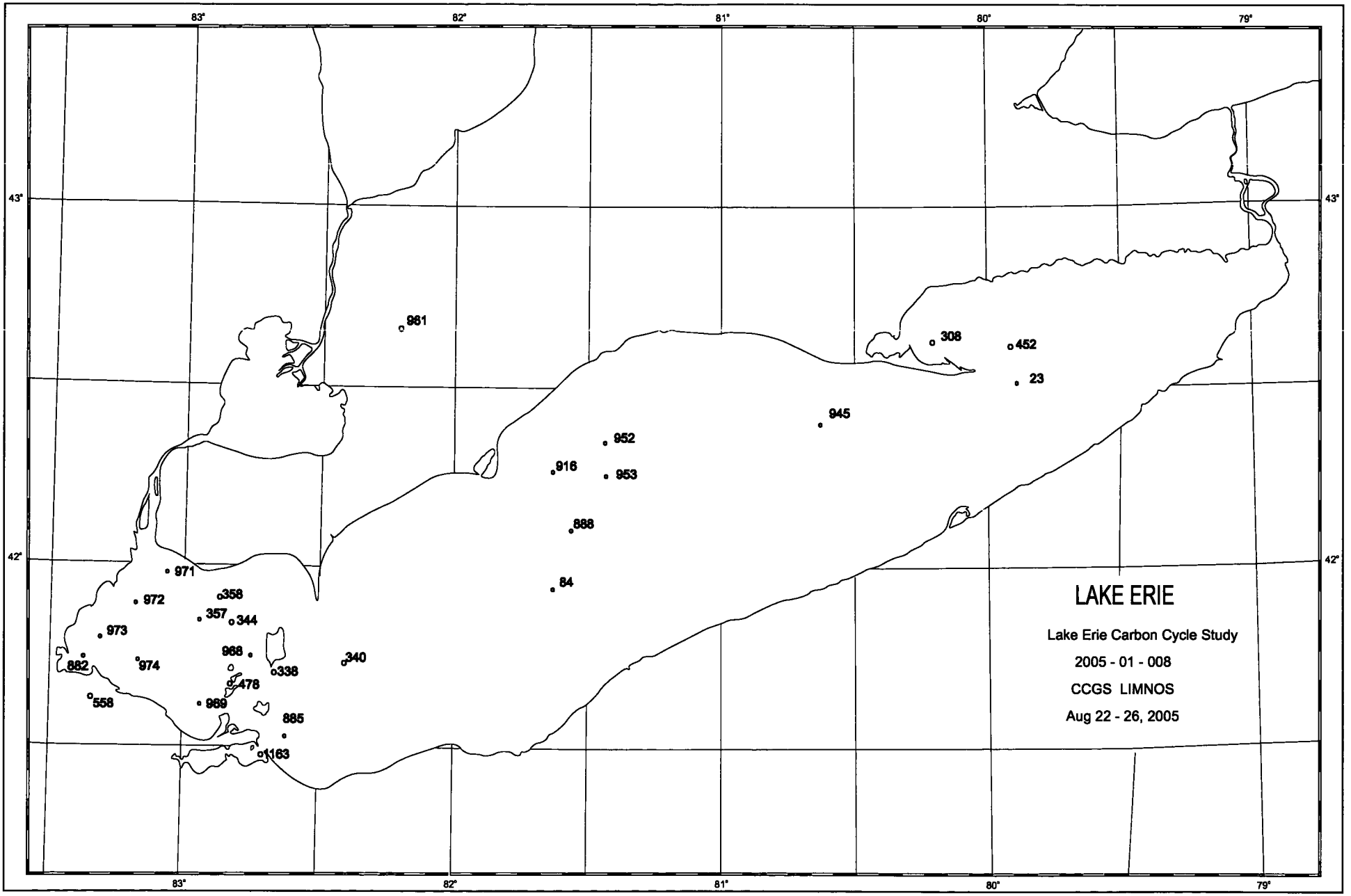
Toxic Cyanobacteria in Lake Erie: Samples were collected in Sandusky Bay, the Maumee River, the Sandusky sub-basin and throughout the western basin of Lake Erie to monitor the genetic diversity (via various DNA targets) as well as activity (via various RNA molecular targets). Samples were also collected to examine various cyanotoxins from surface waters, for the isolation of potentially novel toxigenic species, and for direct cell counts of the toxic filamentous cyanobacteria that dominate some parts of Lake Erie where the hepatotoxin microcystin is detectable, but no toxic Microcystis spp. can be found.

STATION POSITIONS

LAKE ERIE

2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 06"	79° 53' 24"
84	41° 56' 03"	81° 39' 35"
308	42° 38' 00"	80° 16' 00"
338	41° 42' 00"	82° 38' 00"
340	41° 45' 24"	82° 24' 00"
344	41° 47' 00"	82° 50' 30"
357	41° 48' 42"	82° 59' 01"
358	41° 53' 39"	82° 51' 59"
452	42° 35' 03"	79° 55' 14"
478 (Put in Bay)	41° 39' 33"	82° 49' 00"
558 (Maumee River)	41° 39' 33"	82° 49' 00"
882	41° 44' 02"	83° 23' 08"
885	41° 41' 56"	83° 27' 39"
888	41° 44' 02"	83° 23' 08"
916	41° 31' 10"	82° 38' 27"
945	42° 06' 36"	81° 34' 30"
952	42° 16' 52"	81° 40' 19"
953	42° 24' 00"	80° 38' 30"
961	42° 21' 30"	81° 26' 30"
968	42° 12' 30"	81° 26' 30"
969	41° 54' 30"	82° 11' 00"
971	41° 44' 30"	82° 44' 00"
972	41° 36' 30"	82° 55' 30"
973	41° 57' 00"	83° 03' 00"
974	41° 52' 00"	83° 12' 00"
1163 (Sandusky)	41° 47' 30"	83° 20' 00"
1191 (Maumee River)	41° 43' 31"	83° 09' 00"


83°
82°
81°
80°
79°
43°
42°
961
308
452
23
945
952
916
953
888
971
84
972
358
357
344
973
968
340
882
974
338
478
558
969
885
1163
LAKE ERIE
Lake Erie Carbon Cycle Study
2005 - 01 - 008
CCGS LIMNOS
Aug 22 - 26, 2005

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

This study was undertaken to collect mini box cores from representative stations in Lake Superior and Thunder Bay Harbour 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. Samples were also collected in Carden Cove near Marathon to confirm mercury concentrations in the sediment in that area. Work was done from the CCGS LIMNOS and from the launch PELICAN carried onboard the LIMNOS during the cruise, June 9 - 16, 2005.

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 for organic analysis in a hexane-rinsed glass bottle covered with a hexane-rinsed piece of tin foil before the lid was placed on. Samples stored at 4°C.

b) 100 ml for particle size in a plastic pill jar. Samples stored at 4°C.

c) 500 ml for major ions, trace metals, loss on ignition, total organic carbon, total Kjeldahl nitrogen, total phosphorus in a plastic tub. Samples stored at 4°C.

d) 300 ml for organic contaminant analysis in a pre-cleaned amber glass jar. Samples were frozen.

e) 250 ml for mercury analysis in a polyethylene container. Samples were frozen.

At all stations a picture of the sediment (in tray) with the sample ID and date included was taken.

At all stations in Thunder Bay Harbour, five mini PONAR samples were obtained for bioassay experiments. Samples were placed in the bags provided and all air was removed. Samples were stored at 4°C.

At stations 303 and 515, 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.

Additional tasks completed on the cruise were the installation of a current meter mooring in Peninsula Harbour and a video survey of the bottom in Carden Cove for H. Biberhofer, AEMRB and the collection of five 200 litre barrels of water at station 84 in Lake Superior.

STATION POSITIONS

AREAS OF CONCERN
THUNDER BAY HARBOUR
2005 - 2006

STATION NUMBER	AEMRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING	EASTING
511	S05_01	48° 27' 16"	89° 10' 00"	5369070.6	339800.8
512	S05_02	48° 27' 06"	89° 10' 16"	5368794.6	339463.2
513	S05_03	48° 27' 16"	89° 10' 30"	5369103.5	339187.5
514	S05_04	48° 26' 58"	89° 10' 26"	5368941.9	339149.1
515	S05_05*	48° 27' 01"	89° 10' 37"	5368633.0	339136.0
516	S05_06	48° 26' 52"	89° 10' 28"	5368348.1	339208.3
517	S05_07b	48° 26' 48"	89° 10' 40"	5368225.5	338957.8
518	S05_08	48° 26' 51"	89° 10' 50"	5368363.8	338794.1
519	S05_09	48° 27' 03"	89° 10' 50"	5368707.47	338774.63
520	S05_10	48° 27' 04"	89° 10' 59"	5368733.6	338576.5
521	S05_11	48° 27' 15"	89° 09' 57"	5369039.8	339867.4
522	S05_12	48° 27' 05"	89° 10' 23"	5368746.3	339323.6
523	S05_13	48° 26' 58"	89° 10' 26"	5368537.5	339249.1
524	S05_14	48° 27' 05"	89° 10' 41"	5368766.8	338953.4
525	S05_15b	48° 26' 55"	89° 10' 42"	5368453.6	338931.1
530	S05_16	48° 26 57"	89° 10' 37"	5368529.3	339027.7

* = QA/QC station

STATION POSITIONS

REFERENCE STATIONS

LAKE SUPERIOR

2005 - 2006

STATION NUMBER	AEMRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING	EASTING
301	5101	48° 49' 18"	87° 44' 42"	5407909	445305
308	5108	48° 23' 43"	88° 35' 28"	5361458	382222
309	5109	48° 28' 06"	88° 35' 41"	5369584	382123
303	5103*	48° 48' 13"	87° 44' 57"	5405888.7	444996.0
531	51LS	48° 48' 47"	87° 45' 21"	5406938.4	444499.1

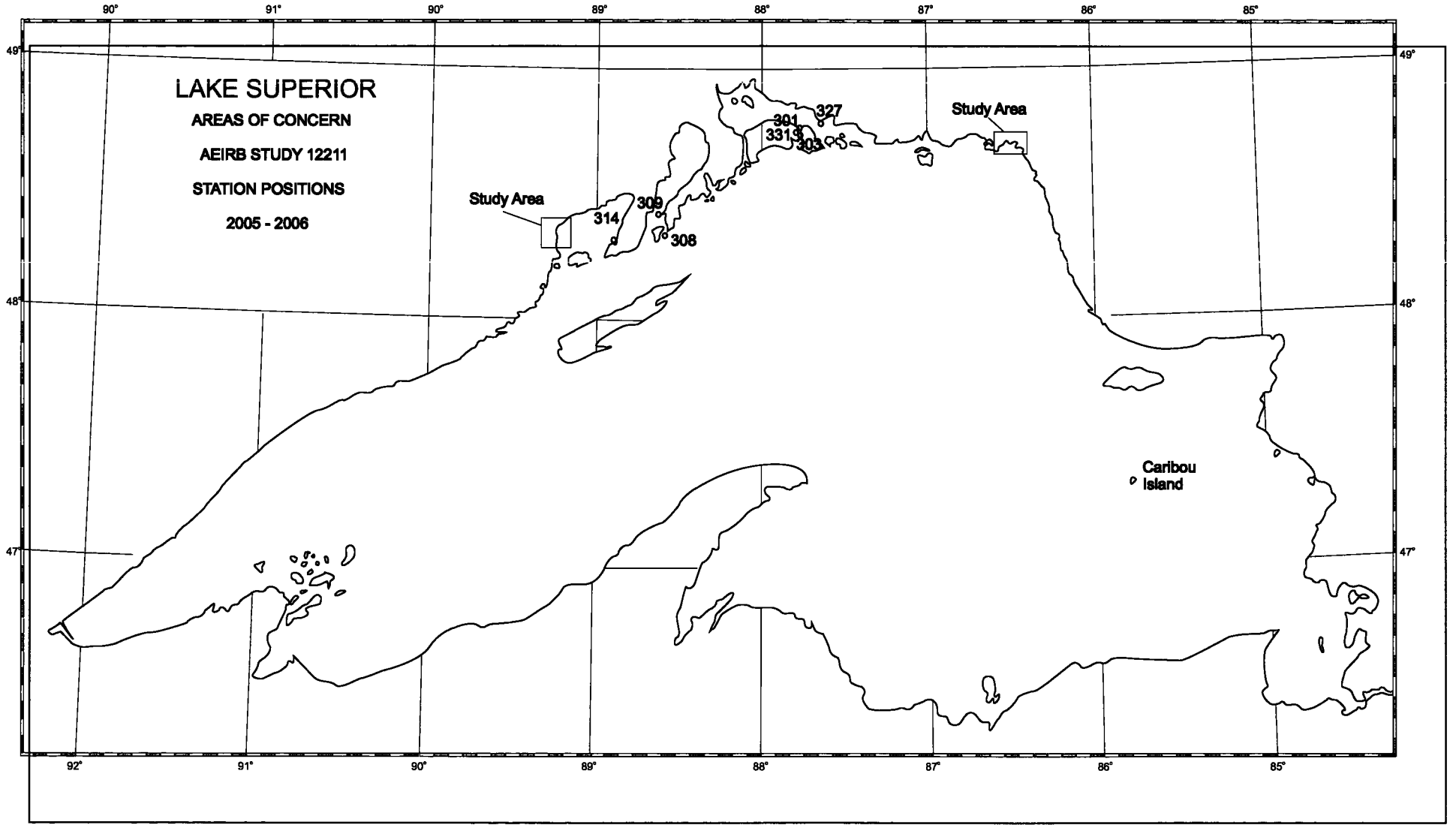
* = QA/QC station

STATION POSITIONS

PENINSULA HARBOUR
CARDEN COVE

2005 - 2006

STATION NUMBER	AEMRB NUMBER	LATITUDE N.	LONGITUDE W.	NORTHING	EASTING
526	PH15	48° 44' 33"	86° 23' 59"	5399015.3	544141.5
527	CC05-A	48° 44' 20"	86° 23' 58"	5398596.2	544155.7
528	2512	48° 45' 37"	86° 23' 44"	5400968.0	544429.0


LAKE SUPERIOR
AREAS OF CONCERN
AEIRB STUDY 12211
STATION POSITIONS
2005 - 2006
Study Area
Study Area
327
301
331
303
314
309
308
Caribou
Island
90°
91°
90°
89°
88°
87°
86°
85°
49°
48°
47°
92°
91°
90°
89°
88°
87°
86°
85°

AQUACULTURE IMPACTS CRUISE, LAKE HURON, GEORGIAN BAY AND THE NORTH CHANNEL
AEMRB STUDY 12240, M. CHARLTON

A single cruise was conducted from June 16 - June 21, 2005, to determine the impacts of the aquaculture industry on water quality in the North Channel, Northern Lake Huron, and Georgian Bay. The purpose was to see if public concern over the industry and its impacts on local aquatic ecosystems are factually based. The cruise was primarily focused around Manitoulin Island. Stations were selected from historical information, and the majority of the stations were existing surveillance cruise sites.

A total of 39 stations were occupied by the CCGS LIMNOS during the cruise. At all stations on the cruise the following parameters were sampled from 1m and bottom -2m if the water column was stratified, and from an integrator if the water column was isothermal: conductivity, pH, chlorophyll a, total phosphorus, total filtered phosphorus, and nutrients (soluble reactive phosphorus, nitrate-nitrite and ammonia). At areas selected by the scientific authority, a small launch was used to collect YSI profiles and water samples. Underwater video was also taken to record any impacts of the aquaculture sites and look at bottom composition. A total of 11 stations were occupied by the CCGL PELICAN during the cruise.

Additional tasks included perchlorate samples collected for Dr. C. Ptacek, AEMRB, from all nearshore stations. A number of net hauls were also collected at selected stations to try and identify the depth of water at which algae if any, was concentrated.

STATION POSITIONS

NORTH CHANNEL and LAKE HURON

STATION NUMBER	LATITUDE W.	LONGITUDE N.
18	46° 02' 30"	83° 08' 06"
50	45° 32' 04"	82° 02' 48"
52	45° 39' 05"	82° 38' 54"
58	45° 51' 47"	83° 15' 55"
59	45° 46' 06"	83° 01' 45"
60	45° 53' 53"	83° 31' 13"
67	45° 56' 03"	83° 54' 03"
68	46° 02' 29"	83° 51' 12"
69	46°04' 41"	84° 01' 41"
70	46° 08' 09"	83° 40' 18"
71	46° 13' 59"	83° 44' 48"
73	46° 11' 11"	83° 21' 16"
75	46° 05' 00"	83° 25' 06"
76	46° 00' 00"	83° 25' 59"
77	45° 58' 12"	83° 11' 54"
78	46° 01' 48"	82° 59' 47"
79	46° 07' 27"	82° 53' 07"
82	45° 56' 09"	82° 45' 27"
83	46° 00' 00"	82° 33' 01"
84	46° 05' 29"	82° 33' 27"
87	46° 03' 39"	82° 11' 49"
88	46° 03' 19"	82° 00' 01"
89	45° 54' 59"	82° 09' 38"
102	45° 59' 13"	81° 55' 26"
593	45° 36' 17"	81° 53' 18"

STATION POSITIONS

GEORGIAN BAY

STATION NUMBER	LATITUDE W.	LONGITUDE N.
33	45° 22' 13"	81° 35' 05"
35	45° 31' 37"	81° 40' 11"
36	45° 42' 28"	81° 37' 13"
42	45° 13' 18"	81° 49' 12"
45	45° 53' 27"	81° 46' 17"
46	45° 45' 51"	81° 48' 16"
47	45° 59' 11"	81° 43' 27"
50	45° 54' 29"	81° 40' 33"
53	45° 58' 41"	81° 54' 16"
256	45° 45' 24"	81° 48' 11"
457	45° 45' 24"	81° 48' 36"
458	45° 45' 24"	81° 48' 58"
459	45° 45' 25"	81° 49' 23"
460	45° 45' 23"	81° 47' 39"

SMALL VESSEL STATIONS

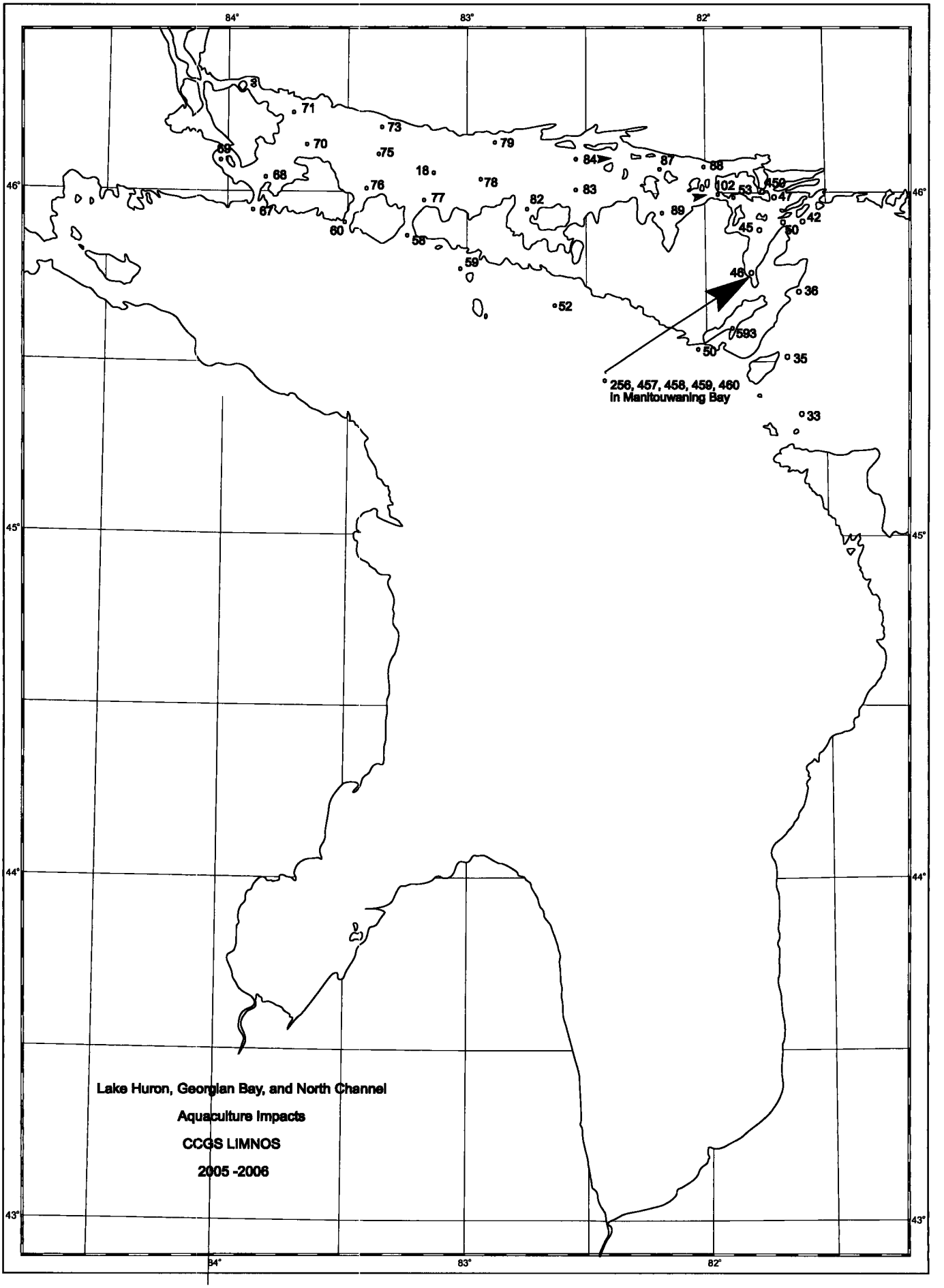
NORTH CHANNEL / LAKE HURON

STATION NUMBER	LATITUDE W.	LONGITUDE N.
173	45° 55' 36"	83° 50' 04"
174	45° 55' 08"	83° 50' 04"
175	45° 55' 14"	83° 37' 52"
176	45° 54' 24"	83° 32' 18"
177	46° 02' 26"	81° 58' 37"
178	46° 00' 37"	81° 58' 37"

SMALL VESSEL STATIONS

GEORGIAN BAY

STATION NUMBER	LATITUDE W.	LONGITUDE N.
450	45° 59' 51"	81° 45' 44"
257	45° 59' 58"	81° 46' 03"
258	45° 59' 56"	81° 46' 29"
259	46° 00' 28"	81° 46' 53"
260	46° 00' 18"	81° 45' 28"


84°
83°
82°
46°
45°
44°
43°
3
71
73
70
79
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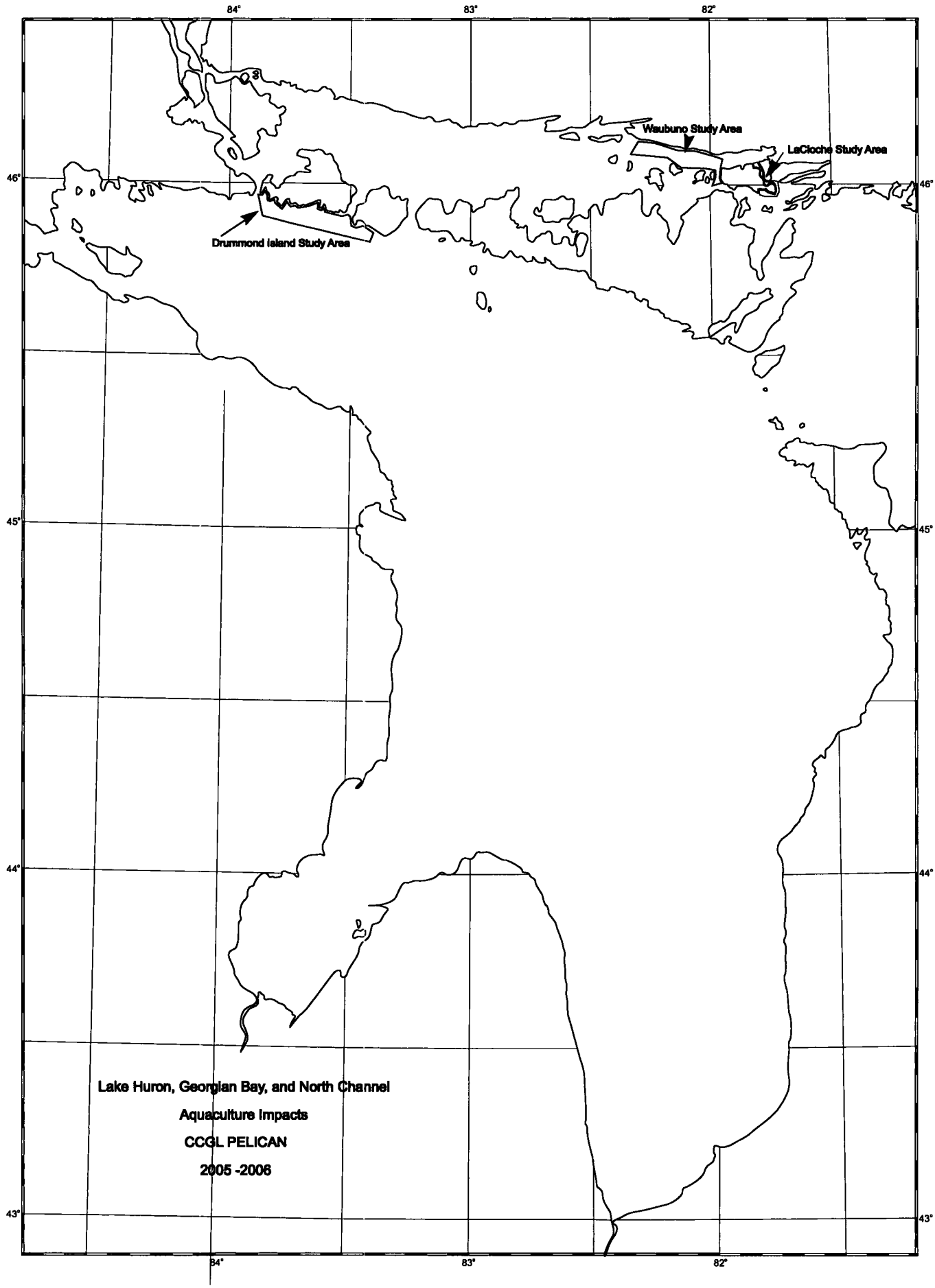
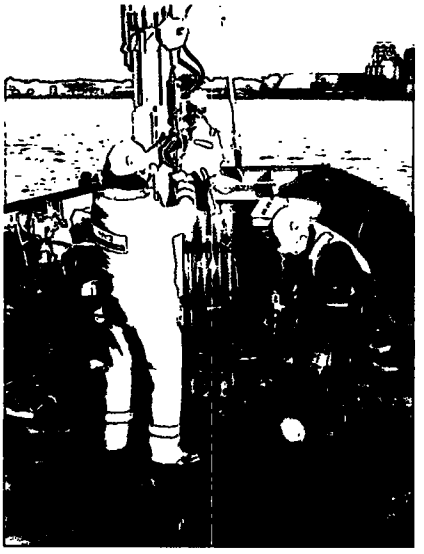
84
87
88
18
68
76
78
83
102
53
459
47
67
77
82
89
42
45
60
58
50
59
46
36
52
593
50
35
256, 457, 458, 459, 460
In Manitouwaning Bay
33
Lake Huron, Georgian Bay, and North Channel
Aquaculture Impacts
CCGS LIMNOS
2005 -2006

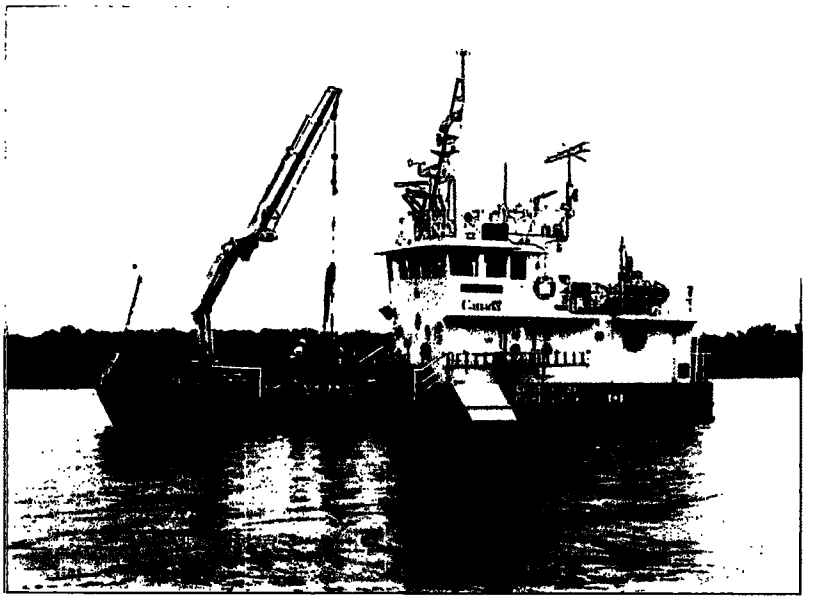

84°
83°
82°
46°
45°
44°
43°
Waubuno Study Area
LaCloche Study Area
Drummond Island Study Area
Lake Huron, Georgian Bay, and North Channel
Aquaculture Impacts
CCGL PELICAN
2005 -2006

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

A total of two cruises were carried out onboard the CCGS LIMNOS and five cruises onboard the CCGS GULL ISLE. The cruises onboard the CCGS LIMNOS took place on April 25 - 29 and July 25 - 29. The cruises onboard the CCGS GULL ISLE took place on the following dates: May 31 - June 1; June 27 - 30; August 29 - September 1; September 26 - 30; and October 31 - November 2.



Sediment traps were installed for Dr. C. Marvin at five 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.

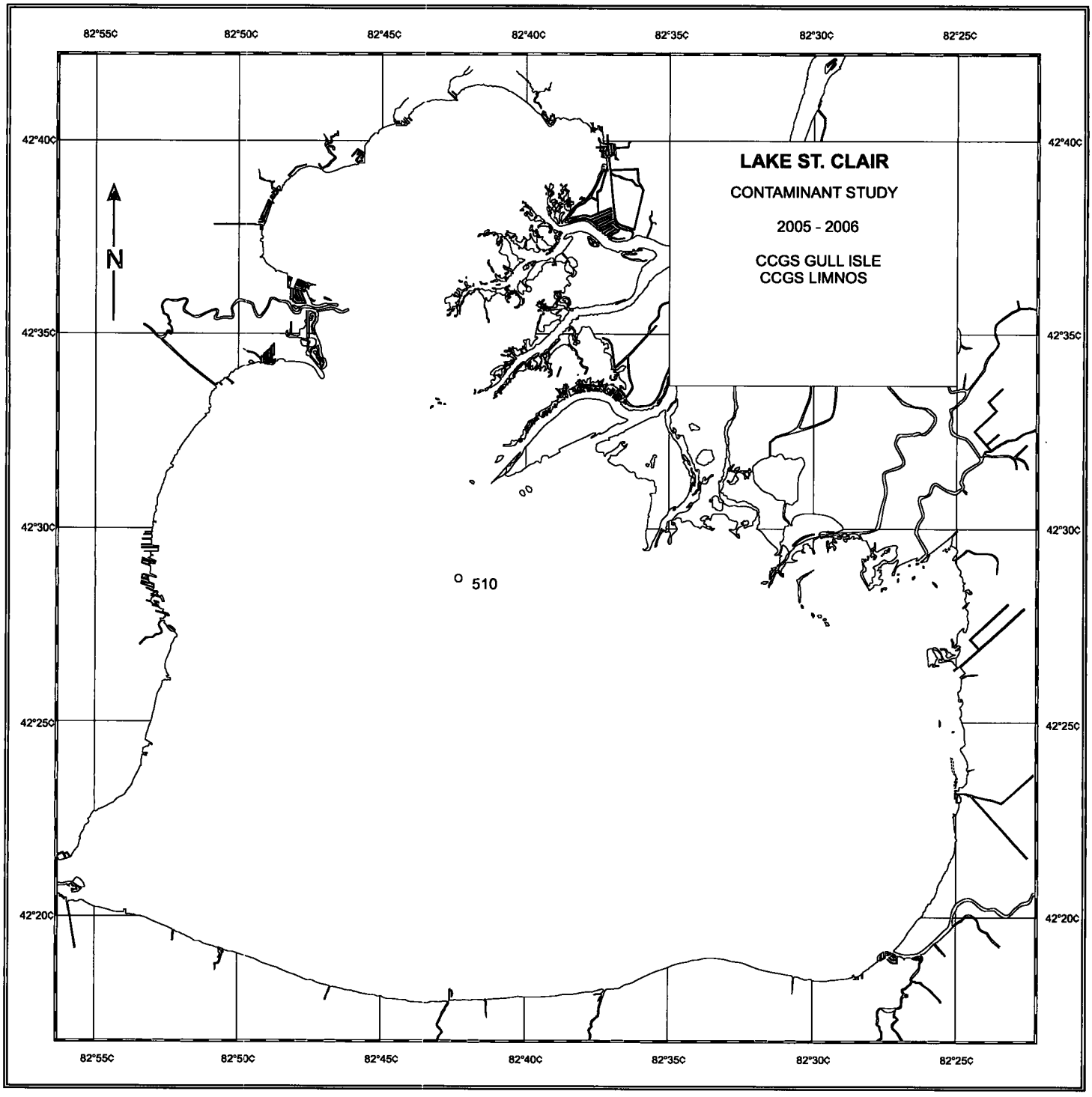


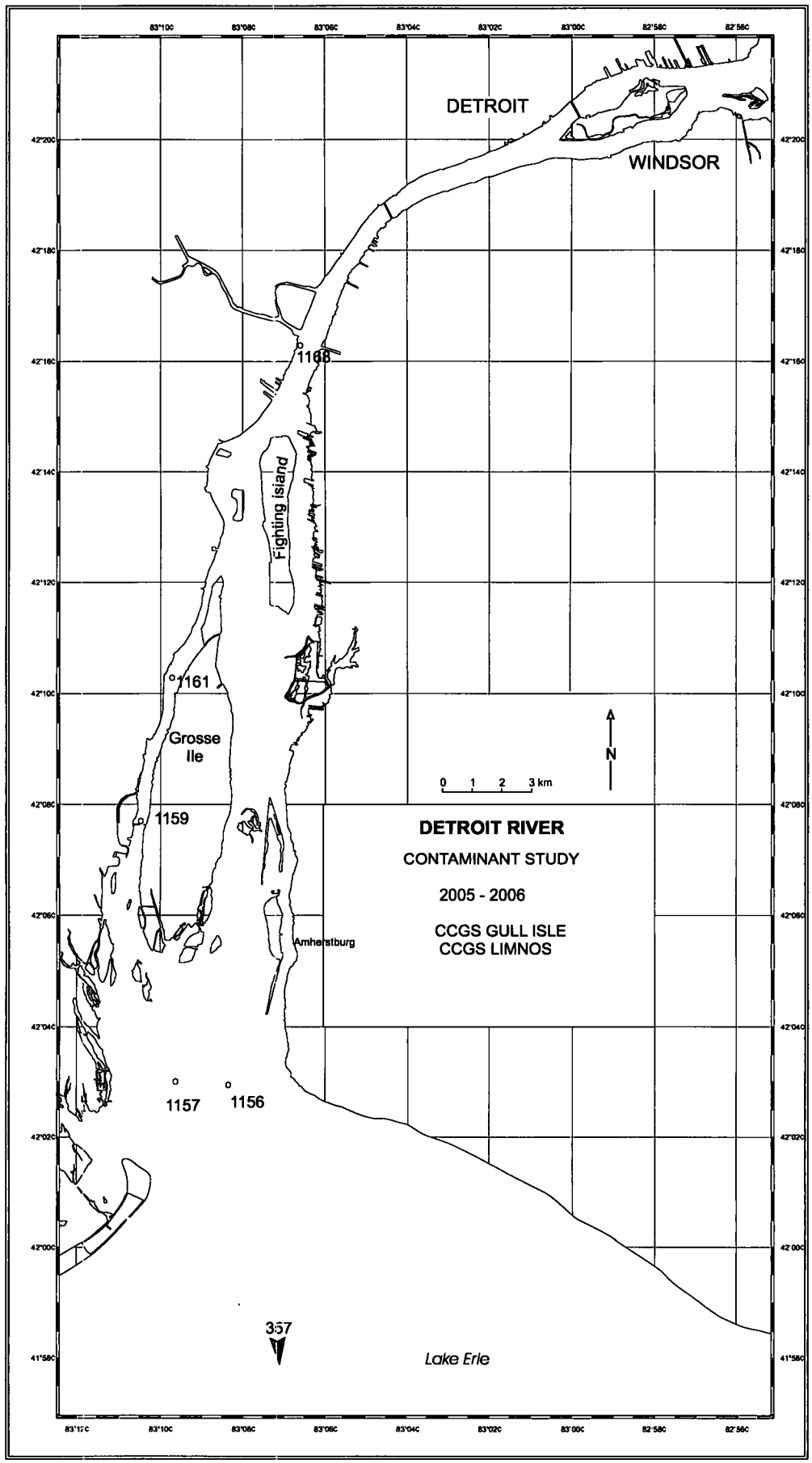
MOORING POSITIONS

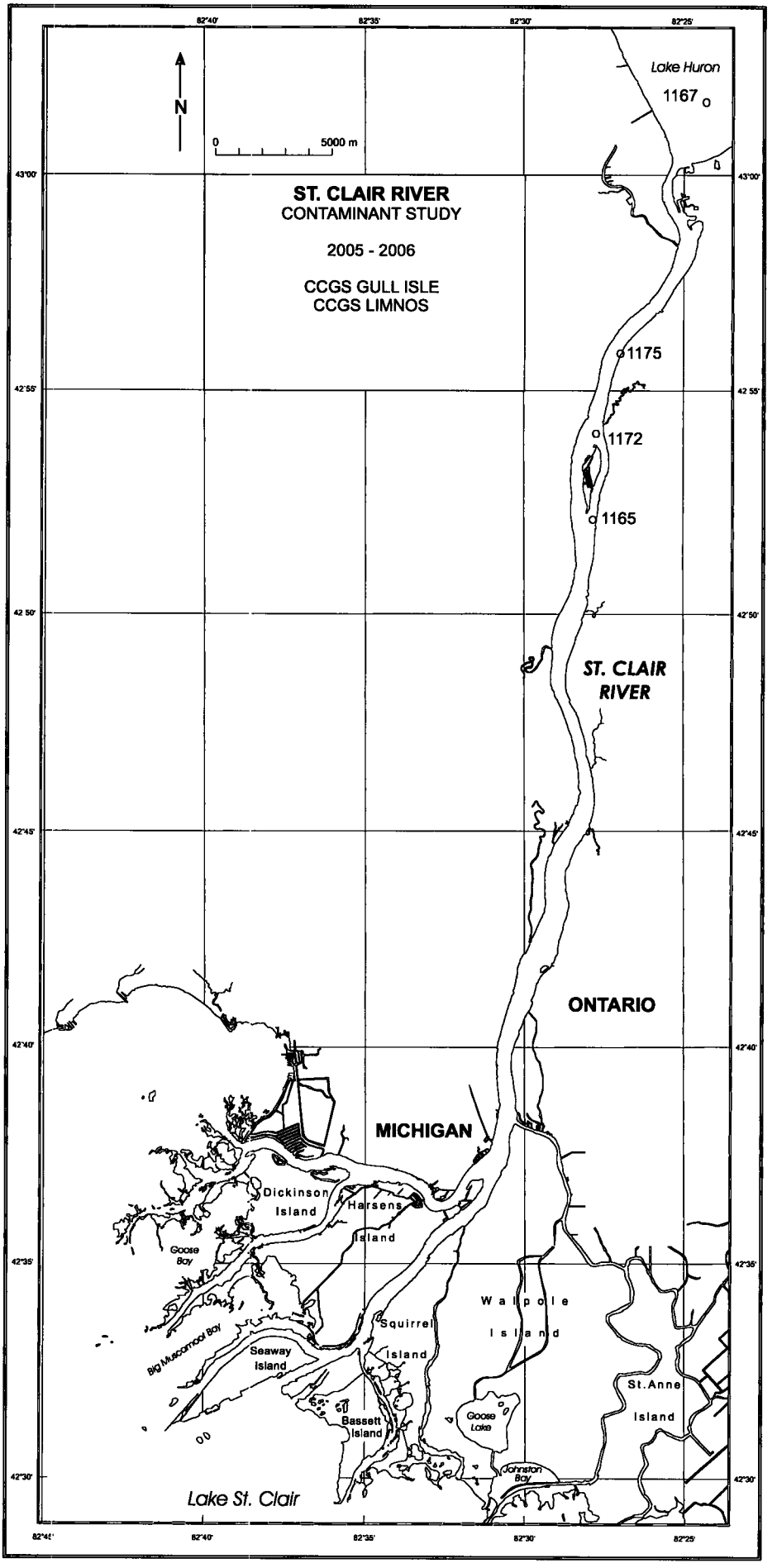
LAKE HURON
LAKE ST. CLAIR/ST. CLAIR RIVER
DETROIT RIVER

2005 – 2006

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
357	2005-01A-06	41° 48' 56"	82° 58' 58"	ST (BTM -1m)
510	2005-04A-29	42° 28' 42"	82° 42' 24"	ST (4.8m)
510	2005-08A-30	42° 28' 45"	82° 42' 28"	ST (4.7m)
1156	2005-08A-09	42° 02' 57"	83° 08' 10"	ST (8.0m)
1157	2005-08A-10	42° 02' 33"	83° 09' 34"	ST (3.2m)
1159	2005-08A-12	42° 07' 46"	83° 08' 10"	ST (5.2m)
1161	2005-08A-24	42° 10' 20"	83° 09' 34"	ST (7.3m)
1165	2005-08A-18	42° 51' 19"	82° 27' 55"	ST (5.8m)
1167	2005-08A-20	43° 02' 41"	82° 24' 37"	ST (5.6m)
1167	2005-08A-21	43° 02' 45"	82° 24' 36"	ST (5.6m)
1168	2005-08A-25	42° 16' 04"	83° 06' 42"	ST (10.2m)
1172	2005-09A-11	42° 51' 00"	82° 27' 34"	ST (7.4m)
1175	2005-09A-19	42° 55' 40"	82° 27' 04"	ST (7.2m)


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
2005 - 2006
CCGS GULL ISLE
CCGS LIMNOS
510


DETROIT
WINDSOR
1160
Fighting island
1161
Grosse Ile
1159
Amherstburg
1157
1156
N
0 1 2 3 km
DETROIT RIVER
CONTAMINANT STUDY
2005 - 2006
CCGS GULL ISLE
CCGS LIMNOS
357
Lake Erie


N
0
5000 m
ST. CLAIR RIVER
CONTAMINANT STUDY
2005 - 2006
CCGS GULL ISLE
CCGS LIMNOS
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
Goose Lake
Bassett Island
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'

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

The objective of this study was to provide insight into the potential for control of taste and odour problems in drinking water. This was the sixth consecutive year that such a cruise was conducted.

The cruise was used to determine the spatial distribution of taste and odour compounds, algal toxins, major nutrients, phytoplankton, picoplankton and nuisance algal taxa (primarily cyanobacteria) in Lake Ontario, Bay of Quinte and the Upper St. Lawrence River. The role of iron was examined in the promotion, development and toxicity of large cyanobacteria. The cruise also located and investigated deep chla maxima; their biomass, taxonomic composition and pigment spectra.

A single, lake wide cruise was carried out on the CCGS LIMNOS from August 29 to September 2, 2005. 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 extended to the substrate, 2 m above the bottom was sampled for phytoplankton, picoplankton and bacterioplankton analysis.

At all stations, 64µ mesh plankton net tow samples were collected from the surface for immediate microscopic screening and later isolation of target cyanobacteria.

From selected stations with high and low cyanobacterial density at the depth of maximum fluorescence, two litres filtered (0.45 um) water were collected for post-cruise analysis of allelopathy and Fe lability under standard light exposure conditions.

At selected stations, with high and low cyanobacterial abundance; samples were taken into 1 L bottles from 1m or depth or max fluorescence, and were incubated in deck incubator with additions of Fe, P and N and analyzed for chl*a*, T/O (HSPME), and used for on board bioassay. (*Watson/Forrester*)

Early and later in the cruise at station 752 (LV3), water samples were collected at surface, 3m, 5m, 1 meter above the thermocline, one meter below the thermocline and bottom minus 2 meters for geosmin and MIB analyses, nutrients (P,N and C) and phytoplankton / picoplankton.

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 cyanobacteria 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.

Additional tasks were completed at stations 15, 61 and 81. Unfiltered samples were collected using a March pump from mid-epilimnion for analysis of pesticides for Alice Dove, Ecosystem Health Division, Ontario Region. At stations 8, 15, 61 and 78, unfiltered samples were collected using a March Pump from mid-epilimnion for analysis of pharmaceuticals for Ontario Region.

Also, at stations 8, 12, 61, 66, 71, 77, 78, 80, 81, 742, 744, 746, 753, and 757 samples were collected for Dr. M. Munawar, GLLFAS, DFO. Samples were collected from an integrated water sample: surface to 1 meter above the knee of the metalimnion when stratified, 0-2 m off the bottom when not stratified. The maximum sample depth was 20 meters. An amber, 250 ml glass bottle containing 5 ml Lugol's solution was collected for Phytoplankton, an amber 250 ml glass bottle containing 10 ml Lugol's solution was collected for Ciliates, and a 50 ml sterile plastic vial containing 5 ml Formalin (37% formaldehyde) for microbial loop was collected at these stations. The microbial loop samples were stored in the dark in a refrigerator.

On a logistical note, on August 31st the ship was in the Eastern end of the lake as the remnants of Hurricane Katrina passed through the area. Heavy rainfall and strong winds were present as the ship approached the Kingston area for the St. Lawrence River part of the cruise. Dr. J. Ridal of the St. Lawrence River Institute for Environmental Science was to meet with the ship in Kingston for small boat work near Wolfe Island. Dr. Ridal was contacted when the weather deteriorated and this part of the work was cancelled. The ship continued the cruise in the protected waters of the St. Lawrence River and Bay of Quinte until the weather system passed.

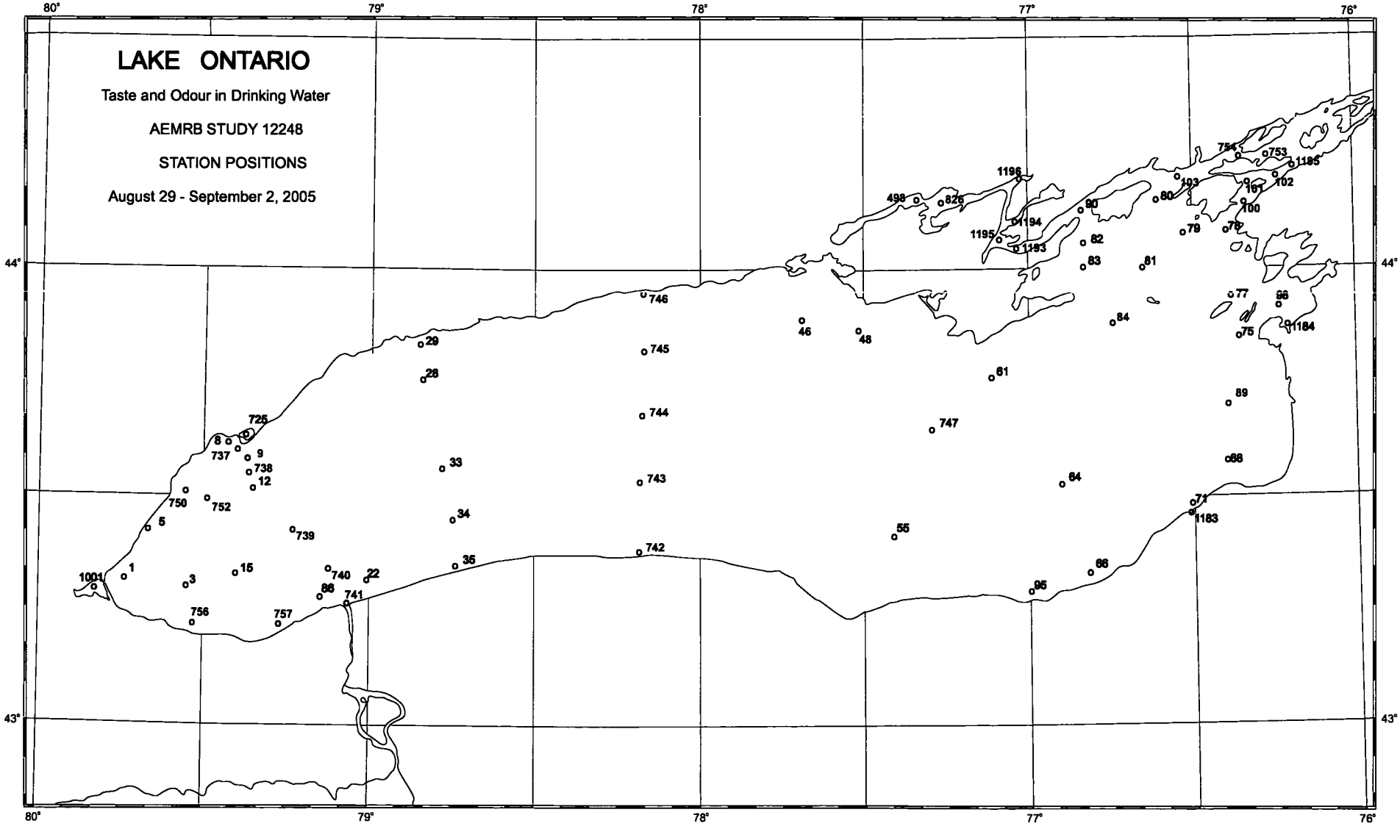
STATION POSITIONS

LAKE ONTARIO

2005

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 18' 48"	79° 45' 06"
3	43° 16' 09"	79° 37' 12"
5	43° 25' 30"	79° 39' 30"
8	43° 37' 24"	79° 27' 12"
9	43° 35' 12"	79° 23' 42"
12	43° 30' 12"	79° 21' 12"
15	43° 19' 03"	79° 26' 30"
22	43° 17' 48"	79° 00' 21"
28	43° 46' 30"	78° 51' 18"
29	43° 49' 48"	78° 52' 12"
33	43° 35' 48"	78° 48' 06"
34	43° 27' 42"	78° 45' 36"
35	43° 24' 39"	78° 43' 50"
55	43° 26' 36"	77° 26' 18"
61	43° 47' 09"	77° 09' 28"
66	43° 20' 00"	76° 50' 24"
71	43° 28' 36"	76° 31' 36"
75	43° 50' 36"	76° 21' 22"
77	43° 57' 24"	76° 24' 29"
78	44° 04' 59"	76° 24' 25"
79	44° 04' 30"	76° 31' 18"
80	44° 08' 30"	76° 36' 36"
81	44° 01' 00"	76° 40' 18"
82	44° 04' 00"	76° 48' 42"
83	44° 00' 00"	76° 50' 36"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
84	43° 53' 12"	76° 44' 00"
86	43° 15' 18"	79° 11' 42"
88	43° 35' 18"	76° 25' 00"
89	43° 41' 54"	76° 25' 00"
90	44° 08' 11"	76° 49' 30"
98	43° 56' 06"	76° 13' 56"
100	44° 08' 12"	76° 19' 48"
101	44° 11' 36"	76° 18' 36"
102	44° 12' 12"	76° 14' 12"
103	44° 12' 12"	76° 32' 36"
498	44° 09' 07"	77° 20' 12"
737	43° 36' 30"	79° 25' 48"
738	43° 33' 48"	79° 23' 12"
739	43° 25' 24"	79° 15' 30"
740	43° 20' 24"	79° 09' 30"
741	43° 15' 24"	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' 54"	78° 10' 06"
747	43° 38' 00"	77° 17' 30"
750 (LV1)	43° 33' 15"	79° 32' 09"
752 (LV3)	43° 29' 55"	79° 28' 58"
753	44° 14' 30"	76° 17' 58"
754	44° 14' 12"	76° 24' 24"
756	43° 14' 02"	79° 24' 29"
757	43° 12' 57"	79° 20' 03"
826	44° 09' 07"	77° 15' 26"
1001	43° 17' 16"	79° 50' 30"
1185	44° 16' 03"	76° 10' 52"
1193 (Glenora)	44° 03' 34"	77° 05' 11"
1194 (Hay Bay)	44° 06' 25"	77° 01' 50"
1195 (Long Reach)	44° 06' 02"	77° 04' 26"
1196 (Desoronto)	44° 10' 32"	77° 02' 46"


LAKE ONTARIO
Taste and Odour in Drinking Water
AEMRB STUDY 12248
STATION POSITIONS
August 29 - September 2, 2005
80°
79°
78°
77°
76°
44°
43°
1001
1
3
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12
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28
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46
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61
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66
68
71
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102
193
498
826
1183
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1193
1194
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1196
725
737
738
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740
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757

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

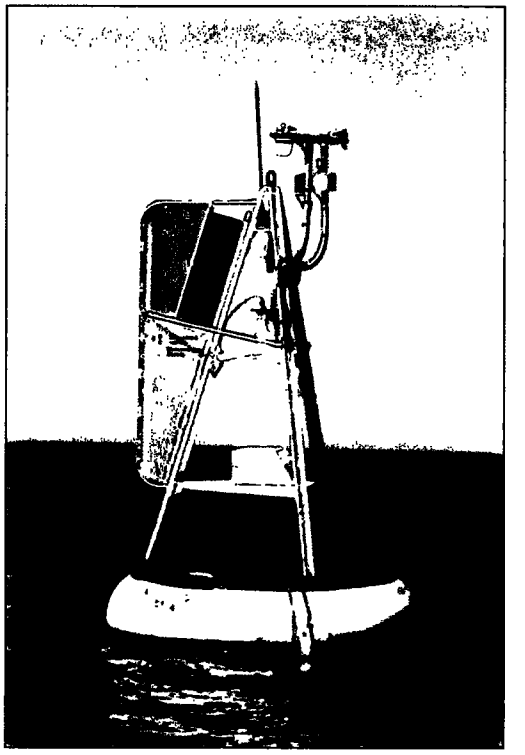
The objective of this study was to collect intensive physical measurements in Lake Erie through the installation of meteorological, temperature and current meter moorings to provide detailed hydrodynamic and thermal observations required to assess/predict changes in water quality and aquatic ecosystem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

All moorings were deployed on the first Lake Erie cruise, April 18 - 22, 2005, from the CCGS LIMNOS. At station 84 in the Central Basin, a meteorological buoy and a Hydra current meter mooring were deployed. At station 452 in the Eastern Basin, a meteorological buoy was deployed. At stations 718, 719 and 732, on the sill between the Eastern and Central Basins thermograph and current meter moorings were deployed to measure the exchange between the basins. Thermograph moorings were also installed at stations 498, 499, 518 and 519 in the Central basin.

All moorings were refurbished during the period of July 4 - 8, 2005 and removed during the period of October 17 - 21, 2005.

On both of the April and July cruises, water samples were collected for oxygen isotope analysis for L. Wassenaar, AEIRB. On the July cruise water samples were also collected for microsystis analysis for Dr. T. Murphy, AEMRB.

In addition, sediment trap moorings were also deployed in each basin of the lake at stations 84, 357 and 452 for Dr. C.H. Marvin, AEMRB Study 12246.

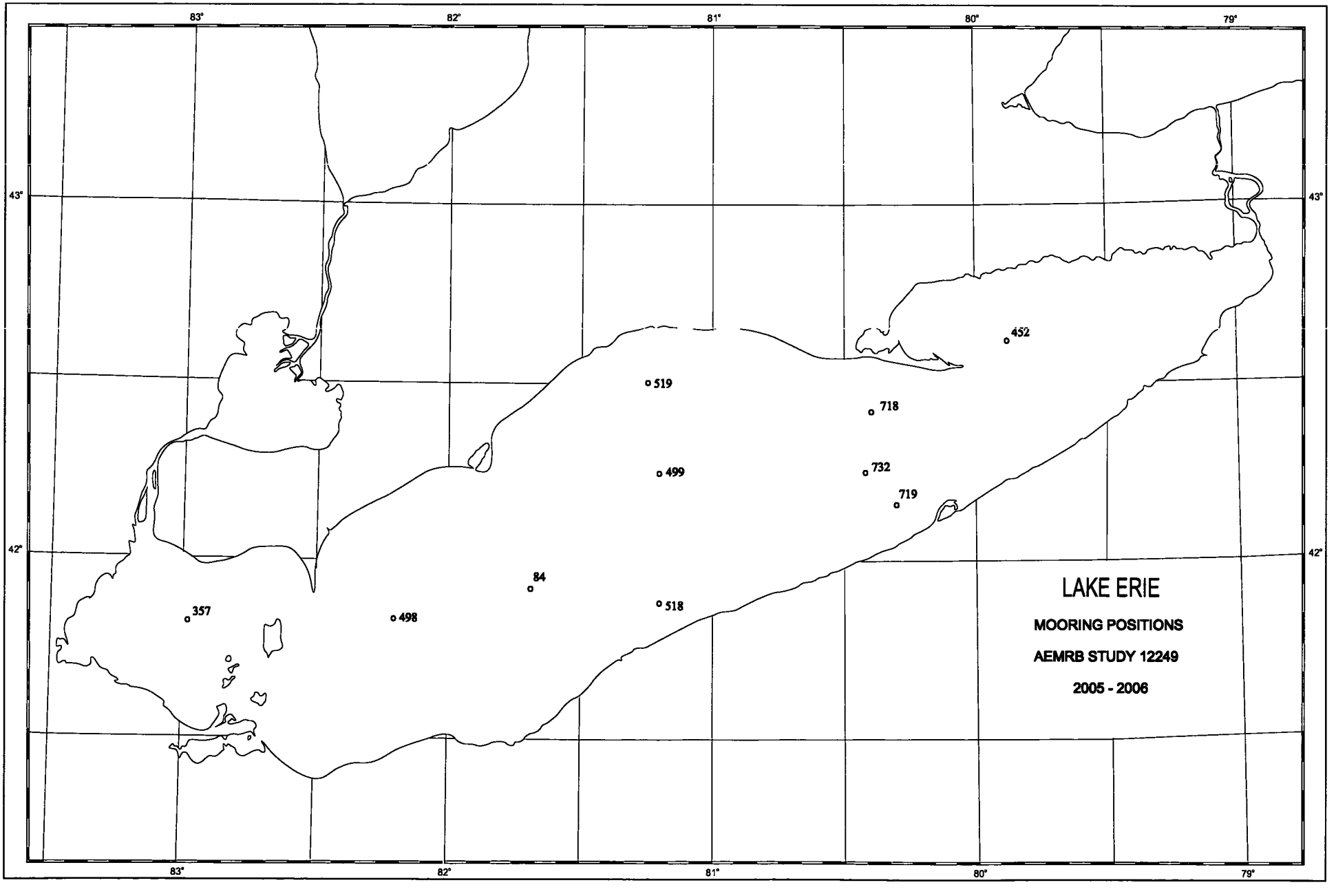


MOORING POSITIONS

LAKE ERIE

2005 - 2006

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
84	2005-01A-04A	41° 56' 42"	81° 38' 44"	ST (18, 21 m)
	2005-01M-17A	41° 56' 45"	81° 38' 35"	Met (T-2m)
	2005-01C-20A	41° 56' 39"	81° 38' 23"	HYDRA (24.85 m)
357	2005-01A-06A	41° 48' 58"	82° 58' 56"	ST (9.5 m)
452	2005-01M-10A	42° 35' 03"	79° 55' 14"	MET (T-2 m)
	2005-01A-13A	42° 35' 18"	79° 55' 18"	ST(20,30,40,50.7 m)
498	2005-01T-11A	41° 50' 00"	82° 11' 59"	T (1,3,5,7,9,11,12, 13,14,15,16,17, 17.7 m) YSI (19.5 m)
499	2005-01T-12A	42° 15' 06"	81° 14' 53"	T (1,3,5,7,9,11,13, 15,16,17,18, 19 m) YSI (21.8 m)
518	2005-01T-18A	41° 53' 00"	81° 15' 00"	T (1,3,5,7,9,11,13, 15,16,17,18,19 m) YSI (20.8 m)
519	2005-01T-19A	42° 30' 02"	81° 11' 43"	T (1,3,5,7,9,11,13, 15,16,17,18,19 m)
718	2005-01CT-14A	42° 26' 09"	80° 24' 14"	ADCP (11.7 m) T (1,3,5,7,9,11 m)
719	2005-01C-15A	42° 09' 33"	80° 17' 52"	ADCP (22 m)
	2005-01T-16A	42° 09' 27"	80° 17' 57	T (1,3,5,7,9,11,13, 15,17,18,19,20,21, 22 m)
732	2005-01CT-21A	42° 15' 09"	80° 26' 50"	T(1,3,5,7,9,11,13 15,17,19 m) ADCP(22m)


83°
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452
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719
84
357
498
518
LAKE ERIE
MOORING POSITIONS
AEMRB STUDY 12249
2005 - 2006

LAKE ERIE REMOTE SENSING CRUISES
AEMRB STUDY 12384, DR. B. BUKATA

A total of three cruises were conducted on the CCGS LIMNOS; May 2-6, July 18-23, and September 19-23. The cruises were conducted to relate basin land-use to lake water quality and develop remote sensing water quality products marketable by the Canadian private sector. These products could be used to outreach value-added remote sensing to environmental stewards, policy makers and to the general public.

All of the cruises during the year were conducted primarily in the central and western basins of Lake Erie. Staff from the University of Waterloo, Department of Biology was also onboard for the first two cruises. They were conducting studies that complimented the work being completed by NWRI scientists.

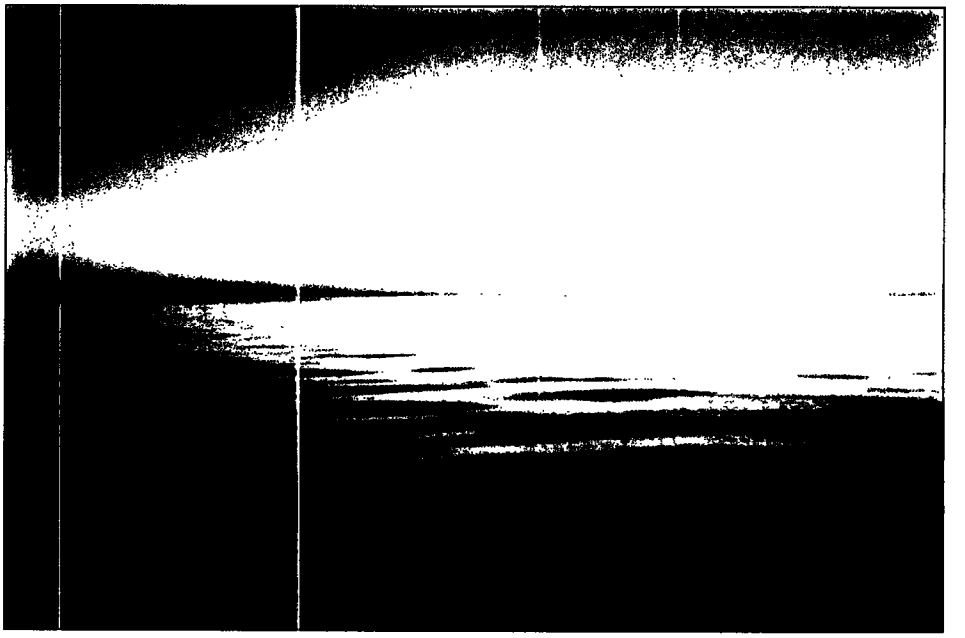
The parameters sampled during the all of the cruises included the following: temperature and transmission profiles, dissolved oxygen profiles, specific conductance, pH, chlorophyll a, total suspended solids (seston), DOC, total phosphorus, total filtered phosphorus, particulate C/N, filter residue spectral absorption, and filtrate spectral absorption.

Additional tasks on the May cruise included perchlorate samples from 10 selected nearshore stations for Dr. C. Ptacek, AEMRB, the samples were collected from 1m. The University of Waterloo conducted fluorometric and solar radiation profiles at selected stations, concentrating their work around station 84 in the central basin, and station 357 in the western basin.

During the July cruise the University of Waterloo again conducted the same array of experiments, as on the May cruise. Additionally, at all stations in July, duplicate 30ml samples were collected from 1 m, and bottom minus 2 m if the depth was greater than 20 m. The samples were for Ms. R. MacDonald of the Department of Earth Sciences, University of Western Ontario. The samples were being analyzed for isotopic compositions of the Great Lakes. At station 113, three 20 litre Ropac containers of sediment were collected for Ms. E. Dussault of the Ontario Agriculture College, Department of Environmental Biology. The samples were being used for sediment toxicity experiments at the University of Guelph. Samples were also collected at selected stations, for plankton spectral signatures and pigments/pigment derivatives as tracers of *Microcystis* and other noxious algal taxa for Dr. S. Watson, AEMRB. Surface samples were also collected for Ms. T. Parr, AEMRB at selected stations.

During the September cruise additional tasks included duplicate 30ml samples collected from 1 m, and bottom minus 2 m if the depth was greater than 20 m at all stations, for isotopic composition. The samples were again for Ms. R. MacDonald of the Department of Earth Sciences, University of Western Ontario. At station 23 a multiple depth sampling profile was collected using the Rosette, for fluorinated compounds. The samples were collected for Dr. B. Scott, AEMRB. At selected stations, water samples

were collected from 1m for Ms. T. Parr, AEMRB. At all stations surface water was collected and a net haul taken for *Mycrocystis* analysis for Dr. S. Watson, AEMRB. Engineering Services staff conducted field testing of the new multi parameter water quality profiling system, at selected stations throughout the cruise.

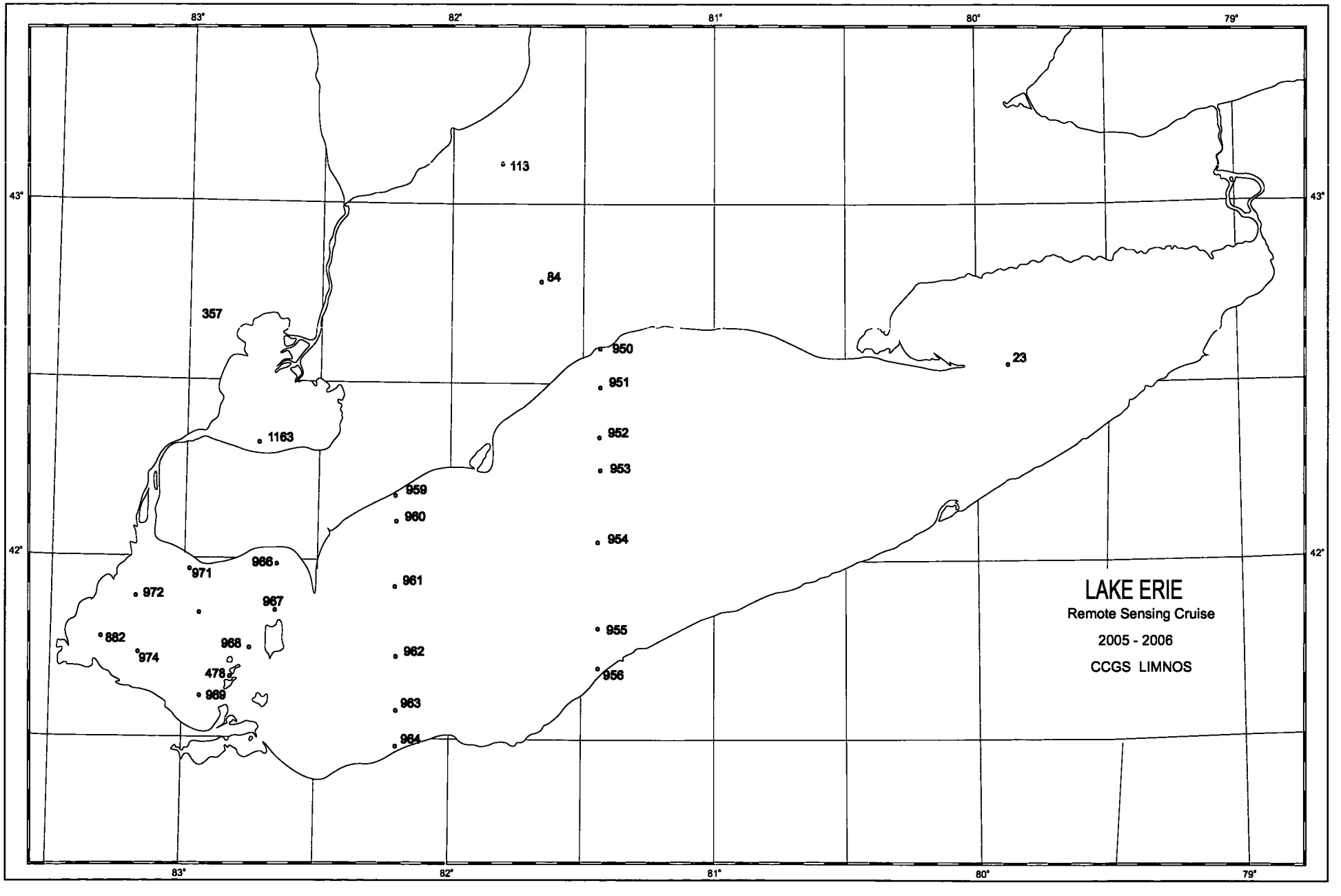


STATION POSITIONS

LAKE ERIE

2005-2006

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 11"	79° 53' 30"
84	41° 56' 09"	81° 39' 16"
113	42° 16' 56"	81° 48' 42"
357	41° 48' 57"	82° 58' 58"
478	41° 39' 33"	82° 49' 00"
882	41° 44' 05"	83° 23' 05"
950	42° 35' 18"	81° 26' 30"
951	42° 28' 30"	81° 26' 30"
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"
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"
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"
971	41° 57' 00"	83° 03' 00"
972	41° 52' 00"	83° 12' 00"
974	41° 43' 30"	83° 09' 00"
1163	41° 28' 16"	83° 43' 05"


83°
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882
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964
LAKE ERIE
Remote Sensing Cruise
2005 - 2006
CCGS LIMNOS

OPEN LAKES SURVEILLANCE, LAKES ONTARIO AND SUPERIOR
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR
RSB STUDY 12632

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.

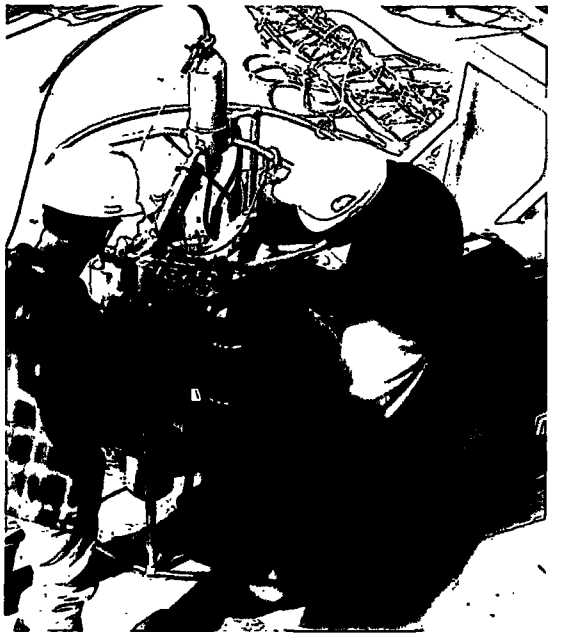
Four cruises were conducted - one on Lake Ontario April 11 - 15 and three on Lake Superior May 22 - June 8, August 2 - 19 and September 26 - October 13, to support this program. All cruises were organized and completed by Technical Operations personnel for ECB-OR and were conducted from the CCGS LIMNOS. 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 and September/October cruises were:

Unstratified Conditions:

- 1 metre
- 50 metres if total depth was greater than 70 m
- 100 metres if total depth was greater than 130 m
- 250 metres if total depth was greater than 300 m
- Bottom -10 metres
- Bottom -2 metres



Repairing the Rosette

Stratified Conditions:

1 metre
1 metre above the knee of the thermocline
Mid-thermocline
1 metre below the knee of the thermocline
100 metres if total depth was greater than 100 m
250 metres if total depth was greater than 300 m
Bottom -10 metres or Mid-Hypolimnion
Bottom -2 metres

Samples for pesticides, pharmaceuticals and organics were collected using the PoPcart and trace metals and mercury samples were collected using the Isomet sampler on the April and May cruises. On all Lake Superior cruises at Lower Food Web stations, samples were obtained for quantitative mysid sampling, zooplankton and rotifers.


Collecting a Rotifer Sample

Thermograph moorings were installed at stations 23, 31, 45, 80, 106, 113, 171 and 189, a current meter mooring was deployed at station 113 and a meteorological buoy was deployed ay station 171 on the May cruise fro Dr. R. Yerubandi, AEMRB. These moorings were removed on the September/October cruise with the exception of the thermograph moorings at stations 45 and 80 which were refurbished as winter moorings. A meteorological station was also established on Caribou Island and was left running over the winter.

Some of the additional tasks performed during the cruises were: water samples in Lake Ontario for primary production collected for Dr. M. Munawar, GLLFAS; in Lake Superior, Contaminant samples were collected for Dr. D. Muir, AEPRB; surficial sediments were collected for Dr. C.H. Marvin, AEMRB; perchlorate samples were collected for Dr. C. Ptacek, AEMRB; perfluorinated compounds were collected for Dr. B. Scott, AEPRB; paleoclimate reconstruction piston cores were taken for Dr. A. Crowe, AEMRB; samples for hexachlorocyclohexanes were for MSC; RNA/DNA and fatty acids in mysids for Dr. O. Johansson, GLLFAS; Microbial food web samples were collected for Dr. M. Munawar GLLFAS, benthic community sampling and stable isotopes and lipids were collected for R. Dermott, GLLFAS; PFOS for the Ontario Ministry of the Environment; isotopic composition for R. Macdonald, University of Western Ontario, particulate organic nitrogen and analysis of ammonia and nitrate for the University of Minnesota, Chlorophyll a by HPLC for J. Kelly, USEPA, bioavailability of nitrate for G. Bullerjahn, Bowling Green State University and low level SRP for R. Sherrell, Rutgers University.

STATION POSITIONS

LAKE ONTARIO

2005 - 2006

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1	43° 18' 48"	79° 45' 06"
2	43° 20' 24"	79° 39' 54"
3	43° 16' 06"	79° 37' 12"
5	43° 25' 30"	79° 39' 30"
6	43° 28' 00"	79° 31' 48"
7	43° 32' 48"	79° 29' 18"
8	43° 37' 24"	79° 27' 12"
9	43° 35' 12"	79° 23' 42"
10	43° 40' 06"	79° 16' 00"
11	43° 35' 06"	79° 18' 42"
12	43° 30' 12"	79° 21' 12"
13	43° 25' 00"	79° 24' 00"
15	43° 19' 00"	79° 26' 36"
17	43° 13' 30"	79° 16' 18"
18	43° 18' 12"	79° 16' 42"
19	43° 23' 00"	79° 17' 06"
21	43° 18' 00"	79° 07' 12"
22	43° 17' 48"	79° 00' 18"
23	43° 22' 12"	79° 04' 00"
26	43° 36' 30"	79° 01' 00"
27	43° 42' 12"	78° 57' 24"
28	43° 46' 30"	78° 51' 18"
29	43° 49' 48"	78° 52' 12"
30	43° 49' 48"	78° 39' 42"
31	43° 53' 12"	78° 27' 36"
32	43° 47' 00"	78° 26' 18"
33	43° 35' 48"	78° 48' 06"
34	43° 27' 42"	78° 45' 36"
35	43° 21' 36"	78° 43' 48"
36	43° 29' 30"	78° 23' 12"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
37	43° 23' 30"	78° 22' 12"
38	43° 23' 00"	77° 59' 24"
39	43° 29' 12"	78° 00' 00"
40	43° 35' 24"	78° 00' 42"
41	43° 43' 00"	78° 01' 36"
42	43° 50' 24"	78° 02' 18"
43	43° 57' 00"	78° 03' 00"
44	43° 52' 54"	77° 54' 30"
45	43° 49' 12"	77° 47' 00"
46	43° 53' 06"	77° 41' 24"
47	43° 57' 06"	77° 35' 18"
48	43° 51' 42"	77° 31' 30"
49	43° 46' 18"	77° 26' 18"
52	43° 26' 00"	77° 42' 42"
53	43° 21' 00"	77° 42' 42"
54	43° 24' 48"	77° 34' 30"
55	43° 26' 36"	77° 26' 18"
56	43° 21' 36"	77° 30' 54"
57	43° 16' 30"	77° 35' 30"
58	43° 19' 42"	77° 26' 18"
59	43° 22' 54"	77° 17' 54"
60	43° 34' 48"	77° 12' 00"
61	43° 47' 12"	77° 09' 30"
62	43° 52' 48"	77° 00' 00"
63	43° 43' 54"	77° 01' 00"
64	43° 31' 30"	76° 55' 36"
65	43° 25' 24"	76° 53' 00"
66	43° 20' 00"	76° 50' 24"
67	43° 24' 30"	76° 47' 42"
68	43° 31' 48"	76° 43' 54"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
69	43° 36' 24"	76° 42' 48"
70	43° 32' 30"	76° 37' 06"
71	43° 28' 36"	76° 31' 36"
72	43° 33' 00"	76° 31' 30"
73	43° 38' 00"	76° 17' 18"
74	43° 45' 00"	76° 31' 06"
75	43° 50' 36"	76° 21' 18"
76	43° 57' 00"	76° 10' 30"
77	43° 57' 24"	76° 24' 30"
79	44° 04' 30"	76° 31' 18"
80	44° 08' 30"	76° 36' 36"
81	44° 01' 00"	76° 40' 18"
82	44° 04' 00"	76° 48' 42"
83	44° 00' 00"	76° 50' 36"
84	43° 53' 12"	76° 44' 00"
85	43° 45' 00"	79° 05' 00"
86	43° 15' 18"	79° 11' 42"
87	43° 17' 54"	77° 31' 06"
88	43° 35' 18"	76° 25' 00"
89	43° 41' 54"	76° 25' 00"
90	44° 08' 11"	76° 49' 30"
91	43° 55' 12"	78° 18' 24"
93	43° 19' 36"	78° 52' 06"
94	43° 19' 30"	77° 13' 00"
95	43° 18' 48"	77° 00' 00"
97	43° 57' 42"	76° 07' 18"
98	43° 56' 06"	76° 13' 54"
988	43° 47' 00"	79° 02' 30"

STATION POSITIONS

HAMILTON HARBOUR

2005 - 2006

STATION NUMBER	LATITUDE N.	LONGITUDE W.
909	43° 16' 50"	79° 52' 22"
918	43° 17' 08"	79° 47' 38"
926	43° 18' 17"	79° 48' 54"
1001	43° 17' 12"	79° 50' 33"

STATION POSITIONS

TORONTO HARBOUR

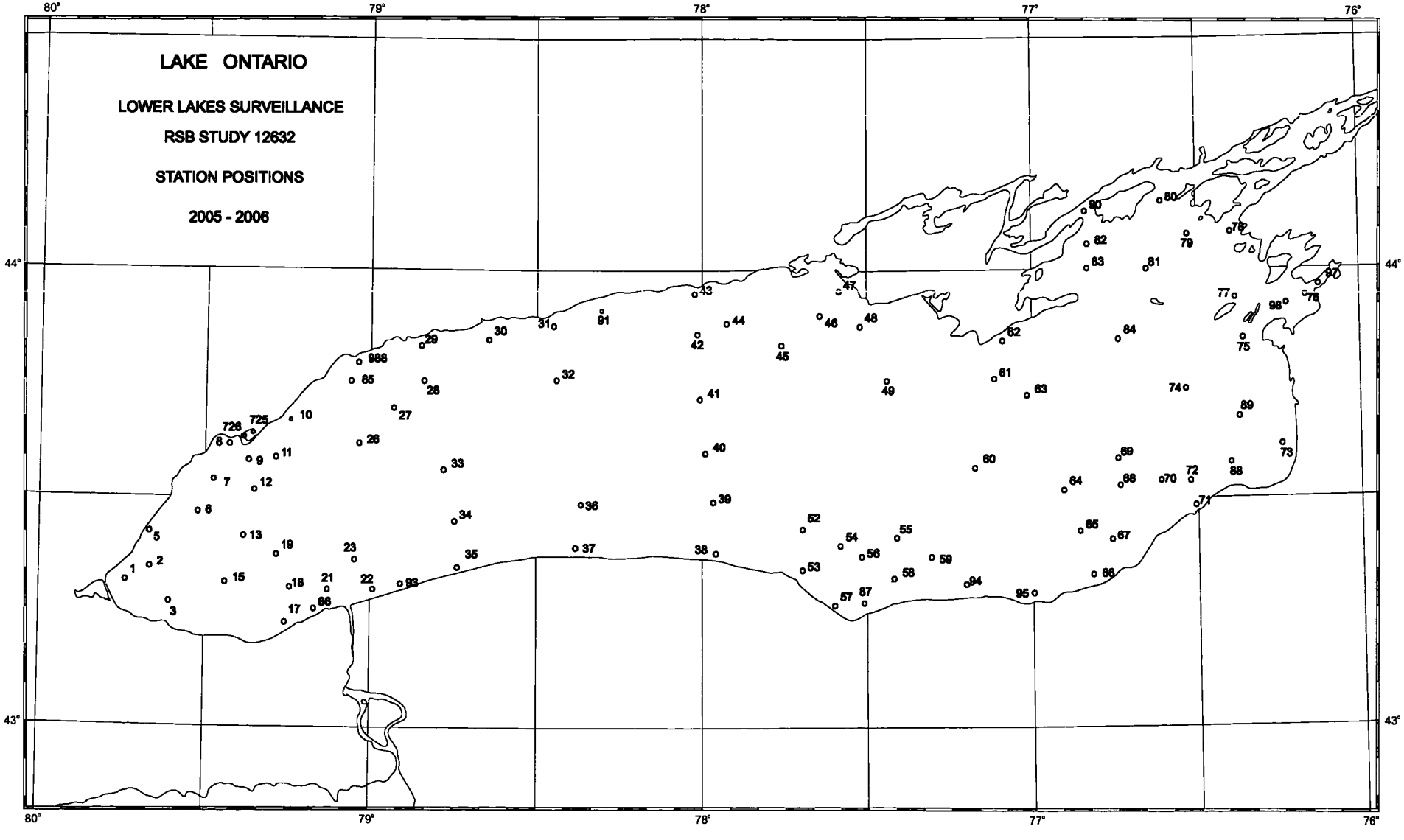
2005 - 2006

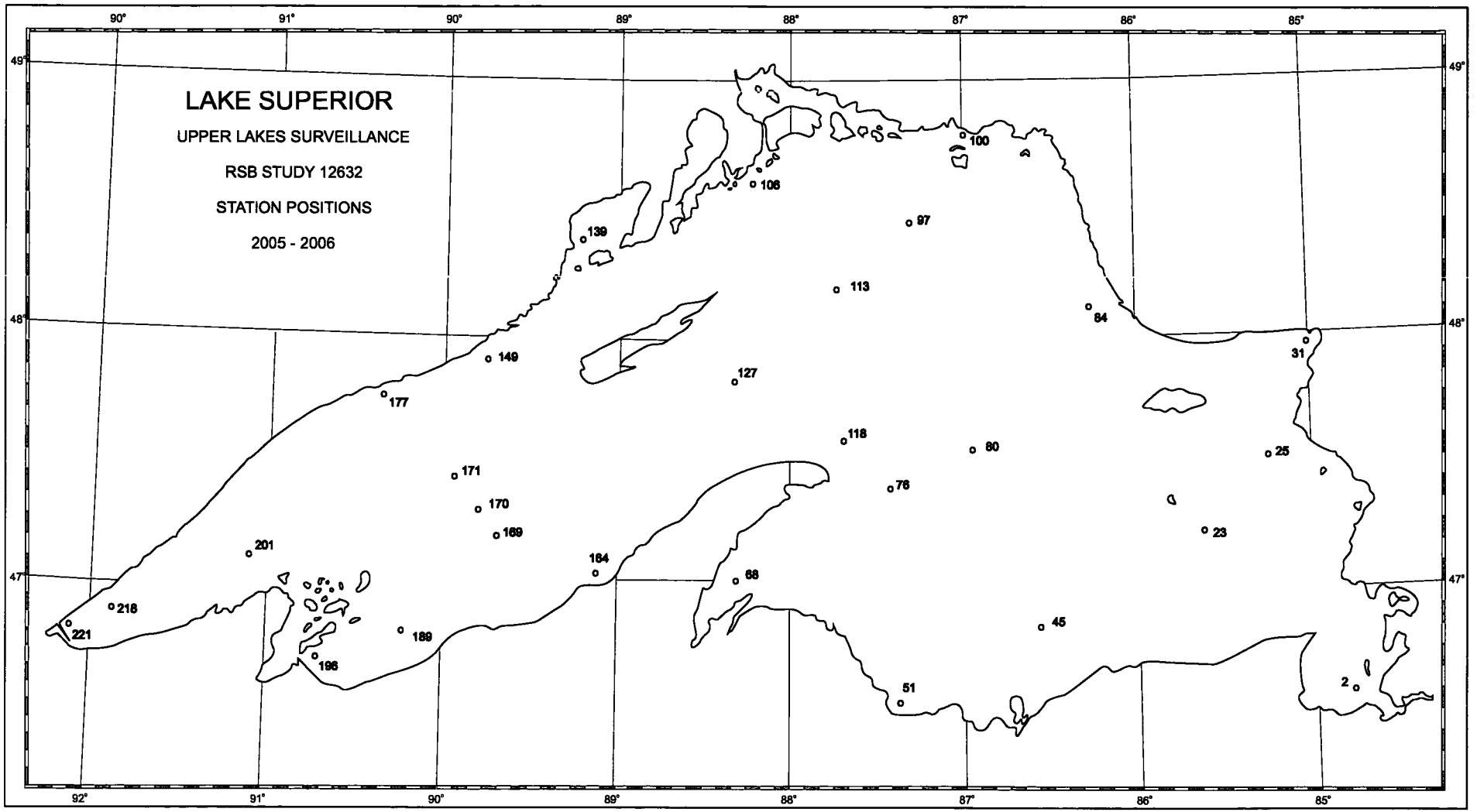
STATION NUMBER	LATITUDE N.	LONGITUDE W.
725	43° 38' 18"	79° 21' 42"
726	43° 37' 56"	79° 22' 46"

STATION POSITIONS
LAKE SUPERIOR

2005-2006

STATION NUMBER	LATITUDE N.	LONGITUDE W
2	46° 32' 36"	84° 44' 54"
23	47° 12' 48"	85° 38' 00"
25	47° 27' 18"	85° 16' 30"
30	47° 43' 12"	85° 08' 20"
31	47° 55' 06"	84° 54' 46"
45	46° 51' 24"	86° 34' 06"
51	46° 31' 00"	87° 20' 12"
68	47° 01' 00"	88° 11' 00"
76	47° 24' 06"	87° 24' 42"
80	47° 35' 00"	86°57' 06"
84	48° 06' 48"	86° 18' 00"
92	48° 35' 00"	86° 33' 54"
97	48° 26' 18"	87° 15' 12"
100	48° 45' 24"	86° 58' 33"
106	48° 34' 30	88° 07' 00"
113	48° 08' 42"	87° 42' 12"
118	47° 36' 24"	87° 42' 36"
127	47° 50' 54"	88° 20' 12"
138	48° 25' 00"	88° 56' 00"
139	48° 15' 12"	89° 10' 48"
149	47° 53' 00"	89° 38' 24"
164	47° 01' 36"	89° 02' 18"
169	47° 12' 24"	89° 40' 00"
170	47° 20' 12"	89° 48' 09"
171	47° 27' 00"	89° 55' 15"
177	47° 44' 48"	90° 14' 06"
189	46° 50' 42"	90° 11' 20"
196	46° 44' 54"	90° 42' 12"
201	47° 07' 54"	91° 06' 42"
218	46° 49' 00"	91° 53' 06"
221	46° 46' 54"	92° 03' 15"


LAKE ONTARIO
LOWER LAKES SURVEILLANCE
RSB STUDY 12632
STATION POSITIONS
2005 - 2006
80°
79°
78°
77°
76°
44°
43°


LAKE SUPERIOR
UPPER LAKES SURVEILLANCE
RSB STUDY 12632
STATION POSITIONS
2005 - 2006
90°
91°
90°
89°
88°
87°
86°
85°
49°
48°
47°
92°
91°
90°
89°
88°
87°
86°
85°
100
106
97
139
113
84
31
149
127
177
118
80
25
171
76
170
169
23
201
164
68
218
221
189
45
196
51
2

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	LAKE ONTARIO
CRUISE TYPE		**N.MI. STEAMED**	1337.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	156	Moorings Refurbished, Sediment Trap	1
EBTT Casts	157	Moorings Established	
Rosette Casts	52	Moorings Retrieved	
Reversing Thermometer Obs. (No. of Therm)		Moorings Established	
Secchi Disk Observations	76	Moorings Retrieved	
Transmissometer Casts			
Zooplankton Hauls 10um	63	Picoplankton Samples (Watson)	167
Zooplankton Hauls 64um	60	Chlorophyll & Phycocyanin Flow Through	5 days
Integrator 10 m	38	Mysid Hauls	5
Integrator 20 m	141		
Phytoplankton Samples	163	Primary Productivity Moorings	
D.O. Profiles	96		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)	114	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	114	Cores Taken, Benthos	
Water Samples Collected (TP uf)	262	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)	152	Grab Samples Taken, PONAR	
Water Samples Collected (Geosmin / MIB)	180	Bulk Centrifuge Samples	
Water Samples Collected (HSPME)	87		
Water Samples Collected (VOC)	19	Observations, Weather	
Water Samples Collected (Ciliates)	14		
Water Samples Collected (Microloop)	14	Pesticides	36
Water Samples Filtered (Chlorophyll a)	217	Pharmaceuticals	16
Water Samples Filtered (POC/TPN)	155	HG, Trace Metals & Popcart	26 of each
Water Samples Filtered (CDOM / Seston)	59		
Water Samples Filtered (TP f)	262	**ONBOARD ANALYSIS**	
Water Samples Filtered (Nutrients)	114	Manual Chemistry, Tech. Ops.	342
Water Samples Filtered (Major Ions)	152	Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered (DIC / DOC)	28	Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	LAKE ERIE
CRUISE TYPE		**N.MI. STEAMED**	3744.78

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	175	Moorings Established, Meteorological Buoy	2
EBTT Casts	176	Moorings Retrieved, Meteorological Buoy	2
Rosette Casts	47	Moorings, Meteorological Buoy Monitored	3
Reversing Thermometer Obs. (No. of Therm)		Moorings Established, Thermograph	5
Secchi Disk Observations	104	Moorings Retrieved, Thermograph	5
Transmissometer Casts	96	Moorings Refurbished, Thermograph	5
Fluorometer Casts	57	Moorings Established, ADCP	1
Waters Buoy Deployments	68	Moorings Retrieved, ADCP	1
Integrator 10 m	90	Moorings Refurbished, ADCP	1
Integrator 20 m	48	Moorings Established, ADCP/Thermograph	2
Phytoplankton Samples		Moorings Retrieved, ADCP/Thermograph	2
D.O. Profiles	130	Moorings Refurbished, ADCP/Thermograph	2
Water Samples Collected (Microbiology)		Moorings Established, Current Meter (hydra)	1
Water Samples Collected (Water Quality)		Moorings Retrieved, Current Meter (hydra)	1
Water Samples Collected (D.O.)	5	Moorings Refurbished, Current Meter (hydra)	1
Water Samples Collected (Cond/pH)	76	Moorings Established, Sediment Trap	3
Water Samples Collected (TP uf)	54	Moorings Retrieved, Sediment Trap	2
Water Samples Collected (TKN)		Moorings Refurbished, Sediment Trap	8
Water Samples Collected (Isotopic Composition)	197		
Water Samples Collected (Perchlorate)	8		
Water Samples Collected ( )		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	71		
Water Samples Filtered (POC/TPN)	91	Cores Taken, Mini Box	15
Water Samples Filtered (Seston)	95		
Water Samples Filtered (TP f)	54		
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)	49	Manual Chemistry, Tech. Ops.	84
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	LAKE HURON
CRUISE TYPE		**N.MI. STEAMED**	1170.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	52	Moorings Established, Sediment Traps	2
EBTT Casts	22	Moorings Refurbished, Sediment Traps	2
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	22	Moorings Established	
Transmissometer Casts	25	Moorings Retrieved	
Van Dorn Casts	82	Moorings Established	
		Moorings Retrieved	
Integrator 10 m	1		
Integrator 20 m	2	Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	14		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)	22	Cores Taken, Mini Box	
Water Samples Collected (D.O.)	4	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	104	Cores Taken, Benthos	
Water Samples Collected (TP uf)	51	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	4	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	8		
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	48		
Water Samples Filtered (POC/TPN)		Algae Nets	25
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	51	10L Bulk Water Samples for MSC	3
Water Samples Filtered (Nutrients)	51		
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	212
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	LAKE SUPERIOR
CRUISE TYPE		**N.MI. STEAMED**	3746.75

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	116	Moorings Established, Current Meter	1
EBTT Casts	90	Moorings Retrieved, Current Meter	1
Rosette Casts	102	Moorings Established, Meterological Buoy	1
Hydrolab Profiles	15	Moorings Retrieved, Meterological Buoy	1
Secchi Disk Observations	60	Moorings Monitored, Meterological Buoy	1
Integrator 10 m	126	Moorings Established, Thermograph	8
Integrator 20 m	67	Moorings Retrieved, Thermograph	6
Integrator 50 m	318	Moorings Redeployed, Thermograph (winter)	2
Mysid Net Hauls	143	Solar Radiation Station Established	1
Zooplankton Net Hauls	191	Rotifers	29
Phytoplankton Samples	31	Ciliates	32
D.O. Profiles	91	Microbial Loop	32
Water Samples Collected (Water Quality)	394	Bioavailability of Nitrates	38
Water Samples Collected (D.O.)	349	Cores Taken, Mini Box	55
Water Samples Collected (Cond/pH)	355	Cores Taken, Piston	4
Water Samples Collected (TP uf)	394	Cores Taken, Benthos, Extruded 10 cm	15
Water Samples Collected (TKN)	254	Grab Samples Taken, Mini Ponar	1000
Water Samples Collected (Alkalinity)	28	Grab Samples Taken, Ponar	338
Water Samples Collected (Isotopic Composition)	292	Bulk Water Samples, 200 L	7
Water Samples Collected (Perchlorate)	10	Observations, Weather	
Water Samples Collected (Perfluorinated Compounds)	46	PoPCart, Contaminants	108
Water Samples Filtered (Chlorophyll a)	90	PoPCart Pharmaceuticals	18
Water Samples Filtered (POC / PON)	131	PoPCart Pesticides	169
Water Samples Filtered (Seston)	6	PoPCart Contaminant Columns	44
Water Samples Filtered (TP f)	366	Bacteria Samples	14
Water Samples Filtered (Nutrients)	366	Infiltrex Columns	14
Water Samples Filtered (Major Ions)	366	**ONBOARD ANALYSIS**	
Water Samples Filtered (DIC / DOC)	39	Manual Chemistry, Tech. Ops.	649
Water Samples Filtered (HPLC Chl a)	29	Nutrients, EHD, ECB, EC-OR	268
Water Samples Filtered (Low Level SRP)	24	Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	L. St. Clair & St. Clair River
CRUISE TYPE		**N.MI. STEAMED**	79.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	8	Moorings Established, Sediment Trap	5
EBTT Casts	8	Moorings Refurbished, Sediment Trap	5
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	6	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	4	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)			
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	GEORGIAN BAY
CRUISE TYPE		**N.MI. STEAMED**	105.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	14	Moorings Established	
EBTT Casts	14	Moorings Retrieved	
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	8	Moorings Established	
Transmissometer Casts	14	Moorings Retrieved	
Van Dorn Casts	30		
Integrator 10 m	2		
Integrator 20 m		Primary Productivity Moorings	
Algae Nets	1		
D.O. Profiles	14		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)	2	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	27	Cores Taken, Benthos	
Water Samples Collected (TP uf)	28	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected ( )		Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	2		
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	27		
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	28		
Water Samples Filtered (Nutrients)	28		
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	56
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS LIMNOS
DATE: FROM		**REGION**	DETROIT RIVER
CRUISE TYPE		**N.MI. STEAMED**	37.4

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	10	Moorings Established, Sediment Trap	5
EBTT Casts	10	Moorings Retrieved, Sediment Trap	
Rosette Casts		Moorings Refurbished, Sediment Trap	5
Reversing Thermometer Obs. (No. of Therm)		Moorings Established	
Secchi Disk Observations	10	Moorings Retrieved	
Transmissometer Casts		Moorings Established	
		Moorings Retrieved	
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	10	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)			
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS GULL ISLE
DATE: FROM		**REGION**	LAKE ERIE
CRUISE TYPE		**N.MI. STEAMED**	97.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	5	Moorings Refurbished, Sediment Trap	3
EBTT Casts		Moorings Retrieved, Sediment Trap	1
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	5	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Surface Temperature Observations	5		
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	4	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	1		
Water Samples Collected (Microcystin)	2	Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS GULL ISLE
DATE: FROM		**REGION**	LAKE HURON
CRUISE TYPE		**N.MI. STEAMED**	15.7

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	5	Moorings Refurbished, Sediment Trap	8
EBTT Casts		Moorings Retrieved, Sediment Trap	2
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	2	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Surface Temperature Observations	5		
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	4	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	1		
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS GULL ISLE
DATE: FROM		**REGION**	DETROIT RIVER
CRUISE TYPE		**N.MI. STEAMED**	93.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	25	Moorings Refurbished, Sediment Trap	15
EBTT Casts		Moorings Retrieved, Sediment Trap	5
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	24	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Surface Temperature Observations	25		
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	20	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	5		
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

STATISTICS SUMMARY

CRUISE NO.		**SHIP**	CCGS GULL ISLE
DATE: FROM		**REGION**	L. St. Clair & St. Clair River
CRUISE TYPE		**N.MI. STEAMED**	202.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	25	Moorings Refurbished, Sediment Trap	20
EBTT Casts		Moorings Retrieved, Sediment Trap	5
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	17	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Surface Temperature Observations	25		
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Isotopic Composition)	16	Bulk Centrifuge Samples	
Water Samples Collected (Perchlorate)	4		
Water Samples Collected		Observations, Weather	
Water Samples Filtered (Chlorophyll a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ( )		Microbiology	

SHORE PROGRAMS

AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH

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

The Turkey Lakes Watershed Study is an ongoing project that monitors the movements and effects of the Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems of this watershed. The chemical and hydrological monitoring of the study area began in 1980 and has been supported by Technical Operations 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 Algoma Highlands, totally forested, uninhabited and receiving 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 transportation to the study area. In addition, nine snowmobiles and four 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 Quattro Communications in Sault Ste. Marie. The security system upgrade at the camp was completed this year and all buildings are now protected by the alarm system which includes the MSC building on the Met Hill. A two-way radio has been installed in the mudroom/cookhouse to allow staff to monitor radio calls when in these buildings. The base two-way radio has been upgraded so that incoming telephone calls can now be received.

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. Aluminum boats from four lakes have been returned to the Coast Guard in Burlington for disposal and will be replaced by new boats in time for the Spring sampling.

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. 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. 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 dumped to a disk and the data is then 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 and the storage module is downloaded each month and the data is electronically sent to CCIW for processing.

Service was provided by TOS staff to 2 Campbell data loggers, 3 storage modules and 2 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. The cave sampling compartment has been modified to include a small propane burner which will be started if necessary to prevent the sampling line from freezing.

All maintenance and repairs to equipment, buildings and vehicles were performed by Technical Operations staff. 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 has been continued this year by AEIRB and TOS staff at the Turkey Lakes. This study is being done in cooperation with R. Semkin, AEIRB.

Staff moved into the base camp at the end of March for the 2005 Spring Melt intensive sampling period. The melt was quite fast again this year as moderate temperatures and little precipitation prevailed throughout April. This year tracks were installed on the Bombardier ATV so it could be used during the latter part of the melt when the Skidoo trails become very poor. They proved to be an asset for accessing remote sampling locations and thus prevented excessive wear on the Skidoos.

The Joint Turkey Lakes Safety Committee was still functioning during 2005. The safety members include 1 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 7 days per week and also of the potential hazards of using any structure in the watershed for their personal use. All Elan Skidoos at the camp have been completely overhauled this year because the bogey wheel Elan is no longer manufactured and it is the ideal Skidoo for Spring conditions.

This summer 2 TOS staff members were at the camp for 2 weeks completing various construction jobs. Major construction this year included the replacement of two large Skidoo/ATV bridges and the width of each bridge was extended to 6 feet for a safer structure. Minor repairs to a few boat docks were also completed.

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 4 university 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 2 large metal MSC buildings on the Met Hill were relocated to the base camp this fall by TOS staff with the assistance of NRCaN staff and the moving contractor. They will be utilized in the future for dry storage at the camp or within the watershed. A pest control company from Sault Ste Marie completed a maintenance rodent treatment program in all EC trailers.

All ATV/Skidoo bridges and boat 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.

MACKENZIE RIVER, TUNDRA LAKES STUDY, NORTH WEST TERRITORIES
AEIRB STUDY 14146, DR. S. BELTAOS AND DR. D. PETERS

Technical Operations supported Dr. Beltaos during an eighteen day period in March at the Mackenzie Delta near the town of Inuvik. Personnel included three staff from NHRI in Victoria, one from Saskatoon and one from NWRI. The first segment of the work was carried out at a site called Scour Hole# 10 located in the East Channel of the Mackenzie River approximately 16 kilometers distance from Inuvik. These deep holes in the river channels are numerous in the delta area and the cause is poorly understood at the present time. A better understanding of these features will be valuable when a future oil/gas pipeline is built through the delta area. The field work consisted of using a benthos coring system to collect bottom cores from the area above, below and in the scour hole to determine the bottom material which would help to understand what causes the formation. Only ten cores were collected because of a very hard bottom and the cold weather which made the work difficult. Water samples and hydro-lab profiles were also collected and shipped daily to Victoria.

The second part of the field work was for Dr. D. Peters, a NHRI scientist working at the Victoria office, and consisted of studying three sets of paired lakes located north-east of Inuvik. These lakes were located in the areas where the new oil/gas pipeline will be built in the future. These lakes are of interest because in each set one has slumping of its shoreline into its basin which causes it to be very different from its nearby neighbour. The lakes were mapped using ground penetrating radar, water samples hydrolab

profiles and cores were collected from the deepest area of each one. Snowmobiles and helicopters were used to reach some of the sites located on the tundra east of the Mackenzie River.

PERIPHYTON SAMPLING IN SOUTH WESTERN ONTARIO CREEKS
AEIRB Study # 14153, Dr. P. CHAMBERS.

This work is part of a four year ongoing program involving streams in agricultural areas "National Agri-Environmental Standards Initiative" (NAESI). The work conducted in Southern Ontario is only a small part of the country wide research initiative. The sampling conducted for this season concentrated on algal growth, water quality, vertebrate sampling and creek discharge. To complete all sampling over the period of one week two teams (of 3 people each) were required. For the past field season TOS staff supported AEIRB on two occasions. This project will continue over the next 3 years.

A sampling protocol was developed which involved dividing the creek into transects. Points along the transect were quantitatively graded based on certain parameters. (Macrophytes present (y/n), filamentous algae growing on macrophytes(y/n), % Periphyton coverage, Periphyton colour, thickness of Periphyton, longest filament, dominant bottom type) Once the dominant substrate along the transect was determined, a sample of Periphyton was collected. One of three methods was used based on the bottom type. For cobble and rock a scrapping was taken from a delineated area with a scalpel and placed in a scintillation vile. For sand, gravel or fines a spatula was forced under a small Petri dish (placed in the bottom) capturing the sample. It was then placed in a whirl pack bag. If the dominant substrate was covered in macrophytes a quadrate was used to delineate an area and the macrophytes were severed at the stock above the bottom and placed in a bag. This process was repeated for each transect along the survey area. The number of transects and sampling points on the transects were determined by the channel width at its narrowest point.

In total 14 creeks were sampled that met the standards set out by the NAESI. They are listed below. Positions were recorded using a hand held GPS in datum WGS84.

Waterbody	Lat.	Long.	County	Twp	Location
Lutteral Creek	43.66693	-80.25590	Wellington	Eramosa	3rd Line @ Birge Mills
Speed R.	43.73540	-80.26176	Wellington	Eramosa	7th Line & Side road 30
Swan Creek	43.65653	-80.40162	Wellington	Pilkington	Downstream of crossing on Cty Rd 7

Waterbody	Lat.	Long.	County	Twp	Location
Cox Creek	43.58337	-80.44632	Waterloo	Woolwich	Upstream of crossing on Line 86
Carroll Creek	43.64743	-80.47301	Wellington	Pilkington	Crossing on Middlebrook Rd.
Blyth Brook	43.72775	-81.35703	Huron	Morris	Crossing on Moncrief Rd. - East of Blyth
Nissouri Creek	43.13075	-80.96313	Oxford	Zorra	Crossing on Rd 78 near Holiday
Nineteen Creek	43.24120	-81.27346	Perth	Blanshard	Crossing on Line 2 - S of Metropolitan
Salem Creek	43.90783	-81.14948	Huron	Howick	Crossing on Salem Line - N of Wroxeter
Muskrat Creek	43.98451	-81.26731	Bruce	Culross	Crossing on Concession 4 - near Teeswater
South Thames trib	43.02366	-80.84655	Oxford	Southwest Oxford	Crossing on Curry Rd. Exit 218 off 401
Falkland (Mud Creek)	43.17323	-80.44005	Brant	Burford	Crossing on Hwy 2 near Falkland
Kintore Creek	43.11513	-80.99938	Oxford	Zorra	Crossing on 23rd Line - south of Kintore
Middle Maitland	43.73740	-80.92221	Perth	Wallace	Crossing on Rd 157 - upstream of Listowel

MUSSEL SURVEY, BAY OF QUINTE, ONTARIO
AEIRB STUDY 14194, J. SMITH

Technical Operations supported Janice Smith and Darryl McGoldrick, AEIRB during the period August 15-18, 2005

This trip was planned to re-visit areas in the Bay of Quinte and Prince Edward County that historically supported populations of freshwater mussels. Since the time of these collections, these locations have been infested with zebra, and/or quagga, mussels. In most cases, the appearance of zebra and quagga mussels in an area is followed by the disappearance of the native freshwater mussels. The purpose of this survey was to

determine if historical freshwater mussels, especially the rare Eastern Pondmussel (Liqumia Nasuta), continue to survive in Consecon L., East L. and the Bay of Quinte.

Although no live native mussels were found during the surveys, the goal to determine if the Eastern Pond mussel still persists in the inland lakes of Prince Edward County and the Bay of Quinte was achieved. Based on the lack of live animals and the presence of only 2 shells at the 15 sites surveyed it seems unlikely that this species still occurs in the area.

Location and Coordinates of Sites Surveyed

Site No.	Waterbody	Locality name	Local Description	Latitude	Longitude
EL-05-01	East Lake – Outlet	Outlet	Bridge crossing on the Outlet R. of East Lake.	43.89854	-77.22114
CL-05-01	Consecon Lake	Consecon Lake	Lake margin along abandoned rail bed - now an OFSC trail	43.99513	-77.49113
BQ-05-03	Bay of Quinte	Bygotts Bay	South east corner of the bay	44.07264	-77.04474
BQ-05-04	Bay of Quinte	Carnachan Bay	South east corner of the bay	44.06898	-77.02751
BQ-05-02	Bay of Quinte	Mallory Bay	Just off the north shore of Mallory Bay	44.07547	-77.06825
BQ-05-01	Bay of Quinte	Hay Bay	Just offshore of Ram Island in Hay Bay	44.12473	-77.01367
BQ-05-05	Bay of Quinte	Indian Point	Off the east shore of the point	44.11473	-76.85034
BQ-05-09	Lake Ontario	Prince Edward Point	Shore by old lighthouse on Long Point Harbour	43.93470	-76.85889
BQ-05-08	Bay of Quinte	Muscote Bay	North shore of Goose Island	44.09205	-77.30621
BQ-05-07	Bay of Quinte	Hungry Bay	West of Salmon Island near the mouth of the Salmon River	44.17316	-77.25357
BQ-05-06	Bay of Quinte	Hungry Bay	Mouth of Marysville Creek	44.16722	-77.21042
CL-05-02	Consecon Lake	Melville	South east end of the lake	44.01161	-77.42589
WL-05-03	West Lake	Sandbanks Prov. Park	Just offshore of the park	43.91960	-77.29313
WL-05-02	West Lake	Hickory Island	Bay next to Hickory Island	43.95285	-77.27071
WL-05-01	West Lake	Cat Island	South shore of Cat Island	43.95593	-77.29959

MUSSEL SURVEY PELEE ISLAND/POINT PELEE, LAKE ERIE, ONTARIO
AEIRB STUDY 14194, J. SMITH

TOS support was provided to J. Smith by leading a team of snorkelers on a search of the western Lake Erie basin to identify native mussel species. The goal of the search was to determine whether native mussel species have been overtaken by invasive mussels.

The survey took place in Western Lake Erie near Amherstburg, Point Pelee and Pelee Island. All work was done by snorkeling from shore or a small vessel in .25m – 3m of water. Several shells were collected but no live specimens were found. Shells were placed in zip lock bags and locations marked on the bags.

Positions of Sampling Sites:
All positions were taken using a hand held GPS using datum WGS84.\

Lake Erie:

Site No.	Locality name	Local Description	Latitude	Longitude
ER-05-01	Holiday Beach	Public beach in the conservation area	42.03170	-83.04332
ER-05-02	Willow Beach	Just offshore of Willow Beach	42.04343	-83.09963
ER-05-03	The Meadows	Just offshore adjacent to The Meadows	42.02319	-83.01590
ER-05-04	Lakewood Beach	Just offshore near the Big Creek Hunt Club	42.03227	-83.05338
ER-05-05	Sunset Beach	Just offshore of Sunset Beach	42.05251	-83.11495
PP-05-01	Point Pelee	Northwest Beach	41.97085	-82.53635
PP-05-02	Point Pelee	East Beach	41.93520	-82.50540
PI-05-01	Pelee Island	Lighthouse Point at the lighthouse	41.83117	-82.63786
PI-05-02	Pelee Island	South of Lizzard Point	41.80798	-82.63057
PI-05-03	Pelee Island	Immediately east of marina in Scudder	41.81287	-82.65685
PI-05-04	Pelee Island	Mosquito Bay	41.73223	-82.67506
PI-05-05	Pelee Island	South Bay	41.74429	-82.65138
PP-05-03	Point Pelee	East shore	41.97807	-82.50229
HM-05-01	Elmdale	Hillman Marsh Conservation Area	42.03406	-82.48455
PP-05-04	Point Pelee	West shore near tip of point	41.92376	-82.51090
PP-05-05	Point Pelee	West shore of point	41.94184	-82.52064
PP-05-06	Point Pelee	West shore - south of Northwest Beach	41.95566	-82.52762

AQUATIC ECOSYSTEM MANAGEMENT RESEARCH BRANCH

TRACE METAL STUDY IN GROUND WATER ALONG THE EASTERN SHORE OF LAKE HURON

AEMRB STUDY 12214, T. MURPHY

During three separate weekly trips, Technical Operations supported T. Murphy's project by assisting in the collection of well samples from private residences along the Eastern shores of Lake Huron.

The purpose of this project is to determine if the metals in the groundwater exceed the guidelines set by the Federal-Provincial-Territorial Committee on drinking water. The study takes into account the different geological formations within the study area between Wallaceburg and Goderich, and will examine if there is a link between the metal concentrations throughout these formations.

Support consisted of a Technical Operations staff member driving a government vehicle to 40 different residences within the study area. At each home visited 3 samples were collected; 1 x 40mL for low sensitivity bacteria and 1 x 125mL for trace metals, both of which were sampled at Point of Consumption, usually from the kitchen tap. The third sample was 1 x 125mL for Trace Metals, which was to represent the well water, and was taken from a port before any filtration or exposure to air. This sample was taken at the well head if there was a tap available, or at the pressure tank. In most cases, the well sample had to be taken at a tap near the pressure tank.

The following GPS positions were taken at or near all the wells sampled:

Sample	Date	Time	Latitude	Longitude
SWON1	24-Aug-05	6:30:00 PM	N 42° 56' 19.8"	W 082° 17' 36.7"
SWON2	25-Aug-05	11:45:00 AM	N 42° 55' 01.5"	W 082° 19' 26.6"
SWON3	25-Aug-05	2:25:00 PM	N 42° 54' 40.1"	W 082° 23' 05.9"
SWON4	25-Aug-05	4:00:00 PM	N 42° 46' 47.6"	W 082° 19' 31.3"
SWON5	25-Aug-05	4:26:00 PM	N 42° 46' 21.1"	W 082° 19' 12.8"
SWON6	25-Aug-05	5:45:00 PM	N 42° 38' 34.1"	W 082° 26' 57.1"
SWON7	26-Aug-05	10:07:00 AM	N 43° 01' 45.0"	W 082° 06' 12.0"
SWON8	26-Aug-05	10:45:00 AM	N 43° 03' 06.8"	W 082° 07' 05.0"
SWON9	26-Aug-05	12:55:00 PM	N 43° 01' 36.6"	W 082° 03' 13.7"
SWON10	13-Sep-05	1:00:00 PM	N 43° 03' 42.3"	W 082° 00' 03.0"
SWON11	13-Sep-05	2:50:00 PM	N 43° 06' 01.1"	W 082° 00' 59.3"
SWON12	13-Sep-05	4:30:00 PM	N 43° 04' 42.2"	W 082° 04' 18.2"
SWON13	14-Sep-05	10:30:00 AM	N 43° 07' 13.4"	W 082° 00' 46.9"
SWON14	14-Sep-05	11:20:00 AM	N 43° 07' 32.0"	W 082° 00' 43.1"
SWON15	14-Sep-05	2:00:00 PM	N 43° 08' 52.8"	W 081° 59' 08.8"
SWON16	14-Sep-05	3:40:00 PM	N 43° 10' 13.3"	W 081° 56' 07.1"
SWON17	14-Sep-05	4:30:00 PM	N 43° 10' 42.0"	W 081° 53' 01.2"

Sample	Date	Time	Latitude	Longitude
SWON18	15-Sep-05	10:00:00 AM	N 43° 11' 03.5"	W 081° 51' 16.9"
SWON19	15-Sep-05	11:10:00 AM	N 43° 10' 43.2"	W 081° 50' 05.5"
SWON20	15-Sep-05	1:35:00 PM	N 43° 11' 36.3"	W 081° 48' 50.1"
SWON21	15-Sep-05	2:25:00 PM	N 43° 12' 54.6"	W 081° 44' 42.7"
SWON22	15-Sep-05	4:50:00 PM	N 43° 17' 33.5"	W 081° 34' 17.7"
SWON23	16-Sep-05	10:35:00 AM	N 43° 25' 17.8"	W 081° 32' 47.9"
SWON24	16-Sep-05	11:25:00 AM	N 43° 24' 31.0"	W 081° 34' 30.0"
SWON25	25-Oct-05	12:30:00 PM	N 43° 26' 20.3"	W 081° 34' 34.5"
SWON26	25-Oct-05	2:30:00 PM	N 43° 28' 39.4"	W 081° 35' 04.6"
SWON27	25-Oct-05	3:35:00 PM	N 43° 31' 04.6"	W 081° 35' 43.2"
SWON28	25-Oct-05	4:30:00 PM	N 43° 31' 43.6"	W 081° 34' 31.8"
SWON29	26-Oct-05	11:00:00 AM	N 43° 31' 24.2"	W 081° 33' 05.5"
SWON30	26-Oct-05	11:45:00 AM	N 43° 34' 01.9"	W 081° 35' 33.6"
SWON31	26-Oct-05	2:00:00 PM	N 43° 35' 32.1"	W 081° 36' 09.7"
SWON32	26-Oct-05	2:50:00 PM	N 43° 37' 57.4"	W 081° 36' 08.2"
SWON33	26-Oct-05	3:45:00 PM	N 43° 39' 48.5"	W 081° 36' 21.3"
SWON34	26-Oct-05	4:00:00 PM	N 43° 42' 01.6"	W 081° 36' 12.8"
SWON35	26-Oct-05	4:45:00 PM	N 43° 44' 20.8"	W 081° 36' 21.1"
SWON36	27-Oct-05	9:45:00 AM	N 43° 42' 03.5"	W 081° 38' 53.2"
SWON37	27-Oct-05	10:40:00 AM	N 43° 39' 33.0"	W 081° 38' 35.1"
SWON38	27-Oct-05	12:15:00 PM	N 43° 35' 20.6"	W 081° 38' 43.3"
SWON39	27-Oct-05	2:05:00 PM	N 43° 32' 32.8"	W 081° 40' 59.9"
SWON40	27-Oct-05	3:05:00 PM	N 43° 27' 21.2"	W 081° 39' 26.0"

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

RoxAnn is an acoustic seabed-classification system which uses differential GPS and an echo sounder to create a lithological map. This system can be mounted on a small launch or a large ship. RoxAnn has an operating range of 2m – 40m of depth at speeds of 3.5 knots to 8 knots. All data collected is checked by running check lines (a series of track lines overlapping each other) and ground-truthing. Ground-truthing is accomplished by two methods. The first is a drop camera mounted on a tripod lowered with a block and tackle attached to a davit. The video is recorded on a digital system with a video stamp displaying time, date, station I.D. and GPS data. Sediment type and penetration of the tripod legs can be observed. The second method of ground-truthing is the physical collection of sediment samples. These sites are selected based on the previous video data. Sampling is accomplished with a Shipek hoisted by a winch. A digital photo is taken of the sediment and a verbal description is recorded. The sediment is then sub-sampled and placed in containers for grain size analysis. All RoxAnn and positional data is recorded and maintained by AEMRB staff.

Keweenaw Peninsula, Michigan; June 13 - 30, R. Neureuther

The purpose of the trip was to obtain RoxAnn and bathymetric data to identify aquatic habitat that contributes to fishery resource management from two areas east of the Keweenaw Peninsula, Michigan.

The first area of concern was Traverse Bay and in particular Buffalo Reef. Both Lake Trout and Whitefish utilize the reef for spawning. Sounding lines were done on Traverse Bay as well as video and sediment collection. The second area studied on this trip was the west shore of Keweenaw Bay from the south entry of Portage Lake to Little Carp River. Sounding lines were done on Keweenaw Bay as well as video and sediment collection.

Both studies contribute to habitat objectives of the binational Lake Superior LaMP program as well as the Great Lakes Fisheries Commission and other Lake Superior fishery management agencies. The work done on Traverse Bay was in partnership with the Great Lakes Indian Fish and Wildlife Commission.

Peninsula Harbour - October 17-26, T. Breedon

An acoustic mapping and sediment classification survey was completed in the Peninsula Harbour (Lake Superior) during October 17-26, 2005. The RoxAnn acoustic sediment classification system was used in conjunction with sediment collecting ground-truthing and video confirmation. Substrate mapping of the basin of Peninsula Harbour will provide a more accurate description of the spatial extent of sediment and the contact boundaries with exposed bedrock. This information will contribute to the assessment of sediment management options and further the understanding of the submerged landscape. Additional box core sampling was taken in the outer harbour for MOE.

A MAV's current meter that was deployed earlier in the summer by the CCGS LIMNOS was turned over and redeployed as a winter mooring. The current meter was deployed to record water currents as part of an assessment of the vulnerability of in-place sediments to erosion from storm events.

Appreciation is given to the Marathon Pulp Mill who let the field party use the secure dock facilities and provided power.

Nipigon Bay & Nipigon River, Lake Superior; September & November, M. Benner

This work was in partnership with the Thunder Bay Ministry of Natural Resources (MNR), and a continuance of the Canada Ontario Agreement (COA). The soundings were in water between 2 and 20 meters over pre-determined critical fish habitat. This work was divided into two trips (September & November).

The survey area was comprised of seven zones which included Grant Point to Cypress Bay, Moffat Straight, Mid Nipigon River Section, East side of Cooper's Point, Cypress Bay to Jackpine River, Condon Island to Cooper's Point and the South-east side of Vert Island. The soundings were in water between 2 and 20 meters over pre-determined critical fish habitat

Trent River, Lake Ontario; September - December, D. Walsh, B. Lalonde

The survey's objective was to further characterize and delineate substrate types located at the mouth of the Trent River.

September, 2005
Due to the high volume of weeds throughout the mouth of the River, much of the data was scrambled and found to be unworkable. Some video work was completed and that data proved to be relevant.

November - December, 2005
Survey lines were done in the mouth of the Trent River with emphasis on a small area on the east side of the Trent River, north of the Centennial Park marina potentially contaminated with high concentrations of dioxins and furans. Video-ground truthing and sediment samples (a push) corer were obtained from selected sites. The cores were brought back to CCIW and extruded every five cm. Other sites were sampled by using a PONAR.

Thunder Bay Harbour, Lake Superior; November 21-26, 2005, B. Lalonde

The survey's objective was to further characterize and delineate substrate types located at the north end of the Thunder Bay Harbour, between the Abitibi Thunder Bay Mill and the United Grain Growers elevators A. Survey lines were done as well as 2m depth contour. Video ground truthing was also done at selected sites. No sediment samples were taken.

St. Clair River at Sarnia, Ontario; December 5 - 9, 2005, S. Smith

The study objective was to collect bathymetric data and substrate information in support of Dr. Krishnappan's modeling study in the headwaters of the St. Clair River. RoxAnn lines were run along the shoreline from downstream of the Black River to upstream of the US Coast Guard Base at Port Huron, Michigan. Lines were run across the channel at 100 metre intervals throughout the entire length of the survey area. Video images and sediment samples were collected from selected locations.

RoxAnn transects at 5 km offsets downstream from the Black River to the Port Lambton area were cancelled due to poor weather.

NOTTAWASAGA BAY, ONTARIO, BACTERIA SAMPLING
AEMRB STUDY 14181, 12240; DR. A. CROWE, M. CHARLTON

The bacterial contamination of the lake waters adjacent to beaches of the Great Lakes is becoming a common and pervasive problem. Numbers of fecal bacteria, and especially *Escherichia coli* (*E. coli*), are often detected at levels considerably higher than the Provincial Water Quality Standard of 100MPN/100ml, resulting in beach closures due to the potential for deleterious effect on human health. In response, a provincial-federal program is being conducted to determine the source of these bacteria. Several possible potential sources for these bacteria in the near-shore waters have been identified including runoff from agricultural areas, streams and rivers, urban runoff, municipal waste-water treatment facilities and wildlife. A sampling program was undertaken during February 2005 to identify numbers of *E. coli* in the beach sands, lake water and groundwater at Woodland Beach and Balm Beach, Georgian Bay.

Technical Operations staff provided support to Dr. A. Crowe, AEMRB, NWRI by helping to obtain groundwater samples and levels from Woodland Beach using the mini drive point system and a post hole auger. Two beach areas were sampled and 167 wells were dug. An additional 23 water samples were taken by hand from local creeks and drainage culverts. The septic tank at 2214 Tiny Beaches Road, South was also sampled for DNA to compare with ground water samples taken from the beach. All the samples were processed at the site by A. Crowe in a temporary lab set up in his shed. No water quality samples were collected at this time, only bacteria.

The elevation and location of each site was then obtained using a measuring tape and the Leica Wild NA2000 electronic level relative to temporary bench marks (nails in posts at both sites) set at previous trips.

Nottawasaga River July 25th 2005, and Balm Beach and Beckwith Island, July 26th 2005

Bacteria sampling was performed by using a sampling pole marked at 1m to which is affixed the sample container. The sampling pole was lowered to a depth of 1 meter and a grab sample was collected.

The first transect was done in the Nottawasaga River and started upstream of the Schooner Tour Bridge all the way down to the mouth of the river. A plume of silty water from the Nottawasaga River was visible in the Nottawasaga Bay and samples were obtained in this plume by transecting perpendicular and parallel to the Wasaga Beach.
Two transects were sampled in Balm Beach from near shore to offshore.
Beckwith Island; 3 transects were sampled on Beckwith Island

Consec		Scientist's	UTM Co-ords	
Stn. #	Stn. #	Stn. Name	Easting	Northing
1	270	WB2-1	579837	4935831
2	270A	WB2-2	579837	4935831
3	270B	WB2-3	579837	4935831
4	270C	WB2-4	579837	4935831
5	270D	WB2-5	579837	4935831
6	270E	WB2-6	579837	4935831
7	270F	WB2-7	579837	4935831
8	270G	WB2-L	579837	4935831
9	271	WB1-1	579820	4935781
10	271A	WB1-2	579820	4935781
11	271B	WB1-3	579820	4935781
12	271C	WB1-4	579820	4935781
13	271D	WB1-5	579820	4935781
14	271E	WB1-A1	579820	4935781
15	271F	WB1-A2	579820	4935781
16	271G	WB1-A3	579820	4935781
17	271H	WB1-A4	579820	4935781
18	271I	WB1-A5	579820	4935781
19	271J	WB1-B1	579820	4935781
20	271K	WB1-B2	579820	4935781
21	271L	WB1-B3	579820	4935781
22	271M	WB1-B4	579820	4935781
23	271N	WB1-B5	579820	4935781
24	271O	WB1-C1	579820	4935781
25	271P	WB1-C2	579820	4935781
26	271Q	WB1-C3	579820	4935781
27	271R	WB1-C4	579820	4935781
28	271S	WB1-C5	579820	4935781
29	271T	WB1-D1	579820	4935781
30	271U	WB1-D2	579820	4935781
31	271V	WB1-D3	579820	4935781
32	271W	WB1-D4	579820	4935781
33	271X	WB1-D5	579820	4935781
34	271Y	WB1-E1	579820	4935781
35	271Z	WB1-E2	579820	4935781
36	271AA	WB1-E3	579820	4935781
37	271AB	WB1-E4	579820	4935781
38	271AC	WB1-E5	579820	4935781
39	271AD	WB1-L1	579820	4935781
40	271AE	WB1-L2	579820	4935781
41	271AF	WB1-L3	579820	4935781
42	271AG	WB1-L4	579820	4935781

Consec		Scientist's	UTM Co-ords	
Stn. #	Stn. #	Stn. Name	Easting	Northing
43	271AH	WB1-L5	579820	4935781
44	271AI	WB1-5N1	579820	4935781
45	271AJ	WB1-5N2	579820	4935781
46	271AK	WB1-5S1	579820	4935781
47	271AL	WB1-5S2	579820	4935781
48	272	WB3-1	579914	4936072
49	272A	WB3-2	579914	4936072
50	272B	WB3-3	579914	4936072
51	272C	WB3-4	579914	4936072
52	272D	WB3-5	579914	4936072
53	272E	WB3-6	579914	4936072
54	272F	WB3-L1	579914	4936072
55	272G	WB3-L2	579914	4936072
56	272H	WB3-L3	579914	4936072
57	272I	WB3-L4	579914	4936072
58	272J	WB3-L5	579914	4936072
59	273	WB4-1	580020	4936631
60	273B	WB4-2	580020	4936631
61	273C	WB4-3	580020	4936631
62	273D	WB4-A1	580020	4936631
63	273E	WB4-A2	580020	4936631
64	273F	WB4-A3	580020	4936631
65	273G	WB4-A4	580020	4936631
66	273H	WB4-A5	580020	4936631
67	273I	WB4-B1	580020	4936631
68	273J	WB4-B2	580020	4936631
69	273K	WB4-B3	580020	4936631
70	273L	WB4-B4	580020	4936631
71	273M	WB4-B5	580020	4936631
72	273N	WB4-creek-B	580020	4936631
73	273O	WB4-creek-A	580020	4936631
74	273P	WB4-culvert	580020	4936631
75	273Q	WB4-L1	580020	4936631
76	274	BB-L0m	579257	4949364
77	274A	BB-L10m	579257	4949364
78	274B	BB-L20m	579257	4949364
79	274C	BB-L30m	579257	4949364
80	274D	BB-L40m	579257	4949364
81	274E	BB-L50m	579257	4949364
82	274F	BB-L60m	579257	4949364
83	274G	BB-L70m	579257	4949364

Consec		Scientist's	UTM Co-ords	
Stn. #	Stn. #	Stn. Name	Easting	Northing
84	274H	BB-A1	579257	4949364
85	274I	BB-A2	579257	4949364
86	274J	BB-A3	579257	4949364
87	274K	BB-A4	579257	4949364
88	274L	BB-A5	579257	4949364
89	274M	BB-A6	579257	4949364
90	274N	BB-A7	579257	4949364
91	274O	BB-A8	579257	4949364
92	274P	BB-B1	579257	4949364
93	274Q	BB-B2	579257	4949364
94	274R	BB-B3	579257	4949364
95	274S	BB-B4	579257	4949364
96	274T	BB-B5	579257	4949364
97	274U	BB-B6	579257	4949364
98	274V	BB-B7	579257	4949364
99	274W	BB-B8	579257	4949364
100	274X	BB-C1	579257	4949364
101	274Y	BB-C2	579257	4949364
102	274Z	BB-C3	579257	4949364
103	274AA	BB-C4	579257	4949364
104	274AB	BB-C5	579257	4949364
105	274AC	BB-C6	579257	4949364
106	274AD	BB-C7	579257	4949364
107	274AE	BB-C8	579257	4949364
108	274AF	BB-D1	579257	4949364
109	274AG	BB-D2	579257	4949364
110	274AH	BB-D3	579257	4949364
111	274AI	BB-D4	579257	4949364
112	274AJ	BB-D5	579257	4949364
113	274AK	BB-D6	579257	4949364
114	274AL	BB-D7	579257	4949364
115	274AM	BB-D8	579257	4949364
116	274AN	BB-E1	579257	4949364
117	274AO	BB-E2	579257	4949364
118	274AP	BB-E3	579257	4949364
119	274AQ	BB-E4	579257	4949364
120	274AR	BB-E5	579257	4949364
121	274AS	BB-E6	579257	4949364
122	274AT	BB-E7	579257	4949364
123	274AU	BB-E8	579257	4949364
124	274AV	BB-1	579257	4949364
125	274AW	BB-2	579257	4949364
126	274AX	BB-3	579257	4949364

Consec		Scientist's	UTM Co-ords	
Stn. #	Stn. #	Stn. Name	Easting	Northing
127	274AY	BB-4	579257	4949364
128	274AZ	BB-5	579257	4949364
129	274BA	BB-6	579257	4949364
130	274BB	BB-7	579257	4949364
131	274BC	BB-8	579257	4949364
132	274BD	BB-9	579257	4949364
133	274BE	BB-GWL1	579257	4949364
134	274BF	BB-GWL2	579257	4949364
135	274BG	BB-GWL3	579257	4949364
136	274BH	BB-GWL4	579257	4949364
137	274BI	BB-GWL5	579257	4949364
138	274BJ	BB-creek1	579257	4949364
139	274BK	BB-creek2	579257	4949364
140	274BL	BB-creek3	579257	4949364
141	275	BB-creek4	579269	4949518
142	276	BB-creek5	579283	4949526
143	277	BB-creek6	579294	4949550
144	278	BB-creek7	579269	4949620
145	279	BB-creek8	579386	4949645
146	280	BB-creek9	579431	4949699
147	281	BB-creek10	579434	4949730
148	282	BB-creek11	579441	4949803
149	283	BB-creek12	579518	4949869
150	284	BB-creek13	579513	4949917
151	285	BB-creek14	579533	4949999
152	286	BB-creek15	579537	4950074
153	287	BB-creek16	579577	4950092
154	289	BB-creek17	579615	4950149
155	273R	WB4-creek1	580020	4936631
156	273P	WB4-culvert	580020	4936631
157	290	WB-creek3	580113	4936631
158	291	WB-creek4	580192	4936606
159	292	WB-creek5	580225	4936653
160	293	WB-creek6	580279	4936710
161	272F	WB3-L1-22	579914	4936072
162	272G	WB3-L2-22	579914	4936072
163	272H	WB3-L3-22	579914	4936072
164	272I	WB3-L4-22	579914	4936072
165	272J	WB3-L5-22	579914	4936072
166	272K	WB3-A1	579914	4936072
167	272L	WB3-A2	579914	4936072
168	272M	WB3-A3	579914	4936072

Consec		Scientist's	UTM Co-ords	
Stn. #	Stn. #	Stn. Name	Easting	Northing
169	272N	WB3-A4	579914	4936072
170	272O	WB3-A5	579914	4936072
171	272P	WB3-B1	579914	4936072
172	272Q	WB3-B2	579914	4936072
173	272R	WB3-B3	579914	4936072
174	272S	WB3-B4	579914	4936072
175	272T	WB3-B5	579914	4936072
176	272U	WB3-C1	579914	4936072
177	272V	WB3-C2	579914	4936072
178	272W	WB3-C3	579914	4936072
179	272X	WB3-C4	579914	4936072
180	272Y	WB3-C5	579914	4936072
181	272Z	WB3-D1	579914	4936072
182	272AA	WB3-D2	579914	4936072
183	272AB	WB3-D3	579914	4936072
184	272AC	WB3-D4	579914	4936072
185	272AD	WB3-D5	579914	4936072
186	272AE	WB3-E1	579914	4936072
187	272AF	WB3-E2	579914	4936072
188	272AG	WB3-E3	579914	4936072
189	272AH	WB3-E4	579914	4936072
190	272AI	WB3-E5	579914	4936072

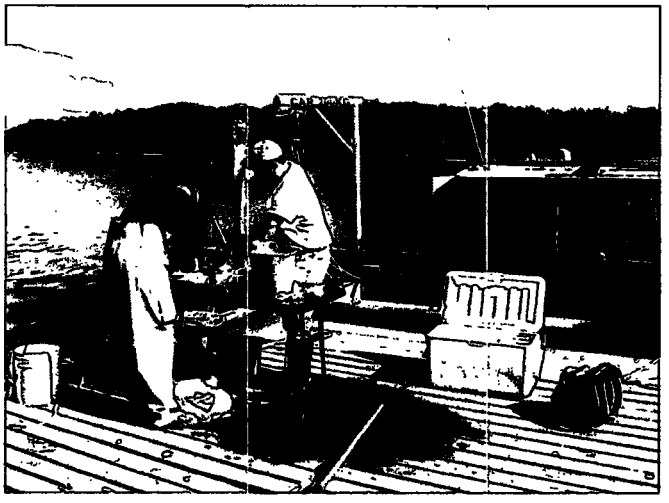
Station	Cons.	Scientist Stn Name	Latitude	Longitude
300	1	NOTTAWR 1	N44° 29' 03"	W80° 03' 13"
301	2	NOT2	N44° 29' 09"	W80° 03' 14"
302	3	NOT3	N44° 29' 13"	W80° 03' 12"
303	4	NOT4	N44° 29' 13"	W80° 03' 02"
304	5	NOT5	N44° 29' 16"	W80° 02' 57"
305	6	NOT6	N44° 29' 23"	W80° 02' 58"
306	7	NOT7	N44° 32' 16"	W80° 00' 29"
307	8	NOT8	N44° 32' 20"	W80° 00' 29"
308	9	NOT9	N44° 32' 30"	W80° 00' 38"
309	10	NOT10	N44° 32' 35"	W80° 00' 46"
310	11	NOT11	N44° 32' 38"	W80° 00' 52"
311	12	NOT12	N44° 32' 41"	W80° 00' 56"
312	13	NOT13	N44° 32' 49"	W80° 01' 13"
313	14	NOT14	N44° 32' 28"	W80° 00' 45"
314	15	NOT15	N44° 32' 24"	W80° 00' 47"
315	16	NOT16	N44° 32' 20"	W80° 00' 49"
316	17	NOT17	N44° 31' 55"	W80° 01' 11"

317	18	NOT18	N44° 32' 35"	W80° 00' 39"
318	19	NOT19	N44° 32' 39"	W80° 00' 36"
357	20	NOT20	N44° 32' 43"	W80° 00' 32"
358	21	NOT21	N44° 33' 03"	W80° 00' 23"
359	22	NOT22	N44° 33' 24"	W80° 00' 17"
360	23	NOT23	N44° 29' 26"	W80° 02' 58"
361	24	NOT24	N44° 29' 32"	W80° 02' 48"
362	25	NOT25	N44° 29' 44"	W80° 02' 39"
363	26	NOT26	N44° 30' 00"	W80° 02' 24"
364	27	NOT27	N44° 30' 20"	W80° 02' 04"
365	28	NOT28	N44° 30' 45"	W80° 01' 36"
366	29	NOT29	N44° 31' 11"	W80° 01' 09"
367	30	NOT30	N44° 31' 13"	W80° 01' 07"
368	31	NOT31	N44° 31' 22"	W80° 01' 03"
369	32	NOT32	N44° 31' 46"	W80° 00' 43"
370	33	Balm Beach 33	N44° 41' 34"	W80° 00' 00"
371	34	Balm Beach 34	N44° 41' 32"	W80° 00' 00"
372	35	Balm Beach 35	N44° 41' 30"	W80° 00' 03"
373	36	Balm Beach 36	N44° 41' 30"	W80° 06' 07"
374	37	Balm Beach 37	N44° 41' 22"	W80° 00' 16"
375	38	Balm Beach 38	N44° 41' 20"	W80° 00' 33"
376	39	Balm Beach 39	N44° 41' 33"	W79° 59' 57"
377	40	Balm Beach 40	N44° 41' 32"	W79° 59' 58"
378	41	Balm Beach 41	N44° 41' 30"	W80° 00' 01"
379	42	Balm Beach 42	N44° 41' 28"	W80° 00' 04"
380	43	Balm Beach 43	N44° 41' 25"	W80° 00' 07"
381	44	Beckwith I. 1	N44° 50' 48"	W80° 06' 01"
382	45	Beckwith I. 2	N44° 50' 46"	W80° 06' 00"
386	46	Beckwith I. 3	N44° 50' 43"	W80° 05' 00"

AQUACULTURE STUDY, DEPOT HARBOUR, ONTARIO
AEMRB STUDY 12240; M. CHARLTON.

This study is part of ongoing research to investigate the effects of aquaculture on water quality. Sediment cores were collected to determine the amount of fish feces and feed that have been deposited under and near the fish cages. Water quality profiles and water samples will determine the effects of this deposition.

The field work took place at Depot Harbour in Parry Sound. The site is an active aquaculture site, one of the largest fresh water sites in North America. A total of 33 stations were sampled over the course of a week. The TOS corer was used to collect sediment at 30 of the sites. The cores were extruded on site with the push stick method. Water quality samples were tested for chlorophyll a, nutrients, and filtered and unfiltered total phosphorus at 10 sites. Underwater video was taken at 20 sites using a drop camera. The drop camera was mounted to a tripod and lowered to the bottom with a rope on a block and tackle. Bright sun and clear water made for excellent images.



SITE POSITIONS

Stn. #	Stn I.D.	Date	Time UTC	Latitude	Longitude	Samples Taken
178	DH1	31/05/2005	13:34	N45°18.894'	W80°06.158'	drop camera
179	DH2	31/05/2005	13:45	N45°18.841'	W80°06.153'	water, drop camera
180	DH3	31/05/2005	14:00	N45°18.894'	W80°06.222'	
181	DH4	31/05/2005	14:05	N45°18.850'	W80°06.217'	water, drop camera
182	DH5	31/05/2005	14:17	N45°18.797'	W80°06.213'	drop camera
183	DH6	31/05/2005	14:24	N45°18.904'	W80°06.343'	
184	DH7	31/05/2005	14:31	N45°18.839'	W80°06.342'	water, drop camera
185	DH8	31/05/2005	14:42	N45°18.769'	W80°06.341'	
186	DH9	31/05/2005	14:55	N45°18.988'	W80°06.424'	
187	DH10	31/05/2005	18:54	N45°18.912'	W80°06.432'	
188	DH11	31/05/2005	19:03	N45°18.846'	W80°06.439'	water
189	DH12	31/05/2005	19:15	N45°18.765'	W80°06.446'	
190	DH13	31/05/2005	19:23	N45°19.051'	W80°06.470'	
191	DH14	31/05/2005	19:33	N45°18.923'	W80°06.537'	
192	DH15	31/05/2005	19:41	N45°18.861'	W80°06.565'	water, drop camera
193	DH16	01/06/2005	12:32	N45°18.791'	W80°06.595'	
194	DH17	01/06/2005	12:39	N45°18.979'	W80°06.641'	
195	DH18	01/06/2005	12:47	N45°18.904'	W80°06.730'	water, drop camera
196	DH19	01/06/2005	13:01	N45°18.847'	W80°06.805'	
197	DH20	01/06/2005	13:07	N45°18.961'	W80°06.935'	water, drop camera
198	DH21	01/06/2005	13:25	N45°19.062'	W80°07.126'	water, drop camera
199	DH22	01/06/2005	14:13	N45°18.922'	W80°06.136'	drop camera
245	DH23	01/06/2005	14:18	N45°18.929'	W80°06.158'	drop camera
246	DH24	01/06/2005	14:21	N45°18.934'	W80°06.178'	drop camera
247	DH25	01/06/2005	14:25	N45°18.946'	W80°06.164'	water, drop camera
248	DH26	01/06/2005	14:33	N45°18.956'	W80°06.155'	drop camera
249	DH27	01/06/2005	14:49	N45°18.932'	W80°06.226'	water, drop camera
250	DH28	01/06/2005	17:35	N45°18.908'	W80°06.204'	drop camera
251	DH29	01/06/2005	17:38	N45°18.915'	W80°06.225'	drop camera
252	DH30	01/06/2005	17:42	N45°18.920'	W80°06.242'	drop camera
253	DH31	01/06/2005	17:50	N45°18.936'	W80°06.203'	drop camera
254	DH32	01/06/2005	18:30	N45°18.951'	W80°06.221'	water
255	DH33	02/06/2005	15:06	N45°18.992'	W80°06.040'	drop camera

HAMILTON HARBOUR
AEMRB STUDY 12240 - M. Charlton

WATER QUALITY MONITORING, Station 1001

Monitoring of a number of water quality parameters continued in Hamilton Harbour over the 2005 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

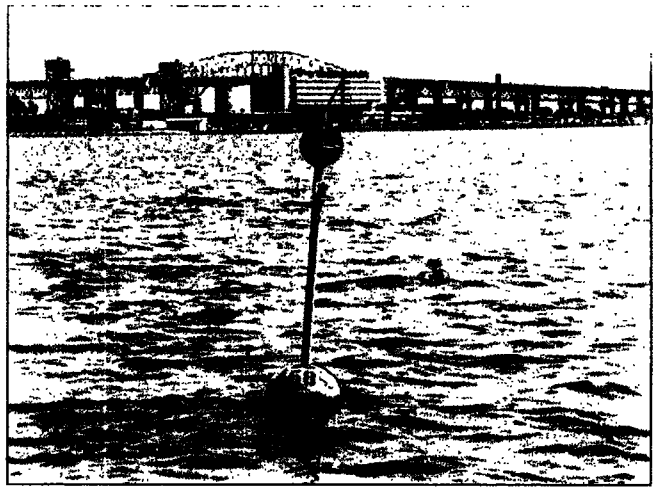
In response to concerns over the health of zooplankton in Hamilton Harbour, a monitoring program was undertaken in 2000 for Dr. M. Evans, AEPRB, NWRI, Saskatoon. Again in 2005, samples were collected from July to October which will provide quantitative and qualitative data on Harbour populations.

FECAL COLIFORM

In response to concerns over water quality in and around Hamilton Harbour, Burlington, Oakville 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 and Pier 4 Park), Burlington, Bronte and Hamilton (north of Confederation Park). Also, three intensive bacterial spatial surveys at thirty stations in the Harbour were conducted in April, July and October.

MOORINGS

A temperature mooring in collaboration with the University of Waterloo was deployed at the Deep Hole area of the Harbour from June to November.



CHARLTON PROFILING, STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1001	43° 17' 15"	79° 50' 17"

CHARLTON/EVANS, NET HAULS, STUDY 12240

STUDY	STATION	LATITUDE N.	LONGITUDE W.
HH52	1001	43° 17' 14"	79° 50' 19"
HH51	9031	43° 16' 46"	79° 52' 19"
HH53	9033	43° 17' 09"	79° 47' 43"
	2195	43° 19' 02"	79° 45' 30"

FECAL COLIFORM, CHARLTON STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
Bay Front Park	***Off shore Water Bacteria***	
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"

		Ground Water Bacteria	
	9066 a,b,c,d	43° 16' 17"	79° 52' 29"
	9067 a,b,c,d	43° 16' 19"	79° 52' 28"
	9068 a,b,c,d	43° 16' 15"	79° 52' 28"
Pier 4 Park		***Off shore Water Bacteria***	
	9070	43° 16' 25"	79° 52' 04"
	9071	43° 16' 26"	79° 52' 04"
	9072	43° 16' 26"	79° 52' 05"
	9073	43° 16' 27"	79° 52' 08"
	9074	43° 16' 29"	79° 52' 14"
		Ground Water Bacteria	
	9069 a,b,c,d	43° 16' 25"	79° 52' 03"
Burlington Beach			
		Off shore Water Bacteria	
BBS	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"
BBN	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"
		Ground Water Bacteria	
BBN	9089 a,b,c,d	43° 18' 42"	79° 48' 01"
BBS	9090 a,b,c,d	43° 18' 30"	79° 47' 58"
Hamilton Beach			
		Off shore Water Bacteria	
	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"

	Ground Water Bacteria	
9091 a,b,c,d	43° 16' 21"	79° 46' 37"

Bronte Beach

	Off shore Water Bacteria	
1229	43° 23' 32"	79° 42' 36"
1230	43° 23' 32"	79° 42' 35"
1231	43° 23' 32"	79° 42' 34"
1232	43° 23' 30"	79° 42' 32"
1233	43° 23' 22"	79° 42' 10"
	Ground Water Bacteria	
1253 a,b,c,d	43° 23' 31"	79° 42' 36"
1254 a,b,c,d	43° 23' 32"	79° 42' 36"
1255 a,b,c,d	43° 23' 33"	79° 42' 35"

FECAL COLIFORM-INTENSIVE, CHARLTON STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
901	43° 17' 50"	79° 47' 57"
902	43° 17' 42"	79° 48' 12"
903	43° 17' 35	79° 48' 41"
904	43° 17' 30	79° 49' 05"
905	43° 17' 25	79° 49' 30"
908	43° 16' 52	79° 51' 53"
909	43° 16' 38	79° 52' 41"
910	43° 16' 47	79° 53' 17"
911	43° 17' 43	79° 50' 29"
912	43° 17' 00"	79° 49' 47"
913	43° 16' 57	79° 48' 41"
914	43° 16' 07	79° 46' 57"
915	43° 16' 18	79° 47' 14"
916	43° 16' 30	79° 47' 26"
917	43° 16' 40	79° 47' 36"
918	43° 17' 07	79° 47' 51"
919	43° 17' 29	79° 48' 23"
920	43° 17' 57	79° 48' 49"

921	43° 18' 24	79° 49' 10"
922	43° 18' 24	79° 46' 48"
923	43° 18' 14	79° 47' 04"
924	43° 18' 07	79° 47' 21"
925	43° 17' 57	79° 47' 43"
929	43° 18' 10	79° 49' 43"
933	43° 17' 25"	79° 51' 10"
945	43° 16' 36	79° 51' 10"
946	43° 16' 28	79° 50' 40"
947	43° 16' 14	79° 47' 57"
1001	43° 17' 15	79° 50' 17"

TEMPERATURE MOORING, CHARLTON (University of Waterloo) STUDY 12240

STATION NUMBER	LATITUDE N.	LONGITUDE W.
9032	43° 17'' 11"	79° 50' 29"

WHEATLEY HARBOUR AOC SEDIMENT SURVEY
AEMRB STUDY 12246, DR. C. MARVIN

Technical Operations supported the Great Lakes Nearshore Monitoring and Assessment project for the Ministry of Environment at Wheatley Harbour during the months of October and November. Environment Canada's involvement is through Dr. C. Marvin who is collaborating with the MOE study.

Wheatley Harbour has long been an area of concern due to its water quality issues and high concentrations of PCB's in the sediments. The hydrology of Muddy Creek at Wheatley Harbour does not follow typical stream hydrology; therefore a better understanding is needed.

Four separate trips were made to Wheatley for the placement of two water level pressure transducers, to measure water levels, as well as two sediment traps for sediment loading and two current meters to measure flow in and out of Muddy Creek. Also eight large diameter cores were collected from various sites throughout Muddy Creek, sub-divided and returned to MOE laboratory in Toronto for analysis of PCB's. All equipment was removed in late November.

Current plans call for a similar field work to be carried out in the spring and summer periods of 2006.

BELLEVUE MARINE PARK SUSPENDED SEDIMENT DEPOSITION STUDY
AEMRB STUDY 12246, Dr. C. Marvin

Bellevue Marine Park is the first depositional zone downstream from the major industries located in Sault Ste. Marie and as a result, there is significant contamination of existing sediment. Elevated levels of contaminants such as PAHs and TPHs have caused impairment of benthic communities and residual toxicity. It is hoped that samples acquired over 2005 will reinforce trends found in a 1995 survey, carried out by MOE. (MOE/DOE WMS section Project Description, April, 2005)

The study area was located upstream of the Bellevue Marine Park and just offshore of the Sault Ste Marie Hospital and the Bush Plane Museum.

Divers installed the sediment tubes on May 17, refurbished them on August 16 and retrieved the moorings on November 15, 2005. At each site the boat was anchored as close as possible to the GPS position and divers were deployed to install sediment traps, as well as survey bottom characteristics and take still images of each site. Two 180 cm sections of rebar were driven into the sediment at each site and (3) 10x60cm sections of core tube secured to each stake with tie wraps. Core tubes were excavated approximately 10-15 cm into the sediment at the base of each stake.

STATION 220

Positions of Sampling Sites

Station	Depth	Easting	Northing
213	6.6	705588	5153172
216	6.0	705525	5153264
220	2.7	705389	5153364

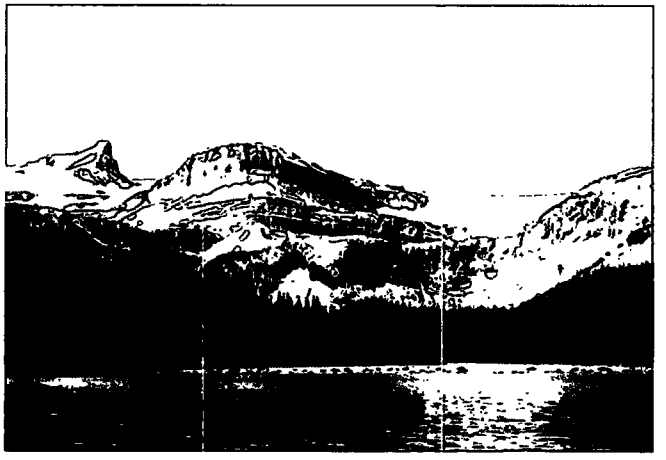
HAMILTON HARBOUR, MOORINGS
AEMRD Study 12246, Dr. C. Marvin

Seven sediment trap moorings were placed in Hamilton Harbour and sampled on a monthly basis. Five of these moorings have been located in the same positions for a number of years. The Deep Hole mooring (9032) was also deployed as a winter mooring. Two sediment trap moorings were placed close to Randle Reef to gain data for the Randle Reef Sediment Remediation Program. The collected sediment was analyzed for organic contaminants (polycyclic aromatic hydrocarbons) as well as metals.

An ADCP and a MAVs mooring were also deployed close to Randle Reef for the season.

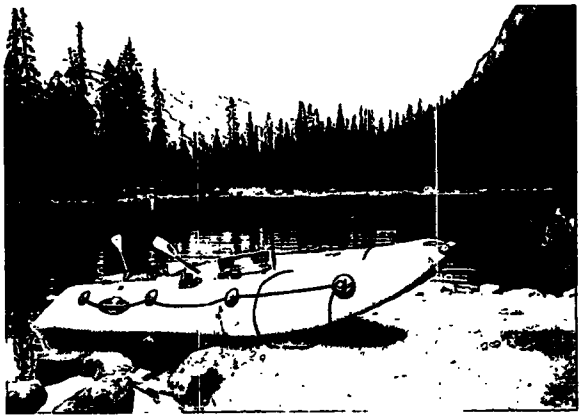
STATION NUMBER	LATITUDE N.	LONGITUDE W
Windermere (Bridge)	43° 16' 08"	79° 46' 54"
9030	43° 18' 13"	79° 49' 02"
9031	43° 16' 47"	79° 52' 31"
9032	43° 17' 11"	79° 50' 37"
9033	43° 17' 06"	79° 47' 41"
9081	43° 16' 29"	79° 50' 21"
9083	43° 16' 24"	79° 49' 57"
9080 (ADCP)	43° 16' 29"	79° 50' 18"
9082 (MAVs)	43° 16' 24"	79° 50' 00"

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 Lake Louise, Alberta during the month of June. 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 six 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, stream flow measurements, light extinction measurements and the set up and operation of a Hydro-lab unit.
An inflatable 12 foot boat was utilized for sampling which was deemed safer than canoes. At least three sampling trips were to be carried out by two personnel from the University of Calgary. The first few stand alone stream temperature measurement gauges were deployed into the streams which feed these lakes. The field work also included the collection of sounding data using a Lowrance GPS/Depth Sounder that will be used to create Bathymetry maps of the six lakes. The data required considerable interpretation for it to be utilized in a usable form for the required maps.



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

Technical Operations supported Dr. Watson during the period of August 23 - 26. The purpose of the 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.

The sampling performed at each sites was as follows:

- Surface temperature and Secchi disk,
- Integrated sample at twice the depth of the Secchi disk reading
  - 3 X 12 mL cryo tubes for algal toxins analysis,
  - 1 125 ml glass bottle for algal composition preserved with Lugol's,
  - 1 X 40 mL glass VOC vial for geosmin analysis,
  - Volume of water filtered for Chlorophyll a,
  - Volume of water filtered for Anatox,
- Grab sample at 0.5 meter depth
  - 3 X 12 mL cryo tubes for algal toxins analysis,
  - 1 125 ml glass bottle for algal composition preserved with Lugol's,
  - 1 X 40 mL glass VOC vial for geosmin analysis,
  - Volume of water filtered for Chlorophyll a,
  - Volume of water filtered for Neurotoxin,
- Benthic sampling, (PONAR),
- Plankton net

Station	Latitude	Longitude	Secchi m	Surf. temp. (°C)
Trenton (T)	44° 05' .310	077° 33' .480	2.0	22.0
T2	44° 06' .646	077° 29' .461	1.0	23.0
B1	44° 09' .004	077° 18' .399	1.3	23.0
B2	44° 09' .017	077° 15' .318	1.2	23.0
B3	44° 08' .872	077° 13' .484	1.2	23.8
B4	44° 09' .065	077° 11' .051	1.3	23.5
B5	44° 09' .397	077° 08' .769	1.4	24.2
B6	44° 09' .926	077° 06' .454	1.4	24.0
B7	44° 10' .786	077° 04' .332	1.3	24.0
Big Bay 1	44° 06' .5263	077° 18' .467	1.3	24.1
N1	44° 09' .530	077° 03' .107	1.1	23.4
N2	44° 08' .144	077° 03' .815	1.2	23.4
N3	44° 06' .807	077° 04' .470	1.2	24.0
HBA3	44° 07' .536	077° 00' .870	1.0	24.75
HBA4	44° 09' .117	076° 58' .183	0.5	26.0
HB1	44° 04' .306	077° 04' .956	1.2	24.4
HB2	44° 03' .056	077° 04' .957	1.5	24.5
Glenora (GL)	44° 02' .796	077° 01' .267	2.7	24.5
Napanee River 1 (NR)	44° 11' .847	077° 00' .892	0.8	23.0
NR2	44° 11' .927	077° 02' .170	1.0 (bottomed out)	25.5

MOORING DEPLOYMENT AT THE LESLIE STREET SPIT, TORONTO
AEMRB Study 12249, Dr. R. Yerubandi

On December 5, 2005 Dr. R. Yerubandi, in collaboration with the Toronto Port Authority, requested the deployment of the following four instruments in the waters off Toronto's Leslie Street Spit:

- (2) ADCPs, a 300 and 1200 KHz unit

- (1) Hydra Current Meter
- (1) Mavs

These instruments will help generate wave, current and climatology data for a coastal stability study in the area. The instruments will log from January to April 2006, in the hopes of capturing data from major winter storm events that may impact this headland. Instruments were deployed from the CCGS Shark and will be retrieved by divers early in the spring for a second deployment.

Positions of Sampling Sites: Cruise # 2005-00-703

Station	Date	Time	LAT N	LONG W
1258	Dec 5, 2005	1700Z	43° 37'167"	79° 19' 348"
1259	Dec 5, 2005	1721Z	43° 37' 082"	79° 19' 786"
1260	Dec 5, 2005	1736Z	43° 36' 866"	79° 20' 346"
1261	Dec 5, 2005	1749Z	43° 36' 887"	79° 20' 702"

TECHNICAL SUPPORT AT DIAVIK DIAMOND MINE, NORTHWEST TERRITORIES, AEMRB Study #12260, DR. C. PTACEK

B. Lalonde provided support to the University of Waterloo in setting up instrumentation in a pile of type III rock at the Diavik Diamond Mine, NWT, during the period of September 7 - September 23, 2005.

The Diavik Diamond Mine is located on a 20 square kilometre island, informally called East Island, in Lac de Gras, approximately 300 kilometres by air northeast of Yellowknife.

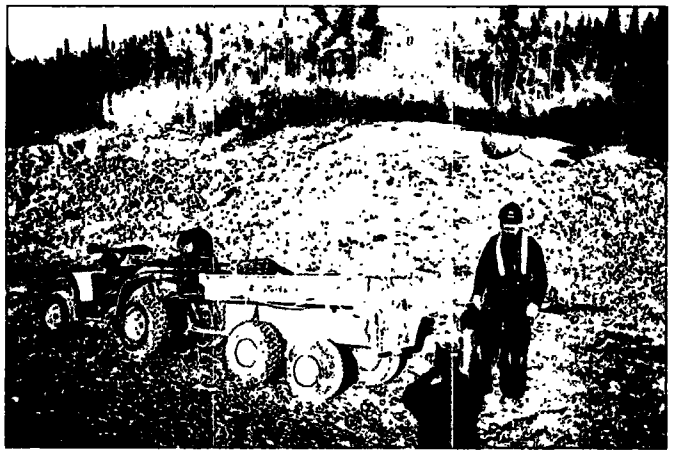
The research project includes participants from the University of Waterloo, Alberta, British Columbia and Carleton Universities, and the Australian Nuclear Science and Technology Organization (ANSTO) and involves the construction of well-instrumented, large-scale test piles containing different rock types to study the evolution of the low sulfide waste rock under the severe climate conditions.

The various tasks listed below were accomplished under the direction of M. Neuner, University of British Columbia, L. Smith, University of Waterloo, and R. Klassen, University of Alberta.

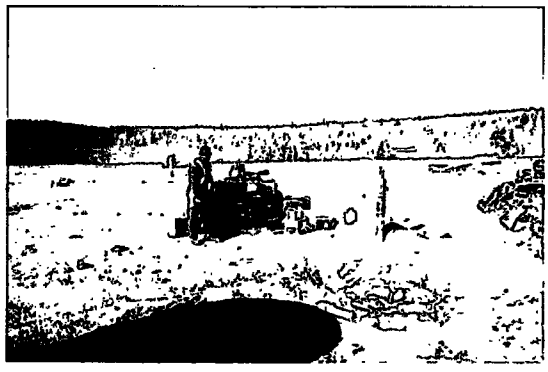
- Health and Safety training course.
- Plumbing of PVC pipes for the "control site".
- Moved sand in lysimetre boxes.
- Shoveled and raked sand in lysimetre boxes to cover heat trace.

- Cleaned trailer to accommodate electrician for power hook up.
- Lined lysimetres with geomembrane.
- Wrote driver's test - Site specific drivers test.
- Retrieved buried well casing on rock pile slope.
- Installed heat trace cable in PVC pipes.
- Installed ¼" tubing in PVC pipes.
- Plumbing of PVC pipes from the lysimetre boxes to the trailer.

SAMPLING AT THE COLOMAC GOLD MINE
AEMRB STUDY # 12264, DR. D. VAN STEMPVOORT



Technical Operations supported this study between the dates of August 22-29, 2005. The Colomac Mine is located 215 km north of Yellowknife in the Northwest Territories. This mining company was in operation in the late 1990's but due to low productivity closed early into the new millennium. The objective of this field work was to determine the amount of petroleum liquid that has accumulated in the bedrock while the mine was in operation. We are attempting to identify how hydrocarbons move through bedrock and how the site will remediate itself in the presence of permafrost. It is also important to conduct Microbial sampling to identify type and amounts of bacteria that utilize petroleum products for their existence. Water sampling was conducted on the 35 established groundwater wells in the site area. The wells that were previously hydraulically tested were sampled with a packer and the remaining wells were sampled from an open casing with a peristaltic pump. Samples were taken one meter below the free product in deeper wells or mid-depth between the free product and well bottom at shallower wells. The following analysis was done at each water well sampling zone: Metals, Volatile Fatty Acids and hydrocarbons. Some wells were also sampled for bacteria analysis and a YSI meter was used to gather ph, conductivity, temperature, ox dating reduction potential and dissolved oxygen. All wells were purged before sampling and water levels and soundings were also taken on all wells. From the information collected from the Colomac Mine site future strategies can be formulated and implemented to facilitate the timely remediation of this natural environment.



WRIGLEY, NORTH-WEST TERRITORIES
AEMRB STUDY 12264, DR. D VanStempvoort

Technical Operations staff provided support to Dr. D. Van Stempvoort, AEMRB, NWRI in establishing a groundwater research site at Wrigley Airport, NWT. This was done in order to investigate potential groundwater contamination and obtain better understanding of the fate and remediation options for petroleum spills in the north, and to address identified gaps in information on near surface groundwater quality and quantity along the proposed pipeline corridor.

Geotech Drilling of Prince George, BC was contracted to drill eight boreholes, ranging from 18 to 31 m in depth using Rotex and Odex drilling methods. Arrangements were made for the use of a NWRI vehicle at Fort Simpson through Kelly Best, AEIRB, NWRI, Saskatoon. Rodger Pilling, Gerry Wright, Water Survey of Canada, Fort Simpson made arrangements for the use of a generator, survey legs and storage shed. Patricia Coyne, Environmental Affairs, Policy and Planning Division, Department of Transport Northwest Territories acquired a compressor, pipes for drive points, groceries and PetroFLAG® test kits. Pumps and sampling equipment were overhauled and shipped to Fort Simpson.

A portable photo ionization detector was used to test the headspace air of bagged drill cutting samples in the field and PetroFLAG® analyses indicated petroleum hydrocarbons were present in all 8 split spoon samples collected.

The water table was encountered ~25 m. below ground within the sand and gravel unit in 5 of the boreholes. In four of these, two inch diameter monitoring wells were installed; a 30 m TempLine™ thermistor string of 8 thermistor sensors and logger recording hourly was installed in the fifth. The sensors were installed in a sand pack at depths ranging from 1 to 30 m below ground. Elevations of all wells and test holes were surveyed, groundwater levels were also measured.

Solinst® Leveloggers® were installed in 3 of the monitoring wells to obtain automated hourly water level data and groundwater temperatures.

Groundwater samples were collected using a bladder pump or bailer from the 4 monitoring wells. Water samples were also collected from a spring located in the northwest portion of the airport property, near the Mackenzie River. A Solinst® Drive-Point Piezometer was installed 2.65 m bellow ground surface 18 m up the bank from the Mackenzie River west of the study area.

In-house well logs will be completed and entered on the shared Well Log spread sheet in the winter months.

ROYAL BOTANICAL GARDENS
AEMRB STUDY 12266, DR. C. PTACEK

Technical Operations staff supported Dr. C. Ptacek, GRP, AEMRB, throughout the year at the Royal Botanical Gardens, Hamilton by obtaining quarterly water levels of monitoring wells installed in 2003.

This was done as part of an ongoing groundwater study of the Cootes Paradise area.

HIGHLAND CREEK STP SAMPLING , SCARBOROUGH
AEMRB STUDY 12440, Dr. P. Seto

Technical Operations support involved assistance in the sampling of sewage and sludge at the Highland Creek Treatment Plant in Scarborough for 2 purposes:

1. a study of the removal and/or partitioning of pharmaceuticals and personal care products (PPCPs) in liquid and sludge through the stages of sewage treatment: primary clarification and secondary biological treatment;

and

2. evaluation of an innovative wastewater treatment technology, the Kaldnes Moving Bed Bioreactor (MBBR) process, for its ability to reduce conventional wastewater parameters (carbon and nitrogen) and PPCPs compared to conventional wastewater treatment.

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

Technical Operation Services provided support to Dr. J. Marsalek, AEMRB on August 9, August 30, October 4 and October 27, 2005.

For the second year, The Department of Transportation and the Department of Water and Wastewater, City of Toronto, were testing 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. Sampling only occurred under dry field conditions, at least 5 days after a rain event of significant magnitude.

Vacuuming and Sweeping
Dry samples were collected from small test sections of the "dry" sampling area in both swept and unswept sections. 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 Wash Off Event
Sections of the test area in both swept and unswept sections were washed off using acidified (pH of 6.0) municipal tap water and a water broom. 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. A Data sonde 4 was used to measure the following parameters; temperature, pH, conductivity and dissolved oxygen. Samples for toxicity, PAH's, total and dissolved metals and nutrients were also collected.

Samples collected

Date	Northbound				Southbound			
	Swept		*Unswept*		*Swept*		*Unswept*	
	DRY	WET	DRY	WET	DRY	WET	DRY	WET
August 4th	X	X	X	X	X	X	X	X
August 30th	X	X	X	X	X	X	X	X
October 4th	X	X	X	X	X	X	X	X
October 27th	X	X	X	X	X	X	X	X

TERRAVIEW WELL INSTALLATION
AEMRB STUDY 12440, DR. J. Marsalek

Technical Operations staff provided support to Dr. J. Marsalek, AEMRB, NWRI by installing eight 1-¼" monitoring wells with attached ¼" sampling tips using the BOA 3M drill rig at the Terraview treatment site. Flush mount well protectors were installed on all wells. One test hole was also done as a well could not be installed due to heavy clay.

The location and elevation of each well was then obtained. Water Levels of all wells were also taken and sampling tips developed.

This was done in order to monitor operation of the Terraview storm water runoff treatment site.

Ministry of Environment Well Records will be submitted and provincial well tags have been installed. The ownership of these wells is being determined. Note: all positions WGS 84, zone 17.

Terraview Wells

Well	Elevation (masl)	Depth(m)	Northing	Easting	Tag Number
2	99.666	2.38	4847298	635832	A010627
3	99.991	8.53	4847269	635844	A010628
3A	99.96	2.36	4847269	635844	A010629
4	99.88	7.01	4847282	635886	A010630
4A	99.854	2.44	4847282	635886	A010632
5	99.307	8.84	4847239	635895	A007828
5A	99.332	2.29	4847239	635895	A010636
6	99.411	7.16	4847224	635956	A010631

SOUTH NATION RIVER PATHOGIN STUDY
AEMRB STUDY 12450, Dr. I. Droppo

Technical Operations provided support to Dr. I. Droppo, AEMRB during the month of November on the South Nation River located south-east of Ottawa. Staff consisted of two members from AEMRB, one from Technical Operations and one from the NHRI office in Saskatoon. This segment of work is part of a larger Agriculture Canada project studying the affects of agriculture runoff into the South Nation River. The purpose of our work was to accurately survey in a cross section of the South Nation River each half kilometer from St. Albert to Casselman, a total of eighteen surveys that will be utilized in models to obtain a better understanding of flow patterns and the shape of the river bottom. The high precision satellite GPS equipment from NHRI was used to accurately position and level the eighteen stakes which became the starting points of the transects. A Distomat was then used to collect the data from each of the transacts from small boats and tag lines across the river.

Technical Operations supported the South Nation River study on another occasion in late November by collecting a large volume of water (1600 L) from the bottom interface of the river and returning it to CCIW for experiments in the rotating flume. A stream gauge measurement was also done and one unfinished transact completed from the earlier work.

COLLECTION OF WATER AND SEDIMENT SAMPLES FROM THE URBAN OTTAWA AREA
AEMRB STUDY # 12450; Dr. I. Droppo

Technical Operations supported this project throughout the year. The purpose of this work is to identify sediment pathogens in streambed sediments in agricultural areas. From this study, potential standard can be determined for use by Agriculture Canada.

Five stations were selected; all stations are located east of the urban Ottawa area. The following is a description of the sampling sites:

Positions of Sampling Sites:

Station	Northing	Easting	Description
MST-8	5011168	490117	Located in St. Albert on South Nation River
MST-9	5014774	494657	Located south-east of Casselman on Butternut Creek
MST-12	5014899	489062	Located on Little Castor River (downstream)
MST-13	5014000	486000	Located on Little Castor River (upstream)
MST-15	5014233	487868	Located north-west of St. Albert on a small creek

Water:
4 litres for particulate settling velocity test
Phytoplankton slide for particulate size analysis
500 mL for total suspended solids
1 litre for bacteria count (Ryerson University)

Sediment:
50 mL for microbial analysis and microscopy (Ryerson University)
50 mL for Pathogen tracing (Dr. Marvin)
50 mL for grain size analysis

Centrifuging:
The sample obtained was homogenized, than split and analyzed for Pathogen tracing (Dr. Marvin) and Microbial analysis (Ryerson University).

Sampling performed on each visit

	Water	Sediment	Centrifuge
MST-8	July 25, Sept 19, Oct 3, Oct 17	July 25, Sept 19, Oct 3, Oct 17	July 26, Oct 3-4, Oct 18
MST-9	Sept 19, Oct 3, Oct 17	Sept 19, Oct 3, Oct 17	July 26
MST-12	Sept 19, Oct 3, Oct 17	Sept 19, Oct 3, Oct 17	Oct 19
MST-13	Sept 19, Oct 3, Oct 17	Sept 19, Oct 3, Oct 17	
MST-15	July 25, Oct 17	July 25, Oct 17	

POINT PELEE NATIONAL PARK
AEMRB STUDY 14181, DR. A. CROWE

Technical Operations supported Dr. A. Crowe AEIRB 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.

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

AMBERLEY BEACH LEVELS AND SAMPLING
AEMRB STUDY 14181, 12240; DR. A. CROWE, M. CHARLTON

The bacterial contamination of the lake waters adjacent to beaches of the Great Lakes is becoming a common and pervasive problem. Numbers of fecal bacteria, and especially *Escherichia coli* (*E. coli*), are often detected at levels considerably higher than the Provincial Water Quality Standard of 100MPN/100ml, resulting in beach closures due to the potential for deleterious effect on human health. In response, a provincial-federal program is being conducted to determine the source of these bacteria. Several possible potential sources for these bacteria in the near-shore waters have been identified including runoff from agricultural areas, streams and rivers, urban runoff, municipal waste-water treatment facilities and wildlife. A sampling program was undertaken during February 2005 to identify numbers of *E. coli* in the beach sands, lake water and groundwater at Amberley Beach, Lake Huron.

Technical Operations staff provided support to Dr. A. Crowe, AEMRB, NWRI on four occasions by helping to obtain groundwater samples and levels from Amberley Beach using the mini drive point system and a posthole auger. A 1.67m core was also taken from water table to 0.30 m into clay using the Vibra-corer. Six test holes were drilled using the BOA 3M drill rig at five locations along two cross sections. Six Vibra - Cores were also done at three locations near shore at the walkway cross section to obtain bacteria and grain size samples and determine depth to clay.

The elevation and location of each site was then obtained using a measuring tape and the Leica Wild NA2000 electronic level relative to temporary bench marks (nails in posts at both sites) set at previous trips. Positions were taken using a hand held GPS in datum WGS84. The positions listed below were entered into the STAR data base.

Bacteria and water quality samples were analysed at a temporary laboratory set up in a hotel room.

Station	Scientist #	Date	Easting	Northing	Samples
134	DCB A4	31/01/05	440655	4877026	Bacteria, WQ
134A	DCB A5	31/01/05	440655	4877026	Bacteria
134B	DCB A6	31/01/05	440655	4877026	Bacteria
134C	DCB A7	31/01/05	440655	4877026	Bacteria
134D	DCB B0	31/01/05	440655	4877026	Bacteria
134E	DCB B1	31/01/05	440655	4877026	Bacteria
134F	DCB B2	31/01/05	440655	4877026	Bacteria
134G	DCB B3	31/01/05	440655	4877026	Bacteria
134H	DCB B4	31/01/05	440655	4877026	Bacteria, WQ
134I	DCB B5	31/01/05	440655	4877026	Bacteria
134J	DCB B6	31/01/05	440655	4877026	Bacteria
134K	DCB B7	31/01/05	440655	4877026	Bacteria
134L	DCB C1	31/01/05	440655	4877026	Bacteria
134M	DCB C2	31/01/05	440655	4877026	Bacteria
134N	DCB C3	31/01/05	440655	4877026	Bacteria, WQ
134O	DCB C4	31/01/05	440655	4877026	Bacteria, WQ
134P	DCB C5	31/01/05	440655	4877026	Bacteria, WQ
134Q	DCB L1	31/01/05	440655	4877026	Bacteria, WQ
134R	DCB L2	31/01/05	440655	4877026	Bacteria
134S	DCB L3	31/01/05	440655	4877026	Bacteria
134T	DCB L4	31/01/05	440655	4877026	Bacteria, WQ
134U	DCB L5	31/01/05	440655	4877026	Bacteria

Station	Scientist #	Date	Easting	Northing	Samples
134V	DCB L6	31/01/05	440655	4877026	Bacteria
134W	DCGW1	01/02/05	440655	4877026	Bacteria, WQ
134X	DCGW2	01/02/05	440655	4877026	Bacteria, WQ
134Y	DCGW3	01/02/05	440655	4877026	Bacteria, WQ
134Z	DCGW4	01/02/05	440655	4877026	Bacteria, WQ
134AA	DCGW5	01/02/05	440655	4877026	Bacteria, WQ
135	WWB C3	01/02/05	440563	4877369	Bacteria, WQ
135A	WWB C4	01/02/05	440563	4877369	Bacteria, WQ
135B	WWB C5	01/02/05	440563	4877369	Bacteria, WQ
135C	WWB sand H2O interface	01/02/05	440563	4877369	Bacteria
135D	WWL1	01/02/05	440563	4877369	Bacteria, WQ
135E	WWL2	01/02/05	440563	4877369	Bacteria, WQ
135F	WWL3	01/02/05	440563	4877369	Bacteria, WQ
135G	WWL4	01/02/05	440563	4877369	Bacteria, WQ
135H	WWL5	01/02/05	440563	4877369	Bacteria, WQ
135J	DC stream north	02/02/05	440563	4877369	Bacteria
136	Access stream south	02/02/05	440169	4878296	Bacteria
136A	HU1 North site inner	02/02/05	440169	4878296	Bacteria
136B	HU1 North site outer	02/02/05	440169	4878296	Bacteria
136C	HU5 South site outer	02/02/05	440169	4878296	Bacteria
135N	WW stream south – east of road	02/02/05	440563	4877369	Bacteria
135O	WW stream south 1	02/02/05	440563	4877369	Bacteria
135P	WW stream south 2	02/02/05	440563	4877369	Bacteria
135Q	WWGW1	02/02/05	440563	4877369	Bacteria, WQ
135R	WWGW2	02/02/05	440563	4877369	Bacteria, WQ
135S	WWGW3	02/02/05	440563	4877369	Bacteria, WQ
135T	WWGW4	02/02/05	440563	4877369	Bacteria, WQ
135U	WWGW5	02/02/05	440563	4877369	Bacteria, WQ
135V	WWGW6	02/02/05	440563	4877369	Bacteria, WQ

AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH

SEDIMENT COLLECTION FROM LAKE RESTOULE
AEPRB STUDY 12213, DR. U. BORGMANN

Technical Operations supported Dr. U. Borgmann with a two day field trip during the month of June for the collection of a bulk sediment sample from Lake Restoule. The sample was collected from the deepest area (30m) using a mini-PONAR and returned to CCIW in coolers where it will be utilized as a medium for bio-assay experiments on toxicity.

Lake Restoule Sample Position

LATITUDE	LONGITUDE
43º 03' 35.8"	79º 47' 56.6"

ARCTIC SAMPLING FOR PERFLUORINATED SULFONIC AND CARBOXYLIC ACIDS, DEVON ISLAND, NUNAVUT
AEPRB STUDY 12310, Dr. D. Muir

Perfluorinated sulfonic and carboxylic acids have recently emerged as priority environmental pollutants due to their persistent and bioaccumulative nature and widespread detection in biota-including arctic species. This study is investigating the annual flux and temporal trends in deposition of these chemicals.

In May of 2005, Technical Operations supported a field trip to Devon Island, Nunavut for Dr. Muir and the University of Toronto. The team arrived at Polar Continental Shelf Project (PCSP) on May 4th and began organizing for the flight to Devon Island that would take place on May 6th. The flight was on schedule and

after 90 minutes it touched down on the ice cap. Camp was set up, equipment organized and the work began. The protocol required a 5 meter hole to be dug into the ice cap to represent approximately 10-15 years of precipitation deposition. The walls of the hole would be sampled horizontally with a stainless steel corer, with the snow being placed into a clean Nalgene container to be analyzed in a clean lab at a later date. The sampling was done every 25cm from top to bottom. After six days on the ice cap the crew returned to PCSP with the sampling completed.

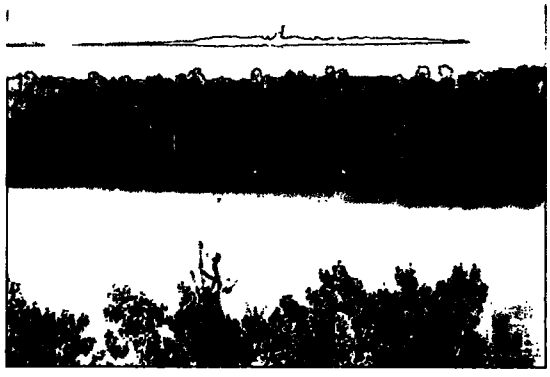
Camp Position	N 75° 20.433	W 82° 40.213
Sampling Position	N 75° 20.151	W 82° 37.253

LONG RANGE TRANSPORT OF AERIAL POLLUTION, SISKIWIT LAKE, ISLE ROYALE, BINATIONAL COOPERATIVE EFFORT, LAKE SUPERIOR STUDY
AEPRB STUDY 12310, Dr. D. Muir and STUDY# 12632, V. Richardson

In 2005/2006 a binational, collaborative program was established to sample Lake Superior. This program was designed to examine several areas highlighted by the Lake Superior Lakewide Management Plan (LaMP). The major thrust of this work is to build a better understanding of chemical loadings to Lake Superior. This will be accomplished by sampling air, water, bottom sediment, precipitation and plankton from Lake Superior for chemicals of interest to the LaMP. Protocol will also be included to sample new and emerging chemical compounds.

As part of this effort, researchers following up on previous studies, traveled to and sampled Siskiwit Lake on Isle Royale on Lake Superior. This body of water provides a unique opportunity to study a "clean", reference site on Lake Superior that experiences only the "Long Range Transport" portion of contaminant loading of the parent Great Lake. Additionally, this lake's food web closely mimics that of Lake Superior, providing researchers with a powerful data set and background reference that will complement data from the 3 CCGS Limnos cruises this year. Researchers attempted to sample as many components of the system and food-web as possible during the 7 day trip to Siskiwit Lake. Sampling included sediment, water, periphyton, plankton, mussels, snails and whole fish (forage and a predator species).

Isle Royale is part of the National Park Service in the U.S. and is a true "wilderness back-country" destination. The island is located 32 km from the mainland, south-east of Thunder Bay, on Lake Superior. It is 72 km long and almost 13 km wide.



The field team included D. Walsh and B. Gray, TOS, Dr. D. Muir, AEPRB and Dr. G. Slater of McMaster University.

The research team spent a total of 7 days sampling Siskiwit Lake before departing the island on September 11, for the mainland.

Ferry access to the Island is from Grand Portage, Minnesota, just south of Thunder Bay or Copper Harbour and Houghton on the Keweenah Peninsula to the south in Michigan.

ISLE ROYALE FERRY

2005-2006 SAMPLING SITES at ISLE ROYALE, SISKIWIT LAKE

SITE NUMBER	DEPTH FT.	LATITUDE N	LONGITUDE W
3	100	47° 59' 36.0"	088° 48' 55.8"
4	150	48° 00' 13-14"	088° 47' 40.0"
5	141-145	48° 00' 17.6"	088° 46' 21.6"

SEDIMENT SAMPLING OF LAKES NORTH OF TORONTO
AEPRB STUDY 12310, F. YANG

Technical Operations supported AEPRB study 12310 for F. Yang at lakes St. George and Phillips located near Richmond Hill for one day in September. The study is looking at levels of heavy metal contamination in bottom sediments of these deep Kettle lakes. One core from each lake was returned to Ryerson University where collaborating work

on methyl mercury is being carried out. The sampling at Lake St. George included four (10cm) cores using the TOS corer as well as PONARS, water sampling and Hydro-lab profiles. Similar work was done at Lake Phillips. Cores were extruded on site except the ones that were returned to Ryerson University.

ONTARIO WIDE SAMPLING OF LAKES FOR PESTICIDE ANALYSIS
AEPRB Study 12310, Dr. D. Muir

On May 30, 2005 the first of three field trips began to complete the three year study on the spatial and temporal trends of currently used pesticides in surface waters and precipitation. This project would encompass only five lakes instead of the original ten (see list) that were 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 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 the end of April. The sampling that took place at the selected lakes included, zooplankton net haul (at selected sites), water quality samples, Hydrolab profile and 20L water sample 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 analytes. 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. A wet-only precipitation sampler was also installed at a central location. The selected location was the Dorset Research Centre. The sampler 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 an 8.0 horsepower motor due to the horsepower restriction rule in effect on Bells Lake. 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 region the Bobby M or a mid sized water craft was utilized for the sampling.

During the length of the project, sampling methodologies and positions were kept consistent during each of the field trips. This was the last year for this specific study with the results and final analysis to be completed in the coming year.

Position (WGS 84)

LAKE AND LOCATION	LATITUDE N.	LONGITUDE W.
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

LAKE HAZEN
AEPRB STUDY 12310, DR. D. Muir

Technical Operations Services provided support to Dr. D. Muir, AEPRB, NWRI by obtaining sediment cores, depth soundings, flow measurements and water samples of Lake Hazen and tributaries in Quttinirpaaq National Park, Nunavut from May 31 to June 19, 2005.

This is a joint multi-year project with the University of Innsbruck, Austria and Parks Canada which began in 2003 and is studying concentrations of heavy metals, especially mercury, and persistent organic pollutants in landlocked Arctic Char and sediment cores from lakes in the high Arctic. The goal is to examine the role of climate warming on the increases found in mercury in landlocked char in some lakes, by examining how warming may be affecting metabolic rates, the accumulation of metals and other contaminants, and associated stress on fish over time. A bathymetric map of Lake Hazen is also being produced to determine the optimal sampling locations and for use by Parks Canada.

Six sediment cores were taken in 264m of water through 1.3 m of ice using a tri-pod and a TOS corer with 20 kg of weight from Lake Station #1 (the deep hole); two 10 centimetre diameter cores 22 and 30cm in length and four 6.7cm diameter 32, 40, 43 and 43 cm

long cores were obtained. Cores were then sectioned as directed. The sediment seemed to be soft silts for the top 10 cm to a little stiffer soft clay base.

Water quality and Mercury samples were obtained from eleven sites; Traverse, Mesa, Skeleton and Blister Creeks, Henrietta, Abbe, Ruggles and Snow Goose Rivers and Lake stations #1, 2 and 3. XAD columns were done for six of these sites, Lake Stations # 1, 2 and 3, Blister and Skeleton Creeks. A Marsh pump was used at all sites to fill cans for columns and bulk containers for water quality which were then taken back to camp and processed. Lake samples were taken from 1.75 metre depth through 1.4 metres of ice; tributaries were sampled from a deeper flowing section of the creek or river. Also tributary measurements, depths and flows were obtained wherever possible. At all sites Mercury bottles were filled using the Teflon bucket supplied by G. Lawson, AEPRB, NWRI. The Very River was unable to be sampled or measured because of dangerous ice conditions and open water. The Ruggles River was then chosen because it was thought that it might be useful and the lack of other logistically accessible tributaries.

Depth soundings of the lake were obtained at 43 locations to enhance the accuracy of the bathymetric map started last year and to investigate the possibility of a second basin in the lake. The methodology and equipment was the same as last year which involved using the Lowrance LCX-15MT GPS/sounder and a dual frequency pole mounted transducer set into a shallow trench filled with water on the ice; because of the poor quality of the ice later in the trip when much of the water on the ice had drained through it, many of the soundings had to be done through drilled holes.

Otolith, liver and muscle samples were obtained from seven Arctic Char which were caught by Parks staff angling near the entrance to Ruggles River.

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 Polar Continental Shelf Project PCSP, NRCan. Parks Canada personnel at Quttinirpaaq National Park were very helpful and provided snowmobiles, komatiqs and the use of the kitchen weather haven while at Lake Hazen. Accommodation was in tents at Hazen Camp.

STATION	LATITUDE N.	LONGITUDE W.
Lake Hazen #1	81° 49' 27"	70° 43' 47"
Lake Hazen #2	81° 43' 47"	72° 08' 24"
Lake Hazen #3	81° 54' 20"	69° 28' 00"
Blister Creek	81° 48' 40"	71° 31' 13"
Skeleton Creek	81° 49' 50"	71° 19' 48"
Snow Goose River	81° 50' 50"	71° 04' 46"
Abbe River	81° 51' 05"	71° 02' 36"
Mesa Creek	81° 54' 25"	69° 46' 28
Henrietta River	81° 45' 45"	72° 33' 24"
Traverse Creek	81° 40' 47"	72° 02' 56"
Ruggles River	81° 47' 41"	70° 26' 55"

HAMILTON HARBOUR, MOORINGS
AEPRB Study 12345, Dr. J. Parrott

Twelve SPMD (semi permeable membrane device) canisters were deployed in the Harbour for a 21 day period in November. Two of these were placed on existing sediment trap moorings and ten were deployed on single point moorings. Bottom sediment was collected at the sites when the moorings were removed. This work was coordinated by Maria Colavecchia for contaminant analysis.

SPMD MOORINGS PARROTT STUDY 12345

STATION NUMBER	LATITUDE N.	LONGITUDE W.
Windermere (Bridge)	43° 16' 08"	79° 46' 54"
1LO (Wave Tower)	43° 16' 12"	79° 35' 34"
3HH	43° 17' 19"	79° 50' 33"
4HH	43° 18' 09"	79° 48' 52"
6RR (9083)	43° 16' 24"	79° 49' 57"
7RR	43° 16' 32"	79° 50' 11"
8RR (9087)	43° 16' 35"	79° 50' 54"
9RR (9084)	43° 16' 31"	79° 50' 44"
11WA (9033)	43° 17' 06"	79° 47' 41"
12WA	43° 17' 22"	79° 48' 12"
13WA	43° 16' 34"	79° 47' 45"
14WA	43° 16' 27"	79° 47' 30"

DIVE SUPPORT FOR MUSSEL COLLECTION, BALSAM LAKE, ONTARIO
AEPRB STUDY 12351; DR. S. ST-JEAN.

Technical Operations dive crew was required for the collection of E. Complanata from Balsam Lake. This one day diving expedition was necessary to complete the initial step in the Hamilton Harbour Remediation Project (2005) Baseline Mussel Study supervised by Dr. Sylvie St-Jean and Chad Boyko of the Aquatic Ecosystem Research Protection Branch.

The sampling sites were located on Balsam Lake, part of the Kawartha's and the Trent Severn Waterway. Balsam Lake is northwest of Peterborough and east of Lake Simcoe.

The work commenced with the deployment of two TOS divers (Benner, Hill). The first site (site #1) was located at the launch facility at Balsam Lake Provincial Park. Site #1 had large quantities of mussels found within the 5' to 10' depths. Bottom type consisted of soft sediment and sand with a light covering of macrophytes. During the dive the vessel was launched and readied. Mussels were counted, sorted and stored in aerated coolers with the extras being returned to the collection area. Site #2 was located north of the park along the west shoreline at a depth of 10' – 20'. The bottom type was the same as Site# 1. Mussel numbers were a lot less at this site. Only a few mussels were of acceptable size for the study. Six pictures were taken with the underwater digital camera. Site #3 was located south of the park along the same shoreline at a depth of 4' – 6'. Bottom type was sandier than the other sites with rocks and boulders in shallower depths. Mussel numbers were much greater than Site #2 and collection was finished quickly. Site #4 was located directly east of the park on the opposite shore at depths of 5' -6'. The bottom was made up of sand and soft sediment with light macrophyte coverage. The mussels were plentiful and of acceptable size. Specimens were placed in coolers with lake water and given to C. Boyko to return to CCIW.

Positions of Sampling Sites:

Station	Date	Easting	Northing
Site #1	May 19/05	670677E	4943220N
Site #2	May 19/05	671099E	4944807N
Site #3	May 19/05	670701E	4943103N
Site #4	May 19/05	671560E	4943321N

HAMILTON HARBOUR, MOORINGS
AEPRB Study 12351, Dr. S. St. Jean

Six moorings were deployed from the end of May until October for Dr. St-Jean for a baseline study. These moorings consisted of fresh water mussels attached on frames in socks in order to study bio-accumulation of toxins.

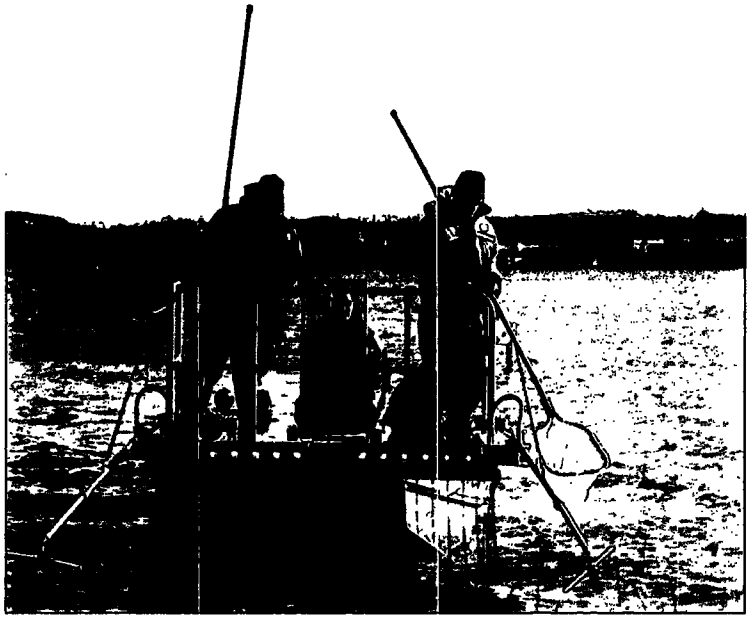
MUSSEL NETS, ST. JEAN STUDY 12351

STATION NUMBER	LATITUDE N.	LONGITUDE W
Waves Tower	43° 16' 12"	79° 35' 34"
9084	43° 16' 29"	79° 47' 34"
9085	43° 17' 09"	79° 50' 37"
9086	43° 16' 40"	79° 50' 06"
9087	43° 16' 57"	79° 52' 35"
9088	43° 18' 10"	79° 50' 09"

FISH COLLECTION FROM AREA'S OF CONCERN, BAY OF QUINTE, CORNWALL & HAMILTON HARBOUR,
AEPRB Study 13310, Dr. Scott Brown, Dr. Jim Sherry & Dr. Mark McMaster

Technical Operations supported this project between the dates of November 7-November 26, 2005. 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 where Environment Canada has initiated studies that are readdressing fish health issues in the Canadian Areas of Concern. These studies are examining endocrine functions in wild fish in comparison to other measures of overall fish health. Fish collections are conducted according to the protocols developed for the Environmental Effects Monitoring Programs for both the pulp and paper and

metal mining sectors. During the fish survey, the physical state of the fish is also assessed. A visual estimation of physical malformations including lesions on the body surface, tumours, parasites or other abnormalities such as eroded, frayed or hemorrhagic fins is completed. The status of a sentinel species, as indicated by a variety of characteristics measured on individual fish will reflect the overall condition of the aquatic environment in which the fish reside. Some of the outcomes from this research will assist in the possible delisting of the identified sites.



The sampling was completed using a Smith-Root 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 one fish species, a bottom feeder was selected for sampling. The Brown Bullhead (*Ameiurus nebulosus),* was chosen as the target species due to the high populations and commonality at the selected sites. Ideally, 20 mature males and 20 mature females of the species are sacrificed, dissected and analyzed for reproductive health indicators. While 20 more fish were collected for a tumor related study bringing the total of 60 fish that were required from each site.

The sampling that occurred at each location was intense so the processing of the fish was completed on site in a mobile lab trailer in an assembly line arrangement. The fish would be processed as it moved down the line for specific protocols. In total 430 fish were sampled from the 7 selected sites.

Bay of Quinte Sites
-Trenton
-Black Creek
-Belleville

Hamilton Harbour
-South West Arm

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

HAMILTON HARBOUR, FISH CAGES
AEPRB Study 13310, Dr. J. Sherry

In December, five moorings were installed that contained speckled trout that were left in situ at four locations in Hamilton Harbour and a control site in Lake Ontario. The fish were given a twenty one day exposure to study the effects of various toxins.

FISH CAGES, SHERRY STUDY 13310

STATION NUMBER	LATITUDE N.	LONGITUDE W
Waves Tower	43° 16' 12"	79° 35' 34"
9085	43° 17' 09"	79° 50' 37"
9086	43° 16' 40"	79° 50' 06"
9087	43° 16' 57"	79° 52' 35"
9088	43° 18' 10"	79° 50' 09"

NATIONAL LABORATORY FOR ENVIRONMENTAL TESTING

BULK WATER SAMPLING AT CRANBERRY LAKE, NEW JERSEY
NLET STUDY 12180, H. ALKEMA

During the period of January 31- February 3, 2005, two Technical Operations staff members supported H. Alkema in the collection of bulk water sampling at Cranberry Lake in New Jersey, U.S.A.

This project which includes the CAEAL, MITE-RN and GEMS programs, is part of an ongoing interlaboratory proficiency testing program.

Facing North on Cranberry Lake

Approximately 1000 Liters were collected using a march pump from a pre-existing fishing hole near the south shore of Cranberry Lake. The samples were kept cold and stored at 4^0C upon returning to CCIW.

Position of Sampling Site:

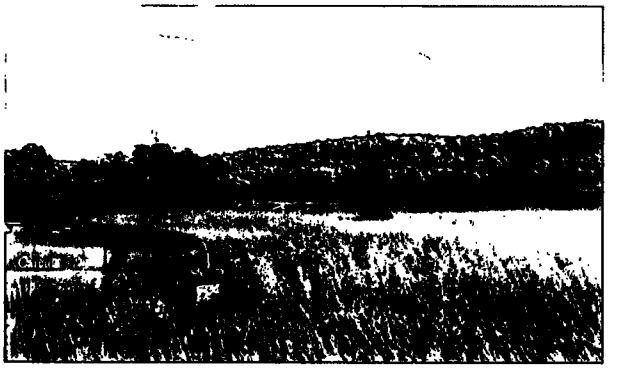
DATE	TIME	ZONE	EASTING	NORTHING	LATITUDE N.	LONGITUDE W.
Feb. 1, 2005	12:45	18	522086	4533379	40° 57' 04.5"	74° 44' 15.4"

PRAIRIE RIVER SAMPLING -
NLET STUDY 12180, H. ALKEMA

Technical Operations supported Harry Alkema of NLET during the period June 13 – 28, 2005.

Rivers within Alberta, Saskatchewan, Manitoba and Ontario (see list below) were sampled in support of H. Alkema's (NLET) Quality Assurance/Quality Control study for proficiency testing of analytical laboratories. Additional work was done for Dr. B. Scott's, AEPRB research on sources of Perfluorocarboxylic Acids, which are recognized as bioaccumulative contaminants. Samples were also collected for Dr. C. Ptacek, AEMRB for analyzing Perchlorate, which is used in the production of fireworks, ammunition, explosives and occurs naturally in Potash. Potash is used extensively in fertilizers and the runoff from fields and livestock are potential sources.

Support consisted of two TOS personnel, a Chevy Crew Cab 4x4 vehicle with a Haulmark trailer and miscellaneous equipment required for sampling. Field work began on June 17th in Medicine Hat, Alberta, and carried on through 17 field sites until completing the last in Minaki, Ontario on June 26th, 2005.

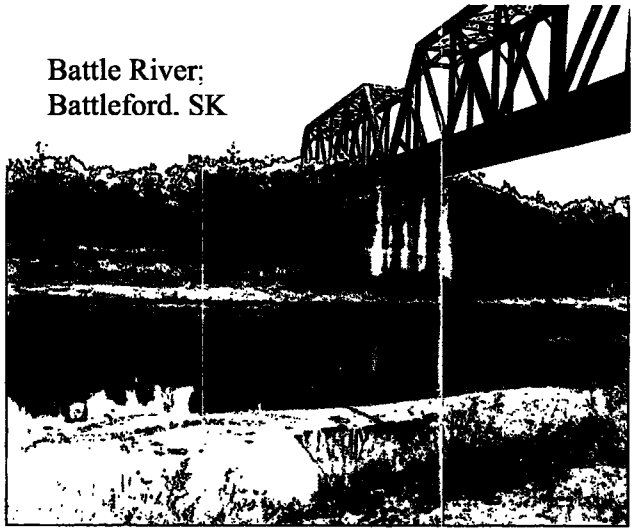


Eleven of the 17 sites visited were sampled for H. Alkema. The sample water was pumped directly from the river and used to rinse and fill a 200 liter barrel. At all 17 sites, a 4 liter jug for Dr. B. Scott and a 125mL bottle for Dr. C. Ptacek were collected. The 125mL samples were kept in an electric cooler at 4°C.

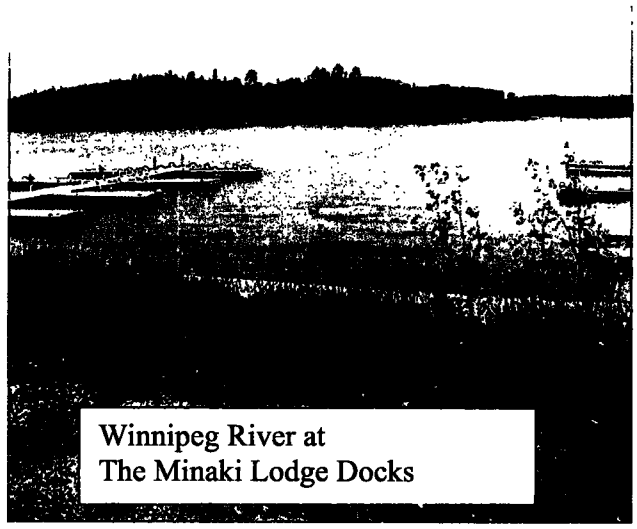
GPS co-ordinates, surface temperature and photographs were taken at each of the following sites:

Site	Site Location	Site Description	Lat & Long
1	South Saskatchewan River Upstream of Medicine Hat, AB	Downstream of Hwy 879 Bridge on SE edge of river	49° 54' 13.6" 111° 28' 36.6"
2	South Sask. River (Old Site #3) Downstream of Medicine Hat, AB	Hwy 41 at Sandy Pt. Park South of Hwy 41 bridge	50° 43' 54.8" 110° 04' 36.8"
3	Red Deer River (Old Site #4)	Downstream of Hwy 41 In Driveway NE of bridge	50° 56' 06.1" 110° 08' 57.2"
4	North Saskatchewan River Upstream of Battleford, SK	Regional Rd. 674 at Ferry SW side of Ferry Dock	53° 01' 22.3" 108° 49' 45.9"
5	Battle River (Old Site #5) Battleford, SK	On Regional Rd 656 Entered driveway Upstream of Railway bridge	52° 43' 00.3" 108° 18' 24.3"
6	North Sask. River (Old Site #6) Battleford, SK	On 1st Dirt Road on left side prior to Hwy 16A bridge between Battleford & Finlayson Isl.	52° 44' 22.3" 108° 17' 33.8"
7	North Saskatchewan River Downstream of Battleford, SK	At Hwy 376 bridge on the SE river bank	52° 29' 31.3" 107° 42' 40.5"
8	South Saskatchewan River Downstream of Saskatoon, SK	Township Rd. 390 at Ferry SW side of Ferry Dock	52° 19' 13.3" 106° 27' 28.1"
9	South Saskatchewan River Upstream of Saskatoon, SK	Under Hwy 15 bridge On the west side of the river	51° 28' 26.5" 107° 04' 45.8"
10	Swift Current Creek (Old Site #2) Swift Current, Saskatchewan	At the City Park above the permanent weir in the creek	50° 16' 42.4" 107° 47' 16.1"
11	Qu'Appelle River (Old Site #1)	Downstream of Hwy 210 bridge	50° 48' 01.5" 103° 53' 43.6"

12	Assiniboine River (Old Site #7) Downstream of Miniota, MB	1 km from Hwy 83 bridge at closed hwy park, east side	50° 05' 42.8" 101° 01' 42.1"
13	Souris River (Old Site #8) Souris, Manitoba	At Victoria Park off dock upstream of Hwy 22 bridge	49° 36' 46.7" 100° 15' 24.3"
14	Pembina River (Old Site #9) La Riviere, Manitoba	Downstream of Hwy 242 bridge (west) near cemetery	49° 13' 56.4" 098° 40' 49.5"
15	Red River (Old Site #10) Upstream of Winnipeg, MB	Downstream of Hwy 205 bridge at park on north side	49° 27' 35.8" 097° 16' 02.1"
16	Red River Downstream of Winnipeg, MB	At park downstream of Hwy 44 bridge/locks	50° 05' 07.1" 096° 56' 14.6"
17	Winnipeg River (Old Site #11) Minaki, Ontario	At Minaki Lodge docks	49° 59' 38.6" 094° 40' 04.2"



Battle River;
Battleford. SK



Winnipeg River at
The Minaki Lodge Docks

RESEARCH SUPPORT BRANCH

UNDERWATER /DIVING OPERATIONS, LAKE TROUT EGG COLLECTION
RSB STUDY 12631, Outside Agencies, GLLFAS

The Diving Operations Unit of Technical Operations Services supported John Fitzsimons of GLLFAS in lake trout egg collection in Parry Sound and Owen Sound. Sixty egg nets were deployed by filling the nets with rocks at each site.

Positions of Sampling Sites:

Station	Latitude	Longitude
Davey Is.	45 20. 4039	80 13.2286
Horse Is.	45 22. 2784	80 09.6098
Bar Is.	45 22. 6415	80 08.4589
Tank Range	518167 E	4953060 N
(Owen Sound)	44 43.2337	80 46.2337

THIAMINE DEFICIENCY STUDY IN AMERICAN EELS
RSB STUDY 12631, GLLFAS, DFO, JOHN FITZSIMONS

The American eel stock that feeds in Lake Ontario is in serious decline but with few indications as to what factor or factors are responsible for the decline. As Lake Ontario resident eels feed heavily on alewives, and an alewife diet has been associated with the development of a thiamine deficiency in trout and salmon, eels may also be affected. In fact preliminary analysis indicates that thiamine levels in Lake Ontario eels are depressed and similar to trout and salmon from this lake. Sampling eels on the lower St Lawrence provides an opportunity to assess thiamine levels of Lake Ontario resident eels just before the stomach atrophies and they make the 3500 mile spawning migration to the Sargasso Sea. It also provides an opportunity to compare thiamine levels to non-alewife consuming stocks along the lower St. Lawrence making the same migration.

The field party met with a member of the Quebec Ministry of Natural Resources that had made arrangements to meet with a local fisherman who had been catching the eels that were required for sampling. The eels ranged in lengths from 79.5 cm to 111cm while the weights were between 1 - 4kg. In total 50 eels were sacrificed and sampled and will be analyzed at a future date.

LAKE ONTARIO AND THE ST. LAWRENCE RIVER, ONTARIO AND NEW-YORK STATE PARCEL SURVEY
RSB STUDY 12631

Technical Operations supported W. Leger, Boundary Waters Issues Division, Ontario Region, during the period July 5 - 13 for land elevation survey of parcels in Lake Ontario and the St. Lawrence River.

The International Joint Commission Study is looking at redesigning the regulation plan for managing water levels and flows on the Lake Ontario-St. Lawrence River system. As part of this project, personnel from the Boundary Waters Issues Division are looking at the potential impacts to various interests. Amongst other things is flooding potential. Suspicious results were discovered in existing databases that need to be check into.

The areas that were surveyed were:
Northumberland County; Port Hope, Coburg and Presqu'ile Bay
Clayton Area; Mainland parcels and island lots, New York State, USA
Grenadier Island to Morristown, Mainland parcels, New York State, USA
Morristown to Ogdensburg, Mainland parcels, New York State, USA

Activities consisted of locating the parcels of interest and in conditions when the land to foundation interface appeared to be 2 meters or less, a reading was obtained from a GPS-Rangefinder that reported the distance, bearing and inclination of the selected target, house or cottage facing the lake/river, visual observation, elevation estimates and pictures were taken. In conditions when the land to foundation interface appeared to be 2 meters or greater, only visual observations, elevation estimates and pictures were taken.

COMMON USER SUPPORT
RSB STUDY 12633

Field stores are operated primarily 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, Provincial and Municipal government departments and universities may also access stores facility when arrangements are made with the Manager of 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 including; safety clothing, sediment and water samplers, surveying instruments, laboratory supplies, cameras and vehicles, to name a few. On return items are inspected for damage and repaired if necessary for re-issue. The majority of repairs are made in house by TOS staff. From January 1, 2005 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 and work vehicles are scheduled and issued through field stores. At present time the fleet consists of, 1 station wagon, 2 sedans, 1 passenger van, 8 full size vans, 4 crew cabs, 3 extended cab 4x4 pick up trucks, 2 mini vans, 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. There is no longer a quiet time of the year for vehicle requests. The 407 ETR usages to date are at 537 trips for the 2005 field season up from 382 in the 2004 season. On average NWRI vehicles travel 4500 km per month on the 407 ETR.

VEHICLE SUMMARY - 2005 FIELD SEASON
RSB STUDY 12633

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

Vehicle support was utilized for several different operational functions. These 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 ship board operations.

A.R.I. Canada, "Automotive Rentals Incorporated", is 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 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 a very efficient and satisfying organization to deal with. They have cut down considerably on the amount of time and effort spent 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 included a dual wheel crew cab, a sedan and a mini van.

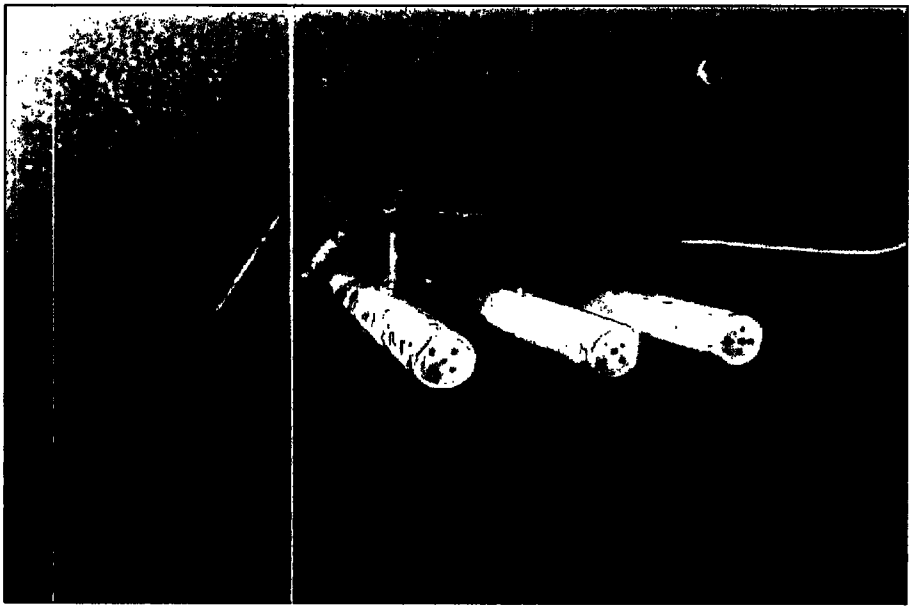
The extensive geographical area covered this field season included locations in New Brunswick, Nova Scotia, Quebec, Alberta, and Ontario. Some U.S destinations included field sites through out the states of New York, Michigan, Illinois.

From April 1, 2005 to present the NWRI fleet has traveled 421,327 km

WATER QUALITY MONITORING STATION INSPECTIONS
WOLF ISLAND , FORT ERIE, NIAGARA-ON-THE-LAKE, PORT LAMBTON
RSB Study 12634

Environment Canada conducts water quality monitoring on the interconnecting channels of the Great Lakes (i.e. St. Lawrence, Niagara, St. Clair and Detroit Rivers) to assess upstream/downstream loadings of pollution in fulfillment of Canada's obligations under the Canada-United States Great Lakes Water Quality Agreement.

Beginning in 1975 in the Niagara River (at Niagara-on-the-Lake), samples have been collected for nutrients (Total Phosphorus, Nitrate-nitrite, etc.), major ions (Calcium, Magnesium, Chloride, Sulphate etc), organic contaminants (Organochlorines, Chlorobenzenes, etc.) and physical parameters (temperature, specific conductance etc.). Other stations were established as follows: in the St. Lawrence River at Wolfe Island, in 1976; in the Niagara River at Fort Erie, in 1983; in the St. Clair River at Point Edward and Port Lambton, in 1986; and in the Detroit River, in 2000. The objectives of the program are to ensure compliance with water quality objectives, evaluate trends in concentrations and loadings and identify emerging issues. All data are stored at the Canada Centre for Inland Waters in the ENVIRODAT database and can be retrieved upon request. (http://www.on.ec.gc.ca/monitoring/water-quality/connecting-e.html)
TOS has provided underwater inspections, yearly upgrades and repair to these facilities since their inception. Yearly inspection and maintenance schedules are organized through B. Harrison, ECB, EHD, Ontario Region.



TOS DIVER CLEANING INTAKE WANDS AT PORT LAMBTON

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