70240

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233 - 7010

Thomas C. Jorling
Commissioner

NOV 30 1990

Mr. Douglas Tomchuk
United States Environmental
Protection Agency
Region II
26 Federal Plaza
New York, NY 10278

Dear Mr. Tomchuk:

RE: Hudson River PCB Sites
Site No.: 5-46-031

The November 21, 1990 response letter has provided a satisfactory response to the comments this office forwarded to you on November 16, 1990, except as noted below. Please provide a copy of the letter being sent to your consultant.

The only comments which needed to be addressed prior to finalizing the Statement of Work are:

1. The Project Sponsor Group (PSG) must be provided the same opportunity that General Electric (GE) is afforded during the project. The PSG has historical knowledge that will be valuable to the Oversight Committee. If the PSG is on the Oversight Committee they will be able to provide updates on their application efforts. This could then eliminate the need for your consultant to track their progress. As I discussed with you before they are a separate entity within our Department. In a way they are identical to GE since they are an applicant bound by regulatory requirements. The roles of GE and the PSG should be equal in the reassessment project.

2. The issue on data collection seems to be misunderstood. There currently exists certain data gaps in the existing data. Currently there is a need for additional data in the river at the Remnant Sites location to the outfall of the Hudson Falls Wastewater Treatment Plant. We do not envision a complete resampling of the entire river at this time. The sampling should be performed during 1991 and its goal should be to verify existing conditions. Complete sampling as performed during a normal Remedial Investigation would be wasteful and would add very little to the current knowledge of the river. In addition the proposed models will need a certain amount of sampling to calibrate and verify their usefulness.

3. The Settlement Advisory Committee is a separate entity. The charge of the Settlement Advisory Committee is enclosed. Please note the Settlement Advisory Committee funding is not related to the funding that reverted back to wastewater treatment projects. Contact of the settlement Advisory Committee should be mande through Mr. John Dergosits.

4. The site characterization should include the data generated by General Electric during the Remnant Site Characterization and the Environmental Monitoring.

We will be sending separate response to the issue regarding the upland disposal areas and the identification of specific applicable or relevant and appropriate requirements (ARARs).

We discussed the above comments in a telephone conversation on November 28, 1990. It was agreed that you would forward a copy of the final Statement of Work after it was revised.

If you have any questions please feel free to call me at (518) 457-5677.

Sincerely,

William T. Ports

William T. Ports, P.E.
Environmental Engineer 2
Central Projects Section
Bureau of Central Remedial Action
Division of Hazardous Waste Remediation

Enclosure

cc: M. Hauptman - w/o enclosure
J. Dergosits - w/o enclosure
D. Steenberge - w/o enclosure

New York State Department of Environmental Conservation
50 Wolf Road, Albany, New York 12233

Thomas C. Jorling
Commissioner

M E M O R A N D U M

TO: Bill Ports
Bureau of Eastern Remedial Action

FROM: John Dergosits, Project Manager
Hudson River PCB Project

RE: Hudson River PCB Project
Reassessment Remedial Investigation/
Feasibility Study R²I/FS

DATE: November 30, 1990

Attached please find a copy of NYSDEC Technical Paper No. 58 and a listing of the members of the Hudson River PCB Settlement Advisory Committee. The technical paper identifies the mandate of the committee as well as their source of funding.

Please inform Mr. Tomchuck that the funding for this committee is not now, nor has it ever been from the Section 116 funds which were granted to the Department by EPA under the Clean Water Act.

Also, as the settlement manager for the committee all correspondence with the committee at this time should be sent to me for distribution.

If you would like to discuss this further, please call me at 7-7470.

Attach a/s

PCB MEMBERS

r. Arthur Glowka
udson River Fishermans

Mr. John Jermano
Transportation Dept.

Mr. Michael Stoll
U.S. Fish & Wildlife Service

Dr. John Sanders
Geology

Mr. Joseph Stellato
Former Director
NYSDOT Waterway

Mr. George Allen
Local Resident

Mr. Moses Chang
U.S.E.P.A.

Ms. Cara Lee
Scenic Hudson, Inc.

Dr. Dominick Pirone
Hudson River Fishermans

Ms. Karen Scelzi
Local Resident

Mr. Kenneth Darmer
Past USGS

Dr. Leo J. Hetling
Health Department

Mr. George Muse
Local Resident

Dr. Clifford Rice
Patuxent Wildlife
Institute

Mr. Joseph Seebode, Jr.
U.S. Army Corps of
Engineers

STAFF

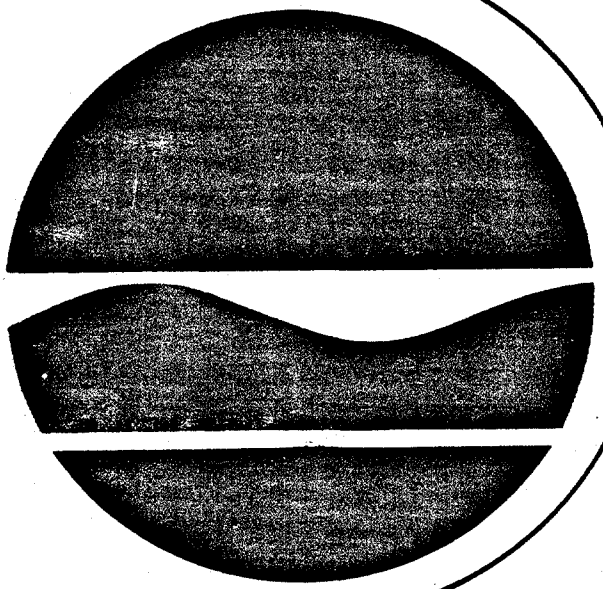
John R. Dergosits, P.E.
Project Manager

Technical Paper No. 58

FILE

HUDSON RIVER PCB STUDY DESCRIPTION AND DETAILED WORK PLAN

IMPLEMENTATION OF PCB SETTLEMENT



Revised
January 1979

NEW YORK STA
DEPARTMENT OF ENVIRONMENTAL CONSERVATIO

SAN-P19 (1000-2/79)

HUDSON RIVER
PCB STUDY DESCRIPTION
AND DETAILED WORK PLAN

IMPLEMENTATION OF PCB SETTLEMENT

Status Report

January 1, 1979
Bureau of Water Research
Division of Pure Waters
New York State Department of Environmental Conservation

Table of Contents

Appendices

INTRODUCTION

On September 8, 1976, the New York State Department of Environmental Conservation and the General Electric Company signed an agreement settling the action brought against General Electric for discharge of polychlorinated biphenyls (PCBs) into the Hudson River. This report presents an updated detailed description of the Department of Environmental Conservation's program for implementing Section 3 of the settlement, monitoring and reclamation of the river. An earlier report[1] describes the background and beginning of this work.

For further information regarding the study, contact:

Italo G. Carcich, P.E.
Acting Director
Bureau of Water Research
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233
(518) 457-7470

or

Allen F. Davis
Executive Assistant
PCB Settlement
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233
(518) 457-7575

PACKGROUND

Polychlorinated biphenyls (PCBs) were first manufactured in 1929 and were soon found to be ideal for a number of industrial uses. PCBs are extremely stable chemically and biologically, have very low electrical conductivity and are nearly insoluble in water. In the United States, they have been used for a wide variety of purposes, principally as a heat transfer fluid and insulator in heavy electrical equipment. However, their useful chemical properties create a significant biological hazard.

This hazard first came to public attention after an industrial accident in Japan that has come to be called the Yusho ("rice oil disease") incident. In 1968 this disease (manifest primarily as a serious skin disorder) was traced to PCB contamination of rice oil during its manufacture. Since that incident, research has revealed disturbing facts.

Yusho victims are still exhibiting symptoms of the poisoning. Though not exposed to additional PCBs, they still have high levels of the chemical in their blood and other body tissues. Several deaths among the victims have been associated with malignant cancers, though it is not possible to conclusively state that the PCBs caused the cancers. Recent evidence shows that the rice oil and tissues of Yusho patients also contained polychlorinated dibenzofurans (PCDFs). PCDFs are more toxic than PCBs. It is therefore not possible to conclusively associate the symptoms of this incident with PCB poisoning[2,3].

Experiments with laboratory animals, including monkeys, however, confirm that many of the symptoms associated with Yusho are directly related to consumption of PCBs and persist in the bodies of all experimental animals long after they are removed from diets containing PCBs. In addition to deaths being noted at high doses, liver tumors have also been induced in mice and rats. An exhaustive summary of these effects can be found in the recent

Criteria Document for PCBs (1976) published by the Environmental Protection Agency[2] and a report published by the United States Department of Health, Education and Welfare[3].

As a result of accumulating research on PCB toxicity, the United States Food and Drug Administration (FDA) has set standards for allowable levels of PCBs in various foods[4]. Fish with a PCB concentration greater than 5 ppm cannot be shipped interstate.

THE PCB SETTLEMENT

In 1975, polychlorinated biphenyls were recognized as a problem in the Hudson River. The United States Environmental Protection Agency and the Fish and Wildlife Service analyzed samples of fish taken from the river and found that PCB concentrations were substantially higher than the FDA limits. The fish could thus not legally be shipped for interstate sale.

Acting on this information and additional evidence collected by the Department of Environmental Conservation, the Department charged the General Electric Company (GE) with polluting the river with the toxic substance PCB. DEC administrative proceedings began on September 8, 1975.

On February 9, 1976, after weeks of testimony recorded in several thousand pages of transcripts, prefiled testimony, reports, studies and other exhibits, the Hearing Officer, Professor Abraham D. Sofaer, found that DEC had presented overwhelming evidence of GE's responsibility for high concentrations of PCBs in the upper Hudson's waters, sediments, organisms and fish. In a 77-page interim opinion, Professor Sofaer detailed the evidence and the violations[5]. It is interesting to note that the Hearing Officer found the unlawful actions to be the consequence of both corporate abuse and regulatory failure by federal and state agencies.

To determine the appropriate remedial measures, a second phase of the hearing was held. A settlement agreeable to all parties was negotiated[6] and signed on September 8, 1976, one year after the administrative proceedings began.

The settlement (Appendix A) calls for a comprehensive program of at least $7 million to deal with PCBs in the Hudson River and related environmental concerns. General Electric was required to immediately reduce its PCB discharges, which had been averaging about 30 pounds per day, to one pound per day, and to construct a wastewater treatment facility at the Hudson Falls and Ft. Edward capacitor manufacturing plants. Total PCB discharges from the plants were reduced to one gram (0.022 pounds) per day by May 1977, and were essentially eliminated in July 1977.

The agreement stipulated that GE must perform $1 million of research related to PCBs, including a study of the environmental compatibility of any PCB substitute.

The company was required to contribute $3 million to the Department as its share of a program to monitor the presence and levels of PCBs in the Hudson; to further investigate the need for remedial action concerning PCBs in the river; to implement remedial action, if necessary to protect public health and resources; and to aid in developing a program to regulate the storage and discharge of environmentally hazardous substances.

New York State was obligated by the agreement to provide an additional $3 million for this work, and the Commissioner of Environmental Conservation became responsible for overseeing and expediting studies and action. An overview of the provisions of the settlement regarding studies of the Hudson River,

and of the Department's activity to date in implementing them is shown in Table 1.

ADVISORY COMMITTEE

A key provision of the PCB settlement is the formation of an Advisory Committee of independent experts and governmental and private interests to "review and make public recommendations to the Commissioner concerning the scope, content, progress and results of the programs, studies and expenditures".*

The PCB Settlement Advisory Committee, formed in 1976, meets monthly to evaluate the work in progress and make recommendations regarding action and further studies (Appendix D).

The relationship of this Advisory Committee to the Department and implementation of the settlement is shown in Figure 1.

THE HUDSON RIVER PROBLEM

Testimony at the PCB hearing documented substantial contamination of Hudson River fish and other animals, and indicated that the bulk of the river's PCBs are held in the sediments of the upper river (Figure 2).

Based on evidence of PCB contamination in fish, the Department in February of 1976 imposed a ban on all fishing between Ft. Edward and Troy, and a ban on most commercial fishing from Troy south to New York Harbor.

Studies conducted by DEC since 1976 (Tables 2, 3 and 4) have reinforced early evidence of PCB contamination, estimating the total PCB load of the river at more than 600,000 pounds, with approximately two-thirds of this amount still located in bed sediments north of Troy. More than 5,000 pounds of PCBs move each year from highly-contaminated upper river sediments into the estuary.

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* The members of the Advisory Committee are listed in Appendix B. The Committee's goals and procedures as outlined in the Settlement are given in Appendix D.

Table 1

Overview of Task Required by Section 3 of PCB Settlement

Settlement Provisions	Department Activity to Date
I. Advisory Committee	
The Commissioner of Environmental Conservation will establish an Advisory Committee consisting of independent experts, governmental and private interests which will, at regular meetings review and make public recommendations to the Commissioner concerning the scope, content, progress and results of the program, studies and expenditures for which provision is made in the agreement.	An Advisory Committee has been formed and it meets monthly.
II. Other Funds	
In the event that the funds herein provided for implementing remedial actions concerning PCBs present in the Hudson River shall be inadequate to assure protection of public health and resources, then the Department will use its best efforts to obtain additional funds from sources other than GE, that are necessary to assure such protection.	The Commissioner has submitted to EPA, Region II an official request for $30 million to carry out a hot spot dredging program in the Upper Hudson.
III. Overall River Program	
1. Monitor the presence and levels of PCBs which have been discharged in Hudson River waters in water, sediment and biota.	An extensive monitoring program was carried out in 1977. This program included contracts for PCB mapping with Normandeau Assoc., PCB lab analysis with O'Brien and Gere, water and sediment transport measurements with USGS, and PCB contamination of landfills, dredge spoil sites and terrestrial vegetation by Weston. An extensive program of fish, macroinvertebrate, water and air monitoring by the Department is also underway. A EPA special core study of the estuary section was carried out in December 1976 by EPA and followed-up in 1977 by Lamont-Doherty. The results of these studies are available(8).

Settlement Provisions	Department Activity to Date
2. Further investigate the need for remedial action concerning PCBs present in the Hudson River.	Contracts with Hydroscience; Lawler, Matusky & Skelly and Malcolm Pirnie evaluated the consequences of various options from taking no action to removing all PCB contaminated sediment in the Upper Hudson. The Advisory Committee and Dept. recommended that sediments contaminated with PCB to levels >50ppm be removed from the river and placed in a secure burial site.
3. Implement remedial action if necessary to protect public health and resources, concerning PCBs present in the Hudson River.	No action can be taken until funding is received (See II above).
4. Aid in developing a program to regulate the storage and discharge of substances hazardous to the environment if sufficient monies are available after implementing remedial action concerning PCBs.	It is now clear (see budget) that there are no funds left for this item. Extensive DEC programs for this are being developed independently of the settlement.

IV. Work to be Carried out by GE($1 million)

GE will conduct research itself or by contract on the environmental compatibility of its substitute non-PCB dielectric capacitor fluids ($400,000). This work is complete[12]. The Advisory Committee and Dept. recommended additional studies, but the funds are exhausted. GE is still considering these studies.

GE will conduct research and pilot plant studies on the removal or treatment of PCBs in supernatent liquids and sediments from the Hudson River.

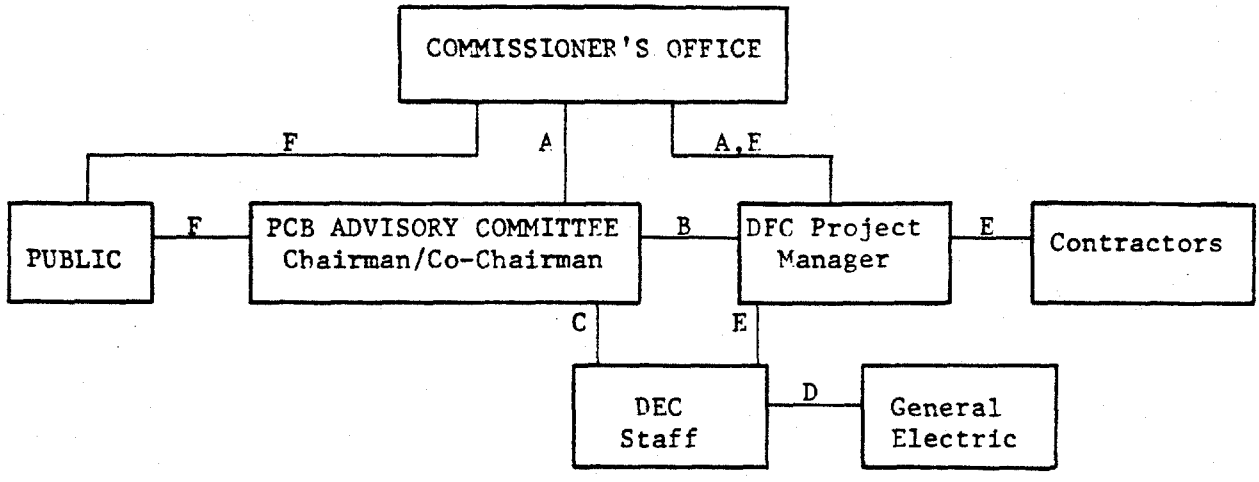
GE completed studies demonstrating the feasibility of incineration, and biodegradation[13]. Additional work addressing the volatilization of PCB is nearing completion.

GE will conduct research as specified by the Commissioner of the effects on the environment of not more than three substances which may be hazardous to the environment and which are to be selected by the Commissioner after his consultation with the Advisory Committee ($200,000).

Petroleum hydrocarbons were selected for further research. GE is narrowing the scope of work and will begin work after approval of a plan of study by the Commissioner after consultation

Figure 1

Organizational Chart for the PCB Settlement Between
General Electric and The Department of Environmental Conservation



A. Give advice and respond to questions.

B. Managerial direction
   1. Advise DEC about short-term and long-term planning.
   2. Receive and react to periodic reports from DEC staff.
   3. Assist DEC in evaluations.
   4. Assist DFC in preparing reports and recommendations to the Commissioner.

C. Technical resource.

D. Exchange of information.

E. Managerial direction.

F. Public access and information.

Figure 2

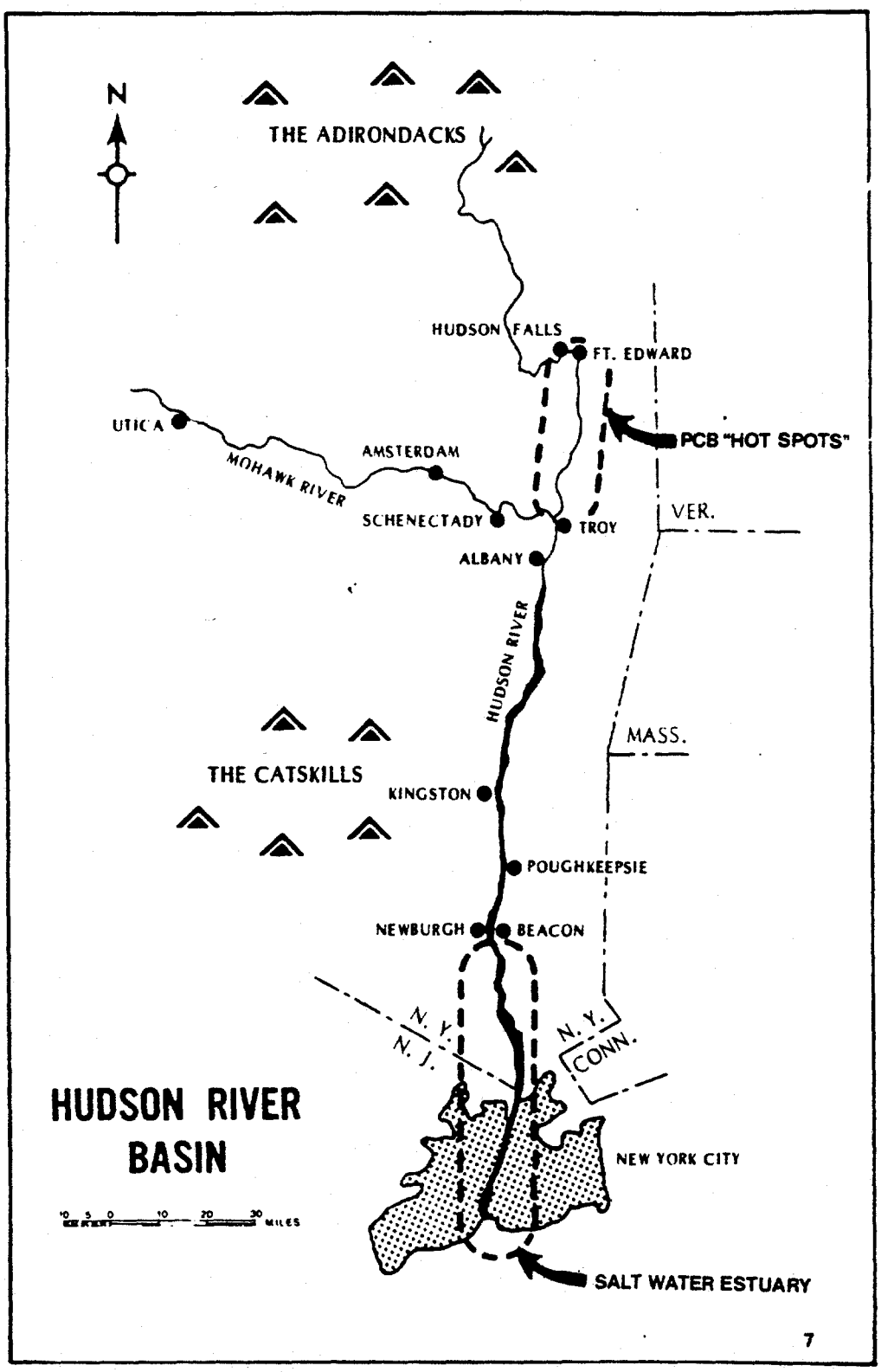


Table 2

Hudson River Drainage Basin Area and Average Flow

Location	Area		Average Flow	
	mi^2	km^2	ft^3/sec	m^3/sec
Upper Hudson Basin Waterford	4,634	(12,002)	7,660	217
Mohawk River Basin Cohoes	3,456	8,951	5,630	159
Lower Hudson Basin Tributaries	5,300	13,727	7,100	201
Total Hudson Basin	13,390	34,680	20,390	577

--from U.S. Department of Interior, Geological Survey, Water Resources Data for New York Water Year 1975, 1976.

TABLE 3

1977 Hudson River PCB Settlement Studies

I. Aquatic Studies

A. Physical
1. Monitoring of river flow and sediment and PCB transport - USGS
2. PCB mapping, upper river - Normandeau Associates
3. Bedload sediment transport - Rensselaer Polytechnic Institute
4. Screening survey of lower river PCB concentrations - EPA
5. PCB concentrations of estuary sediments - Lamont Doherty
6. Groundwater - Weston
7. Wastewater - Pure Waters, O'Brien and Gere

B. Biological
1. Fish monitoring - fish collections and data evaluation - DEC, PCB analyses by O'Brien and Gere
2. Macroinvertebrates monitoring - DOH

II. Land

A. Physical
1. Air monitoring - DEC Division of Air Resources

III. Engineering related to remedial measures

A. Hot spot dredging project - Malcolm Pirnie, Inc.

B. Landfills and Dumps - Weston

C. Alternatives: "No action," Lawler, Matusky and Skelly
Effects of remedial action - Hydroscience

D. Removal and Treatment - GE

TABLE 4

1978 Hudson River PCB Settlement Studies

I. Aquatic Studies
   A. Physical
      1. Monitoring of river flow and sediment and PCB transport - USGS.
      2. Use of high volume centrifuge to better define PCB - particulate - water interchange - DEC Bureau of Water Research
      3. Additional bed sediment sampling - DEC Bureau of Water Research

   B. Biological
      1. Fish monitoring - Fish collection and data evaluation - DEC, PCB analyses by Raltech.
      2. Macroinvertebrate monitoring - NYS Dept. of Health.
      3. Aquatic food chain dynamics and lower trophic level studies - NYU Medical Center, SUNY at Stony Brook and Fordham University.

II. Land
   A. Physical
      1. Air monitoring - DEC Division of Air Resources.

   B. Biological
      1. Plant and Farm Product uptake - Sample collection and data evaluation by DEC Bureau of Water Research and Boyce Thompson Institute, PCB analyses by Raltech.

III. Engineering Related to Remedial Measures
   A. Hot Spot Dredging Project - DEC Bureau of Water Research and Malcolm Pirnie Inc.

   B. Landfills and Dumps - DEC Division of Solid Waste and Weston.

   C. Public Water Supply Remedial Measures - NYS Department of Health and O'Brien and Gere.

IV. Project Management

A. Study Management and data storage - DEC Bureau of Water Research.

B. Laboratory intercomparison and quality control - NYS Department of Health - Division of Laboratories and Research.

C. Modeling
   1. Up river sediment transport modeling - Lawler, Matusky and Skelly.
   2. Biological modeling - Hydroscience.

D. Study Interpretation and Report Preparation - DEC Bureau of Water Research.

Actual water concentrations of PCBs, even in the upper river, are very small, typically measuring around one part per billion. But organisms accumulate PCBs rapidly from the river water, and lose or degrade the chemical only very slowly. In addition, PCBs in contaminated lower-order organisms are magnified many thousands of times in predators, and very high concentrations of the chemical can build up in animals and fish used as human food sources.

Analysis of edible portions of fish from the upper river has shown that PCB contamination often reaches several hundred parts per million, many times the temporary FDA tolerance level of 5 ppm.

Because of the fishery losses and the potential human health hazard, a substantial portion of the PCB settlement study focused on the feasibility of removing the large upriver PCB reservoirs and isolating or destroying the chemical.

Air pollution from PCBs was found to be a distinct possibility. Volatilization of the compound apparently occurs more readily than was predicted from the molecular structure of PCBs, and significant contamination of air could occur near falls in the Hudson (Figure 3) and above high-concentration landfills.

Settlement fund studies pinpointed 40 riverbed sediment areas containing more than 50 parts per million of PCBs. Together, these 40 "hot spots" constitute only 8 percent of the total upper riverbed, but hold 40 percent of all the PCBs contaminating the upper Hudson (Figure 2).

In addition, highly contaminated shoreline deposits have been identified in river areas above Ft. Edward. Large amounts of the chemical were caught in sediment built up behind dams near the capacitor plants at Ft. Edward and Hudson Falls. The first dam, located at Ft. Edward, was removed in 1973, allowing large amounts of contaminated sediment to wash downstream. The remaining dam sediment, containing an additional 28 percent of the upper river's PCBs, now forms part of the riverbank south of Ft. Edward.

REMOVAL TECHNOLOGIES

Technologies for removing in-place contaminants are still in the experimental stages. For contaminants located in a waterway, only dredging has demonstrated efficiency, for use in a full-scale river reclamation project (Table 5).

An essential part of the proposed reclamation project is isolation of contaminated dredgings from the environment after removal from the river. Studies have shown that while it may soon become possible to destroy PCBs by incineration or bacterial digestion, no technology for PCB destruction is yet in full-scale operation, and containment of PCB-laden materials will be necessary at least for some years. It is recommended that contaminated sediments be contained in a 100-acre secure landfill located near the hot spot area. Forty candidate sites for such a landfill, conforming to government standards, have been identified.

Engineering studies and test projects have been completed for clay encapsulation of contaminated sediments, and preliminary results from the test site indicate that PCB losses are minimal.

Among the alternatives considered before the decision to attempt hot spot dredging was that of leaving the Hudson's PCBs untouched. If no action is taken to manage this inplace contaminant, studies indicate that leaching and erosion of PCBs will continue to contaminate the river and its biological system far into the future. Data shows that it is unlikely that contaminated sediments will be covered or moved by nature to a section of the river where they will no longer present a problem.

In June 1978, on the advice of the PCB Advisory Committee, the Department proposed a project of dredging "hot spots" and excavating contaminated bank deposits to remove 70 percent of upper river PCBs between Hudson Falls and Troy. DEC began seeking federal water pollution control funds to pay the estimated $30 million cost of the project.

Figure 3

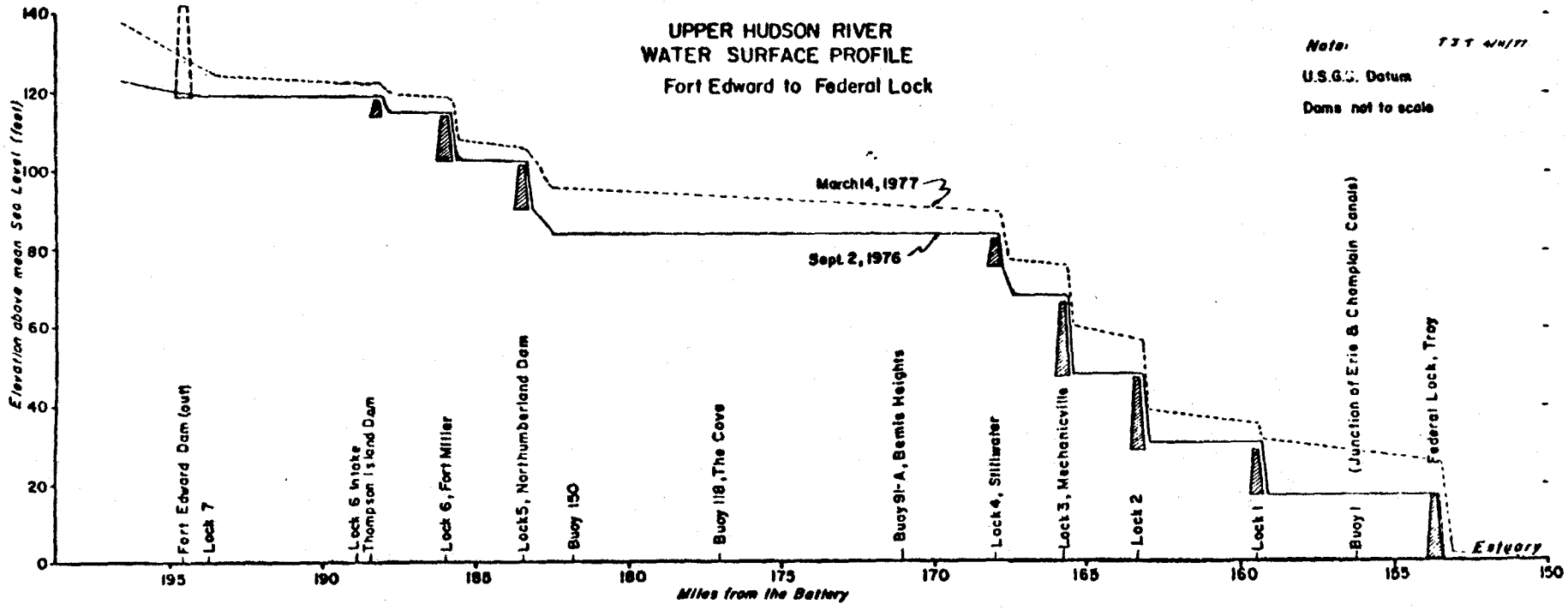


TABLE 5

SUGGESTED MANAGING ALTERNATIVES

ALTERNATIVE	Conceptual	Laboratory	Developed for Closed Systems	Demonstrated
Removal				
Activated carbon		■		
Bioharvesting	■			
Oil soaked mats	■			
Destruction in Place				
Ultra-violet ozonation			■	
Biodegradation		■		
Chemical treatment	■			
Fixing in Place				
Adsorption		■		
Erosion control	■			
Chemical fixation	■			
Covering	■			
Dredging				■

CURRENT STATUS

Results of the study and monitoring program carried out in 1977 under the terms of the PCB settlement were formally presented at a meeting held in Albany in June 1978, and later summarized in a Department report[8]. As a result of the Hudson River PCB studies, more is known today about the Hudson River and its ecosystem than ever before.

The hot spot dredging program chosen as the most cost effective management action, is shown by PCB settlement research to be technically feasible, and environmentally sound. In addition to dredging, excavation and burial of contaminated sediments, the plan includes provisions for monitoring the effects of PCB removal, both during and after dredging, and for maintaining surveillance of the secure landfill when the project is complete. Details of the program are described in a brochure published by the Department[9]. The hot spot dredging program will be possibly the best-documented river restoration project ever attempted.

Multiple benefits are expected from the dredging project:

Public health will be protected by decreasing the human intake of PCBs from public and private water supplies, and from consumption of Hudson River fish. No short-term adverse effect is expected, and seven riverside communities which drink Hudson River water would have less worry about contamination.

The time required until PCB contamination falls to a level permitting the fisheries to be reopened should decrease, and the Hudson's potential as a multi-million dollar commercial and recreational fishery would be brighter.

The spread of 300,000 pounds of PCBs from the river into other environmental systems will be prevented. PCBs in the upper river are highly mobile, and disperse easily into the estuary, the surrounding land, the atmosphere and the ocean. Once dispersed, the chemical is impossible to recover, and extremely slow to degrade.

As soon as funding is received, detailed plans and specifications will be prepared and environmental impact hearings held. It is estimated that actual dredging could be started 12 months after funds are received.

In the meantime, the Department, with the advice of the Advisory Committee, continues to monitor the river and carry out scientific and engineering studies (Table 4) related to PCB contamination. Refined data about the river and PCB contamination will allow better management of this inplace pollutant.

In consequence of the results of the Weston study of dumps and landfills, a separate effort is being initiated to manage hundreds of thousands of pounds of PCBs found in land sites near Ft. Edward.

12/6/78

Estimate of Expenses Related to GE/PCB Settlement Implementation

Expenses Authorized or Encumbered: September 1976-August 1977

Contractor or Item	Purpose	From GE PCB $	From NY State	Other	Total
Normandeau	Surveying, mapping and sedimend sample collection.	$ 98,686	$ 0	$ 0	$ 98,686
O'Brien & Gere	PCB laboratory analysis.	300,390	0	0	300,390
U.S. Geological Survey	Monitoring of water flow, sediments and PCBs.	60,000	0	60,000	120,000
Lawler, Matusky & Skelly	Study and modeling of upper Hudson River sediment movement.	107,000	0	0	107,000
Hydroscience	Study of no-action alternatives with emphasis on biological uptake of PCBs.	58,442	0	0	58,442
Malcolm Pirnie	Assessment of technology, cost and environmental impact of dredging PCB-contaminated sediments.	389,040	0	0	389,040
Roy F. Weston	Study of PCB landfill and spoil disposal sites.	225,000	0	0	225,000
Lamont-Doherty Laboratories	Track down of sources of PCBs in Hudson Estuary	75,834	0	0	75,834
Rensselaer Polytechnic Institute	PCB transport in Hudson River bedload sediments.	0	5,000	0	5,000
Dr. Edward Horn	Coordination of study & PCB Adv. Committee.	5,400	0	0	5,400
Advisory Committee	Operating expenses.	20,000	5,000	0	25,000
Monitoring equipment and supplies	Office and field equipment needed to carry out monitoring studies.	65,000	0	0	65,000

Estimate of Expenses Related to GE/PCB Settlement Implementation

Contractor or Item	Purpose	From GE PCB $	From NY State	Other	Total
Project Management	Special supplies and expenses related to project management.	$ 19,248	$ 0	$ 0	$ 19,248
New York State	In-kind services related to monitoring, data evaluation and study management	0	250,000	0	250,000
	Subtotal	$1,424,040	$260,000	$60,000	$1,744,040
Expenses Authorized or Encumbered: September 1977-August 1978					
Raltech (WARF)	PCB analysis of fish and other biological samples required by 1977-78 .	$ 119,090	$ 0	$ 0	$ 119,090
" "	PCB analysis of plant and other biological samples taken as part of terrestrial contamination studies.	31,360	0	0	31,360
USGS	Hudson River and Estuary water flow, sediment and PCB monitoring.	75,000	0	75,000	150,000
Roy F. Weston	Amendment of existing contract for additional PCB analyses.	10,000	0	0	10,000
Syracuse Research Corp.	PCB analyses of sediment and water samples required by 1978 river and bed sediment monitoring program.	90,000	0	0	90,000
O'Brien & Gere	Hudson River water supply treatability study.	100,870	0	0	100,870
NYU Medical Center SUNY at Stony Brook Fordham University	Studies related to PCB concentrations and transfer rates in the lower trophic levels (biota) in the lower Hudson River.	100,002	0	0	100,002
Hydroscience	Modeling of PCBs, in the river and estuary system with emphasis on biological uptake.	67,673	0	0	67,673

Estimate of Expenses Related to GE/PCB Settlement Implementation

Contractor or Item	Purpose	From GE PCB $	From NY State	Other	Total
Lawler, Matusky and Skelly	Updating of sediment transport model and additional modeling runs.	$ 60,000	$ 0	$ 0	$ 60,000
Boyce-Thompson Institute	Terrestrial contamination studies (contract under negotiation; cost subject to change).	15,000	0	0	15,000
To be selected	Public health or agricultural studies.	55,000	0	0	55,000
Advisory Committee	Operating expenses.	15,000	5,000	0	20,000
Monitoring equipment and supplies	Office and field equipment and supplies and computer services needed to carry out monitoring studies and to prepare summary reports.	20,000	5,000	0	25,000
Project activities and management by NYS	In-kind services related to monitoring, special studies, data evaluation and study management.	0	200,000	0	200,000
	Subtotal	$ 758,995	$210,000	$75,000	$1,043,995

Estimate of Expenses Related to GE/PCB Settlement Implementation

Expenses Anticipated and Reserved for Future River Monitoring: September 1978-August 1983

Contractor or Item	Purpose	From GE PCB $	From NY State	Other	Total
Biological studies	Biological studies in Lower Hudson River 100,000/year for 6 years	$ 300,000	$ 0	$ 300,000	$ 600,000
Fish monitoring	Fish collection and PCB analysis 100,000/year for 4 years	260,000	140,000	0	400,000
Water and sediment measurement	Continued monitoring of bed sediment, suspended sediment and water for PCBs $20,000/year for 4 years	80,000	0	0	80,000
USGS	Hudson River water flow, sediment and PCB monitoring 100,000/year for 4 years	200,000	0	200,000	400,000
Advisory Committee	Operating expenses 15,000/year for 4 years	36,000	24,000	0	60,000
Department study, management and monitoring	$60,000/year for 4 years	20,000	220,000	0	240,000
	Subtotal	$ 896,000	$ 384,000	$ 500,000	$1,780,000

Estimate of Expenses Related to GE/PCB Settlement Implementation

Expenses Authorized, Encumbered or Anticipated for Remedial Actions

Contractor or Item	Purpose	From GE PCB $	From NY State	Other	Total
Ft. Edward Dredging (1977)	Environmental Impact Statement	0	19,500	0	19,500
	Plans and Specifications	0	62,870	0	62,870
	Moreau Spoil Area & Dredging	100,000	1,050,000	0	1,150,000
	Subtotal	100,000	1,132,370	0	1,232,370
Remnant Deposits (1978)	Environmental Impact Statement	0	41,000	0	41,000
	Plans and Specifications	0	60,000	0	60,000
	Dredging, Bank Stabilization and Spoil disposal including Moreau Site dewatering	0	637,426	0	637,426
	Subtotal	0	738,426	0	738,426
Hot Spot Dredging (Future)	Environmental Impact Statement	40,000	0	50,000	90,000
	Public Information Program	30,000	5,000	0	35,000
	Project Management and Pre-Engineering	150,000	15,000	0	165,000
	Detailed Engineering Plans and Specifications	0	225,000	1,275,000	1,500,000
	Monitoring and Studies to determine effectiveness	0	60,000	5,267,723	5,327,723
	Land Acquisition and Dredging (Does not include $50,000 to $200,000 per year for disposal site monitoring and maintenance)	0	0	23,422,277	23,422,277
	Subtotal	$ 220,000	$ 305,000	$30,015,000	$30,540,000
	Net Total	320,000	2,175,796	30,015,000	32,510,796
	Grand Total	$3,399,035	$3,099,796	$30,650,000	$37,078,831

Funds Available from GE	$ 3,000,000
Interest (Feb. 1, 1978)	250,000
Estimated Future Interest	150,000
	$ 3,400,000

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3. Subcommittee on the Health Effects of PCBs and PBBs (1976), Final Report, Department of Health, Education and Welfare, Washington, D.C.

4. Department of Health, Education and Welfare (April 1, 1977), Federal Register 42 (63): 17487-17494.

5. Sofaer, A. February 9, 1976. Interim Opinion and Order, unpublished opinion in the matter of violations of ECL by GE Company New York State Department of Environmental Conservation, File # 2833. 77 pp.

6. Sofaer, A. September 7, 1976, Recommendation of Settlement, unpublished opinion in the matter of violations of ECL by GE Company New York State Department of Environmental Conservation, File #2833. 14 pp.

7. Malcolm Pirnie, Inc., (1975), Investigation of Conditions Associated with the Removal of Fort Edward Dam.

8. Hetling, L.,E. Horn and J. Toffiemire, (July 1978) Summary of Hudson River PCB Study Results. Technical Paper #51, Bureau of Water Research, New York State Department of Environmental Conservation, Albany, N.Y.

9. Cross, Robert. June 1978. The Hudson River: A Reclamation Plan. NYS Department of Environmental Conservation, Albany, N.Y.

10. Malcolm Pirnie, Inc., (April 1977), Environmental Assessment of Maintenance Dredging, Champlain Canal, Fort Edward Terminal Channel, Fort Edward, New York.

11. Malcolm Pirnie, Inc. (May 1977), Supplement No. 1, Environmental Assessment of Maintenance Dredging, Champlain Canal, Fort Edward Terminal Channel, Fort Edward, New York.

12. General Electric Company, (Feb. 28, 1977), Interim Report, Dielektrol Fluids, Environmental Impact Assessment program, GE Co., Capacitor Products Dept.

13. Griffen, P.M. and McFarland, C.M. (Feb. 22, 1977), Research on Removal or Treatment of PCB in Liquid or Sediments Dredged from the Hudson River, Proposed Study.

14. Mt.Pleasant, R., (Oct. 26, 1976), Hudson River PCB Monitoring Data Summary, Past, Present, Proposed, NYS Staff Report.

15. EPA, (Feb. 23, 1977), PCBs in Lower Hudson River Sediments - A Prelimintary Survey 12/11/76 - 12/15/76.

16. Equitable Environmental Health, Inc., Study Plan for Upper Hudson River Related to the Ft. Edward and Hudson Falls Dam.

APPENDIX A

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

IN THE MATTER OF ALLEGED VIOLATIONS OF
§§ 17-0501, 17-0511 and 11-0503 OF THE
ENVIRONMENTAL CONSERVATION LAW OF THE
STATE OF NEW YORK BY:

File No. 2833

GENERAL ELECTRIC COMPANY,

Respondent

AGREEMENT

The following is the agreement made between the Department of Environmental Conservation (Department) and General Electric Company (General Electric) on September 8, 1976 to settle this proceeding:

(1) This agreement is based upon the mutual conviction that it is in the public interest to terminate this proceeding and voluntarily undertake forthwith the cooperative programs provided for in this agreement without further delay.

(2) This proceeding was commenced on September 8, 1975 and hearings began before Abraham D. Sofaer, Esq., the duly designated hearing officer, on October 6, 1975. An interim opinion was rendered by the Hearing Officer on February 9, 1976. Hearings resumed on April 19, 1976 and the record is now complete. All parties have briefed the issues and the briefs have been submitted to the Hearing Officer.

(3) (a) As its full share of a comprehensive program of at least $7,000,000 to deal with PCBs in the Hudson River and related environmental concerns, General Electric will within sixty (60) days of the date of this Agreement contribute $3,000,000 in a lump sum to the Department and in addition, General Electric will perform $1,000,000 in research, making the benefits of the research available to the Department, as specified in Exhibit 1. The Department will participate in the comprehensive program in an amount comparable to General Electric's cash contribution by the expenditure of funds legally available to it and in conjunction with its mandated duties.

(b) General Electric's $3,000,000 contribution shall be used by the Department, in its discretion, as General Electric's share of a program of at least $6,000,000 to: (i) monitor the presence and levels of PCBs which have been discharged in Hudson River waters in water, sediments and biota; (ii) further investigate the need for remedial action concerning PCBs present in the Hudson River; (iii) implement remedial action, if necessary to protect public health and resources, concerning PCBs present in the Hudson River; (iv) aid in developing a program to regulate the storage and discharge of substances hazardous to the environment if sufficient moneys are available after implementing remedial action concerning PCBs.

(c) The Commissioner of Environmental Conservation (Commissioner) will establish an advisory committee consisting of independent experts, governmental, and private interests which will, at regular meetings, review and make public recommendations to the Commissioner concerning the scope, content, progress and results of the programs, studies and expenditures for which provision is made in paragraph 3(b). In addition, the Department will furnish the advisory committee with any interim report(s) and final report(s) of the research described in Exhibit 1. The advisory committee will continue to function throughout the comprehensive program concerning PCBs and related environmental concerns.

(d) In the event that the funds herein provided for implementing remedial action concerning PCBs present in the Hudson River shall be inadequate to assure protection of public health and resources, then the Department will use its best efforts to obtain additional funds, from sources other than General Electric, that are necessary to assure such protection. These best efforts will include preparation by the Department of a plan of action to obtain such funds including specifying applications that will be made to federal agencies and/or other sources of funds in as expeditious a manner as possible. The Department will periodically report to the Advisory Committee concerning its progress in implementing the plan of action.

(4) On or before July 1, 1977, General Electric will discontinue the use of PCBs in the manufacture of capacitors at facilities located in the State of New York, including but not limited to the facilities located in Hudson Falls and Fort Edward, New York (the "Capacitor Manufacturing Facilities").

(5) General Electric will, after the date of this agreement, discharge a monthly average of no greater than one (1) pound (four hundred fifty-four (454) grams) of PCBs per day reaching the waters of the Hudson River from all point sources or discharge outlets from its Capacitor Manufacturing Facilities.

(6) (a) General Electric will, within sixty (60) days after the wastewater treatment facilities described in the Crawford and Russell Report (as hereinafter defined) are installed and made operational, achieve a monthly average discharge of no greater than 0.0022 pounds (one (1) gram) of PCBs per day and a daily maximum discharge of no greater than 0.022 pounds (ten (10) grams) of PCBs per day reaching the waters of the Hudson River from all point sources or discharge outlets from its Capacitor Manufacturing Facilities,

provided, however, that if General Electric can demonstrate that by the operation of the facilities described in the Crawford and Russell Report, and all reasonable modifications thereto, such effluent levels cannot be achieved, then General Electric will be permitted to discharge such average and maximum amount of PCBs as are achievable by the operation of said facilities, but, in any event, no greater than a daily maximum discharge of 0.11 pounds (fifty (50) grams) of PCBs into the waters of the Hudson River.

(b) The goal of the Department and the Natural Resources Defense Council, Inc. is the complete elimination of all PCB discharges.

(c) General Electric will continue to review PCB treatment systems and install such system(s) at its Capacitor Manufacturing Facilities as may be necessary to comply with the requirements of Sections 301 and 307 of the Federal Water Pollution Control Act Amendments of 1972,

(7) General Electric will continue its daily monitoring of the total amount of discharges of PCBs reaching the Hudson River from all point sources or discharge outlets at its Capacitor Manufacturing Facilities. The general conditions for General Electric's program are as follows: (i) hourly samples are composited for each discharge for each twenty-four (24) hour period in proportion to flow; (ii) the results of the analysis for PCBs in each composite daily sample for each week are submitted to the Department and the United States Environmental Protection Agency, Region II, within one (1) week of the close of each calendar month.

(8) Within thirty (30) days of the date of this agreement, General Electric will submit to the Department final plans and specifications for waste treatment and discharge control facilities described in the engineering report prepared by Crawford and Russell, Inc., dated February 20, 1976 and an addendum thereto dated April 7, 1976 (the "Crawford and Russell Report") and after approval of the final plans and specifications which will be issued within sixty (60) days after submission install and cause said facilities to be operational within five (5) months of such approval.

(9) The Department reserves the right by legal procedures for modification of General Electric's SPDES or NPDES permits, and pursuant to applicable provisions of law, to require that General Electric achieve more stringent limitations on the discharge of PCBs or take any additional action to further reduce the discharges of PCBs from any point source at its premises and facilities located at Hudson Falls and Fort Edward, New York.

(10) The provisions of this agreement or the order for which it provides, shall not constitute or be construed as an adjudication or finding on any issue of fact or law, or evidence or admissions by any party with respect to any issue in this proceeding, or be construed as, or operate as, an admission that General Electric has violated any law or regulation or otherwise committed a breach of duty at any time, and shall not constitute, in this proceeding or any other proceeding or litigation or otherwise, any evidence or implication of any such violation or breach of duty. No amount of the settlement contribution by General Electric constitutes a fine or penalty.

(11) (a) General Electric's acceptance of the provisions, terms and conditions of this agreement shall be in full and complete satisfaction and release of each and every claim, demand, remedy or action whatsoever against General Electric, its officers, directors, employees or agents which was or might have been alleged or encompassed within the original or amended complaint in this proceeding, or which the Department may have, relating to or arising from General Electric's direct or indirect discharges of PCBs reaching the waters of the Hudson River from General Electric's premises in Hudson Falls and Fort Edward, New York, including future discharges permitted by this agreement or the order for which the agreement provides.

(b) This release shall inure only to the benefit of General Electric, its officers, directors, employees, agents, successors and assigns, at law or in equity, with respect to the aforesaid matters.

(c) Nothing herein shall be construed as barring, diminishing, adjudicating or in any way affecting any legal or equitable rights or claims, actions, suits, causes of action or demands whatsoever that the Department will have against anyone other than General Electric, its officers, directors, employees and agents.

(12) The right of the Department under law to enforce the terms of this agreement shall not be affected by any release contained herein.

(13) An Order in the usual form and containing all of the provisions of paragraphs 5, 6, 7, 8 and 9 of this agreement should be entered in final and complete disposition on the merits of this proceeding. It is hereby stipulat ed that the Hearing Officer may recommend and the Commissioner of Environmental Conservation may issue the Order.

(14) This agreement, together with its exhibits, constitute the entire agreement between the Department and General Electric concerning the rights and obligations herein provided.

The parties hereto have executed this settlement agreement this 8th day of September, 1976.

GENERAL ELECTRIC COMPANY

BY _____
John F. Welch, Vice President and
Group Executive

DEPARTMENT OF ENVIRONMENTAL CONSERVATION

BY _____
Peter A. A. Berle, Commissioner

EXHIBIT I

General Electric grants to the Department of Environmental Conservation the non-exclusive right to use the results of the following research:

A. General Electric will conduct research, itself or by contract, on the environmental compatability of its substitute non-PCB dielectric capacitor fluids. The research expenditures will be not less than $400,000 of which $400,000 shall be applied to the General Electric $1,000,000 research commitment set forth in paragraph 3(a) of the foregoing agreement.

The research shall consist of chemical and biological tests selected by General Electric from the following:

Acute Oral Toxicity (rats)
Acute Dermal Toxicity (rats)
Skin & Eye Irritation (rabbit)
Acute Toxicity (fresh water fish)
Subacute Toxicity (fish)
Water Solubility
Partition Coefficients
28 Day Rate Feeding
Ames Test - screening test for carcinogenity
Acute Toxicity (birds)
Bioaccumulation (fish)
Biodegradation (CRD)
Acute Inhalation (rats)
Soil Migration
Vaporization Rate
Soil Biodegradation
Soil Organism Toxicity
Acute Toxicity (marine)
Toxicity to Fish Eggs & Fry
River Die-away
90 Day Rate Feeding
Decomposition Products
Subacute Toxicity Tests
Chronic Feeding Studies

B. General Electric, itself or by contract, will conduct research and pilot plant studies to be approved prior to being undertaken by the Commissioner after his consultation with the advisory committee on the removal or treatment of PCBs in supernatant liquids and sediments from Hudson River sludge dredged by the Department and delivered by it to the General Electric premises at Fort Edward. The expenditures for research and pilot plant shall be $400,000, all of which shall be applied to the General Electric $1,000,000

research commitment set forth in paragraph 3(a) of the foregoing agreement. The research and pilot plant studies shall consist of tests of physical, chemical and biological means for the removal and treatment of PCBs.

C. General Electric will conduct research, itself or by contract, as specified by the Commissioner of the effect on the environment of not more than three (3) substances which may be hazardous to the environment and which are to be selected by the Commissioner after his consultation with the advisory committee.

The research expenditures will total $200,000, all of which shall be applied to the General Electric $1,000,000 research commitment set forth in paragraph 3(a) of the foregoing agreement. The research shall consist of chemical and biological tests selected by the Commissioner.

The term "expenditures" shall mean amounts paid for independent contractors, equipment, supplies, standard consulting fees to other G. E. components and actual salary cost plus normal overhead and margins.

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

IN THE MATTER OF ALLEGED VIOLATIONS OF §§17-0501, 17-0511 and 11-0503 OF THE ENVIRONMENTAL CONSERVATION LAW OF THE STATE OF NEW YORK BY

GENERAL ELECTRIC COMPANY,

Respondent

FINAL ORDER

RECITALS

1. This proceeding was commenced by the Department of Environmental Conservation (Department) on September 8, 1975 by service of a notice of hearing and verified complaint upon Respondent, alleging Respondent's violations of ECL Sections 17-0501, 17-0511 and 11-0503 by reason of its discharges of PCBs into the Hudson River. The Respondent filed a verified answer denying the alleged violations.

2. The New York State Department of Commerce ("Commerce"), Associated Industries of New York Inc. ("Associated") and the Natural Resources Defense Council Inc., the Hudson River Fisherman's Association, Inc., the Hudson River Sloop Restoration, Inc. and the Federated Conservationists of Westchester County, Inc. (collectively "NRDC") were permitted to intervene as parties.

3. The hearings in this proceeding commenced on October 6, 1975 before Abraham D. Sofaer, a duly designated hearing officer. The Department appeared by Philip H. Gitlen, Esq., its counsel; the Respondent appeared by Bond, Schoeneck & King, its attorneys, N. Earle Evans, Jr., Esq., Anthony R. Pittarelli, Esq., John F. Repko, Esq., and Arthur V. Puccini, Esq. of counsel;

Commerce appeared by J. Bruce McDonald, Esq., its former counsel and Michael Curley, Esq., its present counsel; Associated appeared by Costello, Cooney and Fearon, its attorneys, Donald L. Nicholas, Esq., of counsel; and NRDC appeared by Sarah Chasis, Esq. and Rosemary Nichols, Esq., its counsel.

5. An interim opinion was rendered by the Hearing Officer on February 9, 1976. Hearings resumed on April 19, 1976, and the record is now complete. All parties have briefed the issues and the briefs have been submitted to the Hearing Officer.

6. Respondent and the Department have entered into a settlement agreement dated September 8, 1976, in which it was agreed that this order may be made.

7. The Hearing Officer has found that the settlement agreement and this order are in the public interest and has recommended that they be executed by the Commissioner of Environmental Conservation.

NOW, after full consideration and upon all of the proceedings and being duly advised, it is ORDERED that:

I. On and after the date of this Order, the discharges of PCBs into the Hudson River from Respondent's premises and facilities located in Hudson Falls and Fort Edward, New York, which cause or contribute to the contravention of the water quality standards adopted for and assigned to the waters receiving Respondent's discharges, shall constitute violations of this Order as well as violations of the Environmental Conservation Law of the State of New York and the rules and regulations promulgated under it; provided, however, that no action or proceeding for penalties or for any remedy or relief whatsoever, for any such violations shall be instituted by the Department for so long as Respondent adheres to and complies with the provisions, terms and conditions of this Order and proceeds with and completes

its water pollution abatement program in accordance with the provisions, terms and conditions of Schedule A which is attached and incorporated by reference. The Department reserves the right, however, by legal procedures for modification of General Electric's SPDES or NPDES permit and pursuant to applicable provisions of law, to require that General Electric achieve more stringent limitations on the discharge of PCBs, or take any additional action to further reduce the discharges of PCBs from any point source at its premises and facilities located at Hudson Falls and Fort Edward, New York.

II. All reports and submissions required by this Order shall be made to the Director of the Division of Pure Waters of the Department in Albany, New York. All time limits set forth in Schedule A shall commence on the date the conformed copy of this Order is served upon Respondent.

III. To insure compliance with this Order, duly authorized representatives of the Department shall be permitted access to Respondent's premises and facilities for the purpose of inspecting them and for the purpose of making or requiring such tests as may be deemed necessary, including sampling of discharges and receiving waters, to determine the status of compliance with the provisions, terms and conditions of this Order.

IV. Respondent shall not suffer any penalty under any of the provisions of this Order, or be subject to any proceedings or actions for any remedy or relief, if it cannot comply with any requirements of the Order because of an act of God, war, strike, riot, catastrophe, or other condition as to which negligence or willful misconduct on the part of the Respondent was not the proximate cause, provided that the Respondent shall notify the Commissioner in writing within a reasonable time after it obtains knowledge of the facts and requests an appropriate extension or modification of this Order.

V. The provisions, terms and conditions of this Order shall be deemed to bind Respondent, its officers, directors, agents, employees, successors, and assigns and all persons, firms and corporations acting under, or for it.

VI. By this order, this proceeding is finally settled and terminated on the merits.

Dated: Albany, New York
September 8 ,1976

PETER A. A. BERLE, Commissioner
New York State Department of
Environmental Conservation

TO: GENERAL ELECTRIC COMPANY
Electronic Components
Business Division
Electronics Park
Syracuse, New York 13201

SCHEDULE A

1. Respondent, after the date of this Order, shall not discharge a monthly average greater than four hundred fifty-four (454) grams (one (1) pound) of PCBs per day reaching the waters of the Hudson River from all point sources or discharge outlets from its facilities and premises located in Hudson Falls and Fort Edward, New York.

2. Respondent shall, within sixty (60) days after the wastewater treatment facilities described in the Crawford and Russell Report (as hereinafter defined) are installed and made operational, achieve a monthly average discharge of no greater than 0.0022 pounds (one (1) gram) of PCBs per day and a daily maximum discharge no greater than 0.022 pounds (ten (10) grams) of PCBs per day reaching the waters of the Hudson River from all point sources or discharge outlets from its facilities and premises located in Hudson Falls and Fort Edward, New York provided, however, that if Respondent can demonstrate that by the operation of the facilities described in the Crawford and Russell Report, and all reasonable modifications thereto, such effluent levels cannot be achieved, then Respondent shall be permitted to discharge such average and maximum amount of PCBs as are achievable by the operation of said facilities, but, in any event, no greater than a daily maximum discharge of fifty (50) grams of PCBs into the waters of the Hudson River.

3. Respondent shall continue its daily monitoring of the total amount of discharges of PCBs reaching the Hudson River from all point sources or discharge outlets at its premises and facilities located in Hudson Falls and Fort Edward, New York. The general conditions for Respondent's program shall be as follows: (i) hourly samples shall be composited for each discharge for each twenty-four (24) hour period in proportion to flow; (ii) the results of the analysis for PCBs in each composite daily sample for each week shall be submitted to the Department and the United States Environmental Protection Agency, Region II, within one week of the close of each calendar month.

4. Within thirty (30) days of the date of this Order, Respondent shall submit to the Department final plans and specifications for waste treatment and discharge control facilities described in the engineering report prepared by Crawford and Russell, Inc., dated February 20, 1976, and an addendum thereto dated April 7, 1976 (the "Crawford and Russell Report") and after approval of the final plans and specifications install and cause said facilities to be operational within five (5) months of such approval.

Respondent hereby consents to the issuing and entering of the foregoing Order, waives its right to the resumption of the hearing herein as provided by law and agrees to be bound by the provisions, terms and conditions contained therein.

Dated: Albany, New York
September 8, 1976

GENERAL ELECTRIC COMPANY

By _____
John F. Welch
Vice President and Group Executive

STATE OF NEW YORK)
COUNTY OF ALBANY) SS:

On this 8th day of September, 1976, before me personally came JOHN F. WELCH, to me known, who being by me duly sworn, did depose and say that he resides at 175 Ann Drive, Pittsfield, Massachusetts, that he is a Vice President and Group Executive of GENERAL ELECTRIC COMPANY, the corporation described in and which executed the above instrument and that he is authorized to execute the foregoing consent to this Final Order.

_____
Notary Public

PHILIP GITLEN
Notary Public, State of New York
Qualified in Columbia County
02-GI4507308
Commission Expires March 30, 1977

STATE OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL CONSERVATION

IN THE MATTER OF ALLEGED VIOLATIONS OF §§17-0501, 17-0511 and 11-0503 OF THE ENVIRONMENTAL CONSERVATION LAW OF THE STATE OF NEW YORK BY:

File No. 2833

GENERAL ELECTRIC COMPANY,

Respondent

STIPULATION

IT IS HEREBY STIPULATED by and between the Attorneys for the Respondent and the Counsel for the New York State Department of Environmental Conservation that sufficient facts exist in all of the proceedings to date herein upon which the proposed Order attached hereto may be predicated and that such Order may be made filed and entered by the Commissioner of Environmental Conservation of the State of New York.

BOND, SCHOENECK & KING
Attorneys for Respondent
General Electric Company

By _____

Dated: September 8 ,1976

Dated: Albany, New York
September 8 ,1976

PHILIP H. GITLEN, Assistant Counsel
New York State Department of
Environmental Conservation

APPENDIX B

PCB SETTLEMENT ADVISORY COMMITTEE

Dr. John Sanders, Chairman
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Hon. William C. Hennessy
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Div. of Habitat Preservation Research
U.S. Department of Interior
Washington, D.C. 20240

APPENDIX C

GE's RESPONSIBILITIES/PCB SETTLEMENT

"The goal of the DEC and the Natural Resources Defense Council, Inc. is the complete elimination of all PCB discharges."

In the second place, "General Electric will continue its daily monitoring of the total amount of discharges of PCBs reaching the Hudson River from all point sources or discharge outlets at its Capacitor Manufacturing Facilities."

The general conditions for GE's program are as follows:

a. Hourly samples collected, and composited daily for each 24-hour period, in proportion to flow.

b. Results of PCB analysis of each composite daily sample for each week are submitted to DEC and to the U.S. Environmental Protection Agency, Region II, within one week of the close of each calendar month.

c. General Electric agrees to discontinue the use of PCBs at its capacitor plants in Hudson Falls and Fort Edward, New York, on or before 1 July 1977 and in the meantime, discharge no more than a monthly average of 1 pound per day (454 g. day^{-1}) into the Hudson River from its capacitor plants.

d. General Electic will install wastewater-treatment facilities as described in the Crawford and Russell report and within 60 days after this facility becomes operational, will reduce the monthly average discharge of not greater than 1 gram (0.0022 pound) per day, with no daily maximum exceeding 10 grams (0.022 pound).

In the event that the funds provided in the agreement are "inadequate to assure protection of public health and resources," then DEC will "use its best efforts to obtain additional funds, from sources other than General Electric, that are necessary to assure such protection. These best efforts will include preparation by the Department of a plan of action to obtain such funds including specifying applications that will be made in Federal agencies and/or other sources of funds in as expeditious a manner as possible." Finally, "The Department will periodically report to the Advisory Committee concerning its progress in implementing the plan of action."

Finally a point made in the recommended settlement that does not appear in the language of the agreement, namely:

That DEC claims that GE be required only "to undertake or pay for a comprehensive study to determine whether a clean-up (sic) should be undertaken and how it can be accomplished, if at all." The admission has been made that "the study may show that reclamation is environmentally undesirable or technologically impracticable."

If such findings are made, then GE would have "to pay only for the study, estimated as requiring about $750,000."

However, GE will pay the full amount, and perform the research described, regardless of the outcome of the study.

"If a clean-up (sic) is determined to be unnecessary, unsound, or impracticable, the Department will be able under the agreement to use GE's payments and research to improve the Hudson River or to deal with the problems posed by toxic substances generally."

DEC has estimated that the cost of actually cleaning up the river might range from $12 million to $20 million, "based on the assumption that virtually the entire length of the river between Hudson Falls and the Troy Dam will have to be dredged." If the "hot-spot" concept proves to be correct, then only selected areas may need to be cleaned up and GE's cash contribution may well cover all or most of the cost.

But the GE contribution cannot be viewed in isolation; GE's agreement to incur $4 million for research and related matters has been based on the supposition that DEC "has agreed to use for the same clean-up operation at least $3 million in funds that are legally available."

A key point in the settlement recommended was the time factor.

"Delay is especially important to avoid in this case because of the persistent and accumulative nature of PCBs and their movement in the Hudson. They are being continually absorbed by creatures of all types and sizes, and passed up the food chain to fish. The evidence also shows that they are now passing over the Troy Dam into the lower Hudson, and may cause extensive damage, possibly avoidable if reclamation is promptly undertaken."

Consistent with this approach is the program to place immediately at the disposal of DEC approximately $6 million in resources "that it can invest in a plan to correct the PCB (and possibly other) contamination".

"The settlement brings no sure solution to a serious and difficult ecological problem. But it does assure that a comprehensive study will occur, and that several millions of dollars will be spent to remove PCBs and improve the Hudson, if those measures are necessary and practicable."

APPENDIX D

PCB SETTLEMENT ADVISORY COMMITTEE

Goals and Procedures

A. Origin and primary charge of PCB Settlement Advisory Committee

The PCB Settlement Advisory Committee (hereafter Committee) came into existence in September 1976 as part of the Agreement in the Matter of Alleged Violations of SS 17-0501, 17-0511 and 11-0503 of the Environmental Conservation Law of the State of New York by: General Electric Company (hereafter GE), Respondent, File No. 2833. Under the terms of this agreement, a "comprehensive program of at least $7,000,000" shall be established to "deal with PCB's (polychlorinated biphenyls) in the Hudson River and related environmental concerns." To this end, GE has agreed to perform $1,000,000 in research and to contribute $3,000,000 in a lump sum to the New York State Department of Environmental Conservation (hereafter DEC). In addition, DEC "will participate in the comprehensive program in an amount comparable to General Electric's cash contribution by the expenditure of funds legally available to it and in conjunction with its mandated duties."

The $3,000,000 shall be spent by DEC "at its discretion" as part of a program of at least $6,000,000 with the following objectives:

1. "Monitor the presence and levels of PCBs which have been discharged" into Hudson-River "waters, sediments, and biota;"

2. Investigate further "the need for remedial action concerning PCBs present in the Hudson River;"

3. "Implement remedial action, if necessary to protect public health and resources, concerning PCB's present in the Hudson River;" and

4. "Aid in developing a program to regulate the storage and discharge of substances hazardous to the environment" on the proviso that "sufficient moneys are available after implementing remedial action concerning PCB's."

The Advisory Committee was the responsibility of the Commissioner of Environmental Conservation (hereafter Commissioner). This Committee shall consist of: "independent experts, governmental, and private interests" and is instructed to:

1. "Hold regular meetings;"

2. "Review and make public recommendations to the Commissioner concerning the scope, content, progress and results of the programs, studies and expenditures" for which provision is made in the agreement.

3. DEC is instructed to "furnish the advisory committee with any interim report(s) and final report(s) of the research" described above.

4. "The advisory committee will continue to function throughout the comprehensive program concerning PCBs and related environmental concerns."

B. Goals of the Committee

1. The primary goal to which the Committee shall address itself is the restoration of the upper Hudson River, in particular from the environmental impacts of the discharge into the Hudson River of PCBs. Other objectives related to this goal are:

   a. To take all steps necessary to minimize the public-health risk associated with PCB contamination of the Hudson River.

   b. To make <u>every</u> effort to assure the protection and enhancement of healthy populations of fish, of wildlife, and of other components of the ecosystem that are necessary to sustain growth, reproduction, and behavior consistent with the historic populations of the Hudson River, its tributaries, and the Hudson Estuary (including in the estuary both anadromous and migratory species).

To accomplish Goal 1, the Committee shall:

   a. Advise and assist DEC in gathering data in a comprehensive study of the present extent of PCB contamination of the Hudson River.

b. Advise and assist DEC in preparing Requests for Proposals (hereafter RFP's) related to the Hudson-River PCB situation.

c. Assist DEC in evaluating proposals received in response to RFP's and make recommendations on the selection of contractors.

d. Advise and assist DEC on the preparation of final work orders issued to successful potential contractors, including the prodecures for handling and preserving core samples, specification of kinds of field surveys; and the setting of standards for laboratory procedures and arrangement of inter-laboratory exchanges of specimens (including blanks and spiked samples).

e. Invite outside experts to make presentations to the Committee on subjects related to PCB's in the environment.

f. Advise and assist DEC and others in the implementation of restoration programs defined under B. 1., above, designed for restoring the recreational and commerical potential of the Hudson River in the minimum time consistent with limits of funding and of risks involved with other alternatives.

g. Review and evaluate previous research on the problems of PCB's in the Hudson River, including DEC, GE, and others.

h. Prepare a research agenda for the Hudson-River system, to serve as a basis for assigning priorities to unsolicited research proposals submitted to DEC.

i. Establish its own procedures, as indicated in a following section.

2. Subsidiary goals of the Committee shall include:

a. Setting of editorial standards for contractors' report and for any special reports that are issued through the facilities of DEC.

b. To strive for the attainment of high-quality research results and for an understanding of the Hudson River PCB problem on levels that can serve as a model to others who may have to face the same or comparable problems.

c. To analyze and evaluate the status of the PCB problem within the Hudson River system in the broader context of the environmental burden of toxic substances generally.

d. To convene and organize scientific symposia for presentation and publication of the scientific results of research on PCB's in the Hudson River and on related environmental problems.

C. Committee procedures.

1. Committee meetings.

a. Committee meetings shall be announced in advance and shall be open to the public.

i. Persons not members of the Committee who attend Committee meetings will be invited by the Chairman at the beginning of the meeting to introduce themselves orally, to state their affiliations, and to sign the meeting roster that will be circulated.

ii. An appropriate place on the agenda will be provided for those desiring to make public statements to the Committee. Persons wishing to make such statements should so inform the Chairman at the time of introductions.

iii. It is understood that all materials coming from the PCB Advisory Committee are public information. The only exceptions are discussions within closed executive sessions (see following section), conclusions of which will be announced in the open parts of the meetings.

iv. Formal recommendations from the Committee to the Commissioner of DEC are also public information. However, as a courtesy to all parties concerned, the Committee must insist that such recommendations not be published or released until such time as the Commissioner has been able to receive the recommendations directly from the Committee.

v. The Committee shall consider breaches of iv. as constituting unethical behavior on the part of news media representatives and shall take up any repeated violations with the employers of such news media representatives.

b. Executive sessions. From time to time, the Committee may find it appropriate to go into executive session to carry on private discussion that shall be closed to all non-members except the Staff Assistant. The results of any votes taken in Executive Sessions will be announced in the open parts of the meetings.

2. Committee Officers

a. The Officers of the Committee shall be a Chairman and a Co-chairman.

b. Terms of election shall be for one year, with term of office renewable.

c. The Committee shall also hire a Staff Assistant.

d. The duties of these positions are indicated below.

3. Duties of Chairman

a. Preside at meetings.

b. Consult with Co-chairman, Committee members, and Staff Assistant regarding preparation of agenda for meetings.

c. Hire and supervise supporting staff.

d. Appoint members to sub-committees as required from time to time.

e. Serve as conduit to DEC for unsolicited research proposals that may be sent to Committee members.

f. Prepare budget for Committee's operations to be reviewed by the Committee, and if approved, transmitted to the Commissioner.

g. Serve as sole spokesman for the Committee in making public announcements to reporters for newspapers, television, or other publications, or to writers and others.

4. Duties of Co-chairman

a. Assist the Chairman.

b. Preside at meetings in absence of Chairman.

c. Prepare first drafts of Committee goals and procedures.

d. Serve as conduit to DEC (as in 3 e, above), for unsolicited research proposals the Chairman may desire to transmit to DEC.

5. Duties of Administrative Assistant.

   a. Assist Chairman and Co-Chairman.

   b. To confer with Chairman and/or Co-Chairman and then to carry out the day-to-day business, including mailings, compilation of replies, making arrangements for meetings and speakers.

   c. To keep summary minutes of meetings and to prepare such minutes for prompt distribution to Committee members after each meeting.

   d. To maintain a document file of Committee correspondence and reports.

   e. To serve as working liaison with DEC.

   f. Scanning literature, abstracts

6. Conflict of interest, Committee Members.

   a. Each member of the Committee shall submit, in writing to the Chairman, a statement fully disclosing any consulting positions held for any private contractor and research awards from DEC in connection with environmental research related to the Hudson-River system, PCB's, and related subjects.

   b. Any conflict-of-interest statement by the Chairman will be prepared as above but handed to the Co-Chairman.

APPENDIX E

SUB-STUDY DESCRIPTION

TERRESTRIAL PLANT CONTAMINATION

Project Title - Contamination of Terrestrial Plants with PCB via Volatilization, Dust Transport and Root Uptake

Principal Investigator - Edward J. Buckley
Boyce Thompson Institute
Tower Road
Ithaca, New York 14853
(607) 357-2030, ext. 631

Date Project Initiated - September 1978

Planned Completion - September 1979

Funding - $15,000 (subject to change; contract under negotiation)

Description of Project -

Vegetation near selected dumps in the Ft. Edward area is highly contaminated with PCB. Although it appears that this contamination is caused by deposition of PCB from the air, the extent of this contamination is unknown and root uptake and transport within the plant remains a possible mechanism.

Further sampling of vegetation near these sites will address the extent of PCB contamination and help determine the mechanism. Laboratory studies will also be designed and carried out to demonstrate the ability or lack thereof of selected plants to remove PCB from soil and transport it to the leaves.

PHYTOPLANKTON

Project Title - An Evaluation of the Lower Food Chain Kinetics of PCBs in the Hudson River Ecosystem

Principal Investigator - Dr. John J.A. McLaughlin, The Louis Calder Conservation and Ecology Study Center of Fordham University, 53 Whippoorwill Road, Armonk, NY 10504 Phone # (914) 273-3078

Date Project Initiated - July 1978

Planned Completion - June 1979

Funding - $29,000

Description of Project -

The goals of the project are to (1) determine those mechanisms that are chiefly responsible for the regulation of PCB levels in the lower food chain (phytoplankton-zooplankton-key benthic fauna) and (2) evaluate the response of the lower food chain to changes in ambient soluble and particulate PCB levels. These goals will be pursued through the analysis and interpretation of experiments being performed at collaborating institutions in addition to data obtained from the literature. Hypotheses formulated from experimental results will be tested through the PCB analysis of field samples. Phytoplankton counts and speciation and chlorophyll analysis will be routinely performed on samples collected by the DEC. Selected samples, preferably taken during bloom or depleted phytoplankton conditions, will be analyzed for nitrogen and phosphorus. Statistical analysis including correlation, regression, and hypothesis testing will be conducted at the Calder Center's computer facility (IBM 5100). This will allow the establishment of confidence limits on data sets as well as testing the reproducibility of data. Moreover, redirection of experimentation will be accomplished through statistical processes designed to show the strength of relationships between variables being considered. The resulting model of PCB kinetics in the lower food chain would be amenable to expansion to include the upper food chain and to employment in a model incorporating transport as well as other components.

SEDIMENT TREATMENT

Project Title - Research to Remove or Treat PCBs in Dredged Hudson River Sediment

Principal Investigator - Mr. Charles M. McFarland, General Electric Company. Corporate Research and Development, 1 River Road, Schenectady, New York 12301 (518) 385-8583

Date Project Initiated - October 1976

Planned Completion - June 1978

Funding - $400,000

Fiscal Year	Personnel & Overhead
1976	35
1977	250
1978	115

Description of Project -

Eight tasks have been selected to determine the efficacy of various approaches for removal or treatment of PCBs in Hudson River sediments.

The first task, the "Development of a Rapid Analytical Technique", is essential to minimize the quantity of sediment which must be removed from the river. "Biodegradation", the second task, is a study intended to seek out naturally occurring microbes which degrade encountered PCBs in sediments and to optimize their activity. The third, fourth, and fifth tasks, "Incineration", "Pyrolysis", and "Distillation", are engineering approaches intended to either separate or directly destroy PCBs in sediments. The goal of the sixth task, "Chemical Approaches", is to explore different additives or solvents which might encapsulate, destroy, or extract PCBs. Task seven is an exploratory effort intended to pursue "Special Investigations" for the State. Task eight is a study of specific "Environmental Dissipation" pathways set up in the laboratory to model exposed spoil banks and sediments in the river.

Of these approaches, those which seem to be feasible as methods of treating PCB contamination will be scaled up into prototype demonstrations for a study of implementation problems.

FATE OF PCBs IN RIVER

Project Title - Analysis of Fate of PCBs in Hudson River Ecosystem

Principal Investigator - Mr. John P. St. John, Hydroscience, Inc.
363 Old Hook Road, Westwood, N.J. 07675,
Phone # (201) 666-2600

Date Project Initiated - June 1978

Planned Completion - June 1979

Funding - $67,673

Description of Project -

The overall purpose of this study is to analyze the fate of PCBs in the Hudson River ecosystem using data from 1977 and additional data to be collected during 1978. The distribution of PCBs in the abiotic and biological sector will be modeled using the basic framework developed in our previous study. The analysis will be further refined and estimates will be made of the effect of various remedial actions on the PCB distribution in the ecosystem. The major emphasis in this study will be on the biological model which was not fully calibrated in the previous study because of insufficient data. The new water column estuary PCB data will also be used to improve the previous model calibration which was limited by minimal available data.

The following tasks outline the study:

(1) PCB data collected during 1977, but not included in previous analyses together with the 1978 data will be reviewed and analyzed for incorporation into existing modeling frameworks.

(2) Water column data from 1977 and 1978 will be analyzed with the same model developed in our previous study. The major emphasis will be on the Hudson Estuary between the Troy Dam and New York Harbor.

(3) The food chain model will be divided into ecological regions within which the model coefficients are constant. Within each trophic region, the model will be either continuous or discrete. The analysis will include the direct physical uptake of PCB, the loss of PCB by excretion and the accumulation of PCB through the food chain.

(4) The analysis of striped bass PCB body burden will be extended with the additional data. In the previous analysis, the striped bass body burden was computed as a function of PCB water concentration, uptake, and excretion. In this study, the contribution of PCB from the food chain will also be included using available data on feeding habits and increase in fish weight as a function of age.

(5) The major emphasis of the projections will be the fate of PCPs in the aquatic ecosystem for a given PCB level in the water column. Projections will be made using both the continuous food chain and the striped bass body burden analysis.

TRANSPORT MODELING

Project Title: Upper Hudson River PCB and Sediment Transport Modeling and Predictions.

Principal Investigator: Dr. Karim Abood, Lawler, Matusky & Skelly Engineers,
One Blue Hill Plaza
Pearl River, New York 10965
Phone: (914) 735-8300

Date Initiated: October 1978.

Planned Completion: July 1, 1979.

Funding: $60,000.

Scope of Work: The work will involve updated models of PCB and sediment transport in the Upper Hudson for both no action and dredging alternatives. A previous model and report on the no action alternative is available. The new work will include the following:

1. Updating of no action model with the following new data:
   a) additional bottom cross-sections and rock elevations in the Lock 1 to Troy Dam and Lock 2 to 3 and Lock 3 to 4 pools.
   b) additional water quality data on PCB and suspended solids in the Upper Hudson.
   c) G.E. data on bottom desorption and volatilization of PCB.
   d) the full updated O'Brien & Gere sediment PCB data file.
   e) additional PCB data in the Locks 2 to 4 and Lock 1 to Troy dam pools.
2. Modeling of the river with source of PCB loss at remnant deposits reduced an appropriate amount.
3. Modeling of the river with 2(above) and the hot spots in the Lock 7 to Thompson Island Dam removed.
4. Modeling of the river with 2 and 3(above) and the hot spots from the Thompson Island dam to the Troy Dam removed.

It is anticipated the modeling will be done and summarized for technical meeting in May, 1979 and the final report will be submitted by July 1, 1979.

REMOVAL ENGINEERING

Project Title - Engineering Studies, Dredging of PCB Contaminated Sediments.

Principal Investigator - Richard F. Thomas, Malcolm Pirnie, Inc., Albany and White Plains, New York Phone No. (914)694-2100

Date Project Initiated - June 1, 1977

Planned Completion - December 1978

Funding - $389,040 - Contract No. C99892

Description of Project -

The objective of this project is an evaluation of alternative dredging systems to remove PCB contaminated debris and sediments from the Hudson River in the vicinity of Ft. Edward to Waterford, New York. The evaluations will consider system effectiveness in removing the PCB contaminated sediments without adverse environmental effects and long term containment or removal of PCBs from the biosphere.

All existing data relating to PCB distribution and proposed data resulting from current DEC study contracts for the Upper Hudson River will be integrated via a data processing and evaluation system. The performance, cost and environmental factors involved in the various dredging systems will be comprehensively evaluated, and a specific, feasible dredging program will be recommended.

The purpose of the additional study report is to provide detailed feasibility evaluation, design criteria and recommendations to the Department concerning key aspects of implementation of a "hot spot" dredging program. Implementation of the dredging program will be contingent upon final approval by DEC after consideration of all aspects of the PCB problem and the findings of concurrent investigations.

AIR CONTAMINATION

Project Title - Ambient PCB Air Sampling

Principal Investigator - Robert Kerr, Division of Air Resources, Special Studies Section, N.Y.S. ENCON, 50 Wolf Road, Albany, New York 12233, (518) 457-7454

Date Project Initiated - August 1976

Planned Completion - November 1978 with possible follow up sampling during and subsequent to enactment of alternate solution chosen.

Description of Project -

The present project consists of three distinct ambient air monitoring phases:

1. Ambient PCB measurements before General Electric discontinued using PCBs at their facilities.

2. Ambient PCB measurements after General Electric discontinued using PCBs at their facilities.

3. Special ambient measurements at two General Electric dump sites and one dredge spoil area.

Sampling to date has shown a definite decrease in ambient PCB levels beginning after General Electric terminated use of PCBs in June 1977. Sampling will continue at the permanent sites until a stable background level has been established. Background PCB levels at Warrensburg (5600-02) and Glens Falls continuous air monitor (5601-04) have been determined to be <20 ng/m^3 or below the minimum detectable limit.

Special sampling at the dumps, Fort Miller and Caputo, showed significantly higher levels of PCBs than the permanent monitoring network.

Special samples were taken at the dump sites and landfill. The special sampling effort will be expanded to evaluate the chosen corrective action for PCB removal. The dump sites and landfill should be sampled annually to determine long-term PCB trends at these potential emission points.

Data from the permanent network were reviewed and evaluated during Fall, 1978. As a result of this review, sampling was discontinued at two of the three regular stations.

FISH FLESH CONTAMINATION

PROJECT TITLE

Monitoring PCB Contamination Levels in Hudson River Fish Flesh

PRINCIPAL INVESTIGATOR

Dr. Ronald J. Sloan, Senior Scientist
Bureau of Environmental Protection
Department of Environmental Conservation
50 Wolf Road - Room 526
Albany, New York 12233
Phone (518) 457-6178

DATE PROJECT INITIATED

April 1977

PLANNED COMPLETION

Open

FUNDING

Unspecified amount by NYS-DEC for collection of fish and administration of program.
- $119,090 - Contract #C126500 to
Raltech Scientific Services, Inc.
3301 Kinsman Boulevard
Madison, Wisconsin
for laboratory analyses.

DESCRIPTION OF PROJECT

The major goal of the project is to systematically sample the most important commercial and sport fish species of the Hudson River to determine incidences and concentrations of three Aroclor mixtures (1016, 1221, 1254) and to monitor trends of these PCBs in fish flesh. Specific objectives include identifying changes in PCB concentration in fish as PCB levels are reduced or as a result of dredging operations; determining if concentration levels in fish of the same species vary with geographic location or in the case of anadromous species with time spent in the river. Seven sampling locations were established for the 1978 collections. From the George Washington Bridge to Poughkeepsie, four areas were selected to sample anadromous species such as striped bass and American shad. Three stations from Catskill to Stillwater were established to sample resident species such as largemouth bass, white perch and goldfish. The 1978 sampling will be the last major year of collecting. During 1979 the emphasis will be on monitoring trends of PCB contamination in a few selected species. Overall, intraspecific contaminant levels in flesh are directly related to time spent in the river and/or distance upstream, presumably closer to the source(s) of contamination.

MACROINVERTEBRATES

Project Title - Occurrence of PCBs in Macroinvertebrates and Artificial Substrate Residues Throughout the Hudson River Ecosystem

Principal Investigator - Dr. Karl W. Simpson, New York State Department of Health, Division of Laboratories and Research, Empire State Plaza, Albany, NY 12201

Date Project Initiated - March 1976

Planned Completion - Open

Funding - PL 92-500, 106 grant

Description of Project

The project's main objective is to determine and monitor the levels of PCBs in the macroinvertebrate communities throughout the Hudson River. Areal and temporal patterns are being monitored through the collection and analysis of residues from artificial substrate samplers. Total residues are being analyzed because sufficient biomass for chemical analysis (200 mg) is rarely obtained solely from the macroinvertebrates. These samplers are exposed at a depth of 3 feet (0.9 meters) for 5 week periods, and material scraped from the plates (algae, sediment, and macroinvertebrates) serves as the sample. The sampling network consists of 20 stations extending from Hudson Falls to Haverstraw Bay.

In addition to monitoring PCBs in the above residues, data are also being compiled on the PCB content in the macroinvertebrates themselves. When sufficient biomass of organisms is encountered, either in the artificial substrate residues or in benthic samples, it is removed and analyzed separately for PCB content. An intensive survey of the pool above Thompson Island has been performed during which macroinvertebrates from as many habitats and trophic levels as possible were collected.

The main focus of this project is to provide information regarding the contamination of organisms at intermediate levels in the food web. Since macroinvertebrates are relatively immobile and have short life cycles, these data provide a measure of the PCB transport into the food web at a particular location and over a relatively short period of time. These data will also help identify the amount of contamination in fish diets, which often contain considerable quantities of macroinvertebrates.

FOOD CHAIN

Project Title - Dynamics of PCBs in Key Hudson River Biota

Principal Investigators - Joseph M. O'Connor
Chun Chi Lee
Theo. J. Kneip
New York University Medical Center
Laboratory for Environmental Studies
Tuxedo Park, New York 10987
(914) 351-5419

Date Project Initiated - 1 June 1978

Planned Completion - 31 May 1979 (Phase I)

Funding - $44,000

Description of Project -

This project undertakes two distinct tasks. First, to determine PCB concentrations in phytoplankton, zooplankton and various life-history stages of fishes in the Hudson River. Second, to describe the dynamics of PCB in selected fish food organisms (e.g. Gammarus, Neomysis, Chaoborus) and in the early life-history stages of estuarine fishes.

Estimates of the PCB concentration in Hudson River biota will be made upon samples taken from three locations: 1) near the Federal Dam at Green Island; 2) in the limnetic sector of the estuary, approximately 20 km upstream of the salt front (0.25‰); 3) in the oligohaline sector of the estuary at a salinity of approximately 10‰. Sampling will take place three times: 1) during summer low flow; 2) during autumn high flow; and 3) during spring high flow. Samples for analysis of PCB in phytoplankton will be collected jointly with DEC and Fordham University. Microzooplankton, macrozooplankton and fish samples will be collected by New York University. Analysis will be carried out using standard extraction procedures and gas chromatographic techniques.

The dynamics of PCBs in selected Hudson River organisms will be described using radiolabelling techniques. Food organisms will be labelled with ^{14}C-aroclors and fed to experimental organisms such as Gammarus, Neomysis, striped bass, white perch and carp. Rates of transfer, accumulation, biodegradation and excretion will be estimated by standard radiotracer methodology.

The overall objective of the project is to provide data relevant to understanding the extent to which the biota function in PCB mass transport in the River ecosystem, and estimate concentrations of PCB in biota during hydrologically distinct portions of the seasonal succession in the Hudson River ecosystem.

REMOVAL FROM DRINK

Project Title - Removal of PCB and Oth
[illegible]

Principal Investigator - Dr. Edwin C. Taffi, Jr.
O'Brien and Ge[illegible]ineers, Inc.
1304 Buckley
Syracuse, [illegible]
(315) 451-4700

Date Project Initiated - July 1978

Planned Completion - September 19[illegible]

Funding - $100,370

Description of Project -

The removal of PCBs and other organic chemicals from drinking water withdrawn from the Hudson River will be studied. The purpose of the program is to establish a preliminary basis-of-design for water treatment plants which use the Hudson River as a source. The emphasis will be placed on PCBs, chlorinated hydrocarbon pesticides, trihalomethanes and volatile halogenated synthetic organic chemicals.

The program will consist of a detailed literature review of existing technologies, bench-scale studies to determine the most promising methods of treatment and pilot plant programs at Waterford and Poughkeepsie to verify the conclusions. The technologies that will be the considered include absorption by granular activated carbon and synthetic resins, coagulation, filtration and oxidation. From this work, a cost-effective treatment technique could be selected for design and implementation.

Project Title - PCB analysis of biological samples

Principal Investigator - Francis [illegible], Ralph [illegible]

Date Project Initiated - 15 November 1977

Planned Completion - 31 January 1978 to 1 April 1978

Funding - $119,[illegible], Contract #01[illegible]
31,260, Amendment

Description of Contract -

Fish, plant and miscellaneous organisms [illegible] 1016/1242 and 1254. The samples are primarily those gathered in the [illegible] Fish and Wildlife project (Fish Flesh Monitoring) and the studies at Boyce Thompson Institute (Terrestrial Plant Contamination). After extraction and cleanup, quantitation is carried out via gas chromatography with electron capture detection. A spike recovery and duplicate is carried out for every 20 samples. Approximately 1800 samples are expected to be analyzed.

LOWER TROPHIC LEVELS

Project Title - The Behavior and Biological Effects of PCB in Aquatic and Estuarine Environments

Principal Investigators - Dr. Charles F. Wurster (516-246-4002)
Dr. Harold B. O'Connors, Jr. (516-246-7715)
Dr. C. Donald Powers (516-246-5913)
Marine Sciences Research Center
SUNY at Stony Brook, Stony Brook, NY 11790

Date Project Initiated - June 1978

Planned Completion - Certain [illegible] May 1979

Funding - $27,000

Description of Project -

We will explore potential biological effects of PCB contamination of simple food chains typical of those of the lower Hudson River estuary. The research will investigate important processes which govern (1) the number of trophic levels involved, and (2) the flow of biomass to harvestable fish populations. Specifically, we will accomplish the following tasks:

1. Measure PCB/sediment and PCB/algal partition coefficients, uptake and desorption rates.

These studies are relevant to the Hudson River situation since resuspended PCB-contaminated sediments may be a source of PCB to an uncontaminated water column, to phytoplankton and higher organisms.

2. Determine the effects of PCB exposure on carbon fixation, growth rate, species composition and size distribution of natural phytoplankton communities.

Studies underway in our laboratory have revealed deleterious effects of low levels of PCB on all of the above variables in certain algal species and natural phytoplankton communities. PCB-induced changes in species composition and size distribution may affect the availability of food for herbivores.

3. Measure PCB concentration and partition coefficients in zooplankton exposed to contaminated water, inorganic and detrital organic particles and phytoplankton food.

Using radioactive PCB mixtures and several species of copepods common to the Hudson River estuary, the ability of zooplankton to acquire PCB from contaminated water, algal food, and detrital organic and inorganic particles will be examined. Rates of PCB loss from contaminated copepods will also be measured.

4. Measure PCB toxicity to zooplankton and effects of PCB-induced changes in the natural phytoplankton community (quantity, species composition and size distribution) on zooplankton survival, food ingestion, growth and fecundity.

These experiments should detect possible toxic effects to the animals from PCB-contaminated food. The influence of PCB-induced alterations of algal community structure on this higher trophic level should also be apparent.

SEDIMENT SAMPLE ANALYSIS

Project Title - Analysis of PCBs in Hudson River Water and Sediment Samples

Principal Investigator - Dr. Harish C. Sikka, Syracuse Research Corporation, Merrill Lane, Syracuse, NY 13210, (315) 425-5121.

Date Project Initiated - July 1978

Planned Completion - June 1979

Funding - $90,000

Description of Project -

The amounts of PCBs will be determined in approximately 1500 samples of water and sediment collected from the Hudson River. The procedures for the analysis of PCBs include Soxhlet extraction, extract clean-up on Florisil and Silica-gel columns and gas chromatography using an electron-capture detector.

RIVER TRANSPORT

Project Title: Measurement and Calculation of PCB Transport in the Hudson River from October 1978 to October 1979.

Principal Investigators: Roy A. Schroeder and Roger J. Archer, USGS, P.O. Box 1350, Albany, New York 12201 Phone: 472-3107

Data Output: Computer printouts of the updated data are available monthly.

Funding: $75,000 by DEC, 75,000 by USGS(matching).

Scope of Work: There will be 5 stations on the Upper Hudson, 5 on the lower Hudson and one on the Mohawk River at Cohoes where suspended sediment water sampling will be conducted. The data from this sampling projected below will also be analyzed.

Upper Hudson	PCB and Related Analyses
1. Glen Falls(Port. Cement)	6
2.* Rogers Island(Rt. 197 Br)	30
3.* Schuylerville(Rt. 29 Br)	12
4.* Stillwater (Rt. 67 Br)	30
5.* Waterford (Rt. 4 Br)	30
Lower Hudson	
1. Castleton	6
2. Catskill	6
3. Straatsburgh	6
4. Clinton Pt.	6
5. Highland Falls	6
Mohawk River (Cohoes)*	20

* Daily suspended sediment analyses.

MIGRATION FROM LAND SITES

Project Title - Study of Migration of PCBs from Landfills and Dredge Spoil Sites as Related to the Hudson River

Principal Investigator - Walter H. Leis, Weston Environmental Consultants, Weston Way, West Chester, Pennsylvania [illegible], Phone # (215) 692-3030

Date Project Initiated - June 1977

Planned Completion - April 1979

Funding - $226,642 - Contract #[illegible]

Description of Project -

Evaluation of the existing landfills and dredge spoil areas having received PCB waste in a disposal operation or as a result of dredging PCB-laden material from the Hudson River.

The primary purpose of this project is to determine migration, if present, of PCBs from landfills and dredge spoil areas, define the effect of these PCBs on soils and/or freshwater aquifers and, if appropriate, discharges to the Hudson River. The program includes sampling of landfilled material, spoil areas, drilling and pit construction, physical testing of subsurface materials, water and leachate collection, sampling and laboratory analyses. An evaluation and recommendation as to the location and design of new dredge spoil areas and remedial measures for existing problem landfill and dredge spoil areas will be made.

APPENDIX F

Hudson River PCB Study - Key Department of Environmental Conservation Personnel

1.	Settlement Manager	Italo G. Carcich, P.E. Bureau of Water Research (518) 457-7470
2.	Engineering Aspects of the Reclamation Program	Italo G. Carcich, P.E. Bureau of Water Research (518) 457-7470
3.	Environmental Impact Analyses	Allen F. Davis Bureau of Water Research (518) 457-7575
4.	Biological Research	Edward G. Horn, Ph.D. Bureau of Environmental Protection (518) 457-6178
5.	Legal	Richard Persico Office of Legal Affairs (518) 457-3550
6.	Water Quality Standards, Overall Monitoring Surveillance	Russell T. Mt. Pleasant, P.E. Bureau of Monitoring and Surveillance (518) 457-7464
7.	Fisheries	Ronald Sloan, Ph.D. Bureau of Environmental Protection (518) 457-6178
8.	Physical Research	T. James Tofflemire, Dr. Eng. Bureau of Water Research (518) 457-7575
9.	Solid Waste and Dredge Material Disposal Sites	David G. Knowles, P.E. Bureau of Solid Wastes (518) 457-6607
10.	Laboratory Quality Control	James Daly Environmental Health Center Division of Laboratories and Research NYS Department of Health (518) 474-7099
11.	Air Monitoring	Robert Kerr, P.E. Bureau of Air Quality Surveillance (518) 457-7455

Appendix G

Annotated Bibliography of Reports and Publications Related to

PCBs in the Hudson River

By Edward G. Horn
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Bureau of Water Research
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January 1978

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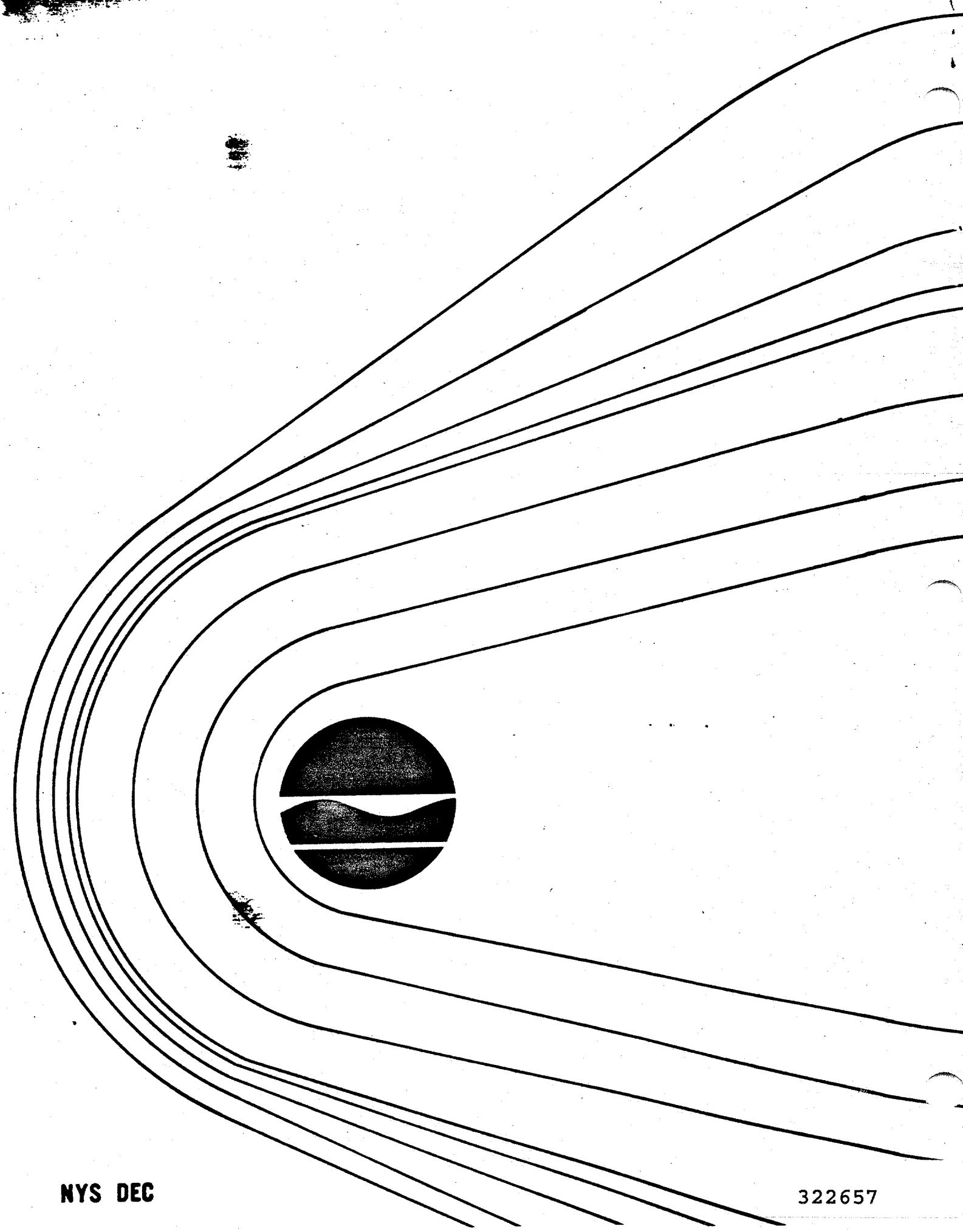

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