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NATIONAL WATER
RESEARCH INSTITUTE
INSTITUT NATIONAL DE
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2001

**2001
ANNUAL ACTIVITY SUMMARY
TECHNICAL OPERATIONS SERVICES
RESEARCH SUPPORT BRANCH
NATIONAL WATER RESEARCH INSTITUTE**



CCGS LIMNOS

CCGL Puffin, Pintail, Gander

St. Lawrence River, Cornwall

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AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH

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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 more recently 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 2001 field season.



Staff bid Sylvia R. Mitchell, secretary extraordinair, a heartfelt farewell



Staff bid Colleen Kennedy, AO extraordinaire, a heartfelt farewell

STAFF LIST

RESEARCH SUPPORT BRANCH

Director (Acting)	P.M. Healey
Secretary	S.R. Mitchell, Retired June 2001 K. Faulkner On Strength August 2001
Branch Finance and Administrative Officer	C. Kennedy, Retired February 2002
Administrative Assistant	C. Perry

TECHNICAL OPERATIONS SERVICES

Manager	M.R. Mawhinney
(Acting [Rotating])	B.H. Moore S.B. Smith F.H. Don

OPERATIONS OFFICERS

M.R. Mawhinney	Sydenham R, Lake St. Clair, Sudbury, Big Trout Lake, Turkey Lakes, Ontario; Goose Bay, Newfoundland; Rouyn-Noranda, Quebec; Gillam, Manitoba
B.H. Moore	OIC CCGS LIMNOS; Great Slave Lake, Northwest Territories
S.B. Smith	OIC CCGS LIMNOS; OIC CCGC SHARK; OIC ERIE EXPLORER; St. Clair R, Eastern Lake Erie, Ontario; Lake Victoria, Uganda
F.H. Don	Diving; Detroit R, Severn Sound, Hamilton Harbour, Cornwall, Ontario; Lake Erie; Lake Michigan

MARINE TECHNOLOGISTS

E.H. Walker	OIC CCGS LIMNOS; Hamilton Harbour, Cornwall, Ontario; Peace River, Alberta; New York State, USA
G.G. LaHaie	OIC Turkey Lakes Watershed
J.A. Kraft	CCGS LIMNOS; Transferred to EHD-OR April 2001
K.J. Hill	CCGS LIMNOS; Detroit/St. Clair Rivers, Hamilton Harbour, Ontario; Rouyn-Noranda, Quebec; Sydney Nova Scotia
R.J. Hess	OIC CCGS LIMNOS; Big Creek, Detroit/St. Clair Rivers, Turkey Lakes, Sarnia, Ontario; Great Slave Lake Northwest Territories
B.L. Gray	OIC CCGS LIMNOS; OIC CCGC SHARK; Hamilton Harbour; Diving; Big Creek, Humber Bay, Cornwall, Detroit River, Ontario; Rouyn-Noranda, Quebec, Grand Prairie, Alberta; Lake Michigan, USA

MARINE TECHNOLOGISTS (Continued)

R.D. Neureuther	CCGS LIMNOS; Detroit and St. Clair Rivers, Big Creek, Hamilton Harbour, North Channel, Ontario; Sydney, Nova Scotia;
C.H. Talbot	Groundwater; Sheridan Manitoba
T.G.D. Breedon	Diving; NWRI Field Stores

ASSISTANT MARINE TECHNOLOGISTS

D.A.D. Gilroy	Diving; CCGS LIMNOS; Cobourg, Detroit River, Severn Sound, Trenton, Cornwall Ontario; Lake Michigan USA;
L.M. Benner	Diving; CSS LIMNOS; Cobourg, Detroit River, Hamilton Harbour, Severn Sound, Cornwall, Ontario

RIGGING UNIT

C.J. Lomas	Senior Rigger; Ship Support
T.C. Gilliss	Vehicle Maintenance Co-ordinator; Clean Lab,

NWRI FIELD STORES

C.J. Lomas
T.C. Gilliss
T.G.D. Breedon

TERM EMPLOYEES

D.P. Walsh	CCGS LIMNOS; Hamilton Harbour, Bay of Quinte, Detroit River, Ontario;
B. Lalonde	On strength June, 2001, CCGS LIMNOS, Hamilton Harbour, Sarnia, Ontario;

SUMMER STUDENTS

B. Cober	CCGS LIMNOS; Hamilton Harbour, Ontario;
A. Morden	CCGS LIMNOS; Hamilton Harbour, Sudbury, Humber Bay, Ontario;
J. DeBruyn	CCGS LIMNOS; Hamilton Harbour, Rouyn-Noranda, Quebec;
A. Raun	CCGS LIMNOS; Hamilton Harbour, Ontario;

CCGS LIMNOS

2001 JANUARY							FEBRUARY							MARCH 2001						
SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6					1	2	3					1	2	3
7	8	9	10	11	12	13	4	5	6	7	8	9	10	4	5	6	7	8	9	10
14	15	16	17	18	19	20	11	12	13	14	15	16	17	11	12	13	14	15	16	17
	22	23	24	25	26	27	18	19	20	21	22	23	24	18	19	20	21	22	23	24
28	29	30	31				25	26	27	28				25	26	27	28	29	30	31
APRIL							MAY							JUNE						
SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT
CCIW	2	3	4	5	6	7			1	2	3	4	5						1	2
	Lake Ontario Surveillance L'Italien				CCIW			Lake Erie Charlton				Port Colborne								CCIW
8	9	10	11	12	13	14	6	7	8	9	10	11	12	3	4	5	6	7	8	9
CCIW	Lake Ont Moorings Contaminants Schertzer Charlton Alae				CCIW	Port Colborne	Lake Superior Surveillance L'Italien					CCIW	Lake Erie Charlton					Port Colborne		
15	16	17	18	19	20	21	13	14	15	16	17	18	19	10	11	12	13	14	15	16
CCIW		L Erie Moorings BCS Grapentine			Amherstburg		Lake Superior Surveillance L'Italien				Sarnia	Sarnia	Port Colborne	Lake Erie Roxann Rukavania				Sarnia		
22	23	24	25	26	27	28	20	21	22	23	24	25	26	17	18	19	20	21	22	23
Amherstburg	Detroit R St. Clair River Marvin					Port Colborne	Sarnia	Sarnia	Det R. Lake St. Clair Marvin Grapentine Det R Marvin				CCIW	Sarnia	Det R. Lake St. Clair Marvin Lake Erie Grapentine				CCIW	CCIW
29	30						27	28	29	30	31			24	25	26	27	28	29	30
Port Colborne	L.Erie						CCIW	Lake Ont. Zooplankton M. Arts					CCIW	Down Time Down Time					CCIW	
JULY							AUGUST							SEPTEMBER						
SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT
CCIW	2	3	4	5	6	7				1	2	3	4							1
	CCIW	Lake Erie Charlton				Port Colborne				NSERC Twiss L Ont Strachan				CCIW						CCIW
8	9	10	11	12	13	14	5	6	7	8	9	10	11	2	3	4	5	6	7	8
Port Colborne	Lake Erie DOM Concentration Bourbonniere NSERC Twiss					CCIW	CCIW	Down Time Down Time				CCIW		CCIW	CCIW	Lake ontario Charlton				CCIW
	16	17	18	19	20	21	12	13	14	15	16	17	18	9	10	11	12	13	14	15
	L Erie Concentration Bourbonniere					Sarnia	CCIW	L Superior Surveillance						CCIW	CCIW	CCIW	Lake Erie Charlton			Sarnia
22	23	24	25	26	27	28	19	20	21	22	23	24	25	16	17	18	19	20	21	22
	L Erie Moorings BCS Charlton Grapentine Det R Marvin					CCIW	CCIW	L Superior Surveillance					Sarnia	Sarnia	Det R St.Clair R Reynoldson					Amherstburg
29	30	31					26	27	28	29	30	31		23	24	25	26	27	28	29
CCIW	Lake Ontario Surveillance						Sarnia	Sarnia	L Erie Moorings & BCS Charlton Grapentine Det R Marvin					Amherstburg	Amherstburg	L Erie Moorings BCS Structure Charlton Grapentine Det R Marvin				CCIW
OCTOBER							NOVEMBER							DECEMBER						
SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT	SUN	MON	TUE	WED	THUR	FRI	SAT
	1	2	3	4	5	6					1	2	3							1
	Lake Ont. Zooplankton M. Arts					CCIW					Grapentine									
7	8	9	10	11	12	13	4	5	6	7	8	9	10	2	3	4	5	6	7	8
CCIW	CCIW	St. Lawrence River Reynoldson						NSERC - Twiss - Lake Erie					CCIW							
	15	16	17	18	19	20	11	12	13	14	15	16	17	9	10	11	12	13	14	15
	St. Lawrence River Reynoldson					CCIW														
22	23	24	25	26	27		18	19	20	21	22	23	24	16	17	18	19	20	21	22
CCIW	L Ont Moorings Charlton Schertzer Alae				CCIW	CCIW														
28	29	30	31				25	26	27	28	29	30		23	24	25	26	27	28	29
CCIW	L.Erie Marvin													30	31					

SHIPBOARD PROGRAMS

MICROBIAL ECOLOGY OF THE LAKE ERIE ECOSYSTEM EDO STUDY 12002, DR. J. CAREY

Current knowledge of the temporal heterogeneity of trace metals in the water column of Lake Erie is not known. However, there is evidence that low trace metal concentrations can induce growth limitation, e.g. iron limitation of phytoplankton growth. Assessing the importance of low trace metal concentrations requires knowledge of the existing spatial and temporal levels in the lake. As well, the bio-availability of trace metals is affected by their chemical form. Of special concern is the ability of DOM to bind trace metals, and depending upon the properties of the metal-binding ligands to make them more or less bio-available.

Two cruises were completed as part of an annual experimental investigation of the Microbial Ecology of the Lake Erie Ecosystem (MELEE). A group of Canadian government and academic scientists and researchers based in the United States collaborated again this year in a broad range of experiments to investigate the chemical, biological and physical controls which influence the cycling of carbon and trace metals in the Lake Erie water column. The emphasis on UV radiation effects, which had been more of a concern on previous MELEE cruises has been largely replaced with new emphasis on the interaction of trace metals, organic matter and Lake Erie microflora.

Biological experiments included numerous on deck incubations in flow through tanks and a moored *in situ* incubation. Experiments to assess the bio-availability of iron and zinc to plankton were conducted in NWRI's Portable Trace Metal Clean Laboratory. Trace metal water quality in the water column was assessed using the deployment of a Diffusion Gradient Thin-Film (DGT) probe attached to a mooring in the central basin. In addition to the chemical, biological and physical experiments and measurements, an attempt to collect concentrated organic matter at several sites using a reverse osmosis system for iron binding studies was prevented by problems with the equipment. Two smaller samples were processed and preserved for possible concentration on a smaller scale RO system.

A trace metal clean sampling system (Teflon tubing, pneumatic diaphragm pump) was used at all pelagic sampling stations to enable large volumes of lake water to be delivered directly into the clean lab in support of chemical and biological studies. In addition collections were made to determine the distribution and character of viruses and their activity. Opportunities to sample for these occurred in all three basins of Lake Erie, the Detroit River, Lake St. Clair and the St. Clair River.

STATION POSITIONS

LAKE ERIE

2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 41"	79° 53' 24"
442	42° 50' 28"	79° 23' 35"
449	42° 45' 41"	79° 59' 13"
450	42° 42' 08"	79° 55' 00"
451	42° 38' 53"	79° 53' 20"
452	42° 35' 04"	79° 55' 20"
453	42° 47' 52"	79° 34' 43"
560	42° 44' 07"	79° 39' 54"
561	42° 36' 36"	79° 46' 34"
933	42° 49' 14"	79° 35' 15"
938	42° 38' 00"	80° 03' 30"

STATION POSITIONS

DETROIT RIVER

2001 - 2002

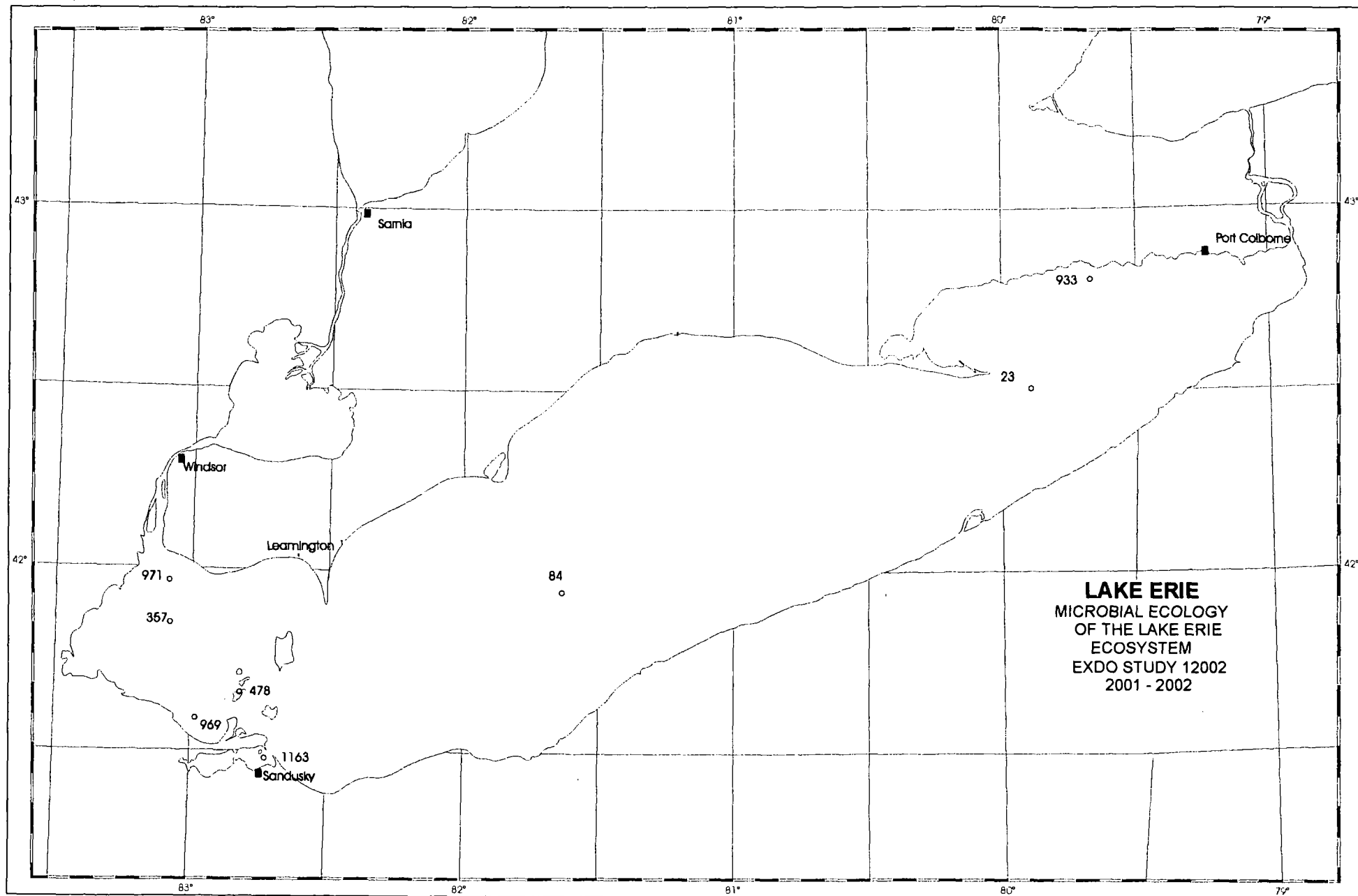
STATION NUMBER	LATITUDE N.	LONGITUDE W.
803	42° 20' 10"	82° 57' 37"
804	42° 08' 31"	83° 07' 13"
1156	42° 02' 50"	83° 08' 05"
1168	42° 16' 00"	83° 06' 39"
1169	42° 19' 57"	83° 01' 17"

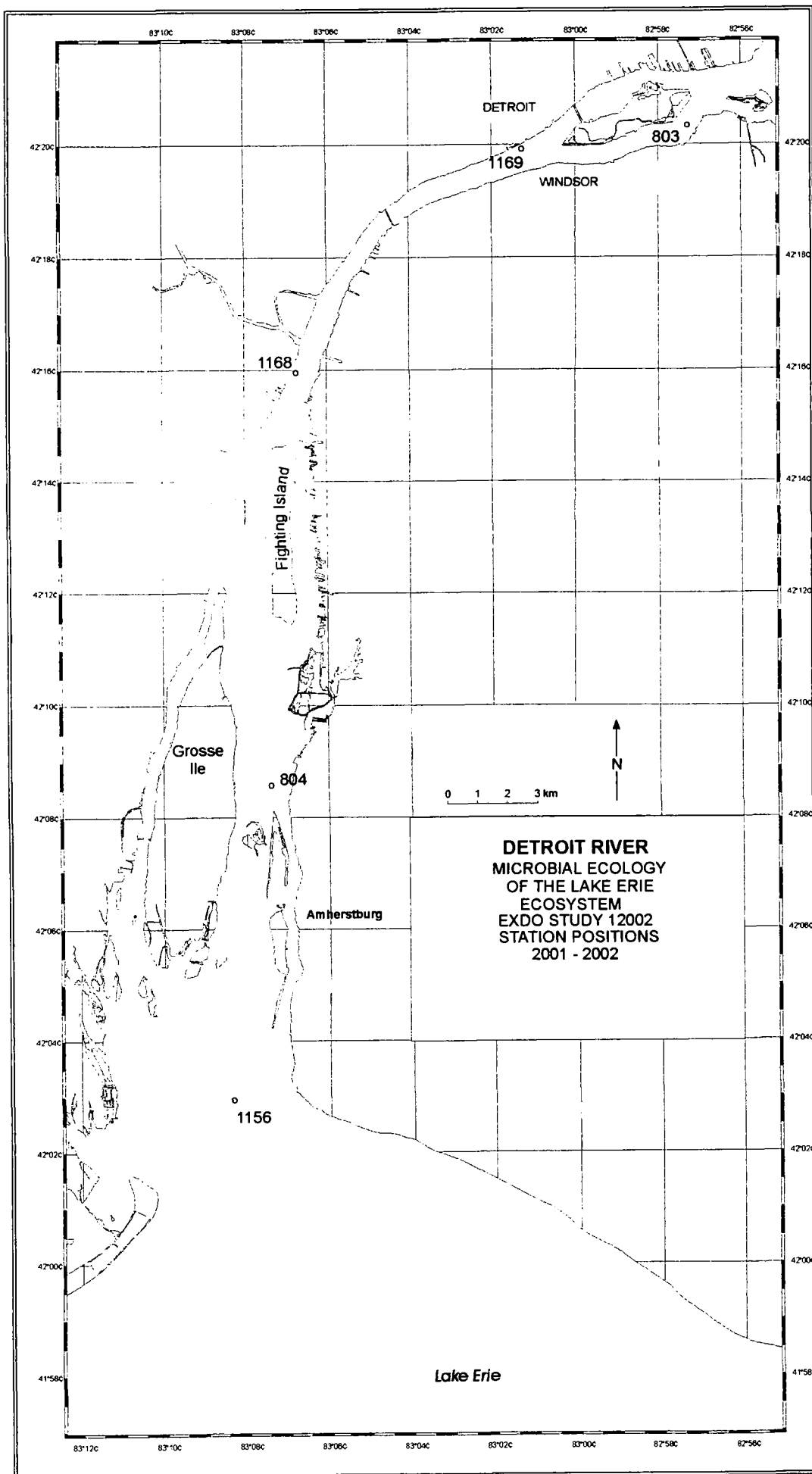
STATION POSITIONS

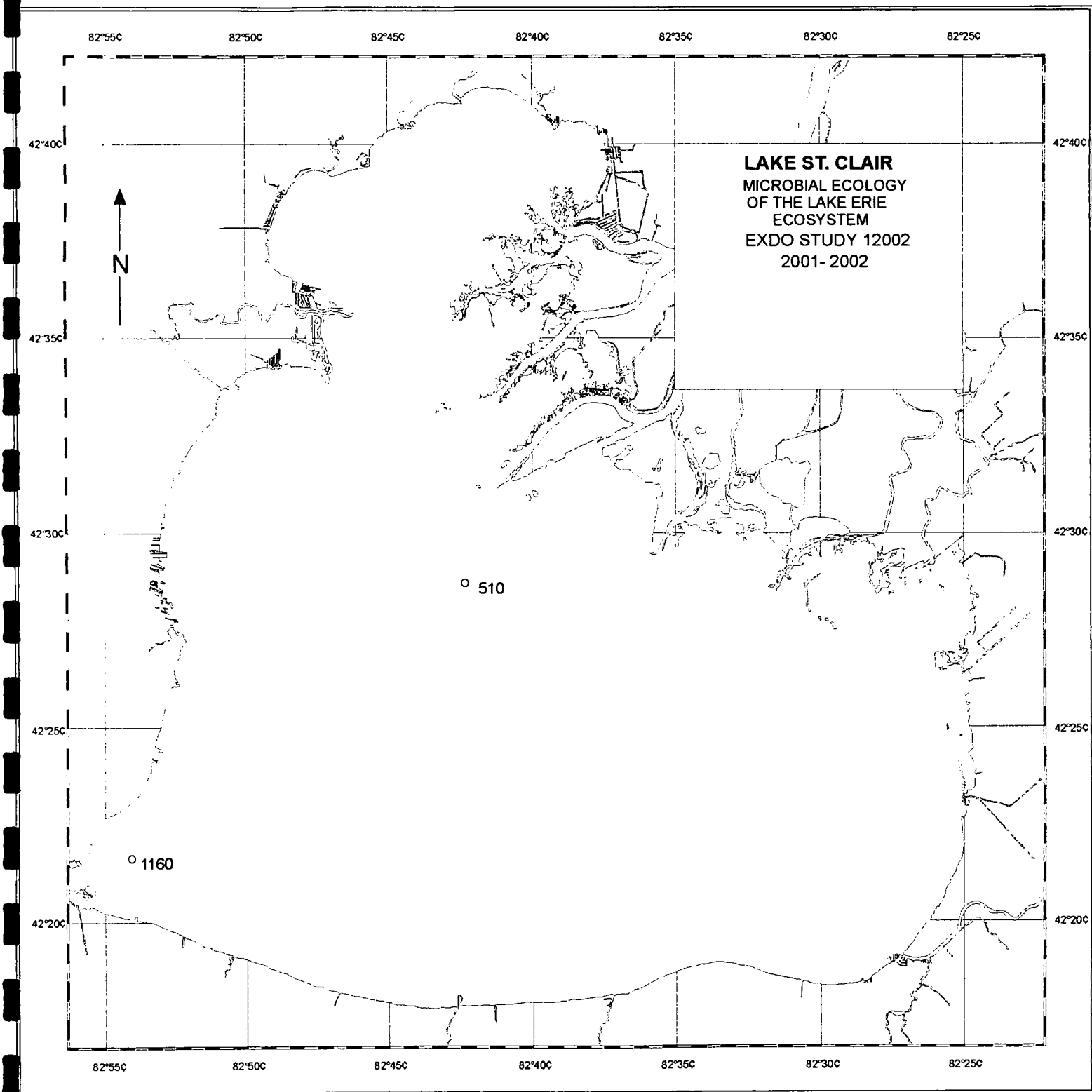
LAKE ST. CLAIR/ST. CLAIR RIVER

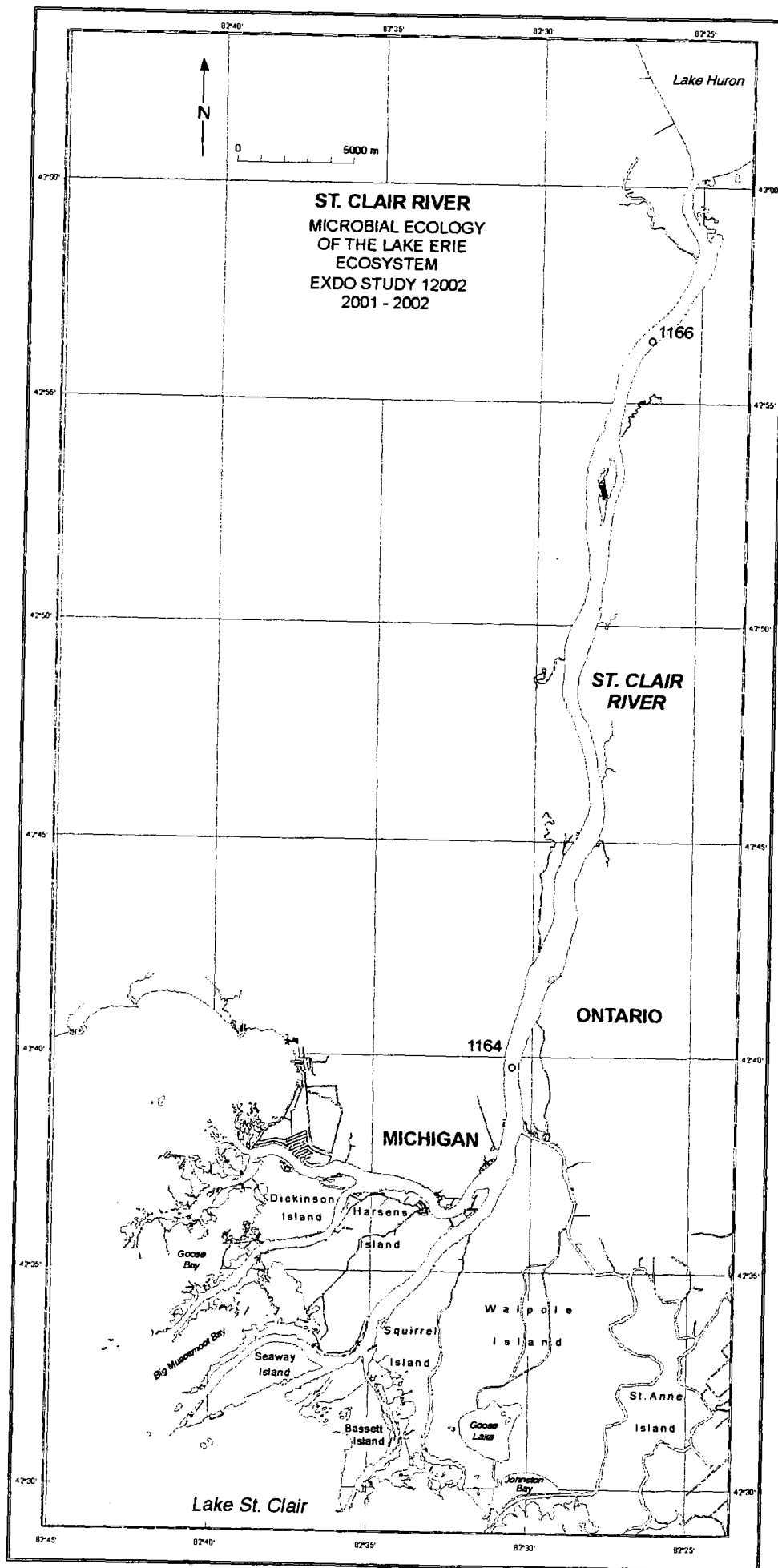
2001 - 2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
510	42° 28' 57"	82° 43' 14"
1160	42° 21' 46"	82° 54' 12"
1164	42° 39' 06"	82° 30' 28"
1166	42° 56' 29"	82° 26' 23"









AQUATIC ECOSYSTEM MANAGEMENT RESEARCH BRANCH**GREAT LAKES AREAS OF CONCERN**

AEMRB STUDY 12211, Dr. L. Grapentine

TOS was tasked with the collection of mini box cores from representative stations in the St. Clair, Detroit and St. Lawrence Rivers. These samples will be used to verify a reference database. The reference database is used to select key species and toxicity tests. Tests that optimize predictive response are most useful in developing numerical biological sediment guidelines. These guidelines are in turn used to determine the need for sediment remediation and are based on the invertebrate fauna and bioassay responses. Work was done from the LIMNOS and from either of the launches PETREL or PELICAN carried onboard the LIMNOS during the cruises, September 17 - 28 and October 9 - 19, 2001. Stations scheduled to be sampled in Lake St. Clair were not done due to poor weather conditions.

At each station the following work was performed:

A mini box core was collected and subsampled in the following manner:

The box core was subsampled using five 6.7 cm diameter tubes from which the top 10 cm were extruded into plastic cups. Samples were sieved using a 250 micron mesh sieve. Residue was placed in the containers provided and preserved in 5% Formalin.

At all stations, the remainder of the top 5 cm of sediment in the box core was removed and placed in a glass dish. This sample was homogenized and sampled in the following manner:

- a) 125 ml was sampled for organic analysis in a hexane-rinsed glass bottle covered with a hexane-rinsed piece of tin foil before the lid is placed on.
- b) 100 ml was sampled for particle size.
- c) 500 ml was sampled for major ions, metals, loss on ignition, total organic carbon, total Kjeldahl nitrogen, total phosphorus and mercury.

If no mini box core was able to be collected, four Ponars were obtained - three for community structure and one for sediment chemistry.

At all Area of Concern stations, samples were obtained for bioassay experiments from Ponar, mini PONAR or mini box core. Samples were placed in bags and sieved onboard the LIMNOS.

At station 106 in the St. Clair River, stations 59 and 63 in the Detroit River and stations 405, 415, 420 and 436 in the St. Lawrence River, triplicate samples were collected for Quality Assurance/Quality Control.

From each mini box core or from every fourth Ponar collected, a small scoop of sediment, the top 5 cm of material removed, was placed in a glass tray and distributed in the following manner:

- a) 250 ml was sampled for contaminants into a pre-cleaned (I-CHEM) amber jar with Teflon lid for analysis of organic contaminants.
- b) 125 ml was sampled into a pre-cleaned polyethylene bottle for analysis of total and methyl mercury.



Ponar sampling, off the CCGS LIMNOS

STATION POSITIONS

AREAS OF CONCERN

ST. CLAIR RIVER

2001 - 2002

STATION NUMBER	REYNOLDSON NUMBER	LATITUDE N.	LONGITUDE W.
34	6648	42° 58' 48"	82° 24' 51"
36	6660	42° 59' 17"	82° 25' 12"
43	6661	42° 58' 42"	82° 24' 44"
45	6662	42° 56' 42"	82° 25' 55"
47	6663	42° 56' 36"	82° 26' 07"
48	6664	42° 56' 23"	82° 26' 26"
58	6665	42° 56' 14"	82° 26' 36"
104	6666	42° 54' 17"	82° 27' 31"
105	6668#	42° 53' 07"	82° 27' 23"
106	6667	42° 53' 47"	82° 27' 25"
107	6669	42° 52' 18"	82° 27' 41"
108	6654	42° 44' 02"	82° 28' 44"
112	AM2	42° 57' 04"	82° 26' 02"
113	6651	42° 37' 13"	82° 36' 19"
114	6697	42° 58' 42"	82° 24' 43"
115	6699	42° 54' 42"	82° 27' 40"

QA/QC stations

STATION POSITIONS

AREAS OF CONCERN

DETROIT RIVER

2001 - 2002

STATION NUMBER	REYNOLDSON NUMBER	LATITUDE N.	LONGITUDE W.
51	6676	42° 20' 46"	82° 56' 12"
52	6677	42° 20' 33"	82° 59' 28"
53	6678	42° 20' 16"	83° 00' 04"
54	6695	42° 20' 42"	82° 56' 11"
56	6680	42° 15' 10"	83° 06' 29"
57	6681	42° 14' 25"	83° 06' 29"
58	6682	42° 11' 47"	83° 06' 25"
59	6683#	42° 10' 16"	83° 07' 34"
61	6685	42° 09' 27"	83° 06' 58"
63	6687#	42° 06' 39"	83° 07' 16"
64	6688	42° 06' 03"	83° 08' 46"
65	6689	42° 05' 03"	83° 10' 19"
66	6690	42° 04' 09"	83° 10' 18"
67	6691	42° 03' 14"	83° 09' 36"
68	6692	42° 02' 50"	83° 08' 16"
69	6696	42° 14' 41"	83° 07' 03"

QA/QC stations

STATION POSITIONS
AREAS OF CONCERN
ST. LAWRENCE RIVER
2001 - 2002

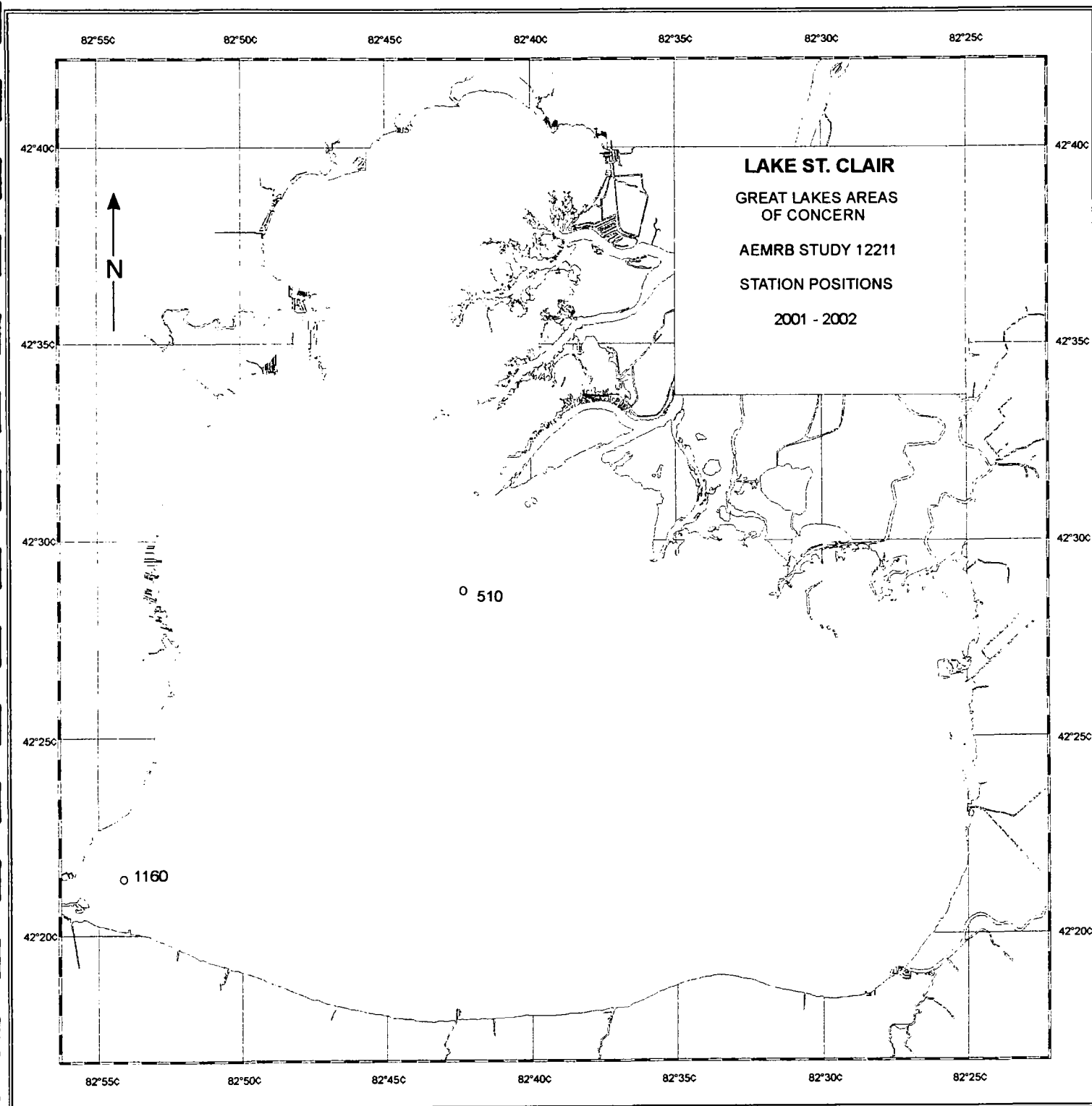
STATION NUMBER	REYNOLDSON NUMBER	LATITUDE N.	LONGITUDE W.
401	1331	45° 00' 45"	74° 53' 41"
402	1321	45° 01' 30"	74° 49' 07"
403	1319	45° 00' 56"	74° 55' 09"
404	1320	45° 00' 31"	74° 56' 05"
405	1332	45° 01' 16"	74° 47' 48"
406	1322	45° 00' 00"	74° 48' 15"
407	1323	44° 59' 52"	74° 48' 15"
412	65M167	45° 00' 42"	74° 44' 49"
413	65M168	45° 00' 42"	74° 43' 51"
414	65M183	45° 00' 36"	74° 43' 54"
415	65M184#	45° 00' 40"	74° 43' 53"
418	65M101	45° 00' 57"	74° 42' 19"
419	65M108	45° 00' 54"	74° 42' 24"
420	65M5#	45° 01' 08"	74° 41' 46"
421	65M9	45° 01' 08"	74° 41' 42"
422	65M16	45° 01' 08"	74° 41' 36"
423	65M17	45° 01' 13"	74° 41' 34"
424	65M19	45° 01' 13"	74° 41' 32"
425	65M27	45° 01' 14"	74° 41' 24"
426	65M31	45° 01' 17"	74° 41' 16"

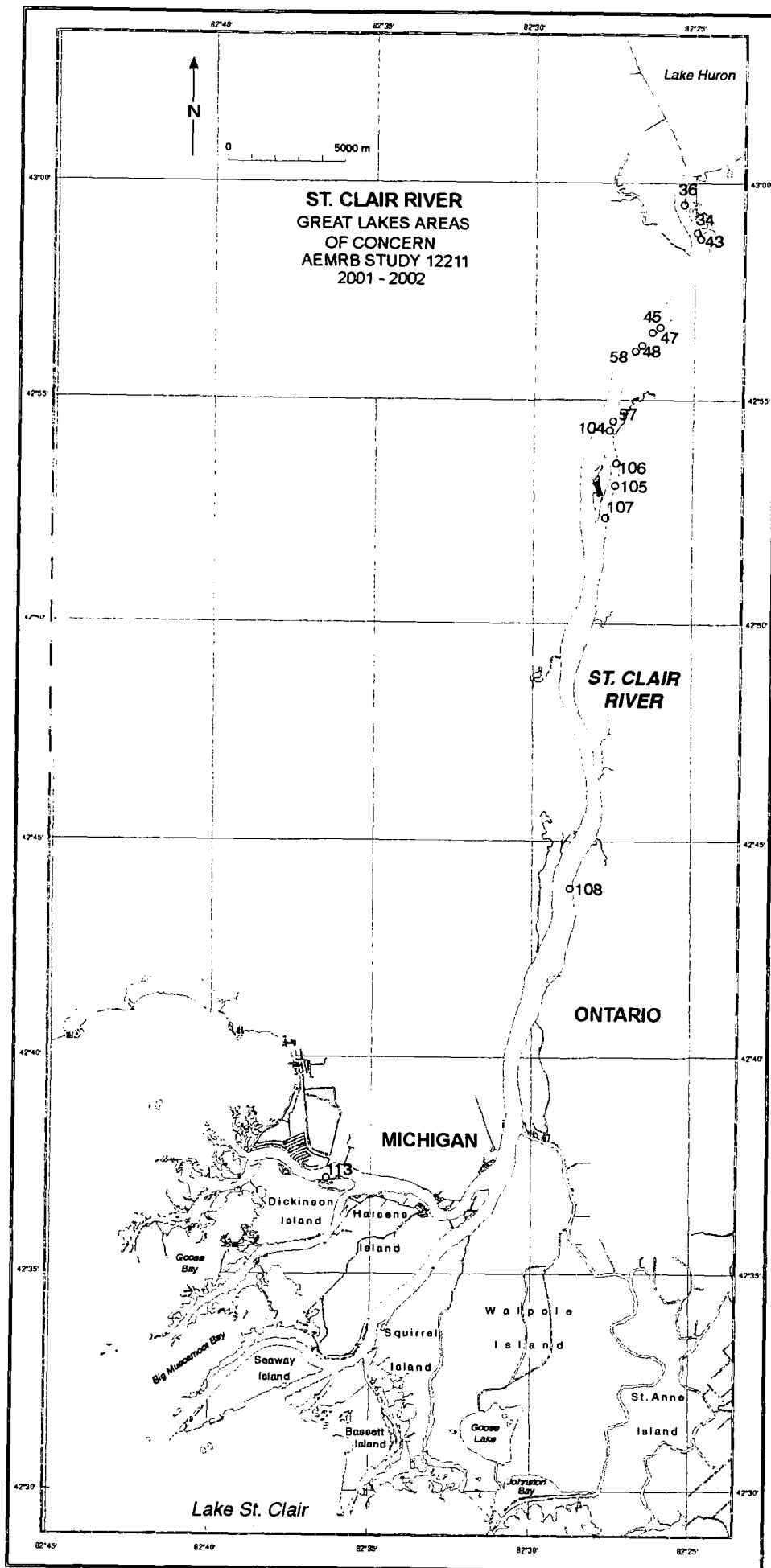
STATION NUMBER	REYNOLDSON NUMBER	LATITUDE N.	LONGITUDE W.
427	65M46	45° 01' 15"	74° 40' 51"
428	65M54	45° 01' 54"	74° 40' 37"
429	65M64	45° 01' 11"	74° 41' 40"
431	65M175	45° 01' 07"	74° 40' 29"
432	65M179	45° 01' 05"	74° 40' 14"
433	65M173	45° 01' 07"	74° 40' 39"
434	65M176	45° 01' 05"	74° 40' 30"
435	65M182	45° 01' 02"	74° 40' 00"
436	65M171	45° 01' 33"	74° 39' 37"
441	65M01	45° 01' 53"	74° 39' 02"
447	1325	45° 01' 30"	74° 52' 30"
448	1326	45° 00' 18"	75° 54' 24"
449	1327	45° 00' 30"	74° 39' 36"
450	1328	45° 00' 24"	74° 40' 13"
# QA/QC stations			

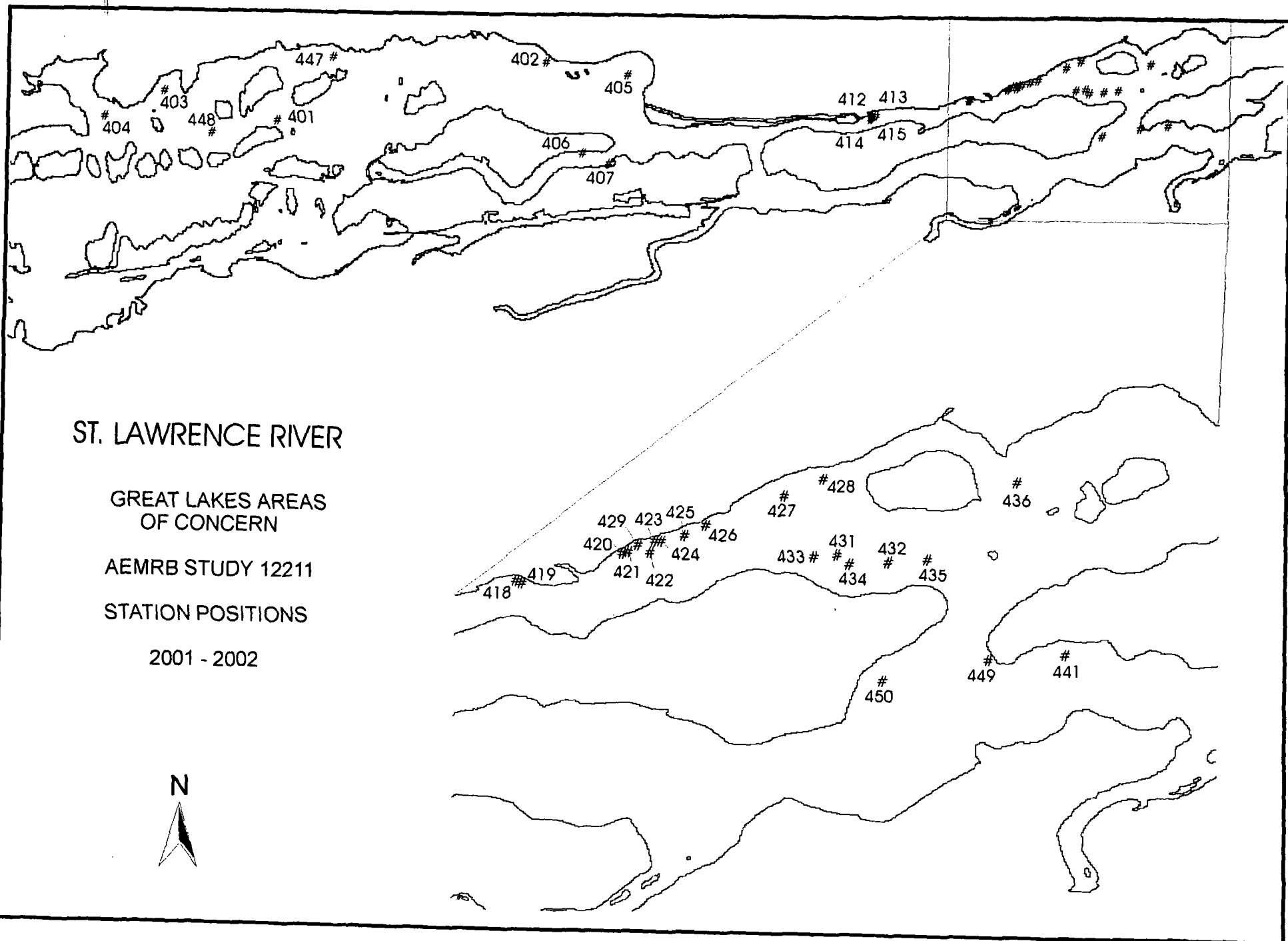
STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	St. Clair, Detroit & St. Lawrence Rivers
CRUISE TYPE	Areas of Concern	N.MI. STEAMED	694.7

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	67	Moorings Established	
EBTT Casts		Moorings Retrieved	
Van Dorn Bottle Casts	67	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations		Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls			
Hydrolab Casts	67		
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	171
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	
Water Samples Collected (TP uf)	67	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	617
Water Samples Collected (Alkalinity)	67	Grab Samples Taken, mini PONAR	26
Water Samples Collected ()			
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)	67		
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	







BENTHIC COMMUNITY STRUCTURE, LAKE ERIE STUDY 12211, DR. L. Grapentine
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A total of seven cruises was carried out onboard the CCGS LIMNOS April 17 - 19, May 22 - 25, June 18 - 21, July 23 - 26, August 28 - 31, September 17 - 28, and October 29 - November 4. The cruises were piggybacked with the Contaminant cruises on Lake St. Clair and the St. Clair and Detroit Rivers.

At all stations, a mini box core was collected and subsampled using five 6.7 cm diameter tubes 10 cm long and extruded into plastic jar's. Samples were sieved by University of Windsor personnel using a 250-micron mesh sieve. Residue was placed in the containers provided and preserved in 5% Formalin. Temperature, eH, and pH were taken of the surface sediment. Five mini Ponar grab samples were collected and sieved onboard by University of Windsor personnel. Residue was placed in plastic bags preserved with 5% Formalin, sealed with twist ties and stored upright. A water sample was collected from a depth of bottom -1 m for dissolved oxygen and pH measurements.

At stations 254, 873 and 1164 DO Logger/Temperature moorings using Greenspan Dissolved Oxygen loggers and Onset Tidbit temperature loggers were installed and refurbished. At stations 196 and 1165 thermograph moorings were installed and refurbished.

STATION POSITIONS

LAKE ERIE

2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 06"	79° 53' 17"
84	41° 56' 13"	81° 39' 06"
196	41° 51' 10"	82° 31' 36"
254	41° 57' 14"	82° 41' 01"
357	41° 48' 45"	82° 59' 00"
873	41° 54' 57"	82° 37' 13"
1164	41° 54' 01"	82° 36' 07"
1165	42° 00' 01"	82° 43' 46"

MOORING POSITIONS

LAKE ERIE

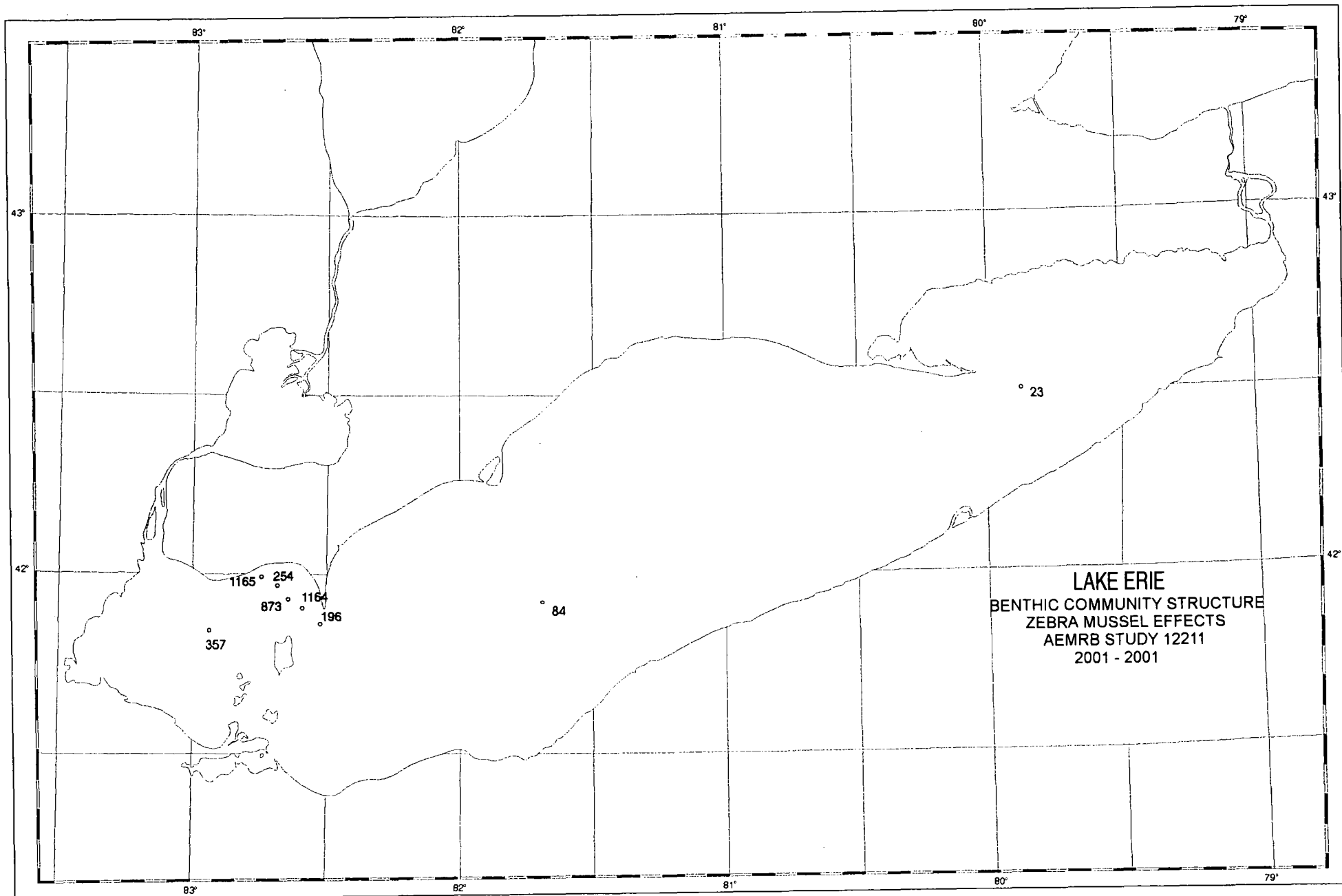
2001-2002

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
84	2001-01A-04A	41° 56' 08"	81° 39' 10"	ST (18, 21 m)
196	2001-01S-07A	41° 51' 12"	82° 31' 27"	T (2.2, 10.8 m)
254	2001-01S-08A	41° 57' 16"	82° 41' 00"	T (2.2 m) DO (btm -.55 m)
357	2001-01A-06A	41° 48' 56"	82° 58' 58"	ST (btm -1.4m) T (2.2, 9.0 m)
873	2001-01S-09A	41° 54' 59"	82° 37' 17"	T (2.2, 9.6 m)
1164	2001-01S-10A	41° 54' 01"	82° 36' 10"	T (2.2 m) DO (btm .55 m)
1165	2001-01S-11A	42° 00' 07"	82° 43' 47"	T (2.2, 7.9 m)

STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	LAKE ERIE
CRUISE TYPE	Benthic Community Structure	N.MI. STEAMED	1395.4

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	60	Moorings Established, Sediment Trap	2
EBTT Casts	60	Moorings Retrieved, Sediment Trap	2
Rosette Casts		Moorings Serviced, Sediment Trap	10
Reversing Thermometer Obs. (No. of Therm)		Moorings Established, Thermograph	3
Secchi Disk Observations	41	Moorings Retrieved, Thermograph	3
Transmissometer Casts		Moorings Serviced, Thermograph	15
Zooplankton Hauls		Moorings Established, DO Logger/Therm	2
		Moorings Retrieved, DO Logger/Therm	2
Integrator 10 m		Moorings Serviced, DO Logger/Therm	10
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	60		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	58
Water Samples Collected (D.O.)	32	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	43	Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, mini PONAR	210
Water Samples Collected ()		Bulk Centrifuge Samples	
Water Samples Collected ()			
Water Samples Collected ()		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	23		
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)	23		
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		ONBOARD ANALYSIS	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	118
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	



TASTE AND ODOUR, CREDIT RIVER AND LAKE ONTARIO AEMRB STUDY 12240, M.N. CHARLTON
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In recent years, Lake Ontario has generated high concentrations of odiferous compounds associated with certain types of algae. This late-summer phenomena has caused users to complain about drinking water quality and express concerns about water safety. As such, this "taste and odour" problem has been targeted as a research priority within NWRI.

Participants in the survey were M.N. Charlton and Dr. B. Brownlee of NWRI-Burlington; Dr. S. Watson, NWRI-Calgary; J. Ridal, St. Lawrence River Institute of Environmental Sciences; S. Siciliano, University of Ottawa; C. Allen, University of Waterloo and M. Meding, University of Calgary. Researchers hope that the combination of physical, chemical and biological data gathered this year compared to that of past and future years will shed light on the taste and odour formation process and suggest possible mitigation strategies. This work is supported by the ongoing research consortium of NWRI and the Ontario Ministry of Energy and Environment, partially funded by several regional municipalities that draw their water from the lake. The Ontario Clean Water Agency co-ordinates the consortium. Working with partners from universities and the Ontario government, NWRI recently conducted a lakewide research survey onboard the CCGS LIMNOS

- a) to determine if there is an inshore-offshore gradient of the offending compounds that may indicate a link to eutrophication
- b) to confirm low levels of the offending compounds in deep water; and
- c) to delineate spatial differences in types of compounds and types of algal assemblages.

Researchers are also focusing on Actinomycetes, as part of a larger study that is investigating the major zones and biota that may be contributing to or causing taste and odour events. The lower Credit River and inshore/offshore area at the mouth are already part of the program and have been sampled by MOEE. So far researchers have identified 22 different strains of Actinos from these samples and found that most are associated with suspended sediment. This may suggest that they originated from a terrestrial environment and have been washed into the system. About half of these produce the taste/odour compounds, geosmin or Methylisoborneol (MIB). Laboratory experiments are being carried out to determine under what conditions they produce odour and if in fact they can grow in the Credit River water or need a more enriched substrate; e.g., littoral or benthic zones. Preliminary results show that some strains of Actinos grow in unenriched river water resulting in exceptional odour production. In support of this work, TOS personnel carried out small boat surveys from the mouth of

the Credit River, out into Lake Ontario to determine if an inshore-offshore gradient could be demonstrated and linked to inputs of algae from the Credit River.

Nearshore surveys consisted of 5 stations—4 running along a transect from the river mouth to an offshore station and a 5th inshore station offset to the southwest. TOS personnel carried out surveys on the following dates: July 10th, 24th, 31st, August 8th, 14th, 21st, 29th, September 19th, 26th. Sampling consisted of a Hydrolab profile, water samples collected from discrete depths based on profile characteristics, Secchi depth and a bucket thermometer. Water samples from surface -1 m were taken for E. Coli and fecal coliform analysis. A single 4-station survey of the Credit River was carried out on October 19th. Water samples were taken offshore at station LV3, the mouth of the Credit River and at 2 upstream stations.

A single lakewide cruise was carried out on the CCGS LIMNOS September 11 - 15, to determine the spatial distribution of these taste and odour compounds in Lake Ontario. At each station, water samples were collected by rosette sampler from depths of 1 m and bottom -3 m for Geosmin and MIB analysis, chlorophyll *a*, total phosphorus (filtered and unfiltered), soluble reactive phosphorus, nitrate + nitrite. An integrated water sample was also 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, sampling was carried out to 2 m above the bottom for phytoplankton, picoplankton and bacterioplankton. Discrete samples were also obtained at selected stations for phytoplankton, picoplankton and bacterioplankton analysis, comparative actinomycete analysis and light attenuation. Water samples were also collected by submersible pump from a depth of 5 m at selected stations for Geosmin, MIB, Hexachlorocyclohexane analysis and zebra mussel larvae. Water samples were also collected by Go-Flo bottle at discrete depths at selected stations for dissolved elemental mercury, mercury speciation, RNA extraction and enzyme extraction.

STATION POSITIONS
NEARSHORE TASTE & ODOUR
2001 - 2002

STATION NUMBER	CHARLTON NUMBER	LATITUDE N.	LONGITUDE W.
749	LP1	43° 31' 31"	79° 35' 17"
750	LV1	43° 33' 15"	79° 32' 09"
751	LV2	43° 32' 36"	79° 30' 07"
752	LV3	43° 29' 55"	79° 28' 58"
660	LV4	43° 33' 44"	79° 33' 32"

STATISTICS SUMMARY

CRUISE NO.	_____	SHIP	CCGS LIMNOS
DATE: FROM	_____	REGION	LAKE ONTARIO
CRUISE TYPE	Taste and Odour in Drinking Water	N.MI. STEAMED	558.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	45	Moorings Established, Sediment Trap	
EBTT /Transmissometer Casts	43	Moorings Retrieved, Sediment Trap	
Rosette Casts	45	Moorings Serviced, Sediment Trap	
Reversing Thermometer Obs. (No. of Therm)		Moorings Established, Thermograph	
Secchi Disk Observations	23	Moorings Retrieved, Thermograph	
Van Dorn Bottle Casts		Moorings Serviced, Thermograph	
Zooplankton Hauls, 64µ		Moorings Established, Meteorological	
Fluorometer Casts	38	Moorings Retrieved, Meteorological	
Integrator 10 m	19	Moorings Serviced, Meteorological	
Integrator 20 m	24	Moorings Established, Hydrolab	
Phytoplankton Samples	43	Moorings Established, ADCP	
D.O. Profiles	43	Photometer Readings	23
Water Samples Collected (Geosmin and MIB)	187	Cores Taken, Box	
Water Samples Collected (Actinomycete)		Cores Taken, Mini Box	
Water Samples Collected (D.O.)	92	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	92	Cores Taken, Benthos	16
Water Samples Collected (TP uf)	108	Grab Samples Taken, Shipek	5
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	6
Water Samples Collected (Bacterioplankton)	107	Bulk Centrifuge Samples	
Water Samples Collected (Oxygen Isotopes)	120	Continuous Air Sampler, Days	4
Water Samples Collected (Seston)	118	Observations, Weather	
Water Samples Filtered (Chlorophyll a)	99		
Water Samples Filtered (POC/TPN)		LICOR Light Profiles	
Water Samples Filtered ()		UV Radiation Profiles	
Water Samples Filtered (TP f)	108	WATERS Buoy Deployment	
Water Samples Filtered (Nutrients)	108		
Water Samples Filtered (Major Ions)		ONBOARD ANALYSIS	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	184
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	

STATION POSITIONS

LAKE ONTARIO

2001- 00 - 005

STATION NO.	LATITUDE N.	LONGITUDE W.
1	43° 18' 47"	79° 45' 05"
3	43° 16' 06"	79 37' 12"
5	43° 26' 31"	79° 39' 29"
8	43° 37' 25"	79° 27' 13"
9	43° 35' 13"	79° 23' 42"
12	43° 30' 13"	79° 21' 08"
13	43° 25' 00"	79° 24' 00"
15	43° 19' 00"	79° 26' 36"
17	43° 13' 29"	79° 16' 18"
22	43° 17' 48"	79° 00' 18"
33	43° 35' 48"	78° 48' 05"
55	43° 26' 37"	77° 26' 18"
63	43° 43' 56"	77° 01' 02"
64	43° 31' 30"	76° 35' 30"
78	44° 04' 59"	76° 24' 20"
80	44° 08' 30"	76° 36' 38"
81	44° 00' 59"	76° 40' 20"
83	44° 00' 00"	76° 50' 37"
86	43° 15' 18"	79° 11' 42"
96	43° 13' 24"	79° 26' 48"
101	44° 11' 36"	76° 18' 36"
102	44° 12' 13"	76° 14' 10"
103	44° 12' 10"	76° 32' 35"
737	43° 36' 29"	79° 25' 46"
738	43° 33' 50"	79° 23' 14"
739	43° 25' 23"	79° 15' 31"

STATION NO.	LATITUDE N.	LONGITUDE W.
740	43° 20' 24"	79° 09' 30"
741	43° 15' 32"	79° 03' 41"
742	43° 22' 59"	78° 11' 41"
743	43° 31' 20"	78° 11' 19"
744	43° 39' 59"	78° 10' 43"
745	43° 48' 24"	78° 10' 24"
746	43° 56' 54"	78° 10' 06"
747	43° 38' 00"	77° 17' 30"
749 (LP1)	43° 31' 31"	79° 35' 14"
750 (LV1)	43° 33' 14"	79° 32' 08"
751 (LV2)	43° 32' 36"	79° 30' 08"
752 (LV3)	43° 29' 54"	79° 28' 57"
753	44° 14' 29"	76° 17' 59"
754	44° 14' 12"	76° 24' 24"
756	43° 14' 00"	79° 34' 30"
757	43° 13' 00"	79° 50' 24"
762	44° 14' 44"	76° 24' 20"
763	44° 13' 58"	76° 23' 52"
1001	43° 17' 17"	79° 50' 23"

ZEBRA MUSSEL EFFECTS AEMRB STUDY 12240, M.N. CHARLTON
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This was an ongoing study to determine the effects of zebra mussels on water quality in Lake Erie.

A total of four cruises were completed to support this study during the field season — April 30 - May 2, June 4 - 7, July 3 - 6, September 12 - 14. An additional cruise, October 29 - November 4, was used to retrieve moorings. A single cruise on the Erie Explorer, Ministry of Natural Resources - Port Dover, was done to refurbish sediment trap moorings in the Long Point/Port Dover area and to collect some water samples for the University of Waterloo. At each station, water samples were collected as follows: an integrated water sample 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. Sampling was carried out to 2 m above the bottom in instances where the sampling depth extended to the substrate. Parameters measured were: conductivity, pH, chlorophyll *a*, seston weight, total phosphorus, total filtered phosphorus, soluble reactive phosphorus, nitrate + nitrite, DOC, ammonia, chlorides and soluble reactive silicates. EBT/transmissometer profiles, DO profiles, Fluorometer profiles, surface bucket temperature and Secchi disc (30 cm) observations were also made at each station.

At all stations, duplicate metered 64µ zooplankton net hauls were taken from bottom -1 m to the surface were taken and preserved in sugared formalin. Seston samples, phytoplankton samples preserved with 5 mls of Lugol's solution and protozoa samples preserved with 10 mls of a glutaraldehyde solution were collected from the integrated sample for Dr. D. Culver, Ohio State University.

At selected stations samples were collected for the University of Waterloo. Samples collected were for chlorophyll *a*, seston weight, particulate carbon/nitrogen, particulate phosphorus, particulate silicate, phytoplankton, bacteria count, alkaline phosphatase activity (APA), N Dat, P Dat, photosynthesis, ammonia and SRP. At all stations sampled during daylight hours, a LICOR light profile and a UV radiation profile were also obtained.

A Water/Air Transfer of Electromagnetic Radiation System (WATERS) buoy was deployed at all stations sampled during daylight hours for J. Jerome, AEMRB.

Sediment trap moorings were installed at stations 23, 439, 443, 449, 451 and 931 during the April 30 - May 2 cruise. A meteorological buoy and a thermograph mooring were deployed at station 452 for Dr. W. Schertzer, AEIRB and serviced on the above mentioned cruises. In addition, sediment trap moorings were installed at stations 84 and 357 on Lake Erie during the April 17-19 cruise and serviced during the Charlton/Graptine cruises on Lake Erie, May 22-25, June 18-21, July 23-26, August

28-31, September 17-28 and final removal on October 29-November 4 cruise. Chlorophyll a and seston samples were collected at trap depth during each cruise. A sediment trap mooring with 6 sediment traps was also serviced at station 403 in Lake Ontario. This mooring was refurbished in May from a winter mooring and refurbished as a winter mooring at the end of October.

During the initial mooring cruise, April 30 - May 2, a meteorological mooring, two Hydrolab moorings and two ADCP moorings were placed at stations 453, 455 and 456 near the outlet of the Grand River for Dr. M.G. Skafel, AEMRB.

STATION POSITIONS

LAKE ERIE

2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
<hr/>		
23	42° 30' 06"	79° 53' 23"
438	42° 44' 49"	78° 57' 22"
439	42° 47' 15"	79° 04' 20"
440	42° 51' 11"	79° 09' 59"
441	42° 40' 01"	79° 05' 14"
442	42° 50' 30"	79° 23' 35"
443	42° 41' 12"	79° 16' 35"
444	42° 32' 36"	79° 15' 06"
445	42° 48' 07"	79° 41' 58"
446	42° 40' 01"	79° 43' 59"
447	42° 26' 00"	79° 38' 06"
448	42° 17' 43"	79° 42' 49"
449	42° 46' 02"	79° 58' 15"
450	42° 41' 49"	79° 57' 00"
451	42° 38' 54"	79° 53' 25"
452	42° 35' 01"	79° 55' 19"
931	42° 50' 59"	78° 56' 30"
934	42° 42' 29"	79° 30' 30"
935	42° 35' 30"	79° 27' 58"
936	42° 28' 29"	79° 24' 30"
938	42° 38' 00"	80° 03' 29"

MOORING POSITIONS

LAKE ERIE

2001-2002

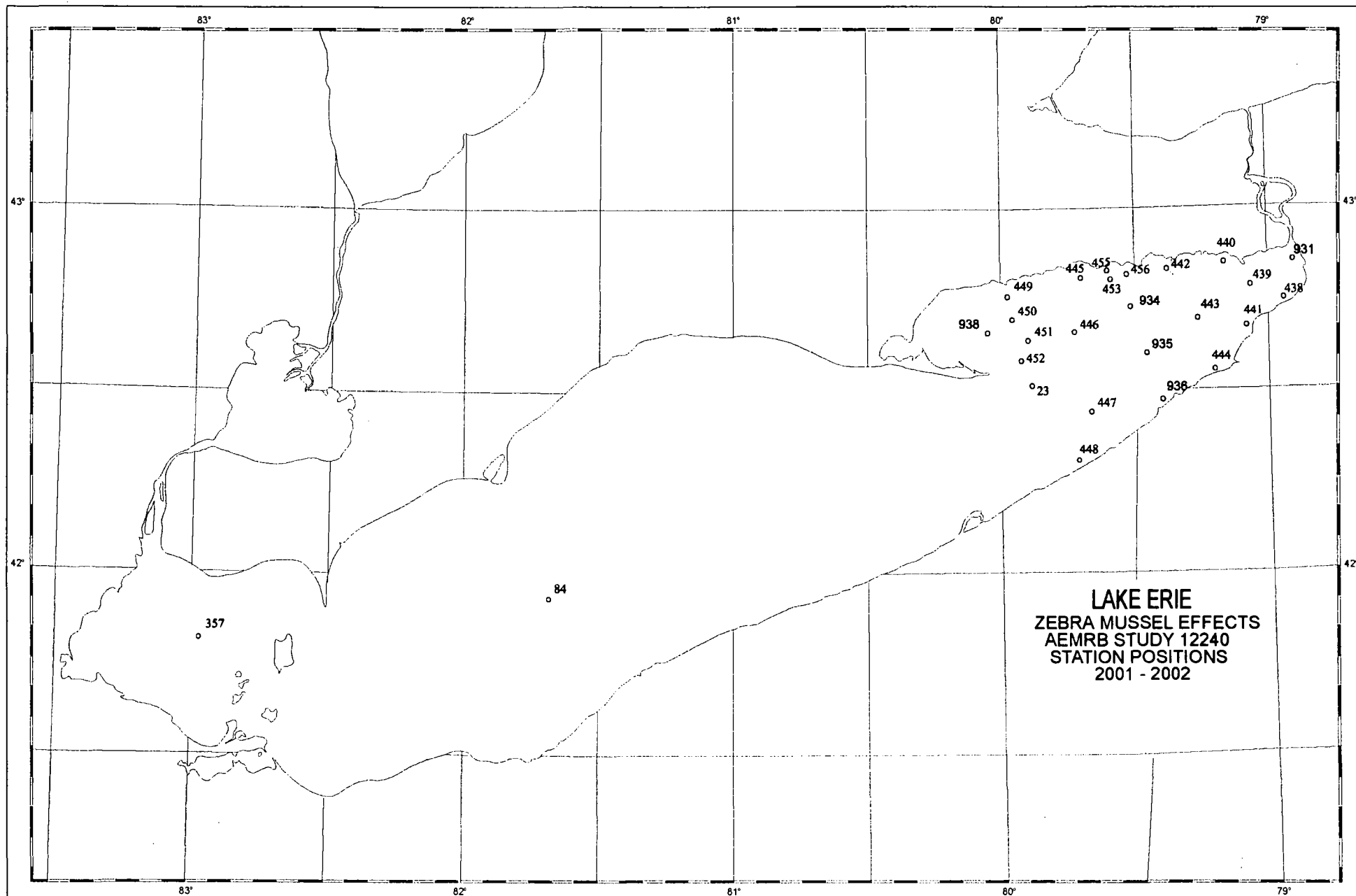
STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST./DEPTH
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23	2001-01A-02A	42° 30' 11"	79° 53' 20"	ST(30,40,59,59 m)
439	2001-01A-30A	42° 47' 18"	79° 04' 11"	ST (16 m)
443	2001-01A-31A	42° 41' 15"	79° 16' 32"	ST (15 m)
449	2001-01S-32A	42° 46' 12"	79° 57' 59"	ST (11.7 m) XMS (12.25 m)
451	2001-01A-33A	42° 38' 55"	79° 53' 24"	ST (15,25,38 m)
452	2001-01T-34A	42° 35' 02"	79° 55' 20"	T(4,6,8,10,12,14, 16,18,20,25,30,35, 40,45,51 m) XMS (11 m)
452	2001-01M-35A	42° 34' 58"	79° 55' 38"	MET T (2 m)
453	2001-01M-37A	42° 47' 50"	79° 34' 47"	MET
455	2001-01C-38A	42° 49' 40"	79° 36' 54"	ADCP (12.8 m)
455	2001-01S-39A	42° 49' 40"	79° 36' 54"	Hydrolab (5.2 m)
456	2001-01C-40A	42° 49' 54"	79° 33' 53"	ADCP (10.3 m)
456	2001-01S-41A	42° 49' 52"	79° 33' 59"	Hydrolab (4.7 m)
931	2001-01A-36A	42° 51' 00"	78° 56' 30"	ST (6.3 m)

STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	LAKE ERIE
CRUISE TYPE	Zebra Mussel Effects	N.MI. STEAMED	1054.1

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	89	Moorings Established, Sediment Trap	6
EBTT Casts	89	Moorings Retrieved, Sediment Trap	6
Rosette Casts	53	Moorings Serviced, Sediment Trap	18
Reversing Thermometer Obs. (No. of Therm)		Moorings Established, Thermograph	1
Secchi Disk Observations	59	Moorings Retrieved, Thermograph	1
Van Dorn Bottle Casts	15	Moorings Serviced, Thermograph	3
Zooplankton Hauls, 64µ	127	Moorings Established, Meteorological	2
Protozoa Samples	82	Moorings Retrieved, Meteorological	4
Integrator 10 m	45	Moorings Serviced, Meteorological	2
Integrator 20 m	68	Moorings Established, Hydrolab	2
Phytoplankton Samples	82	Moorings Established, ADCP	2
D.O. Profiles	88	Fluorometer Profiles	78
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)	92	Cores Taken, Mini Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)	92	Cores Taken, Benthos	
Water Samples Collected (TP uf)	103	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	6
Water Samples Collected ()		Bulk Centrifuge Samples	
Water Samples Collected ()			
Water Samples Collected ()		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	196		
Water Samples Filtered (POC/TPN)		LICOR Light Profiles	41
Water Samples Filtered (Seston)	97	UV Radiation Profiles	22
Water Samples Filtered (TP f)	103	WATERS Buoy Deployment	41
Water Samples Filtered (Nutrients)	103		
Water Samples Filtered (Major Ions)	103	ONBOARD ANALYSIS	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	198
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	



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

A total of seven cruises was carried out onboard the CCGS LIMNOS April 23 - 27, May 22 - 25, June 18 - 21, July 23 - 26, August 28 - 31, September 17 - 28, and October 29 - November 4. The cruises were piggybacked with the Lake Erie Benthic Community Structure mooring cruises.

Sediment traps were installed for Dr. C. Marvin at 9 sites in the Detroit River, one site in Lake St. Clair, seven 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. Moorings 2001-09A-18 at station 1165 and mooring 2001-09A-27 at station 1164 were new moorings established on the April cruise.

MOORING POSITIONS

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

2001 - 2002

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
510	2001-04A-29	42° 28' 44"	82° 42' 20"	ST (3.9 m)
803	2001-08A-07	42° 20' 13"	82° 57' 23"	ST (5.6 m)
804	2001-08A-08	42° 08' 35"	82° 07' 16"	ST (4.0 m)
913	2001-09A-28	42° 37' 04"	82° 35' 08"	ST (4.1 m)
1156	2001-08A-09	42° 02' 54"	83° 08' 12"	ST (4.5 m)
1157	2001-08A-10	42° 02' 50"	83° 09' 42"	ST (2.1 m)
1159	2001-08A-12	42° 07' 48"	83° 10' 29"	ST (3.6 m)
1160	2001-08A-13	42° 21' 38"	82° 54' 09"	ST (3.2 m)
1161	2001-08A-24	42° 10' 14"	83° 09' 50"	ST (5.9 m)
1163	2001-09A-16	42° 34' 13"	82° 34' 21"	ST (8.5 m)
1164	2001-09A-27	42° 39' 11"	82° 30' 27"	ST (11.4 m)
1165	2001-09A-18	42° 51' 21"	82° 27' 53"	ST (5.4 m)
1166	2001-09A-19	42° 56' 32"	82° 26' 16"	ST (5.3 m)
1167	2001-02A-20	43° 02' 43"	82° 24' 44"	ST (4.5 m)
1167	2001-02A-21	43° 02' 39"	82° 24' 44"	ST (4.5 m)
1168	2001-08A-25	42° 16' 03"	83° 06' 43"	ST (6.7 m)
1169	2001-08A-22	42° 19' 59"	83° 01' 17"	ST (5.8 m)
1170	2001-09A-17	42° 37' 15"	82° 31' 10"	ST (5.1 m)
1172	2001-09A-11	42° 54' 15"	82° 27' 47"	ST (5.8 m)

STATION POSITIONS

LAKE ERIE

2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 41"	79° 53' 24"
442	42° 50' 28"	79° 23' 35"
449	42° 45' 41"	79° 59' 13"
450	42° 42' 08"	79° 55' 00"
451	42° 38' 53"	79° 53' 20"
452	42° 35' 04"	79° 55' 20"
453	42° 47' 52"	79° 34' 43"
560	42° 44' 07"	79° 39' 54"
561	42° 36' 36"	79° 46' 34"
933	42° 49' 14"	79° 35' 15"
938	42° 38' 00"	80° 03' 30"

STATION POSITIONS

DETROIT RIVER

2001 - 2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
803	42° 20' 10"	82° 57' 37"
804	42° 08' 31"	83° 07' 13"
1156	42° 02' 50"	83° 08' 05"
1168	42° 16' 00"	83° 06' 39"
1169	42° 19' 57"	83° 01' 17"

STATION POSITIONS
LAKE ST. CLAIR/ST. CLAIR RIVER

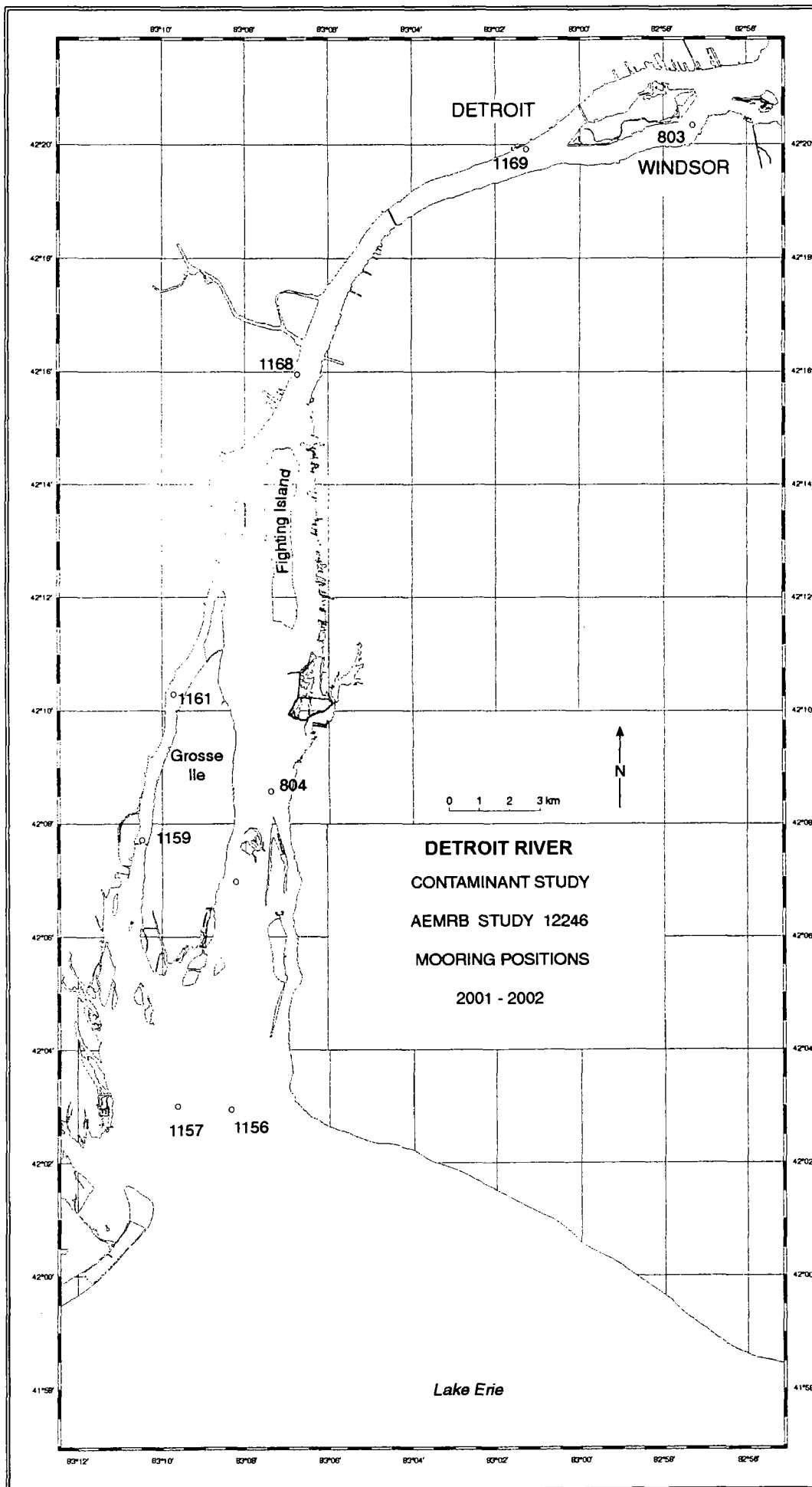
2001 - 2002

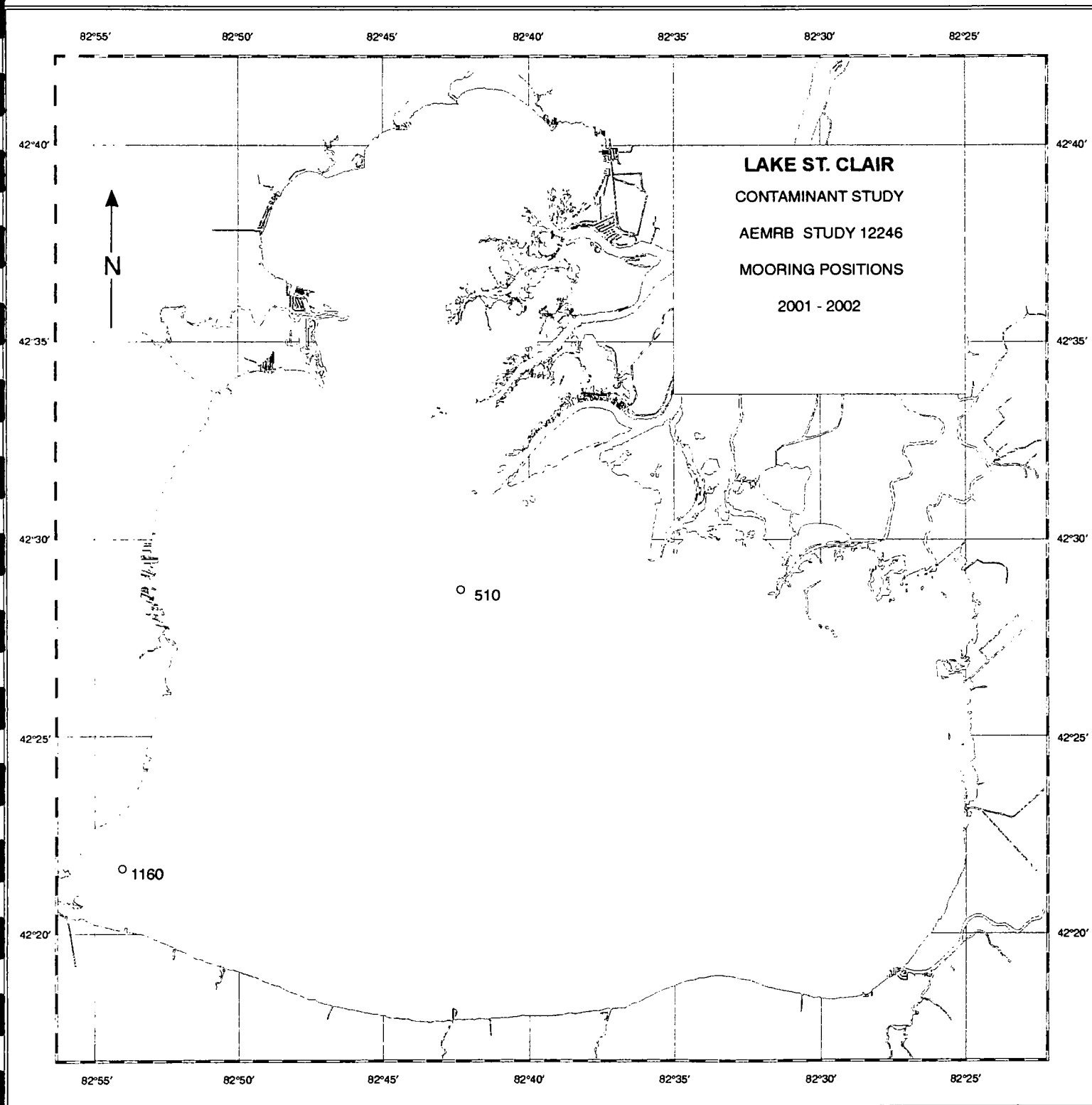
STATION NUMBER	LATITUDE N.	LONGITUDE W.
510	42° 28' 57"	82° 43' 14"
1160	42° 21' 46"	82° 54' 12"
1164	42° 39' 06"	82° 30' 28"
1166	42° 56' 29"	82° 26' 23"

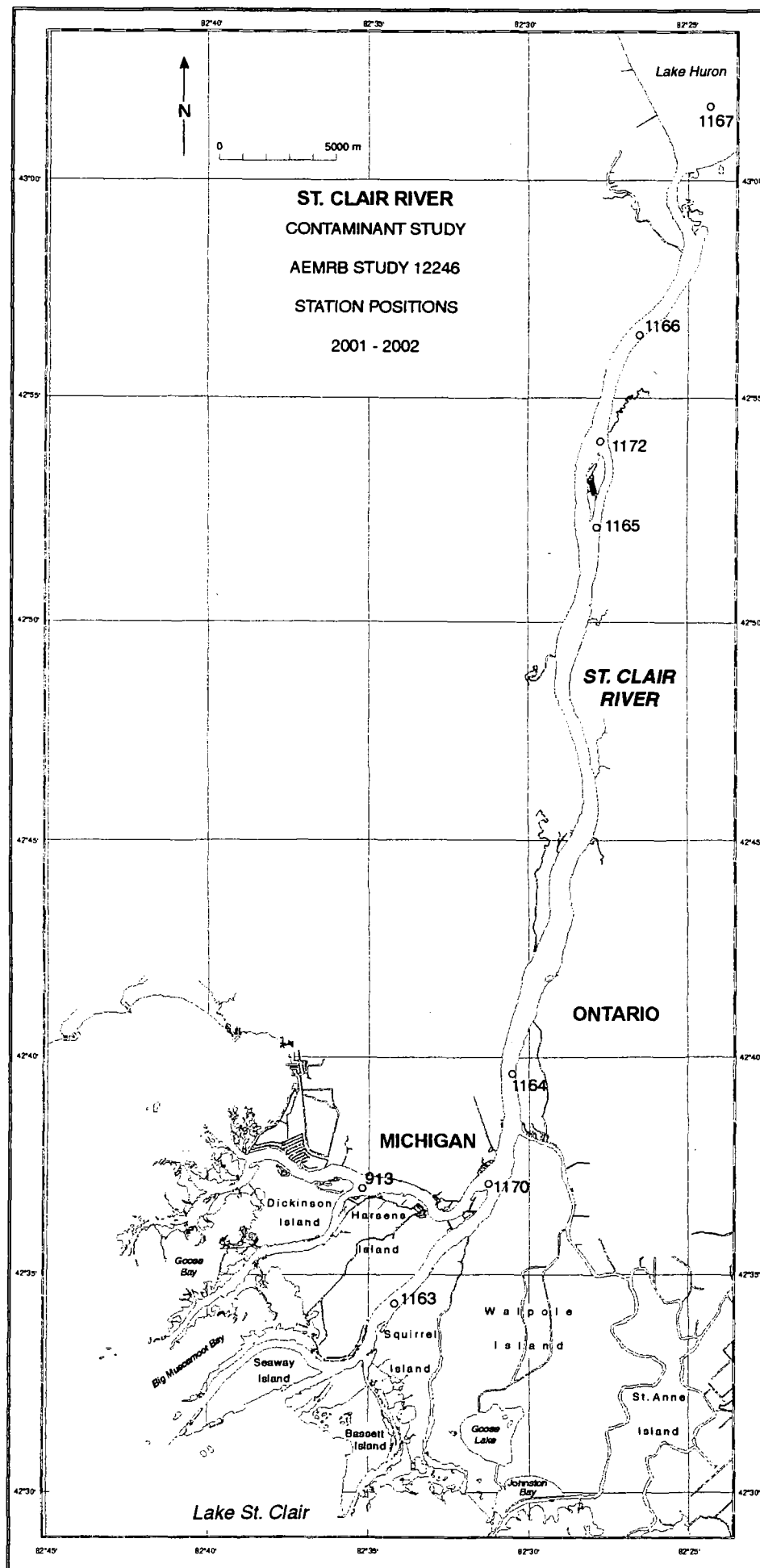
STATISTICS SUMMARY

CRUISE NO. _____ SHIP CCGS LIMNOS
 DATE: FROM _____ REGION LAKE HURON TO LAKE
 ERIE
 CRUISE TYPE Contaminant Study N.MI. STEAMED 1009.8

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	126	Moorings Established, Sediment Trap	19
EBTT Casts	126	Moorings Retrieved, Sediment Trap	19
Rosette Casts		Moorings Serviced, Sediment Trap	95
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disk Observations	79	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls			
Integrator 10 m			
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	126		
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 ()		Bulk Centrifuge Samples	
Water Samples Collected ()			
Water Samples Collected ()		Observations, Weather	
Water Samples Filtered (Chlorophyll <u>a</u>)	18		
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)	18		
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		ONBOARD ANALYSIS	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	34
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	







AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH**POLYBROMINATED BIPHENYL ETHERS AROUND LAKE ONTARIO**
AEPRB STUDY 13316, DR. M. ALAEE

Two cruises were completed to support this study; April 9 -12, October 22-25. This was a multi-faceted study, which included DFO and the EPA, looking for possible sources of Polybrominated biphenyl ethers (PBBE) entering Lake Ontario. These compounds are used in the production of flame retardant chemicals, and have been found to be increasing dramatically in the fish populations in Lake Ontario.

The focus of this part of a large multi-agency study was the contribution of surface input to Lake Ontario. Three stations were sampled in Lake Ontario. Stations 13, 41, and 64.

The summer cruise was conducted onboard the R/V LAKE GUARDIAN, an EPA research vessel. This cruise was conducted July 22 - 26.

Additional tasks performed during the cruise were the retrieval of winter moorings at station 586 for Dr. W. Schertzer, AEIRB and the refurbishment of a sediment trap mooring at station 403 for M.N. Charlton, AEMRB.

MOORING POSITIONS

LAKE ONTARIO

2000-2001

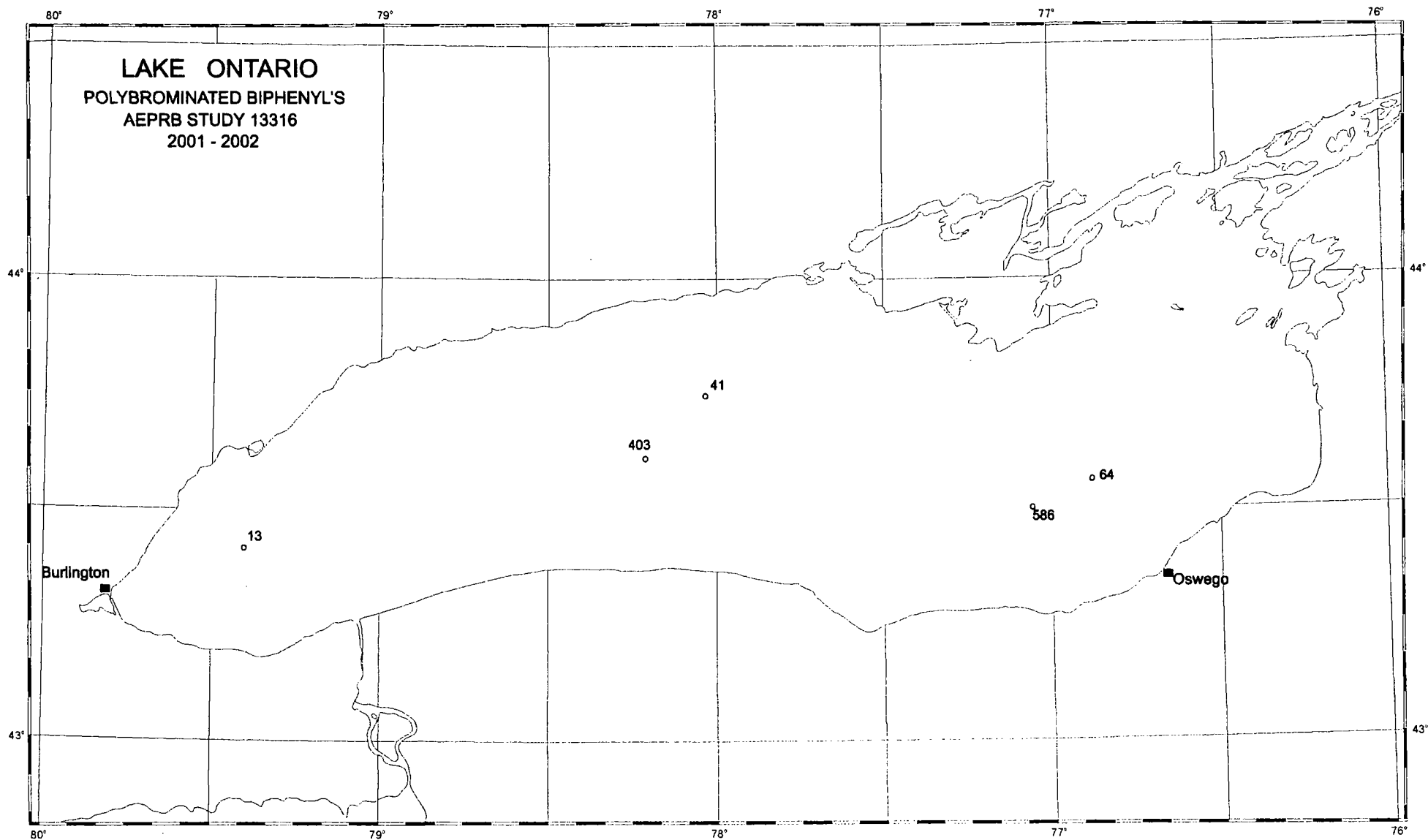
STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
403	2001-00A-65A	43° 35' 38"	78° 13' 37"	ST (20,60, 100,140,166, 174 m)
403	2000-00A-65B	43° 35' 38"	78° 13' 37"	ST (20,60, 100,140,166, 174 m)
586	2000-00T-35B	43° 29' 13"	77° 03' 38"	T (12,16,20, 24,30,40,100, 214 m)
	2000-00T-36B	43° 29' 03"	77° 02' 36"	T (10,16,26, 36,46,61,101, 181 m)

STATION POSITIONS

LAKE ONTARIO

2000-2001

STATION NUMBER	LATITUDE N.	LONGITUDE W.
13	43° 25' 00"	79° 24' 00"
41	43° 43' 00"	78° 01' 36"
64	43° 31' 30"	76° 55' 36"



AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH

MYSIDS AND ZOOPLANKTON SAMPLING, LAKE ONTARIO AEIRB STUDY 14176, DR. M. ARTS

Two cruises were carried out onboard the CCGS LIMNOS May 28 - June 28, October 1- 5. Four stations were sampled to examine the spatial and temporal variability and the potential for mysids to support healthy fisheries. Researchers will be measuring RNA/DNA ratios and the essential fatty acid (EFA) content of mysids and *Diporeia* of lower trophic levels in two depth stations in Lake Ontario.

The parameters sampled during all cruises were: temperature and transmission profiles, dissolved oxygen profiles, specific conductance, pH, chlorophyll *a*, total phosphorous unfiltered, mysids net hauls, zooplankton net hauls, ponar grab samples for *Diporeia* and Secchi disc observations.

Additional tasks performed during the cruise included the refurbishment of a sediment trap mooring at station 403 for M.N. Charlton, AEMRB, and the collection of air samples for H. Wong, AEPRB.

The R/V LAKE GUARDIAN, an EPA research vessel, was used to collect samples for the Study on July 23 - 26.

STATION POSITIONS

LAKE ONTARIO

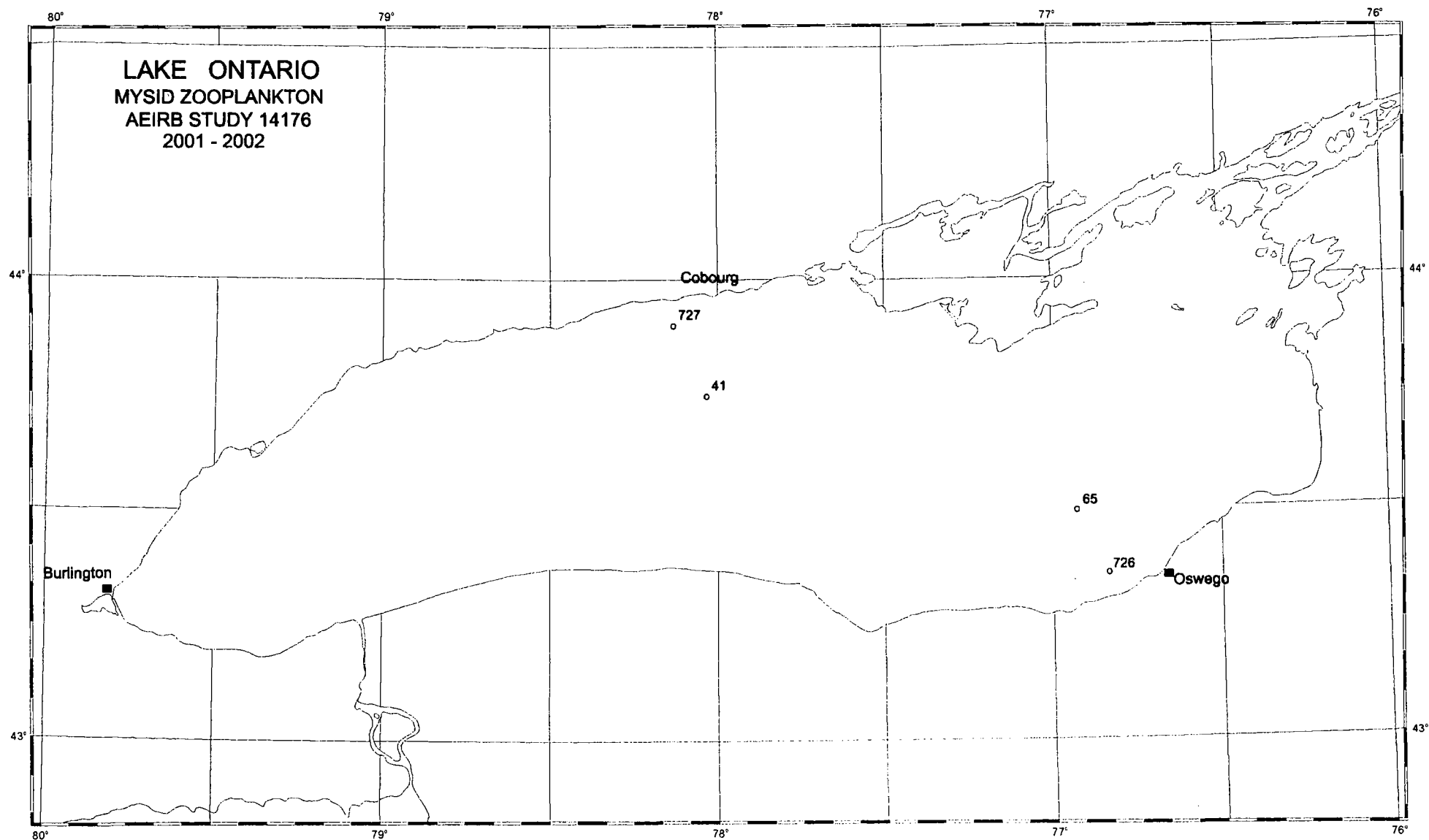
2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W.
41	43° 43' 02"	78° 01' 36"
65	43° 25' 30"	76° 53' 12"
726	43° 20' 40"	76° 53' 33"
727	43° 53' 40"	76° 08' 37"

STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	LAKE ONTARIO
CRUISE TYPE	Mysids and Zooplankton Sampling	N.MI. STEAMED	576.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	8	Moorings Established Sediment Trap	1
EBT/Transmissometer Casts	19	Moorings Retrieved Sediment trap	1
Rosette Casts	9	Moorings Established Infiltrax	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved Infiltrax	
Secchi Disc Observations	9	Moorings Established DO Logger	
Transmissometer Casts		Moorings Retrieved DO Logger	
Zooplankton Hauls	24	Moorings Serviced Meteorological	
Mysids Net Hauls	101	Organic Sediment Samples	
Integrator 10 m			
Integrator 20 m	4	Primary Productivity Moorings	
Phytoplankton Samples		Phenoxy Acid Herbicides	
D.O. Profiles	14	Neutral Herbicides	
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini Box	33
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	28
Water Samples Collected (Ciliate)		Bulk Centrifuge Samples 50 Litre	
Water Samples Collected (Microbial Loop)			
Water Samples Collected (Trace Metals)		Observations, Weather	
Water Samples Filtered (Chlorophyll a)	6	Golden Sampler Extractions	
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)	6		
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	



RESEARCH SUPPORT BRANCH**OPEN LAKES SURVEILLANCE, LAKES ONTARIO AND SUPERIOR**
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR
RSB STUDY 12632, B.H. MOORE

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

Four cruises were conducted—two on Lake Ontario April 2 - 6, July 30 - August 3 and two on Lake Superior May 7 - 17 and August 16 - 24, 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, SO₄, chloride, reactive silicate, major ions (Mg, K, Ca) as well as meteorological and Secchi disc observations.

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

Lake Ontario**Unstratified Conditions:**

- 1 metre
- 10 metres
- 25 metres
- bottom -10 metres
- bottom -2 metres

Stratified Conditions:

- 1 metre
- 1 metre above the knee of the thermocline
- mid-thermocline
- 1 metre below the knee of the thermocline
- bottom -10 metres
- bottom -2 metres

Lake Superior

Unstratified Conditions:

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

Stratified Conditions:

- 1 metre
- 1 metre above the knee of the thermocline
- mid-thermocline
- 1 metre below the knee of the thermocline
- 100 metres if total depth is greater than 130 m
- 250 metres if total depth is greater than 300 m
- bottom -10 metres
- bottom -2 metres

Some of the additional tasks performed during the cruises were: In Lake Ontario water samples were collected for B. Scott, AEPRB, Mercury samples for Dr. W.R.M. Strachan, AEPRB and metal samples for Dr. M. Twiss, Ryerson University. In Lake Superior Mysid net hauls were collected for Dr. O. Johannsson, GLLFAS, phytoplankton samples for Dr. M. Munawar, GLLFAS, sediment samples for Dr. C. Marvin, AEMRB, box cores for R. Dermott, GLLFAS and moorings were installed in the North channel for Dr. P. Hamblin, AEMRB.

STATION POSITIONS

LAKE ONTARIO

2001 - 2002

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"
14	43° 23' 36"	79° 29' 12"
15	43° 19' 00"	79° 26' 36"
16	43° 16' 18"	79° 21' 36"
17	43° 13' 30"	79° 16' 18"
18	43° 18' 12"	79° 16' 42"
19	43° 23' 00"	79° 17' 06"
20	43° 20' 18"	79° 11' 48"
21	43° 18' 00"	79° 07' 12"
22	43° 17' 48"	79° 00' 18"
23	43° 22' 12"	79° 04' 00"
24	43° 26' 24"	79° 07' 42"
25	43° 31' 00"	79° 04' 48"
26	43° 36' 30"	79° 01' 00"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
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"
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"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
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"
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"
78	44° 05' 00"	76° 24' 24"
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"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
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"
96	43° 13' 24"	79° 26' 48"
97	43° 57' 42"	76° 07' 18"
98	43° 56' 06"	76° 13' 54"
104	43° 17' 15"	79° 50' 00"

STATION POSITIONS

HAMILTON HARBOUR

2001 - 2002

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

2001 - 2002

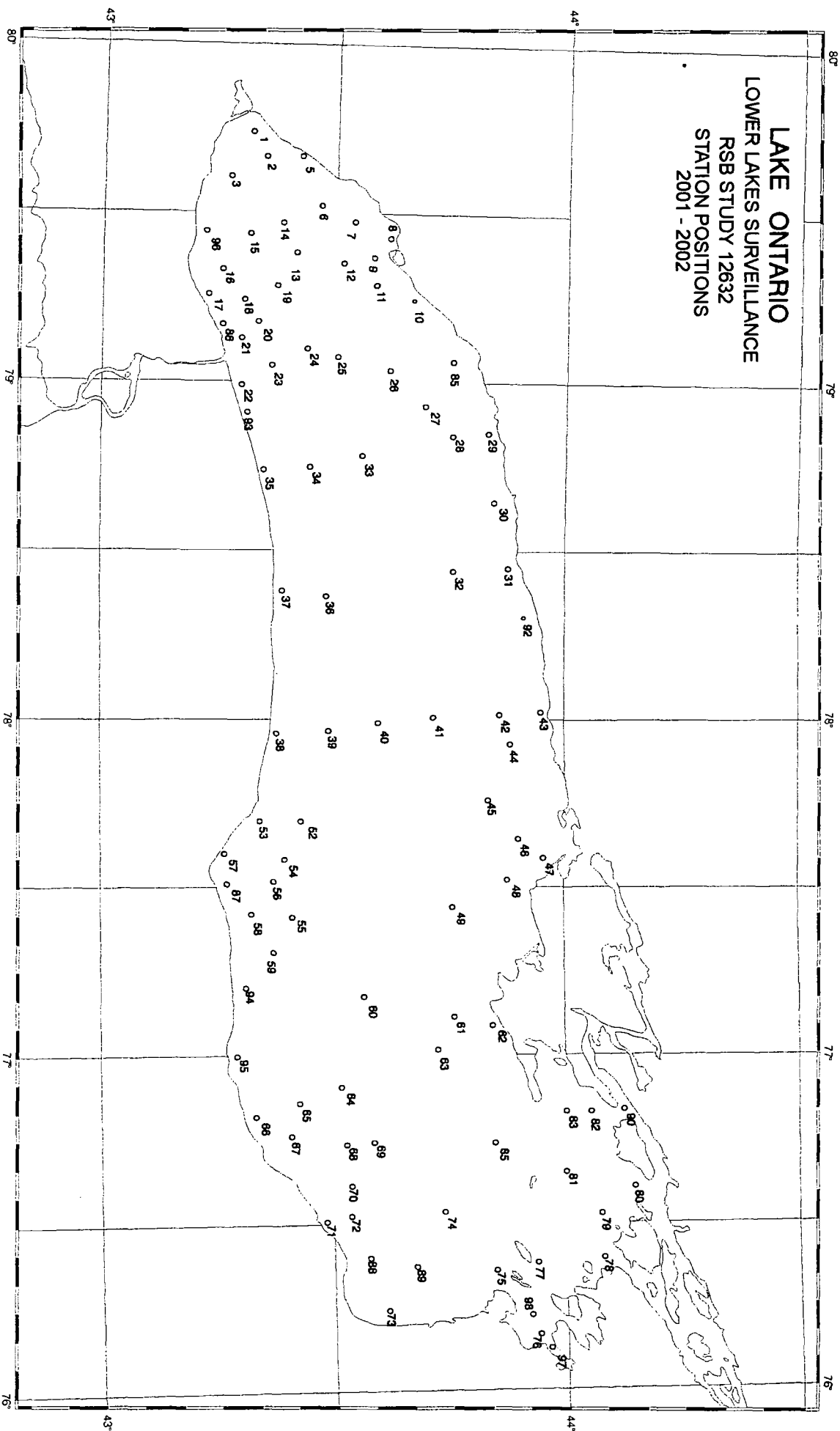
STATION NUMBER	LATITUDE N.	LONGITUDE W.
725	43° 38' 18"	79° 21' 42"
726	43° 37' 56"	79° 22' 46"

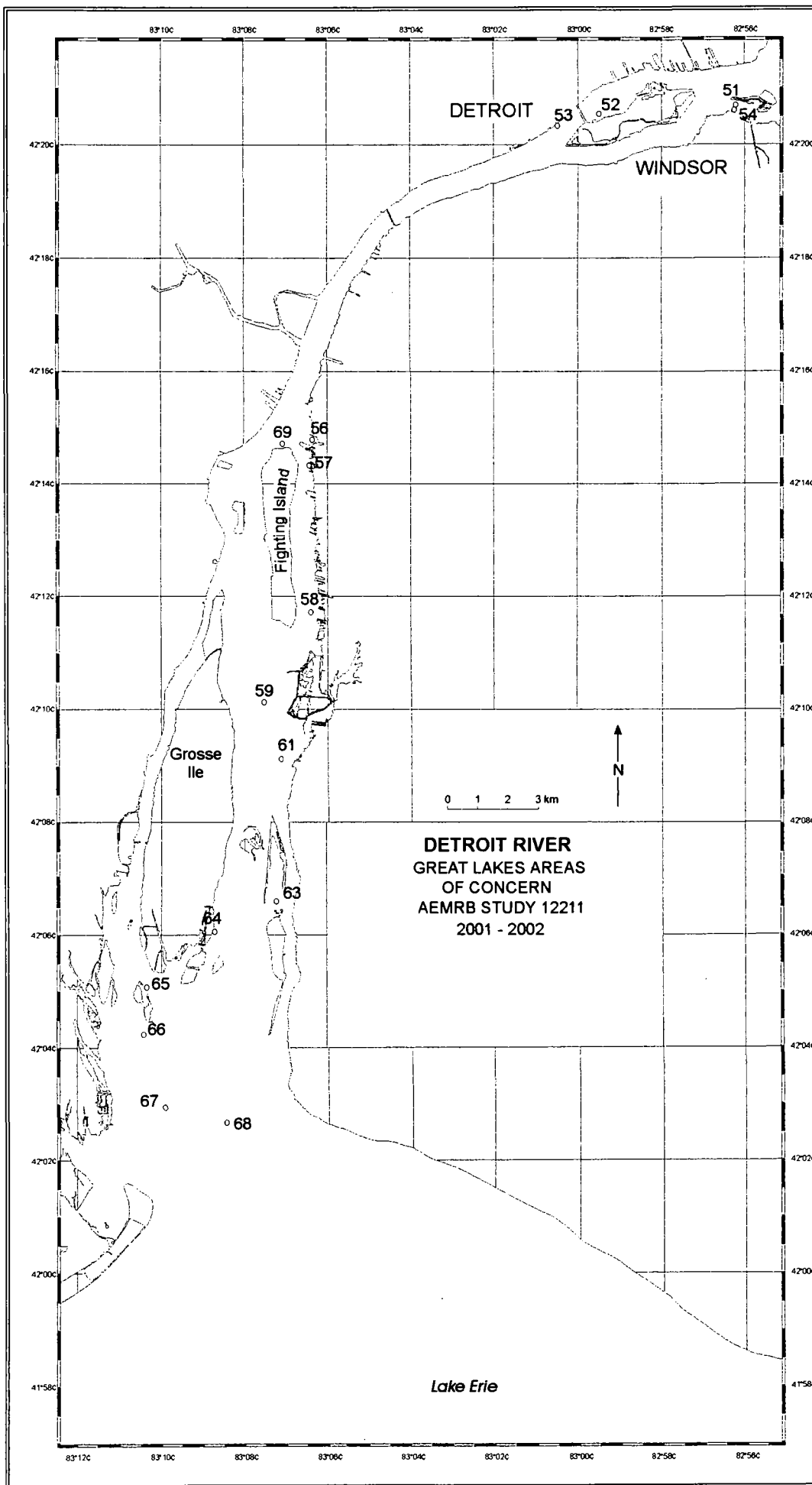
STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	LAKE ONTARIO
CRUISE TYPE	Lower Lakes Surveillance	N.MI. STEAMED	1218.0

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	154	Moorings Established Sediment Trap	
EBT/Transmissometer Casts	157	Moorings Retrieved Sediment trap	
Rosette Casts	116	Moorings Established Infiltrax	
Reversing Thermometer Obs. (No. of Therm)	11	Moorings Retrieved Infiltrax	
Secchi Disc Observations	79	Moorings Established DO Logger	
Transmissometer Casts	36	Moorings Retrieved DO Logger	
Zooplankton Hauls		Moorings Serviced Meteorological	
Van Dorn Casts	115	Organic Sediment Samples	
Integrator 10 m	10		
Integrator 20 m	144	Primary Productivity Moorings	
Phytoplankton Samples		Phenoxy Acid Herbicides	
D.O. Profiles		Neutral Herbicides	
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)	490	Cores Taken, Mini Box	
Water Samples Collected (D.O.)	490	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	490	Cores Taken, Benthos	
Water Samples Collected (TP uf)	490	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	25
Water Samples Collected (Ciliate)		Bulk Centrifuge Samples 50 Litre	
Water Samples Collected (Microbial Loop)			
Water Samples Collected (Trace Metals)	31	Observations, Weather	
Water Samples Filtered (Chlorophyll a)	184	Golden Sampler Extractions	35
Water Samples Filtered (POC/TPN)	235		
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	490		
Water Samples Filtered (Nutrients)	490		
Water Samples Filtered (Major Ions)	112	ONBOARD ANALYSIS	
Water Samples Filtered (DOC)	26	Manual Chemistry, Tech. Ops.	1470
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	

LAKE ONTARIO
LOWER LAKES SURVEILLANCE
RSB STUDY 12632
STATION POSITIONS
2001 - 2002





STATION POSITIONS
UPPER LAKES SURVEILLANCE
LAKE SUPERIOR
2001-2002

STATION NUMBER	LATITUDE N.	LONGITUDE W
2	46° 32' 36"	84° 44' 54"
12	47° 02' 12"	85° 06' 12"
22	46° 58' 06"	85° 43' 40"
23	47° 12' 48"	85° 38' 00"
25	47° 27' 18"	85° 16' 30"
31	47° 55' 06"	84° 54' 46"
39	47° 41' 24"	85° 58' 00"
42	47° 19' 30"	86° 22' 18"
43	47° 04' 48"	86° 28' 40"
45	46° 51' 24"	86° 34' 06"
51	46° 31' 00"	87° 20' 12"
57	46° 56' 00"	87° 18' 18"
59	47° 09' 33"	87° 16' 54"
68	47° 01' 00"	88° 11' 00"
76	47° 24' 06"	87° 24' 42"
80	47° 35' 00"	86° 57' 06"
82	47° 51' 30"	86° 38' 00"
95	48° 13' 06"	87° 01' 00"
97	48° 26' 18"	87° 15' 12"
100	48° 45' 24"	86° 58' 33"
113	48° 08' 42"	87° 42' 12"
115	47, 50' 48"	87° 27' 24"
118	47° 36' 24"	87° 42' 36"
125	47° 36' 18"	88° 13' 00"
127	47° 50' 54"	88° 20' 12"

STATION NUMBER	LATITUDE N	LONGITUDE W
139	48° 15' 12"	89° 10' 48"
152	47° 41' 18"	89° 28' 00"
155	47° 48' 12"	89° 08' 48"
157	47° 36' 48"	89° 00' 00"
160	47° 22' 00"	88° 49' 06"
164	47° 01' 36"	89° 02' 18"
169	47° 12' 24"	89° 40' 00"
177	47° 44' 48"	90° 14' 06"
196	46° 44' 54"	90° 42' 12"
221	46° 46' 54"	92° 03' 15"

MOORING POSITIONS

LAKE HURON

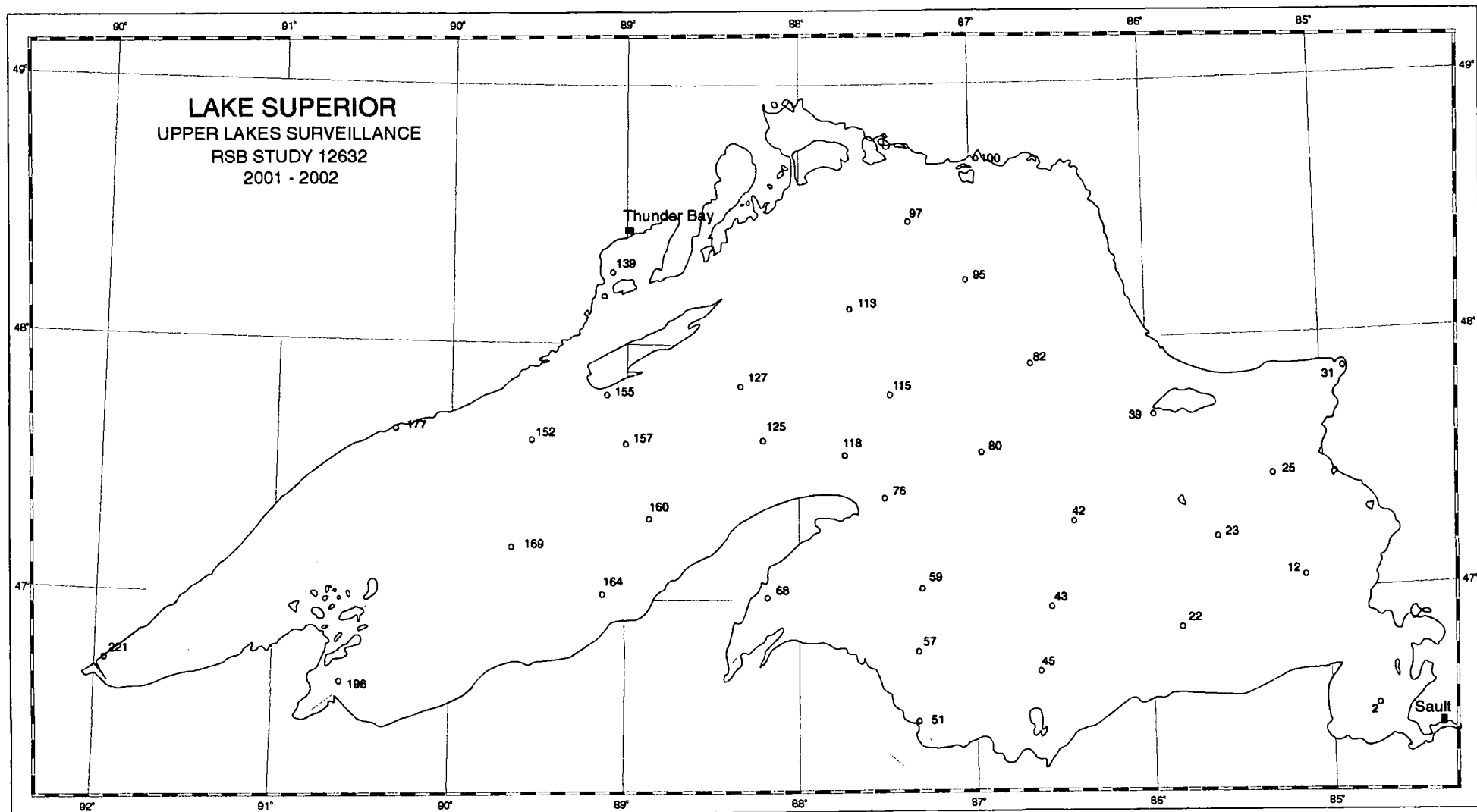
2001-2002

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
104	2001-02S-10A	46° 01' 56"	81° 57' 31"	ADCP(28.5 m)
	2001-02T-11A	46° 01' 32"	81° 57' 39"	T(2.5,5,7.5,10, 12.5,15,17.5, 20,22.5,25 m)
	2001-02S-12A	46° 02' 02"	81° 57' 30"	ADCP(28.5 m)
	2001-02T-13A	46° 01' 27"	81° 47' 41"	T(2.5,14,16.5, 17,21.5,24, 26.5,29,31.5, 34 m)

STATISTICS SUMMARY

CRUISE NO.		SHIP	CCGS LIMNOS
DATE: FROM		REGION	LAKE SUPERIOR
CRUISE TYPE	Upper Lakes Surveillance	N.MI. STEAMED	2311.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	72	Moorings Established Sediment Trap	
EBT/Transmissometer Casts	74	Moorings Retrieved Sediment trap	
Rosette Casts	35	Moorings Established Infiltrax	
Reversing Thermometer Obs. (No. of Therm)	12	Moorings Retrieved Infiltrax	
Secchi Disc Observations	37	Moorings Established DO Logger	
Transmissometer Casts		Moorings Retrieved DO Logger	
Zooplankton Hauls		Moorings Serviced Meteorological	
Van Dorn Casts	34	Organic Sediment Samples	
Integrator 20 m	28		
Integrator 50 m	51	Primary Productivity Moorings	
Phytoplankton Samples	44		
D.O. Profiles			
Water Samples Collected (Microbial Loop)	16	Cores Taken, Box	
Water Samples Collected (Water Quality)	248	Cores Taken, Mini Box	3
Water Samples Collected (D.O.)	248	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	248	Cores Taken, Benthos	
Water Samples Collected (TP uf)	275	Grab Samples Taken, Shipek	22
Water Samples Collected (TKN)	219	Grab Samples Taken, PONAR	6
Water Samples Collected (Mercury)	14	Bulk Centrifuge Samples 100 Litre	14
Water Samples Collected (Neutral Herbicides)	3		
Water Samples Collected (Phenoxy-acid herbicides)	3	Observations, Weather	
Water Samples Filtered (Chlorophyll a)	90	Golden Sampler Extractions	14
Water Samples Filtered (POC/TPN)	97		
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	275		
Water Samples Filtered (Nutrients)	220		
Water Samples Filtered (Major Ions)	220	ONBOARD ANALYSIS	
Water Samples Filtered (DOC)	26	Manual Chemistry, Tech. Ops.	538
Water Samples Filtered ()		Nutrients, EHD, ECB, EC-OR	
Water Samples Filtered ()		Microbiology	



SHORE PROGRAMS**NATIONAL LABORATORY FOR ENVIRONMENTAL TESTING****QA/QC WATER COLLECTION, NEAR NORTH AREA OF ONTARIO
NLET STUDY 12180, H. ALKEMA**

At the end of May, large volume water samples were collected at various lakes in the near north area of Ontario. These will be used as part of a national interlaboratory quality assurance study. A small submersible pump was used to collect approximately 200 litres at each site. Samples were stored at 4 degrees upon return to CCIW. The following small lakes were sampled:

LAKE	AREA
Lake of Bays	Dorset
Raven Lake	Dorset
Lac Des Quinzes	Quebec
Lake Temagami	Temagami
Tomiko Lake	Sturgeon Falls
Clearwater Lake	Sudbury
Long Lake	Sudbury

BUILDING PROPERTY SERVICES**WAVES TOWER AND BEACH TRAILER**
BPS STUDY 12702, B. MALSEED

Inspections of the Tower were carried out by TOS and ES staff in the spring and fall. Lighting systems had minor repairs done during the spring and fall. It will be necessary to replace all flood lighting on the Tower next spring. No winter damage was found on the structure. The structure will require a complete cleaning and minor painting next year. The security system is still unreliable from the Tower but works from the trailer.

An inspection of the trailer and site highlighted the need for safety signage. Emergency phone numbers and warning signage indicating the location of the high voltage underground cables is needed. A field technician from Trans Canada Pipelines was on site observing beach cleaning by heavy equipment and indicated that he had no record of a high voltage cable crossing the beach and the pipeline. Hydro One was also on site and required advice on the location of buried cables in the area as heavy equipment and grounding systems for working on the hydro transmission lines above the trailer site are used regularly.

AQUATIC ECOSYSTEM MANAGEMENT RESEARCH BRANCH

CORE COLLECTION, HAMILTON HARBOUR AEMRB STUDY 12210, DR. A. ZEMAN

Technical Operations supported this project on two occasions in the fall of 2001. Twenty station positions were selected by the study leaders and were first visited to collect one mini box core for grain size analysis. The stations were re-visited approximately two weeks later by the SHARK and one benthos core was collected from each station. All cores were between 0.5 and 1.5 metres in length. The suitcase DGPS was used and the datum was NAD27. Following is a list of station reference numbers and positions.

STATION POSITIONS

CONSECUTIVE STATION NO.	STATION NUMBER	EASTING	NORTHING
1	A1	597311	4792694
2	A3	597749	4792930
3	A4	597759	4792671
4	A5	597899	4792554
5	A7	597620	4792046
6	A8	597855	4792221
7	A10	597965	4792073
8	A11	598085	4792121
9	A12	598247	4792071
10	A13	598105	4791868
11	A14	598310	4791940
12	A15	598202	4791794
13	A17	598411	4791589
14	A18	598566	4791610
15	A19	598707	4791411
16	A20	598473	4791385
17	A2A	597625	4792742
18	A6A	597694	4792216
19	A9A	598005	4792150
20	A16A	598340	4791754

**RoxAnn™ Sediment Surveys, Detroit River, Windermere Arm, Northern Lake Michigan, Western Lake Ontario, Sarnia, Cornwall, and the Bay of Quinte
AEMRB STUDY 12218, DR. N.A. RUKAVINA**

Bottom sediment mapping using the RoxAnn™ Seabed Classification System was conducted again this year at six locations in both Canada and the United States. The CCGL PUFFIN equipped with differential GPS through a SerceI™ GPS receiver, along with the Microplot V7.0™ Navigation System was used again this year on all of the surveys. This was the last field year for the study leader Dr. N.A. Rukavina, after over 30 years of limnogeological work in the Great Lakes Basin. Training of a new study leader began early in the year and continued throughout the majority of the surveys conducted this year. Hans Biberhofer of Ontario Region, will take over the bulk of Dr. Rukavina's work in the future. Training of alternate coxswains also took place during this field season.

The first survey of the year was an extension of work done last year on the Detroit River and the previous two field seasons on the Western basin of Lake Erie. It was also the first RoxAnn™ survey for H. Biberhofer. The survey focused in and around the connecting channels of the lower Detroit River and extending out into Lake Erie to the Detroit River Light (about 10 kilometers out). The purpose was to locate fine grained sediments that may be associating with contaminants from up stream industry. These fine-grained sediments are easily resuspended and provide a vehicle for contaminant migration. Both an extensive RoxAnn™ survey along with UWTV, and Shipek groundtruthing were completed during the survey. The survey lasted one week and was again run out of the Amherstburg Coast Guard Base.

A survey to delineate bottom sediment characteristics of the Windermere Arm in Hamilton Harbour was conducted over an extended period of time during the mid-summer. Scheduling conflicts and weather caused a two week survey to last for almost a month. The water content of the sediments made groundtruthing difficult to obtain in terms of grab samples; and poor visibility made UWTV work almost useless. The bulk of the groundtruthing was done using the STING, (a sediment penetrometer) with some mini-boxcore work being done later in the summer. The main purpose of this survey was to identify areas of contaminated fine grain sediments for core sampling later in the year for Dr. A. Zeman, AEMRB. It was also a chance to gain a larger dataset of the bottom characteristics of Hamilton Harbour, to compliment previously collected data.

J. Fitzsimons, GLLFAS, in partnership with the Michigan Department of Natural Resources is conducting a three year study into the spawning activities of lake trout in and around historical spawning shoals in Northern Lake Michigan. As part of the study, scientists were interested in delineating the boundaries and bottom classifications of these shoals. A trial of RoxAnn™ was contracted during a summer trip to Michigan. Two of the nearshore shoals in Grand Traverse Bay (Engles Point, and Grand Traverse Shoal) were surveyed in high detail to give J. Fitzsimons an idea of the type of data that RoxAnn™ could provide. A third shoal in Little Traverse Bay (Bay Harbour Reef) was

also surveyed. Preliminary reaction to the survey was mixed and time constraints with the priority lake trout work cut the survey short. It is hoped that winter workup of the data will give the study leaders a better insight into what RoxAnn™ can provide for future work of this type.

During the first week of August, a number of testing days were run in western Lake Ontario near Stoney Creek. The purpose of the testing was to tune the head amps provided with a new RoxAnn™ system to mimic older head amp settings. It was also an opportunity to adjust internal settings on both the new and old systems using a controlled and previously surveyed area. It also gave the new study leader a chance to become more familiar with both RoxAnn™ and the new version of Microplot™.

As part of the ongoing Remedial Action Plan of the upper St. Clair River at Sarnia, a RoxAnn™ survey was completed to compliment some other multi agency work being done along the "chemical valley" section of the upper St. Clair. A section of river on the Canadian side from the lower end of Stag Island upstream to Dow Chemical was surveyed parallel to shore to try and identify soft fine grain sediments in the near to mid offshore section of the river. An extensive RoxAnn™ survey was conducted in the first three days of the survey. Groundtruthing via UWTV and Shipek took up the bulk of the survey. A complimentary Multibeam Survey by the Canadian Hydrographic Service was run over the same survey area. Comparison work between the two surveys will take place over the winter. This also brought to an end the field career of Dr. Rukavina. After some 30 years of limnogeology work in the Great Lakes Basin the torch was passed to new study leader, Hans Biberhofer during this survey. Significant overlap between the two scientists should ensure a seamless transfer of the study.

During the middle two weeks of October a large scale survey of the Cornwall waterfront was conducted. The survey had a double focus; a detailed area just downstream of the public boat launch and a small bay downstream of the tankfarm. These two locations were surveyed in high detail. A number of UWTV and STING samples were completed following the RoxAnn™ work. The survey was also used as a basis for site location of Dr. Krishnappan's In-situ Flume. The RoxAnn™ data enabled optimal selection of test sites. After completion of the main survey, additional work was completed to investigate resuspension of sediments due to propwash.

The final trip of the year was during the last week of October and involved the western section of the Bay of Quinte, near Belleville and Trenton. Both RoxAnn™ and sediment coring using a Shipek sampler were completed during the week. This survey also was a training trip for D. Walsh of TOS. Training of a new coxswain for the RoxAnn™ work will allow the work to continue should other jobs come up and/or illnesses or commitments from other team members. This will allow the program to become multidimensional.

All in all this was a year of learning curves and discovery. This study is expected to continue it's evolution as an important research tool for the Institute.

SEDIMENT MOVEMENT STUDY (T- FRAMES, DETROIT RIVER AND CORNWALL)
AEMRB STUDY 12218, DR. N.A. RUKAVINA

Once again Technical Operations Services supported Dr. Rukavina's ongoing sediment deposition and erosion studies in Areas of Concern (AOC) locations. The purpose of the study is to monitor the long term movements of sediments in historically contaminated areas. In mid-May, a TOS dive team (Breedon, Gilroy and Don) traveled to Amherstburg to search for, recover instrumentation and mark two T-frame moorings located in the Detroit River.

The mooring located in the Trenton Channel, was found and marked with a spar buoy. The search proved difficult due to the lack of an operating pinger (broken connector) on the T-frame. A plastic bag was found on the US side XDR and the battery can was found unplugged. All instrumentation was recovered and the groundline removed. A second spar buoy was installed on the spar anchor. The CCGS LIMNOS will recover both single point moorings at this site and move them to a location at the mouth of the Detroit River. Divers working in poor visibility, could not obtain NAR rod readings or underwater video.

The mooring located in the Amherstburg Channel, was found and marked with a spar buoy. The search proved difficult because the T-frame had been dragged 28 metres south of the original position. Divers found a tangled mess of groundline, wire and electrical cable at the T-frame. Working carefully, in poor visibility, to avoid becoming entangled, divers cleaned up the debris. All instrumentation was recovered. The groundline was laid along the bottom, thirty metres to the NE. Divers worked in poor visibility and could not obtain NAR rod readings or underwater video.

In early June, a TOS dive team (Breedon and Don) travelled to Amherstburg to reposition and install XDR's and video logger instrumentation on two T-frame moorings located in the Detroit River. Engineering personnel accompanied the dive team to assist with the installation of the data loggers and video cameras. The dive team utilized the CCGC SHARK to lift and reposition the T-frames.

Mooring 2001-08S-50A was placed, at the mouth of the Detroit River, by the CCGS LIMNOS on May 24, 2001. A diving inspection revealed that the T-frame was resting on a rock bottom. The T-frame was lifted and repositioned as the diver turned the arms to an East/West alignment. Divers installed the XDR instrumentation, data recorder can and video logger system. The new "basket clamps" installed to hold the data recorder can and external battery worked extremely well, saving dive time.

The mooring located in the Amherstburg Channel which had been dragged, by unknown forces, 28 metres south of its original position, was lifted to the deck of the CCGC SHARK where staff installed the XDR instrumentation, data recorder can and video logger system. The complete system was lowered to the bottom close to the original position as the diver turned the arms to an East/West alignment.

Divers returned to both moorings to obtain an underwater video record, NARROD readings and check the operation of the XDR/Video logger systems. Problems occurred at site 27A with the video logger. Divers retrieved the video camera and Engineering Services attempted overnight repairs. By morning the video problems had not been resolved and no help could be obtained from RSB Engineering at NWRI. At this point the decision was made to return to CCIW.

In late June, a TOS dive team (Gray and Don), returned to Amherstburg to service both T-frames and recover the video logger from the lake station. RSB Engineering, met the dive team at the launching ramp.

The team proceeded to the lake site but south winds at 15 - 25 mph made the work too dangerous to attempt. The dive team proceeded to Sarnia to support another commitment and then returned to Amherstburg. Both T-frames were serviced successfully. Problems with the lake station required the removal of all hardware except the transducers. The video system was also removed for repair by RSB Engineering.

In early July, a TOS dive team (Gray and Benner) travelled to Amherstburg to service both T-Frames. The Lake Erie site had both the acoustic logger and video logger re-installed. The surface cable was attached and a test cycle of both loggers was run. The cycle was reset back to the correct sampling interval (1 hour), and left until the next refurbishment. The Amherstburg site had all of the data since the previous trip downloaded. The dive team then installed the video logger, and ran through the same testing and operational procedures as on the lake site. Video footage was taken at the Lake Erie site on this trip, however water clarity made video at the Amherstburg site impossible.

In late September, a TOS Dive Team (Gray and Don) travelled to Amherstburg to recover the data logger and transducers from the Amherstburg Channel T-frame.

In early October, a TOS Dive Team (Benner and Don) travelled to Cornwall to support Dr. Rukavina, (Sediment Mapping) and Dr. Krishnappan, (Sediment/Contaminant Interaction). The Cornwall region of the St. Lawrence River has been part of a long term study, monitoring the movement of river sediments (Rukavina et al). Two new T frame moorings were installed in Zone 1 and Zone 3 and sediment resuspension experiments were carried out near the proposed new marina site.

The T frames were installed near the launching ramp and in the bay downstream of the Government dock. Both moorings were installed using the CCGC GANDER equipped with a hoisting boom. Personnel from Engineering Services travelled to Cornwall to assist with the installation of the electronic data loggers onto the T frames. In addition, the T frame in Zone 3 was equipped with a video logger.

Resuspension experiments began by surveying transects perpendicular to shore between the Pollution Control Plant at the NAV CANADA Training and Conference

Centre and Courtalds. Three sites were found suitable, in 1.5 - 2.0 metres of water and free of macrophyte growth. Cameras were placed on the bottom, below the CCGL PUFFIN, which was anchored. The CCGL GANDER was used to try and create a disturbance of sediment using the prop wash. The cameras detected very little resuspension from the prop wash.

In late November, a TOS Dive Team (Benner and Gray) travelled to Cornwall. Both video and data loggers were removed and refurbished overnight by Engineering Services.

The next morning divers returned and reinstalled both moorings. Preexisting electronics were returned and external battery cans installed for winter deployment. Electronics were tested and found to be operational. Both installations were videoed and spars removed.

The team then departed Cornwall for the Amherstburg and Lake Erie T-Frames. An initial attempt was made to reach the T-frame site off the mouth of the Detroit River on Lake Erie. Conditions proved unworkable with seas running 3-5 feet. The crew returned to Amherstburg, removing the spar on the Amherstburg site on the way back to the dock. There was no dive work carried out at this site. The field crew waited out strong southwest winds and were able to catch a small window late in the day to complete a site inspection and removal of datacan. The following morning, the crew returned and reinstalled electronics and external battery cans to the T-Frame. NAR readings were taken. Conditions did not warrant video work. Electronics were tested and found operational.

Historical work in Hamilton Harbour was put on hold this year. However, future video logger testing in the harbour is being discussed. Future work may involve the movement of an existing T-Frame (located without sampling equipment just west of the sandcap.) T-Frame redesign may make this existing T-Frame obsolete.

The future of the T-Frame program looks strong even with the pending retirement of Dr. Rukavina. The torch is set to be passed on to Hans Biberhofer, presently with Ontario Region. R&D is ongoing with RSB Engineering Services.

WATER QUALITY, HAMILTON HARBOUR AEMRB STUDY 12240, M. CHARLTON

Hamilton Harbour, Water Quality Monitoring, Station 1001:

Monitoring of a number of water quality parameters has continued in Hamilton Harbour over the 2001 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 will be carried out over the winter months if weather permits. This station remains the primary monitoring site for a snapshot of chlorophyll *a*, nutrients, total phosphorus filtered and unfiltered in the harbour. Hydrolab castes 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.

Hamilton Harbour, Net Hauls:

In response to concerns over the health of zooplankton in Hamilton Harbour, a brief monitoring program was undertaken in 2000 for Dr. M. Evans, NWRI, AEPRB, Saskatoon. Again in 2001, samples will provide quantitative and qualitative data on harbour populations.

Duplicate net hauls were taken weekly between May 11th and October 10th.

Hamilton Harbour, Fecal Coliform Sampling:

In response to concerns over water quality in and around Hamilton Harbour, Burlington and Hamilton beaches, a fecal coliform survey was initiated in 2000. The weekly survey was continued this field season, between April 18th and November 7th. The survey consisted of five stations off beaches in Hamilton Harbour (Bay Front Park), Burlington and Hamilton (north of Confederation Park).

A more intensive, 26 station survey was carried out on October 12th and November 7th. Data from this survey provides a more comprehensive snapshot of harbour conditions and supplements data from weekly surveys. Data from this fall survey will be compared to data acquired over the winter, when harbour STPs stop chlorinating their effluent.

Additional Hamilton Harbour Sampling:

EC, ECB, OR, GLSF, Study 12631, Randall Reef Sediment Sampling, J. Shaw:

On June 25th TOS personnel acquired ponar and benthos samples from 2 sites on Randall Reef. The samples will provide baseline data in anticipation of future dredging operations in the area, under the Great Lakes Sustainability Fund.

EC, ECB, EHD, OR, Study 12631, J. Strueger

On September 4th TOS personnel collected 25 L of water from the harbour. A joint study is underway between NLET and Trent University examining pharmaceuticals in the aquatic environment. The study on this emerging issue is focused on detection and methods analysis. Samples are being examined for a broad spectrum of pharmaceuticals and with a view on expanding the program to study veterinary inputs and antibiotics.

AEMRB, Study 12450, Dr. I. Droppo

Efforts continue to build a comprehensive budget of inputs to Hamilton Harbour.

The purpose of this study was to quantify discharge from the Kenilworth catchment to Hamilton Harbour.

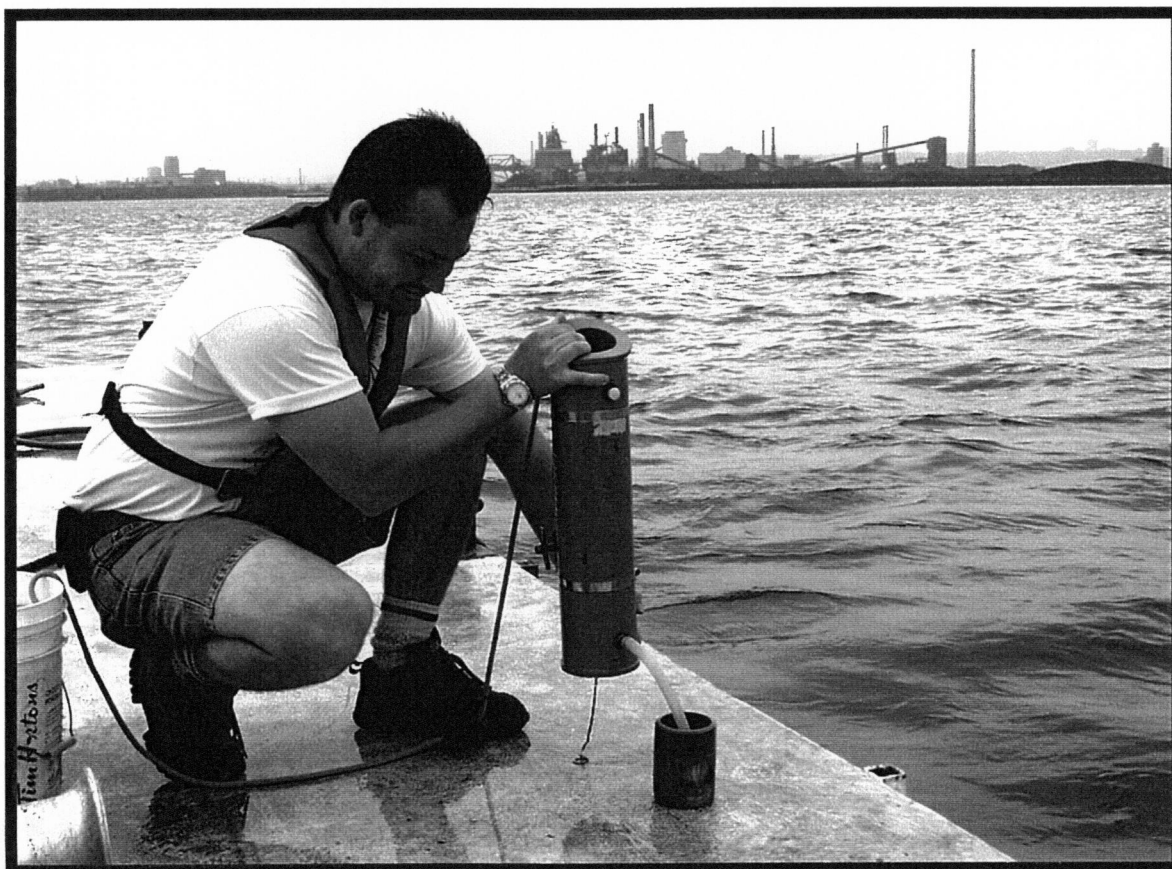
On May 16th TOS personnel and B. Trapp inspected the Dofasco CSO outfall. On May 31st staff installed water quality monitoring gear designed to monitor water levels and temperature exiting the CSO. The plan was to use the data from the two water level probes to help model the discharge into the harbour from this CSO. Preliminary results show that the CSO is greatly affected by the daily Harbour levels causing a by-directional exchange of water in and out of the ponding area. As well, barometric pressure associated with storm events can dramatically lower the harbour water levels in a short period of time causing a greater head differential between the CSO and the harbour.

On December 14th, loggers were removed and measurements were taken to determine the degree of "plugging" of the two 10 foot steel outflow pipes. Preliminary data indicates the northern pipe is 50% plugged and the southern pipe 75% plugged.

Plans are in the works to install loggers earlier in 2002, before lake waters rise. Additional rain gauge sensors will be added to the loggers.

AEMRB, Study 12240, Dr. M. Charlton

On October 4th TOS staff collected water samples at each of four Sediment Trap stations for a collaborative study between AEMRB and V. Hiriart of the University of Waterloo. These samples will be used to examine the effects of UV radiation on DOC and the bioavailability of DOC to Bacteria.



Van Dorn water sampling, Hamilton Harbour

HAMILTON HARBOUR
WEEKLY WATER QUALITY MONITORING POSITIONS
2000-2001

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CHARLTON PROFILING, STUDY 12240		
1001 (Hamilton Harbour)	43° 17' 15"	79° 50' 17"

STATION NUMBER	STUDY DESTINATION	LATITUDE N.	LONGITUDE W.
CHARLTON, NET HAULS, STUDY 12240			
9053	HH19	43° 17' 16"	79° 50' 26"
1001	HH20	43° 17' 53"	79° 50' 35"
9054	HH51	43° 16' 50"	79° 52' 22"
9055	HH53	43° 17' 08"	79° 47' 38"
9056	9L0902	43° 18' 33"	79° 46' 16"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CHARLTON, HIRIAT, WATER SAMPLING, STUDY 12240		
9030 (HH50 NE Corner)	43° 18' 18"	79° 48' 59"
9031 (HH51 West End)	43° 16' 49"	79° 52' 22"
9032 (HH52 Deep Hole)	43° 17' 12"	79° 50' 36"
9033 (HH53 SE Corner)	43° 17' 07"	79° 47' 39"

SITE	NUMBER	LATITUDE N.	LONGITUDE W.
<hr/> CHARLTON FECAL COLIFORM WEEKLY SAMPLING, STUDY 12240 <hr/>			
Burlington Beach	9034	43° 18' 31"	79° 47' 56"
	9035	43° 18' 31"	79° 47' 55"
	9036	43° 18' 32"	79° 47' 54"
	9037	43° 18' 32"	79° 47' 52"
	9038	43° 18' 33"	79° 47' 46"
Hamilton Beach	9039	43° 16' 22"	79° 46' 37"
	9040	43° 16' 22"	79° 46' 36"
	9041	43° 16' 23"	79° 46' 35"
	9042	43° 16' 25"	79° 46' 31"
	9043	43° 16' 27"	79° 46' 27"
Bay Front Beach (Hamilton Harbour)	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"

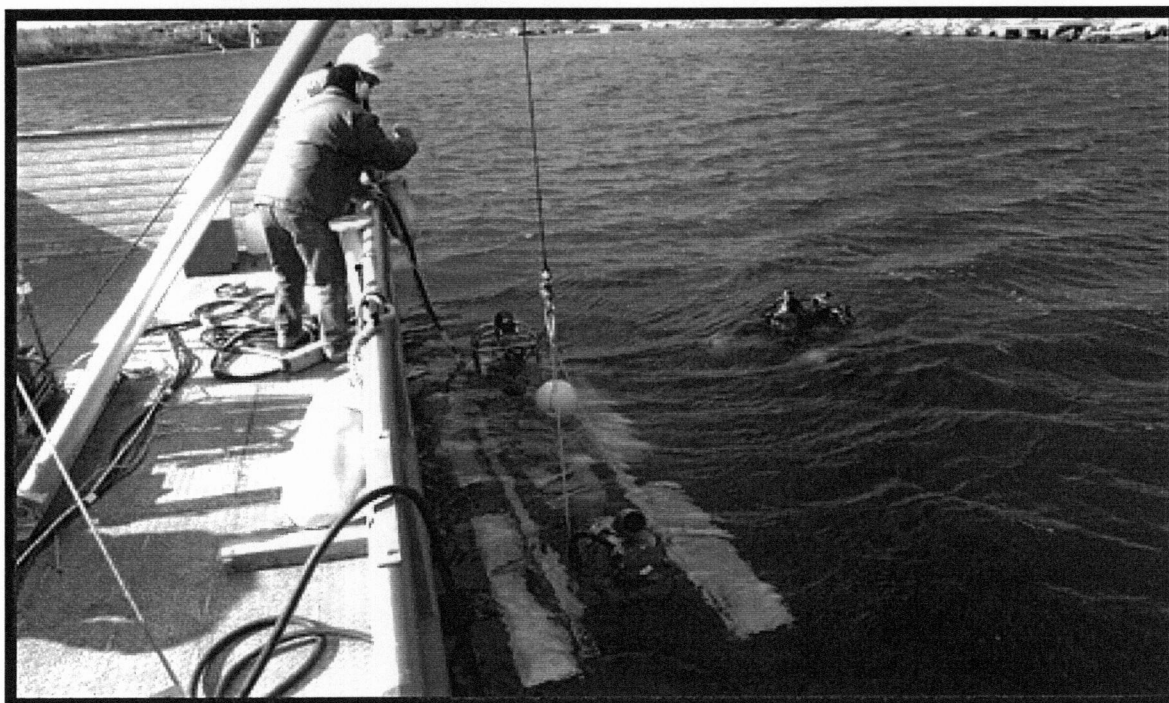
SEDIMENT SHEAR STRESS EXPERIMENTS, CORNWALL AEMRB STUDY 12242, DR. B.G.KRISHNAPPEN

On Monday, October 15, a TOS Dive Team (Benner and Don), commenced support to the Sediment Shear Stress Experiments in the Cornwall area of the St. Lawrence River. The flume and support equipment were brought to Cornwall by Mr. W.B. Taylor, RSB and Mr. R. Stevens, AEMRB. Mr. N. Madsen, RSB and Mr. E. Smith, RSB also arrived on Monday to assist with the setup of the flume, generator and support equipment on the CCGL GANDER.

The in-situ erosion flume was designed by Dr. Krishnappan, AEMRB and built by RSB Engineering Services. The flume is used in the field to measure the critical shear stress for erosion and the erosion rate of fine sediment deposits, using optical photo-diode technology, accompanied by video, pitot tube, and turbidity measurements. The flume was first field tested in Cornwall in 2000, and based on that work, several modifications were made for the 2001 field survey.

Three test sites were selected using RoxAnn data. The CCGL PUFFIN, installed marker floats as guides. The CCGL GANDER was anchored using a three point system, which proved adventurous under the high wind conditions of the week. After stabilizing the flume at the surface, it was lowered to the bottom with a diver guiding the flume onto a clear site. An interface core was collected, by divers, at stations 1 and 2. This was the first time divers had used the new prototype corer. Discussions with RSB Engineering on modifications will hopefully improve the efficiency of the corer.

All work was completed safely and the Dive Team returned to CCIW on Friday, October 19.



**Diver aided, In Situ Erosion Flume deployment,
St. Lawrence River, Cornwall**

STATION POSITIONS

<u>STN.</u>	<u>NORTHING</u>	<u>EASTING</u>	<u>LATITUDE</u>	<u>LONGITUDE</u>
Site 1	4984274.3 N	521165.5 E	45° 00' 41.8" N	074° 43' 53.0" W
Site 2	4984776.0 N	523158.0 E	45° 00' 57.8" N	074° 42' 21.9" W
Site 3	4984318.0 N	521265.0 E	45° 00.7183' N	074° 43.8062' W

ADCP MOORINGS, EASTERN LAKE ERIE AEMRB STUDY 12243, DR. M. SKAFEL
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The ability to characterize complex water movements in dynamic environments and provide descriptive data is critical to many of the institutes research and remediation projects. Water quality in the Grand River is known to be impacted by anthropogenic activities. The nearshore zone of the eastern basin of Lake Erie has been adversely impacted, as evidenced by increased cladophora growth. The goal of this integrated study is to improve the understanding of the water quality conditions across the nearshore-tributary continuum and to explore linkages between the two regions.

On April 30th and May 1st the CCGS LIMNOS deployed two ADCPs and two Hydrolab moorings off the mouth of the Grand River. The CCGC SHARK refurbished these moorings on July 16th. On October 24th TOS staff travelled to Port Colbourne to meet the CCGC SHARK. As it turned out, this was the only window of opportunity in a two week period of extremely high winds on Lake Erie. Crew aboard the CCGC SHARK were able to successfully retrieve the four moorings.

STATION POSITIONS
EASTERN LAKE ERIE
2001-2002

INSTRUMENT	MOORING NUMBER	LATITUDE N.	LONGITUDE W.
ADCP/0218	2001-01C-38B	42° 49' 41"	79° 36' 56"
HYDROLAB/33556	2001-01C-39B	42° 49' 38"	79° 37' 03"
ADCP/0844	2001-01C-40B	42° 49' 54"	79° 33' 54"
HYDROLAB/32603	2001-01C-41B	42° 49' 53"	79° 34' 01"

ADCP and TEMPERATURE LOGGER MOORING RECOVERY, NORTH CHANNEL AEMRB STUDY 12245, DR. P.F. HAMBLIN
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Ongoing is a long-term study of the physical dynamics of water in the North Channel of Lake Huron. On May 9th, in support of this project, the CCGS LIMNOS deployed a series of moorings on the west side of Grand LaCloche Island. On Monday, August 13, a TOS dive team (Benner and Don), accompanied by J. Gabrielle, Engineering Services, RSB traveled to Little Current to refurbish these scientific moorings. The CCGL PINTAIL was used for the mooring operation.

Mooring Summary:

Mooring 2001-02S-10A was retrieved. The Narrowband ADCP was downloaded and refurbished. The mooring was reinstalled as 2001-02S-10B.

Mooring 2001-02S-11A was retrieved. The Workhorse ADCP was downloaded and refurbished. The mooring was reinstalled as 2001-02S-11B.

Mooring 2001-02S-12A was retrieved. The Brantner loggers were downloaded and refurbished. The mooring was reinstalled as 2001-02S-12B.

Mooring 2001-02S-13A was retrieved. The Brantner loggers were downloaded and refurbished. The mooring was reinstalled as 2001-02S-13B.

On Tuesday, November 13, a TOS dive team (Benner, Gilroy and Don), returned to Little Current to remove the scientific moorings for the winter. The CCGL PINTAIL was used for the mooring operation.

The following moorings were removed:

2001-02S-10B Narrowband ADCP

2001-02S-11B Workhorse ADCP

2001-02S-12B. Brantner loggers (temperature)

2001-02S-13B. Brantner loggers (temperature)

All work was completed safely and personnel returned to CCIW on Thursday, November 15.

MOE MONITORING STATIONS, ST. CLAIR RIVER
AEMRB STUDY 12246, DR. C.H. MARVIN

TOS staff were involved in a collaborative study between Mr. P. Kauss, MOE and Dr. C. Marvin, NWRI to measure long term trends in sediment contamination and correlate these with benthic macroinvertebrate community impairment.

On June 20th, six stations were installed on the St. Clair River between Sarnia and Stag Island. Three PVC and six stainless sediment collection tubes were secured to fence post moorings at each site. At each site a small cage containing mussels was attached to a mooring stake on a length of poly rope. At sites 148, 143 and 75 current meters were deployed midwater.

Stations were refurbished on August 27th and 28th and removed on October 29th.

High suspended sediment loads and strong currents made dive support at these stations difficult. Heavy macrophyte growth in and around all sites was evident at the October refurbishment. Over the course of the field season several improvements to mooring hardware and sediment tube construction were identified and should streamline the in-water work for divers next field season. A continual rain of macrophytes from upstream most likely compromised data from the mechanical current meters used.

Station Summary

Station 75:

N 4754829.9	E 382180.7	42° 56.2199'N	82° 26.6399' W
Depth	- 3 m		
Bottom type	- sandy, gravel		
Location	- at an old water out fall pipe at the Dow Suncor property line.		
Installed	- 6 stainless tubes		
	3 PVC tubes		
	1 eliptio mussel cage		
	1 current meter		

Station 139:

N 4753627.9	E 381544.6	42° 55.5647'N	82° 27.0924' W
Depth	- 5m		
Bottom type	- sandy, gravel		
Location	- 300 m upstream of hydro line crossing, upstream of sheet pile dock.		
Installed	- 6 stainless tubes		
	3 PVC tubes		
	1 eliptio mussel cage		

Station 143:

N 4751230.7 E 380906.7 42° 54.2639'N 82° 27.5305' W
 Depth - 3m
 Bottom type - soft silty sand
 Location - 30 m upstream of Talford creek, downstream of the Shell dock.
 Installed - 6 stainless tubes
 3 PVC tubes
 1 eliptio mussel cage
 1 current meter

Station 100:

N 4750325.9 E 381036.1 42° 53.7765'N 82° 27.4232' W
 Depth - 3.5m
 Bottom type - soft silty sand
 Location - 15 m downstream of boat storage dock and at the upstream end of water intake pump house.
 Installed -6 stainless tubes
 3 PVC tubes
 1 eliptio mussel cage

Station 266:

N 4749419.7 E 381135.5 42° 53.2879'N 82° 27.3399' W
 Depth - 3. 5m
 Bottom type - soft silty sand
 Location - 20 m downstream of ferry dock and 3 m downstream of private boat dock
 Installed - 6 stainless tubes
 3 PVC tubes

Station 148:

N 4747618. E 380619. 42° 52.3098'N 82° 27.6966' W
 Depth - 4 m
 Bottom type - sandy, silt
 Location - treed lot between houses with wooden piles at the waterline
 Installed - 6 stainless tubes
 3 PVC tubes
 1 eliptio mussel cage
 1 current meter

SEDIMENT SAMPLING, LAKE ST. CLAIR AEMRB STUDY 12246, DR. C.H. MARVIN

A lake wide sediment survey was conducted in Lake St. Clair in 2001 under the auspices of the Great Lakes Sediment Assessment Program. A combination of surficial sediment sampling and coring enabled sampling with depth. Samples were analyzed for a variety parameters including particle size, nutrients and contaminants.

The focus of this program is the determination of spatial and temporal trends in sediment contamination throughout the Great Lakes in order to track progress towards elimination of sources, and to identify areas where sediment contamination continues to be problematical.

During the week of May 7 - 10 Technical Operations assisted Dr. C. Marvin on his bottom sediment sampling survey of Lake St. Clair. The survey was to be done using the CCGC SHARK but due to ice conditions, the survey had to be postponed from the original date of April 17, 2001. The CCGL PETREL was utilized to visit the sites and collect the sediment samples. Andre Bachteram representing Dr. J. Ciborowski from the University of Windsor was onboard the CCGL PETREL to collect benthic samples for the joint study with Dr. Marvin.

There was a total of 36 stations visited and samples were collected from 34 of the stations. Sediments at stations 171 and 212 did not contain enough fine grain material for analysis or were the wrong bottom type to conduct the required analysis. Four station locations had to be moved due to bottom type or in the case of stations 230 and 231 lack of water for navigation. Stations 230 and 231 are located at the mouth of the Thames River which has silted in and is strewn with flotsam from the spring run-off.

Following is a list of stations visited and their locations:

LAKE ST. CLAIR
SEDIMENT SAMPLING
2000-2001

STATION NUMBER	LATITUDE	LONGITUDE
153	42 20'00.0"	82 47' 29.7"
156	42 20' 00.3"	82 42' 29.6"
162	42 22' 36.1"	82 27' 30.0"
163	42 25' 00.1"	82 27' 29.3"
167	42 22' 36.1"	82 32' 29.8"
168	42 22' 36.1"	82 37' 29.6"
169	42 25' 00.0"	82 37' 30.4"
171	42 30' 01.6"	82 37' 29.6"
172	42 22' 35.8"	82 42' 30.4"
173	42 25' 00.3"	82 42' 29.0"
179	42 40' 00.2"	82 42 30.2"
180	42 37 29.7"	82 47 29.6"
183	42 30' 00.0"	82 47' 29.8"
185	42 25' 01.8"	82 47' 29.9"
186	42 22' 36.0"	82 52' 31.5"
187	42 22' 36.6"	82 52' 31.2"
188	42 25' 00.1"	82 50' 30.1"
189	42 29' 59.9"	82 51' 36.0"
209	42 22 ' 19.9"	82 29' 59.9"
210	42 30' 06.4"	82 42' 07.2"
212	42 20' 01.2"	82 34'; 59.4"
214	42 27' 30.0"	82 40' 23.8"
215	42 27' 30.0"	82 50' 00.0"
216	42 27' 30.0"	82 44' 59.9"
217	42 32' 29.6"	82 49' 59.5"
218	42 32' 30.4"	82 45' 09.6"
219	42 34' 59.4"	82 44' 55.6"
230	42 20' 15.6"	82 27' 18.1"
231	42 19' 35.9"	82 28' 29.9"
232	42 35' 47.9"	82 44' 30.0"
233	42 31' 09.1"	82 48' 40.1"
234	42 28' 45.6"	82 42' 19.7"
235	42 27' 24.7"	82 37' 29.9"
236	42 25' 50.9"	82 33' 09.6"
237	42 19' 19.8"	82 37' 15.1"
238	42 25' 01.2"	82 50' 06.3"

GROUNDWATER SAMPLING, SHERRIDON, MANITOBA
AEMRB STUDY 12265, DR. C. PTACEK

Technical Operations staff supported Dr. Ptacek at Sherridon, Manitoba in July of this year by assisting in sampling, monitoring, positioning, levelling and installing wells. Also staff installed peepers and water level recorders at the site. A rough hydrographic survey of nearby Camp Lake was completed. Hydrolab profiles, benthos cores and water samples were also taken at numerous stations in the lake. Weather data from April through November of the Flin Flon, Manitoba area was obtained through Environment Canada's weather office in Winnipeg.

This trip was carried out in support of a University of Waterloo/Environment Canada project started in the summer of 2000. Hydrogeological and geochemical studies of the Sherridon, Manitoba tailings impoundment are being conducted in an effort to assist in the development of an effective remediation approach for the site.



Syringing Peepers, Sherridon, Manitoba

Positions and Elevations of Sherridon wells and weirs July 30, 2001

Well,Weir,Lake	Elevation(M)	Easting (relative)	Northing (relative)	Easting (GPS)	Northing (GPS)
S1(1/2"pipe)	316.83	10012.176	9866.044	365731	6111402
S1(PVC)	316.58	10012.176	9866.044	365731	6111402
S2(shallow)	321.105	10031.039	9928.912	365752	6111473
S2(intermediate)	321.133	10031.039	9928.912	365752	6111473
S2(deep)	321.124	10031.039	9928.912	365752	6111473
S2(new)	320.766	10031.039	9928.912	365752	6111473
S3(1.5"PVC, low side)	320.96	10041.263	9975.119	365765	6111562
S4	322.556	10022.82	10040.47	365778	6111562
S14-3(PVC)	318.626	10021.854	9894.139	365740	6111438
S14-13	317.984	10021.854	9894.139	365740	6111438
S14-6	318.441	10021.854	9894.139	365740	6111438
S9	317.117	9927.355	9911.572	365655	6111467
S10	317.783	9899.133	9990.018	365645	6111543
Camp Lake	316.374				
S5(jumbo)	317.797	10384.254	10301.904	366219	6111771
S5-3	317.23	10384.254	10301.904	366219	6111771
S5-4	317.498	10384.254	10301.904	366219	6111771
S5-5	317.379	10384.254	10301.904	366219	6111771
S6-J	318.539	10280.42	10327.514	366219	6111771
S6(bundle)	318.637	10280.42	10327.514	366092	6111815
S7-9	322.619	10173.696	10371.842	366003	6111862
S7-6	322.411	10173.696	10371.842	366003	6111862
S8(lowside)	327.653	10072.749	10403.602	365912	6111919
S11	323.557	9759.288	10576.905	365649	6112156
S12	325.923				
S15-4	320.355	10226.656	10349.381	366049	6166846
S15-8	320.357	10226.656	10349.381	366049	6166846
S15-11.4	320.356	10226.656	10349.381	366049	6166846
S15-15	320.36	10226.656	10349.381	366049	6166846
S16-1	317.696	10419.435	10278.637	366237	6111734
S16-2	317.689	10419.435	10278.637	366237	6111734
S16-3	317.698	10419.435	10278.637	366237	6111734
Wood Lake	316.825				
Trap Lake	319.119				

North Pond	322.265
Camp Lake W/L Staff(1m mark)	317.163
Dam Bench Mark	316.542
Wood Creek Weir Staff(0.5m mark)	316.949
Sherlett Creek Staff (2m mark)	317.663
BM495 - D -2 (Cambrian Hotel)	324.03
BM497 -D (mine shaft)	327.52

Note: all elevations taken from BM497-D with the exception of the Sherlett Creek staff which was taken from BM495-D-2.

All relative positions were done on an assumed magnetic north grid, using a Wild T1000 theodolite and Distomat.

All GPS positions were taken using an Eagle handheld GPS using NAD 27 datum.

ECOSYSTEM REMEDIATION AEMRB STUDY 12266, DR. S.LESAGE
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Technical Operations staff supported the Aquatic Ecosystem Remediation Study at several field sites this year, with one Technician being permanently assigned and with other assistance as required.

Smithville

Research at the Smithville PCB site continued until June of this year with monthly monitoring of Westbay and manual water levels. Isolation packers have been removed, refurbished and re-installed in Boreholes: 54A, 54B, 54C, 54D, 55, 56, 57 and 58. BH57 is to be re-installed next year after the Borehole has been cleared of obstructions by commercial drillers. Personnel from the Ministry of Environment, Ontario Clean Water Agency (MOE/OCWA) have been instructed in the use of Westbay and packer monitoring equipment and have taken over regular monitoring. Occasional support was provided as required (approximately 2.5 days since June). Most of the equipment used on site has been brought back to Burlington with the exception of one laboratory trailer and the Argo (ATV) which are being left on site to assist in packer maintenance and equipment storage for future use.

This is being done as part of a contract with Smithville Phase IV bedrock Remediation project, which along with community partners and the Provincial Ministry of Environment is looking at ways to remediate the site.

Clarkson

The Clarkson Groundwater research site is located on Petro-Canada property called the "Eighty-acres" on Southdown Road in Mississauga. Twenty-eight NQ (approx. 3") wells have been installed over time (approximately ten years) at the site. In January of this year three new boreholes were installed using AEMRB's trailer mounted drill rig. These wells are completed in rock to an approximate depth of sixty feet. Ministry well records for these wells have been submitted. Locations and elevations of these wells have been obtained.

Along with regular maintenance of the site and Laboratory trailer, several tests have been done in preparation for the biobarrier experiment which is expected to be under taken sometime next year. Hydraulic testing has been redone over the zone of interest (approx. 10m) using 11cm spaced packers in most of the wells on site. Two pump tests were conducted using the Grundfos pump packer in Borehole 28, pumping at rates of approx. 400 ml/min from depths of 9.04 m -10.34 m and 12.5 m - 13.8m below casing top. While pumping, other wells were continuously monitored, manually and electronically.

Installation of 110 volt AC power supply to power mixing motors in twelve of the wells is underway, all wiring shall be up to code and inspected. Because of the wet conditions a re-inspection by Hydro-One has required the installation of Ground Fault Interrupter's (GFI's) and boxes on all outlets. Also at the request of the Inspector a test for flammable gasses rising out of the wells was done. Boreholes 03 and 28 were tested with packers inflated and deflated using an Aim model 4501 gas detector, which was borrowed from Lindsay Harrower, EDO, NWRI. No dangerous gasses were found.

Samples were obtained monthly, starting in October from BH's 02, 04, 05, 26, 28 and 30. Also a 20 litre carboy was filled bimonthly from the upper fracture of BH28 for use in the fracture table at CCIW.



Trenching lines between wells, Clarkson

CCIW

A well was installed at the south-east lawn of CCIW to supply water to the groundwater remediation laboratory in Aqua-Ref. A three inch casing was installed to a depth of 50 feet using AER's drill rig and 4.25" hollow stem augers. This well has been logged, pumped and developed with water well records forwarded to the Ministry of the Environment.

Shelving assembly and organization of the AEMRB storage area has been completed.

Consultations have been made with electronic engineers at CCIW and radio station CFRB regarding interference with instruments installed at the Clarkson field site. Common grounding of all electronic equipment seems to have reduced the interference but shielding of cables seems to be the only solution if this continues to be a problem. Relative elevations of wells in the Aqua-ref. tank have been obtained.

The drill rig has been maintained, tarped and winterized.

Instrumentation (Eh probes, thermistors, packers) have been prepared and calibrated, as well as the assembly of mixing motors and brackets for installation at Clarkson. Also assembly of a mixing packer has been completed. Testing of motor and method is now underway in the central stairwell of WTC and seems to be working well. A mixing test of the system was undertaken and thorough mixing was obtained instantaneously.

Task Hazard Analyses (THA's) and Standard Operating Procedures (SOP) are being developed in consultation with the building's Health and Safety advisor for the Clarkson field site.

The Well data spreadsheet has been completed and all new installations will be entered upon completion. Copies of logs of wells in PEI and Chippawa have been forwarded to Greg Bickerton, AER, AEMRB, NWRI and Mike Forbes, EDO, NWRI. This has been in response to requests made by a number of individuals involved in the Federal Contaminated Sites Assessment Initiative (FCSAI).

Chippawa

A trip was made to Chippawa to access wells installed there in January 1993 for Dr. Iqbal Noor, Rivers Research Branch, NWRI. Four remaining wells were found. The area around all the wells has been cleared and protectors painted orange to make future locating easier.

Wainfleet Bog

While at Wainfleet Bog monitoring water levels for Dr. A. Crowe, AEIRB, samples were obtained for Dr. D. Van Stempvoort, AEMRB on February 22, April 30 and June 19 from six drainage ditches in and around the Bog. This was done as part of a continuing Groundwater study of The Wainfleet Bog Conservation Area.

Sample Locations (WGS 84)

WB-01	0639071E	4752271N
WB-02	0639044E	4753063N
WB-03	0639066E	4753155N
WB-07	0636614E	4751116N
WB-08	0636537E	4753393N
WB-09	0639014E	4753759N

**LONG-RANGE TRANSPORT OF AIRBORNE POLLUTANTS,
TURKEY LAKES WATERSHED, AEMRB STUDY 12333, R.G. SEMKIN**

The Turkey Lakes Watershed Study is an ongoing project monitoring the movements and effects of Long Range Transport of Airborne Pollutants (LRTAP) on the sensitive aquatic ecosystems of the watershed. The chemical and hydrological monitoring of the study area was begun 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 used for transport to the study area. In addition, 8 snowmobiles and 4 all-terrain vehicles were supplied and maintained for use as transportation throughout the watershed. All tools, sampling and safety equipment for the study were also supplied. Because of renovations to the camp over the summer and fall seasons the Skidoos were removed from the camp and put into storage and are being returned in December.

A security system on the camp at the work site and a 2-way radio system were operated by TOS staff and maintained by Quattra Communications in Sault Ste. Marie. The security system is being redesigned to accommodate the numerous changes to the camp infrastructure in 2001. All roads and trails in the watershed were maintained with assistance from the Canadian Forestry Service at Sault Ste. Marie.

The Department of Fisheries & Oceans support consisted of six small aluminium boats and one canoe (14 - 16 ft.). One outboard motor and items to make the boats safe and operational were also supplied. TOS supplied 2 electric motors.

Technical Operations staff supported Aquatic Ecosystem Management Research Branch staff in chemical and hydrological monitoring of the watershed. Hydrological monitoring consisted of gauging and sampling eight stream locations throughout the watershed on a weekly basis. The samples were analysed 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 summer. This study is completed once/year and groundwater wells at basin CFS47 were sampled

once/month. Groundwater wells at CFS 47, 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 on site and the generation of a backup disk. The data disk is shipped to CCIW each month and on site data processing is performed. The MET III system also allows MET program changes to be made on site and the MET datalogger can be erased to provide continued use with no interruption of data collection. This system also includes a UVB and UVA sensor with continuous data recorded on the Campbell datalogger, CR23X.

The Batchawana Lake Basin CFS47 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 temperature values year round. The datalogger is solar powered and the storage module is downloaded at the end of each month and the data is sent to CCIW for processing.

Service was provided by TOS to 2 Campbell dataloggers, 3 storage modules and 2 solar power panels.

A snow melt cave constructed at the Batchawana Lake location will 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 basis.

All maintenance and repairs to equipment, buildings and vehicles were performed by Technical Operations staff.

Two portable radio systems for the Turkey Lakes Watershed were used by personnel when working alone. These radios allow calls to be made to Sault Ste. Marie from anywhere in the watershed.

Over the summer, equipment support and accommodations at the camp were provided to various Government and university studies occurring in the watershed.

John Spoelstra, University of Waterloo made two trips to the Turkey Lakes this year, 1 Summer and 1 Fall, and was provided with living quarters for 2 people for a period of 2 weeks on each trip. Two ATV's were also loaned to John to assist in his sampling. This study is being done in co-operation with R. Semkin, AEMRB.

Accommodations for 6 personnel from Queen's University was provided over a 2 week period this summer. This is part of the LIDAR study group completing remote sensing work over the watershed.

A reasonable Spring melt occurred this year (normal) and TOS provided additional support during this intensive sampling period. The beaver dam located at the camp even before its inception in 1979 broke over a 12 foot span during heavy rains this Spring. This caused a major road washout at the camp making access directly to the

camp by vehicle impossible. Just prior to the roadway washing away TOS directed and led a convoy of vehicles from the camp to the opposite side of the washout and onto safe ground. The road was repaired by NRCan staff after the rains ceased and the beaver pond returned to normal flow.

An organics study was ongoing this year in support of Dr. W. J. Strachan, AEPRB and ended this summer with the position of a contractor on staff with AEPRB terminated.

Last year a Joint Turkey Lakes Safety Committee was formed at the request of the Turkey Lakes Steering Committee. The safety board consists of 1 representative each from Environment Canada, Fisheries and Oceans and Natural Resources Canada. The safety committee has implemented a sign-in board at the camp for personnel to use 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 persons work location at the beginning of the work day and removed at the end of the work day. This helps provide instant knowledge of who and where a person is working in the watershed if immediate safety issues requires locating them.

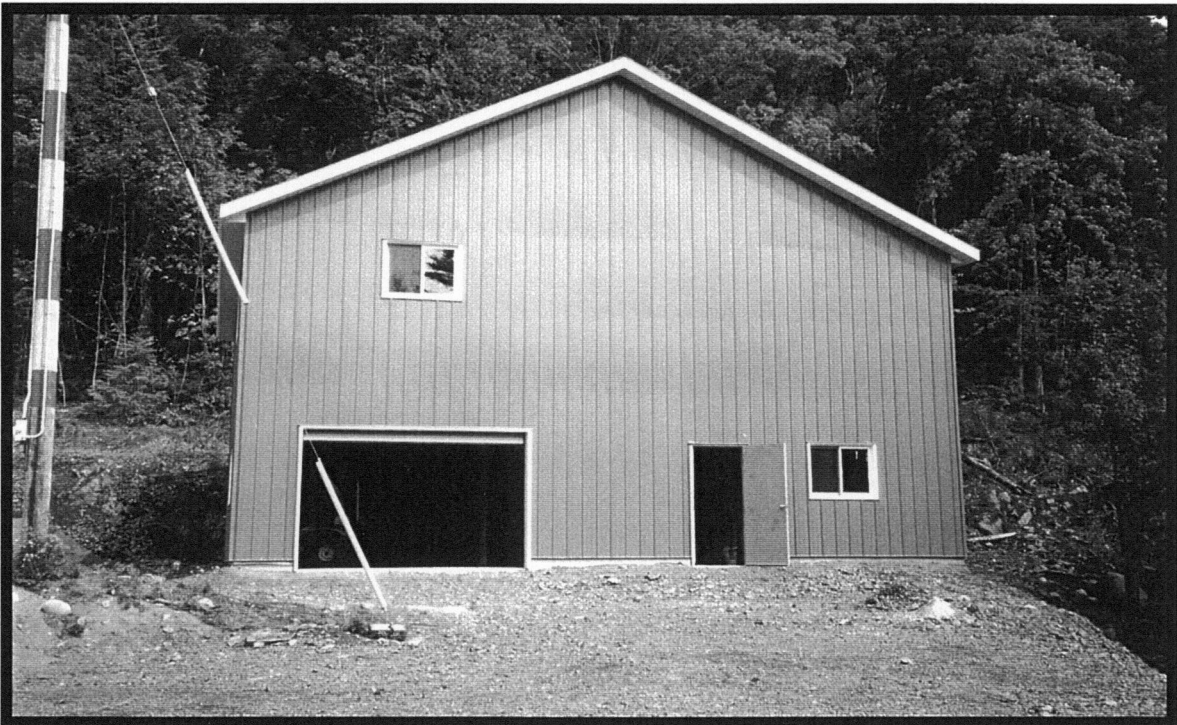
Numerous changes occurred this past year to the infrastructure of the camp. Below is a chronology of the major events and changes.

- the University of Western's laboratory trailer was moved and relocated behind the generator building. This required a bulldozer because the trailer is built on skids.
- one large storage building (small garage) and one small storage building were relocated.
- F&O Atco trailer was written off and removed by EC staff.
- the existing garage and lean-to's were destroyed and removed from the site to a landfill location.
- major excavating of the hillside was completed to make room for new construction.
- a new 2 storey 40X40 foot garage was constructed.
- the Nortod (washroom) trailer and NRCan's accommodation trailer were relocated.
- hydro poles were relocated and new overhead electrical service replaced.
- the new garage was wired for electricity.
- a trench across the camp was dug and water, sewage and propane lines to all trailers were buried.
- a weeping bed system was installed to handle all non toxic waste.
- a new EC lab trailer was delivered and located at the camp.
- a bridge for ATV's and Skidoos was constructed to allow for easy access to the second floor of the garage.
- a 275 foot drilled well was completed this summer and will provide for safe, clean potable water.

All these major changes occurred without disrupting the sampling protocol for the LRTAP study. This was a major undertaking. After all trailers were relocated and levelled, services were then provided to each, i.e. hydro, water, sewage.



Site preparation for the new garage/workshop, Turkey Lakes



The finished garage/workshop, Turkey Lakes

AQUATIC ECOSYSTEM PROTECTION RESEARCH BRANCH

SEDIMENT/WATER SAMPLING SUDBURY AND ROUYN-NORANDA AEPRB STUDY 12213, DR. U. BORGMAN

During the week of May 28 - June 1, 2001, Dr. Uwe Borgman's AEPRB Metals In The Environment (MITE) study at Sudbury and Rouyn-Noranda was supported by TOS staff by sampling water and sediment.

Technical Operations supported this study by collecting sediment and water samples from Raft and Richard Lakes in the Sudbury area and Heva, Dufault and Duprat Lakes in the Rouyn-Noranda area of Quebec. All sampling was carried out from the CCGL PETREL.

At each lake the following sampling was completed: a Hydrolab profile to bottom was conducted to measure temperature, conductivity, pH, and Oxygen; 25 litres of water was collected from 1 meter above the bottom; the top one centimeter of sediment was collected from the mini-box corer using 10 cm core tubes and extruded into glass jars, all sediment and water was stored at 4C until return to CCIW. As well two 25 cm cores were collected from Lac Dufault, to be sub-divided at CCIW later this year. While sampling Raft Lake and Lac Dufault additional Hydrolab profiles were completed at additional locations in the lake to determine spatial variation in water chemistry across the lake.

Sediment samples using a mini-PONAR were collected from Richard Lake for a joint study with the University of Waterloo. The samples were sieved and the residue stored in plastic containers. The remaining lakes visited had sediment samples collected by sub-sampling the mini-box corer. Additional subsurface sediment was collected and stored in plastic bags. Two 50 ml water samples were collected from 1 meter above the bottom. All water, sediment and residue samples were stored at 4°C until return to CCIW.

The sampling locations are as follows:

LAKE	STATION	DEPTH(M)	LATITUDE	LONGITUDE
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Sudbury Lakes

Richard Lake	RicD	9.5	46° 26' 18.26"	80° 54' 57.29"
Raft Lake	RafD	15.1	46° 24' 23.53"	80° 57' 10.87"
Raft Lake	Raf10	10.1	46° 24' 45.64"	80° 56' 13.51"

Rouyn/Noranda Lakes

Lac Heva	HE01	7.5	48° 11' 11.66"	78° 19' 32.59"
Lac Dufault	DF01	15.9	48° 17' 59.97"	78° 59' 26.31"
Lac Dufault	DF02	11.4	48° 17' 53.71"	78° 59' 27.34"
Lac Dufault	DF03	9.9	48° 18' 12.78"	78° 58' 50.42"
Lac Duprat	DP01	6.9	48° 20' 18.80"	79° 07' 23.09"

All positioning was done utilizing the Magnavox 300 in WGS 84 differential mode.



Launching the CCGL Petrel, Lake Dufault, Quebec

PERSISTENT ORGANIC POLLUTANTS, NORTHERN MANITOBA AEPRB STUDY 12215, DR. V. CHEAM

During the weeks of July 9 and 16 Dr. V. Cheam's study of Persistent Organic Pollutants (POPs) funded by NEI was supported. TOS staff travelled via float plane to remote lakes and collected soil, water and sediment samples.

Soil samples were collected from an undisturbed site on shore at approximately the same latitude as the lakes to be sampled near Gillam. The samples were collected for Lead 210 dating, comparing soil versus lake sediments. All positions were taken utilizing a Trimble hand-held GPS system in WGS 84.

The soil samples were collected on July 15 from an old clearing that had been used as a weather station site in Clearwater Lake Provincial Park, 20 km north of The Pas, Manitoba. The position was 53° 58.120' N and 101° 10.049' W. To collect the soil samples, the overburden such as grass and leaves was removed. A hole was then dug to expose a vertical wall from which horizontal slices of the soil were collected and stored in plastic bags. Each soil sample was one centimeter thick.

After collecting the soil samples the field party traveled to Gillam, which is 300 km east of Thompson, Manitoba.

On July 17, access to the remote lakes was by a 185 Cessna on floats owned by Gillam Air. The lakes visited and sampled were Mista and Merrick Lake. At each lake water samples were collected for Phosphate (filtered and unfiltered), Nitrogen (filtered and unfiltered), major ions, nutrients, Seston, chlorophyll a, POPs, Metals and Haloacetic Acids.

Two sediment cores were collected at each lake and subdivided in 1 cm sections on return to the floatplane base.

The sediments at both Mista and Merrick Lake were modern organic material that became progressively firmer towards the bottom of the cores, although the sediments in Merrick Lake were much stiffer than Mista Lake. Most lakes in the north east area of Manitoba are shallow due to the geology of that region and these lakes were no exception. The sampling site at Mista was 3.0 metres deep and Merrick Lake was 2.5 metres deep. To ensure that the lake bed was relatively level, several locations were measured for water depth and for sediment type prior to the actual sampling.

The sampling site at Mista Lake was at 56° 31.06'N and 92° 30.157'W and Merrick Lake was sampled at 56° 32.36'N and 93° 34.53'W .

All water and sediment samples were kept at 4°C with the exception of the large 20 liter stainless steel organics cans. All filtered samples such as chlorophyll a were stored at 4°C and or kept dry in sealed coolers until returned to the scientist at CCIW.

Samples were also collected at the two lake (Mista and Merrick) sites in support of Dr. B. Scott's, AEPRB 12334, Haloacetic Acids study.

ABANDONED COAL MINE STUDY, NEW WATERFORD, NOVA SCOTIA
AEPRB STUDY 12216, H. WONG

For many years, the area around Sydney and New Waterford, N.S. has been used for coal mining and the supporting industries. In most cases, as the mines shut down, the residue from this industry has been left behind. Three streams, which pass through; 1) an abandoned coal mine, 2) an abandoned coal mine tailings deposit and 3) a coal washing plant were sampled. Analysis will look for toxic metals in all sample fractions of the water as well as the toxicity levels in the underlying sediments.

Results should help to answer the following questions:

- What are the differences between reference and impacted stations with regards to sediment and water quality and toxicity?
- Are those differences consistent with what would be expected from a mining site?
- What are the impacts of the reclamation activities on the receiving water stations? Is further reclamation required?

Results will also serve as a baseline for further studies in the area.

In August, Technical Operations staff traveled to New Waterford, Nova Scotia to centrifuge water from the 3 streams and collect samples from the centrifuge bowls for later analyses. In addition, sediment samples were collected and Hydrolab readings were taken at each site.

A total of 3 streams were sampled in 3 different locations: upstream, downstream and a point in between (mid). Following is a record of the volumes sampled:

Northwest Brook upstream	1722 litres	Aug. 15
Northwest Brook mid	1794 litres	Aug. 16
Northwest Brook downstream	1500 litres	Aug. 18
Veres Brook upstream	508 litres	Aug. 16
Veres Brook mid	700 litres	Aug. 15
Veres Brook downstream	1000 litres	Aug. 19
Irish Brook upstream	2050 litres	Aug. 17
Irish Brook mid	700 litres	Aug. 18
Irish Brook downstream	700 litres	Aug. 19

SOURCES OF OLD AND NEW PESTICIDES IN BIG CREEK
AEPRB STUDY 12310, DR. D. MUIR

Under the auspices of the Toxic Substances Research Initiative project #11, the Big Creek watershed has been identified as a representative site to examine the persistence of "old organochlorine (OC) pesticides". This is due primarily to the heavy use of DDT in the past (1950-60's) on the tobacco fields. The objectives of the study are to investigate retention of historic (OC) pesticides and to monitor current use (OC) insecticides by examining concentrations in stream water and air samples. Sampling occurred approximately 5 km upstream of the mouth of Big Creek and downstream of all major tributaries.

This sampling is a continuation of last year's March to October sampling program. In 2001, Big Creek was sampled eleven times between February and July. The standard sampling protocol was followed including the following:

- * Suspended solids from 1000L of creek water centrifuged at 6l/min.
- * litres of filtered creek water for dissolved phase XAD-2 extraction.
- * current water quality data acquired from a hydrolab cast.

A hi-vol. air sampler (PUFF Sampler) was also installed at a field station located on the Long Point Conservation Authority property. Wet only precipitation sampling was also collected at this site between the aforementioned dates in order to capture additional data from spring run-off events.

BIG TROUT LAKE, ONTARIO
AEPRB STUDY 122311, DR. D. MUIR

Technical Operations staff supported Dr. D. Muir's PCB investigation for Health Canada and the Kitchenuhmaykoosib Innuinuwug Band Council in Big Trout Lake, Ontario during the week of July 9, 2001. On arriving at Big Trout Lake, Chief Donny Morris, Environmental Director, Joey McKay, Program Manager, Ananias Anderson and other members of the band council were met to discuss sediment sampling at 4 possible sampling sites on the lake. Bill Morris of Big Trout Lake was the guide assigned to assist us for the entire project. His knowledge of the lake proved very helpful.

The sites selected for coring were:

Site 1: a bay east of the townsite, Site 2: a deep area about 2 km south of the community, Site 3: a deep basin near Ernie Island and Site 4: a background site in a deep zone west of Big Island.

Sampling began at Site 1 on the evening of July 9, with the collection of water samples for basic water chemistry. Prior to sampling, depth soundings were done by lead line to locate the deepest area in the bay. Windy conditions prevented collection of cores at that time. Cores from Site 1 were collected early on the morning of July 10. A 5 kg weight was added to the corer to ensure penetration in the sediments. A description of the cores is listed an attached table provided by Dr. Muir.

Cores and water samples were also collected from Site 2, on the morning of July 10. Site 3 was occupied on July 10, but after spending considerable time locating the deep area (35 M) coring was attempted. The corer was deployed several times in hopes of collecting a core. It was observed on every attempt that the bottom sediments were not modern sediments but pre-glacial clays. It was decided to abandon the site as the sediments would be of no use in the investigation and weather conditions dictated that we return to the community.

During the evening of July 10, two cores and water samples were collected from Site 4, a deep area west of Big Island.

All positioning was done utilizing an Eagle hand-held GPS in the WGS 84 mode. All cores were subsectioned at 1 cm intervals.

Following is a description of the cores and their locations:

Site	Core	Depth	Latitude	Longitude	Description (m)
1	1A and B	7.0M	53° 48.45'N	89° 51.24'W	Brown silty sediments. Low porosity sediments in top 0-2 cm.
2	2A and B	33.0M	53°46.769'N	89° 53.47'W	Brown silty sediments. Low porosity sediments in top 0-2 cm
3	No cores	35.0M	53°46.185'N	89° 49.07'W	Hard Gray, clay bottom over wide area of deep zone.
4	3A and B	20.0M	53°45.58'N	90° 03.68'W	Brown silty sediments. Low porosity sediments in top 0-2 cm.

ATMOSPHERIC CONTAMINANT DEPOSITION, QUEBEC/NEW YORK STATE AEPRB STUDY 12311, DR.D. MUIR
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On August 7-10 Technical Operations staff were involved in sampling in the Laurentien and Adirondac mountains. The purpose of the sampling was to collect sediment cores and water samples in three lakes which form part of a north-south transect (from Ellesmere Island to New York state). Cores will be analyzed for PCBs and other

persistent contaminants which are the result of atmospheric deposition. The goal is to examine geographical trends in this deposition. This trip was a continuation of an ongoing study of the area.

The water samples are to be analyzed for TP (f/uf), TN (f/uf), Metals, Major Ions, Chla-W, CHN and TSS.

Lac Cromwell: From the deep hole (marked with a floating jug) two 20 litre Pepsi cans were filled with surface water as well as two 1 litre HAA sample bottles for Brian Scott, AEPRB. Water from 2m (using a van dorn) was stored in plastic containers to be filtered later. Two sediment cores (using the TOS Corer) were also taken from the deep hole. The cores were then extruded onshore. Both cores were extruded in one centimeter slices with the first core being stored in plastic bags and the second in glass jars. This was done to determine if contaminants are being transferred via sample containers.

Connery Pond: Located at the base of Whiteface Mountain (NY state). After several soundings with a lead line the deep hole was located. The water sampling procedure was repeated but only one sediment core was taken. This core was extruded onshore and stored in plastic bags.

Moose Pond: Using the echo sounder the deep hole was identified. Water sampling continued as previously mentioned. Six attempts to obtain a sediment core were tried without success. A new location was chosen and three more attempts were made. A third site was attempted with similar results. Due to the depth and soft sediments the TOS corer was ineffective. A lightweight corer would be the recommended device for this lake.

Positions for sampling were taken with a hand held GPS using Datum WGS84.

STATION	LATITUDE N.	LONGITUDE W.
Lac Cromwell (deep hole)	45° 59' 21"	74° 00' 00"
Connery Pond (deep hole)	44° 18' 47"	73° 55' 49"
Moose Pond (deep hole)	44° 22' 20"	74° 03' 43"
Moose Pond (site #2)	44° 22' 14"	74° 03' 51"
Moose Pond (site #3)	44° 22' 28"	74° 03' 41"

LAKE ERIE TRIBUTARY SAMPLING
AEPRB STUDY 12335, DR.B. SCOTT

Researchers continue to monitor and evaluate the effects of POPs on Great Lakes waters. Samples were collected to determine if changes had occurred in haloacetic acid profiles compared to previous years. Also the perfluoroalkanoic acid profiles, determined from the same samples, were compared to results of similar profiles from Lake Ontario and the inputs from streams flowing into Lake Erie from the Canadian shore.

On two occasions, (April 23 and 24, September 4 and 5) water samples were collected from various Lake Erie tributaries. Eleven different sites along the north shore were selected. Sampling was started at the East end of Lake Erie and continued west. At all sites four, one litre plastic bottles were filled with creek water using a Van dorn bottle. Samples were stored in a large cooler on ice and returned to CCIW.

The creeks selected for the study were:

1. Grand River,
2. Stoney Creek
3. Sandusk Creek
4. Big Creek
5. Big Otter Creek
6. Catfish Creek
7. Talbot Creek
8. Sixteen Mile Creek
9. Flat Creek
10. East Two Creek
11. Dolson Creek

ATMOSPHERIC CONTAMINATION STUDY LAKE ONTARIO
AEPRB STUDY 12337, DR. W.M.J. STRACHAN

Technical Operations staff provided logistical and technical support to AEPRB in co-operation with the Centre for Atmospheric Research Experiments based in Egbert, Ontario. The 12 metre buoy was located 22 km southwest of Toronto. Data was collected from a variety of experiments, including PUF air samplers, precipitation samplers, NOX gas analyzer, ozone gas analyzer and a mercury analyzer.

Researchers are examining the flux of toxic chemicals (organochlorines and PCBs) across the air/water boundary. Data sets are being collected, from a site on the Niagara escarpment in Waterdown, the Lake Ontario 12-meter buoy and Point Petri in Prince Edward County.

The CCGC SHARK, the CCGL WAGTAIL and the CCGL WOODCOCK were utilized to transport equipment and personnel to the buoy from Burlington as well as the outer harbour marina in Toronto.

A total of 18 trips were made this year. The buoy was brought in to CCIW on November 15 for repairs and maintenance and re-installed back in the lake on December 10.

REFINERY EFFLUENT ENDOCRINE EFFECTS, SARNIA, ONTARIO AEPRB STUDY 12340, DR. J. SHERRY
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Technical Operations staff provided support for a fish exposure experiment in the Sarnia area, led by Dr. J. Sherry and Ms. T. Trepanier. This study attempts to determine the estrogenicity (Vitellogenin induction, estrogen receptor binding) of the effluents from the Shell refinery in Sarnia and the Nova Chemicals refineries at Corunna and Mooretown. The study will compare the results with those from water taken from the St. Clair River upstream at the Purdy Fisheries Dock in Pt. Edward, Ontario.

The caged fish exposure in the river was accomplished as follows: The cages consisted of 106 litre Rubbermaid plastic bins perforated with 5/8 inch holes to allow water exchange. Two cages containing 15 fish each were moored by T frames just off the bottom at each site. These were installed by Pollutech divers. At the Shell site, two cages were suspended from a bridge which spans Talford Creek. This is the refinery outfall. A Hydrolab Datasonde was also suspended in the creek during the exposure period. The exposure of the caged fish was 21 days. After the first 14 days, one cage was retrieved from each site and the fish were injected with the β - estradiol hormone in peanut oil and returned to the river for the duration of the exposure period. Problems were encountered at the Shell and Nova-Corunna (MISA) site. All fish at these sites died and decomposed in a short time. They were replaced a second time with the same results. The effluent temperature at each site was 24° C.

Initially, the fish were tagged electronically and a sample of blood was taken. Shortly after this procedure, it was observed that the health of the fish was declining. A bacterial infection at the hatchery was suspected. A second batch of fish from the same farm produced similar results.

In 1999, the first phase, bioassays were completed using fish in aquaria at the Pollutech facilities in Pt. Edward. This second phase of the project has now been delayed until 2002 due to the infection problem.

ENDOCRINE DISTRUPTION AND REPRODUCTIVE IMPAIRMENT, NORTHERN RIVERS BASIN STUDY, GRAND PRAIRIE, ALBERTA
AEPRB STUDY 12321, DR. M. McMASTER

Over the past decade researchers have attempted to evaluate and design techniques capable of detecting subtle, sublethal responses to a variety of anthropogenic stressors. Specific reproductive studies carried out on pulp and paper mill effluents across Canada have highlighted reproductive impairment in resident fish populations.

Confronted with this data, the governments of Canada, Alberta and the Northwest Territories recommended that these issues be studied in greater detail.

It is hoped that data from the current study, Northern Rivers Basin Study (NRBS), will address potential chronic reproductive impacts and specifically endocrine disruption in fish exposed to pulp and paper effluent.

Technical Operations supported fieldwork over two weeks on the Wapiti River, Alberta. The study had two components; Fish Caging Experiments and Monitoring Of Resident Fish.

FISH CAGING EXPERIMENTS: Fieldcrews attempted to catch "clean" male Longnose Suckers (*Catostomus catostomus*) and expose them over 4 days to 50% effluent and 50% control water. To investigate bioavailable bioactive compounds, hepatic (liver) tissue is extracted and fractionated according to octanol-water coefficient (K_{ow}) using reverse phase HPLC. Various fractions are then tested for their ability to compete with sex steroids.

Transportation of field gear and a 17 Ft. Zodiac Jetboat to Grand Prairie Alberta was carried out between August 31 - September 5. On September 6th a field crew travelled to Joussard and met with Kevin Bell, a commercial fisherman, on Lesser Slave Lake. Two days were dedicated to acquiring Longnose suckers, with little success. It was decided to shift focus to Faucett Lake, two hours east of Joussard, in an attempt to net sufficient numbers of Common White Suckers (*Catostomus commersoni*) for the bioassay.

Efforts were rewarded and fish were transported to and held overnight in holding cages in Lesser Slave Lake. The following morning fish were transported to the municipal water pumping and treatment facility for the city of Grand Prairie. Since clean water and Mill Effluent were already being delivered here to an Environmental Effects Monitoring (EEM) site, it made sense to use this facility for the 4 day bioassay. The assay was set up and exposures initiated on September 10th. Unfortunately excess mortality occurred prior to the 96 hour completion of the bioassay. On September 13th, after acquiring Longnose Suckers, a second 4 day exposure was initiated in the same tanks. These fish had been electroshocked from the Pipestone (upstream) site of the Wapiti River. Fish were again lost before the 96 hour exposure was finished. Initial speculation targeted effluent toxicity as responsible for bioassay mortality. However, fish were lost

from both treated and control tanks, leading Dr. McMaster to contend that low flows were responsible.

On September 16th the assay was torn down and packed up. Parallel to the bioassays and as it turned out, as a backup, SPMDs (semi permeable membrane device) were deployed in the Weyerhaeuser "foam lagoon" (last stop for effluent prior to entering the Wapiti River), and under the bridge at "McGoo's Landing". The SPMDs were deployed on September 11th and retrieved on September 17th.

MONITORING OF RESIDENT FISH : Whereas the 4 day bioassay examined rapid uptake of bioactive compounds or their precursors, "monitoring of resident fish" focused on longer term exposure of non-migratory fish species inhabiting zones of effluent exposure as well as an upstream (control) site.

Sampling of a large fish species, Longnose Sucker, was carried out by Alberta Environment using an electrofishing boat. The small fish species, longnose Dace (*Rhinichthys cataractae*) were collected by NWRI personnel using Smith Root backpack shockers.

Three sites were sampled:

- 1) Tressle bridge, downstream of the mill outfall
- 2) McGoo's Landing, just upstream of the cities water intake/pumphouse
- 3) Pipestone, upstream (approximately 20 Km)

The sampling protocol called for the collection of twenty fish of each sex and species. The length, weight, age, gonad weight, liver weight and any abnormalities were recorded for all fish sampled.

Sampling, analyses and assays were carried out in the field, a provincial laboratory site and back at CCIW for the following:

Longnose Sucker:

Blood steroids	Blood gonadotropin
In vitro steroids	Pituitary gonadotropin
Liver MFO	Sex steroid binding proteins
gonadal histology	Gonadal apoptosis
Vitellogenin levels	Hepatic estrogen receptors
Hepatic oxidative stress	Gonadal androgen receptors
Gonadal oxidative stress	Fecundity

Longnose Dace:

In vitro steroids	Gonadal apoptosis
Liver MFO	Hepatic estrogen receptors
Gonadal histology	Gonadal androgen receptors

With the exception of three rough days on Lesser Slave and Faucett Lakes, the weather and overall conditions on the Wapiti River were exceptional.

Excellent support was received from the Alberta Environment electrofishing crew, as well as Guy Wilson, Site Environmental Leader, Weyerhaeuser Canada, Grande Prairie, Alberta.

All three field sites were accessible by a 4WD crewcab.



Pipestone site, Wapiti River, Northern Alberta

BIOASSAY STAND INSTALLATION, SAULT COLLEGE, SAULT STE MARIE AEPRB STUDY 12345, DR.J. PARROTT

Technical Operations Services supported this study by the construction and installation of a bioassay stand with a toxicant diluting system in the Water Resources Laboratory at Sault College in Sault Ste. Marie, Ontario.

Funding for this project was provided by the Upper Lakes Environmental Research Network (ULERN), a non-profit organization of researchers, resource managers and educators promoting environmental research in Northern Ontario. Support began in November, 2000 and involved the construction from scratch of a new bioassay stand destined for Sault College as well as another unit which was in a nearly finished state in the Wet Lab in Burlington.

Work orders were placed early with Engineering Services, RSB for the large aluminum water bath, the glass diluter chambers, aquarium support racks and several other plexiglass pieces such as aquarium separators and covers. The stand was rigged as a portable unit so that it could be plugged into a GFCI protected receptacle at the college. This required that the stand be partially assembled in Burlington in order to make the electrical supply system as well as the heaters and circulating pumps operational prior to inspection and approval by Ontario Hydro. Floor space and logistical support during the construction phase was provided by Mr. W. Warrender (Head, Hydraulics Laboratory Operations, RSB). The electrical components were acquired by Mr. E.G. Smith (Instrumentation Services, RSB). Mr. Smith completed all of the electrical rigging and saw the system through the approval process by Ontario Hydro in Burlington. Technical Operations personnel sourced and purchased all other supplies needed to complete the project.

The stand was disassembled and loaded into the 3-ton truck for transport. On February 19th the field party consisting of Messrs. Kraft and Smith traveled to the Sault and met the Maintenance Foreman (Mr. D. Rosso) at the Water Resources Laboratory the next morning. The next two days were spent reassembling the stand. Mr. Smith did the final electrical hookup and tested the heaters and pumps. He spent the next two days working in the Turkey Lakes Watershed and then traveled home, arriving in Burlington on February 24th. Mr. Kraft completed the project on February 24th and traveled home the next day. One additional field trip is planned by AEPRB personnel in mid March to calibrate the diluter system and move fish to the college.

The bioassay stand will initially be used at ULERN's "Celebration of Science" event on March 28th to demonstrate the mechanics of a bioassay facility as part of an exhibit pointing out the harmful effects on fish of estrogens in sewage. Experiments are planned which would expose Fathead Minnows to the final effluent of the experimental sewage treatment plant in the Water Resources Laboratory. The sewage treatment plant is not in operation full time but is run during the presentation of some wastewater courses at the college from time to time. These bioassays will identify any endocrine

effects induced by sewage pumped from the adjacent neighboring residential area which has a typical blended demographic mix.

WATER SAMPLING MIRAMICHI RIVER, NEW BRUNSWICK AEPRB STUDY 12461, D. BENNIE
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Salmon represent an important traditional and economic resource that forms the basis of multimillion dollar recreational, commercial and aboriginal fisheries in Canada. Previous work has demonstrated that exposure of salmon to exogenous estrogenic and/or androgenic substances during parr-smolt transformation compromises subsequent sea water adaptability and survival. The present project will verify whether parr-smolt transformation is sensitive to the low levels of estrogenic and/or androgenic substances that are currently discharged into rivers supporting sea-run salmon stocks. This is a joint project between Environment Canada scientists from the National Water Research Institute (NWRI), and Department of Fisheries and Oceans (DFO).

Technical Operations supported this study for a two week period in May and June, 2001. Field work consisted of a refrigerated ISCO sampler installed at the UPM Kymmene (formerly Repap) P&P mill final effluent pond. The sampler was set-up to take a 24 hour composite sample totaling 5 litres. The CCGL PELICAN was utilized to conduct the river survey. Thirteen sampling sites were pre-selected on the Northwest and Southwest Miramichi and the main Miramichi River as far downstream as Middle Island. At all stations approximately 8 litres of water was collected from 1-2 meters and chemical parameters including pH, cond., turbidity, salinity, and dissolved Oxygen were taken. Sample water was later pressure filtered with nitrogen through GFC's and split into multiple samples and preserved with either formaldehyde or sulphuric acid.

Following is a description of the thirteen sampling locations:

1. Northwest Miramichi upstream of Cassilus
2. Northwest Miramichi at Cassilus cage site
3. Northwest Miramichi downstream of Cassilus or lagoon
4. Northwest Miramichi upstream of Repap on North bank
5. Northwest Miramichi downstream of Repap near effluent discharge
6. Northwest Miramichi upstream of Northside STP
7. Southwest Miramichi at Nelson Junction
8. Miramichi downstream of Northside STP discharge, west bank
9. Miramichi downstream of Northside STP at Old Ferry Dock Road, east bank
10. Miramichi mid-stream at Douglastown bridge
11. Miramichi mid-stream at Middle Island
12. Repap pulp mill final effluent
13. Northside STP final effluent

PEEPER SAMPLING, COOTES PARADISE
AEPRB STUDY 12464, T. MAYER

On July 25, T. Mayer's AEPRB study in Cootes Paradise was supported by the installation of peepers at three locations in the watershed for a two week period. The locations where the peepers were installed were: adjacent to the McMaster University wild rice cages; Princess Point (near the Royal Botanical Garden (RBG) boathouse located in the north-eastern corner of Cootes Paradise) and near the cage at West Pond.

Eric Cleveland from the RBG assisted in the deployment of the peepers and acted as guide. A RBG boat was utilized to transport staff and equipment to the three sampling sites.

At the boathouse cage location a Hydrolab datasonde was installed for a 2 week period as well as three additional prototype peepers for intercomparisons with the standard peepers utilized by NWRl.

On August 8 the cage sites at Princess Point and the boathouse were visited and all peepers were retrieved and subsampled to preserve the waters in the peeper reservoirs. The Hydrolab datasonde was retrieved, and returned to Engineering Services, RSB for downloading. It was observed on retrieval that the datasonde was completely fouled with sediment that had fallen out of suspension in the water column. The small quantity of algal growth on the sonde would have had minimal effects considering the sediment fouling. Due to time and weather conditions the site at West Pond was postponed until August 10.

On August 10 the peepers at West Pond were retrieved as well as a single 10 cm diameter core which was subsequently subsectioned at CCIW. Cores were also collected from the Princess Point and the Boathouse sites in early September.

FISH COLLECTION HAMILTON HARBOUR
AEPRB STUDY 12495, DR. J. SHERRY

Technical Operations supported this study with one technician and various boats from November 30 until December 21.

This study is looking at the fish populations in Hamilton Harbour and examining the effects of endocrine disruptors on reproductive success. The Harbour is an area of concern on the Great Lakes. Jordan Harbour, near St. Catharines, was used as a

control site with low levels of the damaging compounds. Brown Bullhead and White Bass were used as both species were in relative abundance at both sites.

The collection of fish in Hamilton Harbour and Jordan Harbour was accomplished by setting trap nets along the shore and leaving these in place for two or three day periods. When collected, the desired species of fish had blood and tissue samples removed immediately and the fish were then returned to CCIW for dissection.

Sufficient numbers of White Bass could not be caught in Hamilton Harbor so a small trawl net was used to catch the fish needed, which had moved into deeper water.

WATER SEDIMENT SAMPLING, GOOSE BAY, LABRADOR AEPRB STUDY 12311, DR. D. MUIR
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From April 27 to May 4 Technical Operations supported several studies from Dr. Muir's project which included a sampling trip to Labrador. Water and or sediment samples were collected from Shipiskan Lake 110 miles northwest, Minipi Lake and Dominion Lake 60 miles south west of Goose Bay. Cores were collected at Shipiskan and Minipi Lakes and subdivided into one centimeter sections. All sections were stored at 4.0 C or frozen until return to CCIW.

There were three cores collected from Minipi Lake and two cores from Shipiskan Lake. Cores at Shipiskan Lake were collected from 80 meters of water in the central area of the lake. Initially coring had been attempted from the deeper area of the lake; measured at over 200 meters. While sampling at Shipiskan Lake several representatives from the Innu Nation were present to observe the methodologies for sampling of sediment and water. Minipi Lake was sampled at the eastern basin in 24 meters of water.

The positions where the sediment samples were collected were as follows:

Lake	Latitude	Longitude	Depth (M)
Shipiskan	54° 39' 25.8"	62° 20' 43	80
Minipi	52° 21' 58.5"	60° 42' 57.1	24

The sediments in Shipiskan were organic in nature and filled the total length of the 20 cm core tubes. At the 20 cm sediment depth there seemed to be a sediment horizon with a more clayish layer below. This layer caused several cores to separate. These

cores were discarded on site. The modern sediments (the top one cm) had a brownish hue. The remainder of the core was organic in nature with a dark brown colour.

The sediments in Minipi Lake were very different from Shipiskan Lake and the cores collected were approximately 12 cm long. The interface was undisturbed and very well defined. The top 8 cm appeared very rich in iron with a bright reddish colour. Sediments below 8 cm were glacial clays with very distinct iron rich varves throughout.

At the request of Dr. Cheam one of the cores from Minipi was frozen immediately upon sectioning. All cores were subsectioned into 1cm intervals as requested by Dr. Muir.

Additional water samples were collected from all of the above mentioned lakes in support of Dr. B. Scott's, AEPRB Haloacetic study. All positioning was done by Universal Helicopters Newfoundland and Labrador, using a Trimble GPS in WGS 84 differential mode.



TOS coring through the ice, Minipi Lake, Labrador

POLYBROMINATED BIPHENYL ETHERS AROUND LAKE ONTARIO
AEPRB STUDY 13316, DR. M. ALAEE

Technical Operations supported this study of Dr. Alaee during the 2001 field season. The large multi-faceted study, which includes DFO and the EPA, is looking for possible sources of Polybrominated biphenyl ethers (PBBE) entering Lake Ontario. These compounds are used in the production of flame retardant chemicals, and have been found to be increasing dramatically in the fish populations in Lake Ontario.

The focus of this part of a large multi-agency study was the contribution of surface input to Lake Ontario. To collect the necessary data six major rivers: Don River, Trent River, Black River, Oswego River, Genesee River, the Welland Canal and twelve Sewage Treatment Plants: Hamilton, Burlington, Humber Bay, Ashbriges Bay, Oshawa, Trenton, Belleville, Watertown NY, Oswego NY, Rochester NY, and two plants in St. Catharines were sampled. All sites were visited in May, again in August and finally in November to determine if there was a large seasonal variance.

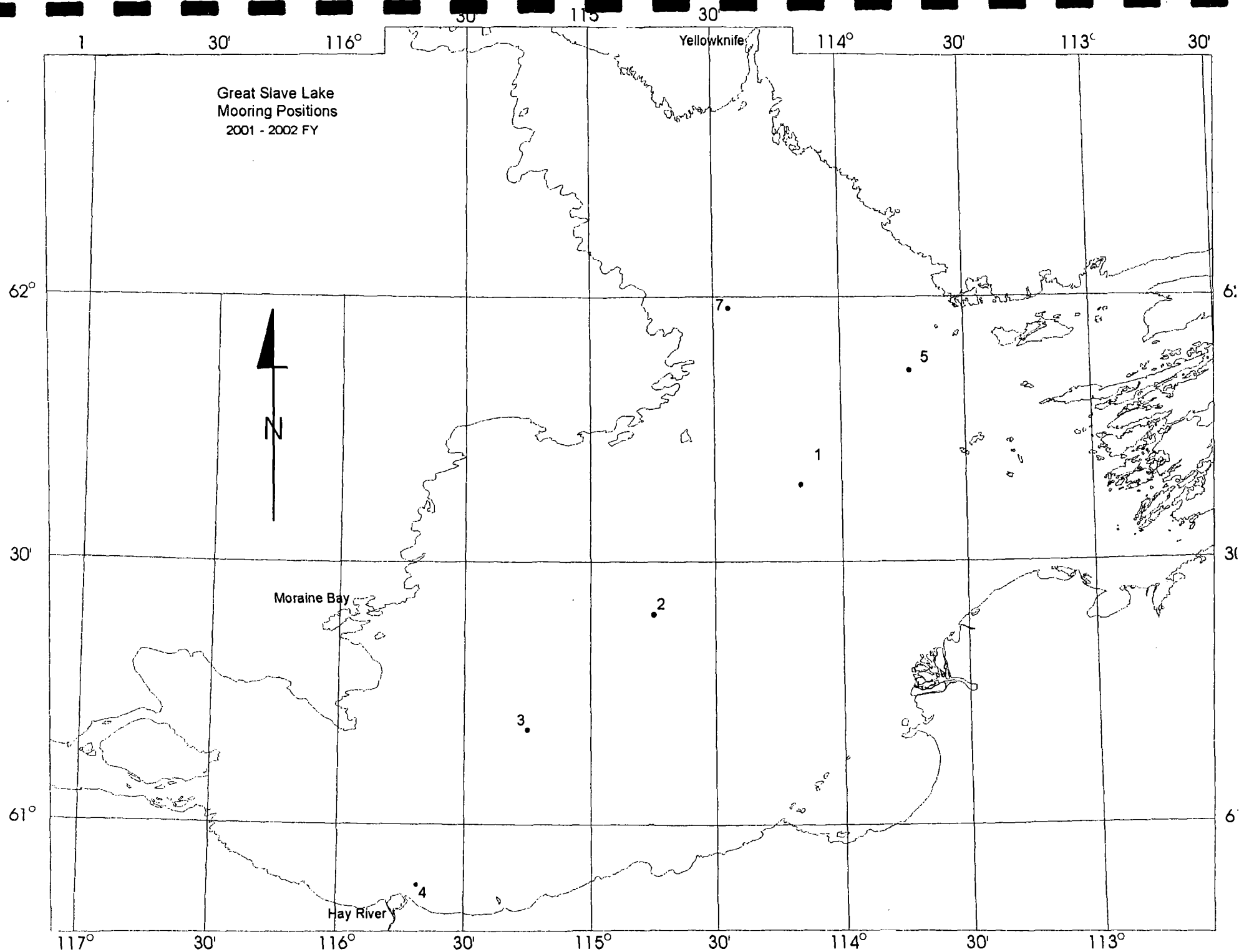
Sampling at the sites consisted of running two centrifuges for at least six hours at six litres per minute, at each river site to collect enough solid particulate for useful analysis. At the Sewage Treatment Plants, which contained more solids, the sample time could be reduced to two hours each. At the same time, at all sites, 200 litres of centrifuged water was passed through two resin columns (100 each) at 0.25 litres per minute to extract organics from the samples.

AQUATIC ECOSYSTEM IMPACTS RESEARCH BRANCH**METEOROLOGICAL AND TEMPERATURE MOORINGS, GREAT SLAVE LAKE
AEIRB STUDY 14145, W.M. SCHERTZER**

The purpose of this study was to deploy meteorological and temperature moorings to give detailed vertical temperature measurements on Great Slave Lake, NWT. To accomplish this, two meteorological buoys were installed at stations 1 and 2 during the June 6 - 26 cruise and retrieved by the CCGS ECAKLOO September 19 and 20. Temperature moorings were installed during the same time period at stations 1, 2, 3, 4, 5 and 7. The temperature moorings were retrieved between September 5 - 11, utilizing CCGC 775. A shore-based station was also set up at Hay River in the NTCL storage area. This was dismantled September 12 and reinstalled at the Coast Guard compound at the Hay River Airport for the winter.

GREAT SLAVE LAKE
MOORING POSITIONS

STATION NO.	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH
1	2001-51T-01A	61° 39' 30"	114° 09' 36"	T (2,5,7.5,10, 13.5,15,20, 25,30,40,50, 75,100 m)
	2001-51T-01B	61° 39' 12"	114° 09' 03"	T (12,14,16, 20,30,50,75, 100 m)
	2001-51M-02A	61° 39' 02"	114° 09' 06"	MET
2	2001-51M-03A	61° 26' 12"	114° 46' 18"	MET
	2001-51T-04A	61° 26' 54"	114° 47' 00"	T (2,5,7.5,10, 13.5,15,20, 25,30,40,50, 56 m)
3	2001-51T-05A	61° 09' 56"	114° 14' 22"	T (2,5,7.5,10, 13.5,15,20, 25,30,40, 56 m)
	2001-51T-05B	61° 10' 16"	115° 14' 00"	T (12,14,16, 20,25,30,40, 55 m)
4	2001-51T-06A	60° 54' 08"	115° 41' 24"	T (Surf,2,5, 7.5,10,12 m)
5	2001-51T-09A	61° 55' 26"	113° 43' 36"	T (Surf, 2,5, 7.5,10,13.5, 15,20,25,30, 40,50 m)
7	2001-51T-10A	61° 59' 21"	114° 29' 15"	T (Surf, 2,5, 7.5,10,13.5, 15,20, 25,30, 40,50,60 m)



ICE JAM STUDY PEACE RIVER
AEIRB STUDY 14146, DR. S. BELTAOS

Technical Operations supported Dr. Beltaos on the Peace River in Northern Alberta during the period between October 8 - 18. The field party consisted of one staff member from NWRI and one from NHRI, in Saskatoon as well as a native Cree Environmental Officer from Fort Chipewyan.

Invaluable assistance was provided by Wood Buffalo National Park staff and the use of their facilities in Fort Chipewyan, Alberta.

This is a continuation of work done in previous years to profile the Peace River from its mouth on the Slave River to Peace Point, located 130 kilometers upstream. This data will be used in a river model to predict possible ice jam locations and the resulting flooding that would result.

The work consisted of the completion of new river profiles on the Peace River between Peace Point and Sweatgrass Landing to complete a section of the river which had not been done in previous years. A total of ten new cross-sections were completed during this field trip as well as the installation of three water level gauges to record water levels during the fall freeze up period.

The profiles were done mostly on locations selected by Water Survey of Canada from the Northwest Territories Offices which were established in 1994. Their survey stakes were located and a total station survey instrument was used to establish distances and elevations of both river banks. The river bottom was done using a GPS and depth sounder unit integrated to read depth and position simultaneously and to log the values to a laptop computer as separate files.

NATIVE MUSSEL INVENTORY SYDENHAM RIVER
AEIRB STUDY 14173, DR. J. SMITH

This ongoing study lead by Dr. Smith is working to inventory native mussel species and identify endangered species in Canadian waters of the Great Lakes.

During the weeks of July 30, August 7 and August 27 the native mussel inventory survey of the major tributaries of the Sydenham River located in South Western Ontario took place. The sites sampled were: downstream of a highway bridge south of Rokeby; 200 meters downstream of the highway bridge at Zion Road south of Warwick and a third site accessed through a farmer's field at the intersection of Mawlan Road and Langbank Road, north of Florence.

The sampling consisted of a careful hand search of a small section of the river bed to enumerate and identify mussels recovered from the sediments. The search area of the river was marked in a grid pattern, both across the river and along the river. The grid dimensions were 5 metres by 5 metres. Three one metre squares were randomly chosen from each grid quadrant and thoroughly hand searched. There were up to five quadrants across the river and up to 10 grid sections along a straight run of the river.

Additional sampling was conducted during the week of September 4 to complete the native mussel inventory survey of Lake St. Clair. TOS supported this segment of Dr. Smith's study by assisting in the field collection of samples from various sites along the north shore of Lake St. Clair at Walpole Island and by transporting staff to several locations along the eastern and northern shore of Lake St. Clair at Anchor Bay.

To sample sites along the shores of Walpole Island and Basset Island, Mr. M. Williams of the Walpole Island Band Council was contacted. Mr. Williams co-ordinated access to the reservation lands and arranged for the use of a guide. After several telephone discussions and meetings at the Heritage Centre of Walpole Island, permission was granted, but with restrictions. The restriction were as follows: no boat with DFO identification was to enter Reservation territory; any boat with DFO wordmarks used to transport staff to a Reservation boundary would vacate the area immediately after delivering staff and anchor in US waters until the staff were ready to be picked up, and lastly a guide must accompany all government employees while on the Reservation. Damien Sampson from the Walpole Island Reservation was the guide hired for the two week period and proved to be a valuable and enthusiastic assistant in the locating of live mussels.

A total of 5 locations surveyed on the Reservation with several species of native mussels was inventoried. Three sites were on the south shore of Walpole Island in a bay west of the outlet of Johnson's Channel and east of the outlet of Chematogan Channel and two sites were located on the south shore of Basset Island, one in Pocket Bay and the other in an embayment west of Basset Channel.

Two DFO boats (the BOBBY M and the PELICAN) and a Zodiac rubber raft were utilized to complete this study. The BOBBY M had all wordmarks removed so that it could be used to sample the area south of Walpole Island during the week of August 27, while the PELICAN and the Zodiac were used to transport staff to and from the Reservation Boundary during the week of September 4.

The sampling on the Walpole Island Reservation was conducted first and then several other sites in Lake St. Clair at Anchor Bay were visited and sampled. The locations were Muscamoot Bay, Goose Bay, Fisher Bay and Bouvier Bay. Because these sites were in shallow waters the launch PELICAN was anchored and the Zodiac ferried staff to and from inshore habitat. An Eagle hand-held GPS system in WGS 84 was utilized to locate the mussels. All positions were logged by the study leader on the study field sheets which included species, size, substrate and algae growth.

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

Technical Operations supported this project with monthly monitoring of water levels of the marsh and wells at the park gate, Northwest Beach and Camp Henry cross-sections.

In April of this year positions and elevations of three sample grids around the Camp Henry area were obtained. A cross-section profile through two of the grids was also done.

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

WAINFLEET BOG CONSERVATION AREA
AEIRB STUDY 14181, DR. A. CROWE

Technical Operations supported this project at Wainfleet Bog Conservation Area with monthly monitoring of water levels in wells WB 01-15 and four area drainage ditches. Two water level loggers were removed in June of this year. These loggers were installed in wells number fourteen and fifteen in the early spring of 2000 and have been recording water levels and temperatures at fifteen-minute intervals since then. They are downloaded monthly.

This is being done as part of a continuing joint Groundwater study of the Bog with Niagara Regional Conservation Authority.

RESEARCH SUPPORT BRANCH**LAKE VICTORIA ENVIRONMENTAL MANAGEMENT PROJECT**
RSB STUDY 12629, J. A. BULL

The Lake Victoria Environmental Management Project (LVEMP) is a regional project being implemented by the three East African countries, Kenya, Tanzania and Uganda. The project is aimed at addressing the increasing environmental degradation and continued deterioration of the water quality of the lake. This degradation has been manifested through the frequent out-breaks of massive algal blooms resulting from eutrophication, increasing problem of anoxia, frequent fish kills and recurrent infestation of the lake with the Water Hyacinth.

LVEMP is comprised of 10 components, one of which is the Water Quality and Ecosystem Management Component (WQESC). The lead agency for the implementation of activities under the WQESC is the Directorate of Water Development (DWD) through the Water Resources Management Department (WRMD). The WQESC is comprised of five sub-components, Management of Eutrophication, Sedimentation Pilot Study, Hydraulic Conditions Pilot Study, Lake Victoria Water Quality Model and Water Quantification.

The major aim of the WQESC is to elucidate the nature and dynamics of the lake ecosystem by providing detailed information on the characteristics of the waters of the lake. In addition, this component also aims to provide details of limnological changes, model and predict their short and long-term consequences, and provide guidelines for ameliorating potentially disastrous lake ecological changes.

The scientific analysis required to support the above component of the LVEMP requires that field measurements be undertaken for key limnological parameters. This, in turn, requires the deployment of various measurement and sampling systems in designated areas of Lake Victoria that are representative of the spatial and time scales of physical processes being studied. The resultant data bases will provide the background information necessary to interpret the physical regime in the areas of study and serve to verify the results of hydrodynamic models.

Under the Contract between UNU-INWEH (United Nations University - International Network on Water, Environment and Health) and the Government of Uganda, UNU-INWEH is to organize and, in collaboration with the Ugandan LVEMP and WRMD, provide qualified technical personnel to train Ugandan staff on the use of specialized equipment required to carry out a small-scale field measurement and sampling program in the Ugandan sector of Lake Victoria. UNU-INWEH is also to supply the necessary measurement and sampling equipment as specified in the Contract. The resultant observational and sampling program will include meteorological measurements, water quality measurements, water temperature/depth profiles, current profiles, suspended sediment measurements and sediment coring.

The activities to be carried out are designed as a capacity building exercise for the Ugandan WRMD and will provide staff of the WRMD with the training and hands-on experience necessary to service, maintain, deploy and retrieve a number of physical measurement and sampling systems and to use such equipment effectively. Additionally, the field data gathered through the agreed activities will contribute to a physical database for Lake Victoria that can be used by researchers. The long term goal here is to provide the capacity to sustain a lake measurement and sampling capability, managed and funded locally.

Under the terms of the Contract, UNU-INWEH personnel will organize the training sessions and provide equipment. In addition, UNU-INWEH personnel will travel to Uganda for a total of 4 periods. The first of these was a 5 day period as an "Inception" trip to finalize the logistical, equipment and facility-provision details of the agreement between the two Parties of the Contract. To accomplish the on-site training and mooring/sampling demonstrations, UNU-INWEH personnel traveled to Uganda for an "operational" period of 28 days, October 4 to 31, and will travel for 2 additional operational periods, 13 days and 12 days, in January and March of 2002 respectively.

The LVEMP National Executive Secretary is responsible for funding of the contract, for the appointment of a Technical Liaison Officer as the contact person between WRMD staff and UNU-INWEH personnel as well as for the provision of suitable training facilities, casual labour, transport for goods and UNU-INWEH personnel within Uganda and a suitable mooring vessel for each of the 3 operational periods.

The activities, including the organization, training and field measurements will be conducted over an 18 month period commencing in April, 2001 and ending in June 2002.

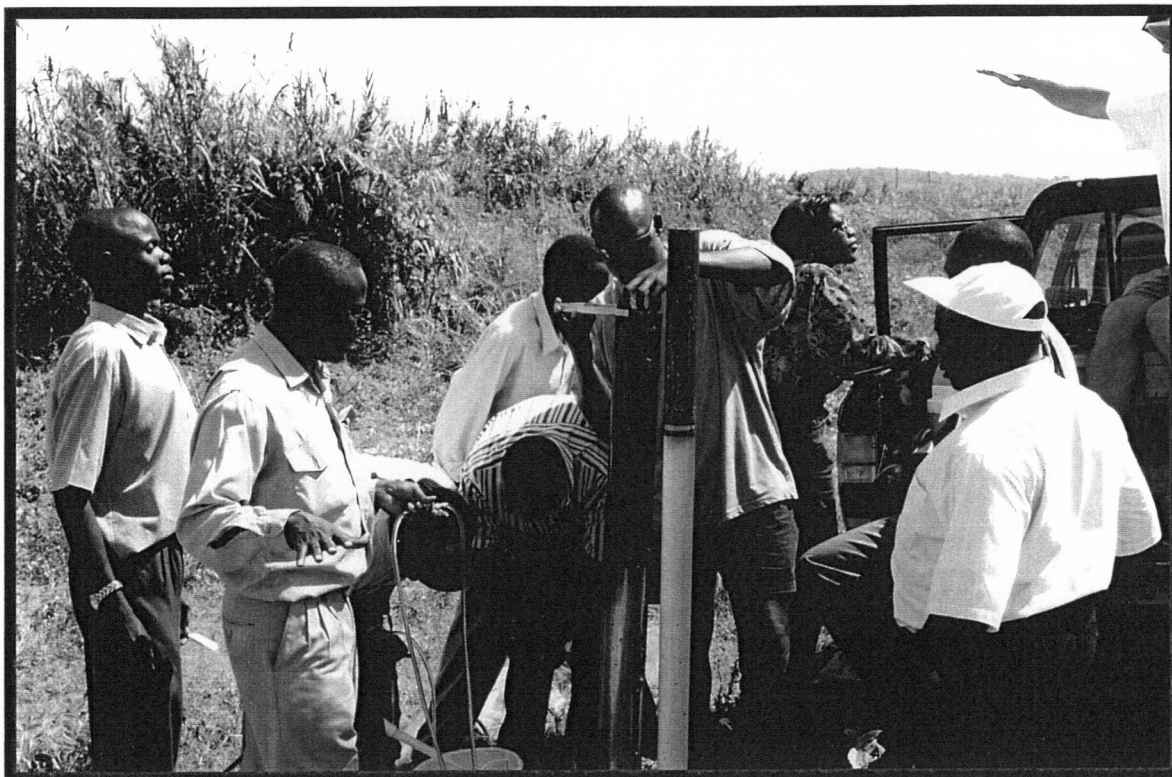
All of the equipment to be supplied under the Contract was delivered to the air-freight forwarders in Toronto, Canada on September 6, 2001 with a projected delivery date to Entebbe, Uganda of September 9th or, failing that, September 16th at the latest. This shipment consisted of 16 boxes - 3 of which were considered dangerous goods (DG) under the international air-freight shipping regulations. The unfortunate events of September 11th caused delays in the movement of these goods from North America. Thirteen non-DG goods boxes arrived in Entebbe on October 7th, a second shipment arrived mid-month and the remaining DG items did not arrived in Entebbe until November 7th due to airline restrictions on such shipments. Since the DG items were non-essential for the training sessions, the shipping delays had a minor effect on the Contract deliverables for this First Operational Trip.

Over the period October 4 through October 30, 2001, UNU-INWEH's technical representatives, S. Smith, TOS, RSB, and Mr. R. Rowsell, ES, RSB worked on-site at the WRMD facility in Entebbe conducting training sessions and equipment demonstrations which were attended by a number of WRMD staff. In liaison with Mr. Fred Kimaite, in his capacity as the LVEMP Technical Liaison Officer for this Contract,

all of the proposed training sessions, all of the sediment sampling demonstrations outlined in the Inception Report for this Contract were delivered as scheduled. However, when the mooring vessel "IBIS" was not available due to a main engine failure, the proposed demonstrations of the mooring deployments could not be fully undertaken. The field demonstrations and training in the use of the Eckman sampler and the TOS corer (i.e. "Benthos corer") were conducted at the National Water site using a small boat that was made available.

An effort by the LVEMP coordinators to obtain a suitably equipped mooring vessel to substitute for the "IBIS" came to fruition on the day before the First Operational Trip was scheduled to end. At that time, in order to ensure that the proposed moorings would be established in spite of the loss of shiptime, it was agreed that the training staff were to remain in Uganda for the time necessary to establish the moorings. The primary motive here was to ensure that a data set would be collected for use during the training modules proposed for the Second Operational Trip in early January, 2002.

It should be noted that, although the moorings were eventually established as planned, the proposed mooring demonstrations and practicing of such deployments by WRMD staff were not undertaken. These activities will be re-scheduled over the next two operational trips.



LVEMP, WRMD staff during a sediment core sectioning demonstration



Lake Victoria, Uganda, sediment core sectioning

UNDER WATER VIDEO SURVEY, MIDLAND FISH HABITAT MANAGEMENT, K. SHERMAN, RSB STUDY 12631, S.B. SMITH

A Memorandum of Understanding (MOU) was agreed upon between DFO, Fish Habitat Management and NWRI, RSB, Technical Operations Services, to provide diving and digital video support to the Severn Sound RAP. Detailed side scan sonar surveys in the Midland area of Severn Sound have located numerous deposits of sunken logs. It is anticipated that these logs will be salvaged by a private contractor over the next few years. Many of the sunken logs are embedded into the sediment and there is concern over loss of fish habitat and that the resuspension of sediments from the removal of these logs, would affect the water quality. The purpose of this underwater survey is to document the logging sites in Midland Bay, prior to the salvage operation and again after completion. It is hoped that video records and accurate positioning of the embedded logs will assist the Severn Sound RAP to monitor the salvage operations and any fish habitat disruption.

On Monday, October 1, a TOS dive team (Benner, Gilroy and Don) traveled to Midland with the dive launch PINTAIL in tow. Mr. K. Sherman (Severn Sound RAP) met the dive team at the dock to prepare a work plan. The survey priority was to obtain diver observations and video transects of three sunken log sites in Midland Bay.

Site #1 - In the inner bay, the West shoreline from the grain elevators to the concrete abutment at Sunnyside Marina.

Site #2 - The Northwest shoreline of the inner bay, from the concrete abutment at Sunnyside Marina to Midland Point.

Site #3 - The South shoreline of the outer bay, from the Sewage treatment outfall to the East property line of the TRW plant.

Using a shot line, with hand-holds on the weight, a diver was towed along the transect line using the liveboat method. Diver observations were recorded and positions of the logs were marked using the MX-300 GPS receiver (Datum - WGS 84). Diver visibility was extremely poor, ranging from one to five feet. A useable video record was not possible under these conditions. Approximately three miles of transects were surveyed and a total of 39 logs were positioned.

Over the summer months, the Midland Bay area of Severn Sound is unlikely to provide sufficient water clarity to obtain clear video footage of the sunken logs. I would propose returning to the site in early Spring 2002 before the water begins to warm up. The logging contractor indicated that he was planning to log the Midland Bay area late this autumn 2001. A spring 2002 trip, with optimum underwater visibility, would create a good video record of the sites after log removals.

TOS divers returned to CCIW on Wednesday, October 3.

SUNKEN LOG POSITIONS

Scale: Small log = < 12"
 Medium log = 12" - 24"
 Big log = 24" - 36"
 Huge log = > 36"

Fix #	Easting	Northing	Remarks
Site #1			
11	587602.	4956793.	Small log
12	587588.	4956886.	Small log
Site#3			
13	589168.	4956886.	Intake pipe at TRW
14	589113.	4956875.	Big log
15	589039.	4956860.	Big logs
16	589036.	4956857.	Log removed
17	589029.	4956852.	Big log
18	589012.	4956855.	Small log
19	588855.	4956869.	Big log
20	589134.	4956833.	4 Big logs
21	589149.	4956838.	Big log
22	589171.	4956859.	Huge log
23	589228.	4956852.	Big log
24	589235.	4956856.	Big log
25	589261.	4956840.	Big log
Site #2			
26	588580.	4958229.	Big log
27	588552.	4958208.	Big log
28	588484.	4958196.	Big log
29	588394.	4958176.	2 logs, 1 small + 1 Big
30	588377.	4958174.	Small log
31	588274.	4958158.	3 small logs
32	588201.	4958140.	Big log
33	588174.	4958124.	Small log, embedded
34	588144.	4958117.	Small log, embedded
35	588058.	4958084.	Big log
36	587969.	4958050.	Big log
37	587839.	4958017.	Medium log
38	587770.	4957956.	4 small logs
39	587758.	4957944.	Big log
40	587746.	4957929.	2 Huge logs

<u>Fix #</u>	<u>Easting</u>	<u>Northing</u>	<u>Remarks</u>
41	587716.	4957871.	3 small logs
42	587709.	4957822.	3 Large logs
43	587719.	4957696.	3 Large logs
44	587697.	4957533.	Large log
45	587692.	4957505.	Large log
46	587684.	4957479.	Big log
47	587681.	4957406.	3 small logs, scattered concrete
Site #3			
48	589285.	4956828.	Shoal east of TRW
49	589445.	4956828.	Big log
50	589341.	4956884.	Medium log
51	589411.	4956776.	Medium log
52	589423.	4956798.	Medium log
53	589449.	4956859.	Big log

DETROIT RIVER, ST. CLAIR RIVER CONTAMINANT SAMPLING ECD/EHD-OR, R. McCREA, RSB STUDY 12631, S.B. SMITH

Sampling in the Detroit River and St. Clair River during this field survey is in response to the binational RAP plan between Canada and USA. Sampling is used to create bench marks in the RAP agreement and to assess progress of beneficial uses. Infiltrax are In-situ resin column and filter based samplers used in the determination of organic chemicals. Other water samples collected during all field surveys were for Phosphorus, Trace metals, Mercury, Arsenic/Selenium, Nutrients, and Major Ions.

This is a continuation of the sampling which began last year and is projected to continue for the next three years. Six surveys were completed on both rivers throughout the year. Following is a list of station numbers and location descriptions. Single Infiltrax were installed at each station with the exception of stations 2210 and 5000 in which double Infiltrax were required due to low contamination levels.

DETROIT RIVER STATIONS

1. Site #2240, Lower Det. R., Amherstburg Channel (Canadian side)
2. Site #1120, Upper Det. R., Fleming Channel (mid-river)
3. Site #2220, Lower Det. R., Sugar Island, (mid-river)
4. Site #2210, Lower Det. R., Trenton Channel, (U.S. Side)

ST. CLAIR RIVER STATIONS

1. Site #5140, Downstream of Port Lambton, (Canadian Side)
2. Site #5110, Upstream of Port Lambton on green navigational buoy #37, (U.S. Side)
3. Site #5000, Lake Huron on red buoy #2, upstream of the Bluewater bridge.

DREDGE MONITORING REYNOLDS SITE CORNWALL 12631 RSB, S.B.SMITH
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Technical Operations supported Ontario Region sampling program, headed by R. Santiago, at the Reynolds Metal Company at Massena New York during the week of July 9-13. Two technicians and the BOBBY M were utilized in the sampling.

Dredging was in progress to remove contaminated sediment from the river bottom at the plant site, and this monitoring was to determine if sheet piling and other precautionary actions were sufficient to isolate the sediment removal activities from the river.

The sampling consisted of taking Hydro-lab readings for temperature, conductivity, depth and turbidity. While dredging was underway behind sheet pile walls, hydro-lab readings were taken outside the sheet piling; upstream and downstream of Active

dredge sites. Water samples were collected if any unusual readings occurred and twice daily samples were collected at a site on the wall, and a background site for PCB's and PAH's. These were sent each day to a lab for analysis.

COMMON USER SUPPORT

RSB STUDY 12633, M.R. MAWHINNEY

RIGGING SHOP

The Rigging Shop was operated by two shop personnel with the assistance of other Technical Operations staff members as needed.

The Rigging Shop staff are responsible for the care of the shop facilities, warehouse storage, outside storage shed and long term outside storage areas as well as maintaining all mooring equipment, buoys, generators, power tools, winches, forklifts, vehicles and various other pieces of research equipment.

Rigging Shop staff are responsible for the delivery of scientific equipment to major ships and field programs throughout the Great Lakes Basin and the St. Lawrence River. They erect towers, operate boats, forklifts and the heavy crane truck and assist with scientific studies when required.

FIELD STORES

Field Stores is operated for the use of the staff within the National Water Research Institute. Staff from other government departments and organizations such as EC-Ontario Region, Fisheries and Oceans, Provincial and Municipal governments, United Nations and universities also use the stores resources when authorized by the Manager, Technical Operation Services and approved by the Executive Director, NWRI.

Field Stores personnel issue project chiefs and study leaders with a variety of specialty equipment such as safety clothing, sediment and water samplers, GPS, survey equipment, pH and conductivity meters, cameras and vehicles. On return the items are inspected for damage, repaired if necessary and re-issued. The majority of repairs are made in house. In recent years a computer inventory data base has proved to be a more efficient service and record system. Over five hundred different requisitions were processed during the season from single item to 150 item requisitions for the CCGS LIMNOS.

During the 2001 field season a fleet of 25 vehicles were scheduled and issued through Technical Operations stores. The vehicles included one mini-van, two sedans, three station wagons, four dual-wheeled pick up trucks, four 4x4 pickups, eight full size vans, one 3-ton truck and the large crane truck. Numerous trailers were also utilized during the field season for various tasks. An average 150 vehicle bookings are made each month.

VEHICLE SUMMARY

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

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

Staff saw to the replacement of some aging vehicles this fiscal year. The Institute has introduced three new replacement vans and one extended cab 4x4 into the fleet this year. These new vehicles were equipped with propane operating systems shortly after entering the institutes fleet. Propane systems were supplied by Eco fuels of British Columbia, and installed by a qualified local vendor Beverly Tire.

A.R.I. Canada "Automotive Rentals Incorporated" are still handling the procurement of all 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 and repair costs. Vehicle records are still kept internally by Technical Operations Services. Vehicle mileage is reported to A.R.I. on a monthly basis. This company continues to be a very efficient organization to deal with. It has cut down considerably on the amount of time and effort spent on monthly paper work for each vehicle in the fleet.

An extensive geographical area was again covered this field season and included travel to Miramichi, New Brunswick, Halifax, Nova Scotia, Prince Edward Island and Grand Prairie, Alberta. U.S. destinations included Nashville, Tennessee, Boston, Massachusetts, various parts of New York State, Ann Arbor and Charlevoix, Michigan.

From April 1 to December 1, 2001, RSB vehicles traveled over a combined distance of 380,267 kilometers. This mileage was accomplished virtually incident free.



Field camp, Lac Pepiniere, Quebec



Diver coring through the ice, Lac Perron, Quebec

DIVING OPERATIONS

RSB STUDY 12634, F.H. DON

The Diving Operations Unit of Technical Operations Services, provided national and international support to various scientific studies in areas of diver certification, inspections, installations and retrievals of hardware, sample collection, videography, television surveys with video documentation, equipment demonstrations/trials, search and recovery, lectures, and diver training. The Diving Operations Unit supported 11 divers at Burlington. A total of 363 hours (accident free) were logged in support of scientific projects for: NWRI, DOE/OR-EHD, BLMSS, DOE/OR-RPD and GLLFAS. A total of 24 hours were logged on MURV, the remotely operated mini-rover underwater camera system. MURV is used for deep water and long duration video recording. Projects have included wreck mapping, sonar surveys, documentation of geological formations and live educational documentaries.

The Dive Shop also has the capability to edit and copy all raw footage for scientific purposes into any desired format. The Head of the Diving Operations Unit (F.H. Don) represented research/scientific diving as a member of the Canadian Standards Association Sub-committee on Diving Competency as chairman of the Contaminated Environment working group. Mr. Don is chairman of the Federal Interdepartmental Committee for Diving Safety. The annual meeting of the Department of Environment Diving Safety Committee was held in April of 2001 in Toronto, Ontario.

The Diving Operations Unit has a complete inventory of modern diving and diver support equipment which, when used and operated by highly skilled TOS divers can complete even the most difficult of sub-sea operations.

Projects supported during 2001 included:

STUDY #		STUDY TITLE	
12212	Rosa	- AEMRB	- Rouyn-Noranda
12242	Krishnappan	- AEMRB	- Cornwall
12243	Skafel	- AEMRB	- WAVES Tower, Hamilton Harbour/ L. Ont.
12245	Hamblin	- AEMRB	- North Channel
12246	Marvin	- AEMRB	- St. Clair River
12465	Smith	- AEPRB	- Mussels, L. Ont. Region
12225	Rukavina	- AEMRB	- Hamilton Harbour, Cornwall and Amherstburg
12631	Outside Agencies:		- DFO/GLLFAS, Fitzsimons, Fish Habitat Studies
			- CCG/MTSB, Hull inspections/repairs
			- DFO/FHM, Sunken Log Survey, Severn Sound



Diver aided, T-Frame deployment, St. Lawrence R., Cornwall



Digital video surveillance of Lake Trout habitat, Finger Lakes, New York

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