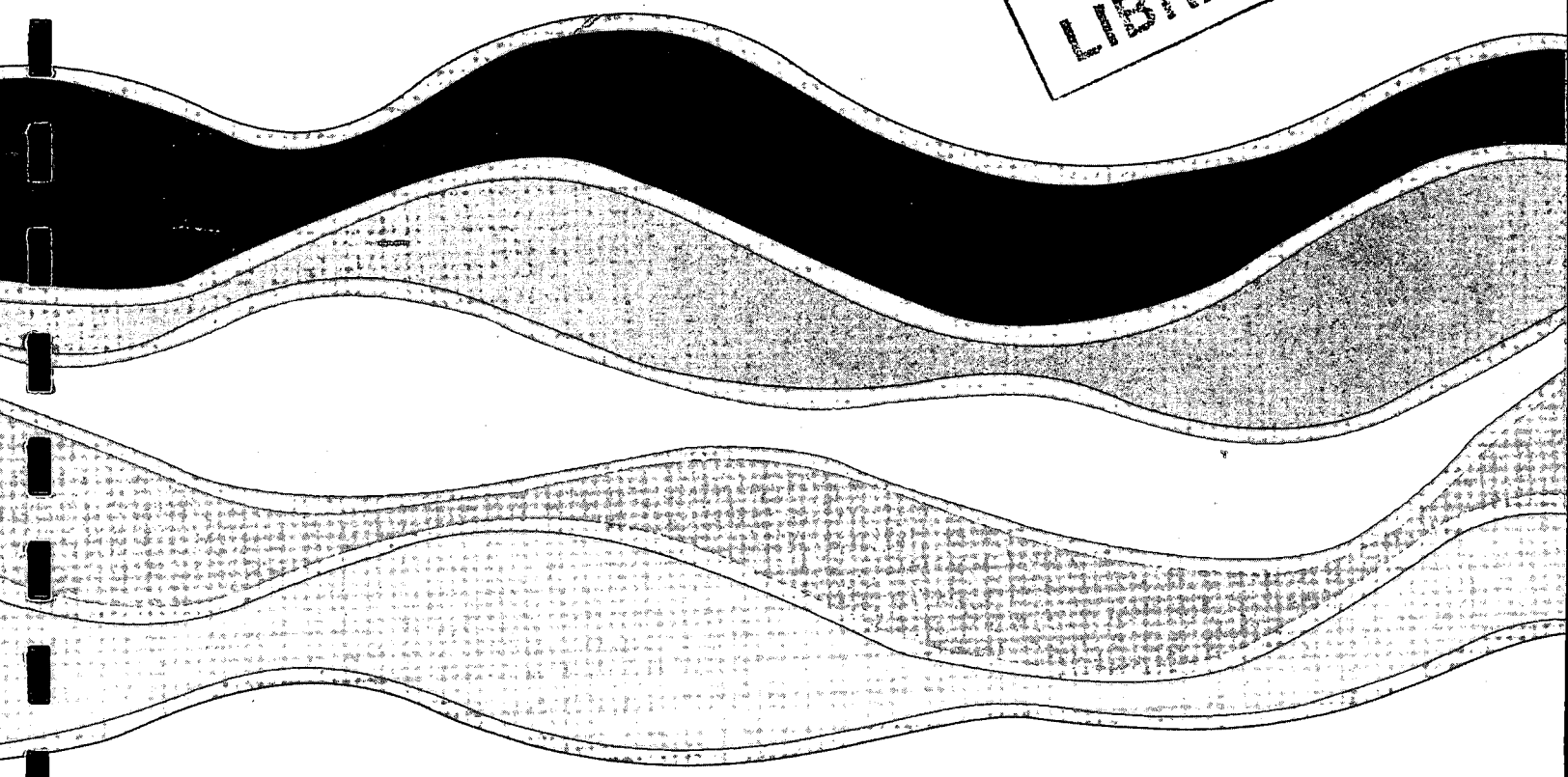
Unpubl. Manuscript

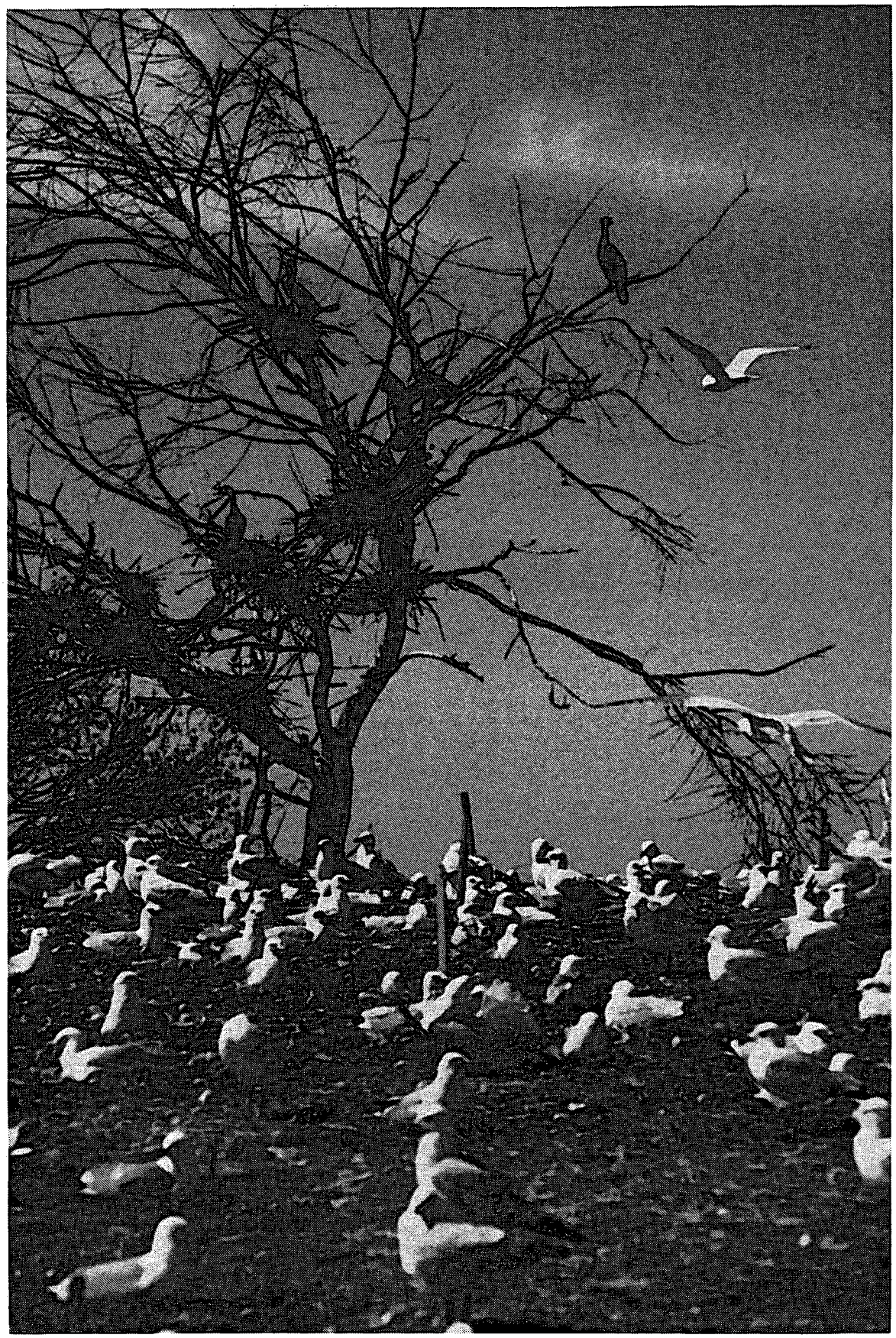
ACTIVITY SUMMARY
1995

NATIONAL WATER RESEARCH INSTITUTE

INSTITUT NATIONAL de RECHERCHE sur les EAUX



1995
ANNUAL ACTIVITY SUMMARY
TECHNICAL OPERATIONS SECTION
RESEARCH SUPPORT BRANCH
NATIONAL WATER RESEARCH INSTITUTE



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INTRODUCTION

The Technical Operations Section of the Research Support Branch has its headquarters at the National Water Research Institute in Burlington, Ontario. The mandate of this section 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 section 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 put them into field situations from coast to coast and into the high Arctic. This unusual opportunity--to work and gain valuable field-related experience in such a varied sphere of operation, develops within the section a tremendous collective wealth of technical expertise unique to this group.

The Diving Operations Unit is ever-expanding its capacity to give scientific programs the up-to-date technological support which is required underwater--the most recent advances being in underwater video capability and the continuing refit and upgrade of the Mobile Underwater Reconnaissance Vehicle (MURV). Annual diver training and certification courses are also conducted to maintain a high level of competence among Institute divers.

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

Technical Operations Section will miss two members of its technical field staff this year due to retirement. Mr. Paulos Youakim served this Section for almost twenty-eight years and Mr. Yvon Desjardins for eleven years. We wish both gentlemen good health and a very long, happy retirement.

This report is intended as an overview of the field activities of this section during the 1995 field season.

STAFF LIST

RESEARCH SUPPORT BRANCH

Director	J.D. Smith
Operations Secretary	S.R. Mitchell
Administrative Clerk	J.McAvella

TECHNICAL OPERATIONS SECTION

Head, P.M. Healey	Nova Scotia

OPERATIONS OFFICERS

M.R. Mawhinney	OIC CSS LIMNOS; FRAP and Chain Lake, B.C.; Collingwood, Cornwall and Ignace, Ontario
B.H. Moore	OIC CSS LIMNOS; Prince George, British Columbia
S.B. Smith	OIC CSS LIMNOS; Ft. McMurray, Alberta
F.H. Don	OIC CSS LIMNOS; Diving

MARINE TECHNOLOGISTS

L.E. Benner	Conservation Strategies Division, ECB, EC-OR
P.R. Youakim	Field Stores; CSS LIMNOS
E.H. Walker	Turkey Lakes; Groundwater; New Brunswick; Cornwall, Ontario
G.G. LaHaie	OIC Turkey Lakes Study Area
J.A. Kraft	Prince George and Kamloops, B.C.; Quebec; CSS LIMNOS
K.J. Hill	New Brunswick; CSS LIMNOS; Nova Scotia; Cornwall, Ontario
R.J. Hess	OIC CSS LOUIS M. LAUZIER; New Brunswick
B.L. Gray	(TMIT) Diving; Quebec

ASSISTANT MARINE TECHNOLOGISTS

R.D. Neureuther	Alberta; New Brunswick; CSS LIMNOS; Cornwall, Ontario
M.F. Dahl	Diving; CSS LIMNOS
C.H. Talbot	Groundwater; Alberta; CSS LIMNOS
T.G.D. Breedon	CSS LIMNOS; Ft. McMurray, Alberta; Diving
J.E. Milne	Hamilton Harbour

RIGGING UNIT

C.J. Lomas	Senior Rigger; New Brunswick; Sault Ste. Marie, Ontario; Lake Ontario; Cornwall, Ontario
T.C. Gilliss	Vehicle Maintenance Co-ordinator; Quebec

NWRI FIELD STORES

Y. Desjardins, retired 31 May 1995
P.R. Youakim, retired 29 February 1996
T.C. Gilliss

STUDENTS

M. de Groot	CSS LIMNOS; Turkey Lakes Watershed
D.A.D. Gilroy	CSS LIMNOS
M. Stone	CSS LIMNOS; Turkey Lakes Watershed
D.J. Welch	CSS LIMNOS

CSS LIMNOS
1995

1995 JANUARY

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

FEBRUARY

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

MARCH 1995

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

APRIL

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3 Lake Ont. Moorings and Bioindex	4	5	6	7	8 CCIW
9 CCIW	10 Lake Ontario Bioindex	11	12	13	14 CCIW	15 CCIW
16 CCIW	17 CCIW	18 Dry Dock	19 Dry Dock	20	21	22 CCIW
23 CCIW 30	24 Lake Erie Surveillance Lake Erie	25	26	27	28	29 Port Colborne

MAY

SUN	MON	TUE	WED	THUR	FRI	SAT
	1 Port Colborne	2	3 Port Colborne	4	5 Port Colborne	6
7 Port Colborne	8 Lake Erie Trophic Transfer	9	10	11	12 Lake Erie	13
14	15	16	17	18 Port Colborne	19	20
21 Port Colborne	22	23 Benthic Community Structure	24	25 Lake Erie	26	27 Port Colborne
28 Port Colborne	29 Zebra Mussel Effect	30	31			

JUNE

SUN	MON	TUE	WED	THUR	FRI	SAT
				1	2 Lake Erie	3 CCIW
4 CCIW	5 CCIW	6 CCIW	7 CCIW	8 CCIW	9 CCIW	10 CCIW
11 CCIW	12 CCIW	13 CCIW	14 CCIW	15 CCIW	16 CCIW	17 CCIW
18 CCIW	19 Benthic Community Structure	20 Lake Erie	21	22	23	24 Port Colborne
25 Port Colborne	26 Lake Erie	27 Zebra Mussel Effect	28	29	30	

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
						Port Colborne
2 Port Colborne	3 Port Colborne	4 Port Colborne	5	6	7	8
9 Port Colborne	10 Lake Erie Sediment Core and Benthic Community Structure	11	12	13	14	15 Port Colborne
16 Port Colborne	17 Lake Erie Zebra Mussel Effect	18	19	20	21	22 Port Colborne
23 CCIW 30	24 CCIW 31	25 Lake Erie UV-B Impact	26	27	28	29 CCIW

AUGUST

SUN	MON	TUE	WED	THUR	FRI	SAT
		1 CCIW	2 CCIW	3 CCIW	4 CCIW	5 CCIW
6 CCIW	7 CCIW	8 CCIW	9 CCIW	10 CCIW	11 CCIW	12 CCIW
13 CCIW	14 Lake Erie Surveillance Lake Erie	15	16	17	18	19 Port Colborne
20 Port Colborne	21 L. Erie Zebra Mussel and Benthic Community Structure	22	23	24 Quantification	25	26 Port Colborne
27 Port Colborne	28 Zebra Mussel	29	30 Effect	31 L. Erie		

SEPTEMBER

SUN	MON	TUE	WED	THUR	FRI	SAT
					1 L. Erie	2 Port Colborne
3 Port Colborne	4 Port Colborne	5	6	7	8	9
10 Port Colborne	11 Lake Erie Benthic Community Structure	12 Zebra Mussel Effect Lake Erie	13	14 and	15	16
17 CCIW	18 CCIW	19 CCIW	20 CCIW	21 CCIW	22 CCIW	23 CCIW
24 CCIW	25 Suspended	26 Lake Ontario Box Coring and Sediment Sampling	27	28	29	30 CCIW

OCTOBER

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

NOVEMBER

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

DECEMBER

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

SHIPBOARD PROGRAMS

CSS LIMNOS

LAKE ONTARIO

DO PROFILES, NIAGARA BAR
AERB STUDY 12200, DR. G.K. RODGERS

During the first two cruises on Lake Ontario, DO profiles were done at 3 transects off the Niagara Bar for Dr. G.K. Rodgers. These conductivity and oxygen profiles showed the changes in the plumes from the Niagara River and the Welland Canal.

All sampling was piggybacked on W.M. Schertzer cruises on the CSS LIMNOS and all statistics were included on sheets for those cruises.

SUSPENDED SEDIMENT SAMPLING AND BOX CORING
AERB STUDY 12210, A. MUDROCH

Suspended sediment samples were obtained at station 81 in the Kingston Basin and at station 884 in the Eastern Basin to evaluate the role of the nepheloid layer in the transport of contaminants across Lake Ontario. Bulk 6000-litre samples were obtained and centrifuged in situ through Westfalia centrifuges at a flow rate of 2 litres/minute. Suspended sediment was retained and frozen.

In addition, box cores or mini box cores were obtained at stations 8, 56, 81, 97, 255, 832 and 887 to document the historical recording of contaminant loading in Lake Ontario.

STATION POSITIONS

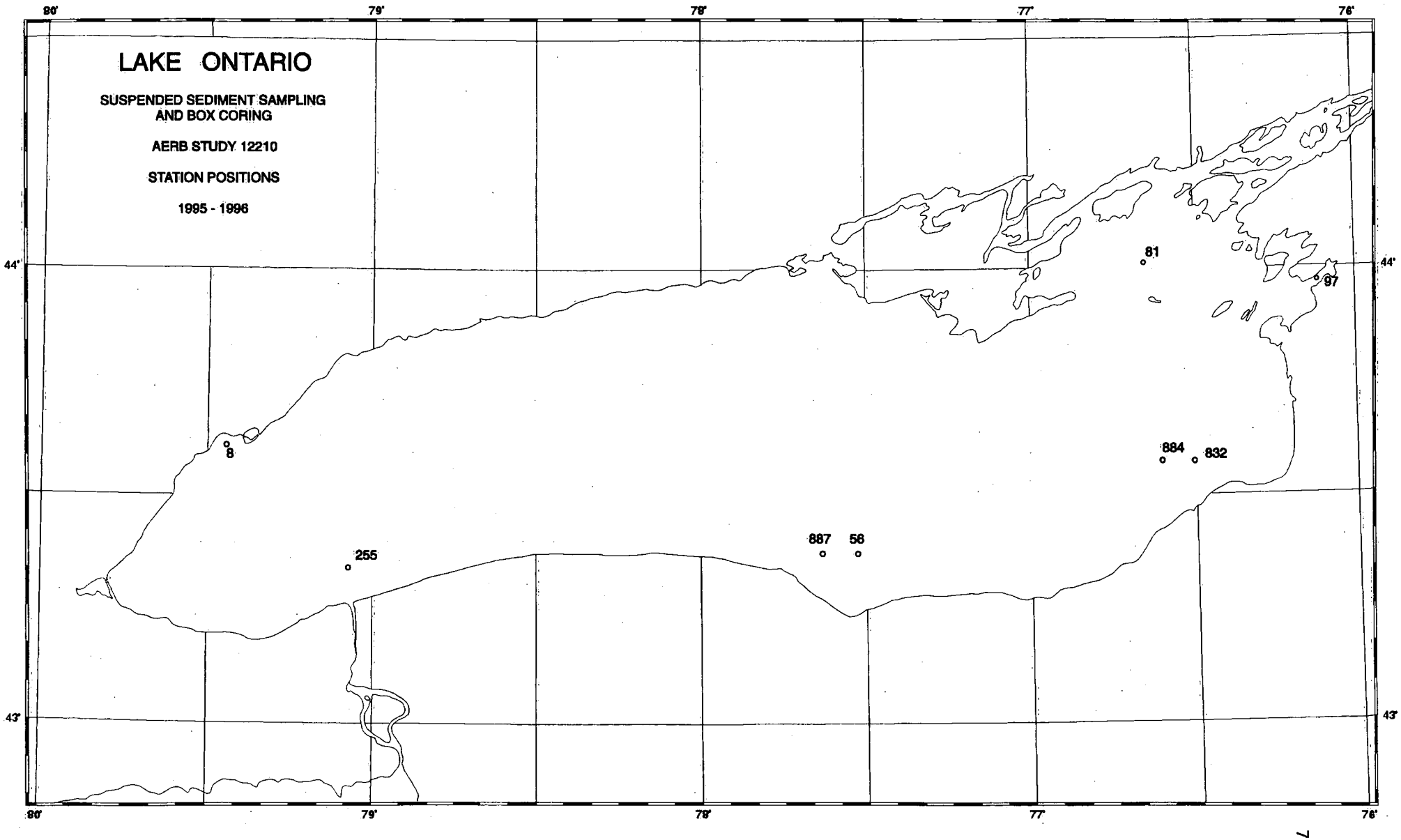
STATION NUMBER	LATITUDE N.	LONGITUDE W.
8	43° 37' 28"	79° 27' 12"
56	43° 21' 30"	77° 31' 00"
81	44° 01' 00"	76° 40' 12"
97	43° 58' 01"	76° 06' 54"
255	43° 20' 12"	79° 04' 12"
832	43° 34' 00"	76° 30' 01"
884	43° 34' 04"	76° 36' 51"
887	43° 21' 27"	77° 37' 36"

STATISTICS SUMMARY

CRUISE NO. _____
DATES FROM _____ TO _____
CRUISE TYPE SUSPENDED SEDIMENT SAMPLING AND BOX CORING

SHIP CSS LIMNOS
REGION LAKE ONTARIO
N.MI. STEAMED 403.95

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	15	Moorings Established	
EBT/Transmissometer Casts	15	Moorings Retrieved	
Rosette Casts		Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disc Observations	6	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 64µ		Moorings Established	
Zooplankton Hauls, 44µ		Moorings Retrieved	
Integrator 10 m		Moorings Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	9
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, 6000 l	2
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)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	


LAKE ONTARIO
SUSPENDED SEDIMENT SAMPLING
AND BOX CORING
AERB STUDY 12210
STATION POSITIONS
1995 - 1996
80'
79'
78'
77'
76'
44'
43'
81
97
8
884
832
887
58
255

SEDIMENT TRAP MOORING
AERB STUDY 12240, M.N. CHARLTON

Due to financial restraints, a sediment trap mooring at station 403 was retrieved on cruise 95-00-002, April 11. This mooring was used to measure regeneration rates of nutrients and contaminants in Lake Ontario. The mooring was not reinstalled for the summer period.

ADCP MOORING
AERB STUDY 12245, Dr. P.F. HAMBLIN

An ADCP current meter mooring--95-00C-01A, was installed at station 586 on cruise 95-00-002, April 11. This mooring was removed on cruise 95-00-313, July 25. It was reinstalled as mooring 95-00C-01B on cruise 95-00-003, September 27 and retrieved on cruise 95-00-004, October 11.

METEOROLOGICAL AND TEMPERATURE MOORINGS
AECD STUDY 12374, W.M. SCHERTZER

The purpose of this study was to deploy meteorological and temperature moorings to give detailed vertical temperature measurements at the deep hole of Lake Ontario. To accomplish this, two meteorological buoys were installed at station 586 during the cruise April 3-7 and retrieved on October 11. The two temperature moorings had been winter moorings installed in October of 1994, refurbished as U-shaped moorings in April of 1995 and then reinstalled as winter moorings in October to be retrieved in the spring of 1996.

MOORING POSITIONS

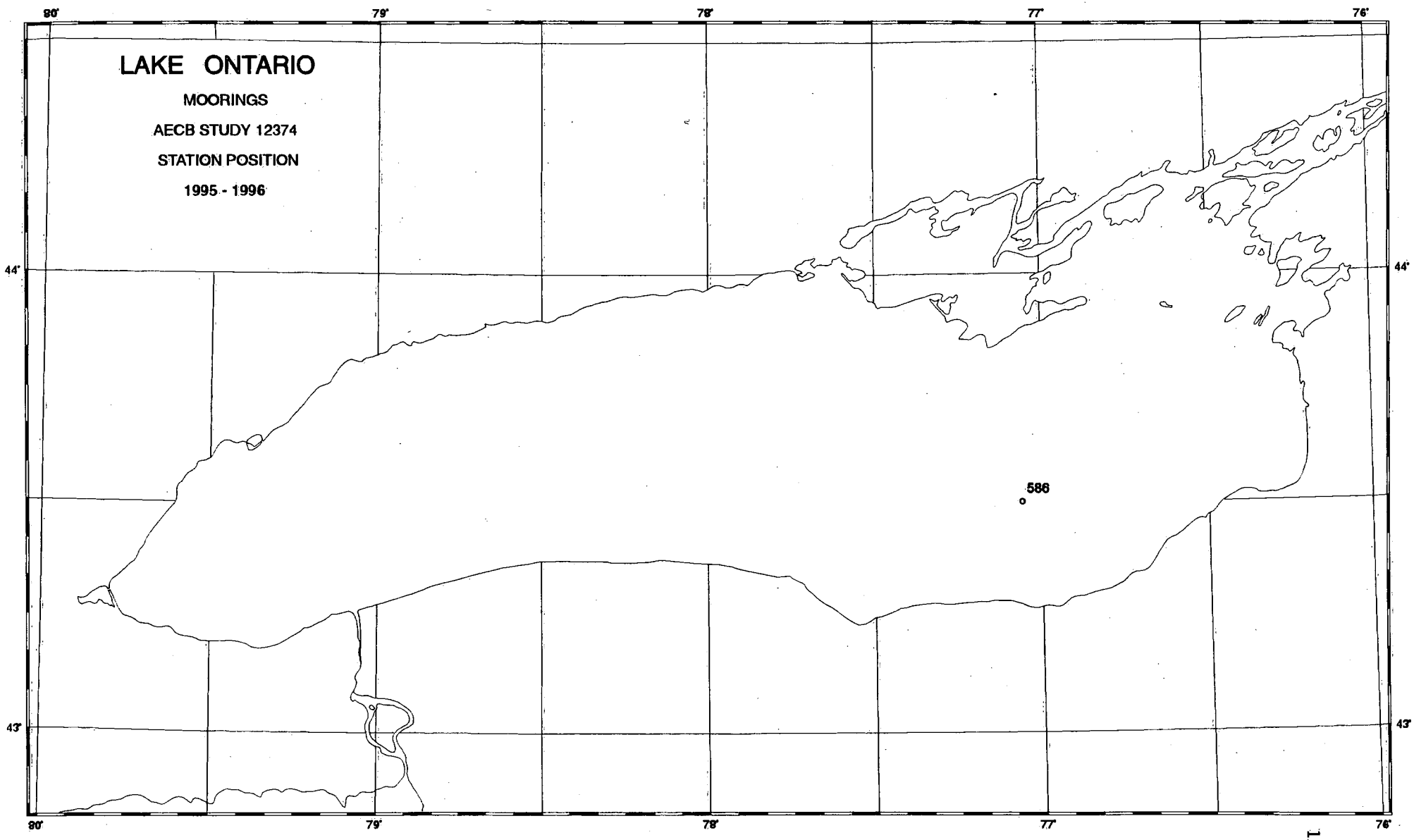
STATION NUMBER	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH m
586	95-00M-33A	43° 29' 09"	77° 04' 21"	MET
	95-00M-34A	43° 29' 10"	77° 04' 07"	MET
	95-00T-35A	43° 29' 58"	77° 04' 53"	T (4,6,8,10 14,18,22, 26,35,50,150)
	95-00T-35B	43° 29' 20"	77° 04' 12"	T (12,21,31 41,51,81,141 216.2)
	95-00T-36A	43° 28' 59"	77° 03' 50"	T (12,16,20, 24,30,40, 100,217.5)

STATION NUMBER	MOORING NUMBER	LATITUDE N.	LONGITUDE W.	INST/DEPTH m
	95-00T-36B	43° 28' 52"	77° 03' 37"	T (10,16,26, 36,46,61, 101,181)

STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS
DATES FROM _____ TO _____ REGION LAKE ONTARIO
CRUISE TYPE MOORINGS N.MI. STEAMED 662.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	43	Moorings Established, Metrological	3
EBT/Transmissometer Casts	9	Moorings Retrieved, Metrological	3
Rosette Casts		Moorings Established, Current Meter	1
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved, Current Meter	1
Secchi Disc Observations	12	Moorings Established, Thermograph	6
Transmissometer Casts		Moorings Retrieved, Retrieved	7
Zooplankton Hauls, 64µ		Moorings Established	
Zooplankton Hauls, 44µ		Moorings Retrieved, Wave Rider	1
Integrator 10 m		Moorings Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	29		
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 a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	


LAKE ONTARIO
MOORINGS
AECB STUDY 12374
STATION POSITION
1995 - 1996
80°
79°
78°
77°
76°
44°
43°
586

LAKE ERIE

BENTHIC COMMUNITY STRUCTURE
AERB STUDY 12216, DR. T.B. REYNOLDSON

A total of seven cruises were carried out onboard the CSS LIMNOS April 24-28, May 23-26, June 19-23, July 10-14, August 14-18, September 11-15 and October 16-20. Cruises in April, August and October were piggybacked on Lake Erie Surveillance cruises. The cruise in September was piggybacked on a Zebra Mussel Effects cruise. This year one extra station was added in the Eastern Basin in addition to the four regular stations.

At each station, a mini box core was collected and five 10 cm cores were subsampled. These cores were extruded into plastic bags and stored at 4°C until returned to CCIW for analysis. A water sample was collected from a depth of bottom -1 m for dissolved oxygen and pH measurements.

At station 23, a winter DO logger mooring was retrieved and reinstalled. DO logger moorings were also installed at stations 84 and 357. These two moorings were retrieved and reinstalled several times during the field year to clean zebra mussels from the oxygen membrane.

Phytoplankton samples at stations 23, 84 and 357 were collected for Dr. M.A. Zarull, AERB whenever samples were collected for Dr. Reynoldson.

On the June cruise, peepers were installed for F. Rosa, AERB Study 12217. These were installed at station 84 by divers.

STATION POSITIONS

BENTHIC COMMUNITY STRUCTURE

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 29' 54"	79° 54' 00"
84	41° 29' 48"	81° 39' 18"
303	42° 34' 10"	80° 02' 11"
357	41° 49' 48"	82° 58' 18"
358	41° 53' 42"	82° 52' 00"

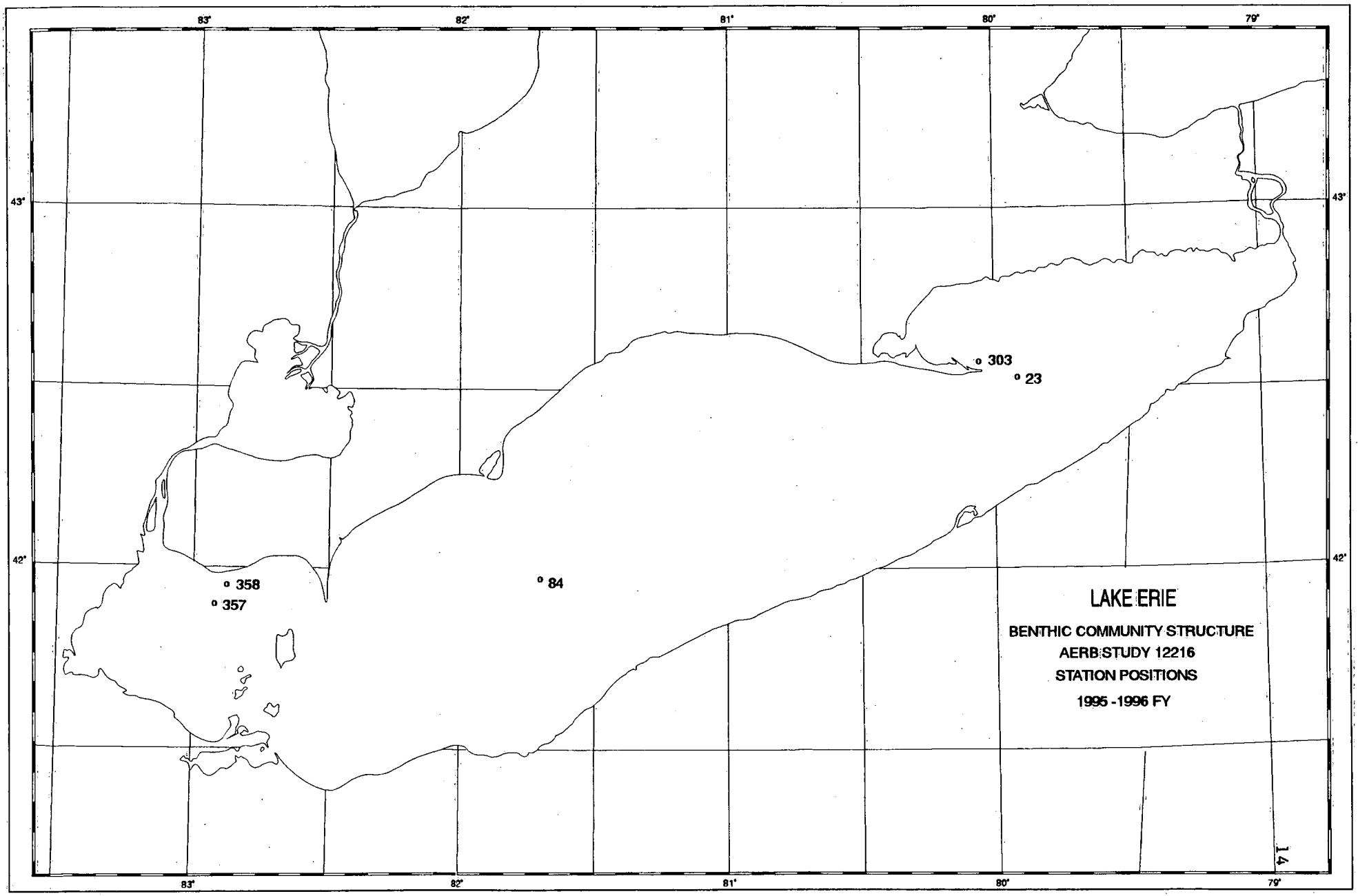
STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS

DATES FROM _____ TO _____ REGION LAKE ERIE

CRUISE TYPE BENTHIC COMMUNITY STRUCTURE N.MI. STEAMED 1233.9

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	23	Moorings Established, Peepers	1
EBT/Transmissometer Casts	21	Moorings Retrieved	
Rosette Casts	3	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disc Observations	11	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 110µ		Moorings Established	
Zooplankton Hauls, 44µ		Moorings Retrieved	
Integrator 10 m	5	Moorings Serviced	
Integrator 20 m	2	Primary Productivity Moorings	
Phytoplankton Samples	12		
D.O. Profiles	11		
Water Samples Collected (Microbiology)		Cores Taken, Box, Small	15
Water Samples Collected (Water Quality)	11	Cores Taken, Mini-Box	30
Water Samples Collected (D.O.)	19	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	15	Cores Taken, Benthos	
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	63
Water Samples Collected ( )		Bulk Centrifuge Samples, 1000ℓ	5
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)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	49
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	


83°
82°
81°
80°
79°
43°
42°
303
23
84
358
357
LAKE ERIE
BENTHIC COMMUNITY STRUCTURE
AERB STUDY 12216
STATION POSITIONS
1995 -1996 FY
14

SEDIMENT CHEMISTRY, LAKE ERIE
AERB STUDY NUMBER 12217, F. ROSA

Two cruises were carried out for Mr. F. Rosa to measure replicate profiles of sediment porewater, using conventional and new in situ dialysis chambers (peepers). Both cruises--95-01-006 and 95-01-008, were combined with regularly scheduled Benthic Community cruises (Reynoldson).

CRUISE 95-01-006

The CSS LIMNOS departed CCIW at 1000 hours on June 19 bound for Lake Erie. After a long and hot transit of the Welland Canal, the ship arrived at Pt. Colborne at 0220 hours. Due to the late hour of arrival, the TOS dive team met the ship at 0900 hours. The LIMNOS departed Pt. Colborne at 0945 hours on June 20 and returned on June 23 at 0045 hours--total of 2 days and 16 3/4 hours. The sampling for this cruise commenced at station 313 where box core samples could not be obtained due to a hard sand bottom. All other samples were collected.

The LIMNOS proceeded to stations 23, 83, 357 and 358 where all samples were collected. At station 84, a single point mooring was installed (95-01S-04A) to be used as a surface marker for the three peeper installations. Due northeast winds and 4 - 6 ft. seas the McKEE could not be used safely to support diving operations. The vessel anchored for the night. The following morning diving operations commenced.

Divers installed three single point moorings, consisting of track anchors and 1/2" poly line tied to a yellow poly ball. These moorings were installed around the spar buoy--poly ball number one to the north, number two to the east and number three to the south. The peepers were installed in the following manner: poly ball number one includes one large peeper and one small peeper. Poly ball number two includes one large peeper and one small peeper. Poly ball number three includes three of the new large peepers.

The Close Interval Water Sampler (CIWS) was deployed at station 84. Divers observed the CIWS closing and the penetration of the legs into the bottom sediments. Divers obtained underwater video of all observations.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CRUISE 95-01-006		
23	42° 30' 26"	79° 54' 10"
84	41° 56' 53"	81° 39' 33"
313	42° 42' 06"	80° 15' 58"
357	41° 49' 45"	82° 58' 20"
358	41° 53' 40"	82° 51' 57"

CRUISE 95-01-008

The CSS LIMNOS departed Port Colborne on July 10 and completed stations in the Eastern Basin of Lake Erie with all tasks being completed. Upon completion of tasks, the LIMNOS steamed overnight to station 84 where samples were collected. An attempt was made to retrieve seven peepers on three moorings that had been installed on cruise 95-01-006, June 19 - 23.

One mooring with two of the old style peepers was lost and the other two moorings were retrieved but two other old style peepers and three new style peepers were lost. The LIMNOS departed station in mid-morning on July 11 and sampled stations 357 and 358 in the Western Basin later in the day.

The LIMNOS then docked at Erieau on July 12 to await Mr. H.A. Savile, ESS, RSB, to arrive. Upon the arrival of Mr. Savile, Mr. M. de Groot, Mr. M. Stone and Ms. D. Welch returned to CCIW in the vehicle that Mr. Savile had driven to Erieau. The LIMNOS then returned to station 84 where Messrs. Hill and Savile each made a dive to the bottom to attempt a recovery of the peepers with no success. Mr. Hill made a short dive later in the evening, again with no success.

Another dive was made by both Hill and Savile on the morning of July 13, again with no success. Upon completion of the dives, the LIMNOS departed station 84 and returned to Port Colborne to end the cruise late on July 13.

Weather for the cruise was nearly perfect with light winds, sunny skies and warm temperatures.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
CRUISE 95-01-008		
23	42° 30' 00"	79° 53' 51"
84	41° 56' 28"	81° 38' 24"
303	42° 34' 05"	80° 02' 30"
357	41° 49' 39"	82° 58' 03"
358	41° 53' 47"	82° 51' 54"

On Tuesday August 1, a TOS dive team (Don, Gray and Gilroy) accompanied by Mr. F. Rosa, AERB, travelled to Fairport, Ohio. The purpose of the trip was to undertake a search for seven missing peepers at station 84 (Lake Erie). The dive launch, PINTAIL was utilized to support operations. Station 84 is located 39 km West Northwest of Fairport Harbour. Although small for mid-lake work, the PINTAIL was adequate for the task, using extra gas cans and with favourable weather conditions.

A spar buoy (number 43), launched by the LIMNOS, was used as the centre reference for the search. The Magnavox DGPS system could not be made operational in standard GPS mode. Marker buoys were installed 600 ft. from the spar for use as a visual reference while running tracklines. MURV was lowered to a level 10 feet above the bottom using a shot line. MURV was towed along the trackline by the boat, as an operator watched the TV monitor on the surface. A total of four miles of tracklines was observed within a 600 ft. radius of the spar buoy. As a last effort, two dives were made at the spar buoy using a search radius of 25, 75 and 125 ft. The search proved to be unsuccessful. All personnel returned to CCIW on Friday, August 4.

ZEBRA MUSSEL EFFECTS
AERB STUDY 12240, M.N. CHARLTON

This study was conducted to determine the effects of zebra mussels on water quality in Lake Erie.

A total of five cruises were completed to support this study during the field season--May 29 - June 2; June 26 - 29; July 17 - 21; August 28 - September 1 and September 11 - 16. 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 either deeper than 20 m or the water column was unstratified. In instances where the sampling depth extended to the substrate, 2 m above the bottom were sampled. Parameters measured were:

conductivity, pH, chlorophyll a, Seston weight, total phosphorus filtered and unfiltered, soluble reactive phosphorus, nitrate + nitrite, chlorides and silicate. At all stations west of 82° 30' 00", chlorophyll a samples were obtained from depths of 1, 3, 5, 7, 9 and bottom -1 m. Filtration was done as per GLLFAS filtration methods. EBT/transmissometer profiles, DO profiles, surface bucket temperature and Secchi disc (30 cm) observations were made.

STATION POSITIONS

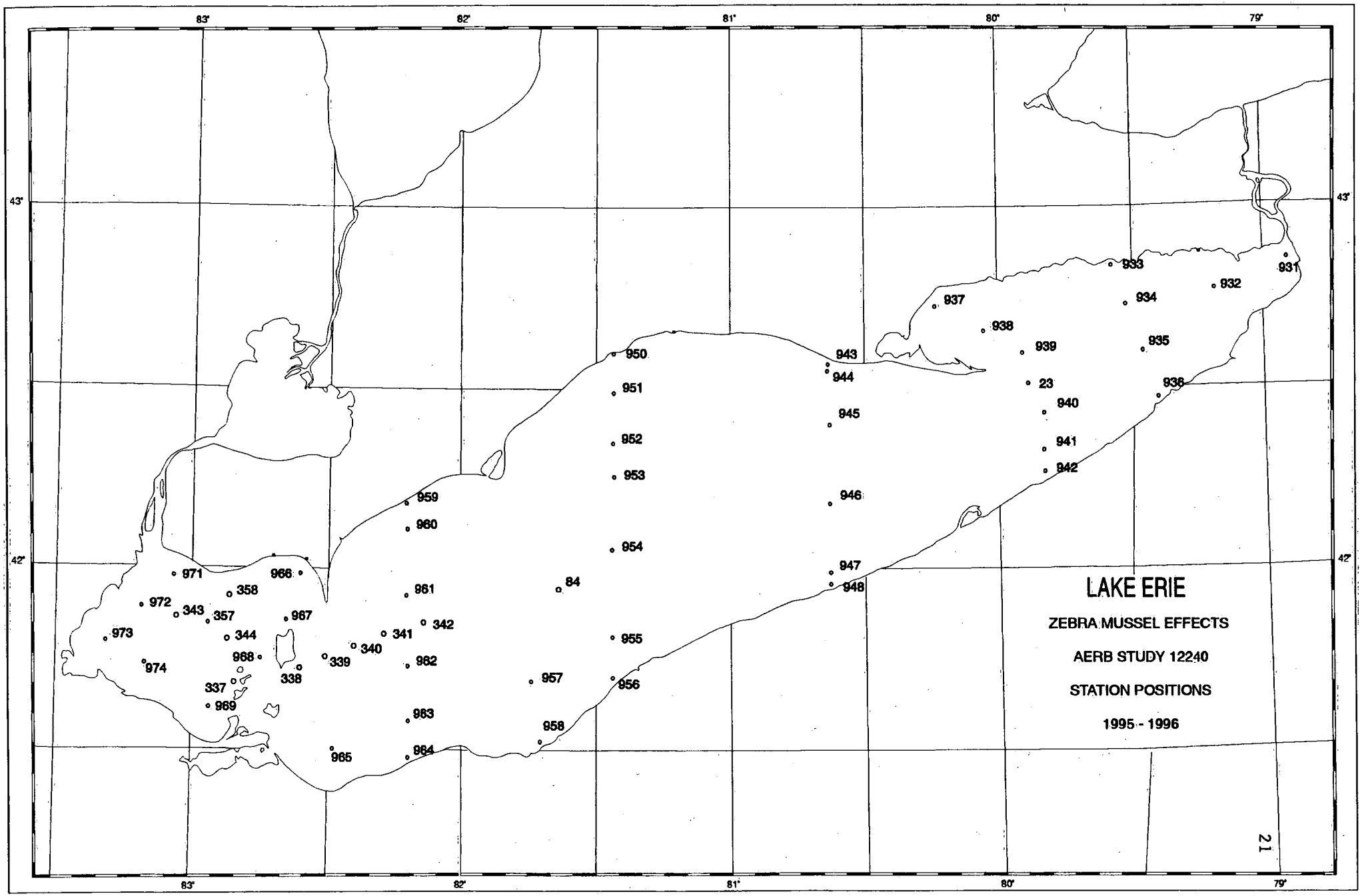
STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 06"	79° 53' 24"
84	41° 56' 06"	81° 39' 30"
337	41° 41' 00"	82° 51' 18"
338	41° 42' 00"	82° 38' 00"
339	41° 43' 42"	82° 31' 00"
340	41° 45' 24"	82° 24' 00"
341	41° 47' 06"	82° 17' 00"
342	41° 48' 48"	82° 10' 00"
343	41° 50' 48"	83° 05' 00"
344	41° 47' 00"	82° 50' 30"
357	41° 49' 36"	82° 58' 12"
358	41° 53' 39"	82° 52' 00"
931	42° 51' 00"	78° 56' 30"
932	42° 47' 30"	79° 12' 30"
933	42° 49' 30"	79° 34' 00"
934	42° 42' 30"	79° 30' 30"
935	42° 35' 30"	79° 28' 00"
936	42° 28' 30"	79° 24' 30"
937	42° 43' 00"	80° 15' 00"
938	42° 38' 00"	80° 03' 30"
939	42° 34' 00"	79° 55' 00"
940	42° 26' 30"	79° 50' 00"
941	42° 19' 30"	79° 50' 00"
942	42° 15' 30"	79° 50' 00"
943	42° 34' 30"	80° 38' 30"
944	42° 32' 00"	80° 38' 30"
945	42° 24' 00"	80° 38' 30"
946	42° 10' 00"	80° 38' 30"
947	41° 59' 30"	80° 38' 30"
948	41° 57' 24"	80° 38' 30"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
950	42° 35' 18"	81° 26' 30"
951	42° 28' 30"	81° 26' 30"
952	42° 21' 30"	81° 26' 30"
953	42° 12' 30"	81° 26' 30"
954	42° 01' 30"	81° 26' 30"
955	41° 48' 00"	81° 26' 30"
956	41° 41' 30"	81° 26' 30"
957	41° 41' 00"	81° 44' 30"
958	41° 31' 30"	81° 42' 30"
959	42° 11' 42"	82° 11' 00"
960	42° 06' 00"	82° 11' 00"
961	41° 54' 30"	82° 11' 00"
962	41° 43' 00"	82° 11' 00"
963	41° 34' 30"	82° 11' 00"
964	41° 29' 00"	82° 11' 00"
965	41° 30' 00"	82° 30' 00"
966	41° 59' 00"	82° 37' 30"
967	41° 53' 30"	82° 40' 00"
968	41° 44' 30"	82° 44' 00"
969	41° 36' 30"	82° 55' 30"
971	41° 57' 00"	83° 03' 00"
972	41° 52' 00"	83° 12' 00"
973	41° 47' 30"	83° 20' 00"
974	41° 43' 30"	83° 09' 00"

STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS
DATES FROM _____ TO _____ REGION LAKE ERIE
CRUISE TYPE ZEBRA MUSSEL EFFECTS ? N.MI. STEAMED 3518.2

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	337	Moorings Established	
EBT/Transmissometer Casts	337	Moorings Retrieved	
Rosette Casts	63	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disc Observations	138	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 110µ	46	Moorings Established	
Zooplankton Hauls, 44µ		Moorings Retrieved	
Integrator 10 m	169	Moorings Serviced	
Integrator 20 m	104	Primary Productivity Moorings	
Phytoplankton Samples	25		
D.O. Profiles	280		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini-Box	
Water Samples Collected (D.O.)	41	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	345	Cores Taken, Benthos	
Water Samples Collected (TP uf)	292	Grab Samples Taken, Shipek	58
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 a)	607		
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)	288		
Water Samples Filtered (TP f)	292		
Water Samples Filtered (Nutrients)	292		
Water Samples Filtered (Major Ions)	292	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	731
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	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LAKE ERIE
ZEBRA MUSSEL EFFECTS
AERB STUDY 12240
STATION POSITIONS
1995 - 1996
21

CONTAMINANTS IN SEDIMENTS
AERB STUDY 12246, M.E. FOX

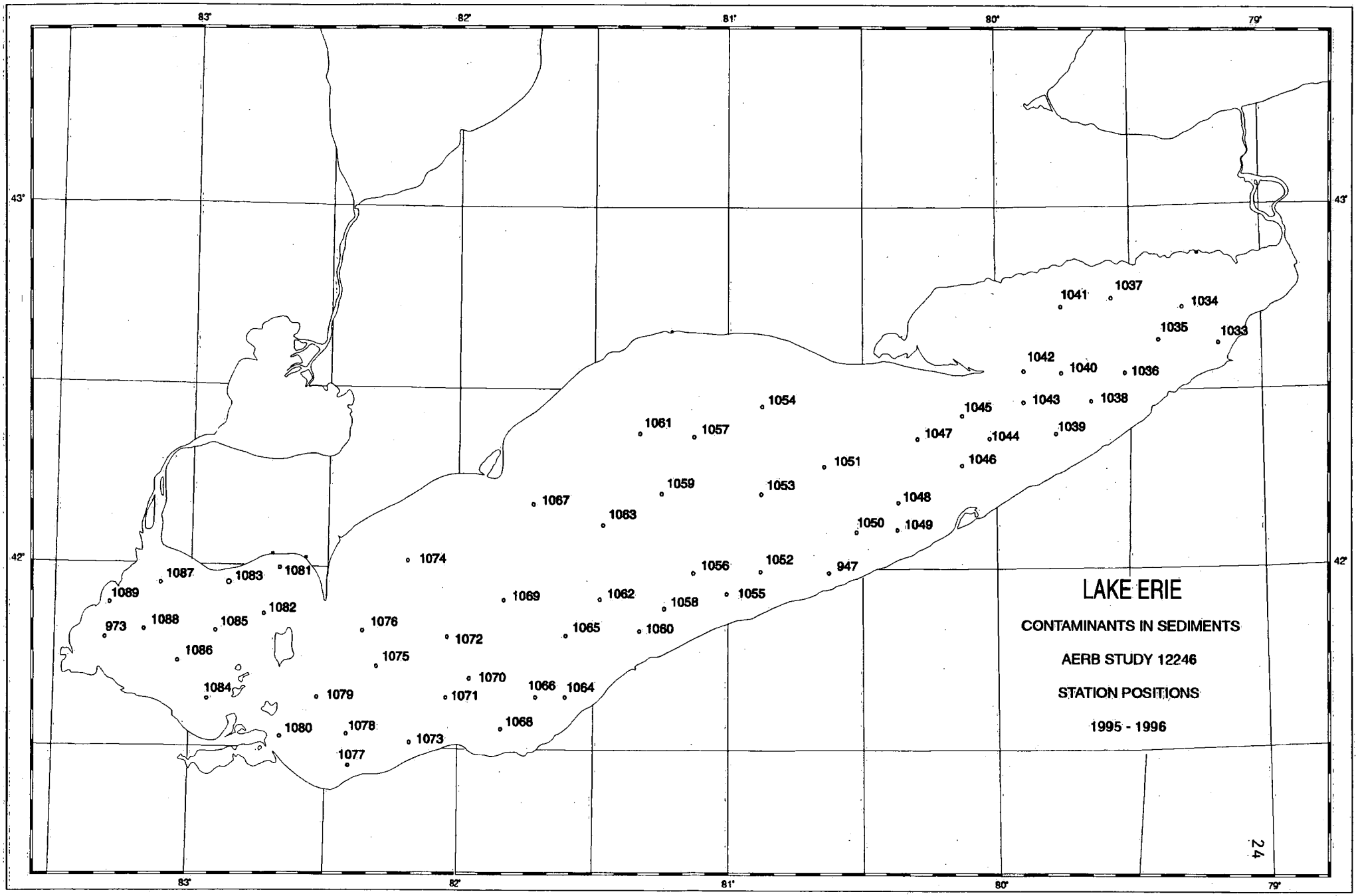
Sampling was conducted to compare with samples collected in 1971. A single Shipek sample was collected and the top 1 cm was removed with a scraper and stored in a glass container at 4°C.

Fifty-nine stations were sampled in Lake Erie from August 28 to October 21. This sampling was piggybacked on cruises 95-01-013, 95-01-014 and 95-01-015. All sampling was piggybacked on M.N. Charlton cruises on the CSS LIMNOS and all statistics were included on sheets for those cruises.

STATION POSITIONS

STATION NUMBER	FOX NUMBER	LATITUDE N.	LONGITUDE W.
947	G-24	41° 59' 30"	80° 38' 27"
973	U-39	41° 47' 32"	83° 19' 58"
1033	N-36	42° 37' 13"	79° 10' 12"
1034	D-35	42° 42' 43"	79° 16' 36"
1035	N-34	42° 37' 21"	79° 24' 51"
1036	M-33	42° 32' 08"	79° 32' 20"
1037	O-33	42° 42' 48"	79° 32' 06"
1038	L-32	42° 26' 51"	79° 39' 46"
1039	K-31	42° 21' 27"	79° 47' 13"
1040	M-31	42° 32' 06"	79° 47' 01"
1041	O-31	42° 43' 10"	79° 46' 42"
1042	M-30	42° 32' 17"	79° 54' 27"
1043	L-30	42° 26' 57"	79° 54' 17"
1044	K-29	42° 21' 36"	80° 01' 38"
1045	L-28	42° 27' 01"	80° 08' 55"
1046	J-28	42° 16' 18"	80° 09' 03"
1047	K-27	42° 21' 40"	80° 16' 23"
1048	I-26	42° 10' 57"	80° 23' 38"
1049	H-26	42° 05' 34"	80° 23' 45"
1050	H-25	42° 05' 36"	80° 30' 58"
1051	J-24	42° 16' 28"	80° 38' 12"
1052	G-22	42° 00' 14"	80° 52' 39"
1053	I-22	42° 11' 04"	80° 52' 35"
1054	L-22	42° 27' 08"	80° 52' 45"
1055	F-21	41° 54' 49"	80° 59' 55"

STATION NUMBER	FOX NUMBER	LATITUDE N.	LONGITUDE W.
1056	G-20	42° 00' 12"	81° 07' 10"
1057	K-20	42° 21' 51"	81° 07' 24"
1058	F-19	41° 54' 50"	81° 14' 26"
1059	I-19	42° 11' 04"	81° 14' 30"
1060	E-18	41° 49' 24"	81° 21' 39"
1061	K-18	42° 21' 48"	81° 21' 48"
1062	F-17	41° 54' 42"	81° 28' 58"
1063	H-17	42° 05' 35"	81° 29' 02"
1064	C-16	41° 38' 28"	81° 36' 10"
1065	E-16	41° 49' 16"	81° 36' 02"
1066	C-15	41° 38' 34"	81° 43' 19"
1067	I-15	42° 10' 53"	81° 43' 30"
1068	B-14	41° 33' 00"	81° 50' 18"
1069	F-14	41° 54' 32"	81° 50' 39"
1070	D-13	41° 43' 48"	81° 57' 38"
1071	C-12	41° 38' 24"	82° 04' 59"
1072	E-12	41° 49' 09"	82° 05' 03"
1073	B-11	41° 32' 44"	82° 11' 56"
1074	G-11	41° 59' 44"	82° 12' 27"
1075	D-10	41° 43' 24"	82° 19' 24"
1076	E-10	41° 48' 51"	82° 19' 30"
1077	A-9	41° 27' 16"	82° 26' 12"
1078	B-9	41° 32' 42"	82° 26' 14"
1079	C-8	41° 37' 56"	82° 33' 40"
1080	B-7	41° 32' 31"	82° 40' 39"
1081	G-7	41° 59' 32"	82° 41' 26"
1082	V-44	41° 51' 18"	82° 44' 48"
1083	W-43	41° 56' 26"	82° 52' 13"
1084	C-5	41° 37' 28"	82° 55' 14"
1085	E-5	41° 48' 28"	82° 55' 32"
1086	D-4	41° 42' 51"	83° 02' 29"
1087	W-41	41° 56' 24"	83° 06' 42"
1088	E-3	41° 48' 11"	83° 10' 03"
1089	F-2	41° 53' 25"	83° 17' 20"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LAKE ERIE
CONTAMINANTS IN SEDIMENTS
AERB STUDY 12246
STATION POSITIONS
1995 - 1996

ZEBRA MUSSEL QUANTIFICATION
AERB STUDY 12247, DR. J.P. COAKLEY

One cruise was carried out onboard the CSS LIMNOS, August 21 - 25 to support this project.

Sampling was carried out in Lake Erie for the purpose of collecting sediment and water samples for I^{29} tracer research. In the Western Basin, diver support and underwater video was used to verify zebra mussel counts.

Additional support was given this project in Hamilton Harbour where twenty-foot piston cores were collected for pore water analyses.

STATION POSITIONS

ZEBRA MUSSEL QUANTIFICATION

STATION NUMBER	AERB ID NO.	LATITUDE N.	LONGITUDE W.
1024	L-30	42° 26' 42"	79° 54' 18"
1025	D-15	41° 43' 54"	81° 43' 18"
1026	Erie-C	41° 58' 34"	82° 51' 26"
1026A	Erie-C	41° 56' 35"	82° 51' 23"
1027	Zebra	41° 49' 45"	82° 51' 58"
1028	U-42	41° 45' 42"	82° 59' 06"
1029	PIPPE	41° 49' 08"	82° 35' 21"
1030		42° 38' 38"	79° 56' 42"
1031	Erie-58	41° 56' 31"	82° 52' 24"
1032		41° 57' 27"	82° 56' 44"

PISTON CORE STATION POSITIONS

HAMILTON HARBOUR

STATION NUMBER	LATITUDE N.	LONGITUDE W.
660	43° 16' 42"	79° 52' 49"
661	43° 16' 49"	79° 51' 49"
662	43° 17' 34"	79° 49' 54"
663	43° 17' 55"	79° 49' 42"
851	43° 16' 59"	79° 48' 36"
852	43° 16' 38"	79° 50' 16"
853	43° 16' 43"	79° 50' 16"
894	43° 17' 25"	79° 48' 30"
898	43° 17' 28'	79° 48' 37"

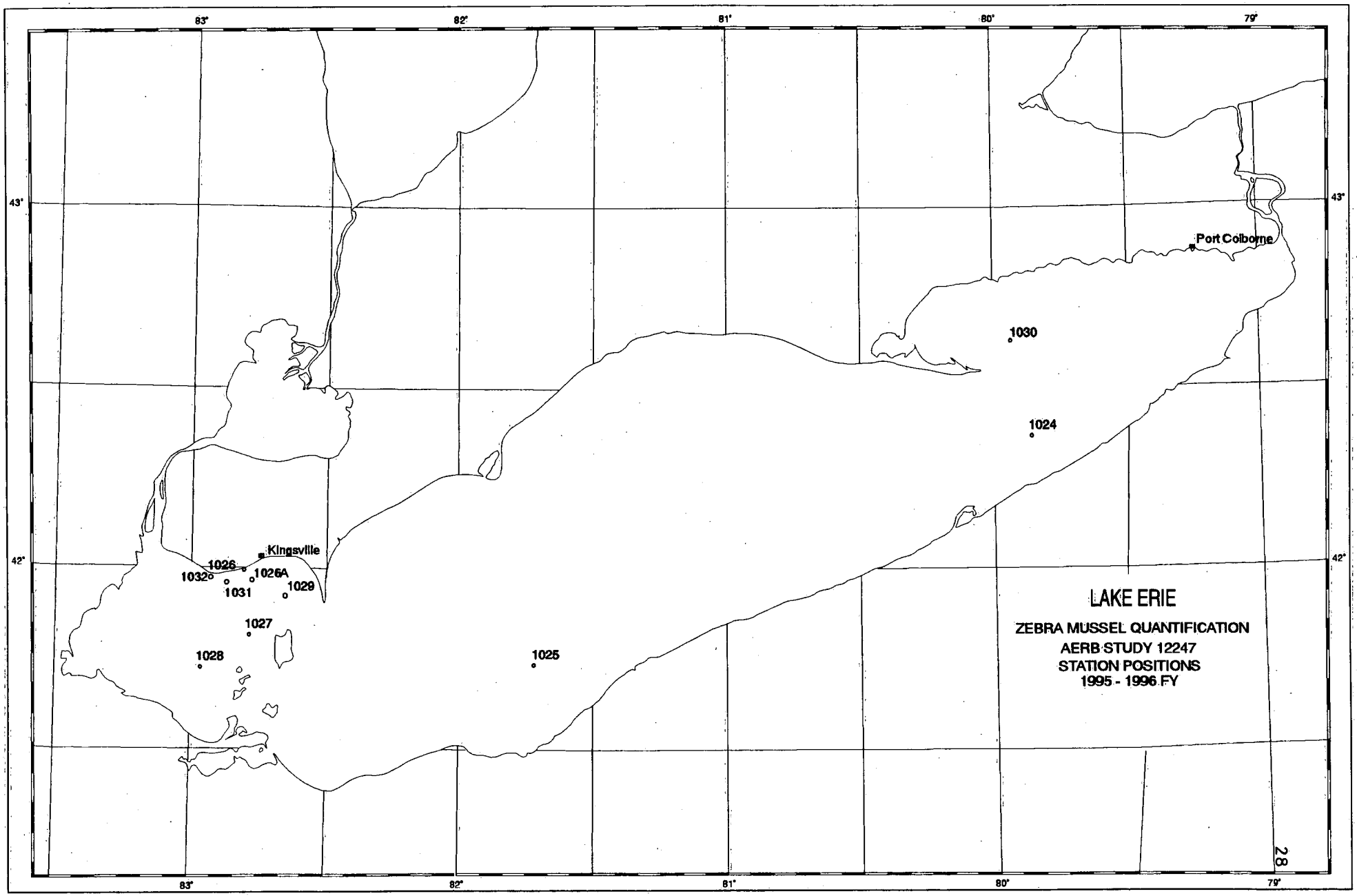
STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS

DATES FROM _____ TO _____ REGION LAKE ERIE

CRUISE TYPE ZEBRA MUSSEL QUANTIFICATION N.MI. STEAMED 343.9

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	14	Moorings Established	
EBT/Transmissometer Casts	14	Moorings Retrieved	
Rosette Casts	9	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disc Observations	5	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 110µ		Moorings Established	
Zooplankton Hauls, 44µ		Moorings Retrieved	
Integrator 10 m		Moorings Serviced	
Integrator 20 m		Primary Productivity Moorings	
Phytoplankton Samples			
D.O. Profiles	14		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)		Cores Taken, Mini-Box	9
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)		Cores Taken, Benthos	7
Water Samples Collected (TP uf)		Grab Samples Taken, Shipek	4
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 a)			
Water Samples Filtered (POC/TPN)			
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)			
Water Samples Filtered (Nutrients)			
Water Samples Filtered (Major Ions)		**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	5
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	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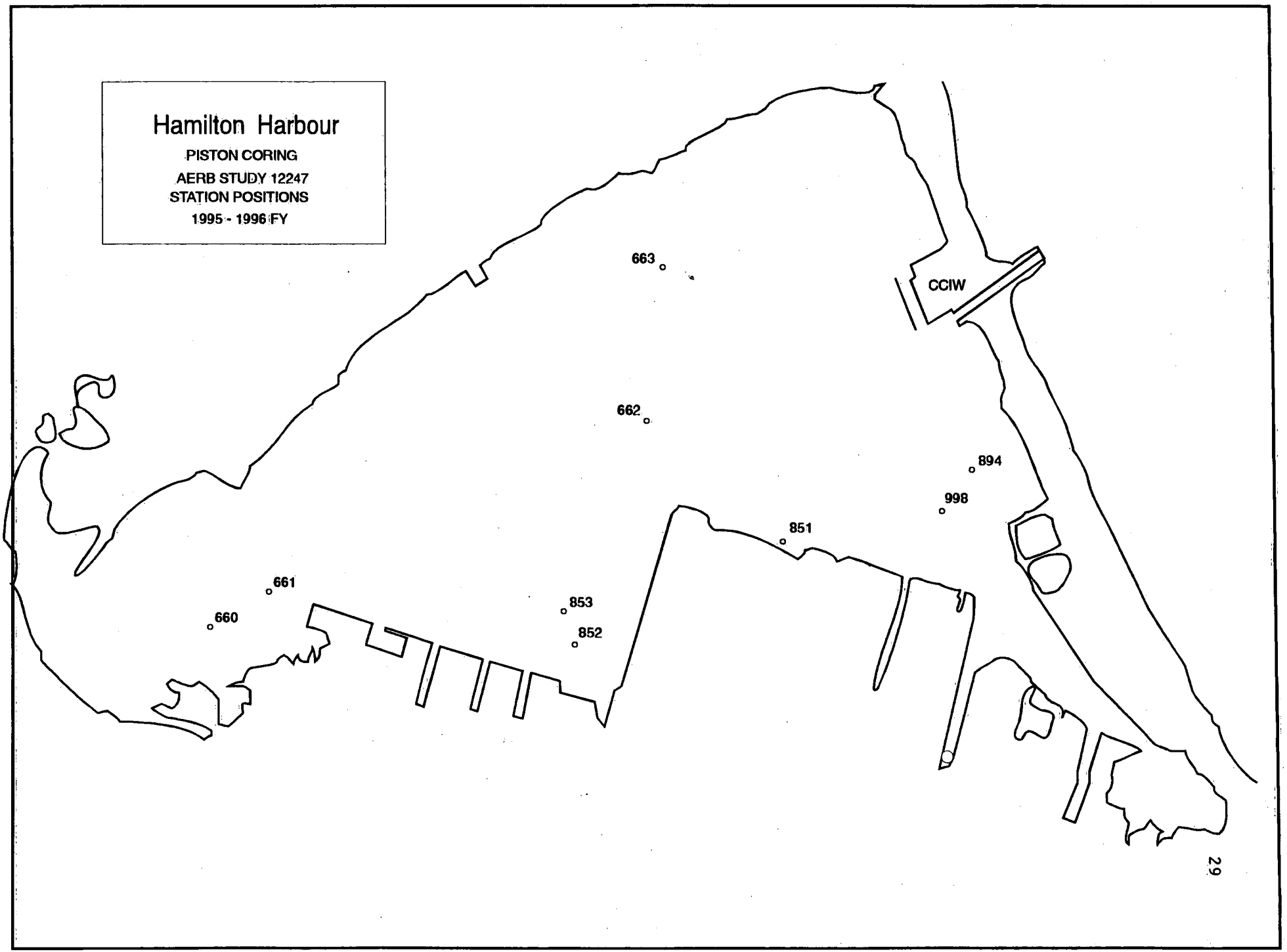
LAKE ERIE
ZEBRA MUSSEL QUANTIFICATION
AERB STUDY 12247
STATION POSITIONS
1995 - 1996 FY


Hamilton Harbour
PISTON CORING
AERB STUDY 12247
STATION POSITIONS
1995 - 1996 FY
663
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852

IMPACT OF UV-B ON AQUATIC COMMUNITIES, LAKE ERIE
AECB STUDY 12380, DR. D.R.S. LEAN

This study was again supported with one cruise on the CSS LIMNOS on Lake Erie, July 24 - 28. The work was multidisciplinary and included scientists from universities of Waterloo, Trent and INRS-Eau, Quebec, working in support of the Green Plan Initiative on environmental effects of increased UV-B resulting from stratospheric ozone depletion. This project studied the influence of ultraviolet light (especially that in the UV-B region 280 - 320 nm) on biological and geochemical ecosystem processes. The hypothesis was tested that UV-B penetrates to only shallow depths; therefore, large lakes would not be impacted.

Parameters collected included EBT/transmissometer profiles, fluorometer/CTD/O^2 profiles, DO profiler profiles, global solar radiation, surface bucket temperature, Secchi disc (30 cm), in situ C-14 primary production rates, trace metal regeneration, total phosphorus (filtered and unfiltered), nutrients, major ions, POC, chlorophyll a, primary production as a function of irradiance, sampling depth and solar ultraviolet radiation exposure.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
23	42° 30' 36"	79° 53' 46"
84	41° 56' 58"	81° 35' 55"

LAKE ERIE TROPHIC TRANSFER
UNIVERSITY OF TORONTO, DR. G. SPRULES
GLLFAS, DR. M. MUNAWAR, DR. O.E. JOHANNSSON, E.S. MILLARD, R.M. DERMOTT
RSB STUDY 12631, P.M. HEALEY

This was the fourth year of a multi-year, major multi-trophic initiative proposed to characterize the Lake Erie ecosystem at different trophic levels, including the zebra mussel invasion. This project plans to simultaneously estimate (for the first time) the biomass of all pelagic organisms from bacteria to fish on a lake-wide basis. The results will: a) provide important baseline information about the status of Lake Erie; b) provide a basis of computing estimates of growth and production of all component organisms; c) permit a rigorous test of particle size theory; d) contribute directly to the management of fish stocks in Lake Erie; e) assess the impact of the zebra mussel on the Lake Erie ecosystem.

One cruise was carried out onboard the CSS LIMNOS to support this project. A spring cruise May 8 - 19 was completed.

Seven transects were distributed across Lake Erie, with six additional stations between transects, consisting of 44 stations in total. Transects 1 and 2 were located in the Western Basin, transects 3, 4 and 5 were located in the Central Basin and transects 6 and 7 were located in the Eastern Basin.

Parameters sampled during the cruise were: EBT/transmission profiles, SeaBird oxygen profiles, pH, conductivity, chlorophyll a, particulate organic carbon, particulate organic nitrogen, total phosphorus, total filtered phosphorus, soluble reactive phosphorus, nitrate + nitrite, chlorides, dissolved inorganic carbon, silicate, primary productivity, ^{32}P-kinetics, phytoplankton, ciliates, microbial loop (bacteria, autotrophic picoplankton), size fractionated primary productivity, quantum meter light profiles, Secchi disk, zooplankton, towed acoustics and fluorometer system, bottom and mid-water fish trawls, PONAR grab samples and mini box core samples.

The study leader for this program was Dr. G. Sprules, University of Toronto, through NSERC funding. Other agencies involved in this study were Department of Environment, Department of Fisheries & Oceans, State University of New York.

STATION POSITIONS

LAKE ERIE TROPHIC TRANSFER

STATION NUMBER	LATITUDE N.	LONGITUDE W.
931	42° 51' 00"	78° 56' 30"
932	42° 47' 30"	79° 12' 30"
933	42° 49' 30"	79° 34' 00"
934	42° 42' 30"	79° 30' 30"
935	42° 35' 30"	79° 28' 00"
936	42° 28' 30"	79° 24' 30"
937	42° 43' 00"	80° 15' 00"
938	42° 38' 00"	80° 03' 30"
939	42° 34' 00"	79° 55' 00"
940	42° 26' 30"	79° 50' 00"
941	42° 19' 30"	79° 50' 00"
942	42° 15' 30"	79° 50' 00"
943	42° 34' 30"	80° 38' 30"
944	42° 32' 00"	80° 38' 30"
945	42° 24' 00"	80° 38' 30"
946	42° 10' 00"	80° 38' 30"
947	41° 59' 30"	80° 38' 30"
948	41° 57' 24"	80° 38' 30"
950	42° 35' 18"	81° 26' 30"
951	42° 28' 30"	81° 26' 30"

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

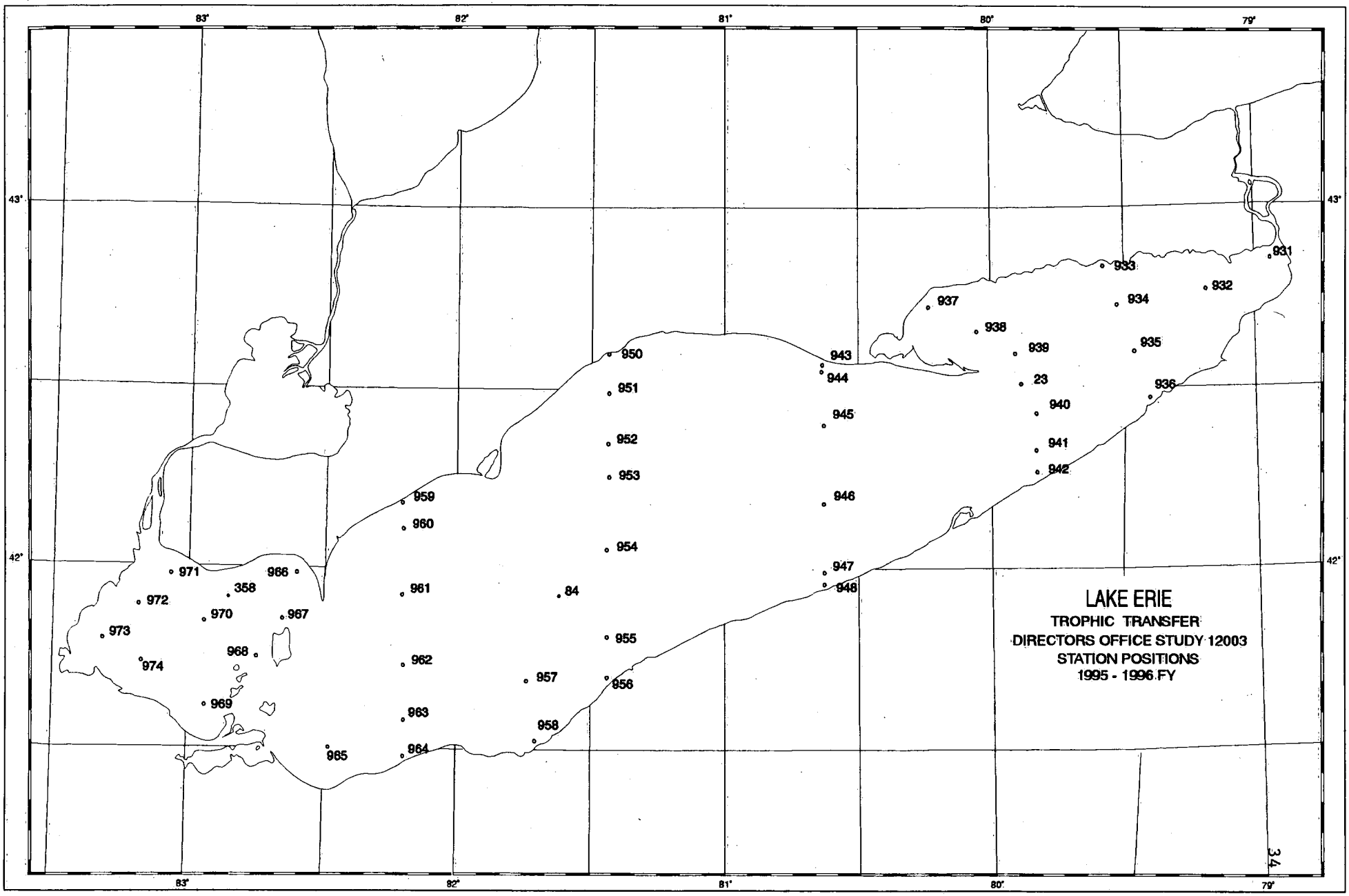
STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS

DATES FROM _____ TO _____ REGION LAKE ERIE

CRUISE TYPE TROPHIC TRANSFER N.MI. STEAMED 991.4

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	62	Moorings Established	
EBT/Transmissometer Casts	62	Moorings Retrieved, ODAS	1
Rosette Casts	1	Moorings Established	
Reversing Thermometer Obs. (No. of Therm)		Moorings Retrieved	
Secchi Disc Observations	43	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 110µ	17	Moorings Established	
Zooplankton Hauls, 40µ	15	Moorings Retrieved	
Integrator 10 m	16	Moorings Serviced, Hydrolab	1
Integrator 20 m	26	Primary Productivity Moorings	
Phytoplankton Samples	84		
Ciliate Samples	42		
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)	42	Cores Taken, Mini-Box	
Water Samples Collected (D.O.)		Cores Taken, Piston	
Water Samples Collected (Cond/pH)	42	Cores Taken, Benthos	
Water Samples Collected (TP uf)	42	Grab Samples Taken, Shipek	
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected ( )		Microbial Loop Samples	42
Water Samples Collected ( )		Primary Productivity	42
Water Samples Collected ( )		Size Fractionated Primary Productivity	42
Water Samples Filtered (Chlorophyll a)	140	Bottom Trawl	17
Water Samples Filtered (POC/TPN)	42	Acoustic and OPC Tows, Miles Steamed	153.7
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	42		
Water Samples Filtered (Nutrients)	42		
Water Samples Filtered (Major Ions)	42	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)		Manual Chemistry, Tech. Ops.	84
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	
Water Samples Filtered ( )		Microbiology	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LAKE ERIE
TROPHIC TRANSFER
DIRECTORS OFFICE STUDY 12003
STATION POSITIONS
1995 - 1996 FY

OPEN LAKES SURVEILLANCE

ENVIRONMENTAL CONSERVATION BRANCH, ONTARIO REGION, ECOSYSTEM HEALTH DIVISION,
S. L'ITALIEN
RSB STUDY 12632, B.H. MOORE

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

Three cruises were conducted--April 24 - 28, August 14 - 18 and October 16 - 21, to support this program. All cruises were organized and completed by Technical Operations personnel for EHD, ECB-OR and were conducted from the CSS LIMNOS. The vessel was equipped with the usual equipment: EBT, rosette water sampler, transmissometer, radar, Loran C and GPS positioning systems and a variety of samplers and winches used for chemical and biological sampling.

The parameters sampled during both 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, nitrite and nitrate, ammonia, reactive silicate, major ions, alkalinity, meteorological and Secchi disc observations.

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

Unstratified Conditions: 1 metre, 10 metres, 25 metres, bottom -10 metres and bottom -2 metres

Stratified Conditions: 1 metre, 1 metre above the knee of the thermocline, mid-thermocline, 1 metre below the thermocline, bottom -10 metres or mid- hypolimnion and bottom -2 metres

Some of the additional tasks performed during the cruises were: vertical zooplankton and rotifer net hauls for Dr. O. Johannsson, GLLFAS; chlorophyll samples for Mr. S. Millard, GLLFAS; the installation of dissolved oxygen logger moorings for Dr. T. Reynoldson, AERB Study 12216.

SURVEILLANCE STATION POSITIONS

LAKE ERIE

STATION NUMBER	L'ITALIEN NUMBER	LATITUDE N.	LONGITUDE W.
879	23	42° 30' 25"	79° 53' 59"
880	84	41° 56' 09"	81° 39' 16"
881	213	41° 58' 08"	83° 12' 30"
882	215	41° 44' 02"	83° 23' 08"
885	268	41° 31' 10"	82° 38' 27"
886	9	42° 32' 18"	79° 37' 00"
887	10	42° 48' 48"	79° 41' 30"
888	37	42° 06' 36"	81° 34' 30"
889	38	42° 16' 54"	81° 40' 18"
931	228	42° 51' 00"	78° 56' 30"
932		42° 47' 30"	79° 12' 30"
933	227	42° 49' 30"	79° 34' 00"
934		42° 42' 30"	79° 30' 30"
935		42° 35' 30"	79° 28' 00"
936		42° 28' 30"	79° 24' 30"
937		42° 43' 00"	80° 15' 00"
938		42° 38' 00"	80° 03' 30"
939		42° 34' 00"	79° 55' 00"
940		42° 26' 30"	79° 50' 00"
941		42° 19' 30"	79° 50' 00"
942		42° 15' 30"	79° 50' 00"
943		42° 34' 30"	80° 38' 30"
944		42° 32' 00"	80° 38' 30"
945		42° 24' 00"	80° 38' 30"
946		42° 10' 00"	80° 38' 30"
947		41° 59' 30"	80° 38' 30"
948		41° 57' 24"	80° 38' 30"
949	221	42° 15' 00"	81° 06' 30"
950		42° 35' 18"	81° 26' 30"
951		42° 28' 30"	81° 26' 30"
952		42° 21' 30"	81° 26' 30"
953		42° 12' 30"	81° 26' 30"
954		42° 01' 30"	81° 26' 30"
955		41° 48' 00"	81° 26' 30"
956		41° 41' 30"	81° 26' 30"

STATION NUMBER	L'ITALIEN NUMBER	LATITUDE N.	LONGITUDE W.
957		41° 41' 00"	81° 44' 30"
958		41° 31' 30"	81° 42' 30"
959		42° 11' 42"	82° 11' 00"
960		42° 06' 00"	82° 11' 00"
961		41° 54' 30"	82° 11' 00"
962		41° 43' 00"	82° 11' 00"
963		41° 34' 30"	82° 11' 00"
964		41° 29' 00"	82° 11' 00"
965		41° 30' 00"	82° 30' 00"
966		41° 59' 00"	82° 37' 30"
967		41° 53' 30"	82° 40' 00"
968		41° 44' 30"	82° 44' 00"
969		41° 36' 30"	82° 55' 30"
970	357	41° 49' 30"	82° 58' 30"
971		41° 57' 00"	83° 03' 00"
972		41° 52' 00"	83° 12' 00"
973		41° 47' 30"	83° 20' 00"
974		41° 43' 30"	83° 09' 00"

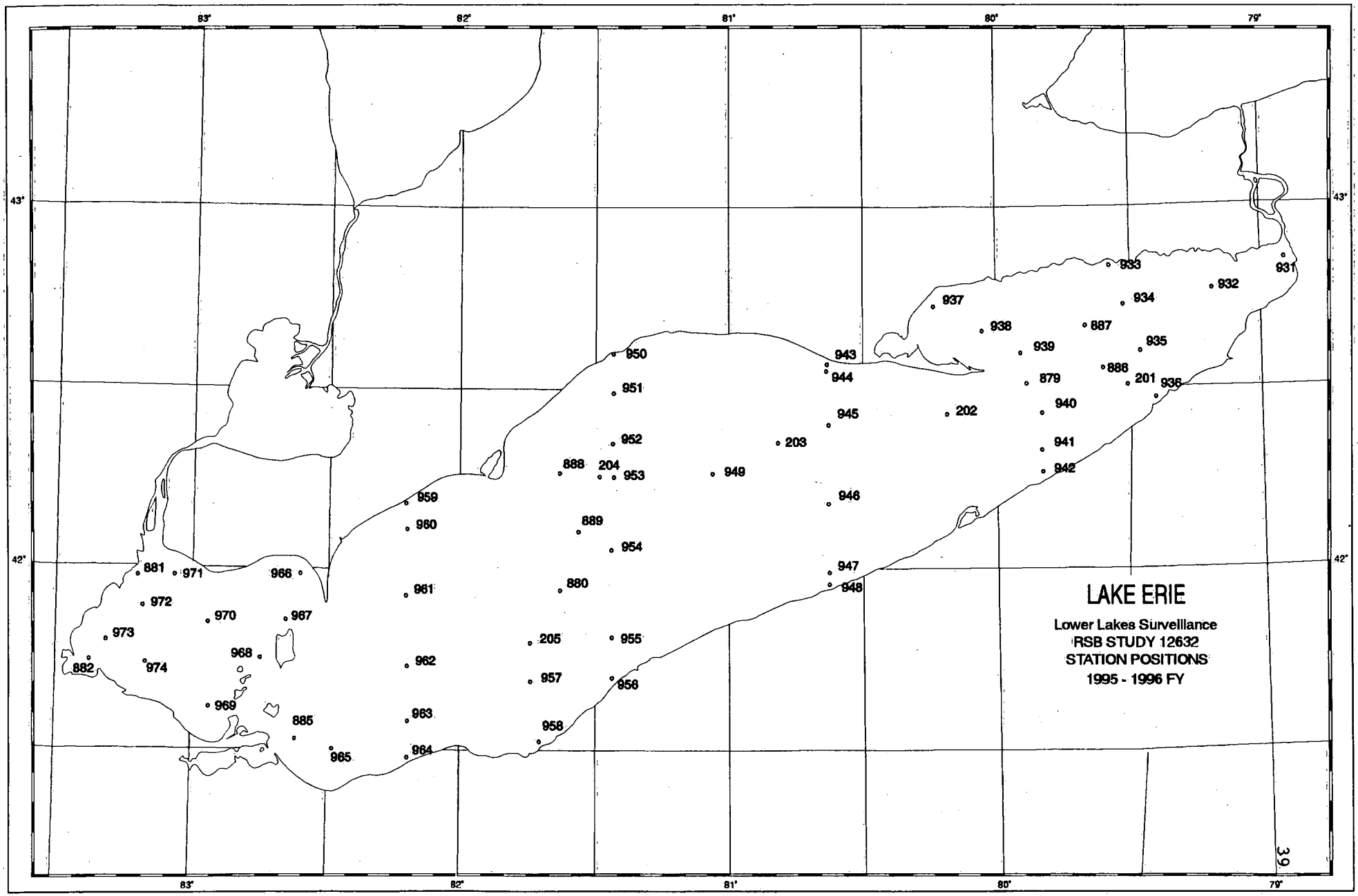
STATISTICS SUMMARY

CRUISE NO. _____ SHIP CSS LIMNOS

DATES FROM _____ TO _____ REGION LAKE ERIE

CRUISE TYPE LOWER LAKES SURVEILLANCE N.MI. STEAMED 2190.6

DESCRIPTION	TOTAL	DESCRIPTION	TOTAL
Stations Occupied	155	Moorings Established Hydrolab	3
EBT/Transmissometer Casts	156	Moorings Retrieved Hydrolab	6
Rosette Casts	100	Moorings Established Marker	1
Reversing Thermometer Obs. (No. of Therm)	20	Moorings Retrieved Marker	1
Secchi Disc Observations	66	Moorings Established	
Transmissometer Casts		Moorings Retrieved	
Zooplankton Hauls, 110μ	24	Moorings Established	
Zooplankton Hauls, 44μ		Moorings Retrieved	
Integrator 10 m	62	Moorings Serviced	
Integrator 20 m	89	Primary Productivity Moorings	
Phytoplankton Samples	10		
D.O. Profiles			
Water Samples Collected (Microbiology)		Cores Taken, Box	
Water Samples Collected (Water Quality)	621	Cores Taken, Mini-Box	8
Water Samples Collected (D.O.)	432	Cores Taken, Piston	
Water Samples Collected (Cond/pH)	432	Cores Taken, Benthos	1
Water Samples Collected (TP uf)	446	Grab Samples Taken, Shipek	5
Water Samples Collected (TKN)		Grab Samples Taken, PONAR	
Water Samples Collected (Suspended Solid)	34	Bulk Centrifuge Samples 1000-3000ℓ	31
Water Samples Collected (Phenxoy Acid)	22		
Water Samples Collected (I^{29})	3	Observations, Weather	20
Water Samples Filtered (Chlorophyll a)	180		
Water Samples Filtered (POC/TPN)	228		
Water Samples Filtered (Seston)			
Water Samples Filtered (TP f)	446		
Water Samples Filtered (Nutrients)	446		
Water Samples Filtered (Major Ions)	446	**ONBOARD ANALYSIS**	
Water Samples Filtered (DOC)	22	Manual Chemistry, Tech. Ops.	1296
Water Samples Filtered ( )		Nutrients, EHD, ECB-OR	249
Water Samples Filtered ( )		Microbiology	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LAKE ERIE
Lower Lakes Surveillance
RSB STUDY 12632
STATION POSITIONS
1995 - 1996 FY

CSS LOUIS M LAUZIER
1995

1995 JANUARY

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

FEBRUARY

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

MARCH 1995

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

APRIL

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

MAY

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

JUNE

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

JULY

SUN	MON	TUE	WED	THUR	FRI	SAT
						1
2	3	4	5	6	7	8
9	10 L. Ontario Trophic Transfer L. Ontario Bioindex Quinte	11	12	13	14	15
16 Lake	17 Ontario	18 Trophic transfer	19	20	21 Lake Ontario L. Ontario Bioindex	22
23 Lott / 30	24 Lott / 31	25 L. Ontario Trophic Transfer L. Ontario Bioindex Quinte	26	27	28	29

AUGUST

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

SEPTEMBER

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

OCTOBER

SUN	MON	TUE	WED	THUR	FRI	SAT
1	2 L. Ontario Bioindex Quinte	3	4	5	6	7
8	9	10 L. Ontario Trophic Transfer L. Ontario Bioindex	11	12	13	14
15	16	17 L. Ontario Trophic Transfer L. Ont L. Ontario Bioindex Quinte	18	19	20	21
	23 ario Trophic Transfer L. Ontario Bioindex	24	25	26 L. Ont	27	28
29	30	31				

NOVEMBER

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

DECEMBER

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

CSS LOUIS M. LAUZIER

LAKE ONTARIO

LONG TERM BIOLOGICAL INDEX MONITORING
GLLFAS PROJECT 9011, DR. O.E. JOHANNSSON
RSB STUDY 12632, B.H. MOORE

In 1978, the International Joint Commission accepted a broader definition of lake health encompassing all components of the ecosystem. The Long Term Biological Index Monitoring Program was initiated in 1981 to provide time-intensive chemical and biological data on selected stations in Lake Ontario for long-term monitoring of the biological community and physical/chemical environment. The program is aimed at regularly sampling the open water pelagic and benthic communities and providing input to an integrated Lake Ontario Biological Monitoring Program.

Twenty-five cruises were completed by the research vessel, CSS LOUIS M. LAUZIER. The first cruise commenced the week of April 19 and the final cruise ended November 3.

Biological and chemical data were collected from the two major Bioindex stations (41 and 81). Biological work included the collection of integrated water samples and temperature-related specific depth samples for phytoplankton, chlorophyll a, particulate organic carbon, particulate organic nitrogen, ash-free weight and the collection of zooplankton net hauls. A pump sampling system was used to collect zooplankton from a known volume of water at specific depths to augment the net haul samples. Primary productivity and phosphorus kinetics studies were carried out at each station. On station 41, two deep hypolimnetic closing zooplankton net hauls were done at four-week intervals and four replicate hauls for Mysis reticulata were completed after dark on a monthly basis. The chemical parameters included the basic manual lab work of dissolved oxygen measurement, pH, conductivity and the processing of water samples for water quality analysis.

LAKE ONTARIO TROPHIC TRANSFER
UNIVERSITY OF TORONTO, DR. G. SPRULES
GLLFAS, DR. M. MUNAWAR, DR. O.E. JOHANNSSON, E.S. MILLARD, R.M. DERMOTT
STATE UNIVERSITY OF NEW YORK, BUFFALO, DR. S. BRANT, G. JOHNSON
RSB STUDY 12631, S.B. SMITH

This project is an ongoing multidisciplinary and international initiative to characterize the Lake Ontario ecosystem by examining its biological structure at different trophic levels. The results will provide important baseline information about the status of Lake Ontario and contribute input to a geographic information system database.

Two cruises to support this study were carried out onboard the CSS LOUIS M. LAUZIER--one in the summer (July 10-28) and one in the fall (October 12, October 17-November 3). Benthic sampling was done during the fall cruise only. Six transects were distributed across Lake Ontario with a total of 54 stations.

Intensive acoustic and optical plankton counting work was completed on a site off Toronto where a grid-shaped track was followed for 24 hours.

Parameters sampled during the cruises were: EBT/transmission profiles, pH, conductivity, chlorophyll a, particulate organic carbon, particulate organic nitrogen, total phosphorus, total filtered phosphorus, soluble reactive phosphorus, nitrate and nitrite, chlorides, dissolved inorganic carbon, silicate, primary productivity, ^{32}p-kinetics, phytoplankton, ciliates, microbial loop (bacteria, autotrophic picoplankton), size fractionated primary productivity, quantum meter light profiles, surface light reflection and attenuation, fish, zooplankton and phytoplankton taxonomy and distribution and Secchi disk readings. A towed multifrequency acoustics and optical plankton counter/fluorometer system was towed along the transects and one mysid net haul was taken at designated stations at night. The acoustics survey was combined with aimed midwater and bottom trawls. PONAR samples were obtained at 44 stations for a benthic survey. At each LOTT station, a metered zooplankton haul was taken from 20 metres to the surface or bottom minus two metres.

The study leader of this program was Dr. G. Sprules, University of Toronto. Other agencies involved were the Department of Environment, Department of Fisheries & Oceans, Buffalo State University and University of Wisconsin.

QUINTE PROJECT
GLLFAS PROJECT 9018, E.S. MILLARD
RSB STUDY 12631, S.B. SMITH

The Project Quinte sampling program began the week of May 1. Four stations in the Bay of Quinte were sampled in support of GLLFAS on a biweekly basis. The stations located near Trenton and Glenora were omitted this year due to lack of funds for sample analysis. This work is a continuation of the long-term monitoring program carried out since 1972 for Project Quinte. The four stations are: B (Belleville), N (Desoronto), HB (Hay Bay) and C (Conway). Typical sampling of these stations included a temperature/depth profile, a transmissometer cast and an integrated water sample for chlorophyll a, particulate organic carbon, water quality and seston. A multi-parameter Hydrolab profile, a light extinction profile and primary productivity and P kinetics experiments were done. Zooplankton samples were collected using a Schindler-Patalas trap. At all stations, water samples were collected for the Ministry of the Environment, including samples for metals, reactive soluble phosphorus, algae and nutrients. The final Quinte cruise was completed during the week of October 2.

ADDITIONAL TASKS

During the last weeks of May, July and September, Dr. Johannsson and staff from Cornell University conducted 24-hour experiments at station 41 to study mysid feeding and nighttime behaviour. A benthic sled was used to collect live samples and two acoustic transducers were deployed during the night to record the ascent and descent rate of the population through the water column.

Each month, zooplankton samples were collected for the Ontario Ministry of Natural Resources at stations located at Van Wagner's Beach, Cobourg, Long Point and Wellington.

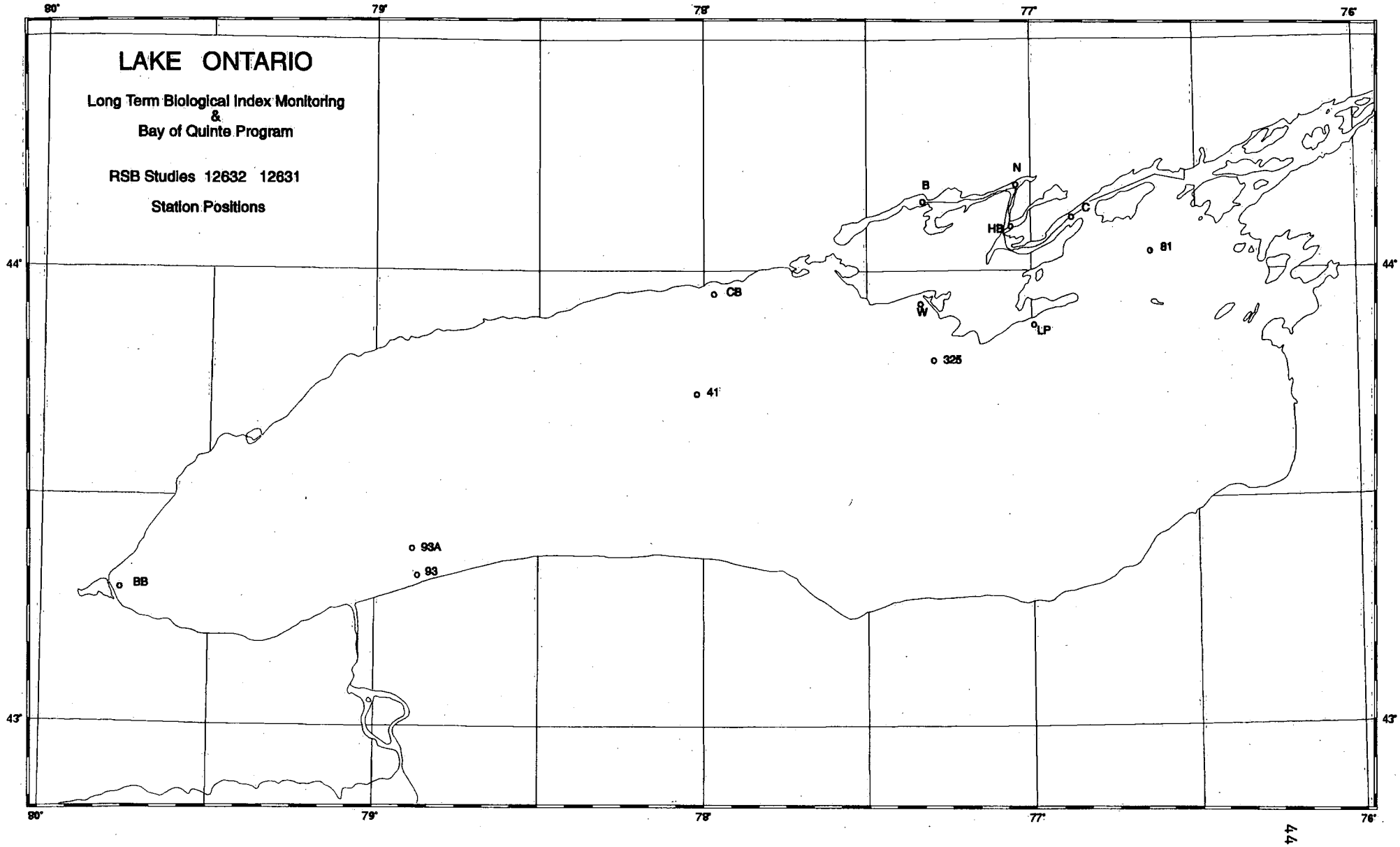
A wave rider buoy was launched from June 28 until October 12 at station 325 for Dr. B. Kerman of AES.

Throughout the season, zooplankton and bulk water samples were collected at stations 41 and 81 for M. Leggett, GLLFAS carbon isotope study.

Benthic samples were collected on three occasions for R.M. Dermott, GLLFAS from Lake Ontario stations 41, 81A, 93, 93A.

STATION POSITIONS

STATION NUMBER	PROJECT	LATITUDE N.	LONGITUDE W.
41	Bioindex	43° 43' 00"	78° 01' 36"
81	Bioindex	44° 01' 00"	76° 40' 18"
B	Quinte	44° 09' 02"	77° 20' 40"
HB	Quinte	44° 05' 36"	77° 04' 13"
C	Quinte	44° 06' 28"	76° 53' 54"
N	Quinte	44° 10' 30"	77° 02' 54"
81A	Benthos	43° 58' 54"	76° 39' 18"
93	Benthos	43° 19' 36"	78° 52' 06"
93A	Benthos	43° 21' 48"	78° 51' 24"
BB	OMNR	43° 17' 31"	79° 48' 05"
W	OMNR	43° 56' 24"	77° 19' 50"
LP	OMNR	43° 54' 14"	76° 54' 02"
C	OMNR	43° 57' 03"	78° 10' 15"
325	AES	43° 50' 59"	77° 21' 55"


LAKE ONTARIO
Long Term Biological Index Monitoring
&
Bay of Quinte Program
RSB Studies 12632 12631
Station Positions
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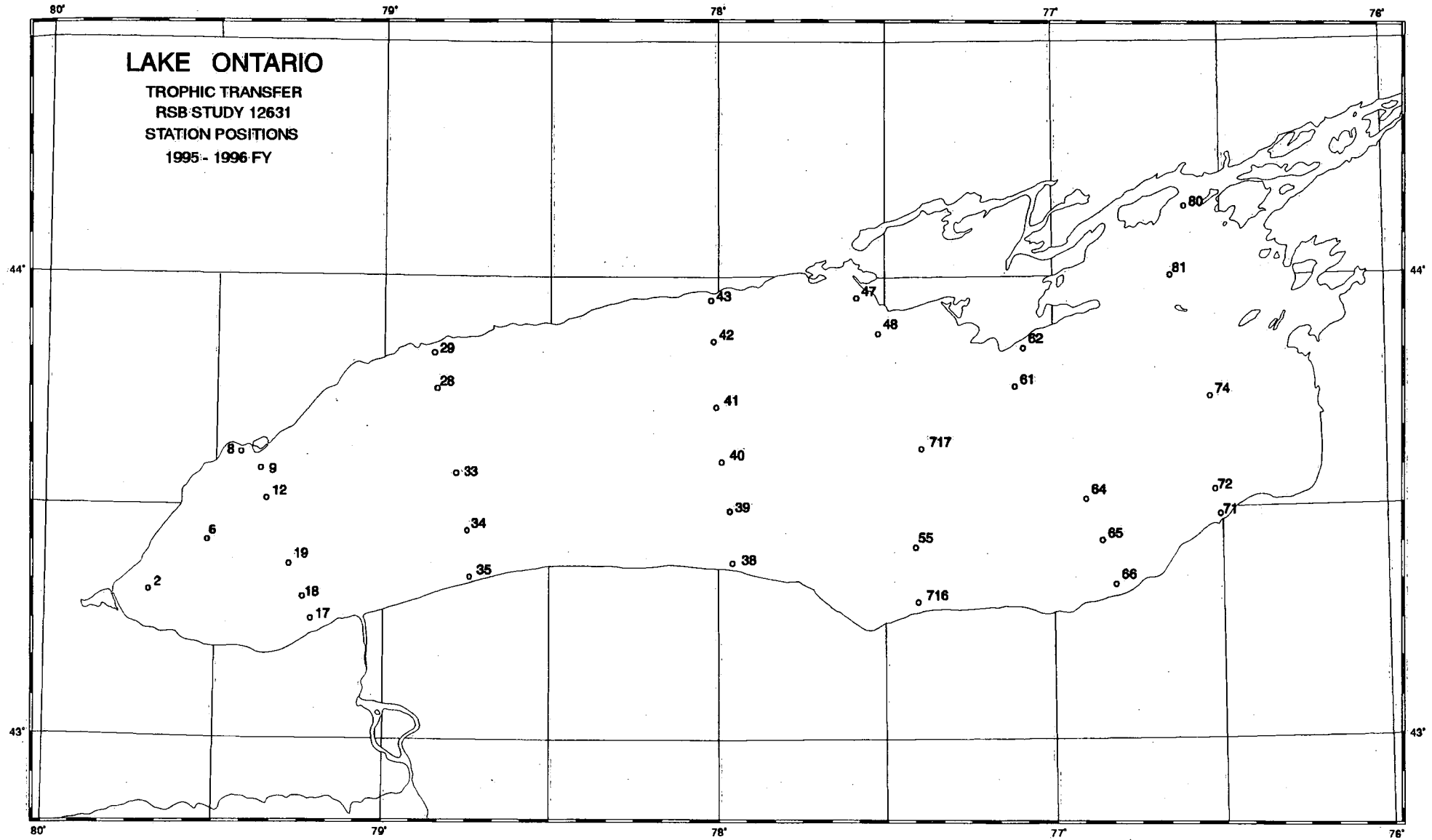
LAKE ONTARIO
TROPHIC TRANSFER
RSB STUDY 12631
STATION POSITIONS
1995 - 1996 FY
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SHORE PROGRAMS

AQUATIC ECOSYSTEM RESTORATION BRANCH

WATER SAMPLING, WHEATLEY
AERB STUDY 12210, A. MUDROCH

Two sixty-litre water samples were collected from offshore at Wheatley in early November as a follow-up on sampling conducted over the past 3 years for trace organics of pesticides and herbicides.

Water was centrifuged through a Westfalia centrifuge at a flow rate of 2 litres/ minute.

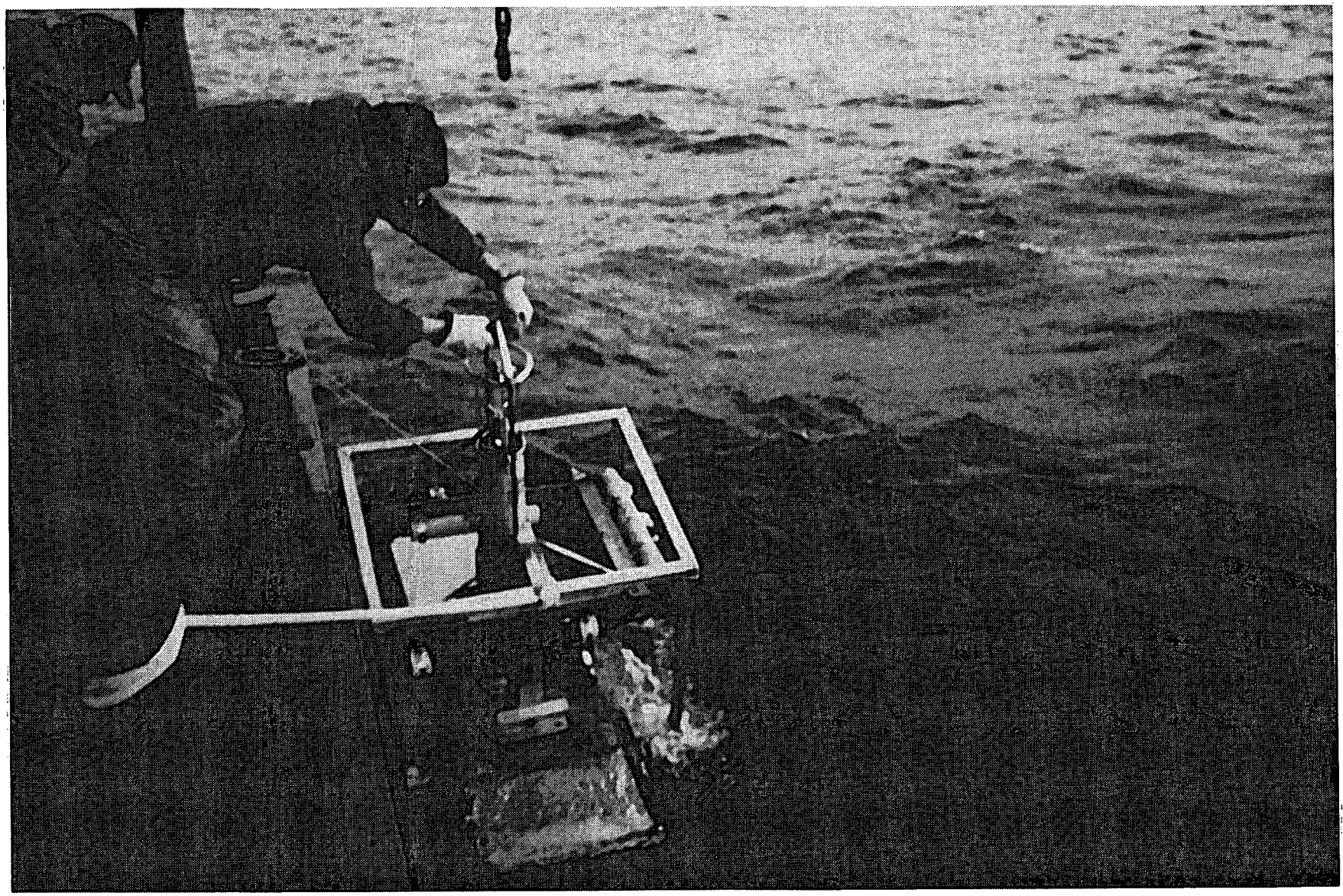
COASTAL DEVELOPMENT
AERB STUDY 12210, A. MUDROCH

Technical Operations staff supported this project in mid-December with the collection of eight 100-litre barrels of water from the harbour at Port Stanley, Ontario. The water was collected using a submersible pump from the harbour wall. The pump was fitted with a screen to exclude large particles and was bounced on the bottom to suspend and collect some of the surficial sediment with the water. A Hydrolab sonde was used to obtain a dissolved oxygen profile after the barrels were filled. The samples were transported to Burlington the same day.

CAPPING, HAMILTON HARBOUR
AERB STUDY 12214

As an alternative method of sediment remediation, sand capping an area of contaminated sediments has been tested in the U.S.A. As part of the Hamilton Harbour Remediation Program, a test site was chosen just west of the LaSalle Marina. The test area is 100 metres square and was covered with a layer of clean sand approximately 35 cm thick. Technical Operations provided support in the areas of moorings, instrumentation refurbishment and diving operations.

During the week of August 6th a test swath of sand was dumped along the southern edge of the sand cap treatment area. The line of sand was approximately 19 metres wide. On August 11, M. Dahl, B. Gray and T. Breedon inspected the sand layer and the settling gauges on the bottom. A 2-metre transition zone between original sediment and thick sand was noted along the edge of the sand lane. At the outer edge, a fine layer of sand lay on top of the sediment. This layer progressively thickened and stiffened to the point that it no longer yielded when pressure was applied to the surface. There was no evidence of mixing between sand and sediment. The sand layer appeared level though the surface was slightly rippled. A fine dusting of silt was observed on top of the sand. This material did not exceed 0.5 cm and was patchy in distribution. Two settling gauges were



CURRENT METER/TRANSMISSOMETER INSTALLATION AT THE CAPPING SITE

covered by the sand. The measurements taken are listed below. Some scour marks on the surface of the sand were observed. It is likely that these marks were made by the cable used to position the sand barge. It should be noted that one of these marks was within 2 metres of gauge #8 (Southeast corner of the sand cap) and that this gauge was damaged. The gauge was tilted to approximately 15 degrees and the reference rod was pulled up about 1.4 metres. The settling tube located near gauge #8 was also knocked over so no measurements could be taken.

GAUGE NUMBER	TOP OF TUBE TO TOP OF SAND	CALCULATED SAND THICKNESS	TOP OF TUBE TO BOTTOM OF COLLAR	TOP OF ROD TO TOP OF TUBE
7	77.0	23.0	0.5	95.5
8	70.5	29.5	135.5	34.0

Site survey of August 26:

The field party consisted of the following personnel: H. Don, M. Dahl, K. Hill, T. Breedon and B. Gray. Most of the morning of August 26 was spent readying moorings, preparing for the dive survey and finally waiting for the Roxann survey and Vibracore raft to clear the site. The settling gauges were examined by swimming the diagonal ground lines (dive #1, southeast->northwest; dive #2 southwest->northeast corners) and the following readings were taken:

SET-GAUGE NO.	SAND SURFACE TO TOP OF TUBE	TOP OF TUBE TO BOTTOM COLLAR	BOTTOM COLLAR TO TOP OF ROD
8	Gauge settling rod and frame bent (as per last inspection)		
6	44.0	0	8.0 rod bent 35° off vertical
7	75.5	0.5	95.5
5	60.0	8.0	17.0

Set-gauge #7 showed signs of scouring at tube base; readings were approximated from level sand away from immediate base. Also the diagonal (diver) groundline was severed just after set-gauge #5.

A calibrated 100 m survey line was deployed across the centre of the capping site (NAD-27:4794075N,593450E). Sand thickness was then measured by divers using a stainless 1 m measuring rod. The sand cap was punctured and the rod pulled back slowly until resistance to the large tip of the rod was encountered. The following results were recorded:

MEASURED INTERVALS (m)	SAND THICKNESS (cm)
0-15	0 (mud)
20	0 (mud, traces of sand)
25	30 (sand)
30	30
35	40
40	40
45	35
50	30
55	35
60	30
60-65	Diver crosses NW->SE diagonal
65	2-3
65-70	Diver crosses SW->NE diagonal
70-100	0 (mud)

On Monday, June 12 after re-rigging the barge GOOSE II, the installation of the settling gauges commenced. Personnel assigned to the installation included a TOS dive team (Dahl, Don and Gray); Mr. J. Gabriele, ESS; M. Stone and M. de Groot, TOS. The GOOSE II was held in position by tying lines to the perimeter spar buoys. The lights were removed from the spars at the beginning of the day, to prevent flooding, and were reinstalled prior to leaving the site. The anchor lines created a hazard to local navigation. Two small boats were used to "guard" the site from unwary boaters and to warn them of the danger before reaching the work area. All anchor lines were removed each evening, leaving a clear area. A 3/16" poly line was installed one metre above the bottom, along both diagonals of the sand capping site. The lines were marked with small floats and weighted down to remain less than 1.5 metres above the bottom.

The settling gauges were assembled on deck, using a frame with a four-metre rod. Two metres of rod extended below the plywood base and one metre protruding above the collar. A diver's weight belt (32 lbs.) was added to the base of the settling gauge to compensate for the buoyancy of the plywood.

The installation procedure follows:

1. The frame was lowered until it was just above the bottom.

2. The diver entered the water and checked that the frame-rod was vertical.

3. At the diver's command the rod was pounded down.

4. A 75-lb. pounder was rigged to pound down onto the rod while being controlled from the deck of the barge.

5. The rod was pounded into the sediment until the top of the rod was one foot above the top of the frame.

6. A diver's stage, with tools and spare parts, was lowered to a level two metres above the bottom.

7. At this point, the diver removed the pounder and added another one-metre section of rod.

8. The rod was again pounded into the bottom until the rod extended approximately one foot above the frame.

9. The extra section of rod was removed and a collar screwed onto the rod at the top of the frame.

10. A measurement was taken from the top of the collar to the top of the rod. At all stations the rods were pounded three metres into the sediments.

11. A 3/16" tag line was tied between the frame and the diagonal bottom grid.

12. The diver removed the weight belt from the frame, checked for loose lines and returned to the surface on the stage.

As the pounder was pushing the rod into the sediment, a DGPS antenna was put on the rope to obtain an accurate position of the settling gauge. At all stations the rods were pounded 3 metres into the sediment. The first two metres of sediment was very soft and the rod descended very easily. The last metre of sediment was much harder to penetrate, with the pounder averaging two blows to the inch. On some sites, the rod reached a halt before the rod reached full penetration.

On Friday, September 22, a TOS dive team (Breedon, Dahl, Don and Gray), using the PINTAIL, went to the sand capping site to read the eight settling gauges and install five long peepers. The first dive took place at the northeast corner. The diver could not find the grid diagonal at the spar anchor. A search of the corner area failed to locate the grid. The second dive at the NW corner was similar, with failure to locate the grid diagonal. From previous inspections, it was known that settling gauges 6 and 8 had been pulled over by the barge cable. Gauges 5 and 7 were upright but had cable marks on them and the grid was broken at gauge 5. The peepers were installed at the NW corner of the site. A 50 ft. groundline was installed on the spar anchor and laid out to the southeast. Five peepers were installed along the groundline. Failure of the contractor to comply with the agreed-upon bottom clearance of three metres caused divers a major problem in being able to locate the settling gauges under low visibility conditions.

On Tuesday, October 31, a TOS dive team (Breedon, Dahl and Gray) accompanied by F. Rosa, AERB, travelled to the Hamilton Harbour sand capping site. Five peepers were installed on September 22 to determine the migration of contaminants up through the sand layer. The first attempt to remove a single peeper resulted in

the peeper breaking in half at the point where they were glued together. Since the installation of the peepers, the sand had packed tightly around them and, combined with their fragile construction, made retrieval difficult. Using an alternate method, the diver was able to successfully remove a second peeper. The peeper was sampled immediately.

A second peeper was removed on November 29 which leaves two peepers installed in the sand cap over the winter.

The sediment trap tripod was refurbished November 29. The tripod was reinstalled in the centre of the sand cap. The surface marker was removed and a 300 ft. groundline was attached between the tripod and the Northwest spar anchor.

The four corner spars were removed and the buoy lines attached to 300 ft. groundlines. On both northern anchors the groundlines run to the north and on both southern anchors the groundlines run to the south. The ends of all groundlines are anchored with a piece of railway track.

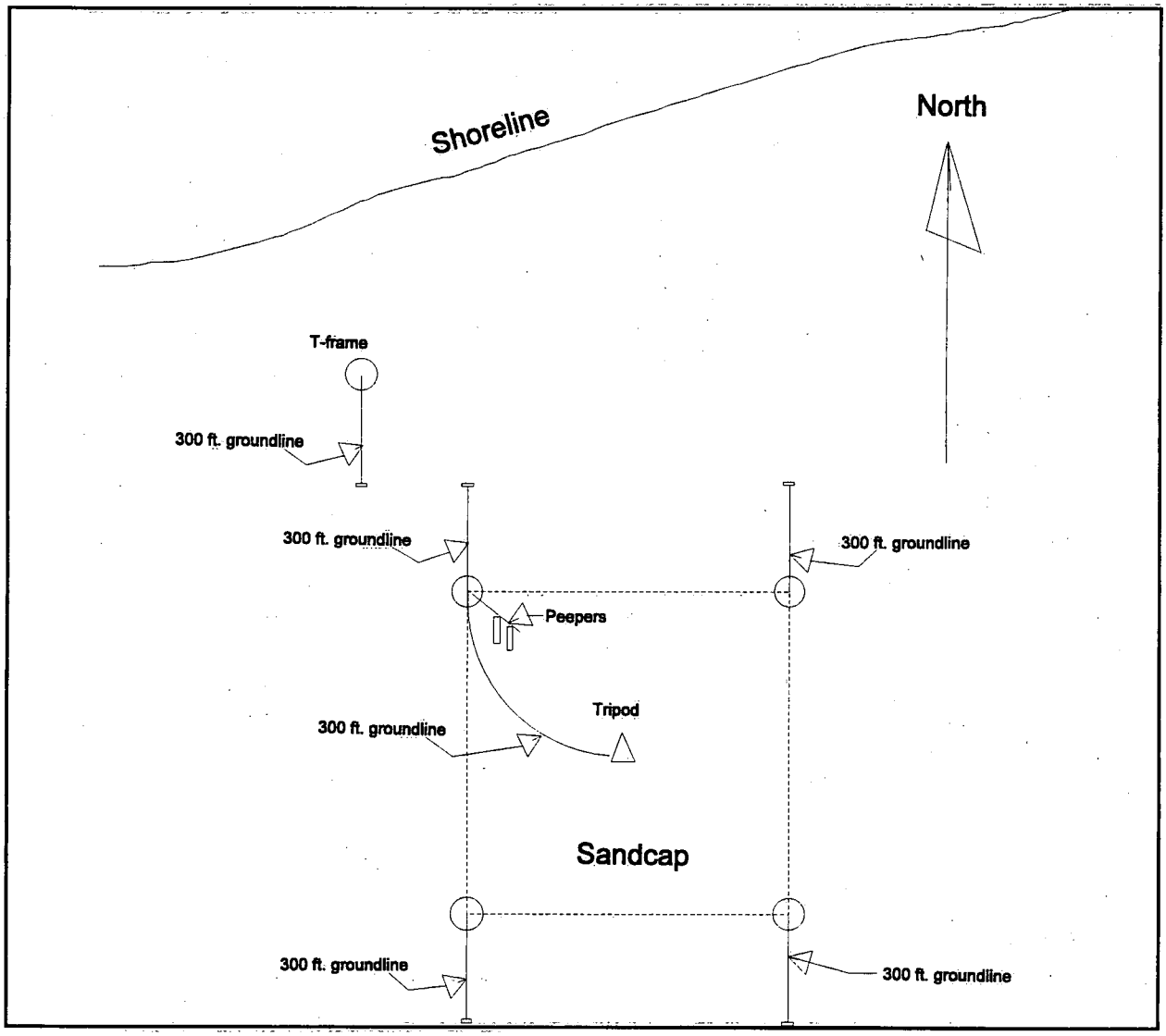
The T-frame was refurbished December 11 with a 27 kHz pinger and the spar buoy removed for the winter. The buoy line was attached to a 250 ft. groundline which was laid down to the south from the spar anchor. The end of the groundline was anchored with a piece of railway track.

Following is a site summary of the underwater status of the site (December 22):

1. The underwater grid installed to relocate the settling gauges has been ripped apart. Between the two diagonals there are three known breaks.

2. Settling gauge status:
   1 - unknown
   2 - unknown
   3 - unknown
   4 - unknown
   5 - OK on August 11
   6 - pulled over
   7 - OK on August 11
   8 - pulled over

3. Two peepers remain inside the NW corner.


Shoreline
North
T-frame
300 ft. groundline
300 ft. groundline
300 ft. groundline
Peepers
Tripod
300 ft. groundline
Sandcap
300 ft. groundline
300 ft. groundline

SEDIMENT REMEDIATION, NOVA SCOTIA
AERB STUDY 12215, H. WONG

During the period from September 25 - October 6, support was provided to H. Wong to conduct a sampling program at abandoned mine sites in the province of Nova Scotia. The purpose of the trip was to determine the environmental impact of: acid mine drainage with respect to metals at coal mine sites; toxic metals introduced or exposed during processing at gold mine sites.

The coal mine sites were situated on Cape Breton Island in the Sydney area. Four locations were selected and sampled:

- at the outflow of an open pit pond on the Sydney Airport property
- from the inside pool, away from salt water influence, at the strip mine site on the north side of Point Aconi
- from a groundwater source 1/2 way down the embankment on the shore of the strip mine site on the south side of Point Aconi
- from the open area near the bend on east side of Edwards Pond off Pitt Street in Sydney Mines

The gold mine sites were situated on the eastern shore off Highway #7 between Sherbrooke and Dartmouth. Two locations were selected and sampled:

- from Gegogan Brook immediately above the entrance of the brook into Gegogan Harbour; access was by way of Sherbrooke Dump Road
- from a spring water source approximately 60 metres from both Highway #7 and the remnants of a service station in Tangier

At each site bulk water samples were collected and centrifuged, the particulate matter from the centrifuged waters was collected for analysis of trace elements. A raw and centrifuged water sample was also collected plus pH and Thallium samples.

During the transit to and from Nova Scotia, additional samples were collected in Quebec and New Brunswick. A total of ten sample sites were visited--five in each province. In Quebec, all sites were sampled for Thallium while in New Brunswick sediment cores were collected from one site and Thallium samples from all sites.

FRASER RIVER ACTION PLAN
AERB STUDY 12216, Dr. T.B. Reynoldson

Several staff members from Environment Canada, NWRI, Burlington; Environment Canada, Pacific and Yukon Region; the Department of Fisheries and Oceans, Winnipeg, the University of Manitoba and the University of British Columbia met in Vancouver to sample the Fraser River and several tributaries from their source to the Straits of Juan de Fuca from September 28 to October 14.

The sampling was in support of the Fraser River Action Plan (FRAP). The purpose of the study was to investigate the benthic community structures and the water quality of each river basin and produce a forecasting mathematical model for stream ecological integrity. All sampling, with the exception of the UBC forests

COLLECTING A KICK SAMPLE

sites, was done from either an Aerospatiale 350BA or a Ecureuil 355 F2 Twinstar helicopter chartered from Canadian Helicopters based in Vancouver, B.C. The UBC forest sites were done by van at the end of the sampling period.

To ensure that all sampling would be handled in the same manner by all staff, a training course was conducted on the Coldwater River near the town of Merritt, B.C. Several staff from other government agencies also attended the training session to observe the sampling techniques and to see if these could be incorporated into their sampling programs. The following staff attended the training session and/or the sampling trip:

Dr. D. Rosenburg, DFO, Winnipeg
Mr. A. Wiens, DFO, Winnipeg
Ms. B. Hall, University of Manitoba
Ms. P. Dymond, University of British Columbia
Ms. T. Touminen, Environment Canada, Vancouver
Mr. M. Sekela, Environment Canada, Vancouver
Ms. B. McNaughton, Environment Canada, Vancouver
Ms. G. Moyle, Environment Canada, Vancouver
Ms. C. Wong, Simon Fraser University (CO-OP student Environment Canada, Vancouver)
Ms. A. Ryan, Environment Canada, Vancouver
Ms. C. Andrews, B.C. MELP, Williams Lake (Ministry of Environment, Lands & Parks)
Mr. B. Carmichael, B.C. MELP, Prince George
Ms. S. Thompson, AERB, NWRI, Environment Canada, Burlington
Mr. C. Logan, AERB, NWRI, Environment Canada, Burlington
Mr. S. Kirby, AECB, NWRI, Environment Canada, Burlington
Mr. M. Mawhinney, RSB, NWRI, Environment Canada, Burlington

The areas that were visited this year were: the Herrick River Basin (12 sites), the Chelaslie River Basin (12 sites), the Stein River (12 sites), the Upper Lillooet River (12 sites), the Upper Nicola River (11 sites), the Upper Fraser River (12 sites), the Thompson River (1 site); three sites in the UBC forest; mainstream Fraser River (16 sites). Repeats were done on mainstream Fraser River (3 sites); the Chilcotan River (2 repeat sites), the Pitt River (2 sites) and the Clearwater River (2 sites).

A total of 99 stations were occupied although there was a total of 101 sites scheduled. Two sites were dropped on the decision of the scientific leader, Dr. Rosenburg. One site was located on the Nicola River in the middle of an Indian reserve and the other site was to be a first order stream on the Pitt River. The stream was in such a stage of flooding that it was futile to try to sample.

At each site samples were collected for total phosphorous, nitrates, major ions, alkalinity, periphyton, benthic fauna, particle size, leaf packs and total suspended solids. Measurements were collected using an H_20 Hydrolab for oxygen, conductivity, pH and temperature. Measurements were done utilizing a Total Station Instrument to collect data for slope percentages of the stream/river sampled and also full bank distances and elevations at full freshet of each stream/river. Photographs were taken of the log sheet, across stream, downstream, upstream and an aerial shot was taken of the site on departure through the aircraft window. Substrate photographs were taken of the sediments

THE FRAP FIELD PARTY

both on the water and on land to log the sediment type and size. Flows were measured using either a Pygmy or a Price 622A flowmeter to give an approximate volume of water flowing through the sampling site.

With the use of ground support, carrying all lab equipment, spare sampling equipment and personal gear, sampling could be conducted even on the days when the field crews moved from river basin to river basin. The ground support and streamlining of sampling protocol saved approximately four days of expensive helicopter time plus the ground support was very useful in several other areas of logistics that are required on a study of this size.

The recommendation of a central location being utilized by the two helicopters for safety and having the scientific crew split into two groups with each staff member conducting the same task throughout the sampling period ensured that the work was carried out in a very efficient manner. When the helicopters returned to base each evening the samples which had to be filtered and preserved were processed by the staff from ground support.

With the downsizing and streamlining of sampling equipment, the helicopters could carry enough sampling bottles to complete nine stations with ease and comfort. The use of individual containers to hold water samples from each site greatly improved the safety and identification of samples when they were returned to CCIW. The use of an SLR camera solved the problems of blurred photographs of the stream beds and aerial shots. The filtration of suspended sediment (Seston) reduced the cost of shipping considerably.

It should be noted that the oxygen data has to be corrected for elevation and when the conductivity falls below the sensitivity of the instrument the readings may be misleading.

All samples that were to be kept cool/frozen were shipped by Federal Express guaranteed overnight/same day delivery. To ensure that the samples shipped to CCIW/FWI arrived when staff were there to accept them, it was arranged that the samples would be shipped early each week so as to arrive during working hours.

Water samples were also collected from several river basins for Mr. V. Cheam of AERB. Samples were collected from the Upper Fraser, the Chelaslie River, the Lillooet River and the Nicola River. The samples were collected for Thallium analysis.

BENTHIC COMMUNITY STRUCTURE, COLLINGWOOD HARBOUR
AERB STUDY 12216, Dr. T.B. Reynoldson

The purpose of this study was to compare sediments in the inner basin of Collingwood Harbour to sediments collected from the same locations in 1994 by the Ontario Ministry of Environment and contract staff. The inner harbour at Collingwood was dredged in the fall of 1994 and it was decided that an intercomparison should be completed.

The sampling was done for Dr. Reynoldson at the request of the Ontario Ministry of Environment. A sampling trip, utilizing the launch, PETREL, was to collect samples for intercomparison during August. Twenty-five stations were occupied.

At each site, a depth sounding and surface water temperature were recorded. A one-litre water sample was collected from b-0.5 m for total phosphorus, alkalinity, nutrients, pH, dissolved oxygen and temperature. Six 10 cm cores were collected from the mini box corer--one for pore water analysis and five for benthic community structure. Five mini PONAR grabs were collected at each site for bioassay analysis. One mini PONAR was collected for organic contaminant analysis, particle size distribution, metals and nutrients. All samples were kept at 4°C in coolers until returned to CCIW.

COLLINGWOOD HARBOUR STATION POSITIONS

STATION	DATE	LATITUDE N.	LONGITUDE W.	DEPTH M
6703	22 AUG 95	44° 30' 27"	80° 13' 13"	5
6704	22 AUG 95	44° 30' 24"	80° 13' 12"	5
6705	22 AUG 95	40° 30' 21"	80° 13' 03"	5
6706	22 AUG 95	44° 30' 18"	80° 13' 02"	5
6707	22 AUG 95	44° 30' 18"	80° 13' 00"	5
6708	22 AUG 95	44° 30' 14"	80° 13' 00"	5
6709	23 AUG 95	44° 30' 19"	80° 15' 04"	5
6710	23 AUG 95	44° 30' 17"	80° 13' 06"	5
6711	23 AUG 95	44° 30' 15"	80° 13' 05"	5
6712	23 AUG 95	44° 30' 39"	80° 13' 23"	2
6713	23 AUG 95	44° 30' 43"	80° 13' 24"	2.5
6714	23 AUG 95	44° 30' 43"	80° 13' 13"	6
6715	23 AUG 95	44° 30' 40"	80° 13' 15"	5.5
6716	23 AUG 95	44° 30' 40"	80° 13' 15"	6
6717	23 AUG 95	44° 30' 40"	80° 13' 17"	5
6718	23 AUG 95	44° 30' 43"	80° 13' 18"	5
6719	23 AUG 95	44° 30' 42"	80° 13' 09"	5
6720	29 AUG 95	44° 30' 44"	80° 13' 08"	5.5
6721	29 AUG 95	44° 30' 39"	80° 13' 11"	5.5
6722	29 AUG 95	44° 30' 37"	80° 13' 06"	5.5
6723	29 AUG 95	44° 30' 37"	80° 13' 10"	5.5
6724	29 AUG 95	44° 30' 38"	80° 13' 06"	5
6735	29 AUG 95	44° 30' 34"	80° 13' 07"	5.5
6726	29 AUG 95	44° 30' 36"	80° 13' 05"	5.5
6727	29 AUG 95	44° 30' 35"	80° 13' 03"	5.5

SEDIMENT REMEDIATION, HAMILTON HARBOUR
AERB STUDY 12216, Dr. T.B. Reynoldson

Mini box core samples and Hydrolab profiles were collected at two stations in Hamilton Harbour. Stations HH3 (Western Basin) and HH19 (Deep Basin) were chosen to study community structure in the area. Samples were collected in the middle of the month from May to November with a total of seven samples collected.

Two DataSonde3 loggers were deployed in the Western Basin and one in the Deep Basin to monitor dissolved oxygen during the months of June to October.

On July 21, 1 mini box core, 1 Hydrolab profile, 1 water sample, and 6 PONARs were collected at nine stations around the sand capping area. The samples were collected to perform toxicity bioassays and to observe any changes in community structure before and after sand capping.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
HH3	43° 16' 50"	79° 52' 20"
HH19	43° 17' 16"	79° 50' 03"

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
DATASONDE3 LOGGERS		
95-50E-55A	43° 16' 48"	79° 52' 21"
95-50E-56A	43° 17' 29"	79° 50' 05"

HYDROLAB DEPLOYMENT, MATTABI MINES
AERB STUDY 12217, F. ROSA

On October 31, a Hydrolab DataSonde3 was deployed in Crown Pillar Pit belonging to Mattabi Mines--a subsidiary of Noranda Mines in Ignace, Ontario.

Prior to deployment of the DataSonde, 3 Hydrolab profiles were collected from three stations in the pit. At the end of the profile, at station 2, the probe was suspended at the 14 m level for approximately 2 minutes to collect data for oxygen, conductivity, pH and temperature. The DataSonde3 was later deployed from this depth. It was observed that the chemocline fluctuates vertically in very minute motions.

Water samples were collected from 1 metre and 19.5 metres (B-1 m) at the pit site. Water samples were also collected from Lyon's Creek (LCL6) and Belle Creek (LCL1). These samples were stored at 4°C or cooler until returned to CCIW.

The sampling that was planned to be conducted on Lyon Lake to assist Ministry of Natural Resources was cancelled due to ice covering the entire lake. The sampling will be conducted by MNR staff when the ice is safe to travel on later in the winter.

A tour of the site was taken to observe the improvements and changes to the two mine sites at the sampling location. The culvert at station LCL6 has been removed so that beavers cannot dam the creek. This lowered the water level in Crown Pillar Pit by 0.75 metres. Sturgeon Lake Pit has had more overburden dumped into it, allowing for upgrading of three tailings ponds upstream of Lyon's Creek. It was observed that seepage of iron-rich water is occurring from the lower side of the top berm belonging to Minova Mines. The seepage is very close to the pond/lake that feeds Lyon's Creek. The beaver dam holding back the pond is also in poor repair and if it fails, flooding could flush large amounts of material downstream into Lyon's Lake and Creek. The water treatment plant utilized by Mattabi Mines to treat contaminated waters was shutdown for the winter and the water level in the polishing pond has dropped. The berms at Mattabi Mines have been strengthened and capped with compacted rock overburden.

SEDIMENT REMEDIATION
AERB STUDY 12217, F. ROSA

On October 3 and 4, four sediment trap moorings and one resuspension sampler were installed around the perimeter of the capping site and one sediment trap mooring was placed at the west end, middle, northeast corner (Rambo Creek) and deep basin by the Windermere Arm. In all there were 9 moorings installed. They were refurbished on November 2, 7 and 10 and removed on November 27, 28 and 29. The samples were analyzed for carbon content, metals, and organics. The purpose of the study was to determine if there was any resuspension and movement of sand or silt away from the sand capping area.

STATION POSITIONS

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
95-50A-75A	43° 17' 07"	79° 47' 37"
95-50A-76A	43° 18' 19"	79° 48' 45"
95-50A-77A	43° 17' 20"	79° 50' 30"
95-50A-78A	43° 16' 50"	79° 52' 19"
95-50A-79A	43° 17' 43"	79° 50' 57"
95-50A-80A	43° 17' 47"	79° 50' 53"
95-50A-81A	43° 17' 43"	79° 50' 48"
95-50A-82A	43° 17' 40"	79° 50' 53"
95-50A-83A	43° 17' 43"	79° 50' 52"

LAKE REMEDIATION, HAMILTON HARBOUR
AERB STUDY 12240, M.N. CHARLTON

Hydrolab profiles were taken at five transects consisting of 34 stations in the Windermere Arm of Hamilton Harbour. The purpose of this study was to find the size of the mixing zone of sewage effluent from the Woodward Sewage Treatment Plant into Hamilton Harbour. This was determined by sampling water at the middle station in each transect and analyzing for phosphorus and nutrients. Water and a Hydrolab profile taken at the deep basin of the harbour was used as a control. Sampling took place every other week between May and October for a total of 12 sampling days.

On May 16, six Tech. Ops. cores were taken at the capping site. The cores were used to compare silt colour, carbon content and organics between harbour sediment and the capping sand.

Zooplankton, phytoplankton, water samples and Hydrolab profiles were taken at four stations in Hamilton Harbour. This was supervised by Dr. Pat Chow-Fraser from McMaster University in co-operation with M.N. Charlton. The purpose of this study is to determine the effects of the Hamilton Harbour Redial Action Plan on zooplankton communities. The data will help establish a baseline in order to observe any changes in the future. Samples were collected between June and October for a total of seven sampling days.

Hydrolab profiles and water samples were collected periodically during the months of January to March. This study was supervised by Dr. G.K. Rodgers in co-operation with M.N. Charlton. The purpose of this study is to investigate the direction of flow of high conductivity coming from the Redhill Creek watershed and entering the harbour through the Windermere Basin.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
WATER SAMPLING AND HYDROLAB PROFILING WINDERMERE ARM - CHARLTON		
1001	43° 17' 16"	79° 50' 26"
1142	43° 16' 06"	79° 46' 55"
1143	43° 16' 07"	79° 46' 54"
1144	43° 16' 08"	79° 46' 54"
1145	43° 16' 09"	79° 46' 54"
1146	43° 16' 10"	79° 46' 53"
1147	43° 16' 10"	79° 47' 14"
1148	43° 16' 11"	79° 47' 12"
1149	43° 16' 13"	79° 47' 10"
1150	43° 16' 14"	79° 47' 09"

STATION NUMBER	LATITUDE N.	LONGITUDE W.
1151	43° 16' 15"	79° 47' 08"
1152	43° 16' 16"	79° 47' 07"
1153	43° 16' 17"	79° 47' 06"
1154	43° 16' 21"	79° 47' 27"
1155	43° 16' 22"	79° 47' 26"
1156	43° 16' 23"	79° 47' 24"
1157	43° 16' 24"	79° 47' 22"
1158	43° 16' 26"	79° 47' 21"
1159	43° 16' 27"	79° 47' 19"
1160	43° 16' 28"	79° 47' 17"
1161	43° 16' 31"	79° 47' 39"
1162	43° 16' 32"	79° 47' 38"
1163	43° 16' 34"	79° 47' 36"
1164	43° 16' 37"	79° 47' 35"
1165	43° 16' 38"	79° 47' 31"
1166	43° 16' 40"	79° 47' 30"
1167	43° 16' 41"	79° 7' 29"
1168	43° 16' 41"	79° 47' 49"
1169	43° 16' 43"	79° 47' 47"
1170	43° 16' 44"	79°47' 44"
1171	43° 16' 45"	79° 47' 42"
1172	43° 16' 46"	79° 47' 40"
1173	43° 16' 47"	79° 47' 38"
1174	43° 16' 48"	79° 47' 35"
WATER, HYDROLAB, ZOOPLANKTON AND PHYTOPLANKTON - McMASTER, CHARLTON		
250 (51)	43° 16' 45"	79° 52' 30"
258 (52)	43° 17' 21"	79° 50' 27"
4 (53)	43° 17' 08"	79° 47' 42"
252 (50)	43° 18' 22"	79° 48' 51"

HAMILTON HARBOUR SAND CAPPING SITE MONITORING
AERB STUDY 12240, M.N. CHARLTON; STUDY 12245 DR. P.F. HAMBLIN

Water samples, Acoustic Doppler Current Profiler (ADCP) profiles, Laser In Situ Scattering and Transmission (LISST) profiles and Hydrolab profiles were taken before, during and after the sand capping project in Hamilton Harbour between July 3 and September 22. The purpose of this study was to monitor the effects of sediment cleanup activities on Hamilton Harbour. During this time, 300 Sestons, 90 ADCP profiles, 60 LISST profiles and 80 Hydrolab profiles were taken.

Sampling took place at various stations within the proximity of the barge used to deploy the sand. Generally, all stations were within the capping area located Southwest of LaSalle Park. A control station was located in mid-harbour.

On July 24, two moorings were installed and taken out 1 week later and also during the months of August and September, four moorings were installed around the perimeter of the sand capping area. Each mooring was equipped with two transmissometers and an Optic Backscatter System (OBS) logger. These moorings were deployed to monitor the effects of the sand capping.

MOORING POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
MOORINGS AT SAND CAPPING SITE		
95-50S-64C	43° 17' 40"	79° 50' 50"
95-50S-65C	43° 17' 40"	79° 50' 54"
95-50S-66C	43° 17' 32"	79° 50' 50"
95-50S-67C	43° 17' 32"	79° 50' 55"
95-00S-004	43° 17' 40"	79° 50' 54"
95-00S-005	43° 17' 40"	79° 50' 53"

SEDIMENT CHEMISTRY, BAY OF QUINTE
AERB STUDY 12248, DR. P.G. MANNING

On Thursday, October 5, a TOS dive team (Breedon, Dahl, Gray and Don) travelled to Belleville on the Bay of Quinte to install two "peeper" moorings for Dr. P. Manning. One mooring was located in Big Bay and the second was one mile west of the Belleville bridge. Both moorings were single point with a spar held by three pieces of railway track. At each mooring a short, forty-foot groundline was installed to create an attachment point for the peepers and to eliminate buoy motion from affecting the peepers. Two double-chamber peepers were installed at each site by a diver. The peepers were pushed into the bottom until the water-sediment interface was at chamber number twelve. Visibility for the diver was poor, requiring the use of lights. The peepers were refurbished on October 19 and removed on October 30.

STATION POSITIONS (NAD 27)

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
94-00S-80A	44° 08' 46"	77° 17' 06"
94-00S-81A	44° 07' 45"	77° 25' 12"

GROUNDWATER REMEDIATION
AERB STUDY 12260, K. NOVAKOWSKI

Technical Operations Section supported the Groundwater Remediation Project throughout the year with one technician being permanently assigned and assisted by other personnel as required.

The Clarkson groundwater field site was an ongoing project which required regular monitoring and maintenance. There were also numerous water level, injection drift, constant head, and pump tests conducted out of various boreholes at the site.

Point Pelee was another ongoing project started in 1993 and continued this year. Eighty-one monitoring wells have been installed along two cross-sections at two septic bed sites. This was part of a joint project between Parks Canada; EHD, OR; AEPB and AERB which is investigating high phosphate concentrations in the marsh. These wells are being monitored and sampled on a regular basis. Cores and water samples were also obtained periodically from the marsh.

AQUEREF (Aquatic Ecosystem Restoration Experimental Facility) was completed and surveyed this year with numerous ongoing tests conducted. This facility is intended to simulate a groundwater remediaton site in sandy soils and has been installed at the east end of the Hydraulics Lab at CCIW.

Another project started this year was in Smithville at the old Chemical Waste Management site (CWML). Seven boreholes were installed to an approximate depth of 200 feet by Marathon Drilling Inc. Technical Operations staff assisted in logging, surveying and hydraulic testing of the boreholes. The purpose of this was to develop a conceptual model of groundwater flow in the bedrock beneath the site. This is necessary in developing future remediaton or containment methods.

Technical Operations and groundwater personnel attended a 40-hour Contaminated Site Health and Safety Course or update.

Technical Operations will continue to support these projects throughout the winter months.

GROUNDWATER REMEDIATION, TRICK CREEK
AERB STUDY 12260, K. NOVAKOWSKI

Technical Operations Section supported Jeff Markle, MOEE with the continued refurbishing of a temperature logger mooring, installed in the Huron County Township Quarry on County Road # 31 east of the town of Bayfield, Ontario. This was done as part of an ongoing joint project with the Ontario Ministry of Environment & Energy, which is attempting to determine the direction and temperature of groundwater flow from the quarry lake, and its effects on trout spawning beds in neighbouring Trick Creek.

Three Brancker loggers were replaced on April 12, July 12 and December 4. The mooring has been in place since June 1993.

Technical Operations staff also installed seventeen multi-level piezometers on a cross-section of the quarry. These were placed through 4.25" hollow-stem augers to a depth of 21-28 feet--1-2 feet into the clay.

AQUATIC ECOSYSTEM CONSERVATION BRANCH

AMITUK LAKE SAMPLING STATION SHUTDOWN
AECB STUDY 12316, R. SEMKIN

The sampling station at Amituk Lake was decommissioned and all sampling and support equipment stored at the Polar Shelf Resolute Bay warehouse was removed March 6-7. The field party included: Ms. J. Franklin, C. Tiexiera, Messrs. R. Neureuther and R. Semkin from AECB and M. Mawhinney from Technical Operations.

On March 8, due to extreme cold (-45°C) and the lack of aircraft, the day was spent preparing all material at the Polar Shelf for shipping on March 9. However, March 9-14 was spent on standby due to very inclement weather. Blizzard conditions and extreme cold with high winds grounded all travel in the north. Sample extractions were continued by AECB staff on all samples that had arrived from various sites throughout the Arctic, including a backlog of samples stored at Resolute Bay for the past two years.

On March 15, the weather was clear and cold(-38°C) with strong east winds to 40 km/hour. A Twin Otter aircraft was readied and the trips to Amituk Lake were made during the day. On arrival, a quick inventory was taken. The sampling equipment most urgently needed in southern Canada was hauled to the aircraft and loaded for Resolute Bay. A total of 4 trips between Amituk and Resolute were completed before the weather deteriorated and airplane availability vanished due to prior commitments. When the plane landed in Resolute with the NWRI staff onboard, visibility was less than 200 metres and a blizzard set in for another day and a half.

Arrangements were made with a local Inuit to visit the site at Amituk to complete the removal of all the remaining equipment to Resolute Bay. Extraction equipment and chemicals were left in the upstairs lab at the Polar Shelf warehouse and shipping containers were left in the storage cage. Chemicals required for extraction were stored in the DFO warehouse. All remaining equipment and chemicals were shipped to Burlington during the summer of 1995 after Dr. Strachan completed extractions on the samples collected during the spring by AES staff throughout the Arctic.

TURKEY LAKES WATERSHED
AECB STUDY 12316, R. 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.

RADAR DOME AT RESOLUTE BAY

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. A second 4-wheel-drive vehicle was utilized during the winter months. In addition, 4 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.

A security system on the camp at the work site and a 2-way radio system were operated by Tech. Ops. staff and maintained by Quattra Communications in Sault Ste. Marie. All roads and trails in the watershed were maintained with assistance from the Canadian Forestry Service at Sault Ste. Marie.

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

Tech. Ops. staff supported Aquatic Ecosystem Conservation Branch staff in chemical and hydrological monitoring of the watershed. Hydrological monitoring consisted of gauging and sampling seven stream locations throughout the watershed on a weekly basis. The samples were analyzed for numerous chemical parameters. Five lakes were sampled on a bi-weekly schedule for the same chemical parameters with the exception of the spring and fall when they were sampled once a week. During the winter, snow cores were collected at 14 locations on a weekly basis. During the year, rain and snow volume samplers (Nipher) were measured and changed weekly. Isco samplers at two locations in the watershed were operated year round. Samples were collected every 12 hours.

To supplement hydrological and chemical data, a full meteorological station and solar radiation unit were operated on a year round basis. A new MET III system is in operation which allows data to be dumped to a disk on site and generates 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 sensor with continuous data recorded on the Campbell datalogger.

In addition, a Campbell Datalogger System is operational at the Batchawana Lake site. The system provides soil temperature data at 2, 8, 20 and 40 cm depths as well as soil moisture values at 20 and 40 cm depths. This fall, additional sensors were installed to monitor and collect snow depth temperatures at 10, 50 and 100 cm. The system is monitored and the data is processed by Tech. Ops. staff on site. The data is dumped onto computer disc at the end of each month and mailed to CCIW for final analysis.

A camper lab has been set up at the Batchawana Lake site for storage of sampling equipment used in the area of the lake and a working space during the intensive run-off period. Solar power was provided to the camper to continuously charge a 12 volt battery which was used to power the furnace and the lights. The camper has been outfitted with dry food supplies, a portable cooking stove, candles, matches and a solar blanket which can be used in emergency situations.

Service was provided by Tech. Ops. to 2 Campbell dataloggers, 3 storage modules and 5 solar power panels.

A snow melt cave constructed at the Batchawana Lake location is in service during the winter months until the end of the spring run-off period. Samples were collected by an automatic Isco sampler powered by a solar power panel during spring run-off conditions. In addition, at this same location, a bulk precipitation sampler was installed and serviced year round on a weekly basis.

All maintenance and repairs to equipment, buildings and vehicles were performed by Tech. Ops. 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.

A winter cover was constructed and installed at stream site S6. This will prevent the weir pipes from freezing and causing extensive damage to the weir wall over the winter and through the spring. The cover appears to be working satisfactorily.

A new winter trail has been brushed through to access 2 snow core sites and groundwater wells at the Batchawana Lake location.

Assistance was provided this summer to AECB Study 12310, led by Dr. W.M.J. Strachan. The use of ATC's, boats and accommodations were provided by Tech. Ops. for a two week period during the months August-September.

Additional staff support was provided by Tech. Ops. during the intensive spring run-off period from March to April.

ATMOSPHERIC CONTAMINANT IMPACT
AECB STUDY 12318, DR. M. ALAEE

Periodically through the summer, between the months of May to September, 40ℓ of surface water were collected at mid-harbour. Samples were collected to monitor atmospheric fluxes of contaminants, specifically, ACHs and PAHs.

REFINERY EFFLUENT STUDY
AECB STUDY 12345, DR. B. SCOTT

The purpose of this study was to provide input to the Municipal Industrial Sewage Abatement program (MISA). Results of the analysis could be used to determine any changes in allowable discharges. On several occasions during the winter, effluent water from Petro Canada refineries in Mississauga and Oakville was collected. Two field trips were also made to the Shell and Novacor refineries in Sarnia.

At each site, water was collected for analysis of various organic compounds. Bulk samples were delivered to B.A.R. Environmental for toxicity testings and bioassays.

SPMD SAMPLING, NORTHERN ALBERTA
AECB STUDY 12346, DR. J. PARROTT

Technical Operations staff supported this Semi-Permeable Membrane Device (SPMD) project between August 8 and September 12. This field trip involved installing 34 moorings in the Athabasca, Clearwater, Steepbank, Wapiti and Peace rivers. There were also 8 moorings installed in three pulp and paper mills--Alberta-Pacific, Weyerhaeuser, Daishowa and one tarsand plant-- Suncor.

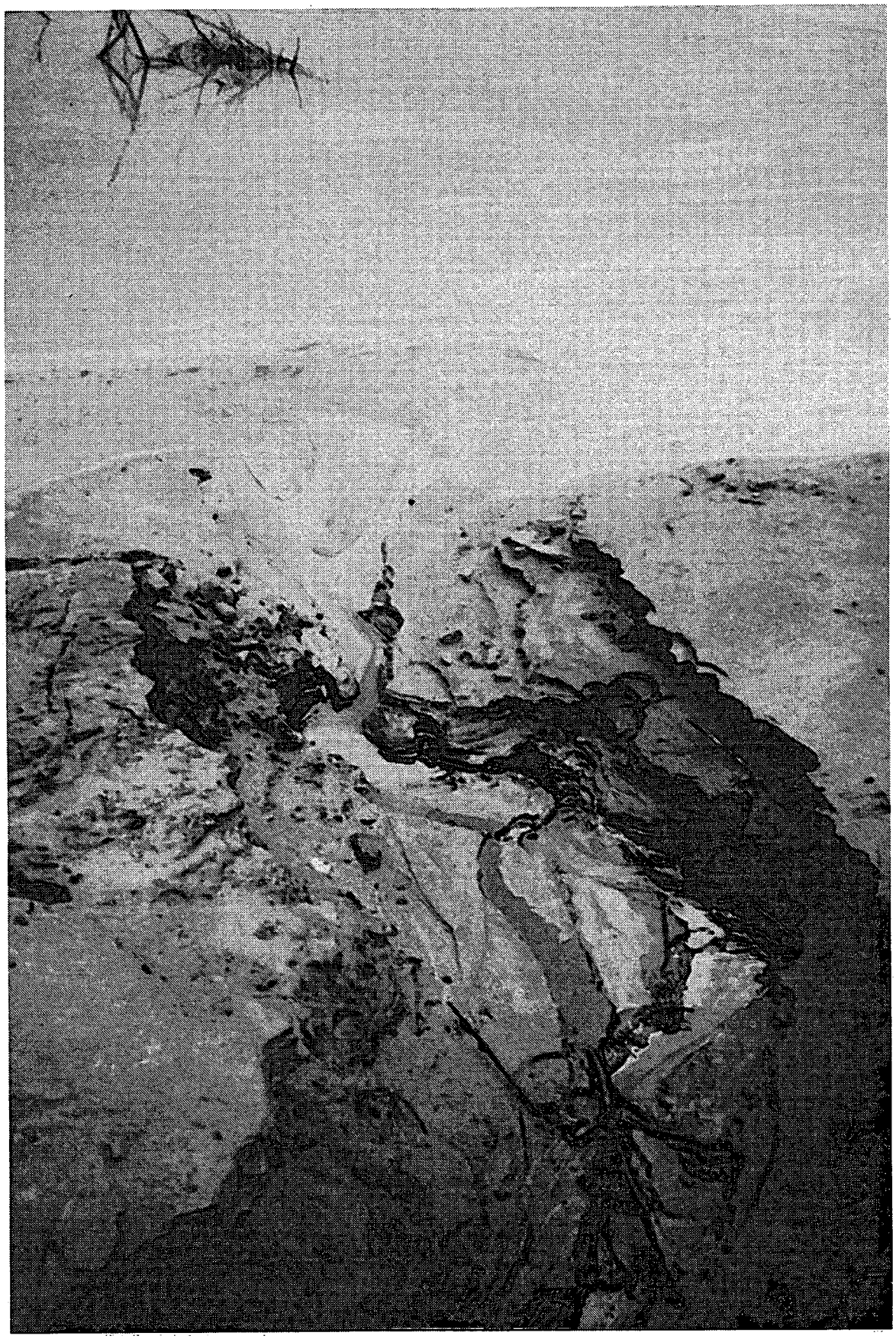
At each mill a vehicle was driven directly to the final effluent pond where SPMD's were installed. River sites upstream and downstream of the final effluent were often accessible from the mill property. Some river installation locations required access to the water via boat ramps, private property or where a country road crossed or ran near the river.

All SPMD's installed into effluent ponds were secured within a perimeter pipe weighted with steel bars and submerged to approximately mid-depth. All river installations also had the SPMD within a perimeter pipe but secured to a tripod type mooring. The moorings sat on the bottom with the SPMD approximately one metre up from the base. The moorings were installed in the river with a rope running to shore and/or a ground line weighted with a brick. Each SPMD installation was done in duplicate with a blank being exposed to the air during installation. The chart following this report includes station positions as well as date, flow, temperature, conductivity and pH measurement of each installation and retrieval. At all stations, approximately two litres of sediment were collected with either a shovel or PONAR.

In addition, staff collected 200 ml water samples for Van Cheam, AERB, from the rivers located in Alberta, Saskatechewan and Manitoba, listed below:

	SITE	DATE	LATITUDE N.	LONGITUDE W.
1.	Athabasca River (AR4)	27-08-95	54° 57' 17"	112° 57' 25"
2.	Athabasca River (AR7)	02-09-95	57° 03' 48"	111° 30' 02"
3.	Smokey River (SR1)	25-08-95	54° 50' 15"	118° 35' 30"
4.	Peace River (PR3)	06-09-95	57° 08' 30"	117° 07' 18"
5.	Moose Jaw River	09-09-95	50° 23' 45"	105° 28' 19"
6.	Assiniboine River	09-09-95	49° 52' 09"	100° 05' 38"
7.	La Salle River	10-09-95	49° 57' 22"	98° 01' 15"
8.	Red River	10-09-95	49° 46' 59"	97° 07' 44"

A NATURAL OIL SEEPAGE HOLE



NATURAL OIL SEEPING INTO THE PEACE RIVER

INSTALLATION AND RETREIVALS OF SPMD'S 1995

STATION	SIDE	DATE	IN \OUT	FLOW	TEMP	COND	PH	LATITUDE	LONGITUDE	EXPOSED
				m/s		uS/cm				
up alpac	south	13-Aug-95	in	0.47	12.6	169.4	7.99	54° 57'17"	112° 57'25"	
		27-Aug-95	out	0.09	14.2	199.3	n/a			66%
	north	13-Aug-95	in	0.52	12.8	161.7	7.97	54° 57'50"	112° 49'50"	
		27-Aug-95	out							all
down alpac	south	13-Aug-95	in	0.18	13.0	154	7.76	54° 57'26"	112° 50'01"	
		27-Aug-95	out	0.49	14.5	205	n/a			ok
	north	13-Aug-95	in	0.28	13.0	153.1	8.02	54° 57'50"	112° 49'50"	
		27-Aug-95	out	n/a	15.1	194	n/a			all
alpac mill		14-Aug-95	in	see	mill	data				
		28-Aug-95	out		22.2	204	7.93			
clearwater	north	16-Aug-95	in	0.10	15.0	107.5	7.50	56° 44'45"	111° 22'35"	
		30-Aug-95	out	0.07	14.1	122.1	7.62			ok
	south	16-Aug-95	in	0.97	14.6	108	7.39	56° 44'40"	111° 22'40"	
		30-Aug-95	out	0.33	13.6	122.7	7.77			ok
up.ft mac	west	16-Aug-95	in	0.59	15.7	165	7.84	56° 43'15"	111° 25'19"	
		30-Aug-95	out	0.65	14.8	183.5	7.97			ok
	east	16-Aug-95	in	0.86	15.5	162.5	7.81	56° 43'00"	111° 25'17"	
		30-Aug-95	out	0.69	14.9	188.1	8.01			exposed
	middle	16-Aug-95	in	1.14	15.5	164.1	7.82	56° 43'08"	111° 25'18"	
		30-Aug-95	out	1.77	15.3	186.4	8.10			ok
suncor	pond	17-Aug-95	in		27.1	778	7.60			
		31-Aug-95	out		24.8	749	7.54			ok
upsuncor	west	18-Aug-95	in	0.74	15.7	168.8		56° 58'45"	111°26'55"	
		01-Sep-95	out	0.91	15.3	181.4	8.00			ok
	east	18-Aug-95	in	0.24	15.4	130.8	9.05?	56° 58'45"	111° 26'20"	
		01-Sep-95	out	1.14	14.9	138.6	7.75			ok
	middle	18-Aug-95	in	0.69	15.7	165	9.27?	56° 58'45"	111° 26'40"	
		01-Sep-95	out	0.57	15.2	191.7	8.02			ok
steep	north	18-Aug-95	in	0.16	13.5	102.4	12.9?	57° 01'15"	111°28'45"	
		01-Sep-95	out	0.76	12.4	115	8.86			ok
	south	18-Aug-95	in	0.14	13.2	104.6	n/a	57° 01'12"	111° 28'40"	
		01-Sep-95	out							exposed
dnsuncor	west	19-Aug-95	in	0.21	15.3	168.6	11.3?	57° 03'48"	111°30'02"	
		02-Sep-95	out	0.19	14.3	144.1	7.79			ok
	east	19-Aug-95	in	1.10	14.3	128.8	12.12?	57° 03'48"	111° 29'30"	
		02-Sep-95	out	0.26	14.3	144.1	7.79			ok
	middle	19-Aug-95	in	1.22	15.0	152.3	n/a	57° 03'48"	111° 29'48"	
		02-Sep-95	out							gone

STATION	SIDE	DATE	IN \OUT	FLOW	TEMP	COND	PH	LATITUDE	LONGITUDE	EXPOSED
				m/s		uS/cm				
far.dn.sun	east	19-Aug-95	in	n/a	13.7	168.7	n/a	57° 08'13"	111° 36'20"	
		02-Sep-95	out	0.21	14.8	177.6	7.83			ok
	west	19-Aug-95	in	n/a	15.0	175	9.59?	57° 08'10"	111° 36'35"	
		02-Sep-95	out							on shore
	middle	19-Aug-95	in	n/a	14.5	145.1	n/a	57° 08'12"	111° 36'30"	
		02-Sep-95	out	0.63	15.4	167.9	8.22			ok
dn.ft.mac	east	20-Aug-95	in	1.14	14.3	114.2	7.76	56° 51'48"	111° 25'20"	
		03-Sep-95	out							exposed
	west	20-Aug-95	in	0.23	14.5	196.2	7.91	56° 52'03"	111° 26'08"	
		02-Sep-95	out							exposed
	middle	20-Aug-95	in	1.14	14.4	131.2	7.96	56° 51'57"	111° 25"42"	
		02-Sep-95	out	1.24	15.3	169.1	8.55			ok
daphine	east	20-Aug-95	in	0.86	14.6	143.7	7.75	57° 12'36"	111° 36'20"	
		03-Sep-95	out	0.20	16.1	187.5	8.41			ok
	west	20-Aug-95	in	1.05	14.8	166	7.99	57° 12'52"	111° 36'54"	
		03-Sep-95	out	0.20	16.1	187.5	8.41			ok
	middle	20-Aug-95	in	1.14	15.0	164.3	7.97	57° 12'40"	111° 36'42"	
		03-Sep-95	out	0.46	16.2	187.5	8.41			ok
weyer.	pond	22-Aug-95	in	mill data	23.8	245	8.42			
		05-Sep-95	out		23.0	221	8.74			ok
dn.weyer	east	22-Aug-95	in	0.60	14.0	23	8.80	55° 04'25"	118° 35'28"	
		05-Sep-95	out	0.53	16.6	2	n/a			ok
	west	22-Aug-95	in	0.33	13.2	23	8.93	55° 04'32"	118° 35'20"	
		05-Sep-95	out	0.46	16.3	2	n/a			ok
up weyer	east	22-Aug-95	in	0.48	13.6	21	n/a	55° 03'53"	118° 40'40"	
		05-Sep-95	out	0.41	16.2	2	n/a			ok
	west	22-Aug-95	in	0.65	13.1	25	n/a	55° 03'57"	118° 40'47"	
		05-Sep-95	out	0.46	16.1	1	n/a			ok
D.M.I.	pond	24-Aug-95	in	mill	33.4	359	7.07			
		07-Sep-95	out		31.3	290	6.90			ok
up dia	west	24-Aug-95	in	0.35	15.5	197	n/a	56° 21'12"	117° 11'50"	
		07-Sep-95	out	0.33	n/a	252	n/a			ok
	east	24-Aug-95	in	0.53	14.2	202	n/a	56° 12'10"	117° 11'34"	
		07-Sep-95	out	0.27	n/a	261	n/a			ok
dn.dia	west	24-Aug-95	in	0.06	14.5	187.8	n/a	55° 24'27"	117° 10'09"	
		07-Sep-95	out							on shore
	east	24-Aug-95	in	0.22	14.6	258	n/a	55° 24'18"	117° 09'50"	
		07-Sep-95	out	0.12	17.0	288	n/a			ok

PRODUCING CROSS-SECTIONS ON THE SAINT JOHN RIVER

ICE JAM STUDIES, NEW BRUNSWICK
AECB STUDY 12382, DR. S. BELTAOS

The Saint John River upstream of Edmunston, New Brunswick and the Matapedia River near Campbellton, New Brunswick have a history of large buildups of ice during the winter months which often form large ice jams. These often cause flooding upstream of the jam and can lead to a reduction in the ability to generate hydro-electric power.

Dr. Beltaos has been investigating the problem here since 1991 and the work completed this year was a continuation of this study.

A TOS survey crew visited the Saint John River between February 28 and March 9 and work was completed on 3 ice jams located at Baker Brook, N.B.; Allagash and Dickey, Maine. At each site, holes were drilled to determine ice thickness and water levels and cross-sections of the jams were surveyed. The survey lines were tied into temporary bench marks (TBM's) which were established on the shore and marked for easy identification.

A TOS survey crew re-visited the Saint John River between June 6th and 12th and a total of 10 river cross-sections were surveyed in the same locations as the winter surveys. The TBM's that had been established during the winter survey were tied into existing bench marks and this allowed accurate determinations of ice and water levels. In addition, bottom sounding was completed along an 8 km stretch of the river near Baker Brook.

On June 12, the survey crew travelled to Campbellton, N.B. to begin work on the Matapedia River. A total of 6 cross-sections were surveyed near the site of a large ice jam in 1993. Once again, all TBM's were tied into existing bench marks. Bottom sounding was also done along a 20 km stretch of the river beginning where the Matapedia joins the Restigouche River.

During the winter trip, all levelling was done using the Pentax level while the Wild NA 2000 automatic level and the T1600/DI3000 distomat were used in June. Travel on the river was done with the TOS 26' canoe in most areas; however, a small 16' canoe borrowed from Roy Gardner in Allagash, Maine was used there.

WAVES/TURBULENCE EXPERIMENT
AECB STUDY 12384, DR. M.A. DONELAN/OREGON STATE UNIVERSITY

On October 27 a three point mooring was deployed 8 km south of Bronte Harbour light to conduct an experiment to determine the nature of turbulence beneath a range of surface wave fields. This project, conducted by Oregon State University, funded by the United States Office of Naval Research, was hosted by Dr. Mark Donelan, AECB. Data collected will be part of the Air-Sea Interchange Lake Experiment.

Two turbulence profilers "*Chameleons*" along with an assortment of computers, an ADCP and MET station were loaded aboard the PELICAN. The PELICAN was moored on site and the profilers were deployed from either side of the vessel via a buoyant bottom block weighed down with a 50 lb. anchor. This allowed the profilers to

freely rise through the water column to the surface and be hauled back down to a starting depth.

A total of 513 profiles were taken during the 16 days that it was possible to secure the vessel on site. Five days of downtime were encountered due to unsafe weather conditions. The project was completed November 29.

AQUATIC ECOSYSTEM PROTECTION BRANCH

HAMILTON HARBOUR
AEPB STUDY 12422, B.J. DUTKA

On May 16, PONARs were taken at two sites in Windermere Basin. The sediment was collected for two experiments. In the first experiment, nonylphenol, aniline, 3,5-dimethylanine benzidine, 3,3 dichlorobenzidine and amino-PAH's were added to the sediment. Differences in toxicity of the chemicals in the sediment were compared to the toxicity of the chemicals in water. In the second experiment, the same chemicals were added to the sediment to determine differences in biodegradation in aerobic and anaerobic conditions.

SURFACTANT TOXICITY STUDY, ONTARIO/QUEBEC
AEPB STUDY 12425, D. BENNIE

In Canada, the pulp and paper and textile industries use large quantities of industrial nonionic surfactant. Of particular environmental interest are the nonylphenol polyethoxylates and their anaerobic degradation products; namely, nonylphenol and nonylphenol monodietoxylates. Because of their biodegradability and their potential toxicity and persistence in sewage water and sediments, they are being studied under the auspices of the Canadian Environmental Protection Act.

Granby and Cowansville, Quebec have active light textile industries that utilize the Embusque and the Embusque South rivers for effluent discharge. As part of a larger nationwide study, 6 sites were identified and sampled daily over a three-day period. Water samples were collected daily and sediment collected once at each site. Samples of water(influent and effluent) and solids (sludge) were taken at the Sewage Treatment Plant in Granby on September 26 and at the Cowansville STP on September 28.

Field personnel included D. Bennie, C. Sullivan, AEPB and B. Gray, TOS.

TRIBUTYLTIN SURVEY, THUNDER BAY TO SOREL
AEPB STUDY 12428, Y.K. CHAU

Testing was done for Tributyltin in sediments and water at selected locations from Thunder Bay, Ontario to Sorel, Quebec during the year. High levels of Tributyltin were detected at several locations and sampling of clams and/or zebra mussels was requested in these areas.

In addition to the sample locations listed below, sampling was attempted at Thunder Bay, Nipigon, Marathon, Sault Ste Marie, Collingwood, Port Lambton, Amherstburg, Cornwall and the Humber River mouth at Toronto. No samples of clams or mussels were found at these locations.

DATE	LOCATION	GPS POSITION	DEPTH	SAMPLE TYPE
SEPT. 5	PORT WELLER	43° 14' 27" 79° 12' 28"	2.5 m	SEDIMENT ZEBRA MUSSELS
SEPT. 7	PORT COLBORNE	42° 53' 30" 79° 14' 30"	7 m	SEDIMENT ZEBRA MUSSELS
SEPT. 18	MIDLAND	44° 45' 06" 79° 51' 05"	2 m	SEDIMENT 20 CLAMS
SEPT. 18	PENETANG	44° 46' 08" 79° 56' 21"	1 m	SEDIMENT 12 CLAMS
SEPT. 19	SARNIA	42° 59' 16" 82° 24' 47"	6 m	SEDIMENT ZEBRA MUSSELS
SEPT. 20	MITCHELLE BAY	42° 28' 15" 82° 24' 37"	1 m	SEDIMENT ZEBRA MUSSELS
SEPT. 21	WINDSOR	42° 20' 32" 82° 55' 35"	4.2 m	SEDIMENT ZEBRA MUSSELS
SEPT. 21	PORT STANLEY	42° 40' 01" 81° 12' 36"	1 m	SEDIMENT ZEBRA MUSSELS
OCT.2	WHITBY	43° 51' 31" 78° 55' 43"	5 m	SEDIMENT 61 LG ZEBRAS
OCT. 2	PORT HOPE	43° 56' 44" 78° 17' 23"	3.6 m	SEDIMENT ZEBRA MUSSELS
OCT. 2	BELLEVILLE	44° 09' 23" 77° 22' 17"	2 m	SEDIMENT ZEBRA MUSSELS
OCT. 3	KINGSTON DRY DOCK MOUTH	44° 14' 15" 76° 28' 36"	4 m	SEDIMENT ZEBRA MUSSELS
OCT. 3	BLUE CHURCH	44° 40' 47" 75° 33' 24"	1.1 m	SEDIMENT 14 CLAMS
DATE	LOCATION	GPS POSITION	DEPTH	SAMPLE TYPE
OCT. 4	MONTREAL OLD MONTREAL	45° 30' 19" 73° 32' 48"	11 m	SEDIMENT WATER
OCT. 4	MONTREAL JACQUES-CARTIER	45° 31' 37" 73° 32' 08"	4.5 m	SEDIMENT WATER
OCT. 4	MONTREAL BUOY M152	45° 38' 32" 73° 28' 57"	3.6 m	SEDIMENT
OCT. 4	MONTREAL ILE CHARRON	45° 35' 18" 73° 29' 25"	1.2 m	SEDIMENT 34 CLAMS WATER
OCT. 5	SOREL	46° 03' 03" 73° 05' 33"	0.7 m	SEDIMENT 50 CLAMS

OCT. 25	TORONTO HARBOUR CASTLE	43° 38' 26" 79° 22' 26"	6.4 to 7.5 m	SEDIMENT CORES
OCT. 26	TORONTO HUMBER RIVER	43° 37' 52" 79° 28' 00"	1.5 m	SEDIMENT WATER
OCT. 26	TORONTO INNER HARBOUR	43° 37' 24" 79° 21' 53"	1.5 m	SEDIMENT ZEBRA MUSSELS
OCT. 26	TORONTO INNER HARBOUR	43° 37' 55" 79° 22' 33"	10.5 m	SEDIMENT WATER
OCT. 26	TORONTO TURNING BASIN	43° 39' 05" 79° 19' 55"	9.6 m	SEDIMENT WATER
OCT. 26	TORONTO KEATING CHANNEL	43° 38' 50" 79° 21' 13"	5.4 m	SEDIMENT WATER
NOV. 7	PORT DOVER	42° 47' 00" 80° 11' 46"	2.0 m	SEDIMENT ZEBRA MUSSELS
NOV. 8	PORT CREDIT	43° 33' 03" 79° 34' 46"	2.0 m	SEDIMENT WATER ZEBRA MUSSELS

SUSPENDED SEDIMENT & PARTICLE SIZE SURVEY, FRASER AND THOMPSON RIVERS, B.C.
AEPB STUDY 12445, DR. B.G. KRISHNAPPAN

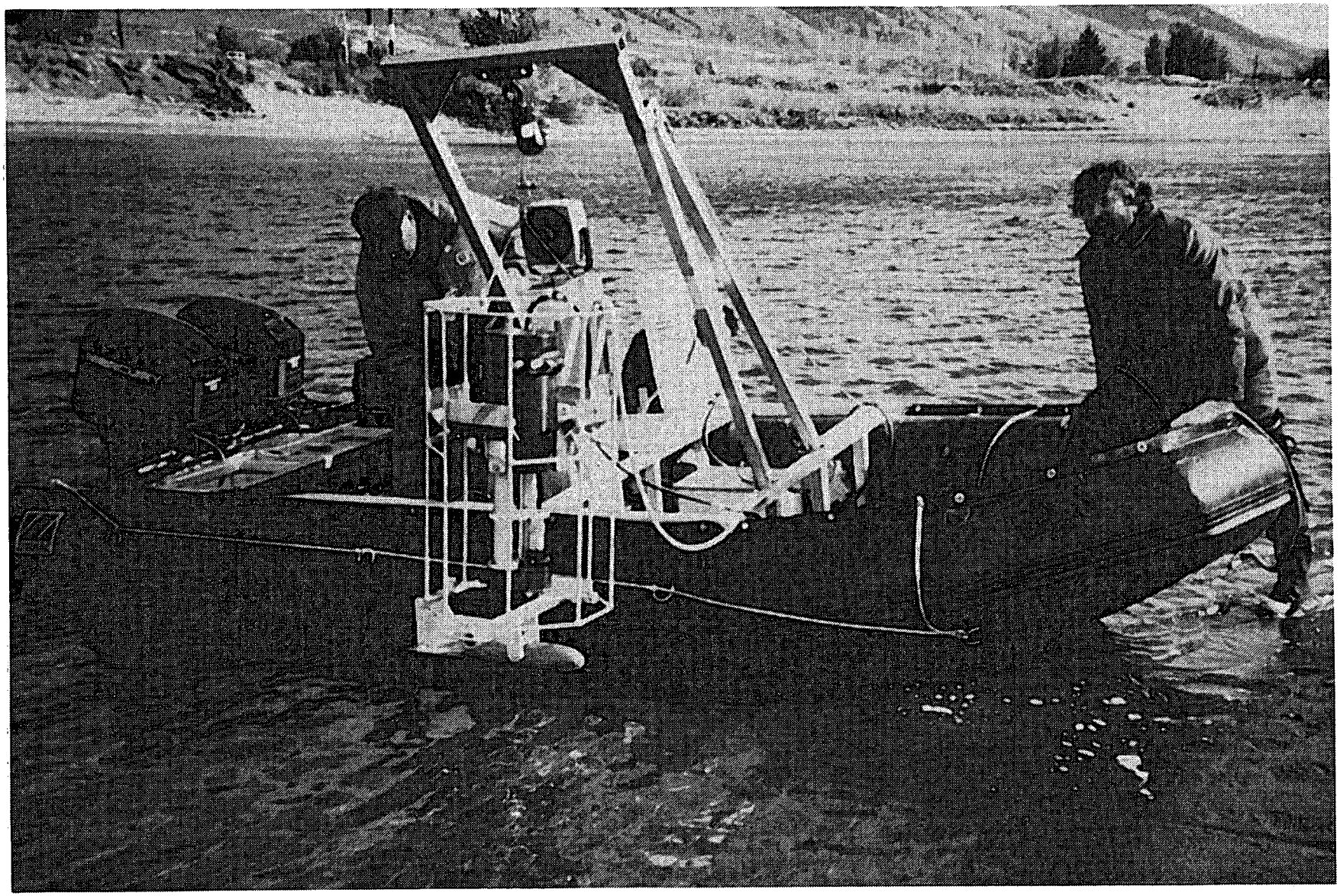
There were two surveys to support this project--March 29 - May 1 and September 25 - October 12. The spring survey was on the Fraser River at Prince George and the fall survey was on the North and South Thompson rivers at Kamloops and the Thompson River from Kamloops to Savona.

During the spring survey, all sampling was completed in the area of the Northwood Pulp and Timber effluent outfall on the Fraser River above Prince George, B.C. The purpose of this survey was to complete transects as soon as possible after ice break-up and at intervals of 10% increase in the river flow. The ice broke up on April 5 but the first transect was not completed until April 11 due to ice jams in the river. Due to cold weather slowing the run-off, the next full transect was not completed until April 17. The remaining transects were completed April 23, 24 and 26. Each day, transects were completed at 100 m above the outfall and 500 m downstream of the outfall. Some additional CDT transects were completed for the University of British Columbia April 16 and 17.

During the surveys the following sampling procedure was followed for each transect:

1. The micro fix was set up and the width of the river measured bank to bank. This distance was divided into seven intervals where the verticals were to be taken.

2. Current flow measurements were taken at each interval as per water survey procedures.



THE MALVERN PARTICLE SIZE INSTRUMENT

3. A P72 water sampler was used at each interval to collect organics, particle size and suspended sediment samples. The depths were top, middle and bottom of the water column.

4. From the surface in mid stream, a drop of water from a pipette was put on a microscope slide to be analyzed by I. Droppo of NTRB at a later date.

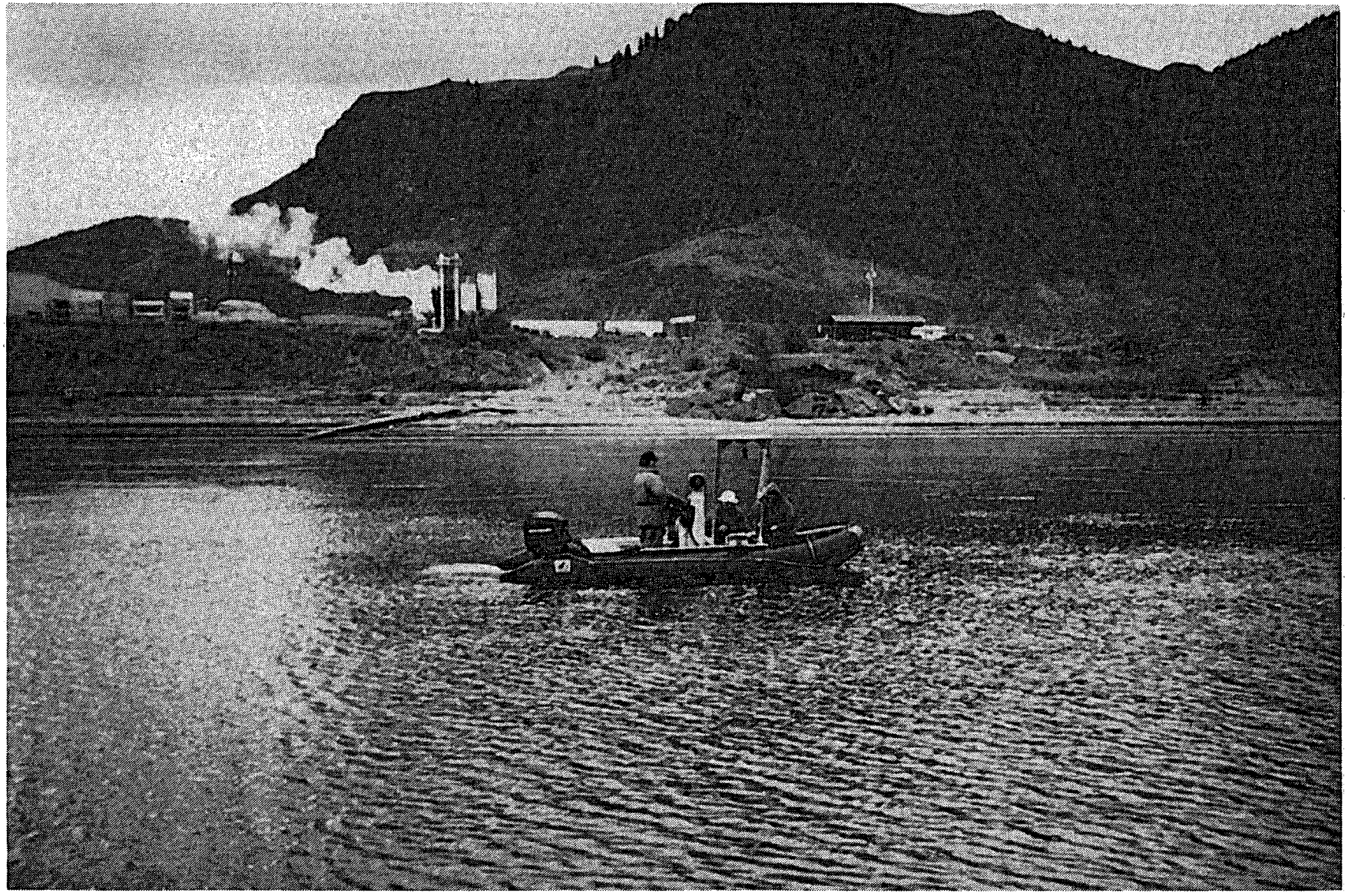
5. The MALVERN was used at three intervals with measurements taken at surface only.

6. A sediment sample was collected on the beach at each site where it was determined that suspended sediment had settled during the winter.

7. Water and air temperature readings were recorded at each transect.

The fall survey was completed on the Thompson River system from Kamloops to 600 m downstream of the outlet of Kamloops Lake. Transects were completed on the North Thompson, South Thompson and Thompson rivers, as follows: October 1, North Thompson; October 2, South Thompson and October 4, 5 and 6 on the Thompson River. Bulk water samples (480 litres) were collected October 3rd from each of the North and South Thompson rivers. These will be used to conduct tests in the rotating flume at CCIW at a later date. Before storing the Zodiac in Prince George, bottom samples were collected at the 100 m downstream site at Northwood Pulp and Timber. A mini PONAR grab sampler was used to collect as much material as possible October 9. As was expected, no sediment was found and the only samples were cobbles ranging in size from 2 - 10 cm in diameter.

Some additional tasks completed during the survey included the collection of bulk water samples (200 litres) for H. Alkema, AEPB Study 12477 and 50 ml of water from the North and South Thompson rivers for V. Cheam, AERB Study 12213. The transect sampling for the fall survey was the same as the spring except eight verticals were completed for current and P72 measurements and five verticals for the MALVERN sampling.



CURRENT METERING ON THE SOUTH THOMPSON RIVER

SAMPLING SUMMARY

DATE	LOCATION	STUDY SUPPORTED	SAMPLE TYPE
April 11	Northwood 100 m U.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
	Northwood 500 m D.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
April 16	Northwood 100 m U.S.	FRAP, Lawrence, UBC	CDT Transect
	Northwood 100 m D.S.	FRAP, Lawrence, UBC	CDT Transect
	Northwood 300 m D.S.	FRAP, Lawrence, UBC	CDT Transect
	Northwood 500 m D.S.	FRAP, Lawrence, UBC	CDT Transect
April 17	Northwood 100 m U.S.	FRAP, Krishnappan/ Lawrence	MALVERN/CDT Transect
	Northwood 100 m D.S.	FRAP, Lawrence, UBC	CDT Transect
	Northwood 500 m D.S.	FRAP, Krishnappan/ Lawrence	MALVERN/CDT Transect
April 23	Northwood 100 m U.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
	Northwood 500 m D.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
April 24	Northwood 100 m U.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
	Northwood 500 m D.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
October 1	North Thompson	FRAP, Krishnappan, NWRI	MALVERN Transect
	North Thompson	SRP, Cheam, AERB, NWRI	Thallium 50 ml H_2O
October 2	South Thompson	FRAP, Krishnappan, NWRI	MALVERN Transect
	Weyerhauser Mill	FRAP, Krishnappan, NWRI	Mill Effluent 40ℓ
	Kamloops Sewage Plant	FRAP, Krishnappan, NWRI	Sewage Effluent 40ℓ
October 3	North Thompson	FRAP, Krishnappan, NWRI	Bulk Water 480ℓ
	North Thompson	QA, Alkema, AEPB, NWRI	Bulk Water 200ℓ
	South Thompson	FRAP, Krishnappan, NWRI	Bulk Water 480ℓ
	South Thompson	QA, Alkema, AEPB, NWRI	Bulk Water 200ℓ
	South Thompson	SRP, Cheam, AERB, NWRI	Thallium 50 ml H_2O
October 4	Thompson R.1600 m U.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
October 5	Thompson R.1400 m D.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
	Thompson R.2700 m D.S.	FRAP, Krishnappan, NWRI	MALVERN Transect
October 6	Thompson R. at Savona	FRAP, Krishnappan, NWRI	MALVERN Transect
October 7	Okanagan L. at Vernon	QA, Alkema, AEPB, NWRI	Bulk Water 200ℓ
October 8	Nechako R. at Pr. Geo.	QA, Alkema, AEPB, NWRI	Bulk Water 200ℓ
October 9	Northwood 100 m D.S.	FRAP, Krishnappan, NWRI	Bottom Samples

NOTE: All recorded distances are measured from the effluent outfalls of Northwood Pulp and Timber in Prince George, B.C. and the outfall of the Weyerhauser Pulp Mill in Kamloops, B.C.

SETTING UP CENTRIFUGES NEAR PEACE RIVER, ALBERTA

TOXICITY TESTING, ATHABASCA AND PEACE RIVERS SEDIMENTS
AEPB STUDY 12446, DR. B.G. BROWNLEE

Sampling was conducted on the Athabasca, Smoky and Peace rivers in Alberta during the month of June. The Athabasca River was sampled from upstream of Hinton to Wood Buffalo Park. Sampling sites were upstream of Hinton, upstream of the Berland River, at Windfall, at the Vega Ferry, upstream of Athabasca, downstream of the ALPAC mill, upstream of the Horse River at Fort McMurray, at mile 34 and at mile 117 in Wood Buffalo Park. The Smoky River was sampled at Smoky Flats upstream of the Wapiti River and at the mouth. The Peace River was sampled from upstream of the Smoky River to Fort Vermillion at Peace River, upstream of the Smoky River, at Notikewin Provincial Park and at Fort Vermillion.

Suspended sediment was sampled using 3 Alfa-Laval centrifuges at flow rates of between 4 and 6 litres/minute. Suspended sediment was retained and stored at 4°C. In addition, 5 mini PONAR grab samples were obtained where bottom sediment was available. Samples were shipped packed in ice to Burlington.

Toxicity testing conducted on the samples included solid phase microtox testing on suspended sediment, basic toxicity testing on extracts of suspended sediment, toxicity with reproduction in the digochaete worm Tubifex tubifex in suspended sediment, testing with mayfly (Hexagenia limbala), midge (Chironamas riparius) and amphipod (Hygalella aztead) for growth/survival in bottom sediment and worm (Tubifex tubifex) for reproduction in bottom sediments.

Samples were also collected for V. Cheam, AERB, on the Athabasca River upstream of Hinton, upstream of Athabasca and at mile 34, on the Smoky River at Smoky Flats and on the Peace River at Notikewin Provincial Park and at Fort Vermilion.

DATE	LOCATION	NAME	TURBIDITY	SUSPENDED SEDIMENT		BOTTOM SED.	POSITION
				TIME CENT.	VOLUME CENT.		
June 8	Athabasca u/s Hinton	AR1	49	9.5 hours	6840 litres	5 bottom sediment (wading)	53° 22' 30" 117° 36' 30"
June 9	Athabasca u/s Berland	AR2	50	7 hours	6720 litres	5 bottom sediment	54° 00' 00" 116° 48' 00"
June 10	Athabasca Windfall	AR3	58	8 hours	6720 litres	5 bottom sediment	54° 14' 00" 116° 05' 00"
June 12	Athabasca u/s Athabasca	AR4	130-150	5 hours	5400 litres	5 bottom sediment	54° 44' 00" 113° 19' 30"
June 13	Athabasca d/s Alpac	AR5	150	4 hours	4320 litres	5 bottom sediment	54° 58' 50" 112° 43' 08"
June 14	Athabasca u/s Horse	AR6 Rep 1	160	4 hours	4320 litres	no bottom sediment	56° 43' 05" 111° 24' 24"
June 14	Athabasca u/s Horse	AR6 Rep 2	160	3 hours	3240 litres	no bottom sediment	56° 43' 05" 111° 24' 24"
June 16	Athabasca Mile 34	AR7	101	4 hours	4320 litres	5 bottom sediment	57° 07' 36" 111° 35' 54"
June 17	Athabasca Mile 117	AR8	125	3.5 hours	3780 litres	5 bottom sediment	58° 10' 09" 111° 21' 45"
June 21	Athabasca Vega Ferry	AR9	35	8 hours	8640 litres	5 bottom sediment	54° 25' 30" 113° 31' 30"
June 22	Smoky Smoky Flats	SR1	>200	1.5 hours	1530 litres	5 bottom sediment (wading)	54° 47' 00" 118° 35' 00"
June 23	Peace Peace River	PR1	>200	0.75 hours	810 litres	5 bottom sediment	56° 13' 00" 117° 20' 30"
June 24	Peace u/s Smoky	PR2	168	3 hours	3240 litres	5 bottom sediment	56° 10' 30" 117° 24' 00"
June 24	Smoky at mouth	SR2	>200	1.75 hours	1296 litres	no bottom sediment	56° 09' 45" 117° 23' 00"
June 25	Peace Notikewin	PR3	>200	2 hours	2196 litres	5 bottom sediment	57° 12' 00" 117° 05' 30"
June 26	Peace Fort Vermillion	PR4	>200	5.5 hours	4056 litres	no bottom sediment	58° 23' 30" 116° 00' 00"


Slave River
Lake Athabasca
Peace River
PR4
AR8
ALBERTA
PR3
AR7
AR6
Fort McMurray
Peace River
PR1
PR2
Peace River
Grande Prairie
SR2
Lesser Slave Lake
AR5
AR4
Wapiti River
SR1
Smoky River
AR3
AR9
AR2
Athabasca River
Edmonton
AR1
Calgary
Pulp Mills
Oil Sands Plants
Sampling Sites

FINAL EFFLUENT COLLECTION, QUEBEC PULP AND PAPER MILLS
AEPB STUDY 12477, DR. K.L.E. KAISER

Technical Operations Section supported this project with the collection of final effluent from seven pulp and paper mills in the province of Quebec while in Quebec collecting centrifuged water samples in support of AEPB Study 12477. Seven 4-litre final effluent samples were collected at the following mills:

1. The Perkins Paper Mill in Candiac, June 7
2. The Kruger Inc. Mill in Bromptonville, June 7
3. The Cascades Mill in East Angus, June 8
4. The Cascades Mill in Kingsey Falls, June 8
5. The Corporation Stone-Consolidated Mill in Shawinigan, June 8
6. The Daishowa Mill in Quebec City, June 9
7. The Avenor Mill in Gatineau, June 12

All of the required samples were collected and transported to Burlington by the field party.

ST. LAWRENCE AND OTTAWA RIVERS TRIBUTARIES, QUEBEC
AEPB STUDY 12477, H. ALKEMA

Technical Operations supported the Aquatic Ecosystems Protection Branch by the collection of centrifuged water samples from tributaries of the St. Lawrence and Ottawa rivers in the province of Quebec for use by the Environmental Standards and Statistics Project. The samples are to be prepared for use as Laboratory Quality Assurance and Quality Control Standards. The ten sites sampled included:

1. The Riviere L'Assomption from under the Autoroute 40 overpass near Le Gardeur, June 6
2. The Riviere Richelieu from a boat launch along Highway 223 near Saint-Marc-sur-Richelieu, June 6
3. The Riviere Saint-Maurice from the Trois Riviere Marina on the Isle de Saint-Quentin, June 8
4. The Riviere Sainte-Anne from a boat ramp downstream of the main street bridge in La Perade, June 9
5. The Riviere Jacques-Cartier from a parking area just downstream of the bridge on Highway 138 at Donnacona, June 9
6. The Quebec City Municipal water supply from a tap near the lock to the inner harbour above Basin Louis at Quebec, June 10
7. The Riviere Sainte-Anne from a parking lot at the Ave. Royale bridge at Beaupre, June 10
8. The Riviere Beauport from a parking lot downstream of the Highway 138 bridge in Beauport, June 11
9. The Ottawa River at Sainte-Anne-de-Bellevue from the dock above the lock to Lac des Deux-Montagnes, June 11
10. The Riviere du Nord from a parking lot downstream of the railway bridge at Lachute, June 12

In all cases, with the exception of the Quebec City tapwater sample which was not centrifuged, a 200-litre volume was centrifuged using a Westfalia separator at the rate of six litres per minute and contained in a polyethylene barrel double-rinsed with deionized water.

The field party received complete co-operation from all contacts made in the course of this field trip and all of the required samples were successfully collected.

NEW TECHNOLOGIES RESEARCH BRANCH

SEDIMENT INJECTION AT DOFASCO AND SAULT STE. MARIE
NTRB Study 12920, Dr. T.P. Murphy

The injection of liquid and solid calcium nitrate into the bottom sediments to act as an oxidant is being tested as an alternative to dredging operations. The intent of this project is to develop in situ bioremediation of organic contaminants in sediments for about 20% of the cost of dredging and storage in a confined disposal facility (Murphy et al, 1994). The addition of calcium nitrate will increase microbial activity, creating an oxic environment to assist the biodegradation of oil and coal tar. During 1995, the injection system was used exclusively in the Dofasco boat slip (Pier 21).

DOFASCO INJECTIONS

On April 26, an area of 7,200 square meters at Dofasco (Pier 21) was injected with 13,000 litres of liquid calcium nitrate. Range poles were used for tracklines and the vessel speed was estimated (0.4 metres/sec.). The #20 nozzles were installed on the injection bar. The nozzles on the upper bar were capped. Flow rates averaged 11,000 litres per hour and the liquid calcium nitrate was delivered to the site by tanker truck.

The tanker was unloaded into three 5600-litre reservoirs onshore. The liquid calcium nitrate was pumped into holding tubs on the GOOSE II which delivered it to the CSL GANDER. The maximum size of the reservoir which can safely be carried onboard the GANDER is 2000 litres. This has restricted the length of the injection line to 150 metres before refilling. During this injection operation the GOOSE II supplied a steady flow of liquid to the GANDER. This allowed for a continuous injection line of 350 metres.

On May 31 and June 1 an area of 20,300 square metres at Dofasco (Pier 21) was injected with 37,550 litres of liquid calcium nitrate. Flow rates averaged 11,000 litres per hour. The liquid calcium nitrate was delivered to the site by three tanker trucks. The arrival of the trucks was staggered to allow for equipment problems. Two truckloads were delivered on Wednesday (0900 and 1300 hours) and one truckload on Thursday (0900 hours).

The tankers were unloaded into three 5,600-litre reservoirs onshore. Each tanker was unloaded in an hour or less, which was well under the allotted time of two hours. The liquid calcium nitrate was pumped into holding tubs on the GOOSE II which delivered it to the GANDER. During this injection operation the GOOSE II supplied a steady flow of liquid to the GANDER. This allowed for a continuous injection line of 360 metres. The in-line filters were cleaned after each injection pass.

On completion of the injections two additional lines were injected from East to West across the boatslip. Both lines were only 20 metres in length and a volume of 1500 litres was pumped into the sediments.

The differential GPS was used to obtain accurate positions of the start and finish of each trackline. The system was also evaluated in trackline mode for use in injecting larger areas.

Post injection cores were collected immediately after completion of the injections. Benthos cores were collected at the following stations: B1, C1, C2, D2, G2, J2 and K2. Cores were returned to CCIW and placed in the lab trailer cooler.

On June 28 and 29 an area of 10,240 square metres at Dofasco (Pier 21) was injected with 50,500 litres of liquid calcium nitrate/brewer's yeast. Range poles were used for tracklines and the vessel speed was estimated (0.3 metres/sec.). The nozzles on the injection bar were drilled out to 0.188" and all flow restricters behind the nozzles were removed. The nozzles on the upper bar were capped. Flow rates averaged 16,500 litres per hour. The liquid calcium nitrate and brewer's yeast was delivered to the site by tanker truck.

The calcium nitrate tankers were unloaded into three 5600-litre reservoirs onshore. Brewer's yeast was added (25% by volume) to the reservoirs from a second tanker. The mixture was pumped into holding tubs on the GOOSE II which delivered it to the GANDER. During this injection operation the GOOSE II supplied a steady flow of liquid to the GANDER. This allowed for a continuous injection line of 340 metres.

INJECTION SUMMARY

April 95

Area injected: 7200 square metres
Concentration: 58 percent
Average flow rate: 10,000 litres per hour
Volume of liquid injected: 13,000 litres
Trackline 1A - 750 litres, 150 m
1B - 750 litres, 150 m, overlap line 1A
2A - 1950 litres, 400 m
2B - 2400 litres, 300 m, overlap line 2A
3A - 3000 litres, 400 m
3B - 2500 litres, 300 m, overlap line 3A
4A - 250 litres, 125 m
4B - 1400 litres, 150 m, overlap line 4A

May 95

Area injected: 20,300 square metres
Concentration: 58 percent
Average flow rate: 11,000 litres per hour
Volume of liquid injected: 37,550 litres
Trackline 1A - 1000 litres, 125 m
1B - 1350 litres, 125 m, overlap line 1A
1C - 1150 litres, 125 m, overlap line 1B
2A - 1500 litres, 150 m
2B - 1700 litres, 150 m, overlap line 2A
2C - 1400 litres, 150 m, overlap line 2B

3A - 1200 litres, 150 m
3B - 3350 litres, 560 m, overlap line 3A
3C - 1350 litres, 150 m, overlap line 3B
4A - 1100 litres, 150 m
4B - 3350 litres, 560 m, overlap line 4A
4C - 1500 litres, 150 m, overlap line 4B
5A - 1000 litres, 100 m
5B - 2400 litres, 560 m, overlap line 5A
5C - 1800 litres, 560 m, overlap line 5B
5D - 3400 litres, 560 m, overlap line 5C
6A - 2500 litres, 560 m
6B - 1850 litres, 560 m, overlap line 6A
6C - 3150 litres, 560 m, overlap line 6B

June 95

Area injected: 10,240 square metres
Concentration: Calcium nitrate = 58 percent
Injection mixture: 75 % calcium nitrate + 25 % brewer's yeast
Average flow rate: 16,500 litres per hour
Volume of liquid injected: 50,500 litres
Trackline 1A - 1200 litres, 125 m
1B - 1800 litres, 125 m, overlap line 1A
1C - 1600 litres, 125 m, overlap line 1B
2A - 1900 litres, 125 m
2B - 1900 litres, 150 m, overlap line 2A
2C - 1850 litres, 150 m, overlap line 2B
3A - 1900 litres, 150 m
3B - 1900 litres, 150 m, overlap line 3A
3C - 1750 litres, 150 m, overlap line 3B
3D - 750 litres, 75 m, overlap line 3C
4A - 1900 litres, 150 m
4B - 1900 litres, 150 m, overlap line 4A
4C - 1800 litres, 150 m, overlap line 4B
5A - 4400 litres, 340 m
5B - 3500 litres, 340 m, overlap line 5A
5C - 4250 litres, 350 m, overlap line 5B
5D - 3650 litres, 320 m, overlap line 5C
6A - 4400 litres, 340 m
6B - 4400 litres, 340 m, overlap line 6A
6C - 3750 litres, 340 m, overlap line 6B

SAULT STE. MARIE

On Monday, July 10, a TOS dive team (Breedon, Dahl, Don and Gray) accompanied by Ms. J. Corsini, NTRB, travelled to Sault Ste. Marie to carry out the 1995 summer coring/injection program at the frame test site in the St. Marys River. Marker buoys were installed at the frame site and 20 metres downstream. A groundline was installed between the marker floats. All underwater tasks were recorded using video equipment.

At the test frame site, cores (three cores per frame) were collected at each frame. All seven frames were cored in the top left quadrant. Frames 1, 2, 3 and

4 were injected with liquid calcium nitrate by divers in 1994 and frame 5 was used as a control. After completion of the coring, frames 1 and 2 were re-injected with calcium nitrate solution (5.68 Kg CaNO3 + 10 litres H2O). Frames 3 and 4 were re-injected with a solution of calcium nitrate and brewer's yeast (5.68 Kg CaNO3 + 1% yeast + 10 litres H2O). Frame number 5 was injected with 10 litres of water. Frames 6 and 7 were injected with a solution of calcium nitrate (21.05 Kg CaNO3 + 20 litres of H2O).

Six box core liners were installed in the bottom along the groundline. Divers pushed the liners down until yield at the wood fibre layer. Then, using a hand saw along the sides of the liner, the diver cut a groove, pushing the liner down until the top was 5 cm. above the interface. Each liner was fitted with 1/4" SS lifting straps and a small numbered subsurface float. An air lift was used to clear the sediment/wood fibre from inside the liner and on one side to allow the insertion of the bottom plate. Sediment was collected from the top 10 cm at the site and placed in twelve 10-litre pails. The pails were taken to the shore facility for treatment.

All twelve pails were dumped into a large holding tub. Sixty litres of sediment were moved into another tub and a mixture of 1.26 Kg calcium nitrate dissolved in 1 litre of water (to achieve a final concentration of 3 g NO3-N/L) plus 1% brewer's yeast was evenly mixed throughout the sediment. The treated sediment was subdivided into 10-litre pails. Divers poured three pails (30 litres) into each of the box core liners marked #3 and #4. Subsamples of the treated sediment were saved for nitrate analysis.

Sixty litres of the mixed untreated sediment was removed from the holding tub into a smaller mixing tub. A mixture of 2.53 Kg of calcium nitrate dissolved in 2 litres of water (to achieve a final concentration of 6 g NO3-N/L) and 1% brewer's yeast was evenly mixed throughout the sediment. The treated sediment was subdivided into 10-litre pails. Divers poured three pails (30 litres) into each of the box core liners marked #5 and #6. Subsamples of the treated sediment were saved for nitrate analysis.

Another sixty litres of untreated sediment was subdivided into 10-litre pails. Divers poured three pails (30 litres) into each of the box core liners marked #1 and #2 which acted as controls. The liners were left at the site until October.

As an additional task, divers injected 4 litres of hydrogen peroxide into the sediment and observed the reaction. The injection caused a large volume of gas to be produced which lasted for 15 minutes. The emission of gas bubbles left a small crater 36 cm in diameter and 9 cm deep.

On Tuesday, October 10, a TOS dive team (Dahl, Don and Gray) accompanied by Ms. J. Corsini, NTRB, travelled to Sault Ste. Marie to carry out the 1995 autumn coring/injection program at the frame test site in the St. Marys River.

On the first dive at the frame site it was apparent that the site had been visited by someone. A hole at the lower right corner of frame 7 showed the characteristics of an anchor drag. There was no sign of movement of the frames. The groundline between the frames and the box core liners was slack, indicating that the liner's marker float was lifted. A survey stake (1/2" copper pipe) with

red fluorescent ribbon was found pushed into the bottom approximately 20 ft. south of frame 1. This indicated that whoever visited the site was diving.

At the test frame site, cores (three cores per frame) were collected at each frame. All seven frames were cored in the lower left quadrant. Frames 1, 2, 3 and 4 were injected with liquid calcium nitrate by divers in July 1995 and frame 5 was injected with 10 litres of water. After completion of the coring, frames 1 and 2 were re-injected with calcium nitrate solution (5.68 Kg CaNO3 + 10 litres H2O). Frames 3 and 4 were re-injected with a solution of calcium nitrate and brewer's yeast (5.68 Kg CaNO3 + 1% yeast + 10 litres H_2O). Frame number 5 was injected with 10 litres of water. Frames 6 and 7 were injected with a solution of calcium nitrate (21.05 Kg CaNO3 + 20 litres of H_2O).

Six box core liners installed in the bottom during the July sampling, were retrieved. As an additional task, six cores were collected at past sampling sites. DGPS was used to position marker floats for the divers. The DGPS worked well, using Nebish Island, Michigan for the differential beacon. All sampling positions, previously obtained using NAD 27 as a datum, were converted to WGS-84 datum to be compatible with DGPS.

ST. MARYS RIVER STATION POSITIONS

Frame:		N = 5153063.	E = 706299.	(NAD-27)
		N = 5153281.	E = 706293.	(WGS-84)

CORING SITES

Treatment Cores:	V95A1-1	N = 5153293.	E = 706243.	(WGS-84)
	V95B1-1	N = 5153298.	E = 706259.	(WGS-84)
	V95C1-1	N = 5153298.	E = 706274.	(WGS-84)
	SV95AX1-1	N = 5153268.	E = 706244.	(WGS-84)
	SV92BX1-1	N = 5153268.	E = 706254.	(WGS-84)
	SV95CX1-1	N = 5153268.	E = 706274.	(WGS-84)

SEDIMENT STUDIES IN THE DOFASCO SLIP

NTRB STUDY 12920, DR. T.P. MURPHY

Water samples and Hydrolab profiles were taken at 4 stations in the Dofasco slip. The purpose of this study was to monitor sewage effluent out of the Dofasco slip. Hydrolab profiles were taken to determine if there were anoxic conditions at any depth of the water column and to measure the amount of turbidity. Water samples were collected to determine the presence of sulphide and to analyze for metals and nutrients. Further water sampling was done to monitor bacterial counts. Two stations were used as controls--one located between the Dofasco slip and CCIW South corner and the second at CCIW dock South corner. Hydrolab profiles and water samples were taken at these stations as well.

Hydrolab profiles (with turbidity) and water samples were taken while following closely behind Great Lakes ships entering the Dofasco slip. The purpose of the study was to determine the amount of sediment disturbed by ship activity. Water samples were taken to monitor the amount of suspended solids. Sampling took place between June and September.

On September 28, 10 mini box cores were collected in the Dofasco slip. Calcium nitrate was then added to the sediment and used as a "bench scale" experiment to determine effects that may result in a "pilot experiment" in Dofasco slip.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
WATER SAMPLING AND HYDROLAB PROFILING - DOFASCO SLIP - MURPHY		
1	43° 16' 04"	79° 48' 04"
2	43° 16' 15"	79° 47' 58"
3	43° 16' 27"	79° 47' 53"
Harbour control	43° 17' 28"	79° 48' 36"
CCIW control	43° 17' 49"	79° 48' 06"
Outflow	43° 16' 14"	79° 47' 56"

CHAIN LAKE B.C.
NTRB STUDY 12920, DR. T.P. MURPHY

This was the final year for support to Dr. Murphy at Chain Lake in British Columbia. During the week of June 12 - 17, the berms that held the dredged material were filled by a local contractor. A final set of water samples was collected from the dredged hole in the lake. The samples collected were for: nutrients, chlorophyll a and total phosphorus. Secchi disc was observed. It was noted that the lake was remarkably clear(4.8 m). A Hydrolab H_2O profiler was used to obtain profiles for oxygen, conductivity, pH and temperature.

All equipment was removed from the lake and stored in a storage area assigned by the property owner. It was picked up by the B.C. Fish and Wildlife staff in late July. The equipment included snow fence, fence posts, rope and buoys.

After the berm was filled in the property owner--Mr. W. Steele, signed off with Environment Canada that his property was returned to its original condition.

HAMILTON HARBOUR
NTRB STUDY 12921, I. DROPPO

Two moorings were installed in the Dofasco slip on June 16 and removed July 28. Each mooring was equipped with a dissolved oxygen, OBS and Brancker logger. The purpose was to determine the effect of ship resuspension and combined sewage outflow on dissolved oxygen, turbidity and conductivity.

On June 6, in the Dofasco slip, 2160ℓ of water were centrifuged with an Alpha Laval centrifuge. On September 28, 210ℓ were centrifuged with an Alpha Laval

centrifuge close behind a Great Lakes ship. The purpose of this study was to determine PAH and suspended solid concentrations in sediment undisturbed and disturbed by ship activity.

On December 8, five mini box cores were collected approximately 200 m south of the Burlington golf course in a relatively low contaminated area. The sediment samples were collected for developing new technologies and modelling for harbour remediation.

STATION POSITIONS

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
DO, OBS, BRANCKER MOORINGS - DOFASCO SLIP - DROPPO		
95-50C-58A	43° 16' 12"	79° 47' 56"
95-50E-59A	43° 16' 13"	79° 47' 55"

COASTAL GEOLOGY
NTRB STUDY 12922, DR. N.A. RUKAVINA

As part of an ongoing Lake Ontario coastal survey, at the foot of Green's Road in the town of Stoney Creek, Technical Operations divers surveyed the site on one occasion (May 16). A busy end-of-year schedule combined with poor weather conditions prevented divers from completing the December survey. Stake measurements were recorded and a video was made to document any changes since the last inspection.

STATION POSITIONS

	NAD 27		NAD 84	
STAKE	NORTHING	EASTING	NORTHING	EASTING
1	4788351.	603598.	4788566.3	603595.1
2	4788391.	603611.	4788606.3	603608.1
3	4788406.	603615.	4788621.3	603612.1
4	4788468.	603634.	4788683.3	603631.1
5	4788546.	603662.	4788761.3	603659.1
6	4788608.	603680.	4788823.3	603677.1
7	4788713	603714.	4788928.3	603711.1

RIVERBED SEDIMENTATION STUDY
NTRB STUDY 12922, DR. N.A. RUKAVINA

This study was designed to test bottom-mounted acoustic systems for high resolution monitoring of riverbed erosion or sedimentation. A system was used to measure sediment flux in the St. Lawrence River at Courtaulds Corp., Cornwall, Ontario. This study will provide data on the stability of the contaminated sediments in the area and will determine whether sediment remediation by injection, capping or dredging is required.

During 1993, three bottom-mounted T-frames were installed downstream of the Courtaulds waterfront. Two sites (1 and 3) were equipped with two transducers, an OBS sensor and a Brancker datalogger. The transducers were mounted facing down on the outside arms of the T-frame. The OBS optical sensor was mounted facing the current on the base of the T-frame 10 cm above the sediment. The T-frame at site number two was not used this year.

Technical Operations divers visited the site bi-monthly (May 9, July 4, September 6, November 7 and December 5) to change the Brancker datalogger and to collect measurements. The T-frame at site #1 was refurbished for the winter period. Underwater video was obtained at each site during refurbishment to document changes in the site composition.

STATION POSITIONS (NAD 27)

STATION	LATITUDE N.	LONGITUDE W.	NORTHING	EASTING
1	45° 01' 04.094"	74° 41' 44.738"	4984756.	523972.
2	45° 01' 15.691"	74° 41' 18.861"	4985116.	524537.
3	45° 01' 25.489"	74° 40' 59.434"	4985420.	524961.

ROXANN SEDIMENT SURVEYS, SAULT STE. MARIE, SARNIA AND CORNWALL
NTRB STUDY 12922, DR. N.A. RUKAVINA

In co-operation with the Ontario Ministry of Environment and Energy, three areas in Sault Ste. Marie were sounded, using an Atlas sounder with the RoxAnn Bottom Classification System aboard the survey launch, PUFFIN. For sub-metre accuracy, Sercel DGPS and Microplot survey software were used. A DGPS reference station was set up at "DYKE"--a CHS survey monument located at the approximate centre of the work area on the St. Marys River. Area 1 was located on the north side of the river between the government dock and Belleview Marina. This area was used as a dumping site during seaway construction and has accumulated a large amount of sediment from local industry. Area 2 was located on the north side of the St. Marys River east of Area 1 between the sewage treatment plant and Partridge Point. This part of the river flows into Lake George. The site has a large shoal extending out from shore, covering the majority of the west end of the

site. Area 3 was located on the west side of the locks from Algoma Steel west, following the north shore for approximately 4 km. Extending from shore about 300 metres. This area contains contaminated sediments from the steel industry. Ground-truth samples and underwater television images were collected by MOEE personnel, utilizing the vessel, MONITOR VI. A total of 150 km of sounding lines were completed in Sault Ste. Marie.

In co-operation with the Ontario Ministry of Environment and Energy, two areas in Sarnia were sounded, using an Atlas sounder with the RoxAnn Bottom Classification System aboard the survey launch, PUFFIN. For sub-metre accuracy, Sercel DGPS and Microplot survey software were used. One DGPS reference station was used at each area. The RoxAnn survey at Sarnia was a repetition of part of a RoxAnn survey run a year earlier. A dive unit contracted by MOEE was used for ground-truthing. The two areas are located on the east shore of the Detroit River. Area 1 extended from the ESSO refinery south about 5 km to the SUNCOR refinery from shore out about 75 m. Area 2 was located south of Sarnia between Stag Island and the east shore. This area covers from the north end to the south end of the island, extending from the mainland 75 m from shore. A total of 140 km of sounding lines were run in Sarnia.

The RoxAnn survey on the St. Lawrence River at Cornwall consisted of 4 areas which were sounded using an Atlas sounder with the RoxAnn Bottom Classification System aboard the survey launch, PUFFIN. For sub-metre accuracy, Sercel DGPS and Microplot survey software were used. One DGPS reference site was utilized at a CHS plug named station "LOCK". Area 1 between Courtaulds and Pilon Island sounded in 1993 and 1994 was sounded again for comparison. A small detail area at the west end of Area 1 was sounded. This area was run with a 5-metre line spacing. Area 2 was located just east of the international bridge from the launching ramp to the civic centre approximately 200 metres wide. These two areas were ground-truthed using a Benthos underwater video camera. Area 3 was a small area 100 m x 100 m just off the eastern tip of Pilon Island. Area 4 was an area measuring 1000 m x 300 m located on the south shore just east of the international bridge and offshore from the General Motors plant. This area was sounded to be used as a reference for dredging of contaminated sediments by the United States "SUPERFUND" group. A total of 180 km of sounding lines were run in Cornwall.

RESEARCH SUPPORT BRANCH

BOTTOM-MOUNTED SCANNER INSTALLATION
ATMOSPHERIC ENVIRONMENT SERVICE
RSB STUDY 12631, S.B. SMITH

Technical Operations supported Dr. B. Kerman, AES, with the installation of a horizontal scanning device on the bottom in Hamilton Harbour. A monitoring cable was laid out from the northwest corner of the finger dock to a point 450 metres northwest, well clear of any interference by way of wave action from the CCIW breakwall. The scanner, mounted on an octagonal aluminum frame 0.6 metres off the bottom, was installed at this point in 8 metres of water and a short groundline was run to a railway track anchor and spar surface marker. Monitoring of the instrument will be done by McQuest Marine Research and Development.

MUD PUPPY COLLECTION, WOLFE ISLAND, LAKE ONTARIO
ENVIRONMENTAL CONSERVATION BRANCH, ENVIRONMENT CANADA-ONTARIO REGION
RSB STUDY 12631, S.B. SMITH

Technical Operations supported this study by assisting with the collection of mud puppies from the nearshore waters between Garden and Wolfe islands in the east end of Lake Ontario. The animals were required to serve as biological indicators of organic contaminants in this area of the lake.

The field party, consisting of a technologist from this section, Dr. Weseloh, a contract employee with the Canadian Wildlife Service and two people from the University of Quebec, assembled at the ferry dock on Wolfe Island in the early afternoon of January 25th. A total of 45 minnow traps baited with frozen minnows were set in groups of five or ten at five nearshore sites in the vicinity of the Marysville ferry dock and Garden Island.

The next morning the traps were checked and a quantity of mud puppies were captured. Forty mud puppies were then dissected and specimens of blood, liver, kidney and ova were collected. The limbs were removed and saved so they could be checked for deformities.

RANDLE REEF SEDIMENT COLLECTION
WASTEWATER TECHNOLOGY CENTRE
RSB STUDY 12631, S.B. SMITH

Technical Operations supported Mr. D. Phagoo, WTC with the collection of bulk sediment samples from Hamilton Harbour, using the mini box core and the barge GOOSE II on October 30-31.

Two sites were sampled within Hamilton Harbour. The first site was chosen as a source for relatively clean sediment and was located in the Western Basin of the harbour. Ten 5-gallon pails of sediment were collected there on the morning of October 30th. Sampling of the second site, located in the corner of the Stelco dock inside of Randle Reef, was postponed until the following day due to high

winds which would have made the handling of the badly contaminated sediment especially hazardous. On the morning of October 31st, thirty pails of sediment were collected from this site. In both cases the barge was anchored during sampling in order to minimize the variability between pails.

The sediment was delivered to the Wastewater Technology Centre upon completion of the sampling both days.

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
Clean Site	43° 16' 48.0"	79° 52' 21.0"
Randle Reef	43° 16' 22.8"	79° 50' 02.1"

OTHER OUTSIDE AGENCIES
RSB STUDY 12631, S.B. SMITH

During the field season, Technical Operations supported a number of other agencies on various NWRI joint projects. Following is a list of this support:

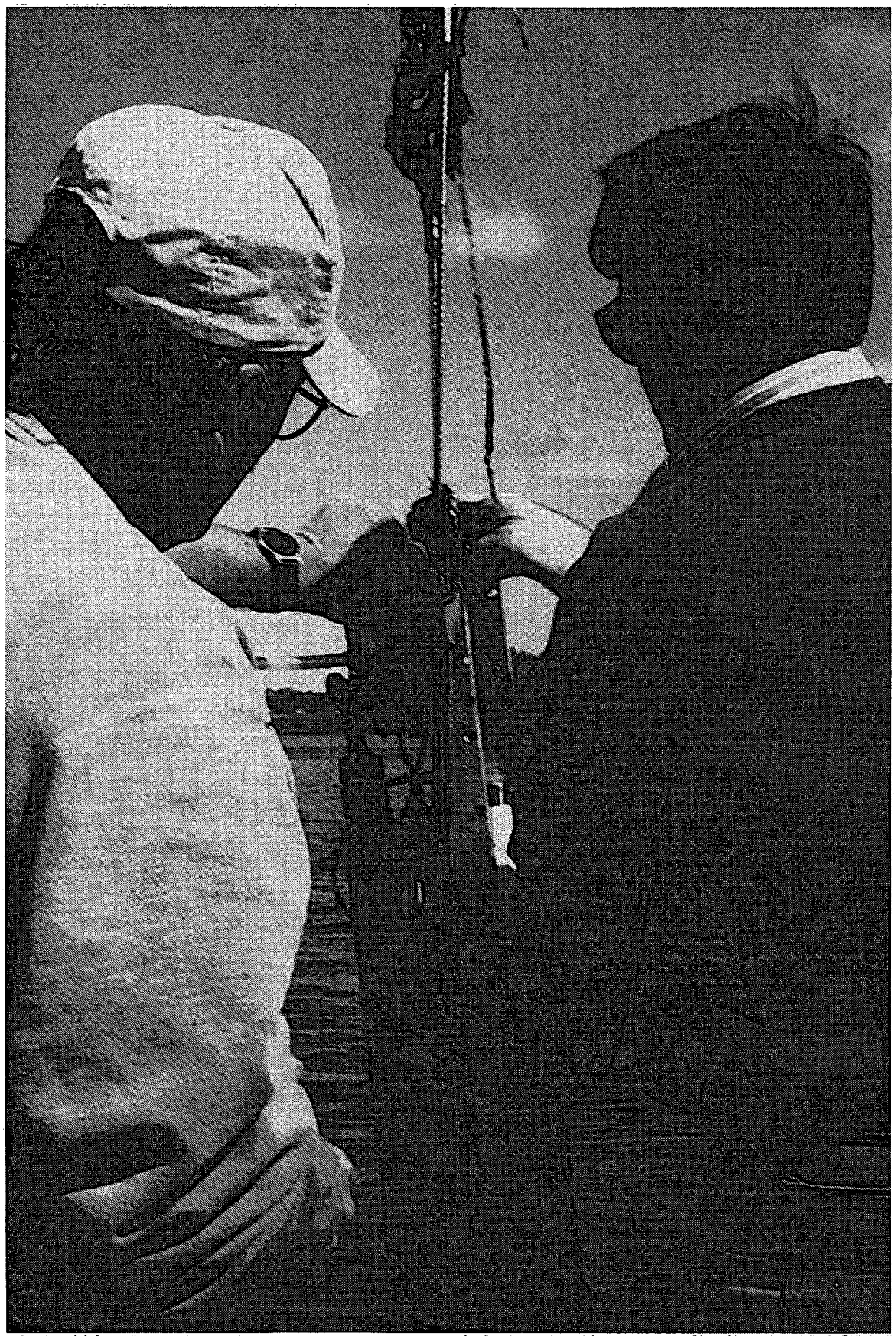
NHRI, Saskatoon	Loan of sampling equipment
GLLFAS, DFO, Dr. O. Johannsson	Anchor moorings, Lake Ontario Zooplankton net hauls, Lake Erie
Environment Canada, Ontario Region	Vehicle Loan ,CWS, AES, EHD
Environment Canada, B. Kerman	Loan of sampling equipment
Wave Climate Study, DFO, Ottawa	Moorings, Lake Ontario
Fisheries and Oceans, CHS	Loan of sampling equipment
Fisheries and Oceans	Dive inspections
Wastewater Technology Centre	Sediment sampling, Hamilton Hbr.
University of Toronto, Dr. G. Sprules	Zooplankton net hauls, Lake Erie
University of Waterloo, R. Fletcher	Sediment samples, Lake Erie
University of Waterloo, Dr. R. Smith	Water samples, Lake Erie
Trent University	Water samples, Lake Erie
University of Michigan	Water samples, Lake Erie
University of Quebec, M. Twiss	Water samples, Lake Erie

University of Toronto, J. Krestow	Sediment samples, Lake Erie
University of Toronto	Water samples, Turkey Lakes
University of Guelph	Loan of sampling equipment
University of Waterloo, E. Harvey	Sediment sampling, Lake Ontario
York University	Loan of sampling equipment
University of Guelph, T. Claxon	Loan of sampling equipment
U.S. EPA, New Jersy	Sediment sampling, Lake Ontario
University of Oregon	Field and equipment, Lake Ontario
N.Y. Dept. of Environmental Conservation	Sediment sampling, Lake Ontario
University of Guelph, A. Sand	Sediment samples, Bay of Quinte
U.S. Fish and Wildlife Service	Moorings
State University New York, Dr. S. Bryant	Acoustics and fish trawls, Lakes Ontario and Erie

ST. LAWRENCE RIVER WATER QUALITY STUDY
ECOSYSTEM HEALTH DIVISION, ECB, EC-ONTARIO REGION, R. McCREA
RSB STUDY 12631, S.B. SMITH

The study was to monitor water quality of the St. Lawrence River as it passes through the Cornwall/Massena Reach. To accomplish this, three moorings were deployed in the river--1 below the Ontario Hydro (Saunders) dam and the remaining 2 in the St. Lawrence River slightly upstream of the Raquette River on the southern side of the river. Four Coast Guard navigation buoys were also used to suspend automatic water samplers. At navigation buoys 5A and 6 on the St. Lawrence, two Infiltrex samplers were suspended from two separate mooring wires. This was to prevent overloading of the wires which would result in lost equipment. At the mooring below the dam, only one sampler was deployed due to extremely fast currents. If more than one sampler was deployed they would be guaranteed to be lost. The mooring nearest the southern shore above the Raquette River had two Infiltrex samplers suspended from the same wire. This was possible at this site because of a much slower current, allowing the samplers to hang properly.

Sediment traps were suspended from moorings on navigation buoys 6A and 7 as well as the fastwater mooring deployed at Cat Island Shoal, above the Raquette River. All samplers and moorings were deployed in early May and retrieved in early December.



REBURBISHING AN INFILTREX SAMPLER AT CORNWALL

STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
95-07S-08A	44° 59' 40"	74° 41' 37"
95-07S-09A	45° 00' 17"	74° 74' 06"
95-07S-10A	44° 59' 48"	74° 41' 36"

LONG-TERM SENSING SITES (LTSS), CORNWALL REGION
ECOSYSTEM HEALTH DIVISION, ECB, EC-OR, H. BIBERHOFER
RSB STUDY 12631, S.B. SMITH

A program was developed to assess the long-term effectiveness of remedial work in the region as a whole. A network of Long Term Sensing Sites (LTSS) was jointly developed by Environment Canada (Quebec and Ontario Regions), the Quebec Ministry of Environment and Wildlife and the Ontario Ministry of Environment and Energy.

The objective of the program was to study the quality of the sediments and suspended solids in order to assess the transport of contaminated material downstream from Massena, N.Y. sources.

Four sampling sites with fixed structures were positioned in the river--one upstream and 3 downstream of the Massena area. The sites were in areas of sediment deposition and were permanently moored for the continuous collection of physical and chemical data. Data collected included: current velocity and direction, turbidity, net sediment accumulation and quantity/quality of sediment suspended in the water column.

Contaminant analysis included selected inorganic substances such as heavy metals as well as PCBs. The sediment results may make it possible to evaluate any PCB enrichment in the suspended solids that may originate from the Massena area.

A pollution chronology study is being carried out at each site by marking the sediment in order to create an artificial horizon within the sedimentary deposit areas. That horizon acts as an temporal benchmark for future sampling at the same sites. Using sediment core collection techniques, the contaminant profile versus time through dating of the various sediment layers will be determined for each site. Contaminant concentrations in the layers above the artificial horizon will make it possible to determine the rates of contaminant transport and accumulation. These core samplings will be repeated on a 5-year schedule and monitor the long-term effects of the remedial activities.

In the first week of April all moorings were located using pinger receivers and marked with spar buoys. Moorings were refurbished monthly (May 8, June 5, July 4, August 8, September 6, October 3 and November 6). The mooring in Lake St. Lawrence was retrieved on October 27 and reinstalled at a new location closer to

the power dam. During the first week of December all moorings were refurbished and the spar buoys removed for the winter. Due to the early freeze-up, the spar buoy on the Lake St. Lawrence mooring could not be removed.

MOORING POSITIONS

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
Lake St. Francis, LTSS		
95-07CA-04A	45° 08' 40"	74° 25' 52"
95-07CA-05A	45° 07' 08"	74° 26' 59"
95-07CA-06A	45° 25' 59"	74° 25' 59"
Lake St. Lawrence, LTSS		
95-07CA-07A	45° 01' 25"	74° 47' 43"

CORNWALL REMEDIATION ACTION PLAN

The LTSS network was supplemented with 2 additional sites in support of the St. Lawrence RAP. These sites were positioned on the Cornwall waterfront to provide the RAP team reference stations to track sediment quality in response to remedial actions and changes in industry in the Cornwall area. Mooring number 95-07A-12A was installed just east of Pilot Island and mooring number 95-07S-03A is a T-frame to which a groundline was attached for the sediment trap mooring.

MOORING POSITIONS (WGS 84)

MOORING NUMBER	LATITUDE N.	LONGITUDE W.
Cornwall RAP Moorings		
95-07S-03A	45° 01' 25"	74° 40' 59"
95-07A-12A	45° 01.523'	74° 39.534'

BIOMONITORING

Mussels feed by filtering water and the associated sediment particles. Accumulation of contaminant levels in the mussel tissue provides an integrated measure of contaminant presence in both dissolved and particulate forms as well as an indication of the bioavailability of contaminants.

A field party consisting of M. Dahl, T. Breedon, TOS, and H. Biberhofer, ECB, OR, arrived in Cornwall on October 23. On October 24th and 25th mussels were collected from nine sites and on October 26th from the remaining three stations. These collections were part of a continuation of a long standing biomonitoring program. Each year freshwater mussels, Eliptio complenata 8.5 - 9.5 cm long, are collected from 13 sites in the St. Lawrence River around Cornwall and St. Regis Islands. This year 10 mussels were collected from each site. At two stations (14 and 10) 2000 zebra mussels were also collected. The zebra mussels and 5 Eliptio from each site were given to the Akwasasne reserve for contaminant analysis. The remaining 5 Eliptio were frozen and transported to CCIW for contaminant analysis.

BIOMONITORING STATION POSITIONS

STATION NUMBER	LATITUDE N.	LONGITUDE W.
2	45° 02.2329'	74° 36.2523
3	45° 01.8371'	74° 36.7007'
4	45° 01.7708'	74° 38.7743'
5	45° 01.4065'	74° 39.1959'
6	45° 01.1706'	74° 39.6248'
7	45° 00.7799'	74° 39.8541'
8	45° 00.7825'	74° 39.5703'
9	44° 59.7361'	74° 42.7208'
10	44° 59.7382'	74° 42.7298'
11	45° 00.2215'	74° 41.4710'
12	45° 01.0111'	74° 37.5815'
13	45° 00.7234'	74° 37.4599'
14	45° 00.5297'	74° 46.1538'

PRODUCTIVE CAPACITY OF FISH HABITAT
GREAT LAKES LABORATORY FOR FISHERIES AND AQUATIC SCIENCES,
V. CAIRNS, J. FITZSIMONS
RSB STUDY 12631, S.B. SMITH

This project was a continuation of past studies to investigate the factors which affect fish and fish habitat associations in Great Lakes areas of concern thereby addressing the terms of the 1988 Great Lakes Water Quality Act (Annex 2). Technical Operations provided diver, diving equipment and underwater television/ video support to this study. The long-term objectives of the work include:

1. To develop habitat assessment and analysis methods (based on GIS technology) which integrate biological, chemical and physical components of the ecosystem.

2. To develop predictive models of fish habitat requirements in relation to fish production for use as management tools in the assessment of proposed changes to fish habitats throughout the Great Lakes.

3. To evaluate fish habitat restoration methods.

TECH. OPS. DIVE SUPPORT

DATE	LOCATION
March 31	Pt. Weller
April 19-20	Parry Sound
May 1	Pt. Weller
May 4	Parry Sound
May 12	Pt. Weller
May 18	Parry Sound
May 19	Pt. Weller
July 25	Aqua Park
August 16-17	Pigeon Island
September 6	Pt. Maitland
September 11-14	Toronto
September 19-20	Pt. Maitland
September 26	Dunkirk, N.Y.
September 27-28	Charlston Lake
November 17	Sam Smith Park
November 23	Ashbridges Bay
November 24	Ashbridges Bay
November 29	Charlston Lake
December 5	Barcelona, N.Y.

WATER QUALITY SAMPLING, WOLFE ISLAND AND NIAGARA-ON-THE-LAKE
ECOSYSTEM HEALTH DIVISION, ECB, EC-ONTARIO REGION
RSB STUDY 12631, S.B. SMITH

On Monday, September 18, two TOS divers (Breedon and Don) travelled to Kingston to inspect the underwater intake moorings at the Wolfe Island Water Quality sampling station. Mr. B. Harrison, EHD, ECB, EC-OR met the dive team at the station on Tuesday morning. During the dive, all parts of the intake moorings were found intact. The outer intake ends were covered with a layer of zebra mussels from one to three inches thick. All the intake wands were cleaned with the exception of one wand on the old intake buoy. The pump table was upright and solid. The concrete cap over the intake lines was in good condition with no signs of ice damage. Both divers returned to CCIW on Tuesday, September 19.

On Thursday November 2, three TOS divers (Breedon, Dahl and Don) travelled to Niagara-on-the-Lake to inspect the underwater intake moorings at the Water Quality sampling station located on the Niagara River. Mr. B. Harrison, EHD,

ECB, EC-OR met the dive team at the station on Thursday morning. During the dive, all parts of the intake moorings were found intact. The outer intake ends were covered with a layer of zebra mussels from one half to one inch thick. All the intake wands were cleaned and mooring hardware was inspected. Divers returned to CCIW on the same day.

CANADIAN WILDLIFE SERVICE
DR. V.W. WESELOH
RSB STUDY 12632, B.H. MOORE

Once again, the Technical Operations Section supported the Canadian Wildlife Service field program. The 1995 short season (April to August) covered a large area of Southern Ontario.

Several independent teams of scientists and technicians worked together to collect the large amounts of data needed for the research of the many study programs. With continuous pressure from upper management to reduce costs, many of the study programs were cut back considerably. Streamlining of research programs was done in such a manner as to maintain continuity with past data from the same or similar studies. Most of TOS support went to the study of colonial waterbirds like gulls, terns and Cormorants nesting on the Great Lakes and connecting waterways.

The main purpose of these studies was to determine or aid in the determination of how various factors constitute biological effects of toxic chemicals in these and other species. For obvious logistical reasons, the majority of the research was done on eggs and chicks from mid-April through mid-July. Field teams were kept very busy visiting the many colonies spread out over the Great Lakes and connecting waterways. Visits during nest-building, egg-laying and chick-rearing were needed. This, plus the fact that different colonies and different species throughout the research area start nesting at different times, added to the tight scheduling of field work.

Twice weekly, shoreline surveys of the Bay of Quinte were conducted to determine bird species, movement and feeding patterns. These surveys were made from a small launch operating just off shore (approximately 200 metres). Each survey started at Deseronto and followed the shoreline, in and out of all bays, even to the shallows at the far end of Big Bay. Then crossing to the south side at the Glenora Ferry Crossing, down to Picton, following the south shore west, crossing again to the north shore at Trident Pt. and back to the Deseronto ramp. Each shoreline survey varied considerably due to erratic Quinte weather but averaged from 5 to 7 hours, covering approximately 80 nautical miles of shoreline and an observation area of approximately 300 sq. miles.

The large marsh area in Muskot Bay that was surveyed in 1994 was again the centre for a full season of research. The marsh was divided into several sectors and marked off with flagged poles. CWS contractors made daily visits to the different marsh sectors and recorded several types of observations. A small trailer and tent were set up in a farmer's field adjacent to the marsh and served as accommodations and office for two CWS contractors throughout the season. In agreement with the farmer, temporary sewage, hydro and water were run to the

trailer. The trailer was on loan to CWS from the local Ministry of the Environment.

The many field trips, requiring long distances of trailering and boat steaming, were again successfully completed without mishap.

COMMON-USER SUPPORT
RSB STUDY 12633, M.R. MAWHINNEY

Field Stores are operated by the Research Support Branch for the use of branches within the National Water Research Institute, other groups within the Department of Environment and the Department of Fisheries and Oceans. Outside agencies such as provincial governments and universities also use the Stores facilities when arrangements are made with Head of Technical Operations Section.

Field Stores was operated by Mr Y. Desjardins who was assisted by Messrs T. Gilliss, C. Lomas, other technicians and students until his retirement in May. The operation of the Stores was then the responsibility of Mr. P.R. Youakim.

Field Stores personnel issue field project leaders with a variety of equipment. Safety, sediment sampling, water sampling, surveying and laboratory equipment is available to all staff. When returned to Stores, this equipment is inspected for damage and repaired before re-issue. Inventory is maintained for availability and accounting.

RIGGING SHOP
RSB STUDY 12633, M.R. MAWHINNEY

The Rigging Shop staff are responsible for the care of shop facilities, warehouse storage, the outside storage shed, the WAVES research tower and the long-term outside storage areas. Mooring equipment, buoys, generators, power tools, winches, forklifts and various other pieces of research equipment are maintained. The Rigging Shop staff deliver scientific equipment to major ships and field programs throughout the Great Lakes Basin and St Lawrence River. They erect towers, operate boats and heavy trucks and assist in scientific studies when required.

Again this year the rigging staff participated in an increased number of field studies due to the considerable demand on the finite resources of this section, while always endeavouring to have a staff member available to provide regular services in the shop.

VEHICLE SUMMARY
RSB STUDY 12633, M.R. MAWHINNEY

Extensive distances were travelled this year, ranging from Nova Scotia and Quebec in eastern Canada to Alberta in Western Canada.

To accommodate budget restraints three vehicles of the NWRI vehicle fleet were removed from service. These included two station wagons and one large specialized truck. The balance of the fleet has been utilized throughout a very busy field season. The downtime on any vehicle this season has been minimal.

Present plans call for the use of alternate fuels; i.e., propane or natural gas. Over the next several years, the fleet will be converted to dual fuel systems or to diesel fuel. The reason for this dual system has to do with the geographical location of some distant work sites and the lack of or distance between alternate refuelling stations. Vehicles must also be run for short periods on a weekly basis on unleaded gasoline to prevent major internal damage to the engine. Approximately eight vehicles will be converted during the 1996/1997 fiscal year.

This year has seen yet another credit card management company employed to assist with the management of the vehicle fleet. With this new system, credit cards are supplied by the ARI Canada. These cards are used as the old government cards were. The ARI is responsible for the procurement of gasoline and vehicle repairs and basic maintenance of the vehicles. Fleet records are still kept internally.

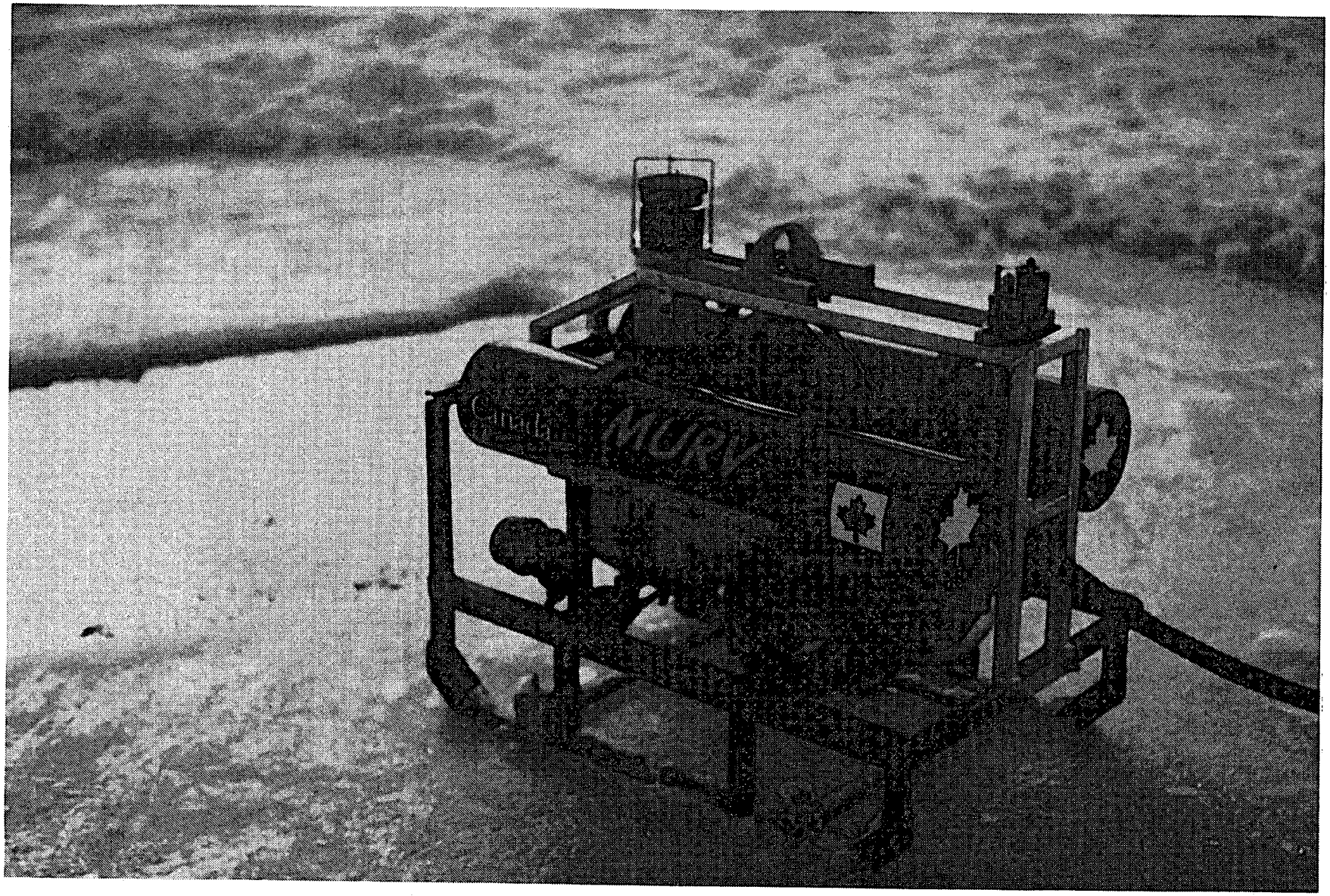
Total mileage travelled by RSB vehicles from December 1994 to December 1995 was 424,546 kilometres.

DIVING OPERATIONS
RSB STUDY 12634, F.H. DON

The Diving Operations Unit of Technical Operations Section provided national support to various scientific studies in areas of diver certification, inspections, installations and retrievals, sample collection, photography, television surveys with video documentation, equipment demonstrations/trials, search and recovery, lectures and diver training. The diving Operations Unit supported 19 divers at Burlington. A total of 633.5 hours (accident free) were logged in support of scientific projects for: NWRI, Ontario Region, BINST, DOE/CPS and GLLFAS. An additional 160 hours were logged during the winter training program in the pool. A total of 38 hours were logged on MURV--the remotely operated miniROVER underwater camera system. Since its rebuild, MURV has been in demand for deep water video recording. Projects included wreck mapping, sonar surveys and documentation of geological formations. 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 CSA Standards Technical Committee on Diving Safety and the Ontario Construction Safety Association Task force on "Diving in Contaminated Environments". Mr. Don is also a member of the Canadian Standards Association Sub-committee on Diving Competency and chairman of the Contaminated Environment working group.

The annual meeting of the Department of Environment Diving Safety Committee was held in April, in Toronto, Ontario. The meeting agenda included:

1. Proposed changes to the DOE Directive for Diving Safety
2. Interpretation and changes to the new Labour Canada Diving regulations
3. Review of diving accident investigations
4. Integration of Heritage Canada with DOE Diving regulations
5. Proposed changes from interdepartmental harmonization

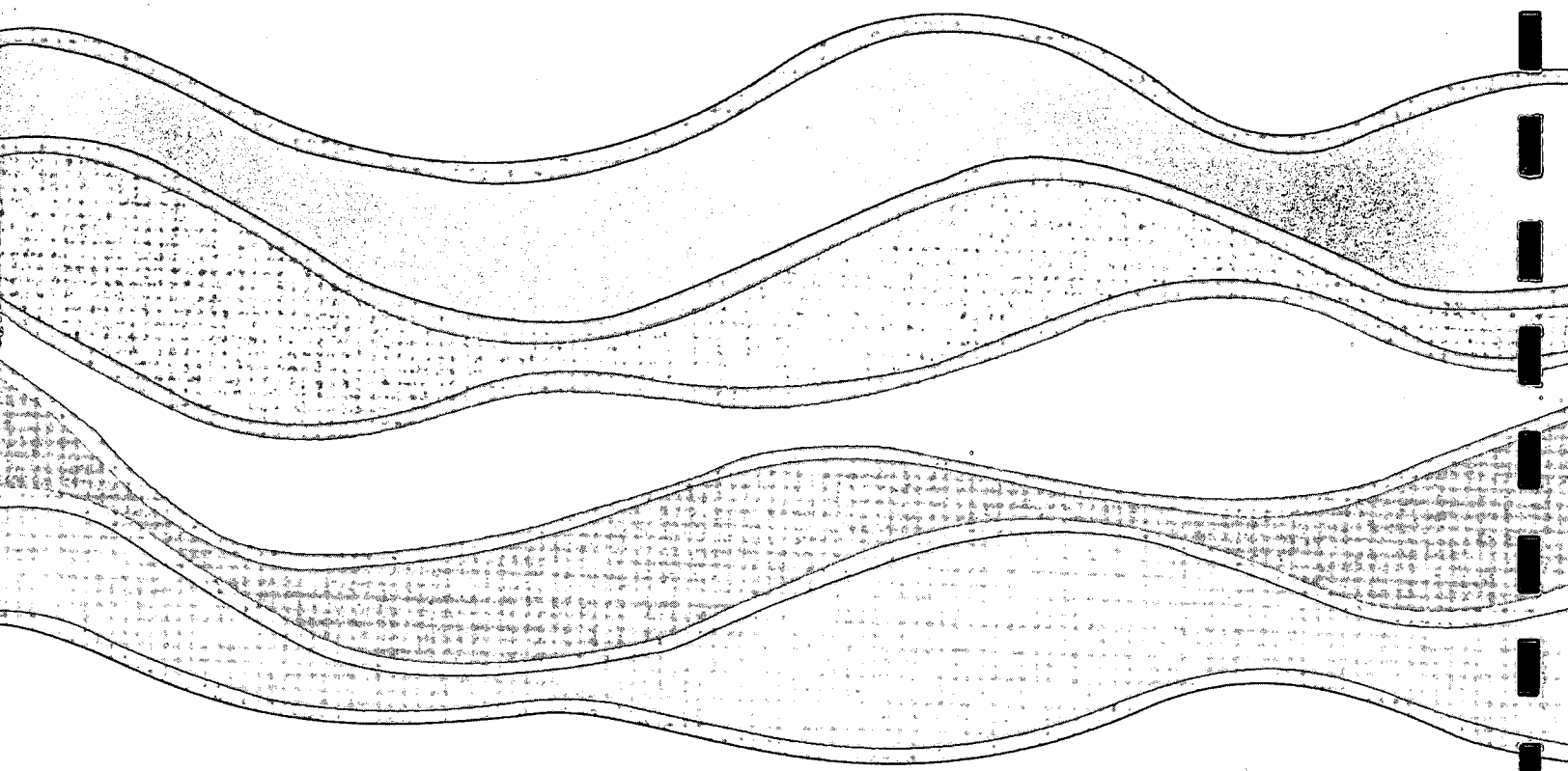


MURV ON ICE

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 1995 included:

STUDY NUMBER	STUDY TITLE
12214	Zeman, AERB, Hamilton Harbour Sand Capping
12217	Rosa, AERB, Sediment Remediation, Lake Erie
12248	Manning, AERB, Lake Remediation, Bay of Quinte
12247	Coakley, AERB, Lake Remediation, Hamilton Harbour/Lake Erie
12920	Murphy, NTRB, Sault Ste. Marie, Hamilton Harbour
12924	Rukavina, NTRB, Hamilton Harbour, Cornwall
12632	Moore, RSB, Water Quality Station, Wolfe Island, Niagara-on-the-Lake
12631	Smith, RSB, Outside Agencies DFO/GLLFAS Fitzsimons, Fish Habitat BINST, Hull inspections



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