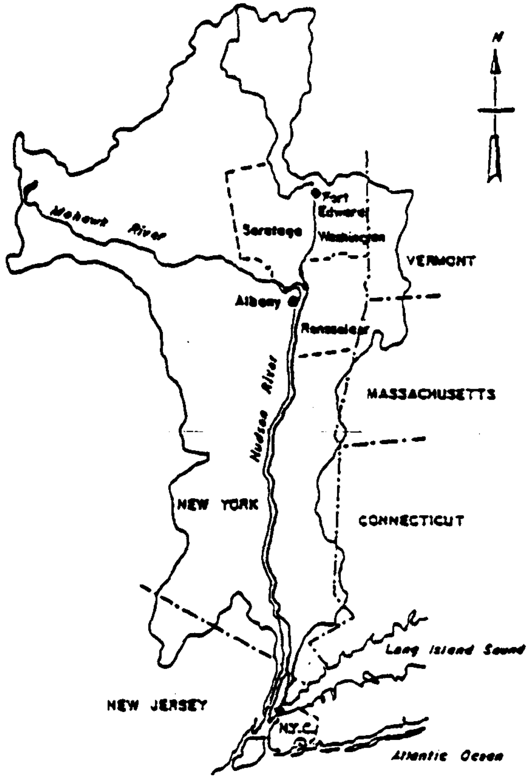
ENVIRONMENTAL IMPACT STATEMENT

ON THE HUDSON RIVER PCB RECLAMATION DEMONSTRATION PROJECT

FINAL

OCTOBER 1982



U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

MONS 009505

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

8 OCT 1982

To All Interested Government Agencies and Public Groups:

This is to inform you that the final environmental impact statement (FEIS) for the Hudson River PCB Reclamation Demonstration Project is available for public review at the following locations:

1. Crandall Library
   City Park
   Glens Falls, New York

2. New York State Department of
   Environmental Conservation
   21 South Putt Corners Road
   New Paltz, New York

3. New York State Department of
   Environmental Conservation
   202 Mamaroneck Avenue
   White Plains, New York

4. New York State Department of
   Environmental Conservation
   2 World Trade Center
   New York, New York

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

This FEIS was prepared by the U.S. Environmental Protection Agency, Region II. The draft EIS (DEIS) was issued on May 8, 1981, and a supplemental DEIS was published on August 28, 1981. This FEIS contains the following:

- findings of the final EIS
- responses to comments made by federal, state, local and other interested parties on the supplemental DEIS
- responses to EPA's independent "peer review" evaluation
- the New York State Department of Environmental Conservation's final Environmental Monitoring Plan
- the decision of the New York State Hazardous Waste Facility Siting Board (dated April 22, 1982)
- Compensation Plan for farmers adjacent to the proposed containment site.

It is important to note that, while the FEIS identified and analyzed potentially significant impacts on the environment resulting from this proposed project, this does not constitute EPA's final decision to fund this action. Section 116 of the Clean Water Act requires the Administrator to make a number of determinations relative to the proposed project. These include:

1. Whether the project will demonstrate the feasibility of indefinite storage of toxic substances in secure landfills;

2. Whether the project will demonstrate an improvement of the rate of recovery of a national waterway;

3. Whether disposal of PCB-contaminated dredged material in a secure landfill would provide a higher standard of protection of the public health, safety and welfare than disposal by other methods; and

4. Whether funds are available to the State of New York for the project under Sections 115 or 311 of the Clean Water Act, or a comprehensive hazardous substances response and cleanup fund.

While the FEIS addresses some of these issues, the Administrator must make the final determination. Comments concerning the content of this FEIS may be submitted to EPA for consideration. All comments must be received within thirty (30) calendar days of the date of this FEIS. Please address your comments to the Chief, Environmental Impacts Branch, U.S. Environmental Protection Agency, Room 400, 26 Federal Plaza, New York, New York 10278.

The Administrator's final determination will not be published until at least thirty days after the date of this FEIS. If you need any additional information, please contact Ms. Robin Rohn, EIS Project Officer, New York/Virgin Islands Section, Environmental Impacts Branch, at (212) 264-8677.

Sincerely yours,

Jacqueline E. Schafer

Jacqueline E. Schafer
Regional Administrator

MONS 009507

EXECUTIVE SUMMARY

DATE:	October 1982
TYPE OF STATEMENT:	Final
RESPONSIBLE FEDERAL AGENCY:	U.S. Environmental Protection Agency (EPA) Region II
TYPE OF ACTION:	Administrative

BACKGROUND

The final EIS identifies the full-scale dredging and upland containment project proposed by the New York State Department of Environmental Conservation (NYSDEC) as the environmentally preferable alternative. Based on numerous evaluations carried out by EPA and its environmental consultants, WAPORA, Inc., it was concluded that the full-scale dredging project would provide the greatest potential for demonstration of river recovery and indefinite storage of contaminated material in an environmentally acceptable manner. The final EIS also identifies the reduced-scale dredging and upland containment project as an environmentally acceptable alternative. Although this reduced-scale project would also demonstrate indefinite storage of contaminated material in an environmentally acceptable manner, the potential for demonstrating an absolute improvement in the rate of recovery of the Hudson River would be less, relative to the full-scale project. A comparison of the full and reduced-scale projects is presented in Table S-1.

A draft environmental impact statement (EIS) was published on May 8, 1981, which presented the impact assessment of various project alternatives as well as recommendations to NYSDEC for the development of project modifications, monitoring programs and contingency plans to ensure the protection of public health and environmental resources. These modifications, monitoring and contingency plans would be a critical element of the project and are consistent with the Congressional intent of section 116 of the Clean Water Act (CWA). A monitoring and contingency plan has been submitted by NYSDEC and is included as Appendix A of this document.

In response to public comment and in the interest of the protection of public health, safety and welfare, NYSDEC has made provisions for financial assurances to farmers whose property adjoins the containment site and whose crops could potentially be contaminated as a result of the two year operation of the containment site during dredging. The details of these arrangements are presented in Appendices A and G of this report.

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Table S-1

Comparison of Full-Scale and Reduced-Scale Projects

Full-Scale	Reduced-Scale
Dredging all 40 hot spot areas in the river bed with containment in a secure site.	Reduction of the number of hot spots to be dredged to approximately 20 sites above Thompson Island Dam.
Design and construction of a secure upland containment site capable of indefinite long-term isolation of contaminated material.	Same, except for a reduction in capacity at the containment site.
Provision of secure cap and top dressing, and further bank stabilization if necessary, for the remnant deposits.	Same
Provision for containment of contaminated materials from three New York State Department of Transportation (NYSDOT) dredge spoil sites (212, 13 and 204 Annex).	Same
Provision for dredging and containment operational standards and procedures, mitigation measures, monitoring programs, and contingency plans necessary to safeguard public health and agricultural resources.	Same
Provision for research studies/environmental monitoring programs necessary to demonstrate the improvement in the rate of recovery of the river and storage of contaminated material.	Same

PURPOSE OF FEDERAL EIS

With the passage of section 116 of the CWA in October of 1980, Congress authorized EPA to make grants up to $20 million to New York State in order to carry out the intent of the "Hudson River PCB Reclamation Demonstration Project."

On January 12, 1981, EPA Region II issued a Notice of Intent (NOI) to prepare an EIS. The purpose of the EIS process is to identify and analyze any potentially significant impacts on the quality of the human environment resulting from a proposed project.

In addition, the EIS process provides the forum for soliciting public comments on a proposed project through a series of public meetings and hearings. A twenty-one member Citizens Advisory Committee (CAC) was formed to advise EPA on issues of public concern regarding the project.

As stated in the NOI, the NEPA EIS evaluated the following:

- no-action alternative
- control of river flow
- in-river detoxification
- in-river containment
- remnant deposit alternatives in the area of the former Fort Edward Dam
- complete or partial dredging, combined with upland containment
- dredge spoil disposal and treatment options
- other alternatives concerning PCB removal, including alternative dredging and transport

These alternatives were evaluated for potential beneficial and adverse, short- and long-term environmental impacts under normal river flows, as well as floodflow conditions. The EIS analyzed the major primary and secondary impacts of the proposed projects on the following:

A. Public Health

1. Protection of downstream water supply
2. Protection of groundwater in the area of the containment site
3. Reduction of PCB volatilization from river bed and remnant deposits into the air
4. Reduction of containment site volatilization
5. Reduction of exposure through the ingestion of PCB contaminated food

B. Fisheries

1. Permanent reopening of the commercial and recreational fisheries
2. Protection of endangered species (shortnosed sturgeon)
3. Reduction of the bioaccumulation of PCBs through the food web
4. Protection of wetlands

C. Maintenance Dredging and Navigation

1. Mitigation of future maintenance dredging and disposal problems in the Upper Hudson River as well as the estuary
2. Maintenance of a navigable waterway serving transportation needs of the upper and lower Hudson River communities

D. Agriculture

Protection of livestock and their food sources through:

1. Reduction of river bed and remnant deposit volatilization
2. Reduction of containment site volatilization
3. Protection of groundwater in the area of the containment site

E. Other Impacts

1. Evaluation of impacts to future hydroelectric dam construction and usage

FINDINGS OF THE NEPA FINAL EIS

1. Disposal of PCB-contaminated dredge spoils in a secure landfill should provide a higher standard of protection of the public health, safety, and welfare than disposal of such pollutants by other methods including, but not limited to, incineration or a chemical destruction process. The basis of the above is that alternative disposal methods are either infeasible or highly speculative and would render the entire project economically infeasible within the amounts of money available for either the full or reduced-scale project.

   However, it is important to note that the statutory provisions of section 116 of the CWA require the Administrator of EPA to render the final decision on the matter of the protection of public health, safety and welfare provided by the containment site. This will be addressed once all public comment is received on the final EIS.

2. The proposed containment site, which now incorporates the modifications and design safe-guards described in the draft EIS, should be environmentally acceptable for indefinite storage of PCB-contaminated sediments. The storage of contaminated sediments at the proposed containment site is not expected to cause significant long-term adverse effects on the surrounding community.

   The approval of the proposed containment site for disposal of PCB-contaminated sediment is not only contingent upon the determination by the Administrator of EPA that the proposed landfill meets the test of public health, safety and welfare provided by section 116, but also upon the Regional Administrator issuing a permit under the Toxic Substances Control Act. Such a permit, if issued, would require the Regional Administrator to grant a waiver of the requirement of 40 CFR 761.75(b)(3), regarding the fifty foot minimum requirement from the bottom of the landfill to the historical high water table.

Because the distance between the bottom of the landfill and the water table cannot be fifty feet or more in many areas east of the Mississippi River due to hydrogeologic conditions, EPA Regional Administrators have had to use the waiver provisions provided for in the regulations in order to approve PCB landfills. The rationale for the waiver include the fact that the use of state-of-the-art landfill design, leachate collection systems and monitoring programs did not present an unreasonable risk of injury to health on the environment from PCB's.

3. The proposed dredging operation, which now incorporates the modifications and design safeguards recommended in the draft EIS, is not expected to have significant short or long-term adverse effects on the surrounding community, downstream water supplies or the ecology of the Hudson River.

4. Removal of PCB-laden sediments in the areas to be determined during the pre-dredging monitoring program should demonstrate an improvement of the rate of recovery of the Hudson River under the full or reduced-scale project.

5. Removal of PCBs from the upper Hudson River should also reduce the risk of:

   - the necessity to once again close the Hudson River fishery in the future due to high flows. (This assumes that the PCB levels in fish would drop to acceptable levels at some time in the future without the project.)

   - conducting environmentally unsound maintenance dredging in the future

   - discontinuing maintenance dredging in the upper Hudson River due to the inability to provide adequate upland containment of PCB contaminated dredge spoil

6. The potential environmental risks associated with the no-action alternative could be greater than those associated with the full or reduced-scale alternative.

7. The reduction in average PCB sediment concentrations in New York Harbor due to removal of PCBs from the upper Hudson River is expected to be relatively small. However, under extreme flooding conditions the action alternative may have some beneficial impact on the harbor area. Also, in areas of rapid deposition in the upper estuary (such as the Albany Turning Basin) where routine maintenance dredging is conducted by the U.S. Army Corps of Engineers, the action alternative may also have a beneficial impact.

8. As presently proposed by NYSDEC, PCB volatilization caused by the discharge of contaminated dredged sediment into the containment site could exceed the New York State Department of Health (NYSDOH) recommended maximum allowable 24-hour average ambient air PCB concentration at nearby residences and at other sensitive receptors under worst case dissolved PCB concentrations and meteorological conditions. However, the analysis conducted by EPA presented in Appendix J of the EIS shows that, with the mitigation measures presented in Appendix A of the final DEIS, the 1 microgram per cubic meter (ug/cu m) ambient air guideline should not be exceeded.

HISTORY AND OVERVIEW OF THE EXISTING PROBLEM

Polychlorinated biphenyls are a class of chemical compounds that have been used in agriculture and industry for decades. Since 1930, they have been used principally in electrical transformers and capacitors, but they have also been used in a variety of other products including lubricants, pesticides, cutting oils, plasticizers, and adhesives.

During a thirty-year period ending in 1977, over 227,000 kilograms (kg) (500,000 pounds [lbs]) of PCBs were discharged into the Hudson River from two General Electric (GE) capacitor manufacturing plants at Fort Edward and Hudson Falls, New York. Much of the discharged PCBs was absorbed by the bottom sediments of the river and accumulated behind the Fort Edward Dam. When the dam was removed in 1973 due to its deteriorating condition, a large amount of the PCB-contaminated sediments was released and migrated downstream. The downstream migration was further accelerated during flood situations, causing PCBs to concentrate in river bottom sediments downstream from Fort Edward.

PROJECT DEVELOPMENT BY NYSDEC

As part of a court settlement between NYSDEC and GE, approximately $3,000,000 was spent by NYSDEC to investigate the extent of PCB contamination in the Hudson River and develop methods to reduce and/or remove the threat of continued PCB contamination.

Forty PCB "hot spots" have been identified in the upper Hudson River, based on five years of scientific and engineering studies. "Hot spots" have been defined as sediments containing 50 micrograms per gram (ug/g) (parts per million [ppm]) or more of PCBs. PCB concentrations along the depositional shore range from 5 to 1,000 ug/g (ppm) in fine-grained sediments. In addition, five PCB-contaminated remnant deposit sites have been identified. Remnant deposits were formed as a result of the removal of the Fort Edward Dam, which caused water levels of the river behind the dam to drop significantly. This caused once-submerged bottom sediments to be exposed to the atmosphere. At present, PCB concentrations in the remnant deposits range from 50 to 200 ug/g (ppm).

The investigations conducted by NYSDEC resulted in a proposal to dredge PCB-contaminated sediments from the upper Hudson River and deposit those sediments in a secure upland containment site. The environmental analysis, costs, engineering, and feasibility of the project proposed by NYSDEC are presented in a draft EIS prepared in accordance with the State Environmental Quality Review Act (SEQRA). The full-scale project recommended in the draft SEQRA EIS was estimated to cost $40,000,000.

Subsequent to the draft SEQRA EIS and in response to Congressional action described below, NYSDEC rescoped the originally proposed project to accommodate the $20,000,000 funding authorized by the amendments to the (CWA) [Sections 116(a) and (b)] and state matching funds. The reduced-scale project, as developed by NYSDEC, would cost $26,700,000.

CONGRESSIONAL ACTION

In September 1980, Congress passed an amendment to the CWA under Title I, sections 116(a) and (b), entitled the Hudson River PBC Reclamation Demonstration Project. Funds for this project have been authorized under Title II, section 205(a), of the Act. Under this legislation EPA is authorized to expend up to $20,000,000 towards a proposed demonstration/reclamation project for removing and disposing of PCB-contaminated sediments from the Hudson River.

> Section 116(a). The Administrator is authorized to enter into contracts and other agreements with the State of New York to carry out a project to demonstrate methods for the selective removal of polychlorinated biphenyls contaminating bottom sediments of the Hudson River, treating such sediments as required, burying such sediments in secure landfills and installing monitoring systems for such landfills. Such demonstration project shall be for the purpose of determining the feasibility of indefinite storage in secure landfills of toxic substances and of ascertaining the improvement of the rate of recovery of a toxic contaminated national waterway. No pollutants removed pursuant to this paragraph shall be placed in any landfill unless the Administrator first determines that disposal of the pollutants in such landfill would provide a higher standard of protection of the public health, safety, and welfare than disposal of such pollutants by any other method including, but not limited to, incineration or a chemical destruction process.
>
> (b). The Administrator is authorized to make grants to the State of New York to carry out this section from funds allotted to such State under Section 205(a) of this Act, except the the amount of any such grant shall be equal to 75 per centum of the cost of the project and such grant shall be made on condition that non-federal sources provide the remainder of the cost of such project. The authority of this section shall be available until September 1983. Funds allotted to the State of New York under Section 205(a) shall be available under this subsection only to the extent that funds are not available, as determined by the Administrator, to the State of New York for the work authorized by this section under Section 115 or 311 of this Act or a comprehensive hazardous substance response and cleanup fund. Any funds used under the authority of this subsection shall be deducted from any estimate

of the needs of the State of New York prepared under Section 516(b) of this Act. The Administrator may not obligate or expend more than $20,000,000 to carry out this Section.

The overall goal of the Congressional authorization is to allocate funding to assist in the cleanup of the PCBs in the upper Hudson River. The specific purpose of the authorization is to demonstrate the improvement of the rate of recovery of a toxic contaminated national waterway by:

- selective removal of PCB-contaminated sediments from the Hudson River
- treating the contaminated sediments as required and burying those sediments in a secure landfill
- development of monitoring and scientific studies for water quality and fish, and monitoring the landfill site

The legislation also states that prior to placing any contaminated materials in a secure landfill the Administrator of EPA must first determine that the placement of the pollutants in a secure landfill would provide a higher degree of protection of public health, safety, and welfare than disposal by any other methods including but not limited to incineration or a chemical destruction process. In addition, before funding under section 116 of the CWA can be provided, the Administrator of EPA must determine that funding is not available under section 115 and 311 of the CWA, as well as any existing comprehensive hazardous substance response and clean-up fund.

MODIFICATIONS

The modifications to the original project, as well as to the reduced-scale project referenced above, include changes in the design, operational standards, contingencies, and long-term monitoring and maintenance programs. These recommendations are consistent with the Congressional intent of section 116 of the CWA. The purpose of these modifications is to provide the higher standard of protection for public health, safety, and welfare during dredging and disposal operations and throughout the life of the containment site. Short-term funding for up to five years would be allocated through federal sources to monitor and demonstrate improvement in the rate of recovery of the Hudson River and storage of PCB contaminated sediment in a secure landfill. The long-term funding for monitoring and operation and maintenance of the containment site would be borne by New York State.

CITIZEN INVOLVEMENT

It is recommended that, instead of a separate Citizen Advisory Committee (CAC) and Settlement Advisory Committee (SAC) continuing through the operational phase of the project, a joint committee be formed. It is recommended that three members of the CAC, each representing different geographic areas along the Hudson River (upper, mid and lower), be selected to serve on the SAC. This joint committee would serve as the focal point for the distribution of project information and data while providing oversight and liaison between the affected communities and the operational and regulatory agencies.

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CHAPTER 1
INTRODUCTION

A draft environmental impact statement (DEIS) for the Hudson River PCB Reclamation Demonstration Project was published on May 8, 1981. After a forty-five (45) day public review period, three public hearings were held. On August 28, 1981, a supplemental DEIS was published. This document contained modifications to the DEIS, responses to public comments received during the 45 day review period, and the New York State Department of Environmental Conservation's Response to the Executive Summary which describes monitoring and contingency plans for the project.

The purpose of this final environmental impact statement (FEIS) is to respond to comments received from the public concerning the supplemental DEIS issued on August 28, 1981, and to present final findings.

The three (3) public hearings on the DEIS were held at the following locations and times.

June 23, 1981, 7:00 PM
Washington County Courthouse
Route 4 and Maple Road
Hudson Falls, New York

June 24, 1981, 7:00 PM
Dutchess County Community College
Pendell Road
Poughkeepsie, New York

June 25, 1981, 6:30 PM
Main Hearing Room, 44th Floor
2 World Trade Center
New York, New York

Public notice of these hearings was made through an Environmental Protection Agency (EPA) notification and through news releases in local newspapers in Albany, Poughkeepsie, and New York. The meetings were co-chaired by the EPA and the Army Corps of Engineers (COE). Representatives of EPA, the COE, and WAPORA, Inc., participated in the presentation and were available to answer questions and comments.

The EPA and COE opened the hearings with a brief synopsis of the purpose of the hearing and format. WAPORA followed with a presentation of the key project issues, findings of the DEIS, and recommendations.

The EPA invited all parties to make comments during the hearing and to submit any additional written comments on the DEIS or COE permit to EPA prior to July 6, 1981. The following is a summary of comments made at the public hearing or received after the public hearing during the 10 day comment period. Responses to comments are contained in Chapter 3 of the supplemental DEIS, and a complete list of organizations and individuals from which comments were received is on pages 3-1 and 3-2.

1. HUDSON FALLS PUBLIC HEARING

Most of the comments expressed at the Hudson Falls public hearing were in opposition to the proposed project. Verbal and written comments were submitted by local government representatives, farmers and landowners with property near the proposed containment site, and other concerned organizations and individuals. The Citizen-Environmentalists Against Sludge Encapsulation (CEASE, Inc.) expressed disapproval of the site and presented preliminary results of a poll they conducted of public opinion about the proposed project. The PCB Project Citizens Advisory Committee (CAC) presented comments and recommendations, but had not yet taken a position for or against the project. The New York Farm Bureau and the Warren-Washington County Farm Bureau expressed opposition to the project. The main areas of concern raised at the hearing were:

- Too little emphasis given to agriculture in the DEIS;
- Potential reduction in property values, especially for farms, near the containment site;
- Public health concerns about the dredging and containment operations;
- Long-term stability of the containment site;
- The need for detailed monitoring and contingency plans for the project;
- Possibility of detoxification of dredge spoils instead of long-term containment; and
- Presence of trace contaminants such as heavy metals at the containment site.

2. POUGHKEEPSIE PUBLIC HEARING

Almost all comments at the Poughkeepsie Public Hearing were in support of the project, although most approvals were expressed with concerns and recommendations for project modifications. Several major environmental groups gave conditional approval of the project, including:

- Sierra Club
- Hudson River Fisherman's Association
- Scenic Hudson
- Clearwater, Inc.
- National Audubon Society

Most of the comments and recommendations concerned the following subjects:

- Preference for the full-scale project, but qualified approval for the reduced-scale project;
- Safety of downstream drinking water supplies during and after dredging operations;
- Need for identification and mitigation of any unknown sources of PCBs in the Upper Hudson River;
- Need for detailed monitoring and contingency plans for the project;
- Importance of continued monitoring of fisheries;
- Education of local people about potential hazards of eating contaminated fish;
- Need for a team of experts to oversee all phases of the project; and
- Urgency of implementing the project as soon as possible to avoid further dispersion of hot spots.

3. <u>NEW YORK CITY PUBLIC HEARING</u>

Comments received at the New York City Public Hearing were in support of the recommended project, although most approvals were expressed with comments and recommendations. The following organizations gave full or conditional approval:

- The Port Authority of New York and New Jersey
- New York City Department of Ports and Terminals
- Save Our Port
- International Union of Operating Engineers Local 251
- Seafarer's International Union
- United New York and New Jersey Sandy Hook Pilots Association.

The Natural Resources Defense Council, Inc., raised a variety of issues about PCB transport mechanisms in the Hudson River, wetland hot spots, monitoring, and other subjects they believed were not adequately addressed in the DEIS. Most comments and recommendations made by organizations and individuals at the hearing involved the following subjects:

- Concern about PCB contamination of New York Harbor sediments, and implications for future maintenance dredging and ocean disposal of spoils;
- Underestimation in DEIS of major benefits of the proposed project for New York Harbor;
- Concern over the protection of drinking water supplies taken from the Hudson River;
- Need for detailed monitoring and contingency plans for the project;
- Preference for the full-scale project, but qualified approval for the reduced-scale project;
- Need to identify unknown sources of PCBs in the Upper Hudson River; and
- Need to assess the stability of remnant deposits.

CHAPTER 2
RESPONSES TO COMMENTS

Comments were received from a variety of government agencies and other interested parties during the comment period for the supplemental DEIS. A list of these organizations and individuals is given on page 4-1. Written comments were reviewed, and representative categories of these comments are addressed below.

The comments addressed are divided into 4 main categories as follows:

I. Dredging Operations
II. Monitoring and Contingency Plans
III. PCB Containment Site
IV. Other Comments

I. DREDGING OPERATIONS

I-1 Comment: The factual data indicate that current "Hot Spots" are being buried in erosion sediments at a reasonably satisfactory rate, and that dredging may well provide nothing more than an artifically induced "scouring" effect.

Coffin, Poughkeepsie, New York

Response: Recent sampling by NYSDEC in June 1981 indicates that, although slightly dilute, the previously identified hot spots are still highly contaminated and continue to be characterized as hot spots. The mechanics of the dredging operations will be designed to minimize the impacts of scour and create no significant impact.

I-2 Comment: Under "The No-Action Alternative" presentation in Chapter 2, page 2-3, there is no reason given for the assumption that 100 percent of the PCB load at Troy enters New York Harbor..." The fact that PCBs settle in the Troy turning basin negates this. Also, what evidence exists for increasing PCB concentration in the turning basin? If that were true, why not dredge there, as would otherwise be necessary, and properly dispose of that material which would have to be dredged anyway?

National Oceanic and Atmospheric Administration office of Marine Pollution Assessment, Stony Brook, New York

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Response: The statement referenced in the EIS is preceded by an "if" and is used only to calculate the worst case condition and resulting average PCB sediment concentration in New York Harbor, even though improbable. Interpreting the results of a 1979 study by Bopp, page 2-3 of the DEIS states that, "...a maximum of 31 percent of the PCB load at Troy enters the New York Harbor."

Losses upstream of the harbor occur due to volatilization, deposition in coves and broad shallow areas, and deposition in dredged areas such as the Albany Turning Basin. Evidence of this fact is documented by 1980 dredging activities by the U.S. Army Corps of Engineers in the Albany Turning Basin. Sediment PCB concentrations ranged from 7 to 48,000 ug/kg (ppb) with highest concentrations in the top 100 inches. This basin is dredged by the Army Corps of Engineers approximately every five years to maintain channel depth and sediments are disposed in upland containment sites. It is extremely unlikely that all of the PCB released from the Upper Hudson River is trapped in the Albany Turning Basin.

I-3 Comment: In Chapter 2, "The No-Action Alternative" section does not indicate how much of the routine channel maintenance dredging would be at the hot spots — if any. Also, there is confusion as regards the volatilization matter in that the amount volatilized before dredging is not compared to that which would exist if hot-spot dredging were to occur. The prime question to address is really the <u>concentrations</u> of PCBs in sediments and their changes over time with or without some action.

National Oceanic and Atmospheric Administration, Office of Marine Pollution Assessment, Stony Brook, New York.

Response: Most of the PCB hot spots are located in quiescent areas along the river. Routine maintenance dredging takes place outside of these areas in the deeper channel area of the river. Routine maintenance dredging would remove only a small portion of contaminated sediment which has been scoured from hot spots by high flows or river traffic. The DEIS estimates that, under normal flow conditions, routine maintenance dredging of 1,100 kg/yr (2,500 lb/yr) of PCB and a volatilization rate of 680 kg/yr (1,500 lb/yr) of PCB would eliminate the PCB load at Troy by the year 2013. The volatilization rate after hot spot removal is estimated on page 2-14 and 2-15 to be 375 kg/yr (825 lb/yr) under the full-scale alternative and 680 kg/yr (1500 lb/yr) under the reduced-scale alternative.

The reduction of PCB load to Troy over time for both the action and no-action alternatives has been estimated in the DEIS. However, this estimate cannot reflect or predict yearly fluctuations of river discharges and variations in the mass of PCB transported. (See pages 2-4, 2-14, 2-15.)

I-4 Comment: On page A-58 there is a list of four conclusions from experience with dredging in the Hudson River. The fourth conclusion is "The worst case condition is likely at a low flow." Two interpretations are possible: the rate of loss of dredged material is greatest at low flow; or the concentration of PCBs in the water immediately downstream of the dredge is greatest at low flow. The first interpretation would not seem to be true but the second would. However, there is also reason to consider that the greatest rate of loss of dredged material is a "worst condition" rather than an increased concentration immediately down river from the dredge. In any event, the meaning of the statement should be clarified.

Kim, Director, Bureau of Toxic Substances Management, New York State Department of Health, New York

Response: The second interpretation is correct in that under low flow conditions dilution is minimized within the plume immediately downstream of the dredge and concentration will be highest in that area. It is not anticipated that losses of PCB mass will vary appreciably within a normal range of river flows. Under flood conditions, or water column thresholds described in Appendix A, dredging will cease.

I-5 Comment: In order to minimize resuspension of sediments and down-river transport, dredging will be limited to "periods of relatively stable flow" (A-23). Dredging will not be done under flood flow conditions at a threshold of 20,000 cfs. How was this threshold determined?

National Resources Defense Council, New York, New York

Response: This threshold (20,000 cfs) is the observed flood flow for the Hudson River at Mechanicville, New York, at which significant sediment resuspension occurs (see Figure 2-1 in the DEIS). Similar thresholds will be selected for other reaches of the river project area.

1-6 Comment: Response to our request for close coordination with state and private dredging operation has not been adequately addressed. We are not proposing use of material from outside the project area. It should be noted that the CAC also recommended that a PCB management plan be developed (S-13). DEC should actively develop a plan to encourage both DOT and private individuals/entities to schedule all operations in this part of the river concurrently with the DEC. This would serve to ensure maximum use of the containment area and minimize interference with monitoring efforts. This might entail informing all potential users of the difficulty inherent in dealing with the problem on their own. Transfer of funds to DEC might result in substantial savings to the applicant while expanding the amount of PCBs safely removed.

U.S. Army Corps of Engineers, New York District, New York

Response: It is our understanding that the New York State Department of Transportation (DOT) is presently developing a plan for future maintenance dredging activities. When this is available, DEC will coordinate with DOT and any other individuals/entities involved in river dredging on the scheduling of such activities.

I-7 Comment: The document does not state whether barge overflow will be allowed or not during clamshell dredging of the hot spots. Our own experience indicates that allowing no barge overflow will reduce the impacts of dredging.

U.S. Army Corps of Engineers, New York District, New York

Response: There will be no barge overflow. All supernatant will be contained within the barge and transported to the containment site for treatment.

I-8 Comment: A document should be published that discusses the results of pre-dredging studies and proposes modifications to the dredging plan based on the information that is uncovered.

National Resources Defense Council, New York City, New York

Response: Such a report will be published by NYSDEC when the predredging monitoring program is completed.

II. MONITORING AND CONTINGENCY PLANS

II-1 Comment: The supplemental DEIS changes the statement on page 2-3 of the DEIS to reflect the new lower EPA water quality criteria for PCBs in water. The statement as revised, however, appears to indicate that the USGS monitoring data at Poughkeepsie and Waterford indicate that PCB levels are below 0.079 nanograms/per liter (ng/l). A reference should be provided. In any event, if monitoring data is referred to, the year of sample collection should be provided as well. The water quality criterion of 0.079 ng/l for PCBs should not be used to judge drinking water quality. Water quality criteria consider the ingestion of contaminated water and contaminated aquatic organisms taken from the water body. Drinking water guidelines are for the ingestion of finished water.

Kim, Director, Bureau of Toxic Substances Management, New York State Department of Health, New York

Response: This correction was meant to reflect the new EPA water quality criterion for PCBs only, not drinking water. The sentence should read, "...PCB levels below the maximum level of 1.0 micrograms per liter (ug/l) (ppb) established by NYSDOH and below the 0.16 ug/l (ppb) level calculated to represent a lifetime cancer risk of one in a million (MPI, 1980d)."

USGS monitoring data were gathered at Waterford and Poughkeepsie until September 1979 for raw water. The levels referred to in the DEIS represent finished water at these locations. (See MPI, 1980d p. 2-7).

II-2 Comment: On page 3-11 of the Supplemental Draft, in response to comment number 11-14, it states that if dredging causes unexpectedly high contaminated concentrations at downriver drinking water intakes, contingency plans for protection of drinking water will be implemented for high levels of metals as well as for PCBs. On page A-22 the sampling procedures are provided. The action level for PCB contamination is mentioned in the EIS, but no value is given for any metal. We assume that the maximum contaminant levels in the State Sanitary Code will be used to determine if metal concentrations in the intake water are so high that contingency steps should be taken.

Kim, Director, Bureau of Toxic Substances Management, New York State Department of Health, New York

Response: The New York State drinking water standards for metals will be used to determine if contingency measures for drinking water are necessary.

MONS 009524

II-3 Comment: The DEIS should design a sampling program so that daily samples are taken upstream from Chelsea with sufficient time for analysis to be completed before PCBs could reach the intake.

Brugger, Assistant Commissioner, New York City Department of Environmental Protection, New York

Response: A water supply monitoring program has been recommended by the New York State Department of Health specifically for that section of the Upper Hudson River where the dredging is to take place (see page A-22 of the supplemental DEIS). The monitoring program is designed so that if no significant impacts of dredging on river water quality in the vicinity of water intakes along the Upper Hudson River are detected, it is anticipated that there will be no impacts further downstream into the estuary. If significant impacts are detected there is provision to increase both the frequency and spatial extent of the monitoring program as well as to implement contingency plans to reduce the resuspension of contaminated sediment. In addition, no dredging will be conducted under flood flow conditions where excessive sediment transport can occur. Under this program, no impairment of Hudson River water quality in the area of the Chelsea pump station due to this project is anticipated.

II-4 Comment: The DEIS should analyze the impacts of long-range transport of PCBs under high flow conditions and determine what cut-off (threshold) points are needed at the dredge sites to insure that PCBs will not enter drinking water supplies. Frequency of high-flow conditions and quantities of PCB transported at various flow rates within the "high flow" range must be documented.

Brugger, Assistant Commissioner, Department of Environmental Protection, New York

Response: All dredging will be done at stable flow conditions. A threshold value of 20,000 cfs at Mechanicville, New York, has been developed to prevent resuspension and long-range transport of PCB. Based on historical records, this floodflow occurs 4% of the time. Above 20,000 cfs dredging would be halted. The sampling program described on page A-22 of the supplemental DEIS will ensure that contamination of drinking water supplies downstream does not occur. Water samples will also be taken immediately downstream of the dredge.

MONS 009525

II-5 Comment: The water supply considerations only cover water supply and do not address effects on biota. In addition, there is no provision to curtail or alter the dredging project if unacceptable levels of PCBs are discovered.

National Resources Defense Council, New York, New York

Response: In the Monitoring and Contingency Plan there are provisions for monitoring fish and macroinvertabrates. The plans also contain multiple mitigation measures to be implemented should unacceptable levels of PCB occur either in the water or air.

II-6 Comment: The major contributors of PCBs to the environment may be hot spots, cold spots, remnant deposits or unknown sources. The project does not allow for the importance of any source except hot spots. It is essential that the contribution of the other sources be carefully evaluated before the dredging begins.

National Resources Defense Council, New York, New York

Response: The final determination regarding the exact locations of dredging sites will depend on the pre-dredging monitoring program. The originally proposed dredging program was developed to maximize the mass removal of PCB from the Upper Hudson River. However, this approach may not control or remove those contaminated areas which can potentially, release, or are now releasing, PCB to the environment. The objective of the pre-dredging monitoring, as described in Appendix B of this report, is to maximize the protection of public health and environmental resources. The criteria to determine final dredge site selection are also discussed in Appendix B.

This pre-dredging monitoring program will be conducted concurrently with containment site construction. It is not anticipated that modifications to the original 40 hot spot dredging program will significantly impact containment site design or construction.

II-7 Comment: Rock diking of hot spot #8 referenced on page A-6 is unacceptable. This rock diking would create a swamplike breeding ground for mosquitoes and alter the river so as to make this area a non-productive backwater with no flow. Presently, we have blue herons, mallards, and black ducks which nest in this area, as well as extensive plant life which would be endangered by this diking project.

Karen Scelzi, Fort Edward, New York

Response: Rock diking has been found to be unacceptable for both hot spot #8 and #35 due to the costs associated with long-term monitoring and maintenance of structural integrity. The final determination of whether no action, full, or partial dredging will take place in these areas will be based on the results of the predredging sampling program as well as the criteria developed by NYSDEC for prioritizing areas to be dredged.

II-8 Comment: It is still unclear where wetlands will be dredged in the reduced-scale or full-scale projects and whether wetland values may preclude dredging of some areas. According to the Wetlands Mapping project description, "a small portion of some of the wetlands adjacent to deep water hot spots and subject to scour will be dredged." The FEIS should contain a detailed description of these hot spots and the wetlands that will be dredged.

National Resources Defense Council, New York, New York

Response: Those wetlands susceptible to scour are heavily vegetated with emergent vascular plants which possess well developed root systems. In comparison to non-wetland hot spots, these areas are not subject to high scouring. EPA has determined that wetland hotspots should only be given consideration for dredging if the predredging sampling program determines that desorption is greater in these areas than in non-wetland hotspots.

II-9 Comment: Although long-term monitoring will not be funded by the EPA grant, it is essential that the state be required to conduct these studies as a condition of the EPA grant. The FEIS should contain a description of the state's long-term monitoring plans.

Natural Resources Defense Council, New York, New York

Response: The state must carry out the specifications of the plan of operation for the containment site and dredging operations according to the conditions of the Toxic Substance Control Act (TSCA) permit. Long-term monitoring is also a requirement of the TSCA permit.

II-10 Comment: There is much discussion on PCB uptake by plants, yet no method has been described for the disposal of the grass cuttings resulting from site maintenance. The primary reason for cutting the grass was to prevent its ingestion by wildlife. If such a potential hazard, it should be disposed of safely, at least until the monitoring program established its safety (if such a conclusion results).

U.S. Army Corps of Engineers, New York District, New York.

Response: PCB in grass clippings is extremely unlikely. Studies by Cornell University have shown that the primary method of plant uptake of PCBs is through the leaves and not the root system. PCB volatilization off of the containment site cap is expected to be virtually non-detectable.

II-11 Comment: Thresholds for implementing contingency actions have been added, as requested. Though useful, many are too general, not providing enough specific data on how and when the plans would be initiated.

U.S. Army Corps of Engineers, New York District, New York.

Response: We have requested that DEC include these thresholds in the final monitoring and contingency package included in Appendix A of this report.

II-12 Comment: In discussion of sampling frequencies at the containment site, the statement "...sampled in accordance with the site permit (TSCA)," appears at a number of places yet there is no permit available to determine what the criteria are. Evaluation is therefore not possible. A copy of the permit should be included or the specifications incorporated into the document for ready availability.

U.S. Army Corps of Engineers, New York District, New York.

Response: The approval required under TSCA will be made prior to the final EPA record of decision. Construction-related requirements will be incorporated into the site construction contract specifications. Long-term monitoring requirements will be included in the record of decision.

II-13 Comment: On page A-20 (of the supplemental DEIS) there is a discussion of air sampling procedures that will be used at the dredge to determine whether workmen and residents along the shore may be adversely affected. According to the information provided, air sampling will only be performed for the initial 10 days of dredging. This should be modified to include monitoring of the first days when elevated temperature and low wind speed conditions are experienced, leading to a greater evaporation rate and a corresponding increased likelihood of high PCB concentration. Limiting such sampling to the initial 10 days, particularly if they are in the Spring at the beginning of the dredging season, probably will not correspond to the maximum likelihood for PCB exposure. Additional sampling should be conducted beyond the proposed total of 20 samples at the dredge and the unloading site, to insure that samples are taken at both sites under conditions of maximum volatilization.

Kim, Director, Bureau of Toxic Substances Management, New York State Department of Health, New York.

Response: The suggestion of increased sampling at the dredge beyond the initial 10 day intensive sampling program, as well as sampling at the unloading site, is considered in the final monitoring and contingency plan package. See page I-7, Routine Monitoring, for details of sampling location and frequency.

II-14 Comment: Air sampling at the unloading site will be performed only if sampling at the dredge indicates concentrations of 1 ug/m^3 or higher. It is assumed that PCB volatilization at the loading site is comparable to that at the dredge site. However, the unloading site is close to the encapsulation site which will have "an overwhelming influence" on the local air quality (A-21). In addition, the process of slurry formation may increase volatilization. Therefore, it cannot be assumed that values at the unloading site will be below recommended standards if they meet these standards at the dredge. Sampling should be done at the unloading site as well as at the dredge.

National Resources Defense Council, New York City, New York

Response: Pages I-5 and I-7 of the Environmental Monitoring Program identify routine air sampling at both the containment site and at the unloading area. If the twenty-four hour average PCB value is greater than 1.0 ug/m^3, mitigation measures will be implemented including increased sampling, treatment of lagoons with a slurry of powdered activated carbon, and use of protective equipment on workers.

II-15 Comment: On page 3-20 of the supplemental EIS, the maximum ambient air criterion for PCBs (1.0 ug/m^3) is cited as a "safety guideline set by NYSDOH for residential exposure." This is an improper interpretation of the intent of the Health Department. This is not a safety guideline for residential exposure but rather a maximum value for the limited duration of the proposed project; it would not be acceptable for long term or continuing exposure of the public.

Kim, Director, Bureau of Toxic Substances Management, New York State Department of Health, New York.

Response: The maximum ambient air criterion of 1 ug/m^3 is noted to be only valid for the limited duration of the project.

II-16 Comment: The monitoring program described in Appendix A of the supplemental DEIS does not include a study to identify unknown sources of PCBs.

National Resources Defense Council, New York City, New York.

Response: The U.S. Geological Survey, under contract to New York State, conducted a survey during the summer of 1981 to determine the unknown source(s) of PCB in the Upper Hudson River in the vicinity of remnant deposit areas. The results of the study indicate that higher PCB concentrations are found in the canal (east) than in the west channel (main river) and are the results of less dilution and limited lateral mixing rather than additional "seepage" from remnant deposit areas. Other potential sources of PCB have not been identified.

II-18 Comment: A more formal commitment to contingency funding than is presently stated in the supplemental Draft is required. The response that the state's self-insurer status should also be sufficient to cover any future claims of damage that the people may have is unacceptable.

Karen Scelzi, Fort Edward, New York

Response: EPA has reviewed New York State's financial assurances proposed under the project monitoring and contingency plans. Under current New York State Law, the Court of Claims Act §8, the state has waived its sovereign immunity from liability and has consented to be subject to suit in circumstances where a private individual or corporation would be subject to suit. Since the state will conduct the project and will own and operate the landfill site, a person injured by negligent operation of the project would have cause for action against the state. EPA has requested and received an opinion from the New York State Attorney General's Office that this project, including the operation of the PCB landfill, would fall within the type of activities for which sovereign immunity has been waived (Appendix C).

Therefore, the state will not be required to adopt unusual procedures or otherwise create "new law" to make recovery against it less difficult.

The New York State Department of Environmental Conservation has complied with EPA's request to provide special financial assurances to protect those farmers surrounding the containment site from economic loss because of the potential for crop contamination during the dredging operation. The assurances have been specified in correspondence from the Commissioner of the DEC and are included as Appendix G, Compensation.

III. CONTAINMENT SITE

III-1 Comment: Construction and operation of the containment site requires a complex array of federal and state permits and certifications. It is essential that the FEIS describe these procedures along with their respective timetables. In this way the public will be informed of the various controls on the design and operation of the containment facility.

National Resources Defense Council, New York, New York

Response: The state and federal permits, certifications ,and approvals required for this project are described on page 1-18 of the DEIS. All state permits, and the certification of the Hazardous Waste Siting Board, were required prior to EPA issuance of a FEIS. The section 10 permit issued by the U.S. Army Corps of Engineers for dredging and the TSCA approval for the site must be issued before EPA approval can be given. Comprehensive specifications for site construction operation and dredging activity will be developed. These specifications will take into account the design requirements and other specifications included in the permits and approvals.

III-2 Comment: The discussion of leachate discharge considers both short- and long-term discharges. These figures should be comparable to those for water quality effects of disposal; however, they differ significantly. In addition, they are not comparable to figures in the DEIS. The following table identifies these discrepancies:

	Water Discharge Million Gallons	Average PCB Concentrations	Mass of PCB Discharged
1) Leachate Discharge (DSEIS A-29)	55	6.3 ug/l	5 lbs. over 2 years
2) Disposal Water Quality (DSEIS A-26)	—	10-20 ug/l	2 lbs/day
3) (DEIS 2-42)	91	—	—

It is essential that this be clarified.

National Resources Defense Council, New York, New York

Response: The numbers presented in each of the three categories listed, i.e., Leachate Discharge and Disposal Water Quality in the SEQR DEIS and the number presented on page 2-42 of DEIS, are in fact different because the pollutant source is different. Leachate discharge is the liquid discharged as a result of natural dewatering, after the site has been closed, for the reduced-scale project. Disposal water quality refers to the supernatant discharged during the dredging operation. The last category (#3) refers to liquid dewatered, after the site has been closed, for the full-scale project.

III-3 Comment Surface water quality considerations estimate a maximum monthly average PCB concentration of 20 ug/l. This will result in an average daily discharge of 2 lbs/day and a 20 percent increase over background levels in the water column. These values are inordinately high, especially when it is considered that the settlement required General Electric to reduce their average daily discharge to .0022 lbs/per day. No contingency plan exists to decrease the concentration or halt this effluent discharge if adverse effects are discovered.

National Resources Defense Council, New York City, New York

Response: Although the effluent PCB concentration is estimated at 20 ug/l, at a river flow of 3000 cfs in the vicinity of discharge, the resulting water column concentration downstream of the point of discharge is estimated to be about 0.1 ug/l. This resulting water column concentration is about 20 percent over background levels, is short-term in duration and is not expected to create any adverse effects. If the effluent concentrations exceed the permit discharge limitations, polymer additions will be provided to reduce the level of PCB. This contingency plan is described on page A-27 of the supplemental draft EIS.

IV. Other Comments

IV-1 Comment: A citizens oversight committee comprised of both members of the TAC and CAC is essential. Although the TAC has the technical expertise, the local citizens are on-site and would have the ability to spot problems on a timely basis.

Karen Scelzi, Fort Edward, New York

Response: EPA has recommended that the current Citizens Advisory Committee be disbanded once the final project recommendations have been made. However, in order to assure that citizen oversight continue through the operational phase of the project, EPA recommends that CAC representatives from three different geographical areas (upper, mid, and lower Hudson) be placed on the Settlement Advisory Committee. This will assure continued citizen input and oversight of the project implementation.

IV-2 Comment: I think it would be helpful if you would provide an exact breakdown of how the 26.7 million dollars will be allocated among the various components of the project. Specifically, how much money will be expended for:

1) actual dredging of the "hot spots"
2) mitigation measures outlined in EIS
3) monitoring devices for water quality
4) monitoring devices for air quality
5) water quality protection devices for communities which rely on the Hudson River as a source of drinking water
6) construction of the containment site
7) monitoring of the containment facility
8) future research

O'Leary, Dept. of Ports and Terminals, New York

Response: The breakdown of these expenditures for the reduced scale project for site construction in 1983 and dredging in 1984 are as follows:

(All costs in Thousand Dollars)

Phase	1981	1982	1983	1984	1985	Total
Site Construction and Acquisition			4,510			4,510
Intermediate Cover				121		121
Cover Costs				1,300		1,300
Site Modifications After Closure				520		520
Remnant Deposit Areas 3 & 5 Top Dressing and Fencing included in hot spot program			242			242
Material Rehandling				267		267
Dredging*				8,660		8,660
Contingencies						1,800
Engineering Design						1,000
Monitoring (Contractual)	335	285	285	375	260	1,540
Field Engineering and Construction Administration			440	2,200		2,640
Legal, Administrative and Program Operating Costs**	470	830	850	950	1,000	4,100
			Total project costs			26,700

* Sufficient funding for 20 hot spots.

** Includes the following:

- Probing and sampling of river
- Implementation of Environmental Monitoring Program
- Staff Engineering Services
- Project laboratories
- Personnel and Equipment

IV-3 Comment: The FEIS should include a copy of the site discharge permit and the TSCA approval and describe any monitoring that is required by these permits.

National Resources Defense Council, New York City, New York

Response: The state's State Pollution Elimination Discharge Evaluation System (SPDES) permit is on file with DEC.

The final Toxic Substance Control Act (TSCA) approval will be made after the final EIS is published and prior to the record of decision (ROD). Reference to the TSCA approval and any monitoring requirements will be made in the ROD.

IV-4 Comment: According to the EIS, the full scale and the reduced scale project will remove and confine approximately 40 to 49 percent and 30 to 35 percent, respectively, of the PCBs from the Hudson River project area. We understand that while both of these alternatives are recommended, selection of the full scale project will depend upon additional State funding. What additional funding sources and legislative avenues are available to implement the full scale project if the State is unable to make up the funding difference of $13,300,000?

Lisella, Chief, Environmental Affairs Group Environmental Health Services Division, Center for Environmental Health, Atlanta, Georgia

Response: At the present time there are no additional federal or state funds available to supplement the existing $20 million dollars which would be used to implement the reduced-scale project.

IV-5 Comment: New chemical methods of PCB degradation are being announced every week. These methods should be examined and, as appropriate, tested to determine their applicability to the material in question. Even if initial costs are higher, the long-term costs may be lower because there would be no need for containment site monitoring.

Bendix, President, Environmental Research, Inc., San Francisco, CA.

Response: The feasibility of various methods of PCB degradation is discussed in the DEIS. These methods are (1) not cost effective, (2) infeasible for use on PCB contaminated sediments, or (3) currently tested as a bench scale operation.

MONS 009535

A process recently developed by the Franklin Research Center in Philadelphia is currently being tested for its effectiveness in degrading PCB-contaminated sediments and remnant deposits from the Hudson River. However, this process is at present used on a bench scale and has not yet received EPA approval for use. If the process is approved before project completion, and if it can be utilized to detoxify wet PCB sediments in the containment site or remnant deposits, its use will certainly be considered at that time. An assessment would be done to evaluate the technical and economic feasibility of the process as well as associated environmental impacts.

IV-6 Comment:

1. There is no indication that PCB concentrations at gauging stations (not at those points where drinking water is drawn) are increasing with time. In fact, the data in Appendix A suggest a decrease with time.

2. The PCB concentrations at gauging stations are indicated at no higher than 0.687 ppb (sometime between 1976 and 1979), considerably below the maximum level of 1.0 ppb presently recommended by the New York State Department of Health.

3. As is indicated in the DEIS, "PCBs can be removed from river water, leaving it suitable for drinking."

4. From the DEIS, it appears that there is no drinking water problem, and even if there were, it could be taken care of.

National Oceanic and Atmospheric Administration, Office of Marine Pollution Assessment, Stony Brook, New York.

Response: Since General Electric has halted the discharge of PCBs to the Hudson River, concentrations in the water column downstream have decreased with time. This trend may continue during the present low flow cycle of the river. However, a recent report by the U.S. Geologic Survey indicates that the PCB levels in the water column increase as a result of desorption during extreme low flows and scour during extreme high flows. As illustrated in Figure 2-1 of the draft EIS, PCB concentrations of up to 5ppm are being recorded during high flows. Available water treatment data from Waterford show that PCB removal is highly variable and averages about 50%. Assuming the 50% removal rate, the NYSDOH 1.0 ppb PCB guidelines for drinking water could be exceeded in finished water during high flows in the river. In the unlikely event they were exceeded, contingency plans would be implemented.

IV-7 Comment: The DEIS still doesn't clarify the possible erroneous conclusion of assuming that the declining levels of PCB in fish associated with the relatively low flow during the past few years will continue. Cleaner deposits have covered PCB sediments and the fish have been equilibrating with the subsequent lower levels in the water. The hot spot areas still remain however, and the first good flood could easily mobilize them by stripping the still thin, clean, sediment cover thus making them available to fish.

U.S. Army Corps of Engineers, New York District, New York

Response: On page 4-6 of the draft EIS, under the impact discussions of the No-Action Alternative, the present situation of PCB concentration decline in fish correlating with low river flows is described. However, also described in the same discussion is the probable reversal of this decline, if flood conditions occur, due to the scouring of contaminated areas which may be presently covered by a fine cover of "clean" sediment.

IV-8 Comment: The DEIS should document current PCB levels in New York Harbor sediment and quantitatively determine rates of transport to the harbor under varied flow conditions. The document can then more accurately address the project's impacts on our ability to dispose of dredge spoils in the ocean.

Brugger, Assistant Commissioner of Environmental Protection, New York City, New York

Response: Current PCB levels in the New York Harbor sediments have been estimated by Malcolm Pirnie, Inc., to be approximately 3 ug/g (ppm). No model currently exists to quantitatively project PCB concentrations in the harbor under varying flow conditions.

IV-9 Comment: It is evident that short-duration high flows in the past have transported PCB-contaminated sediments. It is not evident that this will hold true for the hot spots. If it did, why are there still hot spots? Obviously, short-duration high flows had relatively little impact previously on hot spot areas.

National Oceanic and Atmospheric Administration, Office of Marine Pollution Assessment, Stony Brook, New York.

Response: As illustrated in Figure 2-1 of the draft EIS, during high flows PCB levels have increased to 5ppm in the water column. The most probable source of much of these elevated concentrations is the material scoured from the "hot spots". However, before a final determination is made with regard to "hot spot" removal, a predredging sampling program will be conducted utilizing site selection criteria in addition to mass concentration (See Appendix B). It is possible that there are some areas now defined as "hot spots" which are stable even under extreme flood conditions and will not be dredged.

MONS 009537

IV-10 Comment: There is no convincing argument presented that the project will lower the level of PCB contamination in sediments of the lower Hudson River. Therefore, there is no indication as to how (maintenance) dredging there could be impacted under the no-action alternative.

National Oceanic and Atmospheric Administration, Office of Marine Pollution Assessment, Stony Brook, New York.

Response: As stated under the Findings of the Executive Summary, the reduction in average PCB sediment concentrations in the New York Harbor due to removal and in-place containment of PCB from the upper Hudson is expected to be relatively small. Maintenance dredged material in the lower river and New York Harbor will continue to be a problem under the no-action or the action alternative.

IV-11 Comment: It is stated that the "No-Action Alternative (Assuming That Routine Channel Maintenance Dredging Will Be Halted)" will have greater negative impacts than the "No-Action Alternative (Assuming That Routine Channel Maintenance Will Continue)". This is not substantiated to any sufficient degree.

National Oceanic and Atmospheric, Office of Marine Pollution Assessment, Stony Brook, New York.

Response: PCB-contaminated sediment is presently being removed from the Upper Hudson River by routine channel maintenance dredging. If this dredging is halted due to site unavailability or high costs associated with obtaining secure upland containment sites, PCBs will remain in the river and be available for release to the environment.

IV-12 Comment: The document recommends that no action be taken at remnant areas 3 and 5. However, on page II-1 the issue of human use of these areas is not resolved to the same degree as the PCB volatilization issue. The issue of human use should be more thoroughly investigated before no-action is recommended.

U.S. Army Corps of Engineers, New York District, New York.

Response: Because remnant deposit sites 3 and 5 are sometimes used as a motor bike trail area and are in relatively close proximity to a residential area, the draft EIS recommends that these areas be capped and fenced to prevent volatilization and access. Unless the pre-dredging monitoring program identifies the remnant sites as the "mystery source" contributing significant amounts of PCB to the river above Rogers Island, it has been determined that with capping and additional stabilization, these areas will not need to be removed.

MONS 009538

IV-13 Comment: It is essential that the remnant deposits be carefully monitored to determine their volatilization and PCB contribution to the river. The FEIS should contain a clear description of the relative contribution of all the remnant deposits and the studies that are being done to make these determinations.

National Resources Defense Council, New York City, New York

Response: A study undertaken by the U.S. Geological Survey during the summer of 1981 indicated that the remnant areas are not contributing to further PCB contamination of the river. An on-going study by Dr. Buckley of Cornell University, which monitors the foliar uptake of PCB from volatilization at the remnant areas, indicates that average yearly levels of less than the 1 ug/m^3 guideline are present on the remnant areas. DEC will be requested to do further air sampling on these remnant deposits during the summer months to determine "worst case" volatilization rates.

CHAPTER 3

FEDERAL, STATE, LOCAL AND OTHER SOURCES FROM WHICH COMMENTS WERE RECEIVED FOR THE DRAFT ENVIRONMENTAL IMPACT STATEMENT

Federal Agencies:

U.S. Army Corps of Engineers
Department of Agriculture, Soil Conservation Service
Department of Health and Human Services
Environmental Protection Agency
Fish and Wildlife Service
United States Coast Guard

United States House of Representatives:

Honorable Gerald Solomon

New York State Assembly:

Honorable Joseph Ferris
Honorable Joan Hague

State and Local Agencies:

City of Albany
City of Poughkeepsie
New York City Department of Ports and Terminals
New York Farm Bureau
New York State Department of Environmental Conservation
New York State Department of Health
New York State Department of Public Service
Port Authority of New York and New Jersey
State of New York Department of Agriculture and Markets
Warren-Washington County Farm Bureau

Citizens Groups:

Citizens Advisory Committee to the Dutchess County Legislature
Citizen-Environmentalists Against Sludge Encapsulation
Hudson River Clearwater Sloop, Inc.
Hudson River Fishermen's Association
International Union of Operating Engineers Local 251
National Audubon Society
New York Towboat and Harbor Carrier's Association
PCB Citizens Advisory Committee
PCB Settlement Advisory Committee
Save Our Port
Seafarer's International Union
Sierra Club
United New York and New Jersey Sandy Hook Pilots Association
National Resources Defense Council

Others:

Steven Allen
Debbie Brown
Charlotte Burkhardt
Edward Coffin
Gerry Cutie
Henry De Groot
Robert Eddy
Leroy Fein
Hudson Heights of Moreau, Inc.
Irene Klementowicz
Lawler, Matusky and Skelly Engineers
Guy Matthews
Jeannine Matthews
Ellen Mulvaney
George Mulvaney
Karen Scelzi
Ralph Shapot

CHAPTER 4

FEDERAL, STATE, LOCAL AND OTHER SOURCES FROM WHICH COMMENTS HAVE BEEN RECEIVED FOR THE SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT

Federal Agencies:

- U.S. Army Corps of Engineers
- Department of Health and Human Services
- National Oceanic and Atmospheric Administration

State and Local Agencies:

- New York State Department of Health
- The City of New York, Department of Environmental Protection
- The City of New York, Department of Ports and Terminals

Citizen Groups:

- National Resources Defense Council

Others:

- Karen Scelzi
- Edward Coffin
- Bendix Environmental Research, Inc.

CHAPTER 5

RESPONSES TO PEER REVIEW QUESTIONS

BACKGROUND

On December 28, 1981, the Administrator of EPA approved a peer review process of all EPA's scientific, educational and informational materials to assure that they are based on the best scientific and technical evidence available. (EPA Agency Order 2200.4).

Since environmental impact statements are attributable to EPA, they are subject to this peer review procedure. In compliance with this order, EPA selected technical experts who are familiar with the subject of this document and could fully analyze the data. The reviewers were also selected for their expertise in biological and groundwater research.

PEER REVIEW TEAM MEMBERS

The peer reviewers for the Hudson River PCB Reclamation Demonstration Project and their affiliations are:

Dr. Martha Sager
Professor and Chairperson
Department of Biology
American University

Dr. C. H. Ward
Professor and Chairman
National Center for Groundwater Research
Rice University

Dr. Raymond Harbison
Professor and Director
Division of Interdisciplinary Toxicology
University of Arkansas for Medical Sciences

Dr. Richard Hill
Senior Science Advisor to the Assistant Administrator
for Pesticides and Toxics Substances
Environmental Protection Agency

RESPONSES TO PEER REVIEW QUESTIONS

The following are responses to the comments raised by the peer review process. We have categorized the questions and comments according to topic and provided answers to each. Some of the peer review comments supported the findings of the draft EIS; those comments are not presented below.

Comment #1

"The local residents and their elected representatives are opposed to the project on both economic and environmental grounds. The project is not popular in the Upper Hudson River area."

Response #1

We acknowledge, and have stated in the draft and supplemental DEIS, that many local residents and their elected government officials are opposed to the project. However, we believe that all of the comments, questions, and concerns expressed by the local population have been adequately addressed by the NEPA process.

Comment #2

"The geological studies done at the site to support the appropriateness of the site for PCB disposal are shaky at best. There is no reason why one should not know the location, extent, etc. of sand discontinuities in the subsurface clay. These studies should be completed before further project development."

Response #2

The geological studies conducted at the proposed containment site are completed. Based on these studies, we believe that there is sufficient information to support the adequacy of the site for disposal of PCB contaminated bottom sediments from the Hudson River. With respect to the apparent lack of information regarding the location of sand discontinuities, we refer to information submitted by the New York State Department of Environmental Conservation which includes the testimony submitted to the New York State Hazardous Waste Facility Siting Board by Steven Maslansky, Malcolm Pirnie, Inc., consultants to the NYSDEC on the project:

"The light clay deposits at Site 10 are termed varved clays. During its deposition, the lake in which the clay was deposited went through a series of freeze and thaw cycles. During the period when the lake was frozen, velocities in the lake were reduced and fine grain material was deposited. During periods when no ice was on the lake, velocities were higher and coarse grain material was deposited. The majority of the material on Site 10 is of a slightly coarser nature than the clay. It is a silt deposit and there are also some fine sands within these varves. These sand lenses store water and the permeability of the fine sand varves are approximately 1 or 2 orders of magnitude greater than the clay itself.

The light clay deposits were laid down in horizontal layers. Due to the dessication or drying-out of the clay over the last 13,000 years, some deformation

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of the horizontal position has been experienced. In general, all clays in the Hudson River Valley had the same means of deposition. The varves are normally not continuous, nor do they rarely exceed a thickness of 1/8 inch."

Comment #3

"If it is true (and there is nothing in the reports I read that indicates to the contrary) that dredging of 20 to 30 'hot spots' will remove only 30% of the deposited PCB and will have little or no effect on downstream PCB concentrations now or in the future, and that dredging will only decrease the projected "wash-out" time for PCBs by five years, then I see little to be gained by the project."

Response #3

In responding to comment number 3, we infer that the commentors reference to "downstream" is taken from a statement in the supplemental DEIS referring to New York Harbor. In our estimation, the removal of 30% of the PCB contaminated sediment would not have a great impact in reducing the average PCB sediment concentrations in the New York Harbor. This statement was included in the EIS because of statements made by New York Harbor representatives that this project would "solve" the PCB problem that has created dredging and disposal problems for the harbor in the past. Although the project may in fact reduce the threat of PCB contamination of the harbor in the future, we believe that a less optimistic approach is appropriate. More important is the fact that either the full or reduced scale project will remove PCB hot spots from that portion of the river where they pose a threat to the viability of future maintenance dredging for navigation and serve as a constant source of PCBs to the river in the future.

The projection made regarding "washout" time is based on a number of assumptions. It assumes constant flows, constant volatilization rates and the continuation of navigational dredging (with additional upland disposal sites) over the next 20 to 30 year time period. It should also be realized that dredging removes PCBs from the river ecosystem whereas "washout" merely re-distributes them downstream.

It is important to highlight that taking a cautious approach in projecting any benefits to an area over 200 miles downstream from the immediate project area such as New York Harbor should not undermine the potential benefits to be realized from the dredging program in the upper and lower reaches of the Hudson River.

Comment #4

"It appears that the cost-effectiveness of this project is minimal or negative. The 'do nothing' alternative has not been fully explored, and the potential damage claims may exceed the cost of the project."

Response #4

Studies relating the amount of PCBs removed to cost originally found the full-scale project to be the most cost-effective. However, the total funds made available for this project were $26.7 million. The NYSDEC therefore rescoped the project to identify the most beneficial and cost-effective project elements which could be completed for this amount of money.

With respect to the monetary benefits of this project, Carl Parker, Chief, Office of Freshwater Fisheries Economic Department, NYSDEC, has indicated that the commercial Hudson River finfish fishery was worth more than $1.7 million in 1980. Since 1976, commercial fishermen have been restricted in the sale of Hudson River fish by bans imposed by DEC because of PCB contamination. Were it not for PCB contamination, the Hudson River commercial species such as striped bass and American eel could yield many more thousands of dollars to the New York economy. The average reported commercial catch for striped bass between 1965-1975 was 46,000 pounds. At 1980 prices, the striped bass catch could reach a value of $250,000. Using the NMFS multiplier (National Marine Fisheries Service of the U.S. Department of Commerce) of five, the actual value of the catch could be worth more than $1 million.

The project has incorporated operational measures and extensive monitoring in an effort to mitigate any potential adverse effects. "Damages" resulting from the implementation of this project have been estimated to be minimal. Technical assessments of possible groundwater contamination, surface water supply contamination and air contamination have shown these potential problems to be either virtually non-existent or controllable with existing technology. Localized contamination of agricultural crops has been identified as a possible adverse short-term effect. Estimates of crop cash value in the buffer area are in the hundred thousand dollar range, and a compensation plan for local farmers has been proposed by the state to mitigate this, should it occur. Please refer to Appendix G of the final EIS for details of the farmer compensation program.

Comment #5

"I found no evidence that any credible scientist/engineer was confident in predicting enhanced environmental quality as a result of the project. We have many pressing environmental problems and can ill afford to allocate our resources to projects with low environmental benefit projections."

Response #5

The purpose of the EIS process is to evaluate any environmental impacts that would result from the implementation of the project. The intent of the congressional legislation is to carry out a demonstration project designed to ascertain any improvement in the rate of recovery of the river resulting from the dredging program. This can only be determined by monitoring the river before, during, and after the dredging program.

To the extent which engineers and scientists could accurately and confidently predict environmental benefits, the following estimations were presented in the draft EIS and supporting studies prepared in conjunction with the project: *

* Both of these estimates assume volatilization will continue. They do not reflect fluctuations in river discharge of PCB mass transported.

- under the full scale alternative, the PCB supply above the Troy dam would be exhausted twelve years sooner than the no-action alternative (assuming maintenance dredging continues even if no action is taken).

- under the reduced-scale alternative, the PCB supply above the Troy dam would be exhausted five years sooner than the no-action alternative (assuming maintenance dredging continues even if no action is taken).

- for additional potential project benefits see response No. 4 above.

A major aspect of this project is demonstration of an improvement in the rate of recovery of the river by using the information gathered from comprehensive monitoring. This information will allow us to predict enhanced environmental quality for similar projects in the future.

Comment #6

"The 'demonstration' aspect of the project is highly doubtful and is certainly not unique. We already know how to build 'standard' hazardous waste disposal sites."

Response #6

The Hudson River PCB Reclamation Demonstration Project is unique due to its purpose and design. The project's purpose is to demonstrate that removal and isolation of the PCB-contaminated sediments are technically achievable, and to ascertain any improvement in the rate of recovery of the river due to this action.

The design of the project has been developed and refined through five years of scientific and engineering studies. The design will ensure both safe encapsulation of the PCB-contaminated sediments and dredging that will be carried out in an environmentally acceptable manner. The comprehensive monitoring program will serve not only to protect public health, but also to provide a usable data base for any future actions. (Please refer to Appendix A of this document for the particulars of the monitoring program).

Comment #7

"The Department of the Interior has classified the Hudson River north of Albany as a recreational river because of its ability to support aquatic life and provide the public sector with sport fishing. Since the river is thus classified the river is presumably recovering from PCB poisoning. The assumption should be therefore that such recovery will continue if the river is left undisturbed."

Response #7

The Department of the Interior classification of the Hudson River as a recreational river preceeded the identification of a PCB problem in the Hudson. Thus the presumption that the rivers is recovering from PCB poisoning has no direct correlation to a "recreational" classification.

An assessment of recent fish data indicates the persistence of certain PCBs in the fish. Sufficient data are not available to project whether the decreasing PCB concentrations in fish are a trend that will continue or if this is a temporary phenomenon caused by several years of low flow in the river system.

The no-action alternative guarantees that PCB will be available to the "river system" in the future. Removal of all of the PCB-contaminated sediments from the system guarantees their isolation from the riverine environment and ecological pathways (i.e., fish, water supply, waterfowl). Although total isolation from the environment cannot be achieved within the environmental and financial constaints of the project, and every mechanism of PCB transport and dispersion in the Hudson River environment is not clearly understood, the action alternative will reduce the inventory of PCB in the system.

Comment #8

"The removal of an estimated thirty to forty percent (30-40%) of PCB's from the Hudson River bottom at selected 'hot spots' will leave about 200,000 lbs. (again estimated) of the toxic chemical remaining in the river. These will have been sufficiently re-introduced into the water column and would cause the same kinds of damage to the ecological balance of the river as additional dumping should that amount of PCB's be introduced."

Response #8

It appears that there is a misunderstanding as to the meaning of the removal percentages referenced in comment #8. The estimated 33 to 47 percent of PCBs that would be removed under the reduced and full scale project, respectively, represent the total percentage of PCBs which will be removed from the identified "hot spots" in the river and not the percentage of PCB contaminated sediments removed from each individual "hot spot". The remaining 53 to 67 percent (approximately 200,000 lbs.) of contaminated material is dispersed throughout the river. Theoretically, by dredging 98% of each of the "hot spot" areas, the greatest amount of PCBs would be removed with the least cost and environmental impact, and the opportunity for resuspension of remaining contaminated material would be minimal.

The U.S. Army Corps of Engineers Report 7-77-24, entitled "Aquatic Disposal Field Investigations, Duwamish Waterway Disposal Site, Puget Sound, Washington," presents biological and chemical data for animals, water and sediment samples which indicate that no permanent environmental degradation of the area resulted from the dredging activity.

Extensive dredging operations (1977) by the Department of Transportation at Rogers Island in Fort Edward were monitored and no significant PCB transport was noted within a mile downstream. These results are documented and published in Paper #65 by the New York State Department of Environmental Conservation, April 1981.

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Comment #9

"Measurements of toxic response dosages of micro-organisms to PCB's are customarily measured in micrograms per gram of body weight; measurements of toxics in water use micrograms per liter of water. The amounts of PCB's which will be re-introduced during the dredging will increase biotic systems exposures for food chain organisms through contact and ingestion. When micrograms are compared amounts measured in thousands of pounds, a staggering number of microgram, contacts result. These numbers of exposures of Biotas Systems will not occur: the recovering ecosystem will not suffer such stress if the dredging project is not activated."

Response #9

See response to comment No. 8

Comment #10

"The statement was made in the EIS that the proposed dredging activity would provide potential for the re-development of a former fisheries industry. The upper reaches of the Hudson River maintains one of the largest striped bass spawning grounds in the east coast. It also supports herring, sturgeon, and Shad. Striped Bass eggs and fry are particularly susceptible to toxic chemicals. Dredging the river at the proposed 'hot-spots' will result in the distribution of PCB's to the water column, some which will become attached to suspended solids. Contact with molecules of PCBs and with contaminated suspended solids will greatly increase the chances of exposure of fish population to poisons, and will no doubt result in additional and increasing fish kills. This action would do more to impede the re-vitalization of the fishing industry than to accelerate it. Further, the entire fish population of the river to the NY Bight will encounter these PCB contaminated sediments as they flow with the current."

Response #10

See response to comment No. 8.

Comment #11

"Increased pollutant loads will be placed on the down-stream raw water treatment plants as a result of the dredging operation. According to the EIS Statement, no recent out-of-the ordinary problems have been reported by the treatment plants using the Hudson as their sole water source."

Response #11

Extensive dredging operations (1977) by the Department of Transportation at Rogers Island in Fort Edward were monitored and no significant PCB transport was noted within a mile downstream. These results are documented and published in Paper #65 by the New York State Department of Environmental Conservation.

Since the closest water supply intake to dredging activity is three miles downstream (for the full-scale project) and 26 miles downstream (for the reduced-scale project) no increased pollutant loads on these treatment plants are expected.

Also, see response to comment No. 8.

Comment #12

"The EIS and the supporting documents are prepared to provide assurance that all known technological efforts would be made to protect the human inhabitants of the region during and after the dredging operation. However, a recent technical report reviewed Chem. & Engineering News on Feb. 8, 1982 placed in question the previous notions of harmful human health effects of PCB's."

Response #12

We are aware that a recent report indicates that PCBs may not be as harmful to humans as previously recognized. However, we believe that the safety precautions presented in the EIS are certainly in order until more conclusive scientific evidence is presented.

Comment #13

"In as much as dredging operations are standard operating procedures for many technological endeavors in our society, I assume that the proposed demonstration did not mean to emphasize demonstration of dredging. These demonstrations and lists of land containment storage for toxics will presumably provide some necessary answers."

Response #13

See response to comment No. 6

Comment #14

"Concerns raised for compensation of economic loss resulting from decreased property value of lands near the dredging operations or disposal site...and for creation of a compensation fund as a mitigation measure... are not adequately addressed (in the FEIS response) or the letter from the Solicitor General."

Response #14

The NYSDEC's proposal for compensation is fully discussed in closing statements submitted to the New York State Industrial Hazardous Waste Facility Siting Board. See Appendix G of this document.

Comment #15

"...Clarify the non-applicability of RCRA to this disposal site."

Response #15

The high concentration of PCB (over 50ppm) in the dredged spoils makes the disposal of this material subject to TSCA regulations. The elutriate toxcity test required under RCRA was carried out and the material was not shown to be a hazardous waste.

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However, since TSCA and RCRA regulations may be integrated at some point in the future, RCRA requirements concerning closure, post-closure care, groundwater monitoring, and financial responsibilities will be incorporated into this TSCA permit.

Comment #16

"The primary method of PCB transport in the water column whether dissolved or adsorbed to particulates has not been clarified. Resolution of this uncertainty might allow the dredging operation to focus on these 'hot spots' which if dredged would remove those sources contributing greater amounts of PCB to the water column. It is not stated in the NYSDEC dredging plan (Appendix B) whether the results from the planned study by Malcom Pirnie, Inc. ("PCB Release From Hudson River Sediments") which is designed to investigate and possibly resolve this uncertainty will be used to modify the 'hot spot' dredging plan or reevaluate the 'no action' alternative."

Response #16

The comment overlooks a more fundamental question of which PCB transport mode, i.e., desorption or scour, has a greater influence on the contamination of biological resources in the river. It implies that the mode moving the most PCB in the system has a greater role in contaminating the fishery. Further, this comment also overlooks an obvious cost factor associated with prioritizing hot spots to be removed simply based upon a concept of annual contribution.

The study mentioned is being conducted by the University of Michigan, not Malcolm Pirnie, Inc. The information resulting from work proposed by Dr. Zimmie, at Rensselaer Polytechnic Institute, in addition to the University of Michigan study, should permit incorporation of a prioritizing scheme based upon hot spot erodibility as well as desorption capacity in assigning areas to be dredged within the Thompson Island Pool.

Comment #17

"Several 'hot spots' were identified as productive wetlands which provide quality habitat and storm protection. No mention is made in the FEIS of the feasability of wetlands restoration or creation in these locales. Concern was also raised over dredging 'hot spots' that are now covered with clean, uncontaminated sediments since their present contribution to PCB levels in fish flesh and drinking water supplies, even during storm events, is believed by several respondents to be very small. Response to these concerns should be more fully discussed in Section 2 of the FEIS."

Response #17

The predredging monitoring plan outlines criteria which will be utilized in determining which hot spots, including wetlands, will be dredged. (See Appendix D for criteria.) The EPA recommends that wetlands dredging be carried out only if data from the predredging sampling program indicate that wetland hot spots have a higher desorption rate than non-wetland hot spots. The hot spots, as designated by DEC, are not considered stable. The primary reason for the project is to remove the hot spots and thereby prevent further PCB migration and volatilization.

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There are unresolved questions concerning the long-term stability of hot spots. Although peak sediment PCB concentrations in the Thompson Island Pool tend to be located beneath a thin layer of cleaner sediments, recent sampling by EPA and DEC in this area (1981) indicates that surficial concentrations are still considerably elevated in the project area. The question of stability of existing hot spots in regard to scour by high flow events cannot be definitively answered at present. Additional pre-dredge sampling and analyses should permit a clearer perspective on the importance of this question.

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ABBREVIATIONS USED

CAC	Citizens Advisory Committee
ci	curie
cm	centimeter
COE	United States Army Corps of Engineers
cu ft	cubic feet
cu m	cubic meter
cu yd	cubic yard
DEIS	draft environmental impact statement
EIS	environmental impact statement
EPA	United States Environmental Protection Agency
FDA	United States Food and Drug Administration
ft	foot
g	gram
hr	hour
in	inch
kg	kilogram
km	kilometer
l	liter
LMS	Lawler, Matusky and Skelly Engineers
lb	pound
m	meter
mev	million electron volts
mg	milligram
mi	mile
mm	millimeter
MPI	Malcolm Pirnie, Inc.
mrem	millirem
ng	nanogram
NEPA	National Environmental Policy Act
NIOSH	National Institute for Occupational Safety and Health
NYSDEC	New York State Department of Environmental Conservation

ABBREVIATIONS USED (Continued)

NYSDOH	New York State Department of Health
NYSDOT	New York State Department of Transportation
OSHA	Occupational Safety and Health Administration
PCB	polychlorinated byphenyl
PCDF	polychlorinated dibenzofuran
pci	picocurie
ppb	parts per billion
ppm	parts per million
ppt	parts per thousand
SAC	PCB Settlement Advisory Committee
sec	second
sq cm	square centimeter
sq m	square meter
TSCA	Toxic Substances Control Act
USDA	United States Department of Agriculture
USFWS	United States Fish and Wildlife Service
ug	microgram
yr	year

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CORRESPONDING METRIC AND ENGLISH EQUIVALENTS

Celsius (°C)	Farenheit (°F)
centimeter (cm)	inch (in)
cubic meter (cu m)	cubic yard (cu yd)
	cubic foot (cu ft)
	gallon (gal)
gram (g)	pound (lb)
hectare (ha)	acre (a)
kilogram (kg)	pound (lb)
kilometer (km)	mile (mi)
liter (l)	gallon (gal)
meter (m)	yard (yd)
	foot (ft)
metric ton (t)	ton (tn)
microgram per gram (ug/g)	part per million (ppm)
microgram per liter (ug/l)	part per billion (ppb)[1]
milligram per liter (mg/l)	part per million (ppm)[1]
millimeter (mm)	inch (in)
nanogram per liter (ng/l)	.1 part per billion

NOTE: 1. an approximate equivalent

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LIST OF PREPARERS

This final EIS was prepared by the following EPA Region II staff.

Ms. Anne Norton Miller	Chief, Environmental Impacts Branch
Mr. Richard M. Walka	Chief, New York/Virgin Islands Section
Ms. Robin Rohn	Project Officer/Environmental Scientist

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APPENDIX A

FINAL ENVIRONMENTAL MONITORING PLAN

HUDSON RIVER PCB RECLAMATION DEMONSTRATION PROJECT

ENVIRONMENTAL MONITORING PROGRAM

June 1982

Bureau of Water Research
Division of Water
New York State Department of Environmental Conservation
Albany, New York

MONS 009558

PREFACE

The Hudson River is distinguished as perhaps the world's most severely PCB-contaminated aquatic ecosystem. Several measures undertaken to reduce the major external sources of PCBs have reduced their levels in certain compartments of this system. The proposed removal and isolation of a large mass of PCBs associated with highly contaminated sediments in the Upper Hudson is designed to accelerate reduction of PCBs to acceptable levels in the river's biota. To assure that projected benefits of dredging and encapsulation of highly contaminated sediments are attainable, and to minimize the human health and ecological costs of the process, a comprehensive monitoring strategy has been developed.

The discharge of PCBs to the Hudson River by two capacitor manufacturing facilities in the towns of Fort Edward and Hudson Falls is believed to have begun in 1947. It was not until 1975 that a problem was perceived, when levels of PCBs in Hudson River fish were shown to be substantially higher than limits set by the United States Food and Drug Administration for interstate commerce. Proceedings against the General Electric Company (G.E.), the owner of the discharging facilities, for alleged violations of New York State's Conservation Law resulted in an agreement between G.E. and the New York State Department of Environmental Conservation (NYSDEC). The agreement provided for a reduction in PCB discharge from an estimated level of 14 kg/day in 1972 to 0.001 kg/day in 1977. In addition, the agreement established a $7 million program including the investigation of the extent of river contamination, the assessment of remedial alternatives, and the implementation of remedial measures.

The resulting investigative effort demonstrated that a large mass of PCBs resided in the sediments of the Upper Hudson and in former river sediments exposed when the Fort Edward Dam was removed in 1973. The removal of this dam, downstream of the two PCB discharges, appears to have been a major event in the history of PCB transport in the river. Not only were near-shore deposits exposed to the atmosphere, but a large mass of highly contaminated sediments was made available for scouring and transport downstream. Of the nearly 300,000 kg PCBs estimated to have been discharged to the river, approximately 30,000 kg to 64,000 kg were associated with the exposed river sediments known as remnant deposits. Approximately 157,000 kg PCBs reside in the sediments of an 80 km reach of the Upper Hudson. An additional 76,000 kg PCBs have been deposited in the sediments over the 240 km length of tidal river and estuary from the Federal Dam at Troy to the Battery on the southern tip of Manhattan Island.

The remnant deposits were stabilized from a highly erodible state in 1974 and 1975 by rip-rapping. In addition to this action, the elimination of the PCB discharge, and the relatively mild hydrological regime following a 100-year flood in 1976, have contributed to a substantial decline in the PCB levels observed during the past five years in fish, macroinvertebrates and in the river's base flow. However, it is suspected that PCBs in the sediments of the Upper Hudson are available for indefinitely prolonging the contamination of fishery resources to unacceptable levels. This theory and the present opportunity to retrieve a large PCB mass associated with the most highly contaminated sediments, at a reasonable cost, support an environmentally protective action of removing and isolating these sediments.

The proposed Hudson River PCB Reclamation Demonstration Project will dredge selected areas in an 8.4 km reach of the Hudson River extending from the town of Fort Edward downstream to the Thompson Island Dam. Targeted for removal are 50,000 kg of PCBs in 500,000 m^3 of sediment. The dredged material will be contained in a clay-lined site adjacent to the river at the upstream end of the project area. The proposed containment site consists of a series of storage cells and ponds, having a total exposed water surface area of 16 ha. During a six-month period, sediments will be pumped into the site. Process water at the site will be treated prior to discharge to the river. Upon completion of the dredging the site will be capped with clay.

Human health, ecological, and other impacts of the project have been assessed as part of a lengthy regulatory process. However, additional research and monitoring is required to optimize the benefits of the project and to assure that public health and ecological values are not compromised by the project's short-term activities or the possible long-term containment of the dredged material. In order to address these needs, the monitoring strategy presented in this document employs the resources of the United States Environmental Protection Agency, United States Geological Survey, NYS Department of Health, and the NYSDEC in addition to private academic and research institutions.

The accelerated return of PCBs in the river's fishery resources to acceptable levels is the major anticipated benefit of the reclamation project. Towards optimizing the benefits, the mass of PCBs targeted by the project must be precisely defined and carefully removed. In 1977 over 1300 cores and sediment grabs were collected in the area proposed for dredging known as the Thompson Island Pool. Analysis of these samples permitted the initial definition of "hot spot" areas having an average PCB concentration exceeding 50 ppm. The results also demonstrated that while surficial sediment concentrations were exceedingly high in hot spots, the maximum PCB concentrations were generally several inches below the surface. Prior to dredging, additional investigation is required to better define the horizontal area and depth to which sediments must be removed. To assure that surficial sediment PCBs in a post dredging repose approach background levels, the definition of dredging areas will be followed by monitoring during dredging to improve the effectiveness of the removal of the contaminated sediment layer. Additional survey work after the dredged areas have assumed a more stable repose, will aid an assessment of the river's response to dredging.

The human health and ecological concerns being addressed by the monitoring plan relate to two situations created by the project from which PCBs could be dispersed to the environment: the containment area and the dredging sites. Both sources have two distinct phases in relation to their potential for releasing PCBs to the environment. During the relatively short period of dredging, PCB losses from the containment site will occur primarily from the surface of the site to the atmosphere and from the discharge of process water to the river. Over the long term, following capping of the site, PCB losses should be greatly reduced and occur, if at all, by migration with groundwater and with gasses emitted from the site. Air, surface water, and groundwater, and plant monitoring strategies have been designed for protection of workers at the site and for human health and economic interests of nearby residents and farmers.

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At the dredging sites, downstream losses of PCBs due to resuspension during dredging, in addition to natural scouring resuspension and desorption processes occurring over an extended period after dredging, are of concern to the river's biological resources in addition to drinking water uses. Both long-term and short-term human health and ecological concerns of PCB transport in the Hudson are addressed by the water monitoring program.

Project control in response to real-time analysis of data, rather than pure data collection, is implicit to the design of both the monitoring plan and the reclamation project. Human health-based standards for PCBs in air, water, crops, and fish serve as the primary bases for control aspects of the monitoring program. The overall monitoring program is a multi-disciplinary multi-institutional effort coordinated by and the immediate responsibility of the Division of Water, of the NYSDEC. The following detailed monitoring plan, developed by NYSDEC through cooperation with a number scientists and engineers, presents air, water, plant, aquatic biota, and sediment monitoring strategies as sections. Several investigations supporting the monitoring plan in addition to a definition of resources required to execute the workplan are provided as appendices. The responsible parties within NYSDEC for the development and execution of the monitoring program are:

Dr. Mark P. Brown, Research Scientist IV
Mary B. Werner, Research Scientist II
Bureau of Water Research
New York State Department of Environmental Conservation
Room 315
50 Wolf Road
Albany, New York 12233

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HUDSON RIVER PCB RECLAMATION DEMONSTRATION PROJECT

ENVIORNMENTAL MONITORING PROGRAM

May 1982

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Bureau of Water Research
Division of Water
NYS Department of Environmental Conservation

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INTRODUCTION

Based upon previous research concerning the environmental behavior of polychlorinated biphenyl (PCB) compounds (Doskey and Andren, 1981; Pal et al., 1980; Kalmaz and Kalmaz, 1979; Pavlou and Dexter, 1979; Paris et al., 1978), it is anticipated that activities associated with the proposed dredging and ntainment of Hudson River PCB-contaminated sediments will result in losses of those contaminants to the atmosphere. Although concentrations of PCBs in the air at dredging and containment areas are not expected to reach critical levels (USEPA, 1981; Malcolm Pirnie, Inc., 1980, 1981b), it is necessary to monitor those levels to provide for protection of public health and the environment.

Air monitoring for the proposed Hudson River PCB Reclamation Demonstration Project has been addressed in the Response to the Executive Summary of the Draft Environmental Impact Statement prepared by the New York State Department of Environmental Conservation (NYSDEC, 1981b). The monitoring activities described there have been revised to include recommendations from NYSDEC Region 5, NYSDEC Division of Air, NYS Department of Health, Boyce Thompson Institute for Plant Research, Inc., and the Industrial Hazardous Waste Siting Board.

The air monitoring program described below relates primarily to the period during which contaminated sediments are removed from the river and transferred to the containment site. Prior to that time, baseline monitoring will be carried out both by the NYSDEC and as part of the program carried out by the Boyce Thompson Institute for monitoring PCBs in terrestrial plants (Section III). Beginning in May, 1982, atmospheric levels of PCBs will be measured at the proposed containment site as part of a statewide program conducted by NYSDEC Division of Air. Samples are collected every six days at all sites in the sampling network and sent to the NYS Department of Health laboratories for traction and analysis. Sampling and analytical techniques employed in that program (NYSDOH, 1981) and in the air/plant study (Section III) will be comparable to those used in the program described below, providing a basis for intercomparison of data. After the containment areas are capped, monitoring procedures will be initiated that will accommodate comparison of atmospheric PCB concentrations before and after the operation of the project. These procedures will be continued until ambient levels at the site are at or below background levels measured prior to the project.

The general objectives of the air monitoring program are to:

- measure ambient levels of PCBs in order to determine early in the project, and with changing conditions, whether significant modifications are required in the design and operation of dredging-related activities;
- document worker exposure levels;
- anticipate critical worker exposure levels so that protective equipment may be used;
- document ambient levels related to nearby residential and agricultural areas; and
- anticipate critical exposure levels for local residents and agricultural crops so that contingency measures may be implemented.

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BACKGROUND

Potential Sources of PCB Emission

Potential PCB loss to the air during the project's operation exists where contaminated sediments are exposed or where dissolved PCB concentrations increase due to resuspension of contaminated sediments. Primary concern for such losses is focussed on the large areas of exposed sediment and contaminated water held at the containment site. Losses associated with the dredging activities are expected to be much lower, although sediment will be exposed on the barges and volatilization may be enhanced during the process of slurry formation at the barge unloading area. The concentrations of PCBs in the river are not expected to rise to critical levels. The results of previous monitoring of dredging activities suggest that downstream losses from the dredging site will be less than two percent of the total dredged mass and that any effects will not be detectable more than two miles downstream (NYSDEC, 1981b).

The proposed site for encapsulation of PCB-contaminated sediments consists of a 16-ha containment area, divided into two cells by a central dike, and a treatment area with 6 ha of roughing, storage, and surge ponds. Approximately one acre of sediment could be exposed where the influent pipe empties into the containment cell. If dredging proceeds as scheduled, concentrations of PCBs in those sediments are expected to be approximately 100 ppm in the first year of dredging and 50 ppm in the second year (MPI, 1980). The remaining portion of the containment cell, covered with contaminated water, will progressively decrease as the cell is covered with a temporary cap. Contaminated water will also be exposed in the treatment facility ponds. It is estimated that soluble PCBs in the water at the containment site will be in the range of 10-20 ug/l based upon predicted sediment concentrations and desorption theory (NYSDEC, 1981b).

PCB Behavior Theory and Predictions

The transport of PCBs across the air/water interface is largely governed by two physical properties: water solubility and vapor pressure. Water solubilities have been determined for the individual PCB compounds and commercial Aroclor mixtures, but reliable vapor pressure data are available for only a few PCB isomers and the commercial mixtures (Westcott and Bidleman, 1981; Westcott et al., 1981; Murphy et al., 1981; Mackay et al., 1981). Hence, indirect calculations of transfer rates based upon these two properties are uncertain. Direct measurements of aqueous and vapor concentrations in laboratory tank tests, using saturated solutions of Aroclors or contaminated sediments, have been performed (Doskey and Andren, 1981; Tofflemire et al., 1981; Hetling, et al., 1978; Paris et al., 1978). Results from these experiments vary widely, however, and predictions of volatilization based upon these data are even further complicated by the effects of weathering of individual PCB components, aerosol formation, turbulence, and the physical and chemical properties of evaporative surfaces.

Using the limited information available on the behavior of PCBs at the air/water interface, predictions have been made concerning volatilization rates

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associated with various procedures employed in handling Hudson River PCB-contaminated sediments. The emission rate of PCBs from contaminated water at the containment site has been estimated by Malcolm Pirnie, Inc. (March, 1981b) using measured emission rates from a saturated Aroclor 1242 solution (Mackay, 1978). The calculated emission rate combined with dispersion estimates and meteorological data has been used to predict various air PCB concentrations. During the first year of dredging, 8-hour average concentrations of 0.3 ug/m^3 at the containment site and 0.2 ug/m^3 at the nearest residence have been predicted (MPI, March, 1981b). It has also been estimated that if aqueous PCB concentrations exceed 28 ug/l (WAPORA) or 43 ug/l (MPI), and critical meteorological conditions occur as well, the PCB air concentration will exceed the 1.0 ug/m^3 (24-hour average) guideline recommended by the NYS Department of Health (USEPA, 1981). An analysis of the behavior of PCBs in the containment cells, based upon expected influent sediment mixtures and desorption partition coefficients, suggests that a dissolved concentration of 40 ug/l will not likely be exceeded (USEPA, 1981). Elutriate tests conducted by MPI indicate that, even under worst case conditions, the dissolved PCB concentration will not exceed 29 ug/l (Tofflemire, 1981).

A study, supported by the project, will be conducted to more accurately assess the mass emission rate of PCBs from the containment site (see Appendix A). This study, to be completed before dredging commences, will be based upon flux measurements of those PCB components which are present in contaminated sediments from the proposed dredging area of the Hudson River. The transport of PCBs across both the sediment/air and water/air interfaces will be examined over the range of temperatures anticipated within the containment lagoons.

Air Quality Considerations

Predictions concerning PCB air concentrations at the site and at the nearest sensitive receptor indicate that applicable air quality guidelines will not be violated. The current Federal environmental standard for PCBs (29 CFR 1910.1000), based upon recommendations made in 1968 by the American Conference of Governmental Industrial Hygienists, is 1.0 mg/m^3 for PCB mixtures containing 42 percent chlorine and 0.5 mg/m^3 for mixtures containing 54 percent chlorine (USDHEW-NIOSH, 1977). The National Institute of Occupational Safety and Health (NIOSH) has recommended that the level be reduced to 1.0 ug/m^3. These values are time-weighted averages for up to a 10-hour workday, 40-hour workweek. The NYS Department of Health has recommended an ambient air guideline of 1.0 ug/m^3 (24-hour average) to protect the local population.

Preliminary results from studies on PCB uptake by several species of terrestrial plants (Buckley, 1980) suggest that agricultural crops grown in the vicinity of the containment site could become contaminated beyond current FDA limits. By extrapolation from PCB values measured in samples of corn, alfalfa, and timothy grown in three PCB air concentrations (0.08 - 0.19 ug/m^3), it is predicted that crops grown in air exceeding 0.03 ug/m^3 can accumulate PCBs beyond the 0.2 ppm FDA limit (Buckley, 1981). Further studies are being conducted to substantiate these estimates.

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MONITORING STRATEGY

The monitoring strategy is divided into three phases which, depending upon information requirements, differ by sampling locations and frequencies. Prior to dredging, air PCB concentrations at two locations, along the river and at the containment site, will be determined to verify previous background measurements. At the onset of dredging, intensive sampling will be conducted at the dredge and barge unloading areas and near the area where sediments are introduced to the containment site. This will continue for at least two weeks or until it is established that air concentrations at these locations are below critical levels. Routine monitoring will continue throughout the dredging season unless PCB air levels at a given location become critical. In that event, intensive sampling will be reinstituted at the area of concern until the problem is resolved.

Final site selections will not be made until the containment site is constructed. Consideration will be given to the availability of power sources, suitability of terrain, avoidance of operating space required by dredging and other equipment, and protection from vandalism. Sampling units will be situated as close as possible to the points of concern to obtain the most reliable estimates of exposure levels of workers, residents, and crops to atmospheric PCBs.

A summary of the proposed sampling strategy is presented in Table I-1 and the sampling locations for the three phases of monitoring are shown in Figure I-1. The program is designed to minimize both the number of sampling units required and their movement from site to site and to allow flexibility in the sampling schedule.

Pre-Dredge Monitoring

In order to document baseline levels of PCBs in the air during the period just prior to dredging and to compare those data with determinations from previous years, air samples will be collected along the river and at the containment site (Figure I-1). All sample collection periods will be 24 hours, and five successive collections will be made at each location (Table I-1).

Intensive Monitoring

Intensive monitoring at the onset of dredging will require five continuously operating sampling units collecting 24-hour samples at each location (Table I-1). An additional unit will be employed as a backup. This schedule will be continued for at least two weeks or until five successive PCB values at a given site are less than 1.0 ug/m^3. If that level is exceeded, eight-hour sampling periods will be initiated to determine whether eight-hour average health standards are being violated and to resolve whether critical levels can be associated with any particular period of the day.

Unit 1 will be used to monitor air PCB concentrations associated with in-river dredging activities and the cumulative westerly dispersion from the site and unloading area. Hydraulic dredging will be monitored for only five days since minimal losses of PCBs due to volatilization are expected with this

Table I-1. PCB air sample collection schedule for a six-month dredging season.

Sampling Unit	Location	Purpose	Frequency-Duration	No. Samples
		A. PREDREDGE MONITORING		
A-2	Containment site	Background, on-site	Daily-one week	5
A-1	Unloading area	Background-near river	Daily-one week	5
		B. INTENSIVE MONITORING		
B-1	Dredge area	Worker exposure, westerly dispersion	Daily-two weeks (clamshell) Daily-one week (hydraulic)	14 7
B-2	On-site, near influent pipe	On-site maximum levels	Daily-two weeks	14
B-3	North of unloading area	Worker and resident exposures	Daily-two weeks	14
B-4	South of unloading area	Worker and resident exposures	Daily-two weeks	14
B-5	Site boundary	Upper limit to off-site	Daily-two weeks	14
		C. ROUTINE MONITORING		
C-1	Dredge area	Worker exposure, westerly dispersion	Once every other week	12
	Unloading area	Worker and resident exposure	Once every other week	12
C-2	Containment site	On-site maximum levels	Daily	180
C-4	SW boundary	Resident exposure	Daily	180
C-3, C-5	SE and NE boundary	Crop exposure	Dependent upon meteorological conditions	180

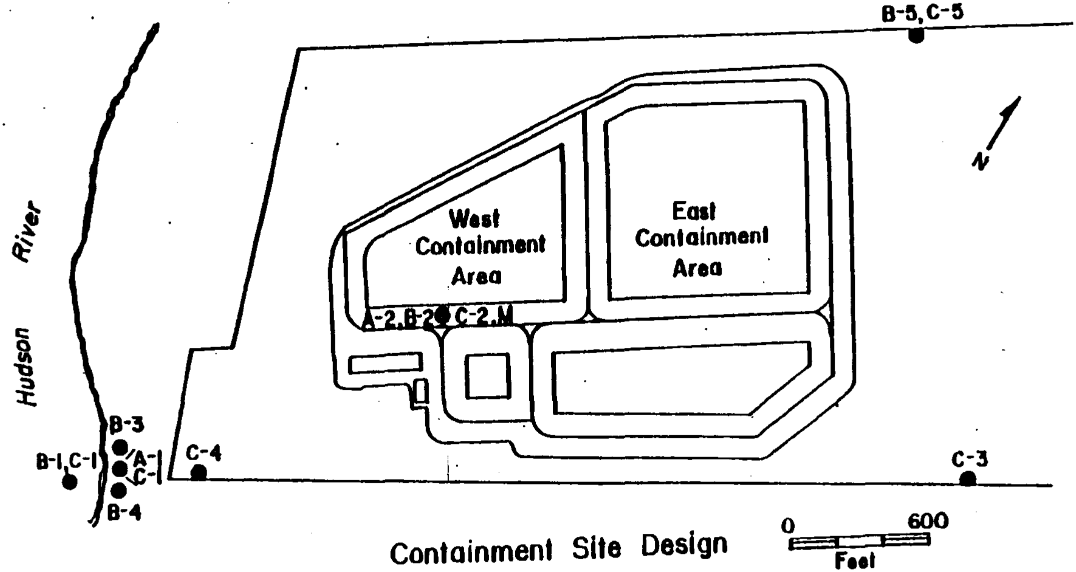

Figure I-1. Locations of meteorological unit (M) and air sampling units (1, 2, 3, 4, and 5) during background (A), intensive (B), and routine (C) monitoring. See Table 1 for further details.

type of dredging (MPI, 1981c). When clamshell dredging commences, it will be monitored for ten days, since PCB air levels are predicted to rise to 0.05 ug/m^3 (MPI, 1981c) due to exposure of sediments during these procedures. The sampling unit will be located as close to the workers as possible and at a point representing their greatest exposure level. This will depend upon the alignment of the dredge and scows and the prevailing wind direction. In the event that the 24-hour average values are greater than 1.0 ug/m^3, eight-hour samples will be collected to determine whether and when protective equipment will be used.

Units 3 and 4 will monitor PCB levels at the unloading area where sediment will be exposed on the scows until it is slurried for transport to the containment cell. The sampling units will be located to the north and south of the unloading area at points that best represent worker exposure levels and also allow estimation of PCB levels at nearby residences (Figure I-1). If 24-hour sample data exceed 1.0 ug/m^3, contingency measures described above will be implemented. Additional measures could include a modification of the slurrying process and covering the exposed sediments on the barges.

Unit 2 will be used to measure the maximum air levels of PCBs within the containment site (Figure I-1). During this monitoring phase the unit will be situated as close as possible to the lagoon influent pipe to obtain information on PCB losses associated with filling the lagoon. Contingency measures at the containment site include reducing the sampling period to eight hours and use of protective equipment if eight-hour average PCB values are greater than 1.0 ug/m^3. Critical conditions related to excessive volatilization from the containment site may be anticipated by following dissolved PCB concentrations in the lagoon and meteorological conditions. Upon authorization from DEC, the influent to the lagoon and flow through the treatment ponds will be temporarily halted, and all units will be treated with a slurry solution of powdered activated carbon.

Unit 5 will be placed on the site boundary in the prevailing downwind direction from the active containment cell, as determined from meteorological data from the previous year (Figure I-1). This unit will be used to estimate off-site atmospheric dispersion of PCBs.

Routine Monitoring

Routine monitoring will consist of a less intensive sampling strategy, particularly at the dredging and unloading areas (Table I-1). Sampling will continue to be performed over 24-hour periods but at varying intervals. Sampling Unit 1 can be alternated between the dredge and unloading areas, providing data at each of those points on a biweekly basis (Figure I-1). The location of the dredge sampling unit will be essentially the same as previously described. At the unloading area the location of the unit will best represent both worker and residential exposure levels. Results from initial monitoring will be used in the actual site selection.

A continuous record of on-site PCB air levels will be gathered from sampling Unit 2, located on the central dike between the active cell and the

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treatment ponds (Figure I-1). The data will be compared with meteorological information from the on-site weather station to determine any correlation between PCB loss from the site and parameters such as temperature, wind speed, and solar radiation.

Monitoring at peripheral stations will include a continuously operating sampling unit on the southwest boundary (Figure I-1) to provide data related to exposure at the nearest residence. Depending upon meteorological conditions, samples will be collected from either the northeast or southeast boundary sampling unit. Data from these samples will be used to assess the degree of potential crop contamination.

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METHODOLOGY

Field and Sampling Procedures

A Climatronics weather station equipped with a cassette-based data logger will begin collecting meteorological data from or near the site as soon as space and power are available. The parameters measured include wind speed and direction, wind sigma (the standard deviation in wind direction changes over time), temperature, dew point, solar radiation, and rainfall. Data will be gathered continuously at selected time intervals (0.3-1.0 minute) and recorded on a strip chart. Hourly and daily average values of each parameter will be provided to the PCB project data management system.

The DEC Division of Air will be responsible for initial calibration and positioning of the meteorological unit and for providing instructions to PCB Unit personnel in the calibration and maintenance of instrumentation. PCB Unit personnel will transfer cassettes from the site to the DEC central office for computer analysis. Computer printouts will be supplied to the PCB Project Unit data management system for each week that the unit is in operation.

Air samples for PCB analyses will be collected by the Florisil cartridge method (NYSDOH, 1980). Sampling equipment and housings will be assembled by the Division of Air. Personnel from that division will also assist in positioning the units in the field and provide instructions for the operation and maintenance of the units. Personnel from the PCB Project Unit will be responsible for changing cartridges and performing flow audits. Exposed cartridges will be labelled with appropriate information (e.g. date, time, duration, and location of sampling), packed to prevent breakage, and transported to the laboratory for analysis. A completed sample submission form (NYSDEC, 1981c) will accompany each cartridge.

Analytical Procedures

Within 24 hours after the sample is collected, PCBs will be desorbed from the Florisil cartridge with hexane, and the resulting solution will be analyzed by gas chromatography (GC). The detection limit for 24-hour air samples, using NYS DOH (1980) analytical procedures for GC detection of PCBs, is 20 ng/m^3. Quality assurance procedures for this analytical method are described in Section No. 6 (PCB Project Lab) and Section No. 4 (Boyce Thompson Institute) of the Quality Assurance Plan for the PCB project (NYSDEC, 1981c). Analytical results will be transferred daily to the PCB project data management system.

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DATA ANALYSIS

The Coordinator of Environmental Monitoring for the PCB Project Unit will be responsible for the evaluation and interpretation of meteorological and ambient air PCB data throughout all phases of the monitoring program. Relationships between PCB concentrations measured in air samples at each site and meteorological parameters will be examined. Estimates of off-site ambient air PCB levels with regard to nearby measurements and agricultural areas will be based on these interpretations. Trends in data will be used to estimate PCB losses from the site for predicted meteorological conditions.

Data summaries will be provided, daily during intensive monitoring and weekly thereafter, to the NYSDEC PCB Project Unit, Division of Air, Region 5, NYSDOH, and Boyce Thompson Institute. At the end of the first two weeks of dredging, representatives from these units will meet with the Coordinator of Environmental Monitoring to determine whether the data indicate that less intensive routine monitoring can be initiated and whether any changes need to be undertaken in the operation of the project.

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SECTION II. WATER MONITORING PLAN FOR THE HUDSON RIVER, CONTAINMENT SITE, AND POTABLE WATER SUPPLIES

Bureau of Water Research
Division of Water
NYS Department of Environmental Conservation

INTRODUCTION

The program for monitoring the environmental impact of the removal and containment of PCB-contaminated sediments as proposed by the Hudson River PCB Reclamation Demonstration Project requires examination of various components of the aquatic environment. The proposed project will produce two distinct short-term sources of PCBs to the Hudson River water column: resuspended contaminated sediments at the dredge and return flow from the containment site. Over the long term, the potential exists for migration of PCB-contaminated leachate from the containment site into underlying groundwaters. Water monitoring activities are designed to measure both long- and short-term consequences of the project in order to comply with monitoring requirements of Federal and State regulations and to document ambient conditions and levels of contamination of Hudson River water resources resulting from the demonstration project. A variety of chemical and hydrological parameters, including the concentrations of PCBs, heavy metals, and suspended solids in water, PCBs in aquatic biota, and river stage, will be measured to permit an evaluation of the project's impact on the aquatic environment.

Several Hudson River monitoring programs, ongoing since 1977, provide baseline information for comparison with data gathered during and after the operation of the project. The United States Geological Survey (USGS) has operated ten monitoring stations in the Hudson River, providing river discharge, PCB, and suspended solids data which constitute the basic information regarding PCB transport through the Hudson River water column. The New York State Department of Environmental Conservation (NYSDEC) has conducted widescale monitoring of PCB levels in both resident freshwater and migrant marine fish species. The NYS Department of Health (NYSDOH), in cooperation with NYSDEC has performed PCB analyses on net-spinning caddisflies (Trichoptera: Hydropsychidae) collected from several sites in the Upper Hudson River. In addition, PCBs are analyzed in residues scraped from artificial substrates held at 16 stations in both the upper and lower portions of the river.

The above programs will be continued, in some cases with minor modifications, as integral components of the overall water monitoring strategy for the PCB Project Environmental Monitoring Program. The combination of individual programs will provide information that will accommodate the optimization of project activities and the evaluation of the short- and long-term consequences of the project. Program descriptions for fish monitoring and for caddisfly and artificial substrate residue studies are described in Sections IV and V. The water monitoring activities described below have been designed to permit assessment of PCB transport in both surface and ground waters from two contaminated areas, i.e. the containment site and the Upper Hudson River.

The general objectives of this portion of the monitoring program are to:

- document ambient levels of PCBs in the Upper Hudson River;
- assess PCB transport to the estuarine portion of the river;
- document PCBs and suspended sediment concentrations near the dredge plume during various hydrological conditions;
- document PCB concentrations in public drinking water supplies drawn from the Hudson River and anticipate critical levels so that contingency measures may be implemented;
- measure dissolved PCBs in the containment site lagoon in order to anticipate critical levels of volatilized PCBs in the air; and
- address potential contamination of groundwaters and private wells near the containment site.

BACKGROUND

PCB Losses Associated with Project Activities

Bottom sediments of the Hudson River, which were a sink for PCBs during the nearly 30 years they were discharged into the river, are currently the primary source from which these contaminants, through complex redistribution processes, are introduced to the water column and aquatic ecosystem. Analyses of Hudson River water samples have shown that PCBs are present in both dissolved and particulate-associated phases. PCBs in Hudson River sediment are most highly concentrated in fine-grained and highly organic materials (Hetling et al., 1978). The partitioning of PCBs between water and solids phases is dependent upon adsorption/desorption phenomena determined by chemical properties of the PCB components and by the physico-chemical properties (Wildish et al., 1980; Kanaga and Goring, 1980; Paris et al., 1978; Halter and Johnson, 1977) and concentration of the adsorbing solids (O'Connor and Connolly, 1980; Pavlou and Dexter, 1979).

During the operation of the proposed project over 500,000 cubic meters of sediment containing approximately 50,000 kg of PCBs will be removed from the river (MPI, 1981). Associated with the procedures for removing and encapsulating those contaminated sediments is the loss of PCBs from two short-term sources: the resuspended sediments in the dredge area and the return flow and leachate from the containment site. Although the mechanisms that govern the flux and subsequent loss of PCBs are not well understood, various predictions have been made concerning the impact of these sources on the elevation of PCB concentrations in the environment. Losses of PCBs to the Hudson River near the dredge area are expected to increase ambient levels by 0.2 ug/l with hydraulic dredging procedures and 0.4 ug/l with clamshell dredging (MPI, 1980). PCB loss in the containment site return flow can be controlled by treatment procedures designed for the project (NYSDEC, 1981a). With hydraulic dredging it is predicted that 70 kg of PCBs will be lost in the return flow, resulting in an increase of 0.1 ug/l PCB over ambient concentrations. When clamshell dredging is employed, discharge and PCB loss will depend upon whether the return flow is recycled.

Whereas the loss of PCBs to surface waters is unavoidable during the operation of the Project, the potential for groundwater contamination is minimal. Since certain features of the containment site and surrounding area act to retard the outward migration of water and because PCB molecules strongly adhere to soil particles, it is expected that PCBs could reach any groundwater areas only after an extremely long period of time (MPI, 1980).

Water Quality Considerations

There are a number of Federal and State regulations which apply to concerns addressed in this portion of the monitoring program. An ambient surface water quality criterion of 0.001 ug/l has been set by the USEPA for the protection of aquatic life (40 CFR, Part 129). New York State has adopted a

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PCB groundwater standard of 0.1 ug/l (6 NYCRR 703). In 1978, NYSDEC adopted in its dredging regulations, a guideline level for PCBs of 0.5 ug/l based on the analytical detection level at that time. The New York State Pollution Discharge Elimination System (SPDES), promulgated under the Federal Clean Water Act and NYS Environmental Conservation Law, establishes effluent limits for point sources such as the project containment site. Specific effluent limitations and monitoring requirements for PCBs, suspended solids, and several metals have been established for the containment site discharge (Table II-1). State regulations for solid waste management facilities (NYCRR Part 360) include monitoring requirements for leachate and groundwaters.

Although there are currently no Federal or State drinking water standards for PCBs, the NYS Department of Health has issued a recommended guideline level of 1.0 ug/l for drinking water. The nearest public drinking water supply that draws from the Hudson River is at Waterford, approximately 48 km downstream or three days travel time at an average summer flow of 85 m^3/s.

<u>Assessment of River Recovery</u>

Analyses of Hudson River water samples collected over a range of river discharge rates indicate that the distribution of PCBs between the dissolved and adsorbed phases is flow-dependent. At low flow, PCBs reside primarily in the aqueous phase and their concentrations are inversely proportional to flow, whereas at high flow they are sorbed to particulate matter that is eroded or scoured from the river bed (Turk, 1980). Thus, flow dependency must be recognized in the design of the river monitoring strategy, in calculating PCB transport to the estuary, and in the assessment of long term River recovery. The project plans to support studies which will elucidate the desorptive and erosional processes related to these observations (see Appendix B). The study will examine the water/sediment interactions of PCBs using a variety of Hudson River PCB-contaminated sediments and a range of flow rates. This information, in addition to annual sediment and water survey monitoring for several years following the project, will support long-term projections of PCB transport from the Upper Hudson.

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Table II-1. SPDES discharge permit effluent limitations and monitoring requirements which apply to the containment site effluent during the dredging operations.

Parameter	Discharge Limitation Daily Avg.	Discharge Limitation Daily Max.	Monitoring Requirements (24-hr. composite)
Total PCBs	20.0 ug/l	100.0 ug/l	Daily
Hydraulic dredging (12 MGD)	2.0 lbs/day	10.0 lbs/day	
Clamshell dredging (1.6 MGD)	0.26	1.3	
Suspended solids	-	25.0 mg/l	Daily
Metals:			
Arsenic	-	0.1 mg/l	Weekly
Cadmium	-	0.2	Weekly
Chromium	-	1.0	Weekly
Copper	-	0.8	Weekly
Lead	-	0.2	Weekly
Mercury	-	0.02	Weekly
Nickel	-	2.0	Weekly
Silver	-	0.1	Weekly
Zinc	-	1.0	Weekly

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Water-related monitoring activities which accommodate the evaluation of impacts of dredging on river biota are addressed in the biological monitoring programs described in Sections IV and V. Certain water measurements are required, however, to both complement those programs and to provide information on ambient concentrations and transport of PCBs in the Hudson River water column, under various hydrological conditions, for the protection of drinking water supplies.

USGS Water Monitoring Program

The water monitoring activities provided by the USGS will serve as the basic component in the monitoring programs carried out prior to, during, and after the dredging project (Table II-2). Between 200 and 400 water samples will be collected throughout each water year at five stations in the Upper Hudson River for PCB and suspended sediment analyses. Sampling periods will be selected to cover high water events, summer low flows, and other critical periods during the dredging season. Three to five high water events, defined by flows of 25,000-30,000 cfs at Waterford and proportionally less at upstream stations, will be covered. The number of samples per event will vary, with up to a maximum number of six samples collected for the peak spring flood event. During low flows, samples collected from the canal and channel at Rogers Island will be flow-proportionally composited, but during high water events separate samples will be collected.

During 1982 intensive sampling will be performed at Stillwater, with 12 samples taken over the hydrograph during one high water event to examine the relationship between PCB concentration and river flow. An additional 12 samples will be collected across the river at or near peak discharge to determine whether lateral homogeneity exists during high water. Suspended sediment and conductance will be measured for each of these samples. For PCB analysis, three subsets of four samples each will be flow-proportionally composited.

During the dredging period, extensive sampling will be conducted at Stillwater to measure lateral homogeneity during two different flow regimes. Samples will be collected across the river at the onset of dredging and, later in the season, when flows have decreased.

As part of baseline monitoring, 20 water samples collected during spring high flow and summer low flow at Stillwater will be analyzed for both total and dissolved PCBs. These data will be used to examine the contributions of sediment desorption and erosion as processes related to PCB transport in the water column.

River discharge will be determined each year, on a continuous basis, at established USGS water-stage recorders at Ft. Edward, Stillwater, and Waterford and, when samples are collected, with a wire-weight gage at Schulylerville. Samples will be collected daily for suspended sediment analysis at Stillwater and Waterford.

Table II-2. Annual sampling matr for USGS Hudson River PCB studies.

Task	Glens Falls	Rogers Island	Ft. Edward	Schuylerville	Stillwater	Waterford
River discharge	-	-	Continuous	For every PCB analysis	Continuous	Continuous
Suspended sediments	For every PCB analysis	For every PCB analysis	-	For every PCB analysis	Daily + 12 per one event	Daily
PCB sampling and analyses:						
Low and base flow	5 samples	25-30 samples (canal + channel composite)	-	25-30 samples	25-30 samples	25-30 samples
High flow events	Up to 6 samples for 3-5 events	Up to 6 samples for 3-5 events	-	Up to 6 samples for 3-5 events	Up to 6 samples for 3-5 events	Up to 6 samples for 3-5 events
Assess variability over one event	-	-	-	-	12 samples	-
Dissolved and total	-	-	-	-	20 samples	-
Sampling quality control	-	-	-	-	12 samples (3 analyses) for one event	-
Duplicates	-	-	-	-	10 samples	-

A cooperative monitoring program between the USGS and NYSDEC will continue at the same level of intensity for a minimum of five years after the dredging project to aid the assessment of river response to dredging.

River Studies During Dredging

The immediate and long-term river monitoring provided by the USGS program will be supplemented during the dredging year with other water studies Table II-3). In an intensive study of water quality near the dredge area, water samples will be collected at various points upstream and downstream from the dredge plume. An attempt will be made to correlate sampling locations with those used in the PCB bioaccumulation monitoring programs (see Sections IV and V). Several dye studies, conducted during the summer prior to dredging to define mixing processes, will aid the positioning of water and bioaccumulation monitoring stations.

PCB transport to the estuary during dredging will be assessed using PCB and suspended sediment data obtained from water samples collected at the Troy Dam. Samples will be collected by NYSDEC for 20 days after dredging commences and on a weekly basis thereafter if PCB levels do not exceed 1.0 ug/l. If concentrations consistently exceed that level, a sampling program will be initiated in the estuary which will include monitoring at public drinking water supplies drawing from the Hudson River (MPI, 1981).

Potable Water Supplies

Primary consideration for the impact of the project on human health involves intensive monitoring at the Waterford public water supply. Finished water will be monitored by NYSDEC for the first 20 days of dredging and once every other week thereafter if levels do not exceed the NYSDOH-recommended guideline level of 1.0 ug/l. If that level is exceeded, an existing connection to the water supply at Troy, New York, will be used for Waterford drinking water.

All potable water supply wells within 800 meters of the containment site will be sampled by NYSDEC twice per year prior to, during, and for five years after the project. Samples will be analysed for PCBs and metals (arsenic, cadmium, chromium, copper, lead, mercury, nickel, silver, and zinc). If these wells become contaminated, NYSDEC will supply bottled drinking water and carbon filters for faucets to households that depend upon these sources.

Containment Site Monitoring Activities

Monitoring at the containment site is partially dictated by various State and Federal permit requirements. The acquired data will be useful in the assessment of ecological consequences and effectiveness of the reclamation methods. SPDES permit monitoring requirements for the containment site are listed in Table II-1. Upon closure of the site, monitoring is required for metals on a monthly basis and PCBs and suspended solids on a weekly basis, but the discharge limitations remain the same.

Table II-3. Sampling matrix for NYSDEC water studies during the six-month dredging season. An asterisk (*) indicates that sampling will be continued after dredging ceases.

Sampling Location	Purpose	Analysis	Frequency	No. Samples
Hudson River in relation to dredge plume	Assess PCB losses from dredging	PCB	As required	As required
Hudson River at Troy Dam	Assess PCB transport to estuary	PCB	Daily for 20 days then weekly	69
		Suspended sediment	"	69
Containment site lagoon	Assess PCB volatilization	PCB	Daily for 20 days then weekly	69
*Containment site return flow	Assess PCB loss to River; SPDES requirement	PCB	Daily	130
		Suspended sediment	Daily	130
		Metals	Weekly	26
*Containment site leachate	Assess PCB loss from lagoons	PCB	Monthly	6
*Groundwater monitoring wells	Assess migration of PCB through soil	PCB	Four times per year	36
Finished drinking water at Waterford	Protection of drinking water supply	PCB	Daily for 20 days then every two weeks	45
Private wells within 800 meters of containment site	Protection of drinking water supplies	PCB	Once per year	35
		Metals	"	35

Every three months, beginning at least one month after the construction of the well-monitoring network, groundwater at the containment site will be monitored for PCBs and metals, as well as water surface elevation. A cluster of three wells will be constructed at six locations around the lagoon area to permit collection of groundwater from depths of 12, 22 and 32 feet. The deepest well will penetrate the rock substrate by at least 10 feet. Groundwater monitoring requirements are specified in the NYS Part 360 permit, which is issued for the construction and operation of a solid waste disposal facility. This permit also requires monthly measurements of the level, transferred volume, and PCB concentration of leachate in standpipes at the containment site. Initially, samples of water from the containment site lagoon will be collected daily in order to assess the fluctuations in dissolved PCBs. Since the lagoon system retention time is several weeks, the frequency of sampling will be reduced after trends in dissolved PCBs are determined. These data will be used to anticipate critical rates of PCB flux from the containment lagoons (see Section I). If excessive dissolved PCB concentrations are approached during adverse meteorological conditions, the influent and flow throughout the containment and treatment areas will be temporarily ceased, and all units will be treated with a slurry solution of powdered activated carbon.

METHODOLOGY

Field and Sampling Procedures

Hudson River water samples will routinely be collected using USGS depth-integrating sampling equipment fitted with a one-liter bottle. Equipment used for collecting samples for PCB analysis will be thoroughly cleaned with hexane initially and will be rinsed with river water prior to each collection. Samples will be collected from bridges near the center-of-flow or from a boat at predetermined locations.

Water samples collected at the containment site entail various equipment and procedural requirements depending upon the area and purpose for monitoring. Effluent from the treatment facility will be composited over 24 hours by an automatic sampler. The sample will be stored in glass and kept cool during the compositing period. Discharge from the treatment facility will be measured using a V-notch weir and stage recorder. Water samples will be obtained from the 18 wells in the groundwater well monitoring network with a Teflon-coated bailer or by pumping through Lexan or Teflon tubing. Composited water samples will be taken from the lagoon either by traversing the area with a boat or by periodic collections at the lagoon outlet.

All samples procured for PCB analysis will be collected and stored in solvent-rinsed glass bottles. NYSDEC specifies hexane and acetone rinses, whereas USGS routinely employs hexane followed by oven-drying at 400°C. Bottles will be capped in the field with Teflon-lined lids, and an effort will be made to minimize air space between the surface of the sample and the lid. Samples taken for the purpose of determining dissolved and total PCBs will be filtered through a 0.45 u silver oxide membrane filter immediately following collection.

Bottles used for collecting samples for suspended sediment analysis will not require a solvent rinse, and NYSDEC samples may be transferred to plastic containers for transport and storage. Water samples for metals determinations will be collected in detergent and acid-washed glass bottles rinsed with deionized water. Immediately after collection, the pH of these samples will be adjusted to less than two with 8N HNO_3 to prevent precipitation of dissolved metals (EPA, 1979).

All sample containers will be appropriately labelled at the time of collection and immediately placed on ice for transport to the laboratory where samples will be stored at 0-4°C until extraction and analysis. A sample submission form will accompany all samples sent to the laboratory, and duplicates will be retained by the sample collector. Details regarding the information required in both the NYSDEC and USGS forms are provided in the project's QA/QC plan (NYSDEC 1981b).

River discharge is determined from stage height measurements at four USGS Hudson River stations (Buchanan and Somers, 1978). Stage height at Schuylerville is determined by wire-weight measurement of the distance from bridge to water surface. USGS gaging stations at Ft. Edward, Stillwater, and

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Waterford provide a continuous record of river stage. Stage-discharge relationships established for these stations are rechecked and updated by direct measurement several times each year.

To assess river mixing for positioning of water and bioaccumulation monitoring stations, several dye tracer studies will be performed during the summer preceding dredging. On several occasions, Rhodamine WT fluorescent dye will be introduced to different areas in the Thompson Island Pool. The dye's transport will be monitored using a Turner Model III fluorometer on the sampling vessel until the dye is laterally well mixed over the river.

Analytical Procedures

PCBs: Water samples are extracted with 15 percent methylene chloride in hexane. The dried and concentrated extract is analyzed by gas chromatography. The PCB project lab will follow procedures outlined in the NYSDOH Handbook of Analytical Methods (NYSDOH, 1980) with the exception that a Hall detector will be employed. Data will be reported as ug/l of Aroclors 1016, 1242, 1254, and 1260. The USGS Atlanta laboratory uses electron capture equipped gas chromatography and reports total PCBs.

Suspended sediments: The PCB project lab will measure both total and filtrable residues dried at 103 -105°C, according to Methods 209A and 209C of Standard Methods for the Examination of Water and Wastewater (1980). USGS samples will be sent to the USGS Ohio district laboratory for suspended sediment analysis which is performed by filtering each sample and drying the residue at 103 -105°C. Size analysis will be performed on samples collected during periods of high flow (USGS, 1972).

Metals: Samples collected for metals analyses will be sent to the NYSDOH laboratories. Analysis is performed by atomic absorption spectroscopy according to procedures described in USEPA Methods for Chemical Analysis of Water and Wastes (EPA, 1979).

Quality Assurance

Quality assurance plans for the above programs appear in Sections No. 1, Quality Assurance Plan for United States Geological Survey, and No. 2, Quality Assurance Plan for PCB Reclamation Laboratory (NYSDEC, 1981b).

DATA ANALYSIS

As indicated by the objectives of the water monitoring program, water quality data will be used for several distinct purposes including:

- assurance that human health standards are being met;
- controlling treatment processes at the containment site;
- screening for groundwater contamination;
- assessment of downstream containment losses and processes associated with dredging; and
- assessment of long-term changes in downstream PCB export from the Upper Hudson attributable to the project.

For control of processes at the containment site in addition to control at the dredge, in response to PCB concentrations in the river water, relatively rapid sample and data analyses will be required. Heavy metals and PCB data from the Waterford Treatment Plant, well water from private residences, and the Hudson River at Troy will be made available to local and State health officials. Initially, this data will be assessed for its significance in relation to the appropriate standards. If a result is near or exceeds a standard, natural variability and sampling and analytical errors in addition to mechanisms producing unacceptable water quality contributing to the incident will be considered. The weight given any one of these factors prior to initiating appropriate action will be a function of the human health/ecological implications of the result. The appropriate action to be taken may include any combination of resampling, reanalysis of reserve sample, and, if the standards are clearly being exceeded, the implementation of remedial measures by the project.

Mean daily discharge from the containment site will be obtained from the site manager. The product of mean daily discharge and the 24 hr composite PCB concentrations will be used for comparison to SPDES discharge limits. For suspended solids and metals, the measured concentrations will be compared directly against SPDES limits. If the flux of PCB or concentration of other SPDES-regulated constituents exceed the defined limits, the treatment process will be altered to bring the discharge within limits.

Special studies of heavy metals and PCB from the dredge site will be analyzed using a mass balance scheme previously applied to Hudson River dredging by Brown (1981). This approach determines sediment and PCB sinking rates in addition to PCB and metals transformation rates using data collected over a river reach upstream and downstream of the dredge.

Adams and Darby (1980) have applied a mixing model to predict soluble contaminant concentrations in hydraulic dredging process water. The model predictions were based upon dilution of sediment pore water with process water. The predictions were then used to assess whether contaminant precipitation or

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re-lease from sediments was occurring. The model will be modified to include explicit consideration of transformation processes and used to assess processes associated with hydraulic dredging. Once validated, the model could be used in the event that further process control is needed to comply with SPDES or other limits. The effect of varying hydraulic dredging parameters on predicted contaminant concentrations in the containment site could be used to adjust dredging procedures if needed.

The USGS data set will be employed in the calculation of annual PCB export. Particular emphasis will be given to losses during high flow events. An effort will be made to account for variability in PCB and sediment concentrations over event hydrographs and during base flow periods. Flow-concentration relationships, developed for non-event flows would be used with flow-duration analysis for loading calculations. Trends in annual loading in addition to annual low flow - PCB concentration relationships will be used to assess the response of the river to dredging. This analysis will be supplemented by data from an investigation of bed sediment erosion and PCB desorption to project the long term transport of PCB from the Upper Hudson. A request for proposals defining the need and objectives for such an investigation is provided as Appendix B.

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SECTION III. PCBS IN TERRESTRIAL VEGETATION GROWING NEAR THE SEDIMENT CONTAINMENT SITE

Bureau of Water Research
Division of Water
New York State Department of Environmental Conservation

INTRODUCTION

The site selected for the encapsulation of Hudson River PCB-contaminated sediments is within an agricultural area primarily devoted to dairy farming. Within a 16-km radius of the site there exist 180 moderately sized, family-owned, active farms. Much of the farmland is used to grow crops, such as corn, alfalfa, clover, and other forage plants, to feed dairy cows. Farmers in the area have expressed concern that their crops and milk might become contaminated with PCBs in excess of federal limits and, therefore, unfit for feed or sale.

The U.S. Food and Drug Administration (FDA) has established tolerance levels of 0.2 ug/g in feed for food-producing animals and 1.5 ug/g (fat basis) for milk and dairy products (Fed. Reg., 44, 38330, June 29, 1929). Since it is possible that some forage crops grown in the vicinity of the containment site will become contaminated to a level beyond the FDA limit (Buckley, 1981), a comprehensive plant monitoring program is required. The monitoring data will be used in conjunction with a compensation plan for affected farmers in the vicinity of the containment site (NYSDEC, 1982). As part of this program, NYSDEC will acquire a temporary easement within a one-half mile radius of the outer limits of site construction. Plants growing within the easement area will not be used for animal consumption, and farmers will be compensated for loss of that land for growing crops. Compensation is also required for farmers suffering economic losses in the event that crops growing outside the easement area become contaminated beyond the 0.2 ppm FDA limit. Any farm or garden crops which become PCB-contaminated as a result of the project will be removed by NYSDEC and placed on the eastern portion of the containment site. The compensation plan and contingency measures related to potential contamination of agricultural resources are strongly reliant upon accurate and timely analysis of PCBs in vegetation.

The plant monitoring program has the following objectives:

- establish background or predredging PCB levels in terrestrial plants growing in the area of the proposed containment site;
- assist in prediction of PCB levels in forage crops growing near the containment site during the operation of the project;
- document changes in air and plant PCB levels during the operation of the project; and
- document air and plant PCB levels after the containment site is capped.

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BACKGROUND

Since 1980, the Boyce Thompson Institute for Plant Research has conducted studies on the accumulation of PCBs by several species of terrestrial plants. Background levels of foliar contamination have been determined for 18 species including goldenrod (Solidago nemoralis L.), staghorn sumac (Rhus typhinia L.), white pine (Pinus strobus L.), field corn (Zea mays L.), and red clover (Trifolium pratense L.). Background levels were found to be species-dependent, with ten-fold differences in PCB concentration levels observed within species growing at a given sits. For example, foliar PCB concentrations ranged from 0.03 ppm in P. strobus to 0.32 ppm in S. nemoralis (Buckley, 1982). To remove the species effect on bioaccumulation and to accommodate expression of PCB levels on a common basis, a "multiples of background level" (MBL) concept was developed (Buckley, 1980). All species were shown to provide the same MBL at a given site with a standard deviation below $\pm$ 25 percent (Buckley, 1982).

Plant bioaccumulation studies have demonstrated that PCBs are not readily transported through roots and shoots and that the major route of uptake is through the above ground plant parts (Buckley, 1982; Strek et al., 1981; Pal et al., 1980; Weber and Mrozek, 1979; Iwata et al., 1974). Further, PCB concentrations in plants were shown to be directly related to ambient air PCB concentrations. The relationships between foliar and atmospheric PCB levels were determined for several plant species along a transect from a known source of PCBs (Buckley, 1980). These relationships were used to predict plant concentrations at various known atmospheric PCB levels (see page I-3).

Ambient atmospheric PCB concentrations in the area of the proposed PCB-contaminated sediment encapsulation site are currently around 0.003 ug/m^3 (Buckley, 1981). During the operation of the project, levels are expected to rise to 0.3 ug/m^3 at the containment site and 0.2 ug/m^3 in areas adjacent to the site (see page I-3). The capability does not exist at this time to accurately predict the areal extent of atmospheric dispersion of PCBs from the containment site. Buckley (1980) has detected elevated foliar PCB concentrations up to 700 m from known PCB dump sites. Considering the uncertainty involved in the estimation of PCB loss and dispersion from the containment area, a flexible and responsive monitoring program will be implemented to assess the degree and extent of PCB accumulation in plants during the operation of the project.

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MONITORING STRATEGY

Background monitoring has been performed for two years on agricultural crops growing within a 9 km^2 area centered on the encapsulation site. Sixteen sample locations were designated by a 1 km x 1 km grid. This sampling design will be continued during the operation of the project, coordinating the sample collection schedule with times of crop harvest.

Perennial and annual plants have been studied and maintained in four replicate plots since 1981. These experimental plots are located 300 m south, 600 m southwest, 800 m northeast, and 1300 m southeast of the encapsulation site. These will be used during the operation of the project for comparison with background data and examination of the relationships between PCBs in air and plants which might be specific to the season during which dredging occurs. This study will include the measurement of PCB levels in the air at the experimental plots. Additional plant collections will be made near the Lock 6 dam to determine any changes in plant PCB concentrations that could be attributed to changes in the rate of PCB volatilization from the river during dredging. Samples will also be collected at remnant deposits 3, 4, and 5 and at the Buoy 212, SA13, and new Moreau sediment disposal areas.

For two years following closure of the encapsulation site, plants near the Lock 6 dam and grass samples from the site's cap will be collected and analyzed.

METHODOLOGY

Standard procedures for plant residue analyses will be used to collect, prepare, and analyze plant samples. In the field, samples of plant tissue will be placed in appropriately labelled, PCB-free plastic bags and frozen on dry ice. The samples will archived at -25°C or transported to the laboratory, accompanied by a sample submission form. In the laboratory, samples will be weighed, lyophilized, re-weighed and Soxhlet-extracted using petroleum ether. The extract will be cleaned on a Florisil column and solvent-stripped. Analysis will be performed with a gas chromatograph equipped with an electron-capture detector. Total PCBs will be reported. Approximately 250 plant samples will be collected for PCB analysis during the operation of the project.

Air samples will be collected by the Florisil method described in the air monitoring program (see page I-9). A detection limit of 0.10 to 0.05 ng/m^3 has been demonstrated using polyurethane foam as an adsorbent (Buckley, personal communication). The use of this adsorbent will be compared with Florisil and used for this study if the lower detection limit is required.

Each sample will be an unispeciate composite of a single plant part from a number of individuals and will be collected in duplicate; one of these will be submitted for PCB analysis while the other will be archived. Duplicate analyses will be performed for every twenty samples. Other quality control measures, such as blanks, standards, and spiked samples, will be the responsibility of the laboratory performing the analyses (NYSDEC, 1981).

INTRODUCTION

Several reports documenting the general decline of Hudson River fish PCB concentrations have resulted from the annual monitoring, since 1977, of Hudson River fish for PCB contamination (Sloan, Armstrong and Horn 1980, Armstrong and Sloan 1980, Sloan and Armstrong 1981a and 1981b, Armstrong and Sloan 1981, Sloan 1981, Sloan 1982). These reports have indicated that the decrease of PCB concentrations has been due to a reduction of Aroclor 1016 and, to a lesser extent, Aroclor 1221. Levels of Aroclor 1254 have declined very little, if at all.

Nonetheless, total PCB contamination remains high. For example, in the Lower Hudson River, 1981 samples of American eel averaged > 10 ppm; striped bass about 5 ppm; white catfish and white perch were also above 10 ppm on the average (NYSDEC 1981b). A spatial gradient is apparent with highest levels reported in the fish collected near the dominant sources at Ft. Edward and Hudson Falls. However, the data also suggest that secondary, but lesser, sources exist in the lower portions of the Hudson River below the Troy dam. With the exception of some migratory species, the trends in PCB contamination are, at present, most satisfactorily expressed on a lipid-adjusted basis (i.e. ug PCB/g lipid). Even in species where the association (correlation) between PCB concentrations and percent lipid is not satisfactory, the same pattern of PCB trend is evident.

PCB levels in the water column (Schroeder 1981) and invertebrates (Simpson 1981, O'Connor 1979) have also decreased over this same period of time.

The fish monitoring project described in this document is a continuation of the earlier work and addresses fishery contamination issues related to the proposed dredging effort.

The general objectives of the fish monitoring project are to:

- identify temporal and spatial changes in levels of fish PCB concentrations as a consequence of abated PCB discharges and
- determine changes in fish PCB concentrations resulting from PCB dredging activities in the Upper Hudson River.

BACKGROUND

Contamination Characteristics

Because of the lipophilic, hydrophobic, and persistent characteristics, PCBs, as a class of compounds, are widely distributed throughout the biota. They accumulate in fatty tissues where the highest PCB concentrations are found (National Research Council 1979). This group of chemicals has been widely used in several industrial and domestic applications. Its primary usage was as an insulating medium in electrical equipment such as transformers and capacitors (U.S. Environmental Protection Agency 1976a).

PCBs were manufactured and used as Aroclor mixtures. Some of the Aroclor mixtures are more persistent (Armstrong and Sloan 1981, Sloan and Armstrong 1981) and toxic (National Research Council 1979) than others. Bioconcentration factors can vary across two orders of magnitude depending upon the degree of chlorination of the biphenyl molecule (National Research Council 1979). In Hudson River species, bioaccumulation appears related to the amount of lipid material in the organism. This relationship holds true both intra- and interspecifically. In other systems, such as large lacustrine bodies, the interspecific relationship is still evident but within the species, variability is not adequately explained by lipid content (Armstrong and Sloan 1981, Sloan and Armstrong 1981). Toxicity may be a function of other contaminants associated with PCB such as polychlorinated dibenzofuran (PCDF) (Litten 1981; Brown 1980).

Historical Data and Trends

In 1975 and 1976, PCB concentrations in the fish of the Hudson River were extremely high (Hetling et al. 1978, Horn et al. 1976). This, in part, resulted in the subsequent order for the General Electric plants at Ft. Edward and Hudson Falls to cease the discharge of PCB to the Hudson River (New York Department Environmental Conservation 1976a and b). As a condition of the 1976 Settlement Agreement signed by General Electric (GE) and the New York State Department of Environmental Conservation (NYSDEC), funds were made available to monitor concentrations of PCB in fish collected annually at various locations below the discharge. The active discharge of PCBs from the GE capacitor manufacturing facilities was sharply curtailed in 1976 and terminated in June, 1977.

The Hudson River fish-monitoring project, fully implemented in the spring of 1977, includes studies of PCB patterns in both resident/freshwater and migrant/marine species. In the introduction, the general conclusions with respect to trends in PCB fish concentrations were listed, and several reports were cited dealing with the results of this project.

Applicable Federal and State Standards

Due to the technical limitations associated with PCB analyses, standards for consumption and environmental concerns utilize total PCB concentrations rather than attempting to differentiate between PCB mixtures (e.g. Aroclor 1016 versus Aroclor 1254) or specific congeners. The U.S. Food and Drug Administration (1977) has a temporary tolerance level for fish in interstate commerce of

5 ppm, and is considering a 2 ppm level as a final tolerance limit. A ruling on this proposed change is expected sometime in 1982.

To avoid confusion in issuing advice to sportsmen and fish-consumers, NYSDEC and the New York State Department of Health (NYSDOH) follow the standards established by the U.S. Food and Drug Administration. The same standard is considered by NYSDEC in regulating commercial fishing.

Currently, commercial fishing is allowed in the Hudson River except for American eel, white catfish, goldfish, carp, white perch and striped bass. Recreational anglers are advised not to consume American eel (until recently, possession of American eel was prohibited), white catfish, white perch, goldfish and carp. NYSDOH advice on striped bass and other species is to restrict consumption to one meal per week.

NYSDOH advises against consuming any fish caught between Ft. Edward and the Troy dam (Axelrod, 1982). Specific details on current regulations regarding the possession and sale of Hudson River fish and eels appear in 6NYCRR 11.1, 11.2, and 37.1(b).

Economic Impacts

Parker (1981), in an economic evaluation of the impact of PCB contamination in Hudson River fish, related that in 1980 the current commercial fishery was valued at more than $1.7 million. The major species was American shad. A summary on the recreational fishery is presented in Table IV-1. He further stated that "with improvement of water quality, toxic substances (e.g. PCB) would become a primary limiting factor in the reestablishment of this multi-million dollar industry."

Parker's evaluation was a follow-up to an earlier estimate by Sheppard (1976) wherein the commercial fishery was generating $150,000 to $200,000 per year, and the recreational sector contributed $1.65 million. The largest Hudson River input to commercial and recreational fisheries was in the marine district, estimated to exceed $20 million annually. Both evaluations concluded that PCB contamination poses a continuing threat to the development or reestablishment of the commercial and/or recreational fisheries and that the potential fisheries are considerably larger than the present fisheries.

Table IV-1. Summary of Present and Future Effort and Associated Values of the Recreational Fisheries of the Hudson River (Parker 1981).

Location		Annual Angler-Days (in 1000's)	Annual Value (1981 dollars)
Glens Falls to Troy Dam	Present	0	0
	Future	25-30	Up to $0.72 million
Troy Dam to Poughkeepsie	Present	8-10	Up to $0.24 million
	Future	56-112	Up to $2.68 million
Poughkeepsie to Battery, New York City	Present	70	Up to $1.68 million
	Future	840-1260	Up to $30.24 million

MONITORING STRATEGY

The objectives for monitoring PCB contamination were listed in the introduction. Because of the specific concerns related to dredging, the overall fish-monitoring strategy involves two designs. First, there is the continuation of the project in place since 1977, which satisfies the first objective. It will also supplement the dredge monitoring objective which involves using live, caged fish at several locations to determine if PCB is accumulating in the test organisms as a result of dredging activities.

MONITORING DESIGN I

The basic sampling locations and schedule for fish collections (Table IV-2) were developed from 1977 to 1980. The species listed for the various locations are either potentially important recreational and commercial species or readily available for collection. The sampling sites were selected in 1977 for ease of access and to represent different river reaches of varying contamination. Continuity of those sites has been maintained over the years. This species/location mix meets the analytical requirements for the non-dredging objective. Adjustments of sample sizes are determined from year-to-year on the standard errors associated with contaminant concentrations from a prior data year (e.g. 1981 results were used to update 1982 requirements). Table IV-2 reflects current sample sizes required to demonstrate, at the minimum, a 50 percent change in total PCB levels. In most cases, the sample sizes are adequate to document a 20 percent shift.

In view of the persistent nature of Aroclor 1254, monitoring beyond 1985 will be necessary. However, the schedule in Table IV-2 should be adequate through the 1985 season with modification and updates as necessary. Radical changes after 1985 are dependent upon an evaluation of conditions at that time.

Methodology

Collection and Preparation of Fish

All fish specimens are collected by Regional Staff of the Bureau of Fisheries, Division of Fish and Wildlife, NYSDEC, using electro-shocking and gill-netting techniques. When applicable, striped bass, American shad and American eel are purchased from commercial fishermen. Collection goals are sometimes limited by availability due to weather and other physical phenomena and changes in species density and composition.

To minimize the possible complication of seasonal variation in contaminant concentration, annual collections of given species at given locations are made as close as possible to the same time of year ($\pm$ two weeks).

Fish are tagged with Monel jaw tags, measured and weighed. Collection records and continuity of evidence forms are maintained, beginning at the time of collection (NYSDEC, 1981). Fish are frozen whole in individual polyethylene bags (quality control checks are maintained on the plastic bags to ensure they are not PCB-contaminated).

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[illegible] Hudson River fish sampling design for fish monitoring; numbers desired reflect 1982 requirements.

LOCATION	SPECIES	DESIRED NUMBERS	DESIRED COLLECTION DATE ± 2 WKS	DESIRED SIZES AVE (RANGE) mm	REMARKS
Above Feeder Dam	Pumpkinseed	75	9/20	--	-age 1+
	Pumpkinseed	75	9/20	--	-ages 2+,3+,4+
Stillwater	Yellow perch	20	6/16	213(193-261)	--
	Brown bullhead	20	6/16	251(178-315)	--
	Largemouth bass	20	6/16	325(203-384)	--
	Goldfish	20	6/16	274(234-328)	--
	Pumpkinseed	75	9/26	--	-age 1+
	Pumpkinseed	75	--	--	-ages 2+,3+,4+
	American eel	?	June	As avail.	-incidental catch; levels not y determined in this species from this s
Albany/Troy	Brown bullhead	30	6/15	292(193-338)	--
	White perch	20	6/15	197(152-277)	--
	Alewife/Blueback herring	30	Peak run	As avail.	-Species to be submi dependent upon cat
	Pumpkinseed	75	9/20	--	-age 1+
	Pumpkinseed	75	9/20	--	-ages 2+,3+,4+
Catskill	White perch	20	--	--	-at discretion of Regional personne
	Largemouth bass	20	--	--	--
	Yellow perch	20	5/18	206(163-264)	--
	Redbreast sunfish	20	6/21	166(140-185)	--
	Alewife/blueback herring	30	Peak run	As avail.	-Species to be submi dependent upon cat
Kingston/ Saugerties	Alewife/blueback herring	30	Peak run	As avail.	-To be submitted dep ent upon catch
Poughkeepsie	Striped bass	25	Peak run	>457 mm TL	--
	American eel	30	July	As avail.	
Newburgh	Pumpkinseed	75	9/20	--	-age 1+
	Pumpkinseed	75	9/20	--	-ages 2+,3+,4+

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Table IV-2. Continued

LOCATION	SPECIES	DESIRED NUMBERS	COLLECTION DATE ± 2 WKS	SIZES AVE (RANGE) mm	REMARKS
Peekskill	Striped bass	25	Peak run	>457 mm TL	--
	American eel	30	July	As avail.	
Tappan Zee Bridge	American shad	30	Peak run	As avail.	15♂♂; 15♀♀
	Striped bass	25	Early run	>457 mm TL	--
		25	Late run	>457 mm TL	-collect not less than 3 later nor more than 1 m
	White perch	20	Fall	As avail.	
	American eel	30	July	As avail.	
	White catfish	10	--	As avail.	-time of collection at di cretion of collector
George Washington Bridge	Striped bass	25	Early run	>457 mm TL	--
		25	Late run	>457 mm TL	-collect not less than 3 later nor more than 1 mo
	American eel	20	July	As avail.	-responsibility: Division Marine Resources

Fish from Regions 4 and 5 are transported in a frozen state to Region 3, New Paltz, for storage until preparation for shipment to Hazleton Raltech, Madison, Wisconsin. At the time of preparation, fish are thawed and a standard fillet is prepared (Appendix C), consisting of an entire side of each fish, with scales removed, extending from operculum to tail. In the case of pumpkinseed, fish are ground whole. Skinned standard fillets are prepared for brown bullhead, white catfish, Atlantic tomcod and American eel.

Fillets are retagged, frozen, and shipped via air freight, priority basis, to Hazleton Raltech, Inc. where fillets are ground and homogenized. The remaining carcasses are kept in storage at New Paltz until results have been submitted by the analytical laboratory and PCB analyses are verified acceptable.

Analytical Methods

A detailed account of analytical procedures by Hazleton Raltech, Inc. is found in Section No. 3 of the Quality Assurance Plan for the Hudson River PCB Reclamation Demonstration Project (NYSDEC, 1981). Briefly, weighed portions of the ground tissue are dried with anhydrous sodium sulfate and extracted with three portions of petroleum ether. An aliquot of the partially evaporated extract is placed on a Florisil column, standardized to elute PCB Aroclors. A sample of the eluted extract is then injected into a gas chromatograph, fitted with an electron-capture detector, and standardized using Aroclors 1221, 1242 and 1254 obtained from the Monsanto Corporation. It is known that the Aroclor 1242 pattern obtained from fish extract is indistinguishable from that produced by Aroclor 1016. The column packing is 3 percent OV-1. Quantitation is done by comparing selected peak heights or areas to those produced by the respective Aroclors. The limit of detection is 0.1 ppm, wet basis, for each Aroclor. From the mass of residue remaining after evaporation of a 5-ml portion of the original petroleum ether extract to dryness at 40°C, the percent by weight of tissue soluble in petroleum ether is calculated. This latter percentage

A quality control protocol consists of two components. Periodic performance samples to assess accuracy are analyzed on a round-robin basis involving Hazleton Raltech, Inc., other private contractors, and several laboratories of NYSDEC and the New York State Department of Health. In addition, Hazleton Raltech agrees that, for each 20 data points reported, three are of a control nature: one reagent blank, one duplicate analysis and a spiked recovery.

Data Analysis

With the exception of American shad and striped bass (both large-sized, migrant species), the variability of PCB concentration within a species, regardless of age, can be expressed on a lipid-adjusted basis. Therefore, all PCB concentrations (total PCB and specific Aroclors) are converted to a lipid basis by dividing each analytical concentration in micrograms of PCB per gram of wet tissue (ppm) by the fractional lipid content of the tissue sample. Resulting concentrations are referred to as lipid-based, and carry units of micrograms of PCB per gram of lipid.

Temporal changes in total PCB and its Aroclors are calculated for given species and locations on a percentage basis from lipid-based PCB concentrations. An effort will be made to account for variability or trends in total PCB and the different Aroclors for a given species, using empirical methods. Trends in recent fish data have been described by a first-order decay model and its associated half-life concept (Armstrong and Sloan 1980, 1981, Sloan and Armstrong 1981).

Half-life values obtained from those calculations do not describe the time required for a 50 percent PCB decline to occur in a given fish. These calculated half-lives reflect the time required for a 50 percent lipid-based decline to be observed in comparable populations of fish of given species and locations collected in different years. Such half-lives therefore depend on both the rates of PCB accumulation as well as the rate of elimination and/or depuration.

Responsible Parties

The overall responsibility for the project lies with:

Ronald Sloan, Ph.D.
Research Scientist II
Bureau of Environmental Protection
New York State Department of Environmental Conservation
50 Wolf Road, Room 526
Albany, New York 12233

Phone: 518-457-1769

The collection coordinator is:

Robert Brandt assisted by Robert Mitchell
Bureau of Fisheries
Region 3, New York Department of Environmental Conservation
21 South Putt Corners Road
New Paltz, New York 12561

Phone: 914-255-5453

Because of the workload associated with the collections, an annual temporary technician (six months each year) is required at New Paltz. Without this position the project cannot function.

The laboratory contact person is:

John Kerman
Hazleton Raltech, Inc.
3301 Kinsman Boulevard
P.O. 7545
Madison, Wisconsin 53707

Reporting Schedule

Data will be reviewed upon receipt, usually within three to six weeks following submission of samples to the laboratory. This will provide for timely, preliminary interpretations to be used by the PCB project in the most appropriate manner related to dredging activities. All data will be summarized and included in the report series "Toxic Substances in Fish and Wildlife" every six months. More detailed reports are generated on an administrative demand basis (oral and written) and scientific documentation and interpretation are planned during the course of the project and at termination.

MONITORING DESIGN II

Even after several years of monitoring, the role of PCB-contaminated sediment and subsequent accumulation in fish flesh is uncertain (Sloan et al. 1981). For the Hudson River, secondary PCB sources are a consideration (Sloan and Armstrong 1981, Bergh and Peoples 1977) which may confound analytical results.

However, where known contaminated sediment is to be removed, it is important to determine the accumulation potential for organisms exposed to dredged materials. Werner (1981) found in the freshwater clam (Elliptio complanatus) little evidence suggesting that dredging would contribute to increased PCB concentration. In a related clam study conducted in the Niagara River, above and below a known chemical discharge, results were inconclusive since all compounds tested were below analytical detection limits for the non-volatile EPA priority pollutants, including PCB (NYSDEC, unpublished data). Thus, the choice of organisms for study may be critical. Since Skea et al. (1979) found significant accumulation occurring in several species of fish held in live-cars over a 14-day exposure in the Hudson River, fish of relatively homogeneous body conformation and size may be more appropriate to ascertain biological implications of dredging. The following suggested study design will augment the invertebrate study proposed by Simpson (1982).

The strategy in Design II involves the placement of live-cars containing even aged (relatively homogeneous sized) fathead minnows (Pimephales promelas) at various locations above and below the proposed area for dredging. Fathead minnows are suggested for use because they are readily available, widely used in bioassay and related testing procedures and can accumulate high PCB levels (U.S. Environmental Protection Agency 1976). Table IV-3 depicts the numbers of fish desired for exposure and PCB analysis (three Aroclors - 1221, 1016 and 1254) and the locations for cage placement. Dates of exposure listed in Table IV-3 related to the projected dredging schedule (Schmitt 1982) are subject to change since the dredging may not proceed as currently envisioned.

This project should also be conducted under the same strategic regime the year prior to dredging to: 1) provide adequate control data over different flow conditions and temperature strata; 2) allow time for development and modification of equipment prior to dredging; and 3) assess adequacy of experimental design (chemical and statistical analyses).

Table IV-3. EXPOSURE AND LOCATION SCHEDULE DESIGN II

Location	Relation to Return Flow (approx.)	Each exposure period Number exposed	Number analyzed
above Feeder Dam above Glens Falls	Uncontaminated control	400 (200 each cage)	2 composit of 50 eac
Ft. Edward (dam site)	Contaminated control	400 (200 each cage)	100 (50 ea cage)-10 composit
Ft. Miller below dam	3 km below (1×10^0)	400 (200 each cage)	100 (50 each cage)-10 composit
below Schuylerville	14 km below (1×10^1)	400 (200 each cage)	100 (50 each cage)-10 composit
above mouth Stockport Creek	100 km below (1×10^2)	400 (200 each cage)	100 (50 each cage)-10 composit
	Total fish over 7 exposure periods	14000	2940 analyzed 294 analyses

	Dates (21 day exposure) Start	End
Pre-dredge exposure	May 18	June 8
Dredge exposure -set 1	June 15	July 6
Dredge exposure -set 2	July 13	August 3
Dredge exposure -set 3	August 10	August 31
Dredge exposure -set 4	September 7	September 28
Dredge exposure -set 5	October 5	October 26
Dredge exposure -set 6	November 2	November 23

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Methodology

Exposure and Preparation of Fish

The test minnows will be purchased from a commercial supplier (to be arranged) to ensure that three-to-four month old individuals (0.5-0.75 gm each) will be used at the start of each of the 21-day exposure periods. This length of exposure will be sufficient since Skea et al. (1979) found several ppm of PCB accumulated over a 14-day period in previously unexposed fish. His tests conducted in the Hudson River and previous analyses of Hudson River migrant species indicate that several hundred ppm on a lipid basis will occur in the proposed 21-day exposure periods.

Adequate numbers (400 at each location) will be placed in the live-cars to allow for some mortality and increase the likelihood that 100 specimens will survive a given exposure location period for subsequent analysis. The cost of test organisms is one of the lesser expenses associated with this project and the benefit of ensuring availability of sufficient numbers for anlaysis cannot be overemphasized. Compositing 10 whole fish at each location/exposure combination will provide adequate mass (> 5 gm) for PCB analysis, in addition to reducing the variance to allow more sensitive statistical analyses. Ten analyses are projected for each location at each exposure period (Table 3).

An Assistant Research Scientist (SG-14) will be hired for one year to oversee the construction, deployment, testing, preparation and data interpretation of the project. The workload cannot be assumed by existing staff. This person will also serve as direct liaison with the dredging project to provide feedback for dredging operation modification, if needed. Another major responsibility will be the tagging, preparation, and shipping of individual whole specimens to Hazleton Raltech at the end of each exposure period and ensuring that analytical turnaround time is kept brief (two to three weeks).

Each exposure setup will consist of a large live-car in which two smaller cages will be suspended, containing two replicates of 200 fish (400 total). Suspending the small units will assure that PCB accumulation will occur as a result of materials in the water column rather than through contact with contaminated sediment. The design of these cages is standard, and detailed plans will be provided at a later date. These types of cages were used in earlier Hudson River work (Skea et al. 1979).

The same general procedures related to Design I data collection and chemical analyses are pertinent to Design II except a detection limit of 0.01 ppm is specified for each Aroclor. The numbers of fish used for analysis reflect two considerations: reduction of variance in the data which provides for more sensitive statistical analyses and ensuring adequate biomass available for chemical analyses.

Data Analysis

The basic design of the overall data analysis is outlined in Table IV-4. The analysis of variance model can be simplified to a 4 x 2 factor analysis for

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Table IV-4

PCB data arrangement for the three-factor design of analysis of variance (4 x 2 x 7); fixed effects model; $N_{ijk} = 5$. Aroclors 1221, 1016 and 1254 analyzed seperately.

Level of C (Exposure Period) k = 7	Level of B (Replicates) j = 2	Level of A (Exposure Location) i = 4			
		Control	1 km	10 km	100 km
May 18	1	$X_{111.}$	$X_{211.}$	$X_{311.}$	$X_{411.}$
	2	$X_{121.}$	$X_{221.}$	$X_{321.}$	$X_{421.}$
June 15	1	$X_{112.}$	$X_{212.}$	$X_{312.}$	$X_{412.}$
	2	$X_{122.}$	$X_{222.}$	$X_{322.}$	$X_{422.}$
July 13	1	$X_{113.}$	$X_{213.}$	$X_{313.}$	$X_{413.}$
	2	$X_{123.}$	$X_{223.}$	$X_{323.}$	$X_{423.}$
August 10	1	$X_{114.}$	$X_{214.}$	$X_{314.}$	$X_{414.}$
	2	$X_{124.}$	$X_{224.}$	$X_{324.}$	$X_{424.}$
September 7	1	$X_{115.}$	$X_{215.}$	$X_{315.}$	$X_{415.}$
	2	$X_{125.}$	$X_{225.}$	$X_{325.}$	$X_{425.}$
October 5	1	$X_{116.}$	$X_{216.}$	$X_{316.}$	$X_{416.}$
	2	$X_{126.}$	$X_{226.}$	$X_{326.}$	$X_{426.}$
November 2	1	$X_{117.}$	$X_{217.}$	$X_{317.}$	$X_{417.}$
	2	$X_{127.}$	$X_{227.}$	$X_{327.}$	$X_{427.}$

the results produced from each exposure period and permutations of exposure periods ($4 \times 2 \times C_k$). The uncontaminated control is not considered in the analytical design because of the exceptionally low PCB concentrations above Glens Falls (at or below the detection limits in most earlier analyses). Test fish placed above Glens Falls will be analyzed but at reduced numbers (two composites of 50 fish rather then 10 composites).

Statistical analyses will be based on lipid-adjusted values. Hydrological time of travel is a consideration in the analysis of the data. Approximately five days time of travel is required between the Ft. Miller site and the Troy Dam (Shindel 1969). Another two days travel might be necessary to reach the Stockport Creek area.

Records on fish mortality will be maintained and analyzed, but accumulation, rather than acute toxic effects, is the prime consideration of this study.

Responsible Parties

See page IV-8.

Reporting Schedule

See page IV-9.

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SECTION V. PCBS IN MACROINVERTEBRATES: LONG-TERM MONITORING WITH CADDISFLIES AND ARTIFICIAL SUBSTRATE RESIDUES AND BIOACCUMULATION MONITORING IN THE UPPER HUDSON RIVER USING THE AQUATIC MIDGE (DIPTERA: CHIRONOMIDAE)

Center for Laboratories and Research
New York State Department of Halath

INTRODUCTION

The results of an Environmental Impact Statement for the Hudson River PCB Reclamation Demonstration Project (Malcolm Pirnie, Inc., 1980) indicate that some PCBs will be lost in the water column during the dredging activities, and that the short-term adverse effects will not significantly offset the long-term reductions of PCB levels in the Hudson River ecosystem. One of the most important long-term objectives of the project is to improve the fishery resource of the river (Malcolm Pirnie, Inc., 1980).

The biological monitoring program described in this document consists of elements for assessing both short-term and long-term effects of the dredging program. The short-term study is designed to assess to what extent dredging alters the PCB concentration by disturbing the contaminated sediments. Although losses to the water column during dredging are not expected to exceed 4 percent, monitoring will be performed to evaluate the biological accumulation of PCBs lost to the river. The short-term study will commence just prior to the onset of dredging and will continue for 18 months. Caged midge larvae (Diptera: Chironomidae) will be placed above and below the dredge site at biweekly intervals during the dredging activities.

The long-term study will be a continuation of an existing monitoring program that has been operational since 1977 (Simpson, 1982). Multiplate samples and caddisfly larvae will be collected from 16 and five sites respectively, including locations upstream and downstream of the areas to be dredged. The long-term effectiveness of the project can be determined by comparing post-dredging concentrations throughout the river with pre-dredging levels.

The macroinvertebrate monitoring program has the following objectives:

- measure levels of PCBs accumulated by organisms located near the dredge area to assess changes in PCB loadings to the river biota during dredging; and

- continue monitoring PCBs in multiplate samples (16 stations) and caddisfly larvae (five stations) to assess subsequent changes in PCB loadings resulting from the dredging program.

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BACKGROUND

General

Macroinvertebrates are an important component of aquatic ecosystems, occupying the intermediate position, in terms of both size and energy-flow, between microorganisms (bacteria, algae, and zooplankton) and vertebrates. The many kinds of freshwater macroinvertebrates include aquatic insects and other arthropods, snails, clams, and various worms. Because they are relatively immobile and are sensitive to changes in water chemistry, they are often used in biological monitoring programs to assess the relative health of surface waters (Gaufin, 1973; Goodnight, 1973). In disrupted or polluted habitats, the severity and general type of stress involved usually can be determined by analyzing the structure and composition of the indigenous macroinvertebrate community. This approach is being used to assess ambient water quality in New York State rivers and canals (Simpson 1980a, 1980b, 1980c, 1980d).

Macroinvertebrates also have the potential for being an important component of toxic substance monitoring programs. Most organisms are relatively immobile and have life cycles of one year or less. Consequently, any contamination found in field-collected organisms will have been accumulated close to the collection site and over a relatively short period of time. Field-collected macroinvertebrates already have been used for monitoring the levels of PCBs in various waterways including the Upper Mississippi River (Mauck and Olson, 1977); Raritan Bay (Stainken and Rollwagen, 1979) and the Upper Hudson River (Simpson, 1982).

Since macroinvertebrates comprise a major ecological unit, results from this monitoring can be used to model PCB biological transport mechanisms in the Hudson River. In addition, they are potentially useful for fisheries resource management. According to Veith (in a personal communication cited in Malcolm Pirnie, Inc., 1980) PCB uptake in game fish occurs primarily by the food pathway when water column PCB levels are relatively low (i.e. less than 0.1 ug/l) and principally via the gill pathway when water concentrations are higher. Macroinvertebrates are an important dietary component for many game fish and consequently may be an important continuing source of fish contamination when concentrations of PCBs in the water column are low.

Analysis of macroinvertebrate tissues also offers advantages over water samples. These organisms rapidly bioconcentrate PCBs to levels many thousands of times greater than levels in the surrounding water. Because the concentrations are higher, the organisms can be more accurately analyzed than water samples. Grab water samples, unless taken frequently, may miss pulses in contaminant concentrations. Data for macroinvertebrate tissues integrate temporal fluctuations for the exposure period. Also, biological uptake of toxics is a variable and dynamic process which is determined not only by the properties of the compound itself but also by such factors as temperature, pH, and hardness of the ambient water (e.g. Braginski and Sheherban, 1978; Cairns et al., 1975; Kawatski and Bittner, 1975). Similar concentrations of the same toxic compound may display quite different uptake rates and bioconcentration factors in different bodies of water. One way of determining biological activity of toxics in a specific location is to collect and analyze macroinvertebrate tissues.

Table V-1 Average PCB concentrations in water, multiplate residues, and caddisfly larvae, 1977-1980. (DWB = dry weight basis; LB = lipid basis.) (Data compiled from USGS Water Quality Records, 1977-1980 and Simpson, 1982).

STATION	PCB CONCENTRATION								BIOCONCENTRATION FACTOR (X 10^3)			
	Water		Multiplate residues (ug/g)			Caddisfly larvae (ug/g)			Multiplate residues		Caddisfly larvae	
	N	ug/l	N	DWB	LB	N	DWB	LB	DWB	LB	DWB	LB
1	39	ND	15	0.5	37	14	5.2	27	*	*	*	*
2	108	0.2	21	8.7	381	25	34.9	208	43.5	1905	174.5	1040
6	71	0.5	15	9.1	615	26	43.4	256	18.2	1230	86.8	512
7	127	0.5	12	7.0	433	22	36.1	218	14.0	866	72.2	436
8	155	0.3	13	4.2	839	10	27.8	114	14.0	2797	92.7	380
9	10	ND	14	2.2	286				*	*		
10	19	0.2	11	3.6	388				18.0	1940		
11	16	0.2	12	2.2	176				11.0	880		
13	16	0.1	10	1.4	170				14.0	1700		
14	16	0.2	9	2.1	198				10.5	990		
15	10	0.2	10	1.6	158				8.0	790		
$\bar{X}$		0.2		3.9	334		29.5	164	16.8	1455	106.5	592

* = bioconcentration factors cannot be calculated because PCBs were not detectable in water samples.

Short-term Monitoring

Prior to dredging, field studies will be conducted to determine the uptake rate and bioconcentration factor for midge larvae exposed in the Upper Hudson River. The primary objectives of these studies will be to determine 1) the time required for the body burden of PCBs to reach equilibrium and 2) the variability of the sampling method.

During dredging, biweekly samples will be taken at three sites: 1) above the dredge site, 2) within the plume below the dredge site, and 3) at Schuylerville. The first two locations will reveal any increased PCB loadings caused by the dredging. The final site is located below all the areas to be dredged and will monitor the levels of PCBs being transported downstream. Sites 1 and 2 will be located above and below the dredge site. The complete portability of the sampling apparatus will allow the sampling sites to be adjusted whenever the dredging site is moved. The exposure sites will be located in areas with similar current speeds to assure that the control and test organisms are exposed to approximately the same volume of water during each test period.

Long-term Monitoring

Multiplate samplers will be installed during the first week in June each year at 16 sites, extending from Hudson Falls to Nyack (Figure V-1) At five-week intervals in July and August, the samples will be harvested and replaced with fresh unexposed samplers. After another five-week period in late September, the final set of samples will be collected.

Caddisfly larvae will be collected from five locations in the Upper Hudson River, extending from Hudson Falls to Waterford (Figure V-2). Sampling will be performed concurrently with the first day of multiplate activities beginning with the first week in June and then at five-week intervals in July, August, and September.

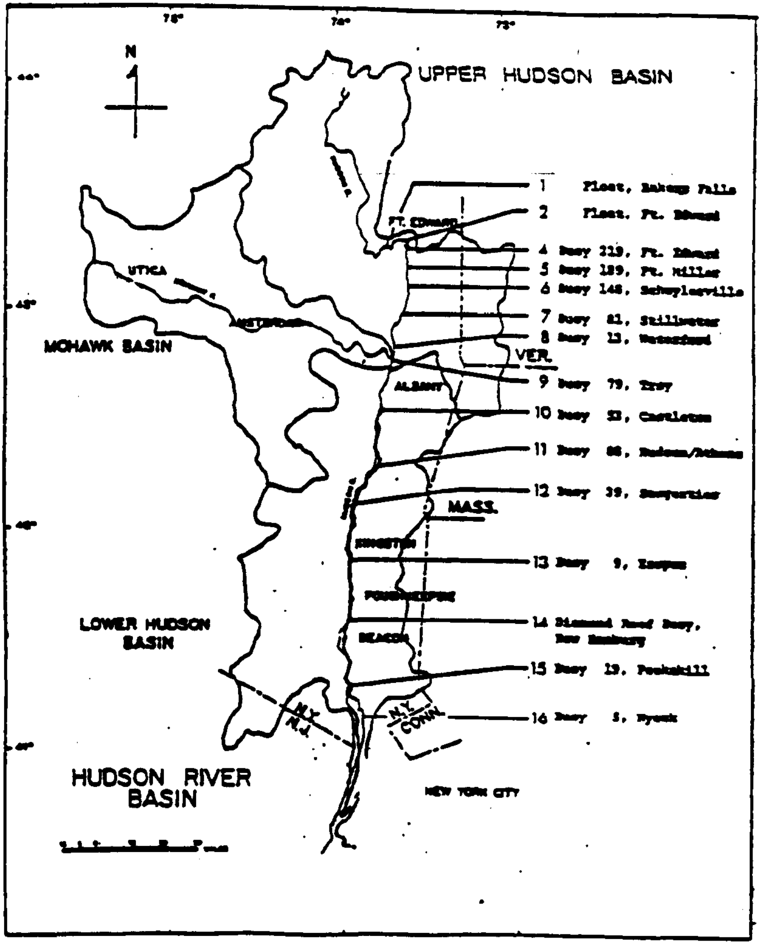

Figure V-1 Multiplate sampling sites.

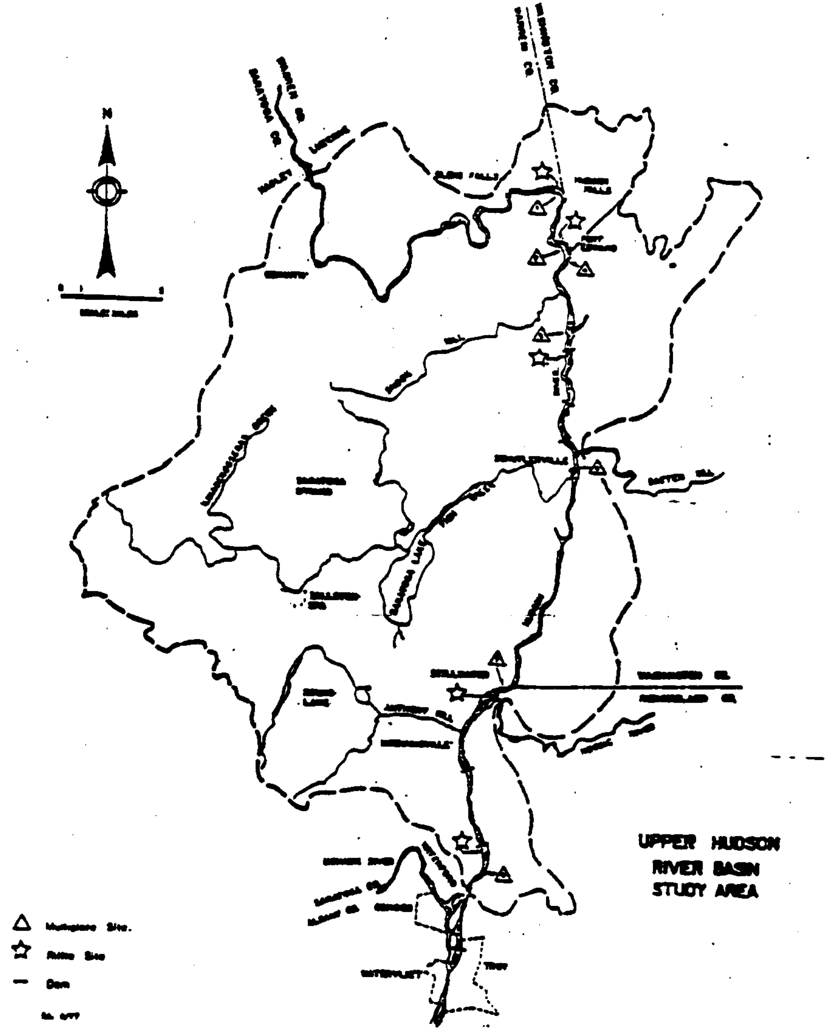

Figure V-2. Multiplate and caddisfly collection sites - Upper Hudson River.

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Field and Sampling Procedures

Short-term Monitoring. The laboratory colony of midge larvae will be maintained following methods in Biever (1965) and Townsend et al. (1981). To minimize possible contamination of the laboratory stock, all equipment (aquaria, aeration devices, etc.) will be non-plastic and solvent-rinsed before use; the water used will be carbon-filtered (available from the Media Unit, Center for Laboratories and Research).

Exposure packets will be constructed from nylon Nitex bolting cloth (360 micron mesh openings) as shown in Figure V-3. Prior to each exposure, mature midge larvae will be removed from the laboratory stock and divided into groups of approximately 200 mg wet weight (10-15 individuals). The number of individuals in each group and their combined weight will be recorded. One group will be retained for control purposes. It will be freeze-dried and later analyzed along with the exposed organisms to assure the purity of the laboratory stock. Each of the remaining groups will be placed in an exposure packet for test purposes.

The packets will be exposed at a depth of one meter beneath the surface and will either be housed in a stainless steel wire basket or suspended individually from small floats. Three-holed concrete blocks will serve as anchors. After exposure, organisms will be removed from the packets, counted, the number of dead larvae noted, placed on ice in solvent-rinsed glassware and returned to the laboratory. Within 24 hours they will be blotted dry, weighed, freeze-dried and reweighed, then submitted for analysis. Used exposure packets will be discarded.

The exposure period to be used during actual monitoring will be determined prior to the commencement of dredging. Test organisms will be placed in the pool above the Thompson Island Dam and retrieved after periods of 1, 2, 4, 8, 16, 24, 36, and 48 hours. The analytical results will be plotted against time, resulting in an uptake rate curve. Based on the literature (see Background Section), it is expected that equilibrium will be reached during this two-day test. If equilibrium is not reached, additional experiments will be performed with longer exposure times (e.g. one, two, three, four, and seven days) until equilibrium is reached. The exposure period to be used will be the lowest whole day number needed for body burdens of PCBs to stabilize in the midge larvae. Once the exposure period is determined, 10 cages will be exposed for the predetermined time and the results used to determine the consistency of this sampling method.

The above tests will be performed during periods of uniform flow in the Hudson River when PCB concentrations in the water column will be relatively constant. Water samples for PCB analysis will be collected at the beginning and at the end of each test and at whole day intervals for tests longer than 24 hours. The average PCB concentration in the water samples will be used to calculate bioconcentration factors for the midge larvae.

Monitoring will be performed biweekly during dredging activities. Three exposure packets will be used at each of the three sampling sites to allow methods are given above.

Long-term Monitoring. Multiplate samplers will consist of 10 plates of pressed hardboard, 15.2 cm (6 inches) square and 0.3 cm (1/8 inch) thick, mounted on an aluminum turnbuckle and separated by small hardboard spacers (Simpson, 1982). Samples will be collected at 16 sites (Figure V-1) in July, August, and September after exposure periods of five weeks each. Exposed samplers will be placed in galvanized steel buckets with 5-10 cm of river water, disassembled and cleaned with a wide-blade spatula. The entire contents of the bucket will be placed in a glass jar, sealed, placed on ice and returned to the laboratory. Within 24 hours, water will be removed from the samples by filtering under suction on No. 41 Whatman filter paper. The filtered samples will be weighed, freeze-dried, reweighed, and submitted for analysis.

Caddisfly larvae (Trichoptera:Hydropsychidae) will be collected with a D-frame aquatic dip net or by picking organisms directly off rocks removed from the river. Specimens will be placed on ice in solvent-rinsed glassware and returned to the laboratory. Within 24 hours, the specimens will be sorted according to size and identified to species (whenever possible) using Wiggins (1977) and Schuster and Etnier (1978). Conspecific specimens of similar size will be placed together for chemical analysis. The specimens will be blotted dry, weighed collectively, freeze-dried, reweighed, and submitted for analysis.

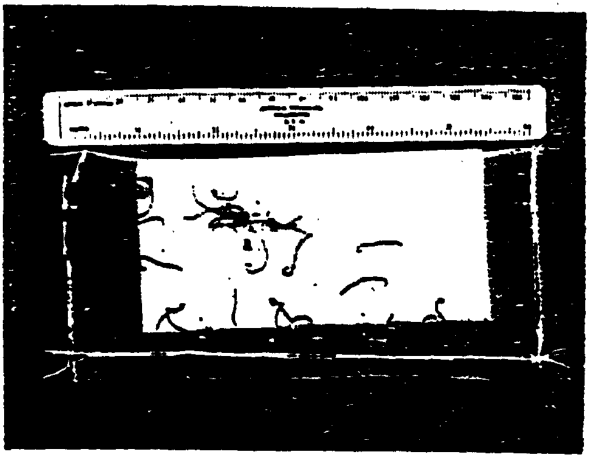

Figure V-3. Short-term exposure packet, containing mature larvae of *Chironomus tentans* Fabricius (Diptera:Chironomidae).

Each sample is to be extracted overnight (18 hr) with hexane on a Soxhlet apparatus, then evaporated to dryness on a rotary evaporator (T=45°C). The entire sample (or 300 mg aliquot of larger samples) is chromatographed on an activated Florisil column and eluted with 6 percent ethyl ether in petroleum ether. The eluate is concentrated to dryness on a rotary evaporator and diluted with hexane.

The resultant extract is analyzed on a Tracor 222 gas chromatograph equipped with a ^{63}Ni electron-capture detector operated in the DC mode. The detector temperature is 300°C and the inlet is 225°C. The column is operated isothermally at 185°C with a flow-rate of 60 ml/min of high-purity dry nitrogen. The column consists of a two-meter glass tube (2mm ID) packed with 10 percent SE-30 on Gas-Chrom Q 80/100 mesh. The detector output is analyzed by a Columbia Scientific Supergrator 3 programmable integrator.

PCB concentrations are calculated by comparison with external standards using the general equation

$$X \text{ ppm} = \frac{abe}{cd}$$

a = nanograms of standard represented by the standard peak
b = height (or area) of sample peak
c = height (or area) of standard peak
d = weight (mg) of original sample
e = dilution factor, derived as follows:

$$e = \frac{\text{ml of extracting solvent X volume of final extract (ml)}}{\text{aliquot of original extract (ml) X ul injected}}$$

Percent liquids are calculated as follows:

$$\frac{\text{weight of sample after Soxhlet extraction and rotary evaporation}}{\text{dry weight of sample}} \text{ X } 100$$

Responsible Parties

Principal Investigator - Dr. Karl W. Simpson, Research Scientist III, 20 percent of time

- Supervise and counsel Assistant to Principal Investigator during all aspects of program except sample analysis

- Handle administrative matters for the program

Analytical Supervisor - Mr. Sam Jackling, Associate Analytical Chemist, 20 percent of time

- Supervise chemical analysis of samples including extraction, clean-up, injection, calculation of results and performance of quality assurance activities

- Assure timely submission of results to Principal Investigator and Research Unit of the Department of Environmental Conservation

Assistant to Principal Investigator - to be appointed, Assistant Research Scientist, 100 percent of time

- Perform predredge and routine monitoring activities for short-term monitoring as described above, supervise and participate in laboratory and field work
- Assist with field work for long-term monitoring
- Perform chemical analyses on samples including extraction, clean-up, injection, and calculation of results
- Interpret results and prepare reports

Laboratory Technician (seasonal) - to be appointed, 100 percent of time

- Assist with field and laboratory activities as directed by Principal Investigator and Assistant to Principal Investigator

Financial Considerations

In support of this work, $77,077 is required. This will provide 18 months-of-service by an Assistant Research Scientist (State Grade 14), eight months-of-service by a Laboratory Technician (State Grade 9), travel expenses, supplies, and overhead to be paid to Health Research, Inc. These resources will be used to complete all aspects of the short-term monitoring and will help with the collection and analysis of samples for the long-term monitoring.

The salary of the Principal Investigator will be paid by funds from section 106 of the Pure Waters Act, administered jointly by the New York State Departments of Environmental Conservation and Health.

The Department of Environmental Conservation's Conservation Fund will provide the monies for the salary of the Analytical Supervisor and the necessary analytical equipment.

Quality Assurance/Quality Control

All materials used in the field and laboratory for holding and processing samples will be non-plastic and solvent-rinsed before use. As part of each short-term test, a sample of laboratory stock midge larvae will be analyzed to assure purity. Sample tracking records, such as those shown in the Quality Assurance Plan, will be kept for all samples.

The analytical laboratory will perform the following internal quality control checks

- At the beginning of the project, the initial Soxhlet extraction will be repeated to determine the percent recovery of the first overnight extraction
- Laboratory-generated replicates will be analyzed at the rate of one per 20 samples

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- Blanks (including reagent checks) will be analyzed at a rate of one per 20 samples

- Spiked blanks and spiked samples will be analyzed at a rate of one per 30 samples

Other procedures such as preventive maintenance and calibration of balances and recorders are given in Section 5 of the Quality Assurance Plan for this project.

DATA ANALYSES

Short-term Monitoring

The triplicate samples used for each exposure will allow the application of Analysis of Variance (ANOVA) and Least Significant Difference (LSD) tests to assess the significance of any differences in mean PCB concentrations between stations and between different exposure periods at the same station.

Long-term Monitoring

ANOVA and LSD tests can also be applied to the multiplate and caddisfly larvae data sets to detect significant yearly differences in PCB concentrations throughout the river. These tests have already been used to show significant differences for multiplate and caddisfly samples for the period 1977-1980 (Simpson, 1982).

REPORTING SCHEDULE

Short-term Monitoring

Samples will be analyzed monthly during dredging. Midge larvae from two consecutive biweekly exposures will be analyzed concurrently to make efficient use of personnel time and laboratory equipment. Sample extraction and clean-up will commence within one week from the time the second sample set is collected. Raw data and interpreted data will be transmitted to the Research Unit of the Department of Environmental Conservation within four and six weeks from the date of the second collection, respectively.

Long-term Monitoring

Analysis of multiplate samples and caddisfly larvae from each year will be completed by April 15 of the following year and the results transmitted to the Principal Investigator. A final report including interpreted results will be prepared by June 1 of the same year.

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SECTION VI. SEDIMENT MONITORING PROGRAM

PCB Unit and
Bureau of Water Research
New York State Department of Environmental Conservation

INTRODUCTION

For a 25 year period ending in 1977, an estimated 350,000 kg of polychlorinated biphenyls (PCBs) discharged to the Hudson River, accumulated in river sediments. PCB transport downstream by several mechanisms has resulted in contamination of river sediments throughout the 300 km reach of river and estuary of the Hudson River. Anthropogenic activities including dredging and removal of a dam at Fort Edward, have also mediated transport of PCBs downstream.

While the spatial distribution of sediment PCB concentrations is highly variable, there is a marked gradient in sediment PCB downstream. Bopp (1979) has estimated that more than 157,000 kg of PCBs reside in the sediments of the Upper Hudson extending 80 km southward from Fort Edward to the Federal Dam at Troy. Approximately 76,000 kg are in the sediments of the 240 km tidal river and estuary below the Troy Dam.

Riverwide PCB contamination has resulted in partial restriction of commercial fishing and recreational fishing in the Upper Hudson (see page IV-3). Several measures, including the elimination of the PCB discharge and stabilization of nearshore sediment deposits exposed following removal of the Fort Edward Dam, were implemented to accelerate the return of fish PCB concentrations to acceptable levels. Concern for potentially prolonged contamination of the Hudson River fishery and the present opportunity to reclaim, at a reasonable cost, a large PCB mass in the most contaminated reach support the proposed demonstration of dredging and encapsulation of contaminated sediments from the Thompson Island Pool.

Earlier investigations of sediment PCB distribution in the proposed dredging area indicated twenty discreet "hot spot" areas having an average PCB concentration in excess of 50 ppm (Tofflemire and Quinn, 1979). More than 300 sediment samples, including approximately 100 cores collected from the Thompson Island Pool for PCB and texture analyses, in addition to bathymetric information, accommodated a delineation of hot spot areas (see Tofflemire and Quinn, 1979). The results indicated considerable spatial variability in PCB distribution in the Thompson Island Pool. The results of these investigations also indicate that the material occupies a relatively shallow stratum within the sediment bed. The composition of sediments, i.e. particle size and organic content, accounted for much of the variability in the distribution of PCBs in the project area. The heterogeneous distribution of PCBs in the project area poses some problems for efficient removal by dredging. The removal efficiency must be controlled, not simply monitored, during the operation. Finally, the PCB distribution in the river's post-dredging repose must be documented to permit assessment of river response and subsequent evaluation of the overall effectiveness of the demonstration project.

The sediment monitoring program has the following objectives:

- improve the definition of areas to be dredged including prioritization based upon credibility;

- improve dredging efficiency during the project;
- document the post-dredging repose of PCB-contaminated sediments in the Upper Hudson for the purpose of assessing the river's response to dredging and net effectiveness of the demonstration project; and
- define the mass of PCBs encapsulated in Site 10.

MONITORING STRATEGY

Areas to be dredged in the Thompson Island Pool will be defined based upon additional sediment PCB data and potential erodibility. A bathymetric survey of the Thompson Island Pool will be performed using a 25-foot sounding grid and having horizontal and vertical accuracy specifications of ± 6 ft., ± 0.5 ft. The survey data, in addition to existing sediment PCB and sediment composition data sets, will be used to direct the pre-dredge sampling of river sediments. Additional sediment PCB and composition analyses will be used to delineate, vertically and horizontally, areas containing greater than 50 ppm PCBs. The distribution of heavy metals, in particular lead, will be assessed using vertically integrated sediment samples. The relationship between ^{137}Cs and PCB concentrations will be advanced for later use as a surrogate analysis for decisions concerning dredging efficiency. During dredging, bathymetric, PCB, and ^{137}Cs measurements will be used to assess the effectiveness of dredging and to formulate recommendations for improvement of the dredging methods.

During the late spring and summer following dredging, the Thompson Island Pool, in addition to other areas in the Upper Hudson, will be resampled to define the post-dredging repose of PCB-contaminated sediments in dredged and undredged areas. This information in addition to data collected by the water monitoring program and an investigation of sediment-water PCB interactions (see Appendix B), will be used to assess the effectiveness of the demonstration project.

Following some stabilization of the sediments in the containment site, the encapsulated sediments will be sampled to determine the mass of PCBs contained by the site.

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METHODOLOGY

Field and Sampling Procedures

The bathymetric survey of the Thompson Island Pool will be conducted by Raytheon Ocean Systems Company (ROSC), East Providence, Rhode Island. Copies of the request for proposals and the ROSC proposal and contract are on file at NYSDEC. The following excerpt from the ROSC proposal provides an overview of the ROSC approach:

> ROSC proposed to utilize the "Mobile Mapper" data acquisition system, a Motorola Mini-Ranger III electronic navigation system, and the Raytheon DE-719B Fathometer to acquire bathymetric data in the survey area. The "Mobile Mapper" system was developed by ROSC to provide a flexible data acquisition system for hydrographic surveys. The system, based on a Hewlett-Packard 9825 computer/calculator, provides survey pre- and post-plots, real time track plots, helmsman information, and magnetic data recording.
>
> The survey vessel, a 22-foot Aquasport with a cabin to house the electronic equipment, will be outfitted with a unique strut assembly, providing optimal mounting for the transducer and navigation system responder to facilitate shallow water data acquisition. The transducer itself will be mounted at the top of a water filled cylinder with an acoustically transparent diaphragm at the bottom. This configuration compensates for a shallow water sounding limit of approximately 1.5 feet, based on the DE 719B transducer "ring down" characteristics.
>
> All survey lines and responder coordinates will be plotted on "boat sheets" prior to the start of survey operations. This procedure will optimize survey time and preclude data gaps by providing a precise, efficient sequence of survey events. All data products will be produced at Raytheon's computer facilities, utilizing state-of-the-art hardware and software.

The data products of ROSC will include: 1) contouring plots of mylar having a scale of 1 in. = 50 ft. with a 250' grid of New York State Plane Coordinate system; 2) approximately 1075 lateral cross sections on mylar at the 25 ft. intervals; 3) annotated data printouts and analog depth soundings; and 4) a data tape containing plane coordinates and soundings, accompanied by written documentation.

Sediment cores will be collected from the Thompson Island Pool during summer and autumn, 1982, by NYSDEC personnel using a 24' pontoon boat and pneumatic coring equipment. Sampling locations will be generally located based upon the existing data set and the bathymetric survey. A range-azimuth digital positioning system will be used to precisely define sampling locations in the field. In the field, visual inspection of material in benthic grabs and bathymetric features of the area measured by a fathometer will guide positioning of cores. The role of bathymetric features such as sandwaves, in contributing variability to the spatial distribution of PCBs, will be given special consideration. Assessment of sampling errors will be the goal of several discreet studies.

Cores will be extruded, sectioned in the field, and placed in appropriately labelled containers required for the individual analyses to be performed. Cores will be sectioned arbitrarily in lieu of visible strata. An average of four sections per core are anticipated.

Graduate students from Rensselaer Polytechnic Institute, under the direction of Dr. Thomas Zimmie, will measure sediment shear strength using vane shear equipment during the pre-dredge sampling survey. Data to be recorded in the field will include location on the New York State coordinate system, depth of water adjusted to the spillway elevation of the Thompson Island Dam, core section intervals, core length, and vane shear strength. In addition, core compaction and qualitative comments regarding sample type will be logged.

The post-dredging sampling will use the same sampling methods but will not be limited to the Thompson Island Pool. Horizontal control for both pre- and post-dredging surveys will use the extensive baseline traverse established by Norman Porter Associates in 1980. Initially, during dredging, the effectiveness of contaminated sediment removal will be made using an analog fathometer. Grab sediment samples, collected by a Ponar or Shipek grab, in addition to core samples will be taken with special consideration to the altered, and probably irregular, bathymetric features of the dredged areas. Compositing of grab samples will be used to overcome problems of spatial heterogeneity in dredged areas. The digital range-azimuth positioning system will be used for locating samples and bathymetric transects.

Following some stabilization of dredged material at the containment site, the site will be sampled to determine the mass of PCBs being isolated. Soil coring equipment will be used, in conjunction with an intensive sampling and vertical and horizontal compositing scheme, to define the total mass of PCBs in the site by analysis of a limited number of samples.

Sample Analyses

Sediment samples collected during summer 1982 for the refinement of hot spot locations will be analyzed for PCBs by Syracuse Research Corporation (SRC) and to the PCB Project Laboratory. The availability of analytical resources in an existing contract between SRC and NYSDEC, delays in the development of the project's laboratory, and the need to develop dredging specifications in the immediate future supported the decision to initially use a contracted laboratory. Approximately 200 sediment samples will be performed by SRC. Subsequent analyses will be analyzed by the project's laboratory. Both laboratories will routinely use packed column gas chromatography.

Samples will be stored frozen until analysis by the project laboratory. River sediments and interstitial sediment water will be analyzed for heavy metals by atomic absorption spectrophotometry at the Environmental Health Institute of the New York State Department of Health. Sediment texture analyses will be performed by the Project Laboratory. Particle size analysis will be performed on a limited number of sediment samples using a pipette method at the Soils Characterization Laboratory, Department of Agronomy, Cornell University. ^{137}Cs analysis will be performed on selected sediment samples collected by the predredging survey in addition to sediment samples collected during dredging. The contract for ^{137}Cs analysis will be either negotiated with the New York State Department of Health or bid through an RFP process.

Responsible Parties

Messrs. Jeffrey Schmitt and Michael Willis, NYSDEC, will be responsible for the overall sediment monitoring program. The pre-dredge bathymetric survey contract being conducted by Raytheon is supervised by Michael Willis. Dr. Sujit Banerjee, Syracuse Research Corporation, and John Ryan, NYSDEC, will be responsible for sediment PCB analyses. Dr. Liquat Hussain, NYSDOT, will be responsible for heavy metals analyses. Dr. Kenneth Olsen, Cornell University, will be responsible for particle size analysis. Dr. Thomas Zimmie will be responsible for definition of hot spot erodibility.

Data Analysis

Pre-dredge sediment PCB data will be managed and analyzed using a Univac 1100 computer. The distribution of sediment PCB in the Thompson Island Pool will be mapped by a digital mapping system to delineate dredging areas using PCB texture and bathymetric data. The distribution of heavy metals in dredged areas in both sediments and interstitial water will be analyzed using a hydraulic dredging model developed by Adams and Darby (1980) to project heavy metal concentrations in the containment site effluent.

During dredging, sediment PCB and ^{137}Cs concentrations in surficial sediments of dredged areas and bathymetric measurements will be used to assess hot spot removal efficiency. Such analyses will be conducted within a few days of sample and data collection to permit redredging if necessary. The post-dredging survey information will be employed with the dynamics of sediment water interactions developed by a contracted research investigation (Appendix A) and the data from the long-term water monitoring program to assess river recovery and response to dredging.

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SECTION VII. PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT FROM DISPERSION OF PCBS RESULTING FROM THE HUDSON RIVER PCB RECLAMATION DEMONSTRATION PROJECT - A PROTOCOL FOR DECISION MAKING

Bureau of Water Research
Division of Water
NYS Department of Environmental Conservation

Protection of Human Health and the Environment from Dispersion of PCBs Resulting from the Hudson River PCB Reclamation Demonstration Project

Protocol for Decision Making

Introduction

The major objective of the project is to restrict the long-term environmental dispersion of PCBs currently located in the sediments of the Thompson Island Pool for the protection of human health and environmental resources. The activities of the project have the potential to increase, for an assumed short period, the rate of PCB dispersion in the environment.

In assessing the Project's technical feasibility and the net human health and environmental benefits, projections and past experience were employed. That is, the likelihood of exceeding certain PCB concentration limits, which were assigned by environmentally protective means, was assessed by application of a substantial body of PCB environmental and human health research and the Department's experience in monitoring dredging procedures in the Hudson River. On balance, the likelihood of exceeding those protective limits and the costs of contingency measures to bring concentrations within acceptable levels are outweighed by the benefits of the project.

Assuming that certain PCB environmental concentration limits should not be exceeded, the tasks to be undertaken are the measurement of environmental concentrations during the project's active phase and the determination of whether those levels are acceptable, and, if not, the types and duration of responses to bring concentrations to acceptable levels. The strategy and methods of assessing environmental levels have been presented in detail in previous chapters of the monitoring plan.

The decisions concerning the acceptability of monitoring results and appropriate responses are the major topics of this section. The environmental concentration limits controlling the decision making process and their technical bases are summarized in Table 1. The Division of Water, NYSDEC, has assumed the protective posture that "levels of concern" are levels that should not be exceeded.

Background and Strategy

The formulation and testing of hypotheses is essentially the heart of decision theory. In the statistical testing of hypotheses, acceptance of the hypothesis as true means that there is insufficient reason to reject it. However, rejection of the hypothesis is the conclusion that it is false. To best serve the interests of the decision makers, hypotheses must be carefully stated. Generally, that which one hopes to reject should be stated as the hypothesis.

The interpretation of analytical results will use the null hypothesis: the environmental concentration is at or above the acceptable limit concentration. Based upon sampling and analytical errors, and a limited number of samples, there is a definable chance that one would reject this hypothesis when it is true. An example of such a type I error would be an assessment that environmental conditions would be acceptable, when, in fact, the true concentration exceeds limits. There is also a chance that on occasion one would accept the hypothesis while it is false. Expression of such a type II error would be an assessment that environmental conditions are unacceptable when, in fact, they are. For this hypothesis, the consequence of a type I error could be the compromising of human health and environmental protection. The consequence of a type II error would be the needless use of project resources to assure that levels are acceptable. In the field of statistical testing of hypotheses, α is typically defined as the probability of a type I and β the probability of a type II error. The values of α and β are interrelated such that design to minimize type I errors increases the likelihood of type II errors.

The environmentally conservative focus on restricting the incidence of type I errors that this program will use, leaves the probability of type II errors undefinable unless specific alternate hypotheses are formed. A specific hypothesis will be used to assess the probability of a type II error.

The first part of the strategy to be employed in screening results as they come from the project laboratory assigns specific concentrations for response based upon a designated probability of type I errors. The assignment of these concentrations is a function of both the acceptance of a value of α and the sampling and analytical errors that will be assumed known and having a normal probability distribution.

In this program two values, α_1 and α_2 equal to .05 and .25, respectively, are used to calculate two concentrations, C_1 and C_2, relative to a defined concentration limit, C_L. Results greater than C_2 will elicit the response of implementation of contingency measures and accelerated data collection. Results greater than C_1, but less than C_2, will be responded to by increasing the intensity of data collection. Results less than C_1, will not require a response.

The general formula for calculating C_1 and C_2 (C_n) is

$$C_n = Z\,[\alpha_n]\,\sigma + C_L$$

where $Z[\alpha_n]$ is the ordinate associated with the cumulative area under the standard normal distribution equal to .05$[\alpha_1]$or .25 $[\alpha_2]$ and σ is the theoretical population standard deviation attributable to sampling and analytical errors.

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For the air concentration limit of 1 ug/m³ (C_L) and a combined air sampling and analysis population standard deviation, σ = .15 ug/m³ as proposed by the project's QA-QC plan, and $Z_1(\alpha_1 = .05)$ = 1.645, C_1 = .75 ug/m³. A summary of results of C_1 and C_2 calculations for various limits and the presently assumed values for are presented in Table 2. Table 2 also presents the probabilities for a type I error when the actual environmental concentration is 2 C_L and for type II error when the actual environmental concentration is 0.5 C_L. One can see that the probability of not responding to a true environmental concentration of twice the level not to be exceeded is extremely small. The probability that one would implement a contingency measure when the true environmental concentration is half the level which should be exceeded is less than 10 percent for water samples and less than 0.4 percent for air samples. Presently, the values of σ are best estimates and would be updated during the course of the project based upon QC data. Subsequent to approval of the project an APL interactive program would be developed for the project management to assess type I and type II errors for other values of α , σ , C_L, C_1 and C_2.

A general decision making protocol was developed to eliminate the need to address each of many unique possible series of occurrences and decisions following the production of a monitoring result greater than C_1. The protocol is presented in algorithmic fashion in Table 3. The general attributes of the protocol in addition to some possible variations for problems related to specific sources will be described.

The increased intensity of data collection that follows the production of a result greater than C_1 involves replication of sampling and analyses and testing the hypothesis that the sampling mean, $\bar{X}$ is equal to C_L or 10 C_L at the .05 level of significance. Sampling mean values equal to, or exceeding, C_2 will result in the implementation of contingency options for remedy of the situation or if contingency options have been exhausted, cessation of the project activity identified as the likely contributor to the unacceptable condition. If sample means exceed the arbitrarily defined level of 10 C_L, then the probable project activity producing that contribution would be halted. The protocol provides for the graded implementation and maintenance of contingency options and cessation of project activities in addition to the relaxation of contingency options and the resumption of project activities. Data collection will generally be determining the rate of decision making and 24 hours can be generally assumed as the time required to update sample means.

Table 4 provides the array of contingency options to reduce the potential sources of PCB dispersion and protect human health during periods of unacceptable exposure to PCBs.

As might be expected by a protocol that attempts to describe a course of action embracing most possibilities, it is deficient in some specific areas. By design the protocol is reactive, that is, decisions concerning data collection and contingency measures are in response to existing conditions. In application, some forecasting, based upon prior research, and experience gained during the course of the project should permit the protocol to be more active. For example, knowledge of the effects of certain meteorological conditions and PCB losses to the atmosphere, or hydrological conditions and time of travel to the expression of PCB losses from the dredge head, at the Waterford Water Treatment Plant should permit a prior assessment of conditions and determine the appropriate response. Such projected values would be treated as the sample mean $\bar{x}$ in stages 2 and 4 in the decision making protocol.

Upon project approval, the decision making protocol would be made available to project management through an interactive APL program.

Table 1. Environmental PCB Concentrations Not to be Exceeded as a Result of Project

Environmental Component	Target	EMP Description (section-pages)	PCB Level (C_L)	Defined by	Likelihood of Occurrence	Basis for Assessment
Water	Public water supply at Waterford	II - 4,8,9	1.0 ug/l in treated water	NYSDOH recommended guideline level levels.	Maximum elevation expected in river water due to dredging and return flow is 0.8 ug/l above ambient PCB levels. The dredge plume is not expected to extend beyond 1.6 km downstream. Since the Waterford intake is 12 km downstream of dredging activity and a 90 percent PCB removal efficiency during water treatment has been demonstrated it is unlikely that the 1.0 ug/l will be exceeded.	MPI feasibility studies on dredging PCB-contaminated sediments; O'Brien & Gere Hudson River water PCB Treatability Study.
	Private drinking water wells	II - 4,8,9	0.1 ug/l	6 NYCRR Part 703, PCB groundwater standard for class GSA waters.	PCB migration through clay materials is exceedingly slow; contamination is highly unlikely.	Theoretical migration rates of water and PCBs through clay materials in MPI feasibility studies.
	Treatment facility effluent	II - 4,8,9	100 ug/l	SPDES effluent limitations	Exceedence of this limit for a 24 hr. period would require the handling of a very large sediment mass containing more than 1,000 ppm PCB. Exceedence is considered unlikely.	MPI elutriate tests and estimates based upon partitioning theory.
Plants	Forage crops	III - 1,3	0.2 ug/g	FDA tolerance level for feed	Crop contamination above the FDA limit may occur at air	By extrapolation using PCB data from plants

				producing animals	PCB levels of 0.03 ug/m^3 and above. Such levels may be anticipated within 800 m of the containment site (i.e. the easement area).	growing in known air concentrations in studies conducted by BTI.
Air	<u>Worker exposure</u> Containment site	I - 3,4,5,7,8	0.5 (54% Cl) to 1.0 (42%Cl) mg/m^3	NIOSH time-weighted average for 10-hr work-day, 40-hr workweek	Highest atmospheric PCB level anticipated at lagoons is three orders of magnitude lower than NIOSH standard. Higher than calculated levels could occur at non-quiescent area near influent pipe and during adverse meteorological conditions.	HydroQual estimates of maximum probable flux to the atmosphere based upon partitioning theory; WAPORA and MPI model calculations of critical dissolved PCB concentrations in lagoons.
	Unloading area	I - 3,4,5,7	0.5 (54% Cl) to 1.0 (42%Cl) mg/m^3	NIOSH time-weighted average for 10-hr work-day, 40-hr workweek	Total atmospheric PCB levels resulting from cumulative flux of PCBs from exposed sediments held on barges and slurried for transport, river water, and the containment site itself depend upon surface area and concentration of PCB in exposed sediments, slurrying procedures, and meteorological conditions.	PCB air data from NYSDEC/DOH investigations at dump sites, dredge spoil and remnant areas, and dams; HydroQual, WAPORA and MPI estimates of PCB flux rates.
	Dredge	I - 3,4,5,7	0.5 (54% Cl) to 1.0 (42%Cl) mg/m^3	NIOSH time-weighted average for 10-hr work-day, 40-hr workweek	Maximum probable increase over ambient in total PCBs in river water are 0.3 ug/l for hydraulic and 0.4 to 0.5 ug/l for clamshell dredging. Volatilization from river water would be minimal at both levels. Greater impact on air PCB levels is anticipated with clamshell than with hydraulic dredging due	MPI feasibility studies on dredging of PCB-contaminated sediments, using loss rate estimates for dredging procedures during low flow; NYSDEC/DOH PCB air data.

				to agitation of water and exposure of sediments and interstitial water on barges.	
<u>Residential exposure</u> Nearest Residence	I - 3,4,5,7,8	1.0 ug/m³	NYSDOH 24 - hour average ambient air guideline	Air PCB levels at residences near the unloading area depend upon factors listed in preceding category. The standard for residential exposure, which is 10^3 times lower than for workers, is the more likely to be exceeded.	See above.

Table 2. C_L, C_1, C_2 concentrations and specific type I and type II error consequences.

Concentrations					Error Probabilities	
C_L	Units	σ	C_1	C_2	Type I at 2 C_L when $x = C_1$	Type II at 0.5 C_L when $x = C_2$
1.0	ug/l (water)	0.25	.59	.83	<.0002	.09
0.1	ug/l (water)	0.025	.06	.08	<.0002	.09
100.0	ug/l (water)	25.00	59.0	83.0	<.0002	.09
0.2	ug/g (plant)	0.05	.12	.17	<.0002	.09
1.0	mg/m^3 (air)	0.15	0.75	.90	<.0002	.004
1.0	ug/m^3 (air)	0.15	0.75	.90	<.0002	.004

* See Table 1.
** See Project QA-QC Plan.

Table 3. General Protocol for Decision Making

1.) <u>Project status (PS) is active.</u> Contingency options (OPTNO) not in effect. Routine monitoring produces result x. First level of data interpretation assumes population standard deviation σ, is know.

PS = 1
OPTNO = 0
if $x \le C_1$, go to 1
if $C_1 < x < C_2$, go to 2
if $C_2 \le x$, go to 3

2.) <u>Data collection at increased intensity.</u> Increased replication accommodates assumption of unknown σ and produces the sample mean, $\bar{x}$.

if $\bar{x} < C_L$, go to 1
if $C_L \le \bar{x} < 10\,C_L$, go to 3
if $10C_L \le \bar{x}$, go to 7

3.) <u>Implementation of contingency measures.</u>

OPTNO = OPTNO + 1
COUNT = 0
Implement Option [OPTNO]
Go to 4

4.) <u>Increase, or maintain increased data collection intensity.</u> Evaluate response to Option OPTNO if project status is active (PS = 1), or to cessation of certain project activities (PS = 0). Assume σ is unknown; produce sample mean, $\bar{x}$.

if ($\bar{x} < C_L$) and (COUNT < 1) go to 5
if ($\bar{x} < C_L$) and (COUNT ≥ 1) and (PS=1), go to 6
if ($\bar{x} < C_L$) and (COUNT ≥ 1) and (PS=0), go to 8
if ($C_L \le \bar{x} < 10C_L$) and (OPTNO < 3), go to 3
if ($C_L \le \bar{x} < 10C_L$) and (OPTNO ≥ 3), go to 7
if ($\bar{x} \ge 10C_L$), go to 7

5.) <u>Maintenance of contingency measures.</u>

Maintain Option [OPTNO]
COUNT = COUNT + 1
Go to 4

6.) <u>Relaxation of contingency measures.</u>
Relax Option [OPTNO]
OPTNO = OPTNO − 1
if OPTNO = 0, go to 2

7.) <u>Cease project activity producing unacceptable conditions.</u>

PS = 0
if OPTNO < 3, go to 3
if OPTNO ≥ 3, go to 4

8.) <u>Resume project activity</u>

COUNT = 0
PS = 1
go to 4

Table 4. Contingency Options

Environmental Component - Water

Target	OPTNO	Description
Public Water Supply at Waterford	1	Reduce cutterhead RPM and swing speed to minimize losses at dredge.
	2	Utilize cross-connection with city of Troy water system.
Private Drinking Water Wells	1	NYS Department of Environmental Conservation will immediately provide alternate water supply.
Water Treatment Plant Effluent	1	Increase polymer dosage rate at water treatment plant.
	2	Initiate polymer feed in containment cell overflow weir.
	3	Reduce cutterhead RPM, pumping rate and swing speed to minimize shear forces and decrease overflow rates at water treatment plant.

Table 4 - Contingency Options

Environmental Component - Air

Target	OPTNO	Description
Containment Site	1	Increase polymer dosage rate at water treatment plant.
	2	Initiate polymer feed in containment all overflow weir.
	3	Reduce cutterhead RPM, pumping rate and swing speed to minimize shear forces and decrease overflow rates at water treatment plant.
	4	Apply Powdered Activated Carbon (PAC) to water surfaces.
Unloading Area	1	Limit number of loaded barges in area.
	2	Cover all barges to reduce volatilization.
Dredge	1	Alter filling procedures to minimize surface area of containment sediment.

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APPENDIX A. Request for a Proposal: Volatilization of Polychlorinated Biphenyls (PCBs) from Contaminated Sediments and Water

A. Statement of Problem

The Hudson River PCB Reclamation Demonstration Project is a federally funded project proposing to dredge and encapsulate River sediments contaminated with PCBs. During the removal and storage of nearly one million cubic yards of sediment, which contain an estimated 137,000 pounds of PCB, nearly 40 acres of contaminated sediment and water will be exposed to the atmosphere. Past research on the behavior of PCBs (Doskey and Andren, 1981; Pal et al., 1980; Kalmaz and Kalmaz, 1979; Pavlou and Dexter, 1979; Paris et al., 1978) indicates that the potential for volatilization from water and sediment held at the containment site should be seriously examined. These studies also demonstrate that the measurements and modeling of PCB flux from water and sediment are complex. It is important, nonetheless, to be able to predict the dispersion of PCBs from the containment site to determine whether its operation will be in compliance with health and environmental standards and whether the implementation of contingency measures should be considered.

Work by Buckley (1980) indicates that plant PCB contamination above FDA limits could occur in the area adjacent to the containment site. The projection of crop losses is desired to minimize the disruption of farming. While the PCB mass emission rate to the atmosphere is perhaps the most critical information for such an analysis, it is presently the most difficult to accurately assess.

B. Background

Data currently available for evaluating the flux of PCBs from water and sediment are sparse. Although solubilities of the various PCB isomers and commercial mixtures have been determined, vapor pressure data are available for only a few isomers and the Aroclor mixtures (Westcott and Bidleman, 1981; Murphy et al., 1981; Mackay et al., 1981). Volatilization of various Aroclor mixtures from water and from PCB-contaminated sediments was measured in laboratory tank tests (Hetling et al., 1978), and the results of these studies have been used to estimate the loss and dispersion of PCBs from the containment site (Malcolm Pirnie Inc., March, 1981). These predictions are based upon data from an experiment using a saturated aqueous solution of Aroclor 1242. Other Aroclor mixtures have been identified in Hudson River sediments as well (Bullar et al., 1976), and over the 25 years that PCBs have existed in the sediments individual components have undoubtedly undergone weathering. For the purpose of predicting losses of PCB at the containment site, it is therefore necessary to determine flux rates of the particular PCB components that currently reside in Hudson River sediments.

PCB concentrations measured in air samples collected above several Hudson River dredge spoil disposal sites were directly correlated with PCB concentrations in the dredged sediment (Tofflemire et al., 1981). At those sites average ambient PCB air levels ranged from 0.3 to 130 ug/m^3 and sediment concentrations were 20 to 50,000 ug/gm (Tofflemire et al., 1981). It is expected that sediments handled in the proposed Hudson River dredging project will average 100 ppm PCB during the first year of operation (Malcolm Pirnie, Inc., 1980). Using desorption theory, the dissolved PCB concentrations in water held at the site are expected to be in the range of 10-20 ug/l (DEC, 1981). DiToro and O'Connor (US EPA, 1981) have calculated, by relating sediment PCB concentration and the desorption coefficient to the percent volatile solids in the sediment, that the dissolved PCB concentration will not exceed 40 ug/l.

The rate of PCB flux from the contaminated sediments and water at the containment site will also be affected by environmental prarameters such as temperature and wind speed. These factors will be taken into account when predicting concentrations of PCB at the site and its surrounding area.

C. Scope of Work

Experimental

The proposed work would result in a means to accurately assess the mass emission rate of PCBs from the surface of the containment area throughout the dredging operation.

Studies should be designed to examine volatilization processes under conditions similar to those encountered at the containment site. It is initially recommended that Hudson River hot spot sediments (> 50 ppm PCB) be employed in the studies. The composition of PCBs in those sediments should be characterized; flux measurements should be based on these interpretations. Relevant environmental parameters should be considered in the design of the study. Errors associated with varying collection efficiencies for PCB compounds and with the use of standard Aroclor interpretation when measuring PCB volatilized from Hudson River sediments should be addressed.

Data Analysis

A calibrated mathematical tool for predicting PCB volatilization as a function of temperature, dissolved PCB concentration, and other relevant factors for sediment/water mixtures and wet sediment should be provided. A rational rather than purely empirical mathematical framework is desired. A final report will be submitted by June, 1983.

D. Instructions and Conditions for Preparation of Proposals

If interested, after reviewing the Scope of Work, potential contractors should submit a proposal to the Department of Environmental Conservation by April 1, 1982. This proposal in addition to clearly outlining the contractor's proposed approach to the study should include the following:

1. What background and expertise does the potential contractor have which he could supply to the project?

2. Cost and price analysis.

Proposals need not be submitted in elaborate format nor in expensive binders.

Final selection of a contractor will be dictated by an evaluation of the contractor's proposed approach to the problem, previous experience in carrying out services of this type, technical expertise and knowledge in the area, cost and overall management capability for carrying out the proposed work. Criteria to be considered in the evaluation of respondents for submission of proposals will include:

1. Specialized experience and professional competence of the respondent and its personnel (including a joint venture or association subcontract) in connection with the type of services required and the complexity of the project;

2. Past record of performance on contracts with the grantee or with others, including such factors as control of costs, quality of work, and ability to meet schedules;

3. Special consideration for small and minority businesses;

4. Capacity of the respondent to perform the work (including any specialized services) within the time limitations, taking into consideration the current and planned workload of the responent;

5. The familiarity of the respondent with types of problems applicable to the project; and

6. Avoidance of personal and organizational conflicts of interest prohibited under State and local law.

In preparing the proposal, the following conditions will be acceptable:

1. If a potential contractor feels that different approaches and/or additional work would be desirable, he should describe and quote them.

2. Specific rigid, detailed time schedules will be required.

3. All equipment purchased with funds to carry out the project will become the property of the Federal government at the completion of the project unless otherwise specified.

4. The potential contractor should indicate the manner in which the data would be reported.

This Request for Proposal does not commit the New York State Department of Environmental Conservation to award a contract, to pay any cost incurred in the preparation of a proposal to this request, or to procure or contract for services or supplies. The Department reserves the right to accept or reject any or all proposals received as a result of this request, to negotiate with any qualified source, or to cancel in part or in its entirety, this RFP, if it is in the best interest of the Department to do so. The Department may require the offerers selected to participate in negotiations and to submit such price, technical or other revisions of their proposal as may result from negotiations.

Any contract awarded under this (invitation for bids or request for qualifications/proposals) is expected to be funded in part by a grant from the United States Environmental Protection Agency. This procurement will be subject to regulations contained in 40 CFR Subchapter B, and particularly Part 33 thereof. Neither the United States nor the United States Environmental Protection Agency is nor will be a party of this (invitation for bids or request for qualifications/proposals) or to any resulting contract.

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APPENDIX B. Request for a Proposal: Release of Polychlorinated Biphenyls (PCBs) from Contaminated Hudson River Sediments

A. Statement of Problem

During a 30-year period ending in 1977, over 500,000 pounds of polychlorinated biphenyls (PCBs) were released into the Upper Hudson River. Results of extensive sampling conducted over the past five years indicate that more than half the discharged mass of PCBs remains in the 200-mile downstream portion of the river (MPI, 1980). Analyses of water and sediment samples (Tofflemire et al., 1979; Hetling et al., 1978) demonstrate that bed sediments, which were a major sink for PCBs during the discharge period, presently act as the major source of PCBs into the water column. In order to reduce the contribution of PCBs from bottom materials and to mitigate the adverse impacts of present levels of PCBs in the Hudson River water column, the New York State Department of Environmental Conservation (NYSDEC) proposes to dredge and encapsulate a portion of the PCB-contaminated sediments (MPI, 1980; US EPA, 1981). The project, as currently proposed, would remove approximately one-third of the PCB contaminants; the remaining PCBs will be subject to natural removal processes.

An investigation of the mechanisms which determine how PCBs are released from Hudson River sediments is required at this time in order to more accurately define bed sediment/water interactions affecting PCB transport and thereby accommodate an assessment of the long-term response of river recovery after dredging.

B. Background

Previous hydrological studies consisting of three years of analytical data and flow measurements at three stations on the Hudson River indicate that release and transport of PCBs from bed sediments are flow dependent. Minimum levels of PCBs were detected in water samples collected during intermediate river discharge rates (400-800 m^3/sec), whereas PCB concentrations rose from minimum values with both increasing and decreasing discharge rates (Turk, 1980; MPI, 1980). Two mechanisms for PCB release from sediments with respect to flow have been suggested:

(1) During low flow, PCBs in the water column are primarily in the dissolved phase, and their concentrations are determined by nearly constant rates of desorption from and migration through sediment materials.

(2) During periods of high flow, PCBs are transported in the water column sorbed to materials scoured or eroded from the river bottom.

Although the data support a flow-dependent relationship, other environmental parameters such as sediment characteristics must be considered in PCB release and transport mechanisms.

Adsorption/desorption phenomena have been related to particle size and organic content as well as other physico-chemical characteristics of natural sorbent systems (Brown and Flagg, 1981; O'Connor and Connelly, 1980; Kenaga and Goring, 1980; Pavlou and Dexter, 1979; Paris et al., 1978). As hydrophobic compounds, PCBs have a strong affinity for particles which are small and therefore possess large surface to volume ratios and for organic materials that possess strong bonding capabilities. Sediment grain size and organic content have been related to PCB concentrations in Hudson River sediments. In the Hudson River, PCB concentrations are generally highest in silty sediments, moderate in coarse sand with wood chips, and lowest in sand and gravel with no organic matter (Tofflemire *et al.*, 1979).

Whereas partitioning of PCBs has been examined in adsorptive processes, little attention has been given to desorption from natural sediments. Halter and Johnson (1977) used a model aquatic system incorporating sediment, water, and fish components to measure the dynamics of Aroclor 1254 under both flowing and static conditions. Wildish *et al.* (1980) examined the desorption of Aroclor 1254 from various particle size fractions of sediments in continuously shaken centrifuge tubes. These and other studies (Tofflemire *et al.*, 1979) indicate that experimentally derived partition coefficients, which range from 10^3 to 10^5 ug/kg/ug/l, may be highly dependent upon the methods and materials used.

Erosional characteristics of the various types of sediments found in the Hudson River play an important role in the transport of particulate-associated PCBs. The rate of erosion and transport of non-cohesive sediment materials may be readily predicted, but parameters influencing the relative erodibility of cohesive materials, which are generally more highly contaminated with PCB, are not well understood. Such properties as mean particle size, percent clay, plasticity index, and dispersion ratio may be used in an attempt to predict erosion rates of cohesive sediments, but field and laboratory measurements are considered more reliable (Gottschalk, 1964). Preliminary laboratory flume studies have been conducted on erodibility of cohesive sediments collected from the Hudson River (Zimmie, 1981).

A PCB transport model for the Hudson River has been developed which is designed for non-cohesive sediment transport (IMS, 1978, 1979). However, the model does not address erosion of fine-grained sediments, such as silt and clay, nor does it discriminate between aqueous and sorbed PCBs. In order to more accurately depict the transport of PCBs, a rational analysis of the processes that contribute to sediment/water PCB interactions, including desorption from and erosion of both cohesive and non-cohesive sediments, is required.

C. Scope of Work

Experimental

The proposed work would result in a means to accurately assess the disposition of PCBs between contaminated bed sediments and the water column in the Hudson River.

Studies should be designed to experimentally relate desorptive and erosional processes as a function of flow rate and sediment characteristics. Consideration should be given to variables known to affect PCB study results such as temperature, suspended solids concentration, and adsorption of PCBs on walls of experimental apparatus.

It is recommended that a variety of Hudson River PCB-contaminated sediments be employed in the studies. These should be characterized with respect to grain size, organic content, and PCB content. PCBs should be analyzed by standard Aroclor interpretation and by identification of individual components. Depth profiles of sediment samples, using the latter method, should permit assessment of PCB weathering. Aqueous samples will be analyzed for dissolved and particulate-associated PCBs.

Data Analysis

Attention must be given to providing a rational mathematical description of PCB release. Classical hydraulic parameters which would influence the application of the study results should be defined. Problems associated with scaling of the experimental system should be accounted for in data interpretation.

A final report will be submitted by June 1, 1983.

D. Instructions and Conditions for Preparation of Proposals

Potential contractors should submit a proposal to the Department of Environmental Conservation by June 1, 1982. This proposal should include the following:

1. Proposed approach to the study;

2. Background and expertise of the potential contractor;

3. Cost and price analysis.

Final selection of a contractor will be dictated by an evaluation of the contractor's proposed approach to the problem, previous experience in carrying out services of this type, technical expertise and knowledge in the area, cost, and overall management capability for carrying out the proposed work. Criteria to be considered in the evaluation of respondents for submission of proposals will include:

1. Specialized experience and professional competence of the respondent and its personnel (including a joint venture or association subcontract) in connection with the type of services required and the complexity of the project;

2. Past record of performance on contracts with the grantee or with others, including such factors as control of costs, quality of work, and ability to meet schedules;

3. Capacity of the respondent to perform the work (including any specialized services) within the time limitations, taking into consideration the current and planned workload of the respondent;

4. The familiarity of the respondent with types of problems applicable to the project;

5. Special consideration for small and minority businesses; and

6. Avoidance of personal and organization conflicts of interest prohibited under State and local law.

MONS 009665

In preparing the proposal, the following conditions will apply:

1. If a potential contractor feels that different approaches or additional work would be desirable, he should describe and quote them.

2. Specific, rigid, detailed time schedules are required.

3. All equipment purchased with funds to carry out the project will become the property of the Federal government at the completion of the project unless otherwise specified.

4 The potential contractor should indicate the manner in which the data would be reported.

This Request for Proposal (RFP) does not commit the New York State Department of Environmental Conservation to award a contract, to pay any cost incurred in the preparation of a proposal to this request, or to procure or contract for services or supplies. The Department reserves the right to accept or reject any or all proposals received as a result of this request, to negotiate with any qualified source, or to cancel in part or in its entirety, this RFP, if it is in the best interest of the Department to do so. The Department may require the offerers selected to participate in negotiations and to submit such price, technical or other revisions of their proposal as may result from negotiations.

Any contract awarded under this (invitation for bids or request for qualifications/proposals) is expected to be funded in part by a grant from the United States Environmental Protection Agency. This procurement will be subject to regulations contained in 40 CFR Subchapter B, and particularly Part 33 thereof. Neither the United States nor the United States Environmental Protection Agency is nor will be a party of this (invitation for bids or request for qualifications/proposals) or to any resulting contract.

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APPENDIX C. Fish Preparation Procedures for Contaminant Analysis

New York DEC conducts studies requiring chemical analysis on fish tissues. Routine monitoring and surveillance studies develop data on contaminants in fish for several reasons:

1. To identify sources of environmental contamination.

2. To identify the geographic extent of environmental contamination.

3. To identify temporal trends of contaminants in fish and wildlife.

4. To provide information regarding human consumption advisories.

Chemical analyses of edible fish flesh have been determined to be the most appropriate analyses for satisfying all of these objectives. The following methodology has been developed in order to standardize the tissues under analysis and to adequately represent the contaminant levels of fish flesh. The methodology is slightly modified from the U.S. Food and Drug Administration procedures. The portion of edible flesh analyzed will be referred to as the standard fillet unless otherwise noted. For some species, the procedure is modified as indicated below.

Procedure for Standard Filleting

1. Remove scales from fish. Do not remove the skin.

2. Make a cut along the ventral midline of the fish from the vent to the base of the jaw.

3. Make diagonal cut from base of cranium following just behind gill to the ventral side just behind pectoral fin.

4. Remove the flesh and ribcage from one-half of the fish by cutting from the cranium along the spine and dorsal rays to the caudal fin. The ribs should remain on the fillet.

5. Score the skin and homogenize the entire fillet.

Modifications to Standard Fillet

Four modifications of the standard fillet procedure are designed to account for variations in fish size or known preferred preparation on methods of the fish for human consumption.

1. Some fish are too small to fillet by the above procedure. Fish less than approximately 6 inches long and rainbow smelt are analyzed by cutting the head off from behind the pectoral fin and eviscerating the fish. Ensure that the belly flap is retained on the carcass to be analyzed. When this modification is used, it should be noted when reporting analytical results.

MONS 009670

2. Some species are generally eaten by skinning the fish. The skin from these species is also relatively difficult to homogenize in the sample. Hence, for the following list of species, the fish is first skinned prior to filleting.

Brown bullhead	White catfish
Yellow bullhead	Channel catfish
Atlantic sturgeon	Lake sturgeon
Black bullhead	

3. American eel are analyzed by removing the head, skin, and viscera; filleting is not attempted.

4. Forage fish and young-of-year fish are analyzed whole. This category is considered to be less than 150 mm (6 inches).

MONS 009671

APPENDIX B

PRE-DREDGING SEDIMENT SAMPLING PROGRAM

MONS 009672

APPENDIX B

PRE-DREDGING SEDIMENT SAMPLING PROGRAM

General

The Pre-Dredging Sediment Sampling Program is being developed consistent with the following objectives:

a) Advance the knowledge of the PCB distribution in sediments in the upper Hudson River
b) Assess the mechanism controlling the redistribution of sediments in the upper Hudson River (e.g., velocity profiling and measurement of sediment erodibility).

The details of the sediment sampling program are presently being developed by DEC. In concept, the program will consist of the following basic elements.

1. Review of existing PCB sediment data and sediment texture.

2. Review of existing fathometry and hydrology to initially assess river areas of high velocity and possible scour and deposits. (Wetlands will also be considered).

3. Development of grid work for the river.

4. Establishing horizontal and vertical control networks for hydrographic survey and fathometry, respectively.

5. Purchase and set up hydrographic survey equipment, boat, and coring equipment.

6. Establish data management system compatible with the DEC project laboratory output.

7. Submit work plan and report by April 15, 1982.

8. Initiate field sampling program.

9. Apply data to simplified sediment transport schemes to verify and possibly modify areas to be dredged.

Sediment samples will be collected by DEC utilizing a vibra core. Location of the cores will be established utilizing the hydrographic survey system being developed specifically for this project. As cores are collected, DEC engineers and scientists will visually inspect the cores and will recommend appropriate sectioning. The cores will then be sent to the DEC project laboratory where they will be analyzed for PCB. Selected cores will be analyzed for metals, ^{137}Cs and Pb. The laboratory data sheets developed by DEC for use in the lab are contained in the QA/QC document developed as part of this project. The laboratory has been established for this project to assure timely completion of the analytical work such that data will be available under very tight time constraints.

As the sediment data becomes available, data analysis will be initiated. The ultimate goal of this sampling effort is to prioritize most critical and cost-effective areas to be dredged under the full scale and reduced scale project. In developing the dredging plans and specifications, the specific areas to be dredged will reflect the information gathered during the 1982 sediment sampling survey. Preliminary criteria which may influence these decisions are (a) areas of highest concentration or greatest mass, (b) areas susceptible to scour or deposition under various hydrologic regimes, (c) areas disturbed by navigation and (d) areas of desorption. Item D above will be developed in more detail following the results of the study entitled PCB Release from Hudson River Sediments being performed by the University of Michigan as part of the Step 1 Grant for this project.

APPENDIX C

LETTER FROM NYS SOLICITOR GENERAL

MONS 009675

STATE OF NEW YORK
DEPARTMENT OF LAW
ALBANY, N.Y. 12224

ROBERT ABRAMS
ATTORNEY GENERAL

SHIRLEY ADELSON SIEGEL
SOLICITOR GENERAL

October 23, 1981

Hon. Robert F. Flacke
Commissioner
New York State Department of
Environmental Conservation
50 Wolf Road
Albany, New York 12233

Dear Commissioner Flacke:

The New York State Department of Environmental Conservation is undertaking the Hudson River PCB Reclamation Demonstration Project, whereby PCB sediments will be dredged from the river in Washington and Saratoga Counties and, after treatment, buried in a containment facility. Your civil counsel has asked whether these are activities for which the State has waived sovereign immunity under section 8 of the Court of Claims Act.

Through the waiver of immunity effected by section 8 of the Court of Claims Act, the State is liable for the torts of its agents on the basis of respondeat superior, notwithstanding the fact that the agent is engaged in a governmental activity (Jones v State of New York, 33 NY2d 275, 280 [1973]). It has been decided that the State can be held liable for its negligent acts in carrying out a governmental plan (Kelly v State of New York, 57 AD2d 320 [4th Dept, 1977]). Generally, as a landowner, the State has a duty not to use its land in a manner so as to cause injury to neighboring property owners (Palmer Ltd. v State of New York, 33 AD2d 412 [3d Dept, 1970]; Poysa v State of New York, 102 Misc 2d 269 [Ct of Claims, 1979]). Of course, for the State to be liable in negligence, the plaintiff must be a person to whom a duty is owed and who has suffered injury or damage (Motyka v City of Amsterdam, 15 NY2d 134 [1965]).

We conclude that the State can be held liable through suit in the Court of Claims for any negligent or other tortious acts of the Department of Environmental Conservation committed in carrying out the Hudson River PCB Reclamation Demonstration Project.

Very truly yours,

Shirley Adelson Siegel

SHIRLEY ADELSON SIEGEL
Solicitor General

APPENDIX D

Summary of Cultural Resource Survey

Results for Site 10, Hudson River Reclamation Project

Summary prepared by New York State Department of Environmental Conservation, Albany, New York, August 1982

CULTURAL RESOURCE SUMMARY:

In conformance with federal and state laws and implementing regulations for the protection of historic and cultural properties (Draft EIS, May 1981: 3-40 to 43; Supplemental Draft EIS, August 1981: Appendix B-1), additional evaluation and documentation for consultation was necessary on resources identified in the Stage 1 cultural resource survey (NYSDEC September 1981: 8-1 to 3; Table 8-1). Further investigations of identified resources were designed to provide the data necessary to evaluate the potential eligibility of historic and archaeological properties for listing on the National Register of Historic Places. Consultation with the NYS Historic Preservation Office (NYSHPO) focused on the evaluation of eligibility to the National Register of all historic structures and archaeological sites located within the proposed containment site (Site 10) boundaries and the "Victorian-style" house located nearby.

The EPA's proposed project impact on the Old Champlain Canal, a property listed on the National Register of Historic Places, required special consideration through consultation with the Advisory Council on Historic Preservation (ACHP). In accordance with ACHP regulations (36 CFR 800.13 a), the EPA determined that the proposed pipeline crossing of the canal would have no adverse effect on this property. The construction corridor will be limited to a disturbed segment of the canal. Protection of the remaining canal within the project area will be enforced. The ACHP, in their letter of January 15, 1982, did not object to EPA's determination pending the outcome of EPA's planned further investigations (Stage 2) and evaluation of resources identified during the Stage 1 survey. The ACHP added the condition that the nearby "Victorian-style" house be evaluated for its potential to meet the criteria for listing on the National Register.

The EPA has complied with the ACHP conditions.

The EPA, in consultation with the NYSHPO, has concluded the following:

- All, resources except for Site 1 (Hudson South), do not meet the criteria for listing on the National Register of Historic Places.

- Site 1, an identified prehistoric deposit will be protected from currently planned and future construction activities. Site 1 is located in a buffer zone of the project area.

- The Dead Creek bank, an area identified as a sensitive archaeological zone during Stage 1 survey, will be protected in a buffer zone of the project property.

- The structural elements of the nineteenth century barns will be offered for salvage a.) to a recognized individual or group that will utilize the materials for historic reconstruction projects; or, if no qualifying party can accept the materials b.) the barns will then be demolished by the project construction contractor.

- According to the no adverse effect determination approved by the ACHP, proposed pipeline construction will be restricted to a corridor that will be fenced during construction. The northern segment of the Champlain Canal within the project area will be protected from impact.

The summary below describes the results of the Stage 2 investigations and EPA's consultation with the NYSHPO concerning the resources investigated. Table 1 summarizes and updates the recommendations for all resources identified during the Stage 1 (Table 3-8 of the Draft EIS, May 1981) and the Stage 2 surveys, and the results of EPA's consultations with the NYSHPO and the ACHP.

Summary of Stage 2 Investigations:

To provide data for an objective evaluation of identified resources, NYSDEC contracted with Hartgen Archaeological Associates for a Stage 2 cultural resource survey. The following cultural resources were investigated (site designation in parentheses appeared in Table 3-8 of the Draft

EIS):

- Sites 1 and 4: prehistoric archaeological deposits (Hudson South and Hudson North)
- Sites 3, 5 and 6: historic archaeological deposits
- Site 7: two nineteenth century barn structures (Old barn complex)
- Site 2: farm water system (Foundations 1 and 2).

Sites 1, 2, 4 and 7 were identified during the Stage 1 field investigation. The historic archaeological sites (3, 5 and 6) were identified during the Stage 2 investigation. All resources, except the two barn structures, are located on the Site 10 property east of the Hudson River and west of the Old Champlain Canal which parallels NYS Route 4.

The archaeological sites were investigated by controlled, systematic subsurface sampling consisting of shovel tests at regular intervals, one-meter squares and trenches. Information concerning the age, cultural affiliation and intergrity of the prehistoric and historic archaeological deposits was obtained. Work on Site 2, two foundations of stone and concrete connected with a small diameter pipe, concentrated on determining the function and associations of this system. An architectural study of the two barn structures was directed at ascertaining construction date, integrity and architectural significance. The following summary derives from the detailed Stage 2 cultural resource survey report (Hartgen Archaeological Associates, February 1982).

1. Prehistoric Resources:

Site 1 (Hudson South): Late Archaic/Middle to Late Woodland Periods (approximately 2000 BC - 1500 AD) interpreted as a lithic manufacturing and hide preparation area; possible stratified deposits with intact features. The site is located within a buffer zone of the project area which will be fenced. Impact will be avoided and, therefore, no further consideration is needed.

Site 4 (Hudson North): Late Archaic (approximately 2000 BC) represents a food processing area. Two hearth features were identified; one within and one below the plowzone. The integrity of the site has been compromised and no further study is recommended.

2. Historic Resources:

Site 2 (Foundations 1 and 2): concrete and stone foundations connected by a small diameter pipe interpreted as a farm water supply system operational from 1910 to 1952. These recent features are adequately documented in the Stage 2 survey. No further study is recommended.

Historic archaeological deposits constitute the remains designated as Sites 3, 5 and 6. These deposits consist of distinctive, but spatially small concentrations of kitchen and architectural materials. The context of these three archaeological deposits were compromised by erosion, flooding and plowing.

- Site 3 represents a short term occupation during the last half of the eighteenth and early decades of the nineteenth century. No structural remains were associated with the artifactural materials.

- Site 5 consists of material adjacent to a drywall field stone and brick feature along the riverbank. The structural remnant is located in the vicinity of a building of unidentified function recorded on the 1830 NYS canal survey for this area. Analysis of the archaeological material indicates a late eighteenth to early nineteenth century date for this deposit.

- Site 6 consists of an early to mid-nineteenth century archaeological deposit. The deposit may have been associated with a structure of unidentified function recorded on the 1830 NYS canal survey map for the area. The structural remains have been destroyed by a boat launch and access road within the project area.

All of these historic archaeological remains have been adequately documented in the Stage 2 report. No further study is recommended.

Site 7 two mid-nineteenth century barns. These barns represent typical structures of the Hudson Valley. These types of structures are well represented within the region. The barns are not associated with a particular farmstead or builder. Architectural documentation of the barns is provided in the Stage 2 survey. No further study is recommended.

"Victorian-style" house: The Stage 2 survey provided the following information on the house: 1900, approximate date of construction; builder, Irving Bristol; Owner, Hattie Bristol. The land was owned by Luther Pike until 1893, when it was deeded to his daughter Hattie (Mrs. Irving Bristol) Pike. The integrity of the house has been compromised by structural modifications and it is the EPA's opinion that the structure is not National Register eligible.

Conclusions:

The EPA and NYSHPO have evaluated the resources in the project area and have consulted on the potential eligibility of the resources to the National Register of Historic Places and the potential effect of the project on any resources meeting the criteria for eligibility. The EPA has concluded that the project will not affect resources on or eligible to the National Register, other than the Old Champlain Canal. The EPA will mitigate the project effect to Old Champlain Canal, a property included in the National Register, by strict adherence to their documentation of no adverse effect as approved by the Advisory Council for Historic Preservation.

MONS 009683

Table 1

Summary of Cultural Resources at and near Site 10

Cultural Resource	EPA opinion	SHPO opinion
1. Old Champlain Canal, National Register Property*	No Adverse Effect (correspondence dated** December 9, 1981, January 15, 1982 and August 11, 1982)	concurrence (correspondence dated** October 28, 1981)
2. Two nineteenth century barns, Site 7 (old barn complex)*	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
3. Prehistoric archaeological Site 1 (Hudson South)*	Site protection; site not in project impact area (FEIS)	No need to evaluate eligibility (August 4, 1982)
4. Prehistoric archaeological Site 4 (Hudson North)*	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
5. Historic archaeological deposits, Sites 3, 5 and 6	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
6. Victorian-style house	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
7. Twentieth century farm water system, Site 2 (two stone and concrete foundations)*	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
8. Two Twentieth century dump sites (Historic dumps 1 and 2)*	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
9. Hudson Valley Railroad segment*	Not National Register eligible (FEIS)	Not National Register eligible (August 4, 1982)
10. Dead Creek bank prehistoric sensitive zone*	Area protection; area not in project impact area (FEIS)	No need to evaluate eligibility (August 4, 1982)
11. House and garage or equipment shed*	Not National Register eligible	Not National Register eligible (November 19, 1981)
12. New barn complex*	Not National Register eligible	Not National Register eligible (November 19, 1981)

*Draft EIS, May 1981, Table 3-8; descriptive label from Table 3-8 in parentheses when different.

**Dates in succeeding items relate to EPA/SHPO correspondence, copies of which are reproduced in this Appendix of the Final EIS for the project.

NEW YORK STATE PARKS & RECREATION Agency Building 1, Empire State Plaza, Albany, New York 12238

Orin Lehman, Commissioner

October 28, 1981

Mr. Stephen Arella
Environmental Impact Branch
U.S. Environmental Protection Agency
26 Federal Plaza
New York, N.Y. 10007

Dear Mr. Arella:

Hudson River PCB Reclamation
Demonstration Project
Proposed Containment Facility
Ft. Edward, Washington County

The State Historice Preservation Officer (SHPO) has reviewed the documentation you provided on this project. Based on this review, it is the SHPO's opinion that the proposed pipeline construction will not adversely affect the Old Champlain Canal, a property listed on the National Register. The proposed construction is limited to an area of the canal ditch that has been damaged by road construction and which contains no distinguishing features.

Should you have any questions concerning this matter, please contact the project review staff at 518-474-3176.

Sincerely,

Ann Webster Smith

Ann Webster Smith
Deputy Commissioner for
Historic Preservation

MONS 009685

NEW YORK STATE PARKS & RECREATION
Orin Lehman Commissioner

November 19, 1981

Mr. Stephen Arella, Chief
Environmental Impact Branch
USEPA Region II
26 Federal Plaza
New York, N.Y. 10278

Dear Mr. Arella:

Hudson River PCB
Reclamation Project
C-36-1167

The State Historic Preservation Officer(SHPO) has reviewed the documentation you provided on this project. Based on this review, it is the SHPO's opinion that the "new farmhouse" and complex referred to in your October 30, 1981 letter is not eligible for the National Register. It is the SHPO's understanding that additional material will be submitted regarding the prehistoric sites, the historic archaeological sites and the "old barn complex" before an SHPO opinion can be provided concerning these resources.

Under separate cover, the SHPO has provided his opinion on this proposed project's impact on the Old Champlain Canal, a property listed in the National Register.

Should you have any questions concerning this matter, please contact the project review staff at 518-474-3176.

Sincerely,

Ann Webster Smith
Deputy Commissioner for
Historic Preservation

Advisory Council On Historic Preservation

1522 K Street, NW
Washington, DC 20005

January 15, 1982

Mr. Stephen Y. Arella
Chief, Environmental Impact Branch
Region II
Environmental Protection Agency
26 Federal Plaza
New York, NY 10278

Dear Mr. Arella:

On December 9, 1981, the Council received your determination that construction of water intake and outfall pipelines for a PCB containment facility in Fort Edward, Washington County, New York, would not adversely affect the Old Champlain Canal. The canal is listed in the National Register of Historic Places.

We understand that it is your intention to complete evaluation of other historic properties that may be affected by construction of the containment site, and (if appropriate) request the Council's comments concerning project effects on those properties at a later date. Therefore, the Executive Director will not object to your determination of no adverse effect for the Old Champlain Canal if you will agree to the following specific conditions:

1. EPA will complete the evaluation process and determine, in accordance with 36 CFR Section 800.4(a), the National Register eligibility of the two prehistoric sites, the two nineteenth century barn structures, and the "Victorian Style" house noted on Existing Site Plan-1 (Attachment).

2. For those properties determined eligible for the National Register, EPA will complete compliance with 36 CFR Part 800, including an assessment of possible visual effects on the "Victorian Style" house (if it is determined eligible.)

If you agree to these conditions, please sign on the concurrence line below and return this letter to us. These will then be incorporated into your determination of no adverse effect for the Old Champlain Canal.

In accordance with Section 800.8 of the Council's regulations, a copy of your determination of no adverse effect, along with supporting documentation and this conditional concurrence, should be included in your record of compliance with the National Environmental Policy Act, Section 106 of the National Historic Preservation Act, and the Council's regulations.

Thank you for your cooperation.

Sincerely,

Jordan E. Tannenbaum

Jordan E. Tannenbaum
Chief, Eastern Division
of Project Review

Enclosure

I concur:

Stephen Y. [illegible] (date) 2/3/78
Environmental Protection Agency, Region II

NEW YORK STATE PARKS & RECREATION Agency Building 1 Empire State Plaza, Albany, New York 12238 Information 518 474 0456
Orin Lehman Commissioner

August 4, 1982

Ms. Anne Norton Miller, Chief
Environmental Impacts Branch
USEPA Region II
26 Federal Plaza
New York, NY 10278

RE: Hudson River PCB
Reclamation Project
C-36-1167

Dear Ms. Miller:

The State Historic Preservation Officer (SHPO) has reviewed the documentation you provided on this project. Based on this review, it is the SHPO's opinion that the two nineteenth-century barns (Site 7), prehistoric site 4, and the four historic archaeological sites (2, 3, 5 and 6), the two twentieth-century dumps, the segment of the Hudson Valley Railroad and the Victorian-style house are not eligible for the National Register of Historic Places. In addition, it is the SHPO's opinion that prehistoric site 1 and the Dead Creek bank prehistoric site will be avoided and therefore, no evaluation of their National Register eligibility is needed.

This, plus our letters of November 19, 1981 and October 28, 1981, constitutes the SHPO's opinion on this project. Should you have any questions concerning this matter, please contact Mr. Bruce Fullem of our staff.

Sincerely,

Ann Webster Smith
Deputy Commissioner for
Historic Preservation

SR/sl
cc: L. Basa

MONS 009689

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION II
26 FEDERAL PLAZA
NEW YORK, NEW YORK 10278

11 AUG 1982

Mr. Robert Garvey
Executive Director
Advisory Council on Historic Preservation
1522 K. Street, N.W.
Washington, D.C. 20005

Dear Mr. Garvey:

The Environmental Protection Agency (EPA) has complied with the Council's conditions regarding our determination of no adverse effect for the proposed impact to the Old Champlain Canal, a property listed on the National Register of Historic Places. As stipulated in the Council's January 15, 1982, letter, the EPA has completed the evaluation process for the resources enumerated.

A Stage II cultural resource survey was conducted to obtain data needed to evaluate the potential eligibility to the National Register of two prehistoric sites and two nineteenth century barn structures. Three additional historic archaeological sites were identified and evaluated during this survey. The EPA has also provided the New York State Historic Preservation Office (SHPO) with documentation on the "Victorian-style" house located in proximity to the proposed PCB containment site. In consultation with the SHPO, the EPA formulated their opinion that the two barn structures, one of the prehistoric sites, the Victorian house and the three historic archaeological sites do not meet the criteria for eligibility to the National Register. The other prehistoric site is located in the buffer zone of the project area and will not be impacted by the proposed project.

To address the Council's concern for visual effects of the proposed containment site, we have enclosed a series of photographs illustrating a model facility. The photographs illustrate a complete encapsulation site at Moreau in Saratoga County, New York. The series document the effects on the landscape during and after construction of an encapsulation project.

If you have any questions, please call Mr. Richard Walka at (212) 264-1858.

Sincerely yours,

Anne N. Miller

Anne Norton Miller, Chief
Environmental Impacts Branch

cc: NYS Historic Preservation Officer
NYS Department of Environmental Conservation

Attachment

APPENDIX E

COMMENT LETTERS RECEIVED ON THE SUPPLEMENTAL DEIS

DEPARTMENT OF THE ARMY
NEW YORK DISTRICT, CORPS OF ENGINEERS
26 FEDERAL PLAZA
NEW YORK, N. Y. 10278

REPLY TO
ATTENTION OF:

NANOP-E

14 October 1981

Ms. Robin Rohn
Environmental Impact Branch
U.S. Environmental Protection Agency
Region II
26 Federal Plaza - Room 404
New York, NY 10278

Dear Ms. Rohn:

Inclosed are comments of the Corps of Engineers on the review of the supplemental Draft Impact Statement for the Hudson River PCB Hot Spot Dredging Project.

Please incorporate these concerns in the Draft Environmental Impact Statement.

Sincerely,

JOHN ZAMMIT
Chief, Operations Division

MONS 009692

REVIEW OF SUPPLEMENTAL DRAFT
ENVIRONMENTAL IMPACT STATEMENT ON THE
HUDSON RIVER PCB PROJECT

a. Executive Summary (S)
No comments to this section - satisfactory

b. Modifications comments to DEIS (Chap. 2-3)

1. Response to our request for close coordination with state and private dredging actions has not been adequately addressed. We are not proposing use of material from outside the project area. It should be noted that the CAC also recommended that a PCB management plan be developed. (S-13). DEC should actively develop a plan to encourage both DOT and private individuals/entities to schedule all operations in this part of the river concurrently with the DEC. This would serve to ensure maximum use of the containment area and minimize interference with monitoring efforts. This might entail informing all potential users of the difficulty inherent in dealing with the problem on their own. Transfer of funds to DEC might result in substantial savings to the applicant while expanding the amount of PCB's safely removed.

2. The DEIS still doesn't clarify the possible erronous conclusion of assuming the declining levels of PCB in fish associated with the relatively low flow during the past few years will continue. Cleaner deposits have covered PCB sediments and the fish have been equilibrating with the subsequent lower levels in the water. The hot spot areas still remain however, and the first good flood could easily mobilize them by stripping the still thin, clean, sediment cover thus making them available to fish.

3. The Impact Section was improved by the addition of table 2-1, (-8), which should preceed this chapter. Some improvement in the layout of the table is still needed. It is suggested that the table be laid out lengthwise (along the 11 inch axis) and utilize 2 adjoining pages so as to make all components and impacts visible at a glance.

2. Response to the executive summary have been previously forwarded. The modified response presented in appendix A of the supplemental DEIS addressed some concerns but failed to respond to comments on the critical studies for the environmental monitoring. Specific comments to the new response are as follows:

a. Operational Standards (A-18)
Much of our original concerns here have been satisfactorily dealt with, especially in tightening up frequency of sampling. Three concerns, however, still remain:

1. In discussion of sampling frequencies at the containment site the statement".... sampled in accordance with the site permit (TSCA)", appears at a number of places yet there is no permit available to determine

what the criteria are. Evaluation is therefore not possible. A copy of the permit should be included or the specs incorporated into the document for ready availability.

2. Thresholds for implementing contingency actions have been added, as requested. Though useful, many are too general, not providing enough specific data on how and when the plans would be initiated.

3. There is much discussion on PCB uptake by plants, yet no method has been described for the disposal of the grass cuttings resulting from site maintenance. The primary reason for cutting the grass was to prevent its ingestion by wildlife. If such a potential hazard, it should be disposed of safely, at least until the monitoring program establishes its safety (if such a Conclusion results).

b. Environmental Monitoring Program (A 36 - 49)

1. Our original comments do not appear to have been answered. Much of the proposed studies lack any detail to comment on and as such can not be properly reviewed or judged. A copy of our original comments are enclosed for reference.

3. In addition, the following should be addressed:

a. The document does not state whether barge overflow will be allowed or not during clamshell dredging of the hot spots. Our own experience indicates that allowing no barge overflow will reduce the impacts of dredging.

b. The document recommends that no action be taken at remnant areas 3 and 5. However, on p. II-1 the issue of human use of these area is not resolved to the same degree as the PCB volitilization issue. The issue of human use should be more thoroughly investigated before no action is recommended.

c. On p. IV-55, the first paragraph ends by stating, "larvae of Chironomous tentans accumulate DDE at the same rate whether alive or dead". Is this statement correct?

STATE OF NEW YORK
DEPARTMENT OF HEALTH OFFICE OF PUBLIC HEALTH
TOWER BUILDING • THE GOVERNOR NELSON A. ROCKEFELLER EMPIRE STATE PLAZA • ALBANY, N.Y. 12237

DAVID AXELROD, M.D.
Commissioner
GLENN E. HAUGHIE, M.D.
Director

DIVISION OF ENVIRONMENTAL HEALTH
LEO J. HETLING, P.E., PH.D.
Director

October 15, 1981

Chief, Environmental Impacts Branch
US EPA - Region II
26 Federal Plaza - Room 400
New York, New York 10278

RE: EIS Hudson River PCB Reclamation Demonstration Project - Supplemental Draft

Dear Sir or Madam:

We submitted comments on the Draft EIS on July 6, 1981. The above Supplementary Draft answers some of the questions we raised in our letter. The Quality Assurance Plan sent to us by the New York State Department of Environmental Conservation provides additional detail on the monitoring programs, which we consider of central importance to the project from the standpoint of protection of public health.

Our only serious remaining questions concern the details of the air monitoring at and around the containment site. Our interpretation of various statements in the original draft, the supplemental draft, and the quality assurance plan is the following: one air sampler will be set up on the site adjacent to the basins and in such a location that it measures the highest concentration at the containment site. Samples from this monitor will be collected daily. Other monitors will be stationed at nearby sensitive receptors, and there will be mobile samplers that can be moved as necessary to verify dispersion predictions. Sampling will be conducted weekly at sensitive receptors; there will be a total of 100 samples per dredging season from the mobile and sensitive receptor monitors, providing an average of 1 such sample per day of dredging. We are concerned that this may not provide adequate assurance that ambient levels are within the guideline value established for the protection of public health. More explicit information should be provided on the sampling that will be carried out. The so-called sensitive receptors should be specifically identified, the criteria for sampling at any particular location should be given, and the general strategy for measuring downwind concentrations on any particular day, taking into account variations in wind direction, should be described.

MONS 009695

On page A-13 of the Supplementary Draft the maximum ambient air concentration of 1 ug/m^3 established by NYSDOH is referred to as a "safety guideline set by NYSDOH for residential exposure." This is an improper interpretation of the intent of the Health Department. This is not a safety guideline for residential exposure but rather a maximum value for the limited duration of the proposed project; it would not be acceptable for long term or continuing exposure of the public.

On page A-20 there is a discussion of air sampling at the dredge to determine whether workmen, and possibly residents along the shore, may be exposed to PCB concentration in excess of the value determined to be acceptable for public health. According to the information provided, air sampling will only be performed for the initial 10 days of dredging. This should be modified to include monitoring on the first days when elevated temperature and low wind speed conditions are experienced, leading to a greater evaporation rate and a corresponding increased likelihood of high PCB concentration. Limiting such sampling to the initial 10 days, particularly if they are in the Spring at the beginning of the dredging season, probably will not correspond to the maximum likelihood for PCB exposure. Additional sampling should be conducted beyond the proposed total of 20 samples at the dredge and the unloading site, to insure that samples are taken at both sites under conditions of maximum volatilization.

The EIS should contain references for the various calculations of ambient air concentrations projected for the project. On page A-40 of the Supplemental Draft reference is made to a probability table, two studies of gas transfer, and various calculations and reports by Malcolm Pirnie Inc., but references are not provided to any of these data sources.

On page A-58 there is a list of four conclusions from experience with dredging in the Hudson River. The fourth conclusions is, "The worst case condition is likely at a low flow." Two interpretations are possible; the rate of loss of dredged material is greatest at low flow, or the concentration of PCBs in the water immediately down stream of the dredge is greatest at low flow. The first interpretation would not seem to be true but the second would. However, there is also reason to consider that the greatest rate of loss of dredged material is a "worst condition" rather than an increased concentration immediately down river from the dredge. In any event the meaning of the statement should be clarified.

On page 3-11 of the Supplemental Draft, in response to comment number II-14, it states that if dredging causes unexpectedly high contaminant concentrations at downriver drinking water intakes, contingency plans for protection of drinking water will be implemented for high levels of metals as well as for PCBs. On page A-22 the sampling procedures are provided. The action level for PCB contamination is mentioned in the EIS, but no value is given for any metal. We assume that the maximum contaminant levels in the State Sanitary Code will be used to determine if metal concentrations in the intake water are so high that contingency steps should be taken.

The Supplemental Draft changes the statement on page 3-17 of the EIS to reflect the new lower EPA water quality criteria for PCBs in water. The statement as revised, however, appears to indicate that the USGS monitoring data at Poughkeepsie and Waterford indicate that PCB levels are below 0.079 ng/l. A reference should be provided. In any event, if monitoring data is referred to, the year of sample collection should be provided as well. The water quality criterion of 0.079 ng/l for PCBs should not be used to judge drinking water quality. Water quality criteria consider the ingestion of contaminated water and contaminated aquatic organisms taken from the water body. Drinking water guidelines are for the ingestion of finished water.

The Supplemental Draft does not answer any of the questions we raised regarding the estimates of PCB flux to the atmosphere. We still question some of the steps in this analysis. Therefore, we consider provisions for air monitoring and timely implementation of contingency plans to be essential. The EIS should provide more detail on air monitoring at and adjacent to the containment site.

Sincerely,

Nancy K. Kim

Nancy K. Kim, Ph.D.
Director
Bureau of Toxic Substances Management

NKK:yaw

MONS 009697

CITY OF NEW YORK
DEPARTMENT OF ENVIRONMENTAL PROTECTION
2358 MUNICIPAL BUILDING, NEW YORK, N.Y. 10007 (212) 566-4124/5

FRANCIS X. McARDLE, Commissioner

8 October 1981

Mr. Steven Arella, Chief
Environmental Impacts Branch
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, room 400
New York, N. Y. 10278

Re: Hudson River PCB Reclamation
Demonstration Project
Supplemental DEIS, August 1981

Dear Mr. Arella:

We have reviewed the Supplemental DEIS for the Hudson River PCB reclamation project. Since the document does not address potential impacts to New York City, we consider the DEIS to be inadequate. Our general concern is that the DEIS does not demonstrate what the downstream transport of PCBs would be during high flow conditions. Despite the document's claim that dredging will not have a detrimental effect on downstream water supplies, it is apparent that resuspension of PCB-laden sediment could increase concentrations to an unacceptable level. As is noted in the DEIS, data for water year October '76 - September '77 reveal maximum PCB concentrations for Schuylerville, Stillwater and Waterford of 2.2, 2.4 and 1.4 ug/l respectively, all well above the 1.0 ug/l maximum level established by NYSDOH. It can be seen from these figures that it is possible for PCBs to be transported as a pollutant slug, most probably under high flow conditions. Specifically, this could impact the possible reactivation of the Chelsea Pump Station should drought conditions necessitate using Hudson River water for New York City water supply.

It is planned in the DEIS that dredging will stop if the river flow reaches 20,000 cfs. However, high flow conditions range upward from 12,000 cfs and a 100-year storm has a flow of 30,000 cfs. Given that the normal flow at the dredging site is about 5,000 cfs, we believe that this 20,000 cfs threshold is too high, unless it can be documented that there will be no long-range transport of PCBs. Unfortunately, this type of analysis has not been done.

The sampling program as designed would not give New York City sufficient time to switch off the pumping station before resuspended PCBs are introduced into the system. In sum, if New York City needs to activate the Chelsea Pump Station during the dredging operation, we cannot be assured that PCBs will not enter our drinking water supply.

The effect of upstream dredging on PCB transport to, and accumulation in, New York Harbor is not adequately addressed. As noted in the DEIS, should PCB deposition increase in the Harbor, levels above 4 ppm could preclude ocean disposal of maintenance dredge spoils from the Harbor. There is no discussion or mapping in the DEIS of current site-specific Harbor levels of PCB, nor quantification of how the levels might be altered under high flow conditions. Additionally, there are no data on depositional rates in New York Harbor. Given that New York is considering some substantial dredging operations in connection with the coal facility in Staten Island, this project could have a significant economic impact.

Our recommendations are as follows:

- The DEIS should analyze the impacts of long-range transport of PCBs under high flow conditions and determine what cutoff (threshold) points are needed at the dredge sites to insure that PCBs will not enter drinking water supply. Frequency of high-flow conditions and quantities of PCB transported at various flow rates within the "high flow" range must be documented.

- The DEIS should design a sampling program so that daily samples are taken upstream from Chelsea with sufficient time for analysis to be completed before PCBs could reach the intake.

- The DEIS should document current PCB levels in New York Harbor sediment and quantitatively determine rates of transport to the harbor under varied flow conditions. The document can then more accurately address the project's impacts on our ability to dispose of dredge spoils in the ocean.

Thank you for this opportunity to comment on the Supplemental and Draft Environmental Impact Statements. If we can be of any assistance to you, or if you wish clarification of any points raised in this letter, please do not hesitate to contact me.

Sincerely,

Robert L. Brugger

Robert L. Brugger
Assistant Commissioner
Department of Environmental Protection

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Centers for Disease Control
Atlanta, Georgia 30333

(404) 262-6649

October 7, 1981

Chief
Environmental Impacts Branch
U.S. Environmental Protection Agency
Region II
26 Federal Plaza, Room 400
New York, New York 10278

Dear Sir:

Thank you for sending us a copy of the Supplemental Draft Environmental Impact Statement (EIS) for the Hudson River PCB Reclamation Demonstration project. We are responding on behalf of the Public Health Service. We understand that the recommended action is to undertake the originally proposed $40,000,000 full-scale project with the required modifications.

Since our June 30, 1981, comments on the former Draft EIS were not specifically addressed in the EIS, we trust that these comments will be addressed in the Final EIS. We have no additional comments to offer at this time.

We look forward to receiving a copy of the Final EIS as soon as it becomes available.

Sincerely yours,

Frank S. Lisella, Ph.D.
Chief, Environmental Affairs Group
Environmental Health Services Division
Center for Environmental Health

The City of New York
DEPARTMENT OF PORTS AND TERMINALS
Battery Maritime Building, New York, N.Y. 10004
Telephone: 212-248-
Linda W. Seale, Commissioner

October 13, 1981

Robin Rohn, Project Manager
Hudson River PCB Reclamation Project
Environmental Protection Agency
26 Federal Plaza
New York, New York

Dear Ms. Rohn:

I have reviewed the supplemental draft of the environmental impact statement prepared by your agency.

I think it would be helpful if you would provide an exact breakdown of how the 26 7 million dollars will be allocated among the various components of the project. Specifically, how much money will be expended for:

1) actual dredging of the "hot spots"
2) mitigation measures outlined in E.I.S.
3) monitoring devices for water quality
4) monitoring devices for air quality
5) water quality protection devices for communities which rely on the Hudson River as a source of drinking water
6) construction of the containment site
7) monitoring of the containment facility
8) future research

Thank you very much for all your time, attention and patience. I look forward to seeing you at the next C.A.C. meeting.

Sincerely,

Linda O'Leary

Linda O'Leary
Project Manager

Northeast Office
State University of New York
Stony Brook, New York 11794

DATE: June 29, 1981

TO : PP/EC - J. Wood

FROM: RD/MPF26 JH. Stanford Jack O'Connor

SUBJ: DEIS 8105.23 -- Hudson River PCB Reclamation Demonstration Project

Northeast Office comments are directed primarily to those parts of the DEIS that pertain to the Hudson-Raritan Estuary. Comments are:

1. The no-action alternative has received woefully inadequate attention.

2. Because of the inadequate attention to the no-action alternative, a definite bias toward an action alternative appears to have resulted.

3. The "Purpose of and Need for the Project" (pages 1-5 to 1-10) do not truly define the <u>need</u> for the proposed action:

   a. <u>Drinking water</u>

      1. There is no indication that PCB concentrations <u>at gauging stations</u> (not at those points where drinking water is drawn) are increasing with time. In fact, the data in Appendix A suggest a decrease in time.

      2. The PCB concentrations <u>at gauging stations</u> are indicated at no higher than 0.687 ppb (sometime between 1976 and 1979), considerably below the maximum level of 1.0 ppb presently recommended by the New York State Department of Health.

      3. As is indicated in the DEIS, "PCBs can be removed from river water, leaving it suitable for drinking."

      4. From the DEIS, it appears that there is no drinking water problem, and even if there were, it could be taken care of.

   b. <u>Food</u>

      1. In the DEIS, it is stated that "Comprehensive human food monitoring data on PCB levels are not available for the Hudson River area." It seems inappropriate to make large-scale decisions without such data.

2. Also in Appendix A, there is a statement that "Recent trend analyses on levels of PCBs in upper Hudson River fish indicate that a 5 ppm level may be reached by mid-1980 <u>without</u> dredging and <u>possibly</u> sooner if contaminated sediments are removed [Emphasis added.].

3. There is a statement that "the <u>possible</u> local exposure to PCBs resulting from the opening of the fishery in the upper Hudson River must be considered" (Emphasis added.).

c. <u>Routine Maintenance Dredging</u>

1. It would seem that <u>if</u> such dredging were necessary around hot spots, then special precautions (such as those proposed in the DEIS) could be used for just those particular cases.

2. There is no convincing agreement presented that the project will <u>lower</u> the level of PCB contamination in sediments of the lower Hudson River. Therefore, there is no indication as to how dredging there could be impacted under the no-action alternative.

d. <u>Hudson River Fishery</u>

1. There is an indication of a loss of value of the Hudson River fishery. This does not include assessment of how much of this value is really expended elsewhere in the general area. Fishermen aren't going to quit fishing; they will just go elsewhere.

4. In Chapter 2, "The No-Action Alternative" section does not indicate how much of the routine channel maintenance dredging would be at the hot spots -- if any. Also, there is confusion as regards the volatilization matter in that the amount volatilized before dredging is not compared to that which would exist if hot-spot dredging were to occur. The prime question to address is really the <u>concentrations</u> of PCBs in sediments and their changes over time with or without some action.

5. Under "The No-Action Alternative" presentation in Chapter 2, page 2-3, there is no reason given for the assumption that 100 percent of the PCB load at Troy enters New York Harbor ..." The fact that PCBs settle in the Troy turning basin negates this. Also, what evidence exists for increasing PCB concentration in the turning basin? If that were true, why not dredge there, as would otherwise be necessary, and properly dispose of that material which would have to be dredged anyway?

MONS 009703

6. It is evident that short duration high flows in the past have transported PCB-contaminated sediments. It is not evident that will hold true for the hot spots. If it did, why are there still hot spots? Obviously, short-duration high flows had relatively little impact previously on hot spot areas.

7. Downstream deposition is dealt with in a very hypothetical manner, with little evidence for the suppositions. Also, if the physical composition of the transported sediment doesn't change, then the PCB concentration won't change either.

8. Throughout the DEIS there is conjecture with little, if any, supporting factual data and information. This is particularly evident as regards PCDFs (page 2-5). Is there any indication of a problem?

9. It is stated that the "No-Action Alternative (Assuming That Routine Channel Maintenance Dredging Will Be Halted)" will have greater negative impacts than the "No-Action Alternative (Assuming That Routine Channel Maintenance Will Continue)". This is not substantiated to any sufficient degree.

All in all, there is insufficient rationale for considering further anything but the no-action alternatives.

Should you desire any additional comments, or clarification/amplification of those provided, please advise.

cc: L.W. Butler
J.H. Kravitz
P.K. Park
J.R. Schubel
R.L. Swanson
NEO Staff

Natural Resources Defense Council, Inc.

122 EAST 42ND STREET
NEW YORK, N.Y. 10168

212 949-0049

Washington Office
1725 I STREET, N.W.
SUITE 600
WASHINGTON, D.C. 20006
202 223-8210

Western Office
25 KEARNY STREET
SAN FRANCISCO, CALIF. 94108
415 421-6561

October 14, 1981

Steven Arella
Chief, Environmental Impact Branch
U.S. Environmental Protection Agency
Region II, 26 Federal Plaza
Room 400
New York, New York 10278

Dear Mr. Arella:

The Natural Resources Defense Council (NRDC) appreciates this opportunity to comment on the Supplemental Draft Environmental Impact Statement (SDEIS) on the Hudson River PCB Reclamation Demonstration Project. In our comments on the DEIS we identified eight major issues that should be resolved before EPA approves the project. (See Appendix A to these comments.) The DSEIS begins to address some of these issues. However, it has a number of shortcomings which we identify in the following comments.

We look forward to working with you on the continuing review of the PCB Reclamation Demonstration Project.

Sincerely yours,

Janice Silverstein

Janice Silverstein
Research Assistant

Karim Ahmed

Karim Ahmed, Ph.D.
Senior Staff Scientist

Sarah Chasis

Sarah Chasis
Senior Staff Attorney

JS/KA/SC:skb
cc: James G. DeZolt
John Sanders

MONS 009705

New England Office: 17 ERIE DRIVE · NATICK, MA. 01760 · 617 655-2656
Public Lands Institute: 1657 PENNSYLVANIA STREET · DENVER, CO. 80203 · 303 831-7101

Natural Resources Defense Council, Inc.

122 EAST 42ND STREET
NEW YORK, N.Y. 10168

212 949-0049

Washington Office
1725 I STREET, N.W.
SUITE 600
WASHINGTON, D.C. 20006
202 223-8210

Western Office
25 KEARNY STREET
SAN FRANCISCO, CALIF. 94108
415 421-6561

COMMENTS OF THE NATURAL RESOURCES DEFENSE COUNCIL ON THE SUPPLEMENTAL DRAFT ENVIRONMENTAL IMPACT STATEMENT ON THE HUDSON RIVER PCB RECLAMATION DEMONSTRATION PROJECT

October 14, 1981

Janice Silverstein
Karim Ahmed
Sarah Chasis

MONS 009706

New England Office: 17 ERIE DRIVE · NATICK, MA. 01760 · 617 655-2656
Public Lands Institute: 1657 PENNSYLVANIA STREET · DENVER, CO. 80203 · 303 831-7101

These comments are ordered to track the eight major issues we identified in our previous comments.

1. SOURCES AND DISTRIBUTION OF PCBs

The major contributors of PCBs to the environment may be hot spots, cold spots, remnant deposits or unknown sources. The project does not allow for the importance of any source except hot spots. It is essential that the contribution of the other sources be carefully evaluated before the dredging begins.

Hot Spots

As we said previously, the concept of "hot spot" dredging is a good one. However, hot spot criteria should consider not only concentration but also scour, desorption and total mass. It is not clear that this redefinition has been considered in the resampling and monitoring program.

Cold Spots

Detailed information must be generated on the size, mass, location, depth of contamination, scour rates and desorption rates of cold spot areas as well as hot spots. In this way dredging can be targeted to those areas contributing the most PCBs to the environment.

Once again, the program does not give adequate consideration to cold spots. According to the description of the Coring and Fathometry Study that will be conducted by NYSDEC and

Malcolm Pirnie, Inc. (MPI), "detailed location maps of both hot and cold areas will be prepared." However, coring will take place "in and near hot spot areas." Cold spot areas will not receive the sampling that is required to evaluate their importance.

Remnant Deposits

In addition to cold spots, the NYSDEC response ignores that importance of remnant deposits. After an evaluation of the costs of remedial action the NYSDEC recommends that no action be taken "[s]ince evidence exists indicating that remnant areas 3 and 5 do not pose a human health risk and because of their isolation, stability and natural inaccessibility." These assumptions are not necessarily ture.

According to Italo Carcich of NYSDEC in a May, 1981 letter to NRDC, "[t]he most recent data for the 1980 water year indicate that the remnant deposits are a significant source of PCB." In addition the DEIS estimates that 130 ug/yr of PCBs volatilize from the deposits (p. 2-23) and that estimates of total loss vary from 200 to 1300 ug/yr (p. 2-22). The DEIS states further that "[t]he amount of PCBs released from the remnant deposits to the Hudson, however, has not been adequately determined" (p. 4-24). This evidence refutes the conclusion that the remnant deposits are stable. If studies have been conducted since the DEIS was published, the FEIS should cite and discuss any new evidence that has been uncovered.

Furthermore, the DEIS does not support the conclusion that the remnant deposits are isolated and inaccessible. According to the DEIS, "[t]here is evidence that children occasionally play on some of the deposits and that motorcycles are driven over them. Animals also have free access to the sites" (p. 2-24). In addition, "[t]he remnant deposits, especially those on the east side of the river, are in fairly close proximity to residential areas" (p. 4-24).

It is essential that the remnant deposits be carefully monitored to determine their volatilization and PCB contribution to the river. The FEIS should contain a clear description of the relative contribution of all the remnant deposits and the studies that are being done to make these determinations. This will allow for a clear evaluation of what actions are necessary with regard to remnant deposits.

Unknown Sources

According to the DSEIS (Response VI-1), "As part of the pre-dredging baseline monitoring program designed by NYSDEC for the dredging project, the presently unknown source of PCBs in the Upper Hudson River will be identified, and remedial action, such as removal, will be undertaken." However, the monitoring program described in Appendix A of the DSEIS does not include a study to identify unknown sources of PCBs.

2. PCB TRANSPORT

We are pleased to see that a study will be done to examine the rates of PCB desorption and erosion from bottom sediments of the river. This may help to clear up the questions of the "low flow anomaly" and to improve the predictions of the Hydroscience model.

However, the study is not being used to help locate the primary source of downstream PCBs. If the model shows that at low flow desorption is the principal release mechanism and at high flow erosion releases the most PCBs, then the relative PCB release at low and high flows must be determined. As we suggested in our July 7th comments:

> If the PCB load in lbs./day were multiplied by the number of days in the year that such flows occurred, an estimate of the amount of PCBs transported under low or high flows could be made.

This would be important in deciding whether to dredge those areas most likely to be scoured or those that desorb most readily. For example, if yearly low flow contribution is higher, then areas of greatest desportion should be dredged. It must also be considered that contaminated sediments that are scoured may resettle faster and cause less harm than PCBs that are desorbed into the water column.

Furthermore, the study will examine the effects of sediment quality on the relationship between desorption rates and flow velocity. This information may be useful in determining which sediments desorb PCBs most readily. However, the study will only examine "hot spot" sediments from the area proposed to be dredged. The cold spot sediments will not be examined. However, cold spot sediments have different settling qualities and may be larger in size or lower in organic material than hot spot sediments. Cold spot sediments may also have significantly different desorption characteristics. Therefore cold spot sediments should also be examined.

3. SAMPLING AND MONITORING

According to the DSEIS (Response II-2):

> As part of the pre-dredging monitoring program, NYSDEC will sample sediments in the Upper Hudson River to define hot spots, as well as areas with less than 50 ug/g (ppm) PCBs, in terms of location, extent, PCB concentration, depth of contamination and PCB mass...NYSDEC will also assess how susceptible the contaminated areas are to scouring under normal and flood conditions. This pre-dredging sampling is described in Appendix A.

However, the sampling program described in Appendix A does not include projects to fully resample hot and cold spots as described in Response II-2. The resampling study must be described in more detail.

In addition, there should be an opportunity for the public to review the results of these studies and to provide input to decisions on where to dredge. In order to facilitate this public review, a document should be published that discusses the results of pre-dredging studies and proposes modifications to the dredging plan based on the information that is uncovered.

The following are our detailed concerns with the Operational Standards and Procedures, Mitigating Measures, Contingency Plans and Environmental Monitoring Programs that are described in Appendix A of the DEIS.

MONS 009711

(a) Dredging In River Containment and Stabilization

-- Are all the residents who will be contacted before dredging commences now informed about the project? (A-13)

-- Air sampling at the unloading site will be performed only if sampling at the dredge indicates concentrations of 1 $\mu g/m^3$ or higher. It is assumed that PCB volatilization at the unloading site is comparable to that at the dredge site. However, the unloading site is close to the encapsulation site which will have "an overwhelming influence" on the local air quality (A-21). In addition, the process of slurry formation may increase volatilization. Therefore, it cannot be assumed that values at the unloading site will be below recommended standards if they meet these standards at the dredge. Sampling should be done at the unloading site as well as at the dredge.

-- The water quality considerations only cover water supply and do not address effects on biota. In addition, there is no provision to curtail or alter the dredging project if unacceptable levels of PCBs are discovered.

-- In order to minimize resuspension of sediments and down river transport, dredging will be limited to "periods of relatively stable flow" (A-23). Dredging will not be done under flood flow conditions at a threshold of 20,000 cfs. How was this threshold determined? According to the DEIS (p. 2-9) average flow at Fort Edward is 4,000 cfs. A flood threshold of 20,000 cfs seems unreasonably high and far from "stable flow" conditions.

(b) Disposal

-- Surface water quality considerations estimate maximum monthly average PCB concentration of 20 µg/l. This will result in an average daily discharge of 2 lbs/day and a 20 percent increase over background levels in the water column. These values are inordinately high, especially when it is considered that the settlement required General Electric to reduce their average daily discharge to .0022 lbs/per day. No contingency plan exists to decrease the concentration or halt this effluent discharge if adverse effects are discovered.

(c) Long Term Storage

-- The discussion of leachate discharge considers both short and long term discharges. These figures should be comparable to those for water quality effects of disposal; however, they differ significantly. In addition, they are not comparable to figures in the DEIS. The following table identifies these discrepancies.

	Water Discharge Million Gallons	Average PCB Concentrations	Mass of PCB Discharged
Leachate Discharge (DSEIS A-29)	55	6.3 ug/l	5 lbs. over 2 years
Disposal Water Quality (DSEIS A-26)	--	10-20 ug/l	2 lbs/day
(DEIS 2-42)	91	--	--

It is essential that this be clarified. The effluent discharge from the containment site is considered to be the greatest PCB loss to the river from the Reclamation Demonstration Project. Although more PCBs will be removed from the river than returned as discharge, the effects of this direct discharge into the water column must be balanced against those of leaving the contaminated sediments in place.

-- The FEIS should include a copy of the site discharge permit and the TSCA approval and describe any monitoring that is required by these permits.

-- The DSEIS states that:

> The potential for gas generation in the containment cells is minimal because of the low overall level of organic material present in the contained material.

However, there is no estimation of what the overall level of organic material in the containment site

It is essential that dredging losses be carefully evaluated before dredging begins to avoid adverse biota effects and to accurately assess the quantity of PCBs that will be removed from the river. If it is discovered after dredging starts that losses actually exceed previous estimates, then the project may have to be halted and funds may not be available to make the necessary changes.

5. TREATMENT OF DREDGE SPOIL

Fortunately, the DSEIS provides a clearer description of the containment site. Construction and operation of the containment site requires a complex array of federal and state permits and certifications. It is essential that the FEIS describe these procedures along with their respective timetables. In this way the public will be informed of the various controls on the design and operation of the containment facility.

Although long-term monitoring will not be funded by the EPA grant, it is essential that the state be required to conduct these studies as a condition of the EPA grant. The FEIS should contain a description of the state's long-term monitoring plans.

6. DREDGING WETLANDS

It is still unclear where wetlands will be dredged in the reduced scale or full scale projects and whether wetland values may preclude dredging of some areas. According to the

Wetlands Mapping project description, "a small portion of some of the wetlands adjacent to deep water hot spots and subject to scour will be dredged." The FEIS should contain a detailed description of these hot spots and the wetlands that will be dredged.

In addition, we identified a discrepancy about which hot spots overlap with wetlands. We would appreciate a detailed response to the concerns contained in our comments on the DEIS and our March 11 letter. These are included in Appendix B to these comments.

7. COMPENSATION FUND

In our previous comments, we identified the need for a compensation fund for damages caused by the dredging project and we proposed seven principles to guide the consideration of such a fund. The DEIS contains no response to our suggestions and the state has proposed no such fund. The Section of Appendix A on Liability and Financial Assurances only states that the State is a self insurer and has adequate funds to cover claims. This is a far cry from a special fund directed at compensating damages resulting from the Reclamation Project. It is essential that the FEIS consider as a mitigating measure the creation of such a compensation fund.

APPENDIX A

The Natural Resources Defense Council (NRDC) offers these comments in response to EPA's Draft Environmental Impact Statement (DEIS) on the Hudson River PCB Reclamation Demonstration Project. The DEIS recommends dredging 40 spots in the Hudson River contaminated with PCBs. Since it projects insufficient funds for this dredging operation, the DEIS also endorses a project, reduced in scope, that would remove fewer hot spots.

Having reviewed the DEIS, we believe that there are still several central issues that have not been addressed. We identify these issues below, and point out why we believe that they must be resolved before EPA approves the project.

1. The major source of downstream PCBs has not yet been adequately identified. The proposed Reclamation Plan involves dredging only the "hot spots" in the Upper Hudson. It assumes that areas of highest PCB concentration contribute most to the downstream load and concludes that they should be dredged first. Yet many hot spot areas are stable sediments and may be scoured under only the severest flood conditions. Some sediments containing relatively lower concentrations of PCBs appear to scour at a higher rate and could be contributing significantly to the overall PCB downriver flow.

2. The primary method of PCB transport in the water column, whether dissolved or adsorbed to particulates, has not been clarified. To properly assess remedial measures we

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need more information about the mode of transport. If PCBs, for example, are carried downstream on sediments, areas of high scour should be dredged; if they are desorbed from sediments and carried downstream in the water phase, the areas of high desportion should be attended to.

3. The possibility that the total contribution of PCBs from low flows may exceed that from high flows has not been fully investigated. Since-the source of PCBs under these two conditions may differ, the appropriate remedial measures (such as where to dredge) may differ.

4. A condition of project approval should be the requirement for a thorough resampling and monitoring program. Resampling to accurately determine the locations of all PCB sediments is essential in order to analyze the most effective dredge sites. In addition, PCB sediments may have shifted since the time the original survey was done. A thorough monitoring program should also be conducted to ensure environmentally sound decisions regarding the project. This program should include monitoring of: (a) losses to the water column and the air before, during, and after dredging; (b) containment site losses to river, air, and groundwater; (c) short- and long-term effects of the dredging project on water quality, air quality, fish and agriculture.

5. The amount of PCBs missed or resuspended during dredging has not been adequately analyzed. The estimates presently given vary considerable (2% to 13%). Furthermore, the assumptions made in arriving at these estimates may not

be applicable to the Hudson River. The amount of PCBs lost during dredging is an important factor to be considered in analyzing both the overall benefits of the project and the relative benefits of the different dredging techniques.

6. The method by which the dredged material will be treated is not discussed in sufficient detail in the EIS. Thus, the effectiveness of this method in minimizing PCB losses is unclear. Furthermore, the adequacy of the containment facility in preventing PCB losses is not clearly demonstrated.

7. What effect will hot spot dredging have on wetlands? The possibility that wetland values may preclude dredging of some hot spots should be thoroughly investigated, particularly in connection with the full-scale project.

8. The DEIS fails to consider as a mitigating measure the creation of a special fund to compensate the victims of injury caused by the Reclamation Project.

APPENDIX B

DREDGING WETLANDS

Under the full-scale project, it appears that 14 biologically active wetlands would be dredged. We have reservations about the wisdom of such an endeavor; we detailed these reservations in our letter of March 11, 1981.

Under the reduced scale project, there would still be a certain amount of conflict with wetlands. The DEIS at 3-20 identifies hot spots 8 and 18 as being situated in wetland areas. In addition, it is unclear whether hot spots 13 and 19 and 20 might not overlap with wetlands. Regarding hot spots 19 and 20, for example, the DEIS at page 3-20 states that there are "no significant wetlands." This apparently means that there are no wetlands present, as the DEIS refers to other hots spots as having "no wetlands."

We still have questions about the utility of dredging the wetland hot spots that would be dredged under the reduced scale project. If the wetlands in question serve as stable traps for PCBs and also serve other functions, such as flood control buffers, might there not be greater overal utility in not dredging them? This inquiry is inadequately developed in the DEIS.

OVERLAP OF HOT SPOTS AND WETLANDS

In a DEC memorandum of September 15, 1978, Alan L. Koechlein reported on wetlands south of Griffin Island. We compared the wetlands with the locations of hot spots (as shown in Malcolm Pirnie, 1978c). The following quotes from the Koechlein memorandum are followed by our assessment of wetlands/hot spot conflicts.

> (1) A long slough on the west side of Griffin Island is an excellant wetland. I don't know if it represents a hot spot but I would object to its demise. The area is over 15 acres.

This area includes part of hot spots 13 and possibly 15. The mean PCB concentrations are 89 and 103 ppm, respectively.

> (2) Small wetlands occur north of Thompson Island...The areas, combined, are less than 5 acres in extent but represent veluable wildlife habitat.

This region includes hot spots 18 and possibly 20. Their mean PCB contamination is 94 and 249 ppm.

> (3) "Galusha Island offers waterfowl brood and migrant habitat. Recreational hunting is permitted throughout this area...It would be undesirable to disturb the Galusha Island Wetlands."

The Galusha Island wetlands are in direct conflict with hot spot number 25. The mean concentration at this area is 100 ppm.

> (4) "Wetlands located between Thompson Island and the Saratoga shore...I do not rate...very highly but [are] integrated with Galusha Island."

Although these wetlands are not critical habitat, their destruction, it appears, may lead to erosion or disturbance of the Galusha Island area. These wetlands (hot spot number 22 are less contaminated than Galusha Island with a mean PCB concentration of 75 ppm.

(5) A small tributary [Tuttle Brook?] enters the Hudson River on the west side, above Lock 6. Small oxbows create a deciduous wetland of seasonally flooded woods used by waterfowl. Although two acres in size, it would be undesirable to disturb this area.

This area, in conflict with hot spot 26, has a mean PCB concentration of 47 ppm.

(6) "Located south of Lock 6...the area serves muskrat, raccoon, waterfol broods and migrants. It would be undesirable to remove the wetlands. If only the floating and submergent sections are dredged, leaving the emergent sections, the area will continue to be useful for muskrat but drastically reduce waterfowl usage."

This area -- overlapped by hot spot 28 -- appears to be extremely biologically diverse and active. The mean PCB concentration of hot spot 28 is 109 ppm.

(7) "Located below the New York Route 4 overpass and Thompson Road, this wetland is between 10 and 12 acres and is very valuable. It provides nesting, brood rearing and migrant waterfowl habitat. I recommend this area remain untouched."

This area is entirely contained in hot spot 35. The mean concentration of this area is 105 ppm.

Two other areas listed in the memorandum could not be located on the map.

Edward W. Coffin
51 Lakeview Road, Poughkeepsie, New York 12603

10/9/81

Robin Rohn
USEPA Region II
26 Federal Plaza, Rm 400
New York, N.Y. 10278

Dear Robin:

Enclosed are my comments on recent information sent to me in connection with the Hudson River PCB project. I hope they arrive in appropriate time.

Since this is the last comment period before the final document appears, I would like to express my appreciation for the opportunity to participate in the EPA- CAC process.

The opportunity and issues have been very eye-opening and enlightening to me. They have made me appreciate why some can get so emotionally involved in these kinds of environmental issues. I have made every attempt to avoid that approach in this situation. Thus my comments, intended to be as objective as possible, may be unintentionally controversial to those with a different approach or agenda to this project.

I will, of course, send a copy to J.De Zolt and to Dr. Sanders and to Mr. Mulvaney. Depending on the date convened and time I would hope to attend what I believe to be the last CAC meeting. At any rate, if there is not one, I hope to receive a copy of the final EIS.

Thank You
Edward W. Coffin
Edward W. Coffin

MONS 009723

[illegible]
51 Lakeview Road
Poughkeepsie, NY
12603

USEPA Region II
Environmental Impacts Branch
26 Federal Plaza, Room 400
New York, NY 10287

Subject: Comments on Hudson River PCB Project.
Reference: EPA-EIS, Supplemental Draft, Aug. 1981
Misc. previous references.

An increasing number of newspaper reports in the months of September and October, have illustrated the generally harmful levels of PCB material contained in both fish and wildfowl. These reports do not, in general, specify what type of PCB and/or where the fish/wildfowl samples have been taken or when. Some fish samples mentioned the Lower Hudson, Tappan Zee area.

Thus I am lead to infer that my prior documents provided at EPA hearings and CAC meetings have tended to be sustained. If there is any confusion on this, I must regret my apparent lack of clarity.

In addition, a US Dept. of Int., Geo.Survey "information Release" dated Sept. 14,1981 indicates a report "Polychlorinated biphenyl transport in the Hudson River, New York" was received by me. It indicated review copies available in Albany and purchaseable copies from NTIS at cost. Neither alternative was an option available to me at this time. From the description, I must assume the report is strongly associated with Figure 2-3 of the NYSDEC- DEIS, Sept.'80 and its replication in EPA-DEIS, May '81. Since I have previously submitted comments showing the decreasing PCB flow over the time frame of those charts, there is no reason to review that analysis here. As a result of that prior analysis, I strongly doubt the current (1981 to 1983) validity of the 7 lbs./day (providing about 2560 lbs/yr) passing Waterford. Nor would I argue against it for years prior to 1980.

It seems, that data developed mainly prior to 1979, is assumed to hold continuously for the future. Yet not of the facts available for review confirm that assumption. As I have shown in prior documents, all factual data shows descreasing flow of PCB material. One can only conclude, reasonably, that as the upstream sediments and remnant materials became saturated with discharged PCB isomers, that newer additions went further downstream to fresh absorbing material, i.e. organic and sediments.

Thus, a report showing a current level of 7 lbs(PCB)/day flowing past Waterford must be indicating either the "mystery" sources or fresh additions to the river due to illegal dumping or leachate from contaminated ground water flowing into the Hudson resulting from historical land-fills or similar sources.

Directly related to the EPA-EIS Supplement, Ref., a few observations may be in order.

- Page A-46: In my prior papers to EPA et al, I have illustrated the fallacy in the correlations between PCB and "Cs137". You, of course, have Dr. Saunder"s letter of June 28th to me confirming that the radiological source is actually unknown except as a gamma ray emitter. Hence, Item III -16, page 3-24, Comment & Response, is irrelevant in terms of Cs and is further misleading due to the criteria for concentration of gamma ray emitting material associated with dredged material at the dump site. In this matter, I note, that prior to 1970, low level nuclear waste possibly including some transuranic material and uranium, was being collected and contained at the National Lead site, in the Albany,N.Y. area. (Since then it should have been sent to Idaho Falls, Idaho or Richland Washington. I am then forced to consider the potential gamma ray sources to include the possible "nocturnal dumping" of such waste in the Upper Hudson. From the logic associated with such actions, it is easier than making the long haul or paying deposit fees? Certainly, it is not unheard of and may be just as readily conjectured as a gamma ray source, as "bomb fallout".

- Page 3-25 Item III-17, Comment & response. This discussion completely ignores the effects of high temperature cooking of the PCB contaminated material. This, in the lower Hudson, would clearly occur in the "cooling water" associated with Indian Point as well as to eaters of fish taken from the river. Further, the response, ignores your prior discussion of the subject in EPA-EIS May 81, Appendix A, page A-16. Your reply also ignores the dioxin compound. Recent fish studies on fish in that area tend to confirm my earlier comments which include dioxins, and which you ignore.

- Page A-58 Sect. D items 2 & 3; and attached Poughkeepsie Journal items of 7/5 and 7/22/81/

  Item 2 and the 7/5 article reassert the short movement of disturbed sediment and the difficulty of desorption of the attached PCB material. The 7/22 article, provides for the emergency water protection if PCB increases should occur. Item 3 of Sect. D asserts - "The return flow from the spoils lagoon represents the largest potential loss of PCB and solids from the dredging process."

  I agree with both positions and hence conclude that -

  <u>DREDGING IS MORE HARMFUL THAN LEAVING IT ALONE?</u>

<u>CONCLUSIONS</u>

(1) I continue in my position that since the major portion of PCB material has long since passed ofer the dam or been volatilized, the proposed dredging portion of this project is not likely to improve any existing situation.

(2) No factual data, provided to date, illustrates any potential in future years, for significant change in the Lower Hudson. As shown in prior papers of mine, the closer one gets to m.p.0 the lower the content of the lesser isomers of the Aroclor mixtures exists. Heavier isomers also do appear to have longer lives and persistence. Since however, Aroclor 1016 is said to be the principle mixture purchased, and hence presumed to be the waste, from 1972 onward, its consequent existence since 1977 in the Upper Hudson has been clearly diminishing. Aroclors 1242 and 1254, principly the higher isomers, would have achieved relative stability in the 12 to 13 years since 1971. Hence, the lack of effect at m.p.0 except for leachate and other Lower Hudson sources.

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(3) The entire project appears to rest on an assumption that PCB flows and related criteria existing prior to 1979 will continue to behave in the same way. This is simply not true. Had these proposals been achieved in 1976-1977, some of the desired effects might have been achieved. But, in my opinion, in 1982-1983 the opportunity for improvement has basically been lost.

(4) In the course of this CAC program, I have been repeatedly asked why I just didn't accept the experts judgements. I can only reply with the observation that I felt the CAC was created to examine those judgements. When I further ask if they have bothered to read the material I've prepared, I find that shortage of time and other considerations have not made that practical. But having mainly written to fulfill my obligation to the EPA, I can only suggest that we all seem to have our own agendas. Mine is to provide a reasonable analysis from the factual data provided and studied by myself.

(5) In my response to Dr. Sander's letters to me of June 26 & 28, I stressed that I was interested in dealing only with the factual material. I do not find myself concerned with more politically oriented aspects of the decisions.
On the factual basis, nothing proposed shows any real solution to the PCB contamination of the Upper or Lower Hudson. The factual data does indicate that current "Hot Spots" are being buried in erosion sediments at a reasonably satisfactory rate. And that dredging may well provide nothing more than an artifially induced "scouring" effect.

(6) On the basis of the factual material presented and used, this project seems to result in potentially more harm to the Washington Cty. environment than the "No-Action with normal DOT activity." Efforts to cover over remaining remnant deposits and make progress with the major landfills seems to provide the greatest benifit to the Washington County environment. The simplistic belief that partial dredging of the Upper Hudson will releive the contamination of the Lower Hudson, particularly at m.p.0 and nearby, has no basic justification other than the wishful hope that it be so. Lower Hudson contamination might be better served if more attention were paid to the chemical content of organic residues passing through the Indian Point cooling processes.

Respectfully
Edward W. Coffin
Edward W. Coffin

MILLER, MANNIX, LEMERY & KAFIN, P.C.
ATTORNEYS AND COUNSELORS AT LAW
11 CHESTER STREET
GLENS FALLS, NEW YORK 12801
P.O. BOX 765
(518) 793-6611

John W. Miller (1908-1968)
John C. Mannix
John C. Lemery
Robert J. Kafin
Benjamin R. Pratt, Jr.
Robert L. Wolff, Jr.
Joseph M. Walsh

Capital District Direct Line
(518) [illegible]
Lake George Office
Canada Street
(518) [illegible]

June 10, 1981

Ms. Karen Scalzi
CEASE, INC.
RD #1
PO Box 193
Fort Edward, NY 12822

Re: Funding Contingency Plans - PCB Dredging & Encapsulation Project

Dear Karen:

Pursuant to your request, here is a brief summary of several potential methods for funding contingency plans associated with the PCB dredging and encapsulation project. Please note these are "theoretical" in nature; as of this time we do not know if any of these mechanisms could find practicable application.

1) Line Item on Annual Budget:

This is probably the least acceptable alternative because it will be subjected to political influences of changing legislatures and governors over the years. This mechanism could, however, become more meaningful if the federal funds to be granted were made contingent upon New York's promise to provide funding on a yearly basis for the life of the project, with an additional stipulation that if the State annual appropriations discontinue for any reason prior to the permanent disposal of the PCBs, the State will immediately repay the Federal Government the amounts initially advanced, with interest. Any portion of an annual appropriation not expended in a given fiscal year should be earmarked for a trust fund, to accrue interest thereon, and be used in the future if necessary.

2) Creation of a Trust or "Super" Fund:

Rather than rely on relatively small, annual line item appropriations, the State could appropriate several large amounts over a period of several years to be held in trust for the exclusive purpose of

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funding annual maintenance costs and building up a reserve for and in the event of the occurrence of the "worst case" contingency - ground water contamination. The major advantage of this mechanism is that it will not be subject to the political whims of future State legislaturesand governors. Once again, lobbying to get EPA to condition the project funds on New York setting up a trust fund would further facilitate the implementation of this or any other funding mechanism.

3) Insurance:

The State could purchase insurance to cover the various potential risks the project poses to the environment and public health. I have no idea if the State or Federal Government will be able to readily obtain such insurance. In theory, any risk can be insured. Insurance can be a very flexible funding mechanism. For instance, the State could insure against only some risks while acting as a self insurer with respect to all others. Similarly, the State could have a "deductible" policy, whereby the State would be liable for the first "x" dollars of claims and the insurer would be liable only for claims in excess of this deductible amount.

4) EPA to Act as a Surety:

A remotely possible funding mechanism is getting EPA to agree to act as the surety, or guarantor, of New York State's obligations with respect to funding the monitoring and contingency plans. In the event EPA is called upon to perform the financial obligations of the State, it would have the right to seek reimbursement from the State. This right of reimbursement will obviously not provide much of an incentive for EPA to agree to act as a guarantor. On the other hand, the argument can be made that if the Federal Government is willing to fund and approve the project, it ought to be willing to insure the health and property of those citizens most likely to be adversely impacted by the project. This gesture on the part of the Federal Government would at least help to instill public confidence and trust in the project.

5) Creation of an Enforceable Contractual Undertaking:

A somewhat novel approach would be for DEC, on behalf of the State, to enter into a formal contract with EPA

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or some other entity, where the terms of the agreement evidence an intent to benefit or compensate the residents of the project area in the event implementation of contingency plans becomes necessary. This would, as a matter of contract law, give rise to the right of project area residents to enforce the contract for their own benefit. This would also allow the EPA or other party to the contract to enforce the contract on behalf of the project area residents. The disadvantage of this mechanism is the need to enforce the contract by means of a law suit - a potentially expensive and time consuming endeavor.

The above funding mechanisms are those which immediately come to mind. Undoubtedly, there are other more elaborate mechanisms, including combinations of the above mechanisms. The above should, however, serve as a discussion vehicle to get DEC and EPA thinking along such lines. Another significant task is to determine as early as possible what the dollar figures are for each of the proposed contingency plans, as the dollar amounts involved may have an important bearing on which of the funding mechanisms can be realistically employed.

I hope the above will be of some assistance in helping CEASE to begin developing some sound proposals. If you have any questions on the above, please feel free to contact me at any time.

Sincerely,

MILLER, MANNIX, LEMERY & KAFIN, PC

Joseph M. Walsh

JMW/cmb

R.D. #1, East River Road
Fort Edward, New York
September 25, 1981

Ms. Robin Rohn, Project Officer
Hudson River Reclamation Demonstration Project
Environmental Protection Agency
26 Federal Plaza
New York, New York 10278

Dear Ms. Rohn:

I have three comments to make in regard to the Supplemental Draft dated August 1981.

Firstly, On Page A-96 the last paragraph says the people of Washington County should be assured by New York State's status as a self insurer, that the post-closure requirements will be carried out. This self-insurer status should also be sufficient to cover any future claims of damage that the people may have. This is unacceptable. I am enclosing for inclusion in the formal comments the letter of June 10 from CEASE's attorney. I know that you presently have been handed this letter, but I wish to formalize this transmittal. DEC's past performance in our area necessitates a more formal commitment to contingency funding than is presently stated in the Supplemental Draft. The Carter Pond Project, undertaken by DEC in conjunction with the Waterfowl Improvement Assn., in the Town of Greenwich, Washington County, is one case I would like referenced. In this case DEC allocated funds for the creation of a wildlife habitant and nature trail system for Washington County. The project was completed and now the dam has become unstable allowing flow to increase too much. DEC now says that no funds are available for the maintenance of said dam. I fear that the same may become true of Site 10 maintanance.

Secondly, I find the Rock Diking of Hotspot #8 referenced on Page A-6 unacceptable. This rock diking would create a swamplike breeding ground for mosquitoes and alter the river so as to make this area a non-productive backwater with no flow. Presently, we have blue herons, mallards, black ducks which nest in this area, as well as extensive plant life which would be endangered by this diking project. Boyce Thompson states "area judged not to present major conflict." I disagree. As a basis of disagreement, I can attest to the improvement of this area over the last three years. I feel stopping the flow by diking would be disastrous.

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Ms. Robin Rohn, EPA
Page 2
September 25, 1981

Additionally, the need for a citizens oversight committee comprised of both members of the TAC and CAC is essential. Although the TAC has the technical expertise, the local citizens are onsite and would have the ability to spot problems on a timely basis.

Thank you for your attention to the above matters.

Very truly yours,

Karen Scelzi

Karen Scelzi
Citizens Advisory Committee

Enc.
cc: Mr. James DeZolt, ENCON

Also, Sinclair residents should be <u>consulted</u> prior to dredging of Sinclair. Not merely <u>notified</u> as stated in the Supplemental Draft.

MONS 009731

BENDIX ENVIRONMENTAL RESEARCH, INC.
FOX PLAZA, SUITE 902 • 1390 MARKET STREET • SAN FRANCISCO, CA 94102 • TELEPHONE (415) 861-8484

5 October 1981

Chief, Environmental Impacts Branch
USEPA -- Region II
26 Federal Plaza, Room 400
New York, NY 10278

RE: Hudson River PCB Reclamation
Demonstration Supplemental DEIS

Dear Chief:

Subject DEIS recommends land disposal of PCB-contaminated dredge spoils from the Hudson River. I agree that removal of PCB hot spots is desirable and urgent, but I wish to express concern over land containment of such material.

Land storage imposes a lengthy committment to monitoring of the of the containment site and a long-term risk of dissemination into the environment. Compliance with the Section 116(a) provision that: "No pollutants removed pursuant to this paragraph shall be placed in any landfill unless the Administrator first determines that disposal of the pollutants in such landfill would provide a higher standard of protection of the public health, safety, and welfare than disposal of such pollutants by any other method including, but not limited to, incineration or a chemical destruction process." could avert the necessity of land storage of the PCB-contaminated material.

New chemical methods of PCB degradation are being announced every week. These methods should be examined and, as appropriate, tested to determine their applicability to the material in question. Even if initial costs are higher, the long-term costs may be lower because there would be no need for containment site monitoring.

Sincerely,

Selina Bendix

Selina Bendix, Ph.D.
President

SB/hs

MONS 009732

APPENDIX F

NEW YORK STATE HAZARDOUS WASTE FACILITY SITING BOARD DECISION

MONS 009733

STATE OF NEW YORK
INDUSTRIAL HAZARDOUS WASTE SITING BOARD

CERTIFICATE OF ENVIRONMENTAL SAFETY
AND PUBLIC NECESSITY

The Industrial Hazardous Waste Siting Board hereby issues this Certificate of Environmental Safety and Public Necessity upon the terms and conditions set forth below.

Permittee: Division of Water
New York State Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-0001

Description of the Project:

The applicant's project consists of dredging a portion of the Upper Hudson River between Lock #2 of the Champlain Canal and Fort Edward, New York, and encapsulation of the dredged material in a specially designed and constructed secure landburial facility to be located on a 250 acre site, 2.5 miles south of the Village of Fort Edward immediately adjacent to Route #4. The purpose of the dredging project is to remove river bed sediments contaminated by polychlorinated biphenyls (PCBs). The applicant has identified 40 PCB contaminated "hot spots" in the Upper Hudson River as a result of a number of years of scientific and engineering studies. The term "hot spots" refers to areas of river bed sediments containing 50 micrograms per gram or more of PCBs. The location of these "hot spots" are shown on maps contained in the DEIS (Exhibit 36), Malcolm Pirnie SEQR DEIS dated September 1980 (Exhibit 17) and the Phase 1 Engineering Report by Malcolm Pirnie, dated December 1978 (Exhibit 44). The "hot spot" dredging project, as originally conceived, included removal of the 40 "hot spots" and 2 remnant river bank deposits, located above the former Fort Edward dam site, with encapsulation in a containment site. As originally designed, the containment site for the PCB contaminated material would have had capacity for all of the 40 "hot spots", the remnant river bank deposits and three New York State Department of Transportation dredge spoil areas. In addition, a segregated cell at the containment site was to be provided for the contents of three abandoned industrial dump sites located in the Fort Edward area, but this was not included in the cost estimates for the original "hot spot" dredging project. The cost of the original "hot spot" dredging project was estimated at $40 million based on construction of the containment site in 1981, and a two-year dredging program during 1982 and 1983.

Subsequent to the development of the original full-scale project, the applicant was forced to rescope the project due to funding constraints. Total funds available for the project at this time are $26.7 million ($20 million in Federal grants and $6.7 million in State funds). As a result of this funding constraint, the applicant has rescoped the project by reducing the number of "hot spots" to be dredged, deleting provisions for the disposal of the remnant river bank deposits and the material in the DOT spoil areas, and reduced the capacity of the containment site. Reductions were also made in the proposed levels of research studies. Therefore, the "hot spot" dredging project, as it presently is proposed, included the dredging of at least 20 "hot spot" areas with continuation of dredging of additional "hot spots" until project funds are exhausted. The earliest that dredging will take place is 1983 as the applicant has stipulated that there will be no dredging of "hot spots" during 1982. Dredging of "hot spots" will be performed by either clamshell dredging with hydraulic pumpout unloading or hydraulic dredging and transport as described in the Dredging System Report #2 dated September 1980 (Exhibit 18) and the Containment Site Investigation Report #1, dated May 1980 (Exhibit 19) and as required by the Department of Environmental Conservation regulations governing the construction and operation of secure landburial facilities (6 NYCRR Part 360).

Conditions: See Appendix A.

Issued by the Industrial Hazardous Waste Siting Board on the 22nd day of April, 1982.

Effective date: May 1, 1982.

IN WITNESS WHEREOF, the Industrial Hazardous Waste Facility Siting Board has caused this Decision to be signed and issued and has filed the same with all maps, plans, reports and other papers relating thereto in the offices of the Department of Environmental Conservation in Albany this 22nd day of April, 1982.

INDUSTRIAL HAZARDOUS WASTE FACILITY SITING BOARD

Richard A. Persico

VI. MINORITY REPORT

HUDSON RIVER PCB RECLAMATION PROJECT
STATEMENT TO DENY CERTIFICATE OF NEED

The Department of Environmental Conservation (DEC) has done a superb study of the problem of PCBs in the Hudson River sediment and has proposed a workable project to remove 30 to 35% of the PCBs from the channel above the Troy dam. (Hearing exhibit 36 - Federal Draft Environmental Impact Statement Table 2-7 and exhibit 23) The dredged material is to be deposited in a secure containment site in the Town of Fort Edward. The cost of the proposed project is 26.7 million dollars.

The environmental conservation law (ECL Section 27-1105.3(f) set up a board consisting of representatives of five New York State departments and three outside members to review the project. This board is to deny issuing the required certificate of need if it finds that "the facility is not necessary or is otherwise not in the public interest to be approved". The purpose of this document is to express the position of members of this board who feel the certificate of need should be denied.

POSSIBLE CONTAMINATION

As a result of testimony by Dr. Edward Buckley, the board decided that the risk of adjacent crop contamination from PCB volatilized during filling of the site was great enough to require permit condition #11 which purchases, through an easement, all crops within a specified area from the site.

Testimony by Steven P. Maslansky (of Malcolm Pirnie, Inc., the project engineers) indicated that the clay on the site is not homogeneous (Volume 8 of Testimony, page 38) but rather has horizontal layers of "a fine sand varve that may be in contact with the shale rock. At present, the shale rock is acting to push the water away from the shale into the clay. Of course, we've said that there is the potential to reverse that gradient by the construction of the site". (V8, p. 46)

These remote risks of air and water contamination would not exist if the project is not undertaken.

HEALTH

When Dr. Leo J. Hetling, Director, Division of Environmental Health, NYS Dept. of Health, who has been associated with the project since the GE hearings, was asked what is the single most important justification for carrying out the project, he discussed two reasons. First "it's essentially the national policy of the U.S. to make all waters swimmable, drinkable, and fishable". The Federal Water Pollution Control Act has a similar but seemingly unachievable policy of "(1) it is the national goal that the discharge of pollutants into the navigable waters be eliminated by 1985". Second, "there is a Health Department policy because of the health unknowns, and problems of doing risk assessment with these type of chemicals to reduce human exposure to these chemicals to the extent 'practical'. (V12, p. 19) He believes "I think always 'practical' implies a dollar limit". (V12, p. 60). With or without the project there will be a PCB intake by humans from food and air. (p. 45)

The present project area's PCB levels in the air (around 0.02 ug/m^3) is only 20% of the average suburban level (of 0.10 ug/m^3) (V12, p. 11) and is less than one ten thousandth of the current OSHA standard (V12, 84). The NIOSH study on 2500 PCB workers found no increase in overall cancer rates in workers exposed to air with a PCB level at average of more than 100 times the level found in the project area (V12, p. 41).

Except for a short time in 1976 in Waterford, the PCB level measured in treated water in communities drawing from the Hudson River are well below the recommended health standard (V12, p. 78) and in Waterford in the past year has been less than detectable. (V12, p. 43)

WATER QUALITY AND FISHING ISSUE

In the Federal EIS (exhibit 36) the proposed project is assumed to remove 30% of the PCB above the Troy dam for an estimated exhausting of the PCB above the dam by the year 2008. (Table 2-7, pages 2-15). If no action is taken other than normal navigational dredging and volatilization, the Federal EIS estimates the exhausting of the PCB above the dam to occur in 2013 or only five years later. Thus undertaking this project would not appear to significantly improve the water quality or allow the removal of the warning against consuming fish taken the Hudson River much sooner than not undertaking the project.

WATERWAYS DREDGING

Mr. Joseph R. Stallato, Director of DOT's Waterways Maintenance Division, testified that in the past five years DOT has not dredged any sediments which exceed 50 ppm PCB (V17, p. 82 & 87) or had any problems obtaining DEC water quality permits for dredging. (V17, p. 66) He says that the present method of adding a flocculation agent to the dredged water removes 90 to 95% of the PCB (V17, p. 76) He states that the dredging has been very carefully monitored by the DEC (V17, p. 55) and would require an EPA waiver if sediments exceed 50 ppm PCB (V17, p.71). This seems to refute his prefiled testimony of project need that "If the project is not completed, I believe that it will be difficult and perhaps impossible to dredge the canal because of dredge disposal problems." (V17, p.17)

DEMONSTRATION PROJECT

While there is some merit in proceeding with the project as a Riverbed Cleanup Demonstration Project, the Moreau site is an excellent smaller scale demonstration of a PCB containment site and the DOT routinely demonstrates that they can dredge the river bed.

FEDERAL GRANT

It should be noted that if the certificate of need is not issued, the $20 million of Federal grant funds allocated to this project may be "lost". There is always the possibility that money not spent on this project will be spent on some other project of even less value in some other state. Nevertheless, we have to continue to have faith that our system of government has the integrity to spend our money wisely or not spend it at all!

SUMMARY

We recognize there were valid reasons to have initiated the project study. However, having reviewed the record, we, the undersigned members of the board, feel that the applicant has failed to prove that the facility is necessary or otherwise in the public's best interest. Therefore, we respectfully find that the certificate of need should be denied.

Peter S. Kent

PETER S. KENT

Nathan G. Dickinson Jr.

NATHAN G. DICKINSON, JR.

COMMENT ON SITING BOARD

It is our opinion that every member of the board acted with intergrity and good conscience that his decision to approve or disapprove the certificate of need was done for the best interest of the citizens of New York State.

We feel that, to broaden the scope of future boards, two representatives from the educational field balancing an equal number of state an ad hoc members should be considered such as proposed in NYS legislative bills A-9725 and S-7872.

Peter S. Kent

PETER S. KENT

Nathan G. Dickinson, Jr.

NATHAN G. DICKINSON, JR.

APPENDIX G

COMPENSATION PLAN FOR FARMERS

COMPENSATION

Background

While expert testimony indicated that contiguous residential populations would not be endangered, vegetation, particularly crops growning within one-half mile from the encapsulation site, could be detrimentally affected by airborne PCB.

The applicant since early in the development of the project, has recognized and accepted that it has a responsibility to provide just compensation for damages resulting from such airborne materials.

The need for such a plan was also highlighted by the U. S. Environmental Protection Agency both in the Federal Draft Environmental Impact Statement and a letter by Acting Regional Administrator Richard T. Dewling dated August 17, 1981 to Commissioner Robert F. Flacke in which he stated

> "...the possibility exists for some crop contamination in the affected area. Notwithstanding the operational measures which are being developed to mitigate the impacts of PCB volatilization on the surrounding area, NYSDEC should consider how to protect the farmers from financial losses should their crops become contaminated during the operation of the containment site.
>
> This concern has been expressed many times during public meetings and hearings and EPA agrees that the farm families and their livelihoods should be considered during the operation of the project. A financial assurance plan could be developed to protect the agricultural interests as part of the overall project contingency plan."

On October 6, 1981 the applicant met with approximately 28 farmers/residents or agents thereof to solicit further clarification of compensation issues. At that time the applicant distributed a survey/questionnaire seeking specific information relating to the individual parcels of land surrounding the encapsulation site. One spokesman at the meeting strongly urged those present not supply the information and despite repeated requests for the information, informally and on the record, to this date the applicant has received only four responses.

The Siting Board throughout the course of the Hearing indicated the necessity of a compensation plan.

Based on the record, as well as discussions with the farmers, it is apparent that due to the farmers' financial arrangements and the fact that crops cannot be instantly created, it is important that compensation be made in a timely fashion. The applicant recognizes that the general rules of compensation require an actual loss as opposed to one that is speculative. The applicant recognizes the need for compensation prior to actual losses.

The Siting Board in an effort to develop a complete record requested representatives of various agencies to address specific issues of crucial concern to this project. On the last day of the hearing, representatives from three of the four agencies requested supply information appeared and provided information in their respective areas of expertise relating to this project.

The Division of the Budget, Executive Department of the State of New York was represented at the hearing by Mr. David Googins. He serves as the Deputy Chief Budget Examiner.

Mr. Googins addressed the concern about the State's long-term commitment to this type of project in light that one sitting

Legislature cannot commit a succeeding Legislature.

He states that maintenance and perpetual care of a facility as this is a function of the State's stability and the longevity of the government itself, and by the State's commitment to its social obligations.

Another concern addressed by Mr. Googins was the State's ability to respond quickly and adequately to emergency situations. He mentioned the extraordinary resources available to the State as was demonstrated during the Thruway accident of December 23 involving a truck that spilled hazardous waste.

Within minutes, State Police were on the scene, with members of the Department of Health arriving within the hour. Within the first 24 hours of the mishap, 25 man days had been provided to the site.

Similarly, on April 19, 1979, the State was faced with an emergency situation when the vast majority of the State's correction officers walked off the job. Within hours, National Guardmen assumed tasks normally undertaken by the correction officers. Twenty-four hours later, 8,000 troups were manning 26 correctional facilities arround thè State.

Mr. Googins explained that the State possesses a financial interest in maintaining a properly run facility. In the case of a demonstrative default, the State is subject to a suit by the injured parties.

If the State did not pay the settlement fee ordered by the court in the case of such a suit, it would then be subject to interest on the amount of monies not paid.

Mr. Googins also noted that agriculture business is the largest single industry in the State of New York.

If the Department were to request funding to pay farmers for projected losses (anticipatory losses determined by experts' findings), Mr. Googins felt that such funds would be approved.

Finally, Mr. Googins stated that if pressure was put on the Comptroller to give the issue priority, then farmers could receive funds from the State via the temporary easement process in one day.

Compensation is thought to be the only viable alternative for farmers in the region because of opinions expressed by Mr. John Kerwin, Chief of the Bureau of Insurance, Office of General Services.

Mr. Kerwin stated that it was the general policy of the State of New York not to insure its buildings, contents or other properties.

The only forms of insurance purchased are automobile and boiler (where inspections are required).

The Area Affected

Based on the expert testimony, it is reasonably projected that an area 700 meters from the point source may be subjected to deposits from airborne PCB so as to exceed the USDA standard of 0.2 parts per million in crops. The result could be characterized as an encroachment which constitutes a taking for a public use and for which the owners and lessees must be compensated.

The exact area subject to actual PCB deposits that exceed the standard is subject to further study and field survey. Weather station data is essential for this growing season so that the degree and range of PCB contamination can be calculated during next winter. No detailed arrangements for financial compensation can be finalized until these predictions are made.

Timing of Payments

There are four potential approaches to compensation for affected parcels of land (1) payment of the estimated loss, (2) payment of the estimated loss with provisions for adjustment, (3) payment for actual loss and (4) establishment of a buffer zone through temporary easements over the area for which contamination is projected.

The applicant finds alternatives one, two and three unacceptable. Payment is estimated losses may well not reflect the true situation, thus either providing a gift to the farmer or inadequate compensation depending on the particular circumstances. The state is constitutionally precluded from paying speculative compensation, while being mandated to provide full compensation for damages it inflicts.

As indicated earlier, the financial situation of the farmers makes alternative three less than satisfactory. Should compensation not be paid until after the crops are grown and contamination proven, it would be too late in many instances to obtain substitute crops in a timely fashion. Such a situation could easily force the farmers, who have a cash flow problem, out of business.

Alternative two initially appeared to be acceptable. However, the approach is untried, requires agreement, and requires continued negotiation for the duration of each particular agreement.

As indicated earlier, there is an indication that reaching such agreements may be impossible, and most importantly, the payment would have to be made on an annual basis. The applicant recommends alternative four.

The concept of a buffer zone was a logical result stemming from the concern over the deposit of airborne PCB from the disposal site on adjoining lands, which are primarily dairy farms. The concern is the threat of contamination that PCB pose to the cattle and other livestock by virtue of their introduction into the food chain.

The buffer zone is intended to prevent this contamination by eliminating agricultural use of lands within the buffer zone for a period of two growing seasons beginning with the season during which dredging will begin.

The buffer zone will be established by the use of temporary easements. These easements would vest in the Department the right to use and occupy the site in any manner necessary to implement the buffer zone concept, reserving to the owner the right to maintain and use any existing structures and such other uses of the premises as the Department may permit. Present indications are that neither the growing of crops nor the pasturage of livestock will be allowed but that residential use will be permitted. Further refinement of the right to be acquired and the language necessary must be accomplished through negotiations between the applicant and the owners.

Scope of Easements

By law, the applicant is required and desires to justly compensate the affected owners. The owner affected should be determined conservatively that is use a minimum of one-half mile (2640 ft.) from the point source as opposed to 700 meters (2296 ft.). This distance will be increased if testing results indicate the need.

This area for labeling purposes should be characterized as a buffer zone.

Where the projected buffer zone boundary would intersect a field resulting in a sliver parcel, the entire field should be included.

Scope of Compensation

It is necessary to establish the just compensation which each owner is entitled to receive. The traditional measure of just compensation due the owner of land subject to a temporary easement is the rental value of the land for the period of occupation. This easement involves the disruption of a going commercial enterprise with the possibility of long-range effects due to the interruption of the enterprise. Accordingly, any calculation of just compensation must include an analysis of the following factors:

1. the rental value of the land;
2. the cost of either temporarily relocating the farmer or maintaining his livestock during the period pasturage and crop production are prohibited;
3. any severance damages inflicted on the land which was subjected to the easement upon the return of the land to the fee owner;
4. any damages caused to any portion of a farm over which we did not acquire an easement but which is a remainder of a farm over a portion of which we did acquire an easement;
5. any damages to the capital assets of the farmer.

The major advantage of this approach is the ability to compensate initially for the total projected damages set forth above. This permits the owner to utilize his compensation in any manner he sees fit.

Secondly, the establishment of the buffer zone, through the easement process, permits the Department to control completely the use of the property by the terms of the easement and thus through proper language will prevent the possibility of raising contaminated crops. The principle, permitting the State to purchase property as a buffer zone, has been well established and thus this approach avoids many of the administrative and legal questions encountered by the other approaches evaluated.

Finally, under the buffer zone approach, compensation will include all factors pertaining to the use of the land, including the values of crops which would otherwise have been growing.

Identification of Appraisal Problems and Process

The applicant has already consulted with an independent appraisal firm. This firm, through an individual with specific skills related to agricultural valuations will be guided by the following appraisal process in determining just compensation:

1) each property within the buffer zone will be individually evaluated. This evaluation will include the following determinations:

   a) the area of the parcel affected;

   b) the percentage of the total parcel affected;

   c) the percentage of land used for corn, hay pastures and other agricultural crops affected;

   d) the type of operation undertaken on the parcel with special emphasis on severance factors as that is appropriate;

   e) the type and size of the operation and the effect of loss of use on the remaining portion of the parcel.

As a result of the gathering of this information which will include personal contact between the appraiser and property owners as well as the development of all pertinent cost figures and information regarding operation, an appraised compensation figure will be estimated by the independent appraiser.

Procedural Steps for Acquisition of Easements

The steps which the applicant proposes to follow in order to obtain the easements are summarized as follows:

1) secure approval from the Commissioner to acquire the easements;

2) have an accurate map and description prepared and forwarded to the Department of Law with a request for a Certificate of Title;

3) secure entry onto the premises for survey and appraisal purposes;

4) obtain appraisals and seek a voluntary negotiated aquisition at 100 percent of the highest approved appraisal;

5) in the event a negotiated settlement cannot be reached, the State will proseed to take the easement by appropriation. The State will make an offer of 100 percent of the highest approved appraisal and the owner will be advised of the availability of an Agreement for Advanced Payment. This Agreement permits the owner to accept the offer and at the

same time provides the owner the right to seek greater compensation for the easement by signing a claim in the Court of Claims.

Other Legal Remedies Available

The proposed plan compensates for all damages caused by the acquisition of the easement. Owners, where no easement is acquired, still may bring an action against the State for damages caused by PCB deposited as a result of the project.

The Attorney General has concluded that the State can be held libel through suits in the Court of Claims for any negligent or other tortious actions of the Department of Environmental Conservation committed in carrying out the Hudson River PCB Reclamation Demonstration Project. This opinion is based on the State's waiver of immunity effected by Section 8 of a Court of Claims Action. The State is libel for the torts of its agents even though its agent is engaged in a governmental activity. (Jones v State of New York, 33 NY2d 275, 280 [1973]). Furthermore, the State may also be held libel for negligent actions for carrying out a governmental plan [Kelly v State of New York, 57 AD2d 320 [4th Dept, 1977]). The State, as a land owner, has a duty not to use its land in a manner so as to cause injury to neighboring property owners (Palmer Ltd. v State of New York, 33 AD2d 412 [3d Dept, 1970]; Poysa v State of New York, 102 Misc 2d 269 [Ct of Claims, 1979]).