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NEW BEDFORD
REMEDIAL ACTION MASTER PLAN

FINAL REPORT
1 May 1983

Prepared by

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Burlington, MA

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NEW BEDFORD

REMEDIAL ACTION MASTER PLAN

1. INTRODUCTION

1.1 Definition and Purpose of RAMP

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, also known as Superfund, authorizes the Federal Government to respond to releases or threatened releases of hazardous substances that may endanger public health or welfare. The Superfund program is built on the recognition that responses must be tailored to the specific needs of each site.

Prior to initiating remedial work, a lead agency is designated to act as the principal organization to manage the site. In this case, the U.S. EPA is the lead agency.

The first step in developing a program to address these specific needs is the preparation of a Remedial Action Master Plan (RAMP). This RAMP has been developed as a general planning tool to be used by the EPA for overseeing remedial actions in the New Bedford, Massachusetts, area. The primary functions of the RAMP are to review available data, to assess data needs, and to identify the type, scope, sequence, schedule, and costs of remedial projects which are appropriate to the situation. To this end, a principal component of the RAMP document is the series of prepared work statements which appear in Appendix A. Major issues addressed include: site investigations, feasibility assessment, permit requirements, data management, quality assurance, and public participation.

Normally, a RAMP would address a single problem relating to one uncontrolled site or source of contamination, such as a field of buried chemical waste drums. Because of the extensive and varied nature of the New Bedford situation, this RAMP differs from most others. The New

Bedford RAMP has been developed to accommodate the numerous individual sites which occur as distinct but interrelated problems. The RAMP report includes:

- Introduction - providing background information and describing the basic approach;
- Summary of Present Knowledge and Information Needs - providing a general overview of the situation as well as site-specific assessments;
- Remedial Action Master Plan - providing the actual planning model and descriptive text;
- Administrative Requirements and Special Problems - describing protocol and potential obstacles to execution of remedial projects;
- References;
- Appendices - including project work statements and synopses of past investigations.

1.2 Background

The New Bedford situation is one of the most extensive cases of environmental contamination by polychlorinated biphenyls (PCBs). While much is yet to be learned about chronic long-term exposure to PCBs, still less is known about the occurrence and effects of other chlorinated hydrocarbons, like polychlorinated dibenzofurans (PCDFs), polychlorinated quarterphenyls (PCQs), and dioxins, which may associate with PCBs. The environmental and health risks of PCB exposure were considered significant enough by the U.S. Environmental Protection Agency (EPA) to warrant a ban on all further PCB production in 1977.

Paralleling the extensive PCB contamination in the harbor is contamination by toxic heavy metals. Summerhayes [17] found high levels of copper, chromium, and zinc in sediments throughout the harbor. In localized areas, these three metals constituted more than one percent of the dry weight of sediments. The occurrence and distribution of these toxic metals should be investigated.

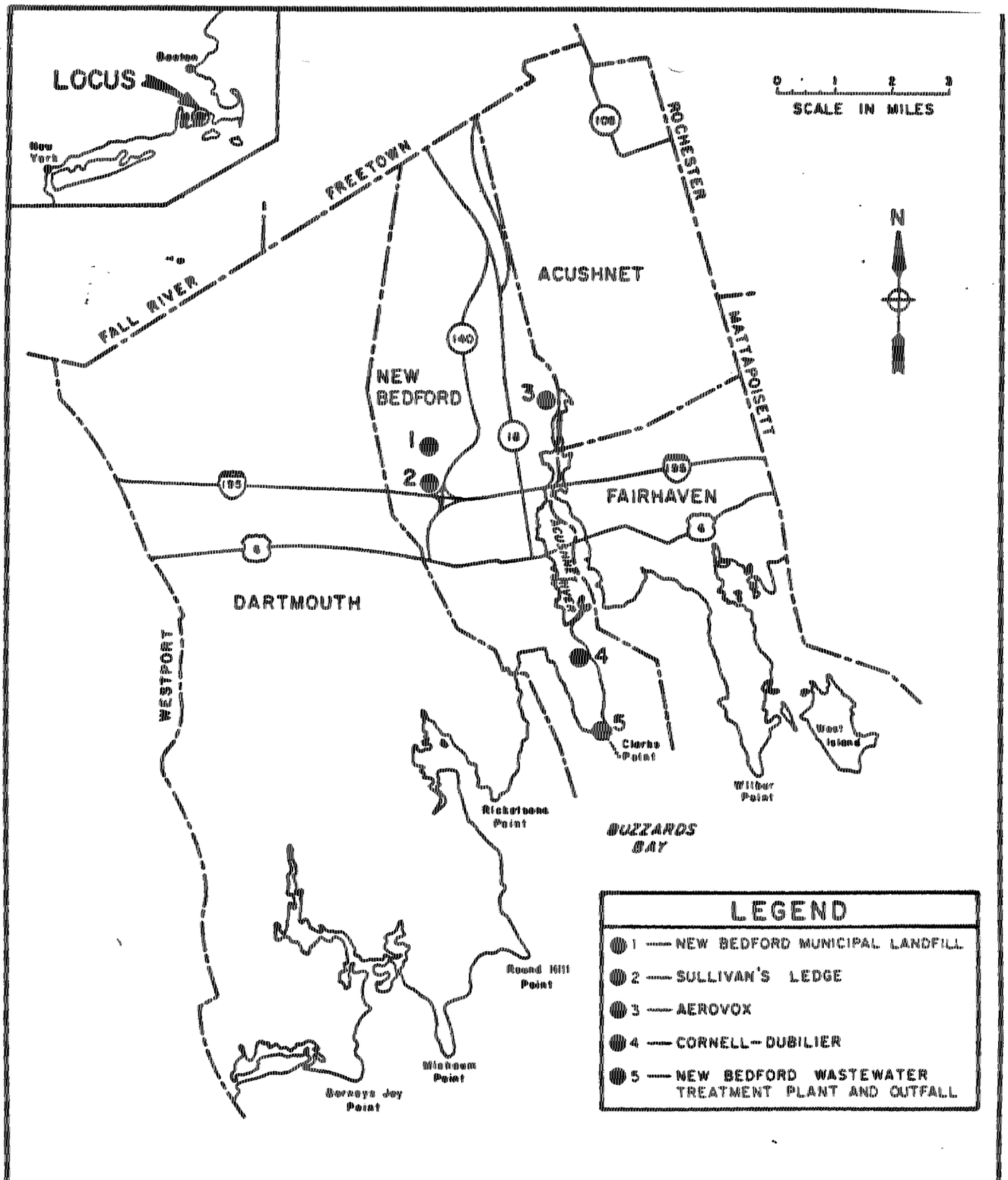
PCB contamination in the New Bedford area (Figure 1-1) is widespread. The majority is the result of industrial uses of PCBs over a period spanning several decades up until the late 1970s. The largest known users of PCBs were the Aerovox Company and Cornell-Dubilier Electronics Corporation, two New Bedford manufacturers of electronic components. The present owners of these facilities, operating under consent orders, are presently involved in the cleanup of PCB contamination on their respective properties (Cornell-Dubilier had completed most items by December 1982). Consequently, the cleanup activities of Aerovox and Cornell-Dubilier are outside the scope of the RAMP.

The presence of PCBs has been documented in the following areas:

- The sediments and water column of the Acushnet River Estuary/New Bedford Harbor/Buzzards Bay;
- The New Bedford municipal landfill and adjacent wetlands;
- Sullivan's Ledge, a former solid waste disposal site in New Bedford;
- The New Bedford municipal sewer system and wastewater treatment plant;
- Ambient air in the general area;
- Biota.

Numerous studies have confirmed the presence of PCBs in samples of marine sediments, upland soils, surface and ground waters, ambient air, and the biota. In addition to the documented sources and sites noted above, there are more than thirty other potential or suspected locations of PCB contamination in the general area encompassing New Bedford, Fairhaven, Dartmouth, and Acushnet. These other locations include landfills, industrial waste disposal sites, dredge disposal sites, and scrap metal dealers.

Heavy metal contaminants also are known to be present in the environment around New Bedford Harbor. Marine sediments have been found to contain enriched levels of the metals copper, chromium, lead, zinc, arsenic, silver, cadmium, and mercury. While the occurrence of



USEPA CONTRACT No. 68-03-1613 WORK ASSIGNMENT No. Z-2-14.11 WESTON	NEW BEDFORD REMEDIAL ACTION MASTER PLAN	FIGURE 1-1 PROJECT AREA

elevated concentrations of heavy metals is not central to the issue of PCB contamination, the former constitutes a major concern and will be addressed in the course of remedial investigations.

Of immediate concern to the local economy is the closure of portions of New Bedford Harbor and Buzzards Bay to the taking of certain commercially important fish, particularly lobster. The accumulation and concentration of PCBs in the edible portions of bottom feeders and free-swimming species is linked to contamination in the sediment and water column. The highest sediment PCB concentrations have been found in the upper area of the Acushnet River Estuary. These PCB hot spots will be the focus of a feasibility study over the next 6-12 months.

1.3 Objectives of Remedial Action

The broad objectives of the New Bedford remedial action program are:

- To protect the health and welfare of the public and the environment;
- To enable the return of commercial fishing in PCB-impacted areas wherever economically feasible;
- To allow previously proposed maintenance and developmental dredging projects in New Bedford Harbor to proceed;
- To restore the recreational use of the harbor, including fishing and lobstering, wherever feasible.

1.4 Basic Approach

The basic approach to remedial measures for the New Bedford area problem is illustrated in Figure 1-2. Technical efforts will proceed according to the following general sequence:

(1) Remedial Action Master Plan

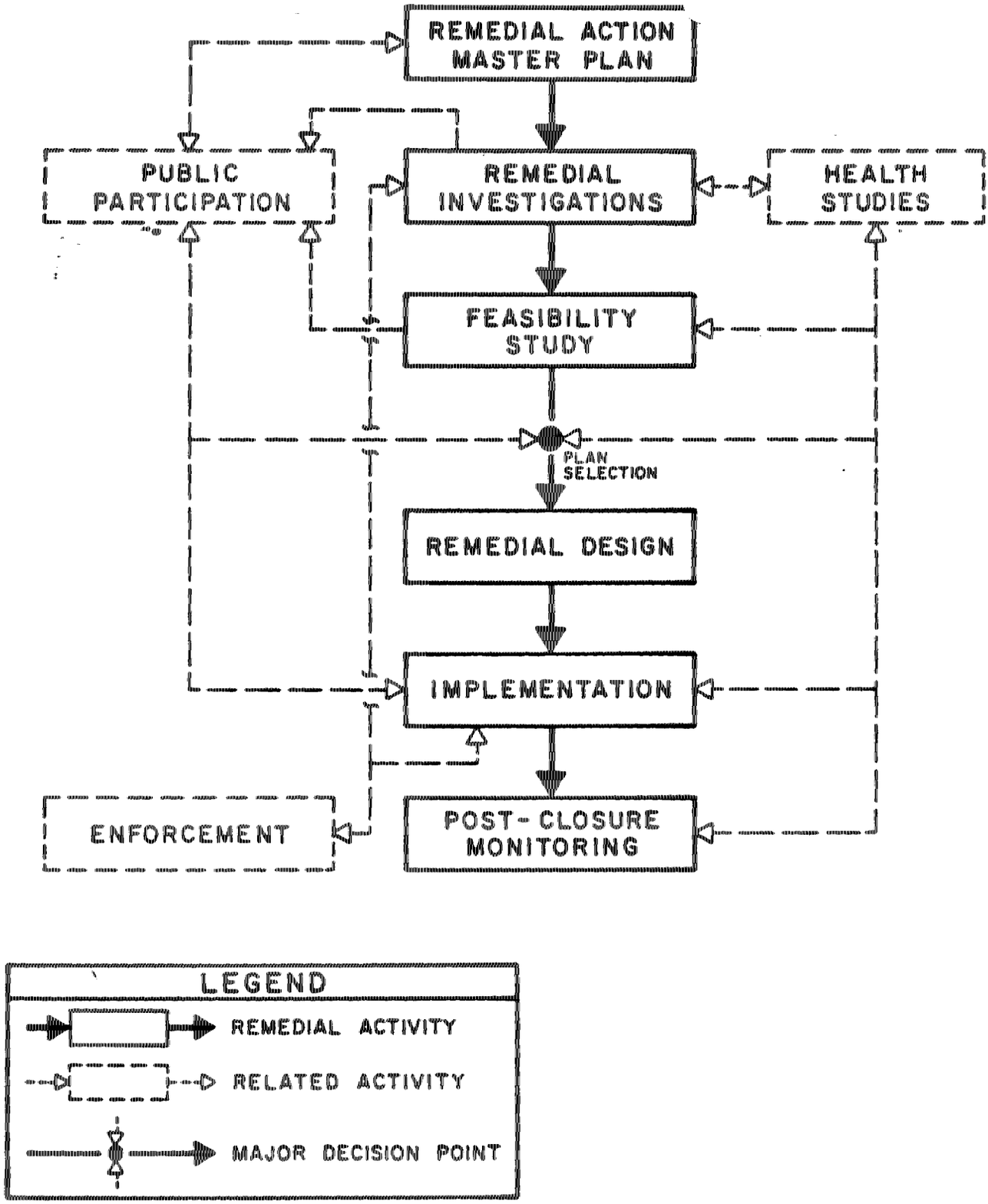
(2) Remedial Investigations

(3) Feasibility Study

(4) Remedial Design

(5) Remedial Construction/Implementation

(6) Post-Closure Monitoring



USEPA CONTRACT No. 68-03-1613 WORK ASSIGNMENT No. Z-2-14.11 WESTON	NEW BEDFORD REMEDIAL ACTION MASTER PLAN	FIGURE 1-2 BASIC APPROACH

These activities will occur in conjunction with health studies, enforcement, and public participation. The sequence (1)-(6) will be phased to permit fast-track evaluation and remediation of PCB hot spots and other priority sites as determined by the lead agency. Thus, certain aspects will proceed from study through design and implementation while others are still in the investigatory stages. Fast-tracking essentially will limit only the time element, not the content, of the remedial process. Fast-track remedial implementation projects must, like normal projects, be demonstrated as cost-effective and consistent with a permanent site remedy.

1.4.1 Remedial Action Master Plan

This RAMP document will serve as the basic planning tool for conducting all remedial activities. As these activities progress, new information will be developed; thus, the definition of the problem and the determination of information needs should be continually refined. As a flexible planning tool, the RAMP will undergo periodic revision in response to the dynamic situation. EPA will track the progress of remedial activities and make adjustments to the RAMP as necessary.

1.4.2 Remedial Investigations

Remedial investigations will consist of data searches, PCB transport and food chain modelling, site reconnaissance, and sample collection and analysis for the purposes of documenting and characterizing each source/site, assessing the degree of hazard, and setting priorities for remediation.

1.4.3 Feasibility Study

Alternatives for remedial action at each source/site will be developed and evaluated in a technical feasibility study. The study will assess the public health and environmental effects, engineering aspects, and costs of implementation for each alternative considered. Recommendations will be presented in the feasibility study, and a plan of action for each site will be selected by the lead agency with input from state and local agencies and the general public.

1.4.4 Remedial Design

Following plan selection, design of the remedial program will commence. Design will consist of preparing engineering drawings and specifications for each proposed action. These technical documents will serve as the bid packages for execution of the work and will undergo an in-depth review by the lead agency before issuance.

1.4.5 Remedial Construction/Implementation

Prior to execution of the work, an implementation plan will be developed. Aspects of implementation will include project overview, competitive bidding, sequence of work, quality control, health and safety, community relations, permit requirements, technical requirements, environmental monitoring, site closure, and miscellaneous other considerations.

1.4.6 Post-Closure Monitoring

Post-closure environmental monitoring will be instituted following remedial action to determine whether the desired effects have been attained or whether further action may be necessary.

1.4.7 Public Participation

Public participation will occur throughout the course of remedial activities and will be organized along lines established in a Community Relations Plan [23]. Public participation, besides being an integral part of the RAMP itself, will be solicited by EPA in conjunction with its review and selection of remedial plans. By informing and involving the public in the remedial efforts, it is intended that final remedial actions will be accepted by a consensus of affected parties.

1.4.8 Health Studies

Epidemiological and health effects studies may be pursued apart from, but parallel to, remedial activities. Data from the health studies may be used by the lead agency to assist in determining the scope of remedial activities.

1.4.9 Enforcement

Enforcement, while not a direct component of the RAMP process, will be pursued by the lead agency. The findings of remedial investigations may lead to enforcement actions against responsible parties and to subsequent cleanup and cost recovery efforts.

1.5 Legal and Institutional Framework

Zones of contamination in the New Bedford area together comprise one of the more than 400 sites on the National Priorities List under what is commonly known as the Superfund Program. This Federal program, developed to respond to the most serious uncontrolled releases of hazardous substances, was authorized with passage of CERCLA.

Pursuant to CERCLA, the specifics for remedial action are set forth in Subpart F, Phase VI, of the National Contingency Plan (NCP) (40 CFR 300.68). An outgrowth of this rulemaking is the Remedial Action Master Plan, or RAMP, developed by the U.S. Environmental Protection Agency as a technical and financial planning document to assist in meeting long-range needs.

Responsibility for administering and funding remedial action programs is shared by EPA and the States. Funding may be either 90% Federal/10% State or 50% Federal/50% State, depending on the qualifications of the particular site. However, the States are required to assume all future maintenance of remedial actions. EPA may operate as the lead agency in taking response actions authorized under CERCLA or may encourage a State to take the lead role by contract or cooperative agreement. As mentioned previously, EPA will be the lead agency at this site.

The regulatory agency in Massachusetts which has been most consistently involved in the New Bedford situation is the Department of Environmental Quality Engineering (DEQE). Other principal parties who have contributed to efforts to date are listed in Table 1-1. The Executive Office of Environmental Affairs (EOEA) in Massachusetts is the umbrella agency for the Department of Environmental Quality Engineering (DEQE), Department of Fisheries, Wildlife, and Recreational Vehicles (DFWRV), Office of Coastal Zone Management (CZM), and Massachusetts Environmental Policy Act Unit (MEPA). An

TABLE 1-1

PARTICIPATING AGENCIES AND INSTITUTIONS

Federal

- Environmental Protection Agency (EPA)
- Centers for Disease Control (CDC)
- National Oceanic and Atmospheric Administration (NOAA)
- U.S. Coast Guard (USCG)
- U.S. Army Corps of Engineers (COE)

State

- Executive Office of Environmental Affairs (EOEA)
- Department of Environmetal Quality Engineering (DEQE)
- Department of Public Health (DPH)
- Office of Coastal Zone Management (CZM)
- Department of Fisheries, Wildlife, and Recreational Vehicles (DFWRV)
- Massachusetts Environmental Policy Act Unit (MEPA)
- Department of Public Works (DPW)

Local

- City of New Bedford Planning Department

Private Institutions

- Woods Hole Oceanographic Institution

Committees

- Acushnet River Estuary PCB Commission
- Interagency Task Force
- Ad Hoc Committee on the Acushnet River Estuary Disaster

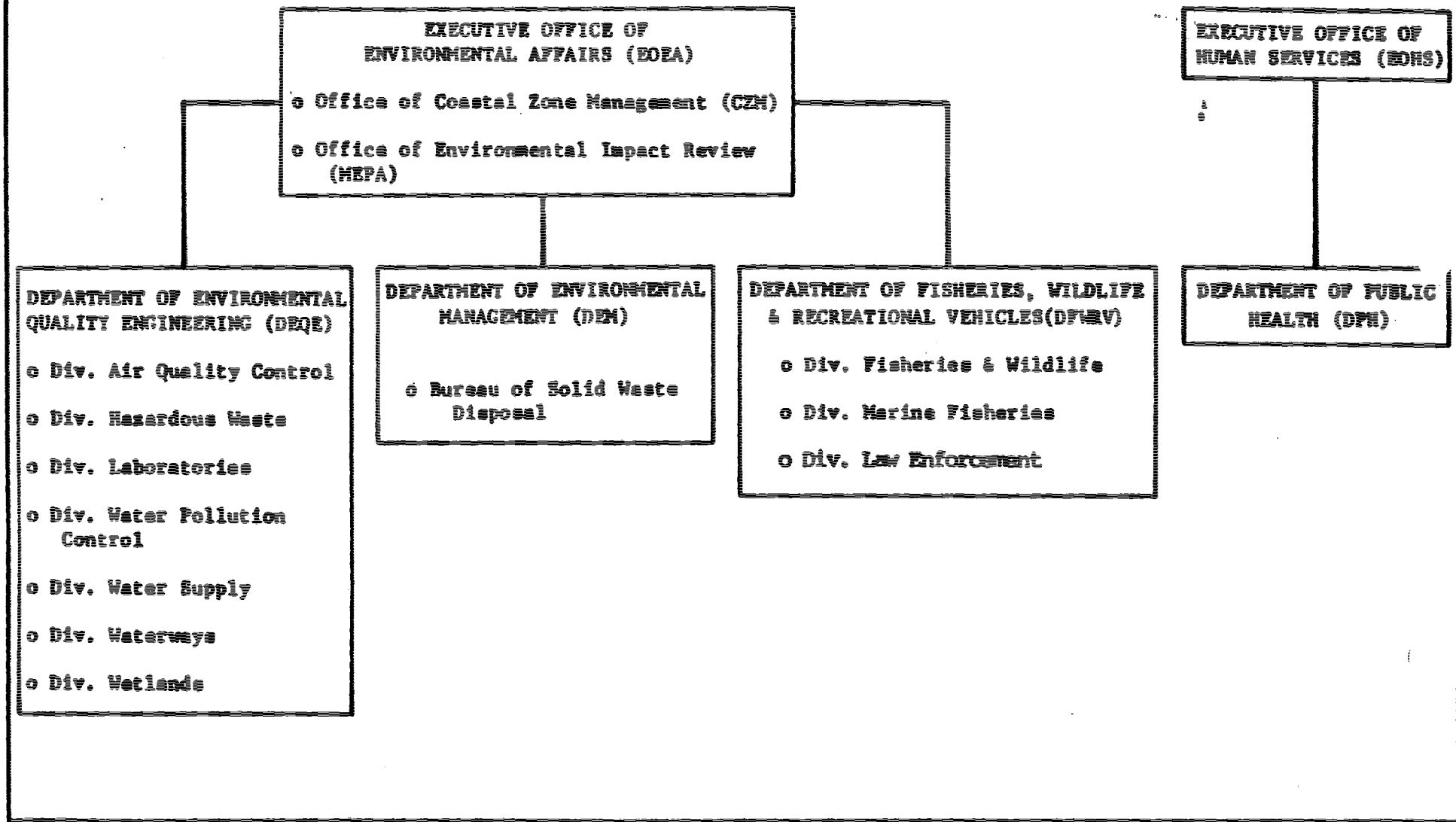


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FIGURE 1-3
PARTICIPATING KEY AGENCIES
OF THE
COMMONWEALTH OF MASSACHUSETTS

organizational chart showing State agencies and principle subdivisions involved in the New Bedford remedial action program is presented in Figure 1-3. The Department of Public Health (DPH) is under the Executive Office of Human Services (EOHS).

Committees established to address the New Bedford PCB problem include: the Acushnet River Estuary PCB Commission, established by Governor's Executive Order No. 216; the Interagency Task Force, led by DEQE; and the Ad Hoc Committee on the Acushnet River Estuary Disaster, initiated by State Representative Roger Goyette.

2. SUMMARY OF PRESENT KNOWLEDGE AND INFORMATION NEEDS

2.1 General

The various sources and sites of PCB contamination in the New Bedford area are:

- The sediments and water column of the estuary/harbor/bay environment;
- The New Bedford municipal landfill;
- Sullivan's Ledge;
- The New Bedford municipal wastewater system;
- Commercial properties, including Aerovox and Cornell-Dubilier;
- Ambient air;
- Undisclosed sources and sites;
- Biota.

As previously stated, cleanup activities at the Aerovox and Cornell-Dubilier sites are being pursued independently by the two firms and are beyond the scope of the RAMP. All of the remaining sources and sites are addressed herein.

Numerous studies and many thousands of dollars have previously been committed to identifying and characterizing PCB-contaminated sites and in proposing possible remedial measures. The fact that a large number of agencies, institutions, and individuals have participated in these efforts has resulted in

overlapping studies, differing objectives and points of focus, inconsistency of methods and data, and a diversity of opinions and ideas. However, past efforts have enabled the construction of a data base which may be useful to continuing and future remedial activities. The purpose of the RAMP is to synthesize the existing information into a consolidated remedial program for all participating parties to follow under the guidance of a single, lead agency.

A number of reports describing the nature and status of the New Bedford PCB problem have been produced. Rather than duplicate these efforts, the RAMP refers the reader to four of the most recent and comprehensive of these reports: Weaver [25], Acushnet River Estuary PCB Commission [1], Santos [16], and Rivkin [15]. Further information on past activities is contained in the series of Work Inventory and Status Briefs in Appendix B.

2.2 Data Management and Evaluation

All available analytical data on soils, sediment, air, water, and biota have been assembled and entered into a computerized data management system. There are approximately 4,000 entries to date. The system allows ready access to the data base and provides flexible output capabilities including statistical and graphics capabilities. Metcalf & Eddy, Inc.(M&E), under contract to EPA, is custodian of the data management system [13]. The computer software package employed is Digital Equipment Corporation's DATATRIEVE-II. M&E enters and validates new data as they become available.

Most of the existing data pertain to harbor sediment samples, and the majority of analyses are for PCBs (expressed most often as Aroclors 1016, 1242, 1248, and 1254). While some data exist on heavy metals and priority organic pollutants, the focus of sampling and analytical efforts has been on PCB contamination.

Because various sampling and analytical procedures have been employed by different investigators, the data are generally not comparable and possess varying degrees of validity; for example, some data is presented on a dry-weight basis and other data on a wet-weight basis. Consequently, it has become necessary to evaluate the existing data against a set of criteria which relate to sample collection and analysis. The data screening process has been designed to assist in determining which data are reliable and useful, and to help identify additional data needs. The screening of data and

identification of data gaps are being performed by M&E under the data management contract. Since the RAMP is based on a determination of data needs, and because these needs cannot be precisely established until after completion of the data evaluation, the present document is based on preliminary evaluation of the data.

- Future data management will be built upon the existing data management system. Under EPA's direction, all incoming data will be validated and evaluated in a manner consistent with current procedures to ensure consistency of the data base.

2.3 Preliminary Source/Site Evaluations

The following subsections provide a brief review of each PCB source/site, including present site conditions, quantity and quality of data, ongoing investigations, data gaps and needs, and remedial objectives.

2.3.1 Estuary/Harbor/Bay Environment

PCBs are present throughout the bottom sediments of the Acushnet River Estuary in concentrations ranging from less than 1 to greater than 100,000 parts per million (ppm), dry-weight basis. Contaminant levels vary considerably with depth and location over relatively short horizontal distances. However, PCB concentrations in general depend on the distance and direction from source, circulation effects, and the presence of fine-grained sediment.

Approximately 100 core samples have been taken to date, depths generally not exceeding 18 inches. Most contamination resides in the uppermost 6 to 12 inches with subtantial attenuation below this level. The presence of PCBs correlates well with that of fine-grained sediment and organic matter, which tend to occur in thin surface layers and accumulate most readily in the deeper portions of the harbor [17].

Figures 2-1a and 2-1b show the distribution of PCBs in bottom sediments. The indicated levels are a composite of values (arithmetic average) for surface and shallow samples (up to 6-1/2 inches deep).

In the upper estuary, north of the I-195 bridge, concentrations are generally in the range of 500-1000 ppm. The major exception is a zone of PCB hot spots in the upper estuary, where levels exceed 1,000 ppm. Levels in excess of 100,000 ppm have been reported.

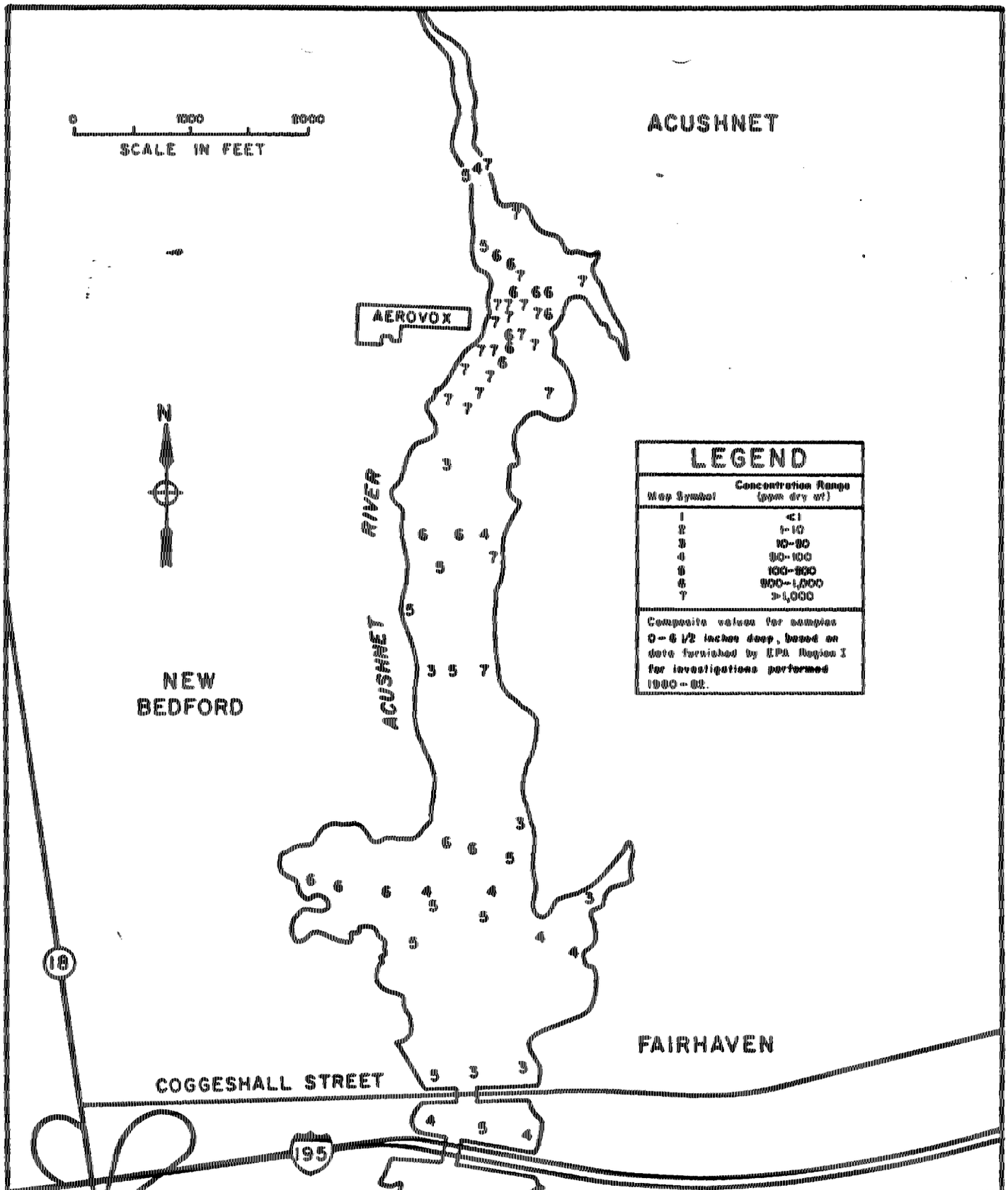

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FIGURE 2-1a
PCBs IN BOTTOM
SEDIMENTS
(UPPER ESTUARY)

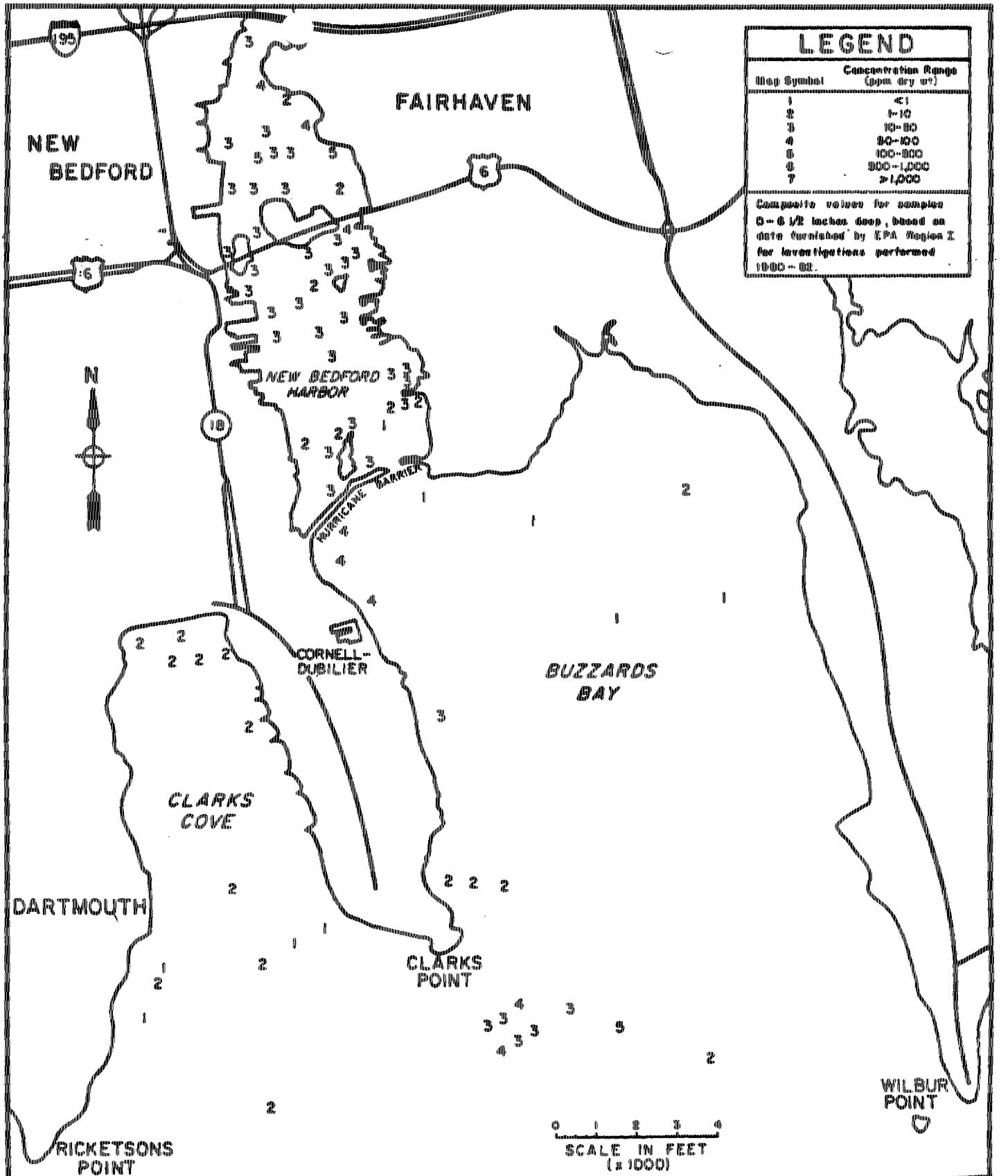

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FIGURE 2-1b PCBs IN BOTTOM SEDIMENTS (LOWER ESTUARY)

South of I-195 but north of the hurricane barrier, PCB levels fall to 10-50 ppm in most sample locations. The fact that the hurricane barrier acts as an obstruction to the outward migration of PCBs is indicated in the generally lower sediment PCB concentrations (less than 10 ppm) of the outer harbor. Localized higher concentations of about 50-100 ppm occur along the shoreline north of Cornell-Dubilier and off Clarks Point in the area of the wastewater treatment plant outfall.

Because of the changing nature of the estuarine environment, and to present the most updated situation, data collected prior to 1980 were not included in Figures 2-1a and 2-1b. Most of the data are for total PCBs, but approximately one-third of the sample analyses were for Aroclor 1242 only, and may therefore be understated because 1254 was not included.

Recent data on contamination of the estuary by metals (primarily Cu, Cr, Pb, Zu, As, Ag, Cd, and Hg) are meager, compared to available PCB data. Additional sampling and analysis for heavy metals will be conducted to further delineate the problem.

Like PCBs, metals tend to associate with fine-grained sediment. Summerhayes [17] found that copper is a good indicator of metals contamination in the harbor. The limited recent data on copper in sediment samples taken from the outer harbor permit some preliminary observations. Most of the outer harbor between Ricketsons Point and Wilbur Point has copper concentrations of 10-100 ppm in surface sediment. The highest levels in this area appear to be in the vicinity of Clarks Point and the municipal wastewater outfall.

These data contrast with information presented in Summerhayes' 1977 study. The estuary above the hurricane barrier was reported to have copper concentrations exceeding 1,000 ppm in surface sediment. Levels were 500-1,000 ppm in the outer harbor extending 1.5-2.5 miles southeast from the hurricane barrier, and 100-500 ppm in most remaining harbor areas between Ricketsons Point and Wilbur Point. Concentrations increased to 500-1,000 ppm around the wastewater outfall off Clarks Point.

Data on the water column in New Bedford Harbor have shown PCB levels in the range of 1 part per billion (ppb) [25]. Values of this magnitude exceed EPA's criterion of 0.03 ppb (24-hour average) for salt water environments [22].

PCB contamination of fish in New Bedford Harbor has been monitored since 1976 by the Division of Marine Fisheries. A report [10] for the years 1976-80 indicates that PCB levels in bottom feeders correlate generally with the degree of sediment contamination. Species differences in PCB body burden correspond to body fat content, degree of exposure, size (age) of organism, and possibly, seasonal metabolism.

Samples of lobster and finfish have revealed PCB levels exceeding the 5 ppm (wet weight) Federal action limit for edible species, but not all bottom-feeding finfish in the closure area between Ricketsons Point and Wilbur Point (Closure Area 2) have had PCB levels exceeding this limit. There may be seasonal variations or, possibly, a decreasing trend. However, there is a lack of data to draw any conclusions. Seasonal migration of lobsters is cited as a problem in the interpretation of data on this species.

Continuing investigations on bottom sediments of the Acushnet River Estuary are being performed by GCA Corporation under contract to EPA. This work consists of 30-50 core samples in the estuary above the I-195 bridge to fill in data voids downstream from the previously identified PCB hot spots. Samples were collected in January 1983 and analyzed for total PCBs (no metals). A report of the findings is due in May 1983.

Other ongoing investigations on the estuary are being performed by the Woods Hole Oceanographic Institution (WHOI) and by the U.S. Coast Guard (USCG) in conjunction with EPA. WHOI is conducting limited studies involving circulation patterns, biological transport mechanisms, effects of PCBs on marine organisms, and analytical PCB chemistry. USCG is investigating the migration of PCBs from the upper estuary to the lower estuary. Their laboratory studies include a determination of PCB partition coefficients under quiescent conditions and under worst-case leaching of completely mixed sediment and water. Field efforts include measurements of tidal flows and height, concentrations of PCBs and particulates in suspension, and turbidity.

Remedial measures in the less contaminated areas will be supported by the development of a model to describe quantitatively the transport of contaminants in the harbor/bay system. An analysis of PCB and heavy metal

transport and fate, including distribuiton in biota is needed. The analysis would include two major components: 1) a model of PCB and heavy metal transport processes including spatial and temporal distribution; and 2) a model to evaluate the relationship between PCB and metal levels in the environment and the resultant contamination of the food web, including commercial fisheries.

The principal objective of remedial action in the estuary is to attenuate the release of contaminants to a level that is consistent with public health, safety, and welfare. The solutions should be permanent and cost-effective. Other objectives include the return of commercial fishing in areas presently affected by closure, protection of the ecosystem, removal of barriers to commercial development of the waterfront, restoration of the recreational potential of the harbor environment, and protection of the environment.

2.3.2 New Bedford Municipal Landfill

The New Bedford municipal landfill had its origins as the site of soap manufacturer in the 1920s and 30s. A decade later, the city constructed a solid waste incinerator at the site and buried the ash there. The incinerator was phased out and the site became used as a sanitary landfill for the community's refuse. The New Bedford landfill, while still an active facility, is likely to be filled to capacity before 1985.

The landfill received an estimated 500,000 pounds of solid PCB wastes from 1971 to 1975; prior to that time, incinerator ash containing unknown quantities of PCB residue was buried there. Liquid PCB wastes and other hazardous substances also may have entered the landfill since its inception. A possible continuing source of PCBs at the landfill is ash from the municipal wastewater sludge incinerator.

Data on the types and quantities of PCB wastes, and on the fate of PCBs in the environment surrounding the landfill, are scarce. EPA sponsored a study [5] in 1978 which documented contamination of less than 1 ppb in shallow groundwaters to the immediate north of the landfill. No contamination within detectable limits was found to the west, northwest, and east of the site. Low levels of PCBs were found in the sediment and benthic

organisms of the adjacent Apponagansett Swamp and Paskamanset River. PCBs were also detected in fish and field mice taken from the surroundings. Historically, air-borne PCBs at the landfill registered only 0.02 ug/m^3 in winter but exceeded 1 ug/m^3 in summer. Recent EPA data indicates that summer levels have dropped to typical ambient levels (0.008 ug/m^3). This is probably due to the fact that historic PCB deposits have been covered by several feet of refuse.

The New Bedford landfill is situated over an aquifer which is the source for the municipal wells of the town of Dartmouth. The 1978 study showed no PCB contamination of this drinking water supply, a finding which also was reached in 1980 by Gidley Laboratories, Inc.[9]. However, Gidley did detect low levels of PCBs in some surface waters.

There is a limited amount of data available to assess the current magnitude and scope of the problem at the landfill. Therefore, a more comprehensive assessment is required.

The scope of work for the initial phase of field investigations has already been drafted by EPA Region I. This effort is nearly completed and consists of:

- A review of existing data;
- Development of a test plan and protocols for sampling and analysis;
- Construction of monitoring wells (approximately 4);
- Collection of soil and water samples from each well and analysis for PCBs, pesticides, and volatile organics;
- Development of an outline for subsequent investigations.

This first site study phase awaits approval from EPA Headquarters. The work could be commenced on short notice and completed by mid-1983. Additional data needs may include:

- Topographic survey and preparation of a topographic base map to suitable scale;
- Geophysical confirmation (GPR or seismic);

- Sampling and analysis of adjacent surface waters and bottom sediments;
- Exploratory borings;
- Collection of hydrologic data and development of a mass water balance;
- Construction of additional monitoring wells in and around the site;
- Collection and analysis of groundwater and soil samples for PCBs and priority pollutants;
- Isometric mapping of PCB contamination;
- Modelling of contaminant transport.

Principal results of these efforts would include: a determination of the types, quantities, and distributions of PCBs and other important contaminants in and around the landfill; an evaluation of the direction and rate of contaminant migration from the site; and an assessment of the degree of hazard which the uncontrolled situation presents to the health of the public and the environment.

In the case of the New Bedford landfill, a major objective is protection of groundwater and surface water resources, particularly those which serve as actual or potential drinking water supplies.

2.3.3 Sullivan's Ledge

There are very few data on PCBs at Sullivan's Ledge, a former granite quarry to the south of the municipal landfill. Sullivan's Ledge has been filled to its approximate original grade with unknown materials from unknown sources. It is probable that PCB wastes and other hazardous substances were buried at the site [25].

In the 1978 study of the municipal landfill, a sample of bottom sediment from a stream near Sullivan's Ledge was collected and analyzed; extract of the sediment yielded 288 ppb PCBs. Recent ambient air testing in the vicinity of this site showed air-borne PCB levels of about 0.29 ug/m^3.

- The data gaps, information needs, and remedial objectives for Sullivan's Ledge are virtually identical to those for the New Bedford municipal landfill. EPA's initial test plan for the municipal landfill provides for equivalent investigations at Sullivan's Ledge.

2.3.4 New Bedford Municipal Wastewater System

PCBs entered the New Bedford sewer system over a period of years as a result of industrial wastewater discharges from Aerovox, Cornell-Dubilier, and other possible sources. These discharges led to contamination of sewer lines, the municipal wastewater treatment plant, and bottom sediments in Clarks Cove and New Bedford Harbor. Point sources which have contributed to contamination of bottom sediments include the treatment plant outfall off Clarks Point and numerous combined sewer overflows which may discharge during wet weather. Present discharges from the treatment plant outfall are a continuing source of contamination in the outer harbor.

Aerovox and Cornell-Dubilier have effectively reduced PCB discharges into the municipal sewer system. However, significant PCB contamination remained when wastewater samples were collected and analyzed in June 1982 [4].

Eighteen stations were sampled: eight stations in the New Bedford sewer system showed less than 1 ppb total PCBs; five stations receiving wastewater from the New Bedford Industrial Park had 0-5 ppb Aroclor 1248 (source unknown); one station near Cornell-Dubilier had 2-3 ppb Aroclor 1254, while three others had 23-120 ppb Aroclor 1242 and 1254; the New Bedford treatment facility and Cove Road pump station receiving these flows had 5-10 ppb Aroclor 1242 and 1254 in both influent and effluent. Wastewater sludge at the New Bedford facility showed PCB concentrations of less than 1 ppb, as did wastewater samples from the Fairhaven Municipal wastewater treatment plant.

PCB concentrations determined from the June sampling translate into a mass flow rate of 1.5-2 lb/day (500-700 lb/year total PCBs entering the harbor from the Clarks Point outfall. Much of this contamination could be attributed to sewer line deposits containing PCB residues. Cornell-Dubilier recently cleaned some collector sewers in the vicinity of the their plant; this effort yielded approximately 50 barrels of sediment containing 10,000-25,000 ppm PCBs. These barrels were disposed of at an authorized hazardous waste disposal facility.

With the cleaning of the city sewer lines and independent efforts by Aerovox and Cornell-Dubilier, the major sources of PCB contamination in the wastewater system may have been reduced. Possible continuing sources are the industrial park, combined sewer overflows, remaining sewer line deposits, and the physical structures of the wastewater system - sewer pipes, concrete tanks, etc. Other significant sources may include grit, screenings, and primary wastewater sludge from the treatment plant. The sludge is incinerated on site, producing ash, scrubber effluent, and flue gas as waste products, all of which may contain PCBs and, potentially, PCDFs, which can be formed during low temperature incineration.

Remedial measures for PCBs in the municipal sewer system will have the objective of reducing residual concentrations to a level consistent with protection of the public health, welfare, and the environment.

2.3.5 Ambient Air

Recent data on ambient air quality in the New Bedford area have been produced. A sampling program involving approximately 21 contaminant monitoring stations and 6 meteorological stations was conducted in September 1982. Significant levels of air-borne PCBs (about 0.29 ug/m^3) and were detected at the one station located on Sullivan's Ledge. Sampling locations adjacent to the mud flats at the northern end of the Acushnet River also had elevated PCB concentrations. All other stations registered contaminant levels which did not differ significantly from background concentrations.

The ambient air monitoring was performed by GCA under contract to EPA. A final report is due in May 1983. Previous work by GCA [6] investigated the atmospheric release of PCBs during incineration of New Bedford's Municipal wastewater sludge. This 1977 study found that flue gas emissions released PCBs at the rate of 8-25 mg/hour at concentrations of 3.1 to 10.6 ug/m^3, representing 2-3 percent of the total PCB input to the incinerator.

Ambient air quality data needs include a repetition of certain elements of the 1982 monitoring program. Additional testing is needed to confirm the recent findings and to elucidate conditions at Sullivan's Ledge. Use of a mobile air monitoring unit to measure air-borne contaminants in real time could prove valuable as an alternative to fixed monitoring stations. The sampling period should be selected to coincide with typical hot summer weather, when the natural release of PCBs from contaminated soil and water would be at or near maximum. The need for additional testing at the sludge incinerator was stated in the previous subsection.

2.3.6 Undisclosed Sources and Sites

In addition to those sites for which documentation already exists, there are numerous, other suspected locations of PCB contamination within the New Bedford area for which no data exist. These other possible sources and sites number greater than thirty, and are grouped as follows:

- Public and private landfills and chemical disposal areas;

- Dredge disposal sites (upland, shoreline, and ocean);
- Miscellaneous public and private properties, including fill areas;
- Scrap metal dealerships;
- Properties adjacent to areas of known high PCB concentrations;
- Other sources/sites.

Data needs will entail records searches, interviews, and site reconnaissance to permit an initial assessment of hazard potential at each suspected site. Those sites determined to possess significant hazard potential will require detailed remedial investigations to quantify the distribution and magnitude of contamination by PCBs and other hazardous substances before remedial measures can be taken.

2.4 Completed Engineering Studies

Two engineering feasibility studies have been completed, one by Geotechnical Engineers, Inc. [8] and the other by Malcolm Pirnie, Inc. [11]. Each deals with the removal of harbor sediments by dredging, and neither is intended as a final determination of the proper course of action. Instead, these reports develop on a conceptual level some of the technical requirements and costs of removing PCBs from the harbor, and follow with recommendations of further study.

The former report describes available dredging technologies and discusses the advantages and disadvantages of hydraulic, pneumatic, and mechanical dredging systems. The report notes that the removal and transportation of dredge material is inseparably tied to disposal and that the present lack of disposal sites may be the greatest impediment to dredging.

The latter study deals primarily with dredging alternatives, i.e., the location and scope of harbor dredging. Three alternative remedial dredging projects are proposed, involving removal and disposal of volumes from 70,000 cubic yards (PCB concentraitons > 500 ppm) to 4,400,000 cubic yards (PCB concentrations > 10 ppm) at costs from $5 million to $110 million. Harbor development projects could result in the dredging of an additional 80,000 to 90,000 cubic yards of material.

Both reports are reviewed in greater detail in Appendix B. If there is criticism to be levied against these studies, it is that they readily dismiss alternatives to conventional dredging and disposal of harbor sediments. In view of the potentially large costs of remediation, it is recommended that all possible options - including in-situ treatment and/or confinement, and off-site treatment after removal - be given due consideration. Specific options will be outlined in the feasibility study.

3. REMEDIAL ACTION MASTER PLAN

The Remedial Action Master Plan presented herein is designed to meet the needs and objectives outlined in the previous sections. The plan has three essential components:

- Project Work Statements - a series of work descriptions comprising the scope of activities leading to remediation;
- Schedule/Cost Summary - a capsule report of estimated time and cost requirements for completion of the principal work elements outlined in the Project Work Statements;
- RAMP Model - a line diagram representing key activities; showing interrelationships among activities, the sequence and duration of activities, and the timing of major decision points.

3.1 Project Work Statements

The Project Work Statements present the strategy and scope of activities for addressing all known and suspected uncontrolled sources/sites in the project area. These statements can form the basis of the final detailed work scopes which will be prepared by the lead agency for prosecution of remedial activities under contractual agreements with public and private parties. The Project Work Statements are located in Appendix A.

The level of detail contained in each work statement varies with the level of information currently available on each source/site and with the degree to which the problem has been defined. In certain work statements, precise information needs cannot be established until preceding investigations have been completed. Each statement addresses a site-specific need, category of investigation, or remedial program element, and is organized as follows:

- Purpose - stating broad or specific objectives;
- Description - presenting the scope of proposed activities in appropriate level of detail;
- Products - identifying reports, data packages, graphics, etc. to be delivered to the lead agency;
- Decisions/Results - describing major decisions or determinations internal to the proposed activities (i.e., those which must be made in order to complete the activities) as well as those which will result from the proposed activities;
- Schedule - providing an estimate of time to complete the scope of activities, with specific note of fast-track items;
- Costs - providing order-of-magnitude estimates for completion of the proposed activities, including a probable range of costs.

There are fifteen Project Work Statements. Numbers 001 thru 007 present the scope of remedial investigations: records searches, site reconnaissance, sample collection and analysis, in-situ testing, and physical modeling. Statements 008 thru 010 deal with the technical feasibility and institutional constraints of remedial alternatives. Statements 011 thru 014 outline the scope of support functions relating to data management, quality assurance, health/safety, and community relations. Statement 015 describes the framework for implementation of remedial measures. Each of the Project Work Statements is briefly identified below:

001 - Ambient Air Testing

Air-borne PCBs and other priority pollutants will be monitored in the summer of 1983 to assess the effects of known contaminant sources on ambient air quality. Particular attention will be given to air quality in the vicinity of Sullivan's Ledge. The need for subsequent testing will be established.

002 - Hydrogeologic Inventory of Ground Water Resources

An inventory of ground water resources and principal ground water uses and users in the New Bedford area will be developed. Selected sources will be monitored for PCBs and other contaminants. An assessment of impacts to ground water quality will be prepared, and potential public health hazards will be identified.

003 - Sampling Investigation - Acushnet River Estuary/New Bedford Harbor/Buzzards Bay

A phased sampling and analytical program will be undertaken to provide data for Task 007, and to obtain a comprehensive definition of the lateral and vertical distributions of PCBs, metals, and other contaminant substances in the sediments of the estuary/harbor/bay. The sampling program will use a statistical design approach. Estimates of contaminated sediment quantities corresponding to designated concentration ranges will be prepared. Initial remedial measures will focus on PCB hot spots in the upper estuary and in other critical areas north and south of the hurricane barrier. Subsequent efforts will provide further definition of identified areas and a general description of sediment conditions in Buzzards Bay and Clarks Cove.

004 - Hydrogeologic Investigation of the New Bedford Landfill

Investigations will be performed to develop a complete hydrogeologic characterization of the municipal landfill site. This information will be used to assess the environmental impacts arising from site use, possible future waste disposal at the site, and ultimate closure of the site in a secure manner. Quantities, distributions, and migratory effects of PCBs, metals, and other priority pollutants will be evaluated. The local stratigraphy will be determined, a flow net analysis conducted, and ground and surface water resources identified and tested.

005 - Hydrogeologic Investigation of Sullivan's Ledge

The investigation of Sullivan's Ledge will be performed in similar manner to the investigation of the municipal landfill. A full hydrogeologic characterization of the site will be developed, and contamination by PCBs and other wastes will be documented. Since this site is not presently in use, active management of the site will not be an issue.

006 - Investigation of Undisclosed Sources/Sites

Suspected sources and sites of PCB contamination for which there is presently no documentation will be investigated. New sources/sites will be identified, characterized, and assessed with respect to hazard potential. The lead agency will develop a priorities list of identified sites, and a plan for detailed remedial investigations will follow.

007 - Investigation of Biological, Chemical, and Geophysical Pathways in New Bedford Harbor

The distribution, transport, and fate of PCBs, metals, and other contaminants in the estuary/harbor/bay environment will be evaluated. Samples of the water column, sediment, and biota will be collected and analyzed. Transport and food web models will be developed and field validated. The results will be applied to predicting responses of PCB residues to various remedial alternatives.

008 - Feasibility Study

An in-depth evaluation of remedial alternatives will be conducted and recommendations developed for each source/site. Various possible technologies and system alternatives will be identified and then screened in terms of effectiveness, costs, engineering feasibility, and environmental impacts. Detailed analysis will be reserved for the most promising alternatives. Findings and recommendations will be presented in a comprehensive engineering report, including preliminary design of remedial actions selected by the lead agency. The feasibility study will be phased to permit fast-track remediation of PCB hot spots.

009 - Investigation of Potential Disposal Sites

Removal of contaminated soil and sediment would require the development of suitable disposal sites or facilities - ocean, shoreline, or upland. The identification, evaluation, and selection of disposal sites will be performed in parallel with the feasibility study and will relate to specific remedial alternatives. Initial efforts will be fast-tracked to coincide with remedial actions directed at PCB hot spots.

010 - Identification of Permit Requirements

Regulatory constraints and permit requirements will influence the selection of remedial actions. The investigation of permit requirements will be performed in conjunction with the evaluation of alternatives during the feasibility study. Applicable statutes and regulations, agency review procedures, and potential regulatory obstacles to implementation of contemplated actions will be identified. This activity will be phased to accommodate fast-track remedial efforts, and will be conducted by EPA and DEQE.

011 - Data Management and Evaluation

All data from all investigators will be consolidated into one, central, computerized data base. The data management system will allow ready access to the data base and will have flexible output capabilities. Statistical and graphical packages will be available to the system. All entered data will be screened against a set of pre-established criteria to assess the validity of the data.

012 - Health/Safety Program

Individual agencies and contractors engaged in on-site remedial activities will be responsible for the health and safety of their personnel. Each such agency or contractor will be required to develop a health/safety plan designating responsible officers and describing medical surveillance, employee training, and site safety programs.

013 - Quality Assurance Program

Consistent and accepted techniques in sample collection and analysis will be necessary if the data produced from site investigations are to be reliable and useful. Thus, each agency or private contractor performing remedial investigations will develop, with guidance from the lead agency, a quality assurance (QA) plan for sample collection and analysis. EPA will identify reference methods and will have final approval of each QA plan. Each participating laboratory will take part in the Laboratory Performance Evalaution Sample Program under the direction of the EPA Regional Quality Control Coordinator.

014 - Community Relations Program

Opportunities for public participation will be provided during the course of remedial activities through such vehicles as newsletters, media announcements, citizens' advisory groups, and public hearings. EPA will solicit public comment before deciding on final remedial actions. The specifics of public participation will be outlined in a Community Relations Plan.

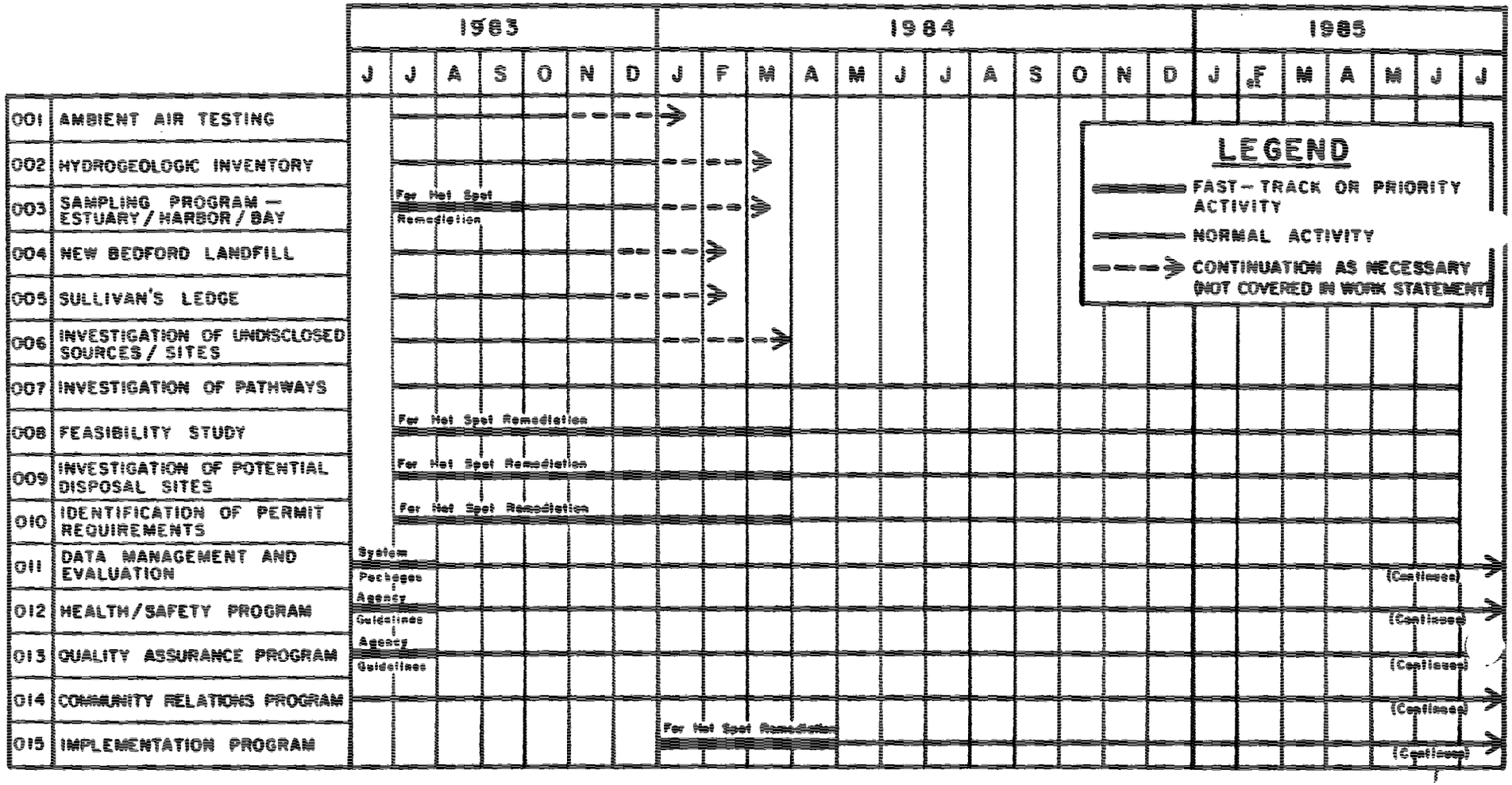
015 - Implementation Plan

An implementation plan will be prepared to provide guidance to the lead agency in directing and monitoring operations once the appropriate remedial measures have been decided. The plan will address all aspects of project management, procurement, prosecution of the work, environmental monitoring, and post-closure surveillance. The plan will be phased to coincide with fast-track remedial activities.

3.2 Schedule/Cost Summary

The tentative schedule for completion of activities defined in the Project Work Statements is shown in Figure 3-1. Three types of activities are represented. The bold solid lines denote fast-track or priority activities. Medium-weight solid lines represent project activities having a normal progression. Dashed lines indicate the possible extension of activities in accordance with needs established from preceding efforts. Since these additional activities cannot presently be defined with any precision, they are not covered in the Project Work Statements and accompanying cost estimates.

The assumed starting date for most activities is 1 July 1983. Initial remedial investigations (Project Work Statements 001-006) will be conducted over a 3-6 month period. Although not indicated on the schedule, actual starting dates are likely to be staggered so as to provide for effective project management.



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WESTON

NEW BEDFORD REMEDIAL ACTION MASTER PLAN

FIGURE 3-1

PROJECT SCHEDULE

TABLE 3-1

ESTIMATED DURATION AND COSTS
OF REMEDIAL ACTIVITIES

Project Work Statement	Phase (See Note 1)	Duration	Costs
001 - Ambient Air Testing	Total	4 Months	$ 20,000-40,000
002 - Hydrogeologic Inventory of Ground Water Resources	Total	6 Months	$ 50,000-70,000
003 - Sampling Investigation - Estuary/Harbor/Bay	a. Phase I b. Phase II	3 Months 3 Months	$ 95,000-155,000 $ 85,000-145,000
004 - Hydrogeologic Investigation of New Bedford Landfill	Total	5 Months	$ 85,000-145,000
005 - Hydrogeologic Investigation of Sullivan's Ledge	Total	5 Months	$ 70,000-120,000
006 - Investigation of Undisclosed sources/ Sites	Total	6 Months	$ 70,000-105,000
007 - Investigation of Pathways	Total	2 Years	$750,000-1,500,000
008 - Feasibility Study	a. Fast-track b. Total	8 Months 2 Years	$ 60,000- 80,000 $400,000-650,000
009 - Investigation of Potential Disposal Sites	a. Fast-track b. Total	8 Months 2 Years	$ 75,000-125,000
010 - Identification of Permit Requirements	a. Fast-track b. Total	8 Months 2 Years	-
011 - Data Management and Evaluation	(See Note 2)	2 Years	$160,000-350,000
012 - Health/Safety Program	Guidelines	2 Months	(See Note 3)
013 - Quality Assurance Program	Guidelines	2 Months	(See Note 3)

TABLE 3-1 (Continued)

Project Work Statement	Phase	Duration	Cost
J14 - Community Relations Program	(Continuous)		$25,000
015 - Implementation Plan	Fast-track	4 Months	$40,000-50,000
	Total Cost		$2.0 - 3.5 Million

NOTES:

1. Indicated phases cover only those activities defined in the Project Work Statements; "Total" does not include possible follow-up efforts.

2. Data Management is to be continuous; given costs are for first two years only.

3. Health/Safety and QA programs will extend for duration of remedial site activities; costs of same are to be included under site activities contracts.

Agency guidelines for the Health/Safety Program (012) and Quality Assurance Program (013) will be needed before certain aspects of the remedial site investigations can begin. Since development of these guidelines will be internal to the lead agency, their preparation should be started at the earliest possible date. Another immediate need is the development of the system packages for data management - the data base file, statistical, and graphical packages, and accompanying user manuals and descriptive text.

The four support functions defined by Data Management and Evaluation (011), Health/Safety Program (012), Quality Assurance Program (013), and Community Relations Program (014) are continous and will be maintained for the duration of remedial activities. A community relations program is already in process under the direction of EPA.

The evaluation of technical feasibility and institutional constraints (Project Work Statements 008-010) and the investigation of contaminant pathways (Project Work Statement 007) will require approximately two full years for completion. However, fast-track activities directed toward remediation of PCB hot spots in the Acushnet River Estuary will span approximately six months, commencing on or about 1 July 1983. It is intended that a plan for remediation of hot spots be selected by 1 January 1984 and an implementation plan completed the following month. Remedial planning for other sources/sites will be subsequent to these initial actions.

The estimated costs of activities defined in the Project Work Statements are summarized in Table 3-1. These estimates, expressed as a probable range, are order-of-magnitude costs and are intended to be used for preliminary budgeting of the remedial action program. Partial cost breakdowns are included in the individual Project Work Statements appended.

3.3 RAMP Model

The Remedial Action Master Plan Model is presented in Plate 1. The model consists of a line diagram showing the timing of major activities and decision points and their interdependencies. It is set up in similar fashion to the simpler project schedule diagram of Figure 3-1.

The horizontal axis of the RAMP Model represents time; activities are represented by horizontal lines, the length of the line signifying the duration of the activity. Stacked vertically at the left margin are a series of boxes containing activity key words and numbers corresponding to specific Project Work Statements. Horizontal lines drawn to the right of the boxes represent the principal component tasks of each general activity.

Vertical lines drawn between horizontal lines of different activities represent the interdependencies between activities. Circles at lines and junctions denote task start/stop points or major decision points. By tracing a path from left to right, it is possible to discern when each task will begin and end, where the decision points will occur, and what the interrelationships are among different activities. Letter codes attached to each labeled task identify responsible parties - agency, contractor, or general public.

Heavy solid lines are used to distinguish fast-track or priority activities from normal activities. Dashed lines denote activities not covered in the Project Work Statements. Where dashed lines are employed to signify possible extension of designated activities, the scope of the additional work cannot be determined until completion of preceding efforts.

The degree of definition of the RAMP model is highest for the first 6-8 months since the prescribed activities are based on known information needs. It is intended that the model be periodically updated as needed activities and scheduled dates become better defined.

Following the evaluation of PCB hot spots in the Acushnet River Estuary, greater emphasis will be applied to the remaining sources and sites; and the corresponding portions of the model will be clarified. The findings of remedial investigations will serve as input to the feasibility study, while the information needs of the feasibility study will simultaneously serve to define the content of remedial investigations. The time required for data collection and evaluation will ultimately determine how fast the feasibility study proceeds to final selection of remedial measures.

4. ADMINISTRATIVE REQUIREMENTS AND SPECIAL PROBLEMS

While final administrative decisions will be made by the lead agency, a large number of other agencies, institutions, private parties, and individuals will also participate in the decision-making process. A high level of cooperation among participants will be needed to avoid administrative delays in the remedial action program. A timely balance must be struck between Federal and State interpretations of the goals, methods, and institutional requirements of remediation.

The Interagency Task Force will provide the forum for a cooperative interplay of ideas and opinions and for forging direction. The task of weighing conflicting interests, degree of public acceptance, and compatability with established objectives will fall to EPA and to the Task Force.

4.1 Goals and Objectives

The broad objectives of remediation noted in 1.3 are recognized by all parties. It will be necessary to define these objectives in terms of specific goals for each source/site. Remedial actions will be based upon a cost-effective approach, within the context of the established goals and objectives.

4.2 Regulatory Requirements

A major function of Federal and State regulatory bodies will be to examine possible remedial measures for conformance to applicable statutes and regulations. If required, responsible agencies will rule on proposed waivers of existing requirements. Consideration should be given to precedents and the legal ramifications of granting waivers for certain proposed actions. It also may be necessary to examine proposed actions as they relate to international codes and treaties. Specifically, the international implications of ocean disposal of PCB-contaminated dredge spoil should be considered.

4.3 Scheduling

EPA will establish priorities and determine the phasing of remedial program activities. It will also be necessary at an early date for EPA to produce guidelines for the health/safety and quality assurance programs.

An additional scheduling concern will be the integration of newly discovered sources and sites into ongoing program activities. The extensive list of suspected sites is likely to yield confirmation of one or more new areas of PCB contamination for which there is presently no remedial schedule.

4.4 Information Needs

The analysis of incoming data should be prompt, leading to a determination of additional data needs and amendment of the data collection programs according to those needs. Unnecessary delays in information gathering should be avoided so that the feasibility study can proceed in an expeditious manner.

The data collection programs should be cost-effective and well designed, producing the maximum amount of useful information for a given expenditure. In particular, the investigation of PCB pathways in New Bedford Harbor should result in data which are useful to a determination of necessary actions. While the volume and complexity of the data for this activity will necessitate a modeling approach, the original purpose should not be lost in a mathematical exercise.

4.5 Appropriate Technologies

The lead agency ultimately will rule on what technologies are appropriate for handling and disposing of the different waste materials. PCB-contaminated soil or sediment, for example, may necessitate different methods according to the degree of contamination. A number of technologies will be available which are developmental or not commercially demonstrated. The probable effectiveness, environmental impacts, costs, and risks of new technologies must be evaluated against those of proven commercial applications.

4.6 Impact Assessment

EPA and the State must collaborate on determining the requirements for environmental impact assessment. The feasibility study will provide an evaluation of the environmental effects of alternative remedial actions;

however, the extent to which this effort will correspond to the requirements of the National Environmental Policy Act (NEPA) and the Massachusetts Environmental Policy Act (MEPA) must be established.

4.7 Health Effects

Federal, State, and local administrators must reach a concensus on the public health goals of the remedial action program and on the health implications of proposed remedial measures. In the selection of final actions, health goals will have to be reconciled with the anticipated health effects and implementation costs of technically feasible alternatives. The Federal Centers for Disease Control will be the primary source of guidance to the lead agency in decisions relating to public health.

4.8 Remedial Operations

During the conduct of remedial operations in New Bedford Harbor, primary concerns will be prevention of further migration of PCBs, and maintenance of the waterway for passage of commercial vessels and pleasure boats. Also to be considered is the coordination of remedial operations with the proposed reconstruction of the U.S. Route 6 bridge and with possible harbor development projects [18].

4.9 Evaluation of Progress and Results

The lead agency should establish standards for measuring the progress of remedial operations and the effectiveness of completed actions. Remedial measures which do not attain defined goals may be cause for additional action and possible revision of strategy. Milestones should be established so that actions which are not producing the desired results may be identified early.

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APPENDIX A

PROJECT WORK STATEMENT 001

AMBIENT AIR TESTING

PURPOSE

Monitor ambient air levels of PCBs and other contaminants to permit judgement of the effects of known contaminant sources on ambient air quality in the study area.

DESCRIPTION

Conduct comprehensive ambient air monitoring for PCBs in July or August 1983. Eight-hour samples are to be collected on one day from approximately 10-12 monitoring stations (some previously established), including 3-5 new stations to be installed in the vicinity of Sullivan's Ledge. The selected sampling period is to coincide with typical hot summer weather, when volatilization of PCBs from contaminated soil and water would be at or near maximum. Consideration will also be given to using the Sciex mass chromatography system, consisting of a mobile unit capable of measuring organic contaminant levels on site in real time, as potentially more cost-effective than fixed-station monitoring. Meteorological data from three existing monitors will be collected concurrently.

PRODUCTS

A written report will present the findings, including a discussion of all data past and current, observed discrepancies or trends, a judgemental evaluation based on existing air quality criteria and standards, and recommendations for future monitoring.

DECISIONS/RESULTS

EPA will use this data as baseline information to be included in the decision-making process of selecting appropriate remedial responses, and in determining the effectiveness of remedial actions in reducing fugitive PCB emissions.

SCHEDULE

Four months (maximum); completion by 1 November 1983.

COSTS

Labor (40 mandays)	$15,000
Analytical	10,000
Expenses	5,000
Total	$30,000
Range	$20,000-40,000

PROJECT WORK STATEMENT 002

HYDROGEOLOGIC INVENTORY OF GROUND WATER RESOURCES

PURPOSE

Identify, evaluate, and document ground water resources and uses, including potable water supplies, in the New Bedford, Dartmouth, Fairhaven and Acushnet areas of Bristol County, Massachusetts, as well as contiguous areas known to have received PCB wastes in the past.

DESCRIPTION

A water resource inventory will be prepared which will focus on available ground water resources in the region (including untapped aquifers) and consumptive sources of ground water. Large scale ground water dewatering operations such as quarries will also be identified.

The inventory will be initiated from a literature survey. Federal and State agency documents, both published and unpublished, will be researched. Interviews with appropriate municipal officials will be conducted to document existing area ground water users. Local well drillers will be contacted for drilling records from the areas of interest.

The available data will be inventoried and mapped to fully characterize the hydrogeologic setting and nature of ground water withdrawals. This will include type of source, construction and service details, and water quality summary.

Depending on the number of public, private, and industrial sources, contacts will be made with owners and operators to verify and update the inventory data.

The inventory will be evaluated. Selected ground water sources will be sampled and analyzed for total PCBs and selected priority pollutants. A total of 20 PCB and volatile organic analyses is estimated.

PRODUCTS

A written report will be prepared of all findings and recommendations. An assessment will be made of he hydrogeologic significance of the area's aquifer resources, ground water uses, and impacts, if any, relating to contamination. Public health hazards will be described. Recommendations will be made for further investigations or ongoing monitoring as required.

DECISIONS/RESULTS

Data outputs are to be integrated with background data and overall impact assessments for regional remediation programs.

SCHEDULE

Six months; completion by 1 January 1984

COSTS

Labor (130 mandays)	$48,000
Analytical	5,000
Expenses	8,000
Total	$61,000
Range	$50,000 - 70,000

PROJECT WORK STATEMENT 003

SAMPLING AND ANALYSIS - NEW BEDFORD HARBOR/
BUZZARD'S BAY

PURPOSE

Undertake a phased sampling and analysis program that would fulfill the data requirements of Project Work Statement 007 and, where such data is lacking, comprehensively define the lateral and vertical distribution of PCBs and other selected contaminants in the Harbor/Bay system.

DESCRIPTION

A phased sampling and analytical program will commence in accordance with the following plan:

Phase I Investigations

Phase I will provide the necessary field data in support of Project Work Statement 007. At this time, only a generalized outline of the sampling protocol can be presented because specific data needs will be determined jointly by EPA and the contractor to perform Task 007.

Sample acquisition will include: concurrently collected sediment and water samples from specifically selected locations; and, three types of biota (pelagic finfish, bottom fish, and a crustacean). These samples will be analyzed for Aroclors 1016/1242 and 1254, and selected heavy metals. Some samples will be analyzed for specific PCB congeners.

Spatial and temporal sampling protocols and the number of specimens collected will be determined jointly by EPA and the contractor. The protocol will be designed to allow for statistical analysis of the reuslting data and model.

Phase I work will commence immediately upon finalization of the sampling and analysis protocol. Phase II may be initiated before Phase I is completed.

Phase II Investigations

Based upon present knowledge (i.e. sediment type/PCB relationships, existing data points, etc.) additional core and grab samples will be taken to define the distribution of PCBs and metals. It is estimated that this may include 50 additional samples and 200 additional analyses.

PRODUCTS

Prior to initiation of the Phase II investigation, detailed preliminary isopleth maps illustrating the lateral and vertical extent of contamination in appropriate ranges of concentration will be prepared. Corresponding estimates of contaminated sediment quantities will be prepared. The lead agency and the statistical consultant will determine the need for specific additional sampling and analyses in the Phase II program. At the completion of the Phase II program, a final report will be prepared presenting the final isopleth maps and quantity estimates. All remaining samples and partial cores will be preserved for future analysis or reference. Should the contamination criteria for taking remedial action change, the library of core samples will be valuable.

DECISIONS/RESULTS

Establishment of criteria for the sampling and analytical protocol will reside with EPA and its consultants.

SCHEDULE

Three months for Phase I, completion by 1 October 1983; an additional three months (minimum) for Phase II.

COSTS

	Phase I	Phase II
Labor (150 mandays - total)	$ 30,000	$ 25,000
Analytical	55,000	30,000
Geotechnical Subcontract	25,000	50,000
Expenses	15,000	10,000
Total	$125,000	$115,000
Range	$ 95,000 - 155,000	$ 85,000 - $ 145,000

PROJECT WORK STATEMENT 004

HYROGEOLOGIC INVESTIGATION OF THE NEW BEDFORD LANDFILL

PURPOSE

Develop a complete hydrogeologic characterization of the landfill for the purpose of fully assessing the environmental impacts arising from site use and ultimate closure of the site in a secure manner.

DESCRIPTION

A program will be implemented to address site conditions as they relate to present environmental impacts and capacity of the site to receive additional wastes, primarily originating as contaminated dredge spoil. The final selection of tasks to be performed will be based upon the results of a preliminary assessment report, in progress.

Tasks may include:

- Review existing reports evaluating the full extent of fill deposits within the swamp and quantifying the magnitude of contamination within and directly beneath the landfill;
- Determining the local stratigraphy through the uppermost water-bearing zones in the underlying bedrock;
- Conducting a flow net analysis of the site in both horizontal and vertical directions;
- Identifying permeabilities, seepage velocities, and multi-aquifer analysis as necessary;
- Preparing a water balance of the site;
- Identifying ground and surface water resources and users in the area and testing those users nearest the landfill;
- Evaluating the capacity of the site for acceptance of additional PCB and other wastes.

Work to be implemented initially will consist of:

- Review of existing topographic map and grid layout of the landfill and areas 600 feet beyond the present site perimeter. The survey will be based on recent air photos with base control covering a minimum one square mile around the center of the landfill;

- Detailed analysis of site disposal records including interviews with landfill operators to isolate known hot spots or suspected zones of concentration; review of existing well data; air photo analysis;

- Layout of an exploratory boring program and monitor well cluster installation;

- Preliminary surface water and sediment sampling beyond the site perimeter. Test pits or power auger to be excavated on a radiating pattern from the fill perimeter. Sampling of soils at two-foot intervals to uppermost zones of saturation or to six feet. Retention of soil samples for possible future analysis for selected contaminants. Lithologic description of soil profile. Sediment sampling in perimeter streams and swamps following a radiating pattern from site perimeter. Surface water sampling on a grab sample basis in conjunction with soil and sediment sampling. Stake location of all sampling points. The total number of test pits/power auger holes is estimated at 30; each hole will average four soil samples. A total of 20 sediment samples are estimated from the swamp and tributary streams to the Paskamanset River. Twelve surface water samples are estimated from the Paskamanset River and tributary waters emanating from the landfill area.

Surface water, groundwater, sediment, and soil samples will be analyzed for total PCBs and selected pollutants. The analytical protocol for PCB analyses of soil samples from test pit and power auger probes will require that all surface samples (mixed top six inches) be analyzed for total PCBs. If greater than

10 ug/g the next lower sample will be analyzed until results less than 10 ug/g are obtained. A minimum of six samples will be run from mid-depth ranges of two to four feet independent of the surface results. A total of forty test pit soil samples are estimated.

Following the initial survey work and sampling, an exploratory boring and piezometer installation program will be undertaken. This work may consist of the following elements:

- Drilling through the fill deposits with split spoon sampling at standard five-foot intervals; all soil samples to be retained and preserved for possible later chemical analysis. Construction of a two-inch diameter piezometer in each exploratory boring in the uppermost zone of saturation beneath the fill deposits. The screened zone of each piezometer is to be isolated by tremie grouting above the sand-packed annulus. A minimum of three exploratory borings contemplated in fill.

- Performing deep exploratory borings with split spoon samples to refusal on bedrock. Confirmation of bedrock by nominal coring (dependent on geologic conditions). Constructing shallow and deep piezometer couplets to monitor hydraulic heads or multi-aquifer conditions utilizing two-inch diameter PVC with non-glued fittings. All grout seals to be tremie placed. A minimum of four perimeter couplets and three remote couplets (within 200 feet of site). Continuous split spoon samples from three of the seven deep borings. Cohesive soils sampled with Shelby tube or Denison sampler.

- Construction of three bedrock monitoring wells at the three remote piezometer couplets. Wells to be drilled a nominal distance into bedrock (fifty feet); wells to be set with six-inch casing and bentonite sealed annulus a minimum of five feet into rock (as dictated by geologic conditions).

- Performing hydrogeologic and engineering analysis of all data.

- Performing field studies consisting of in situ hydraulic conductivity tests, water level measurements, level run on top of casings, and water quality sampling for total PCBs. Estimated 20 samples of ground water from wells and piezometers. Collecting of ground water samples from nearby private, public, industrial well supplies.

- Collecting hydrologic data for preparation of mass water balance. Staff gages set in swamp.

- Performing total PCB analyses on 20 ground water samples. Resampling any hot spots identified in surface water and sediment grab samples. Estimated 6 soil, 3 water. Performing total PCB extract of soils. Soils to be analyzed sequentially from borings using following protocol:

Sampling Interval	Results	Action
Surface	All concentrations	Sample mid-depth
Mid-Depth	if <10 ug/g	Stop
Mid-Depth	if 10-50 ug/g	Sample bottom 1/4
Mid-Depth	if >50 ug/g	Sample top 1/4 & bottom 1/4

Splitting profile to be continued until full range >50 ug/g defined.

PRODUCTS

Following the completion of all field work, a detailed hydrogeologic and engineering report of the site will be prepared, directed to fully describing the site and characterizing the impacts of waste disposal at the landfill as it relates to the hydrogeology of the site. The potential for additional PCB waste disposal will be addressed in terms of volume, capacity, and expansion possibilities.

Recommendations for further work will be detailed in the report.

DECISIONS/RESULTS

The lead agency will decide on what additional investigations, if any, might be required.

SCHEDULE

Five months minimum; earliest completion by 1 December 1983.

COSTS

Labor (110 mandays)	$ 40,000
Analytical	40,000
Geotechnical Subcontract	17,000
Expenses	18,000
Total	$115,000
Range	$ 85,000 - 145,000

PROJECT WORK STATEMENT 005

HYDROGEOLOGIC INVESTIGATION OF SULLIVAN'S LEDGE

PURPOSE

Document and define the extent of PCB and selected priority pollutant contamination within and around the former quarries known as Sullivan's Ledge.

DESCRIPTION

A phased program will be implemented to address site conditions at Sullivan's Ledge. This phased program will be coordinated with former and on-going studies relative to ambient air and perimeter conditions at Sullivan's Ledge.

Phase 1 - Site Identification - Preliminary Definition

In conjunction with the historic data collected during the investigation of undisclosed sites (Project Work Statement 007), the precise locations of backfilled pits and quarries at Sullivan's Ledge will be accurately determined. Tasks will include:

- Fracture Trace Analysis;
- Geophysical confirmation (GPR or seismic);
- Test pit investigations within and around suspected PCB disposal sites on the property (to a depth of approximately 12 feet);
- Sampling of the stream (and streams sediments) which flows northerly on the northeast side of the property;
- Preparation of a topographic base map of the Sullivan's Ledge area (estimated 15 acres) to a scale of 1 inch = 50 feet and a contour interval of 2 feet;
- Analysis of soil, water, and sediment samples

for total PCBs and selected priority pollutants. An estimated 25 soil and sediment samples, 5 surface water samples and 4 groundwater samples will be analyzed. Additional soil samples from test pits will be preserved for future analysis if necessary.

Phase II - Full Hydrogeologic Investigation

Results of the Phase I Study will be used to finalize a Phase II hydrogeologic investigation of the site. The Phase II investigation may consist of the following elements dependent upon the findings in the Phase I preliminary study:

- One exploratory boring drilled within each backfilled quarry or pit. Standard split spoon sampling at five-foot intervals to define stratigraphy and relationship of fill to saturation. Construction of a two-inch diameter piezometer in each boring beneath the fill deposits. Piezometers to be isolated in first zone of saturation beneath fill deposits by tremie grouting above screened zone. Three borings estimated.

- Piezometer couplets around perimeter of quarries and at remote positions on property to define flow in rock and unconsolidated deposits and relationship to stream flow. Deep piezometers immediately adjacent to fill deposits to be continuously sampled. Cohesive soils to be representatively sampled with Shelby tube or Denison. Eight couplets estimated - two piezometers per couplet.

- Field studies consisting of in situ hydraulic conductivity tests, water level measurements, level run on top of casings, and water quality sampling for total PCBs. Estimated 24 samples of ground and surface water.

- Collection of hydrologic data for preparation of mass water balance. Flow measurements on stream.

- Analysis for total PCBs and selected pollutants on ground water samples. Phase II analysis of surface stream. Total PCB extract of soils. Soils to be analyzed sequentially from borings using following protocol:

Sampling Interval	Results	Action
Surface	All concentrations	Sample mid-depth
Mid-Depth	if <10 ug/g	Stop
Mid-Depth	if 10-50 ug/g	Sample bottom 1/4
Mid-Depth	if >50 ug/g	Sample top 1/4 & bottom 1/4

Splitting profile to be continued until full range >50 ug/g defined.

PRODUCTS

Findings are to be presented in a written report. The report will review the factual historical findings of previous site use for waste disposal. The report will characterize contaminated areas and probable modes of dispersion in the soil and water (surface and ground water) at the site through a comprehensive hydrogeologic analysis. The report will present further study requirements as identified for remedial action.

DECISIONS/RESULTS

The lead agency will decide on what additional actions, if any, might be required to assure long-term containment and isolation of contaminants at the Sullivan Ledge site.

SCHEDULE

Two months for Phase I, completion by September 1983; three months for Phase II, completion by 1 December 1983.

COSTS

Labor (90 mandays)	$33,000
Analytical	30,000
Geotechnical Subcontract	20,000
Expenses	14,000
Total	$97,000
Range	$70,000-120,000

PROJECT WORK STATEMENT 006

INVESTIGATION OF UNDISCLOSED SOURCES/SITES

PURPOSE

Identify, evaluate, and document sources and sites of PCB contamination which are presently suspected or unknown.

DESCRIPTION

Undisclosed sources and sites will be identified and characterized in accordance with the following general plan:

(1) Source/Site Identification

Sources and sites will be identified by means of interviews and a search of pertinent available literature and records. Resources would include: past investigators; waste management personnel in local, regional, and state government; private waste handlers; private landfill owners and operators; personnel in industry; dredge operators; industrial records from PCB manufacturers, suppliers, and buyers; shipping manifests and billing records from waste handlers and landfill operators.

The investigation of principal industries will focus on PCBs but will also include surveillance for metals and selected other pollutants. Data gathering will include: types and quantities of waste generated by individual industries; past and present practices in waste treatment, storage, and disposal; locations both on-site and off-site, of waste treatment, storage, and disposal.

In addition to Sullivan's Ledge and the New Bedford Municipal Landfill, the following sources/sites are possible repositories of PCB wastes and are to be investigated. This list is not necessarily inclusive since other unknown sources/sites may exist in the greater New Bedford area.

(a) Landfill Sites

- o Acushnet Municipal Landfill
- o Dartmouth Municipal Landfill
- o Fairhaven Municipal Landfill
- o Private Landfills

(b) Dredge Disposal Sites

- o Route 195 crossing of Acushnet River
- o Popes Island
- o Marsh Island, Fairhaven
- o Area off Mt. Pleasant St. behind New Bedford Airport
- o North Fort Pheonix Beach, Fairhaven
- o Playground near South Terminal, New Bedford
- o Merrill's Wharf
- o West Island disposal area
- o North side of Coggeshall St., Fairhaven

(c) Other Suspected Sites

- o Railroad siding (chemical transfer area), New Bedford
- o Francis Playground
- o New Bedford High School property
- o Cushman Park, Fairhaven
- o Miscellaneous private properties
- o Roadways (waste oils)

(d) Scrap Metal Dealerships

(2) Source/Site Characterization (Preliminary)

Individual sources and sites will be characterized as fully as possible on the basis of the findings of (1) above and through site inspections, study of available maps and aerial photographs, and application of available scientific and engineering data. Pertinent information to be recorded will include:

- Description of physical site, including size (area and depth), general appearance, current use, vegetative cover, presence of surface water, presence of manmade structures, visible signs of contamination, etc;

- Location of each source/site on a base map of appropriate scale;

- Sketch of each site to approximate scale showing pertinent features;

- Description of general surroundings, including type of environment (e.g., urban, suburban, etc.), topography, vegetation, surface waters, roadways, utilities, human habitation, commercial development, etc;

- Background data on area geology and hydrogeology;

- Estimation, to the extent possible, of the types and quantities of PCBs and other identified or suspected hazardous substances present at the site; and approximate distribution of these substances if such can be determined;

- Apparent violations of environmental, health, or safety statutes and regulations;

- Sampling and analysis for PCBs.

Following completion of (1) and (2), the lead agency will prioritize identified sources and sites for subsequent action according to the estimated severity of contamination and public health hazard. Recommendations will be presented for detailed investigations leading to remedial actions, including fast-track items.

PRODUCTS

A written report will present all findings, indicated agency priorties, and recommendations.

DECISIONS/RESULTS

The lead agency must establish criteria for prioritizing sites and the methodology for phasing in newly discovered sites with ongoing program activities (e.g., feasibility study). The result will be an inventory of sites and a strategy for addressing them. Decisions will include which sites to investigate.

SCHEDULE

Six months; completion by 1 January 1984

COSTS

Labor (140 mandays)	$56,000
Expenses	11,000
Analytical	20,000
Total	$87,000
Range	$70,000-105,000

PROJECT WORK STATEMENT 007

INVESTIGATION OF BIOLOGICAL, CHEMICAL, AND GEOPHYSICAL PATHWAYS IN THE NEW BEDFORD HARBOR

PURPOSE

Evaluate the distribution, transport, and fate of PCBs and other contaminants - including trophic relationships - in New Bedford Harbor and Buzzards Bay, and to predict the effects of various remedial actions.

DESCRIPTION

The primary objective is to determine the effectiveness of various remedial actions in reducing PCB and other contaminant residues in the fishery populations of the study area. The effectiveness of a given course of action will be expressed in terms of the spatial and temporal scales of the responses of the residue levels. The focus will be on total PCBs and metals (Cu, Cr, Zn,).

The study will be approached in four phases:

(1) Contaminant Sources and Distributions

Data acquisition on the water column, sediment, and biota will provide a complete source inventory and determination of present contaminant distributions. This effort will expand upon the existing data base and will supplement the sediment sampling, analysis, and mapping (Project Work Statement 004) to be performed under a separate contract. The effort should be conducted at a level sufficient to produce a statistically significant sampling. Investigations will include:

- o Measurement of contaminant levels in representative samples of the water column, sediment, and biota (it may not be necessary to evaluate all parameters in all samples);
- o Evaluation of particle size, density, and composition of suspended and bottom sediments, and PCBs associated with specific fractions;

- Determination of observable correlations among physical and chemical parameters; identification of indicators.

Before undertaking these investigations, the agency or private contractor performing this work will first review all available data and establish the data needs, then scope out and design the data collection program in detail. The design of the program may be amended at any point during the investigations in response to new findings or data requirements.

(2) Transport and Fate of PCBs in the System

A mathematical model of physical transport for the New Bedford Harbor - Buzzards Bay system will be developed and validated by field and laboratory measurements. This model will describe the movement of PCBs in the system, with emphasis on exchanges between the harbor and the bay. The model will describe the processes of resuspension, transport, and redeposition, and will be used to estimate redistribution of PCBs by tides, currents, winds, and storm events. Related efforts will include:

- Evaluation of PCB adsorption/desorption rates between water column and sediment;
- Evaluation of bioturbation and mechanical disturbances (prop wash) on sediment and PCB transport;
- Mapping of scourable sediments;
- Evaluation of micro- and macrocirculation patterns; evaluation of the effects of the hurricane barrier on circulation and transport;
- Mapping and profiling of tidal currents to determine suitable zones (less than 1 knot) for use of silt curtains during dredging;
- Mass balance calculations on PCB distribution and migration.

(3) Food Web Model

A mathematical model which incorporates the structure of the food web, and which describes biotic residues in terms of bioconcentration from environmental exposures and bioaccumulation from trophic transfers, will be developed and field-validated. The relationship between sediment PCB concentration and that in the biota will be established. Data will be collected in conjunction with (1) above. While the result of this effort will be a mathematical model, the emphasis will be on field validation supported by short-term laboratory studies. Investigations will include:

- Inventory of flora and fauna of the area;
- Identification of target species;
- Literature search on PCBs in target species and cogenus species;
- Evaluation of the relative importance of direct PCB uptake from food organisms, including analyses of the various food groups (benthos, plankton, fish, etc.);
- Evaluation of the relationship between target species body burden and site-specific levels of water column and sediment PCBs;
- Evaluation of PCB depuration rates in harvestable species, including review of literature pertinent to the subject;
- Testing of locally favored edible species at specific sites;
- Seasonal migration patterns.

(4) Environmental Responses to Remedial Actions

Results from (2) and (3) will be synthesized to provide predictions of the spatial and temporal responses of PCB residues corresponding to various remedial alternatives. These alternatives could include, but are not limited to: no action; confinement of contaminants in specified areas; or removal, in whole or in part, of contaminants from specified areas. Estimates will be made of the required level of action to ensure that PCB residues are forced below the FDA (or other applicable) action limit in specified areas.

PRODUCTS

A predictive model will be developed. A descriptive summary of the model and all output data will be presented in a written report with graphic displays; relevant input data will be appended.

DECISIONS/RESULTS

The lead agency will make judgements of the effectiveness of various remedial alternatives and will establish action levels consistent with protection of human and fish populations.

SCHEDULE

One year for development of basic transport and food web models, One year for subsequent field valildation, completion by 1 July 1985; models to be available for rough prediction of environmental responses at beginning of second year.

COSTS

Range $750,000-1,500,000

PROJECT WORK STATEMENT 008

FEASIBILITY STUDY

PURPOSE

Perform an evaluation of remedial alternatives in-depth and present recommendations for remedial action.

DESCRIPTION

The feasibility study will describe each identified site as to its nature, hazard potential, and priority for remedial action; identify, develop, and evaluate alternatives for remedial action at each site; and, based on these determinations, present recommendations for corrective action. The study will be phased as necessary to permit early (fast-track) evaluation and remediation of situations deemed by the lead agency to have highest priority. Presently, EPA and DEQE have determined that PCB hot spots in the Acushnet River Estuary near the Aerovox plant are a priority site. Other fast-track items may also be identified.

(1) Site Descriptions

All available data on each site will undergo a comprehensive review. Site investigations in progress will be evaluated as to the availability of current data, the direction of continuing efforts, and the extent to which those efforts address the needs of the feasibility study. On-going studies may be amended or new data collection initiated at any time by the lead agency to meet the data requirements of the feasibility study. To this end, the contractor selected to perform the feasibility study will continually evaluate and make known his information needs.

Based on the above data review, a written description of each site will be prepared. Each site description will contain a summary of all pertinent technical data on the site with tables and graphic displays. Information to be noted will include:

- General description of site and surroundings, including visible evidence of contamination;
- Geologic and hydrologic data;
- Types and distributions of contaminant residues in sediments, soils, surface waters, groundwaters, air, and biota;
- Identified pathways, rates of migration, and mass balance calculations for PCBs and other contaminants present;
- Actual, imminent, or potential hazards to the environment or to public health and welfare;
- Discernible violations of statutes, regulations, and codes pertaining to the environment or to public health and safety.

The lead agency will rank each site in terms of the severity of contamination and the degree of hazard to the public and the environment. Priorities will be established and additional fast-track items determined.

(2) Alternatives

Various source control and off-site remedial alternative actions will be identified, developed, and evaluated for each site. The approach will be multi-phased (to permit priority evaluation of hot spots), bi-level (consisting of an initial screening followed by detailed evaluation), and site-specific (to account for the variability of site conditions and requirements). The consideration of alternatives will conform to 40 CFR 300.68 (g)-(i) of the National Oil and Hazardous Substances Contingency Plan.

(a) Development of Alternatives

Different technical strategies and methods for remediation are to be identified and developed for each site. Alternatives worthy of consideration may be drawn from a partial list of possible remedial methods published in 40 CFR 300.70. While numerous alternatives will be identified, they may generally be grouped into four major categories:

- o Removal, followed by treatment and/or disposal;
- o In-situ treatment;
- o In-situ confinement;
- o No action.

Removal would be the excavation or dredging of contaminated soil or sediment. In the case of the dredging of harbor sediments, alternatives to be considered relate to:

- o Scope and phasing of removal;
- o Dredging technology (mechanical, hydraulic, pneumatic);
- o Use of silt curtains and coffer dams;
- o Treatment (including dewatering) of dredge spoil;
- o Disposal of dredge spoil (shoreline or upland sites).

Removal of contaminated sediment or soil will necessitate the development of suitable treatment or disposal facilities. For sediment or soil containing low levels of PCB contamination, suitable disposal may consist of engineered landfilling, shoreline, or ocean disposal. Higher concentrations may require more stringent control procedures as dictated by the Toxic Substances Control Act (40 CFR Part 761).

Engineered secure landfills are a probable means of disposing of the more highly contaminated materials. Various treatment technologies may prove suitable as an alternative to secure containment. The selection of potential disposal sites is beyond the scope of this work statement and is addressed in Project Work Statement 010. However, the engineering of selected sites is a concern of the feasibility study.

Treatment may involve physical, chemical, or biological processes. Treatment methods appropriate for PCBs may include incineration, chemical dechlorination, carbon adsorption/recovery, biodegradation, etc. In-situ confinement could include the use of soil sealants, cement-forming materials, or polymer films. (Such technologies have been tried at the demonstration level or in Federally sponsored research projects.) No action implies abandonment of a situation to natural forces and long-term, self-cleansing mechanisms.

(b) Initial Screening of Alternatives

Alternatives developed for each site will be given an initial evaluation to screen out those candidates which do not warrant further investigation. Three broad criteria will be used in the initial screening:

- Costs - both capital and operation/maintenance costs;
- Effects - consideration of, first, adverse environmental impacts and, second, the degree to which adequate control of the source material will be achieved and the health of the public and the environment will be protected;
- Engineering feasibility - the extent to which an alternative is applicable to the particular site location and conditions and represents a reliable means of addressing the problem.

(c) Detailed Analysis of Alternatives

This analysis will be performed on the limited number of alternatives which survive the initial screening. Each of these alternatives will undergo refinement and careful delineation, with emphasis on the use of established technology. (However, promising new technologies should not be excluded from consideration). Alternatives will be evaluated in terms of their:

- o Costs;
- o Health and safety aspects;
- o Environmental effects;
- o Engineering constructability and implementation capability.

Additional data will be gathered as necessary to support these determinations. As the selection process narrows the field of possible alternatives, data needs will become more clearly defined and will drive the data collection program. Evaluations may entail bench-scale or pilot studies.

Detailed cost estimates will be prepared for each alternative. The cost analysis will give the present worth of capital and operation/maintenance costs and will show the distribution of costs over time.

Each alternative will be assessed in terms of its anticipated effectiveness in mitigating the environmental and public health hazards created by the contaminant source materials. In addition, an analysis of any adverse environmental impacts resulting from the proposed remedial actions will be conducted. The latter analysis will include consideration of mitigative measures to minimize expected adverse impacts.

COSTS

Labor (220 mandays)	$85,000
Expenses	15,000
Total	$100,000
Range	$75,000-125,000

PROJECT WORK STATEMENT 010

IDENTIFICATION OF PERMIT REQUIREMENTS

PURPOSE

Identify permit requirements for implementation of various remedial actions.

DESCRIPTION

Consideration of any remedial action must take account of federal, state, and local regulations and permit requirements. The investigation of these requirements should be performed in conjunction with the evaluation of alternatives during the feasibility study (Project Work Statement 009) and should occur early enough to identify possible regulatory obstacles and to avoid delays in implementing remedial actions. The party charged with this task will identify:

- Areas of jurisdiction and legal responsibility among Federal, State, and local authorities;
- Applicable statutes and regulations;
- Agency review procedures;
- Permit requirements;
- Potential conflicts or obstacles (as between different agency requirements or between new technologies and standing regulations);
- Approximate required time alotment for project review and issuance of permits by responsible agencies.

To expedite the removal and disposal of PCB hot spots in the Acushnet River Estuary, the investigation of permit requirements will be pursued as a priority activity.

Federal and State legislation which may pertain to the various remedial measures considered includes, but is not limited to, the following:

Federal

- o National Environmental Policy Act of 1969 (NEPA)
- o Water Pollution Control Act of 1972 (WPCA) as amended by the Clean Water Act of 1977 (CWA)
- o Marine Protection, Research, and Sanctuaries Act of 1972 (MPRSA)
- o Safe Drinking Water Act of 1974 (SDWA)
- o Toxic Substances Control Act of 1976 (TSCA)
- o Resource Conservation and Recovery Act of 1976 (RCRA)
- o Clean Air Act as amended, 1977 (CAA)
- o Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)

State

- o Massachusetts Environmental Policy Act of 1972 (MEPA)
- o Hazardous Waste Management Act of 1979 (HWMA), MGL Ch.21C
- o Hazardous Waste Facility Siting Act of 1980 (HWFSA), MGL Ch.21D

Agencies having responsibility for project oversight, review, and permit issuance include:

Federal

- o Environmental Protection Agency (EPA) - Primary interpreter and enforcer of federal regulations, and general administrator of the Superfund Program under CERCLA;
- o Army Corps of Engineers (COE) - Responsible for overseeing and permitting projects involving dredging, filling, or ocean disposal; issues permits under CWA Section 404 for dredging and filling, Section 10 for structures in waterways, and MPRSA Section 103 for ocean transport and disposal of dredged materials;

State:

- Executive Office of Environmental Affairs (EOEA) - Umbrella agency for state environmental departments; processes notifications of proposed projects and ensures compliance with MEPA;

- Office of Coastal Zone Management (CZM) - Establishes management policies for coastal areas and reviews projects for consistency with same;

- Department of Environmental Quality Engineering (DEQE) - Principal regulatory and enforcement agency in environmental matters; responsible for technical review of project plans; issues licenses and permits; administers State and Federal programs including Superfund;

  - Division of Water Pollution Control - Administers CWA, issues discharge permits, regulates special wastes;

  - Division of Hazardous Wastes - Administers RCRA and HWMA, reviews all landfill projects for both hazardous and non-hazardous materials;

  - Division of Air Quality Control - Administers CAA, regulates hazardous waste incinerators, monitors fugitive emissions;

  - Division of Waterways - Issues permits for dredging and licenses for construction in waterways;

- Department of Environmental Management (DEM) - Responsible for implementing HWFSA through its Bureau of Solid Waste Disposal, in cooperation with the Hazardous Waste Facility Site Safety Council.

Local agencies having review authority may include conservation commissions, boards of health, and others. Site assignment for hazardous waste disposal facilities is the responsibility of local boards of health.

PRODUCTS

All findings applicable to the proposed remedial actions will be presented in written report form, including step-by-step procedures for fulfilling the requirements of the regulatory process. Potential obstacles to, and delays in, implementation of specific remedial measures will be duly noted.

DECISIONS/RESULTS

Consideration of permit requirements will result in a determination of what technical options can be pursued within the current regulatory framework and what actions will require waiver of prevailing regulations or codes. It will be incumbent on the various regulatory authorities to weigh the institutional and legal constraints of proposed alternatives and to decide upon the appropriate remedial actions.

SCHEDULE

Nine months for identification of permit requirements relative to PCB hot spots, completion by 1 April 1984; two years for full investigation, completion by 1 July 1985.

COSTS

To be assumed by EPA and DEQE.

PROJECT WORK STATEMENT 011

DATA MANAGEMENT AND EVALUATION

PURPOSE

Consolidate all data from all investigators into one, central, computerized data base having ready access and flexible output capabilities, and to screen the data according to the needs of the various remedial activities.

DESCRIPTION

The data management system will incorporate all existing data and will be supplemented by new data from continuing studies as these data become available. The system will have the following features and capabilities:

- Each parameter value will be entered in an individual data field with corresponding descriptive information such as sample number, date, source, etc. Data may be numerical, alphanumeric, textual, or coded.

- The data will be filed in such a format as to provide ready access, allowing addition of new records, deletion of old ones, and modification of existing records.

- The system will be a well documented, user-interactive system with report-writing output capabilities to select, sort, and plot the data for purposes of evaluation. Statistical and graphical capabilities will be available either through programs inherent to the system or by merger with separate software packages.

The task of data evaluation will include screening the data against a set of pre-established criteria relating to sample collection and analysis. This screening process will allow the selecting out of those data points which are reliable or usable for the purposes of a particular investigation. The data evaluation criteria will be developed jointly by the lead agency and the data management contractor and will receive an independent peer review.

PRODUCTS

Data management system software package; statistical and graphical packages; user manual(s); data management report; output data reports and graphics.

DECISIONS/RESULTS

Determination of data evaluation criteria; selected data output.

SCHEDULE

All software packages in place, evaluation criteria established, and report completed by 1 August 1983.

COSTS

Labor (650 mandays)	$190,000
Computer	15,000
Expenses	10,000
Total	$215,000
Range	$160,000-350,000

PROJECT WORK STATEMENT 012

HEALTH/SAFETY PROGRAM

PURPOSE

Protect the health and safety of workers assigned to on-site investigations and remedial activities.

DESCRIPTION

The health and safety of personnel will be the responsibility of the individual agencies and contractors engaged in on-site activities, operating within health/safety guidelines established by the lead agency (40 CFR 300.71 requires that all private contractors conform to applicable OSHA requirements and other guidance established by the lead agency). Health and safety will be promoted through the use of special protective clothing and safety equipment and, where practicable, through control of the work environment.

Each agency or contractor involved in on-site activities will prepare a health/safety plan. This plan will designate lines of responsibility, present a personnel training program, and provide a site safety plan for each site where activities are scheduled. A suggested outline of such a plan would be as follows:

I. Responsible personnel

   A. Executive health/safety officer
   B. Project manager(s)
   C. Site safety coordinator(s)

II. Medical surveillance program

III. Reporting and information handling

IV. Training Program

   A. Recognition of hazards
   B. Basic safety procedures
   C. First aid and CPR
   D. Emergency procedures
   E. Protective and emergency equipment

V. Site safety plan

A. Organization - safety coordinators, project teams
B. Equipment
C. Site characterization and hazard assessment
D. Site entry
E. Sampling procedures
F. Monitoring
G. Decontamination
H. Emergency reponse

Each health/safety plan will have the final approval of the lead agency.

PRODUCTS

Each health/safety plan will be presented in complete written form identifying key personnel and emergency contacts, and providing sample report sheets for accidents and emergencies.

DECISIONS/RESULTS

Health and safety guidelines are to be established by the lead agency.

SCHEDULE

One month to prepare guidelines, to be issued by 1 July 1983; individual health/safety plans to precede field activities.

COSTS

All costs to be included under individual site activities contracts.

PROJECT WORK STATEMENT 013

QUALITY ASSURANCE PROGRAM

PURPOSE

Produce reliable and useful data on air, water, soils, sediments, and biota through the application of consistent and accepted techniques in sample collection and analysis.

DESCRIPTION

Each agency and private contractor involved directly in sample collection and/or analysis is to develop its own quality assurance (QA) plan. Each QA plan will be prepared with guidance from the lead agency. The lead agency will be responsible for seeing that minimum standards are met and that methodologies will provide consistency of results between different sample collectors/analysts. To this end, the lead agency will identify reference methods to be used by all parties and will rule on suggested alternate procedures. In addition, each participating laboratory will take part in the Laboratory Performance Evaluation Sample Program under the direciton of the EPA Regional Quality Control Coordinator. Each QA plan will have the final approval of the lead agency.

QA plans will address all of the following items:

- o Designation of reponsible personnel;
- o Objectives for precision, accuracy, and validity of data and methods used;
- o Sampling procedures;
- o Sample preservation, storage, and shipment;
- o Sample custody, tracking, and labeling;
- o Sample preparation;
- o Analytical procedures;

- Calibration procedures;
- Data reduction, validation, and reporting;
- Internal quality control checks;
- Performance audits;
- Preventive maintenance of equipment;
- Procedures for corrective action.

PRODUCTS

Each QA plan will be presented in a written report, complete with sample data sheets, custody record forms, laboratory report forms, example calculations, etc.

DECISIONS/RESULTS

EPA will establish quality assurance guidelines, identify reference methods, and make decisions where questions of procedure will affect the representativeness, comparability, or usefulness of the data.

SCHEDULE

One month to establish guidelines, completion by 1 July 1983; individual QA plans to precede field sampling.

COSTS

All costs to be included under individual sample collection and analysis contracts.

PROJECT WORK STATEMENT 014

COMMUNITY RELATIONS PROGRAM

PURPOSE

Provide timely and accurate information to the public about the nature of the contamination problems and actions being taken to alleviate them. Also, provide the opportunity for public comment and input to decisions made by EPA regarding response actions.

DESCRIPTION

The community relations plan is designed to reach all of the varied sectors of the community interested in, and affected by, the problem. It is intended to provide a means of communication between the communities and the regulatory agencies.

Specific activities to be undertaken to achieve these goals include:

- Public meetings to be held at key points of the remedial process to provide the opportunity for public questioning and comments on proposed activities.
- Local document repositories established at the New Bedford and Fairhaven town halls and libraries.
- An informational brochure on the nature of PCBs and their environmental impact.
- News releases.
- Fact sheets to explain site activities and study findings.
- Briefings with local government officials.
- Small group meetings.

- Formal public hearings on recommended remedial actions.
- Slide show and script for public meetings.

SCHEDULE

Continuing throughout Superfund activities.

COSTS

$25,000

PROJECT WORK STATEMENT 015

IMPLEMENTATION PLAN

PURPOSE

Provide a master plan for all remedial measures (an extension of the RAMP process after remedial courses of action have been decided).

DESCRIPTION

The implementation plan will provide the necessary guidance to the lead agency to direct and monitor clean-up operations and other remedial activities. This plan cannot be developed until after the feasibility study has been completed, recommendations made, and appropriate courses of action set.

The basic sequence of events will consist of engineering design of the selected action, competitive bidding to select a contractor for the proposed operations, prosecution of the work, environmental monitoring during and after operations, and post-closure surveillance. This sequence will be repeated in as many phases and activities as are ncessary to complete the remedial actions, with one or more contractors handling different assignments. Certain fast-track activities may proceed to implementation while other work elements are still in the pre-design stage.

The implementation plan will address all of the following:

- Project oversight - management structure, scheduling, cost control, and reporting;
- Project phasing and prioritization;
- Quality assurance;
- Health and safety;
- Site security;

- Community relations;
- Permit requirements;
- Technical requirements - surveys, design drawings and specifications, pilot studies;
- Competitive bidding process;
- Prosecution of remedial activities;
- Coordination with harbor improvements;
- Maintenance of waterway;
- Environmental monitoring;
- Site selection for dredge material;
- Site Closure;
- Post-closure surveillance;
- Reopening of fisheries;
- Enforcement and cost recovery.

PRODUCTS

The implementation plan will be presented in written report form with estimated timetables and costs for completing the individual work elements.

DECISIONS/RESULTS

The implementation plan will comprise a series of decisions and guidelines for implementing remedial measures.

SCHEDULE

Six months for preparation of the implementation plan for fast-track remedial measures, to be issued by 1 October 1984; implementation plans for subsequent remedial measures to follow.

COSTS (Fast-track only)

Labor (100 mandays)	$40,000
Expenses	4,000
Total	$44,000
Range	$40,000-50,000

APPENDIX B

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY:	Review of New Bedford PCB problem
SPONSORS:	Executive Office of Environmental Affairs and Office of Coastal Zone Management
PURPOSE:	To provide the New Bedford PCB Task Force an overview of the problem and report of work to date
DESCRIPTION:	Introduction to PCB chemistry, measurement of PCBs, health and environmental effects, limits and standards, history and sources of PCB contamination in the New Bedford area, chronology, case histories of PCB pollution, glossary, references.
STATUS:	Completed, June 1982
REPORT:	Weaver, Grant. "PCB Pollution in the New Bedford, Massachusetts Area: A Status Report." Massachusetts Office of Coastal Zone Management, Boston, June 1982.
ANALYSIS:	Concise, but inclusive, review of the problem - touches all facets, points to on-going studies and information gaps. (Other opinions indicate less-than-acute effects to biological populations; see Drill, Friess, et.al., 1982.)

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Appraisal of New Bedford Harbor situation

SPONSOR: Office of Marine Pollution Assessment, NOAA

PURPOSE: To review the New Bedford Harbor situation and determine its relevance to NOAA vis-a-vis future management, research, or environmental surveys.

DESCRIPTION: Brief history; geologic, physical, and biological background; problem appraisal; study needs; possible courses of action; NOAA's involvement.

STATUS: Completed, April 1982

REPORT: Mayer, G.F. et al. "Appraisal of the New Bedford Harbor (Massachusetts) PCB Situation and Its Relevance to NOAA." Office of Marine Pollution Assessment, SUNY, Stoney Brook, NY, 26 April 1982.

ANALYSIS: Good synopsis of harbor-based problems and issues. Points out information gaps and study needs. Identifies areas of study in which NOAA can assist other agencies and institutions in resolving the situation.

Needed study areas cited include refinement of data base on vertical and horizontal distribution of contaminants; evaluation of transport mechanisms, review of effects on commercial fisheries; evaluation of effects on fish, the ecosystem, and public health; development of a food web model; evaluation of impacts to economic development.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Background data on current rate, wind velocity, and tidal movement in the New Bedford area

SPONSOR: Woods Hole Oceanographic Institute

PURPOSE: To assist in defining the physical setting

DESCRIPTION: Cataloging of data by location, type of measurement, frequency of measurement, period of record, and study source

STATUS: Completed

REPORT: Acushnet River Estuary PCB Commission. Appendix V of Status Report. Commonwealth of Massachusetts, Office of the Governor, Boston, September 1982.

ANALYSIS: Serves as basis for further study. Additional data are needed on the inner and outer harbors for comprehensive evaluation of water circulation and sediment transport.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: PCB analyses of fish in the New Bedford area

SPONSOR: Mass. Division of Marine Fisheries

PURPOSE: To determine PCB content of edible portions of marine finfish, shellfish, and crustaceans in the New Bedford area waters

DESCRIPTION: Review of fishing closure; sampling and analysis in Areas 1 thru 4; results, discussions, and recommendations.

STATUS: Completed initial four year testing, January 1981

REPORT: Kolek, A. and R. Ceurvels. "Polychlorinated Biphenyl (PCB) Analyses of Marine Organisms in the New Bedford Area 1976-1980." Mass. Div. of Marine Fisheries, Boston, January 1981.

ANALYSIS: PCB levels in bottom feeders correlate generally with degree of sediment contamination. Species differences correspond to body fat content, degree of exposure, and size (age) of organism. Not all bottom-feeding finfish in Area 2 had levels exceeding the 5 ppm FAL. The data suggest that depuration in some species occurred over the four-year study period. Seasonal migration of lobsters is a problem in the interpretation of data on this species.

Additional data are needed on PCB levels in biota and sediments and on depuration rates. DPH harvesting regulations should be reevaluated as soon as possible.

Some monitoring of the biota for PCBs has occurred since this report was issued.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Review of solid waste land disposal practices in the New Bedford area

SPONSOR: Mass. Southeastern Regional Planning and Economic Development District (SRPEDD)

PURPOSE: To evaluate existing land disposal sites and make recommendations for improvements to comply with Mass. DPH regulations (as part of comprehensive areawide solid waste study).

DESCRIPTION: Cataloging of sites as to location, service area, ownership and operation, wastes accepted, facilities and personnel, terrain, remaining life, recommended improvements, estimated costs of improvements and closure.

STATUS: Completed, March 1973

REPORT: Camp Dresser & McKee, Inc. "Greater New Bedford Solid Waste Study." Massachusetts Southeastern Regional Planning and Economic Development District, Marion, MA, March 1977.

ANALYSIS: Only the New Bedford municipal landfill and Sullivan's Ledge are specifically mentioned as having received liquid and/or sludge wastes, but the municipal landfills in Acushnet, Fairhaven, Dartmouth, and New Bedford are all listed as repositories of industrial wastes. No reference is made to PCB disposal. Seven other special disposal sites are described, both public and private. Any of the eleven sites could have received PCBs. Disposal of dredged harbor sediments is not mentioned.

More detailed study of the above sites and other possible disposal sites, including dredge spoil areas, is needed. Significant changes could be expected since the 1973 study.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Assessment of New Bedford municipal landfill

SPONSOR: Office of Toxic Substances, USEPA (Contract No. 68-01-3248)

PURPOSE: To establish the degree and extent of PCB contamination and migration from the New Bedford municipal landfill

DESCRIPTION: Evaluation of ground waters, surface waters, drinking waters, soils, stream sediments, vegetation, aquatic and terrestrial biota, and air for Aroclors 1016, 1242, and 1254.

STATUS: Completed, May 1978

REPORT: Environmental Science and Engineering, Inc. "Environmental Assessment of Polychlorinated Biphenyls (PCBs) near New Bedford, MA, Municipal Landfill." USEPA Office of Toxic Substances, Washington, DC, 26 May 1978.

ANALYSIS: Less than 1 ppb contamination in shallow groundwaters to the immediate north of the landfill, ND to the west, northwest and east, and in the artesian aquifer (drinking water). Surface soils within Apponagansett Swamp had max. of 0.44 ppm PCB. Some contamination of Paskamanset River sediments north of I-195. Benthic organisms of river and swamp 1.4-2.5 ppm. Fish average 0.34 ppm. Herring gull eggs 4.6 ppm. Field mice 0.016 ppm. Extract of stream bottom sediment near Sullivan's Ledge 288 ppb. Summer airborne PCB at landfill exceeded 1 ug/m^3; in winter, 0.02 ug/m^3. Negligible emissions from sludge incinerator and Cornell-Dubilier. Significant increase in PCB downwind from Aerovox.

No effort made to investigate PCDFs, PCQs, heavy metals, or other toxics. Additional migration is possible since study was completed.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Report on disposal of PCBs by Aerovox and Cornell-Dubilier

SPONSOR: USEPA

PURPOSE: To review PCB liquid and solid waste disposal practices by both industries since the 1930's

DESCRIPTION: Review of PCB waste sources, disposal sites, and early monitoring efforts undertaken in 1976

STATUS: Completed, June 1976

REPORT: Moon, D. "Draft #2: Aerovox Industries and Cornell Dubilier, PCB Waste Processing." Internal report. U.S. Environmental Protection Agency, Region I, Boston, MA., June 1976.

ANALYSIS: Virtually all commercial/industrial waste was incinerated at the New Bedford municipal incinerator until 1971-74, when the incinerator was phased out. Such incinerators typically do not reach temperatures high enough to destroy PCBs but only volatize them. The ash was disposed at the municipal landfill prior to 1971 as were all solid PCB wastes from 1971 through the first half of 1975 (an estimated 500,000 lb). There is no information on liquid PCBs disposed by Aerovox and Cornell-Dubilier in the municipal landfill sewer system, or elsewhere. Ash from the treatment plant sludge incinerator is disposed in the New Bedford landfill.

PCBs were detected in one of four monitoring wells at the toe of the landfill's west face, in a surface leachate seep sample, and in the first 7.5 feet of a core sample. These data may not represent the present status.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Study of fine-grained sediment and metals distribution

SPONSOR: NOAA, Office of Sea Grant (Contracts 04-6-158-44016 and 04-6-15-44106)

PURPOSE: To evaluate movement and accumulation of fine-grained sediment, human waste, and industrial waste in the waters of New Bedford Harbor and Buzzards Bay

DESCRIPTION: Water properties; sediment properties; dispersal of sediment; sedimentation rates; origin, distribution, and dispersal of metals; accompanying maps and diagrams

STATUS: Completed, April 1977

REPORT: Summerhayes, C. et al. "Fine-Grained Sediment and Industrial Waste Distribution and Dispersal in New Bedford Harbor and Western Buzzards Bay, Massachusetts," WHOI Technical Report 76-115. Unpublished manuscript. National Oceanic and Atmospheric Administration, Woods Hole, MA, April 1977.

ANALYSIS: There is a net landward movement of fine-grained sediment into New Bedford Harbor. More silt than clay is deposited as a result of partial fractionation. The clay is preferentially concentrated in the deeps rather than the shallows. The clayey suspensions appear to be organically enriched, resulting in a thin mobile layer of "fluffy" sediments (easily disturbed) and a poorly developed sediment-water interface. Construction of the hurricane barrier caused sedimentation rates to increase from a few mm/year to about 4 cm/year in the deeper portions of the harbor.

The solids in wastewater discharges are agglomerates of clay-silt size. They tend to settle to the bottom but are readily resuspended. Fine-grained surface sediment is richer in organic matter than the underlying silt.

Large quantities of Cu, Cr, Pb, and Zn, with lesser amounts of As, Ag, Cd, and Hg have been discharged into the harbor (a total of approximately 10^8 kg of Cu, alone, in the past 80 years; EPA estimates 90 kg/day recently). The metals are mainly confined to the harbor and are found at or near the surface only, in close association with the clay fraction. Concentrations decrease exponentially with distance from the harbor. Copper was found to be a good indicator of metals contamination.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Hot spot sediment sampling near Aerovox

SPONSOR: USCG

PURPOSE: To reveal the degree and depth of PCB contamination in the Acushnet River Estuary in the vicinity of the Aerovox plant

DESCRIPTION: Core sampling and analysis of bottom sediments; isometric mapping of concentration

STATUS: Completed, March-August 1982

REPORT: U.S. Coast Guard. Internal memoranda and accompanying analytical reports. USCG, Groton, CT, 11 June and 1 July 1982.

ANALYSIS: Core samples at approximately 50 sites (the exact total is difficult to discern from the reports) were taken; replicate samples were collected. Samples were prepared from slices taken from the top inch, from 5-1/2 to 6-1/2 inches in depth, and from the bottom 2 inches of the core. Analysis was done by three methods (LC, TLC, and GC) for total PCB as Aroclor 1254 (no isomer study). Hot spots to >10,000 ppm were delineated. Most values were in the range of 100-1000 ppm at the surface, somewhat greater at mid-depths, and 10-100 ppm at the bottom of cores. Hot spots occurred in two locations along the west shore adjacent to Aerovox property. The main channel appeared to have concentrations below 1000 ppm at all depths studied.

Action Level	Cumulative Volume	Cost
500 ppm	70,000 cu.yd.	$5-10 mil.
50	2,200,000	60-70
10	4,400,000	110

Four additional alternatives for harbor development would involve dredging 80,000-900,000 cu.yd., depending on the scale of development, and would be considered apart from, or in conjunction with, remedial dredging for removal of contaminated sediment.

Dredge sediments containing >50 ppm PCBs would require upland disposal. Sediments <50 ppm PCBs were assumed suitable for shoreline disposal. No consideration of metal contaminants was made.

The report recommended the following further study:

(1) Evaluation of conceptual dredging costs vs. anticipated benefits to determine economic feasibility.

(2) Detailed monitoring program following initial dredging.

(3) Continued sampling of sediment, water, and biota; modeling studies to clarify PCB transport and uptake and the effects/benefits of remedial dredging on aquatic organisms.

(4) Technical studies to support remedial dredging program(s), including additional sediment sampling and site investigations, and pilot studies to evaluate dredge sediment settleability and treatability.

(5) Detailed sampling to fully characterize sediments which would be removed in harbor development programs.

The report concluded remedial dredging to be technically feasible but summarily dismissed other alternatives (e.g., in situ treatment or confinement) which could prove feasible on closer examination for certain portions of the harbor. An in-depth feasibility study should consider all possible options, given the scope and potential costs of remedial action. The presence of heavy metals should be evaluated.

- The indicated order-of-magnitude dredge volumes and costs are conceptual. Real costs will be sensitive to methods and locations of dredge sediment treatment/disposal. The reported cost estimates were based largely on mechanical dredging technology. Careful consideration of pneumatic dredging (e.g., Oozer and Amtec) is warranted.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Review of data needs and dredging techniques

SPONSOR: Mass. DWPC

PURPOSE: To catalog PCB data on the Acushnet River/New Bedford Harbor area, identify data needs, and review applicable dredging techniques.

DESCRIPTION: Listing PCB concentrations by source, date, and location; general statement of data deficiencies and needs; review of dredging techniques, their advantages and disadvantages.

STATUS: Completed, August 1981

REPORT: Tomczyk, R. "A report on the PCB Data Needs and Dredge Techniques for the Acushnet River-New Bedford Harbor Area." Mass. DWPC, Boston, 17 August 1981.

ANALYSIS: Available PCB data are not comparable because of various expertise and techniques among the many laboratories which have performed sampling and analysis. Analysis for different isomers of PCB has been lacking. Other flaws: sampling locations not accurately known, collection of samples not uniform or precise. "There is a need for a well planned sampling program conducted by one laboratory experienced in PCB analyses..."

Hydraulic dredges: 80% water, 20% sediment. Pneumatic dredges: 20% water, 80% slurry, but need min. 30-40 feet of water. Most areas of the estuary and harbor are less than 20 feet deep. Mechanical dredges increase costs because sediments must be handled twice.

Open-ocean dumping may be prevented by the Clean Water Act and the Marine Protection, Resesarch, and Sanctuaries Act - also, the London Ocean Dumping Convention Limits. PCBs greater than 50 ppm may have to be incinerated, disposed in a secure landfill, or disposed by other EPA-approved method.

The Japanese have developed a technique for immobilizing PCBs by solidification of disposed dredge materials.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Investigation of dredging techniques

SPONSOR: New England Governors' Conference, Inc.

PURPOSE: To identify feasible dredging techniques for the removal of PCB-contaminated sediments from New Bedford Harbor and the Acushnet River Estuary

DESCRIPTION: Introduction to the problem; characterization of sediments; discussion of dredging techniques, transportation of dredged material, and disposal options; relevant case histories.

STATUS: Draft report completed, August 1982

REPORT: Geotechnical Engineers, Inc. "Dredging of PCB-Contaminated Sediments, New Bedford Harbor/ Acushnet River Estuary, MA." Draft report. New England Governors' Conference, Inc., Boston, 13 August 1982.

ANALYSIS: PCB's are only slightly water-soluble but are readily adsorbed and held by fine-grained and organic sediments. Mobilization of PCBs during dredging would be minimized with hydraulic and pneumatic dredging; mechanical dredging may be acceptable in conjunction with silt curtains. Hydraulic and pneumatic dredging result in large volumes of entrained water requiring separation and treatment, hydraulic being worse in this regard, but less costly. Mechanical dredging has practical limitations. Lack of disposal site(s) may be the greatest impediment to dredging. Dredging and transportation techniques are tied to disposal; therefore, recommendations cannot be made at this time. The report dismisses incineration and biodegradation as feasible disposal options.

High concentrations of copper, lead, zinc, cadmium, and chromium were measured in sediment samples taken from tidal flats in the Acushnet River Estuary.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Investigation of PCB removal in biological wastewater treatment

SPONSOR
a. USEPA (Contract No. 68-01-3273, Task 13)
b. Monsanto Company

PURPOSE: To evauate the biodegradability and efficiency of removal of PCBs in wastewater treatment facilities

DESCRIPTION: Bench-scale evaluation of biodegradation rates of commercial PCBs; evaluation of unit process PCB removal efficiencies at two publicly owned secondary wastewater treatment plants

STATUS: Completed: a. July 1977; b. March 1975

REPORTS:

a. U.S. Environmental Protection Agency. "PCBs Removal in Publicly-Owned Treatment Works." Report No. 440/5-77-017, USEPA, Criteria and Standards Division, Washington, D.C., 19 July 1977.

b. Tucker, E.S. et al. "Activated Sludge Primary Biodegradation of Polychlorinated Biphenyls. Bull. Environ. Contam. Toxicol., 14,6,705. 1975.

ANALYSIS: Bench studies showed mono- and dichlorobiphenyls are readily biodegradable. Resistance to biodegradation increases with increasing chlorine substitution. This explains the presence of highly chlorinated biphenyls as residues in weathered samples.

Overall PCB removal efficiencies were 80-90% at the two municipal plants - slightly less than BOD and SS removal efficiencies. Primary treatment removed about 50% of total PCB. Correlation with SS removal was observed in four of six unit processes.

Both studies indicated volatilization was not a significant mechanism in PCB removal.

Only primary degradation was evaluated. Neither study considered the fate or identity of associated compounds or degradation products.

The results of these studies should be directly applicable to the New Bedford situation.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: PCB survey of New Bedford sewer system

SPONSORS: Mass. DEQE and USEPA

PURPOSE: To identify sources and measure concentrations of PCBs in the municipal wastewater collection system.

DESCRIPTION: Sampling and analysis for Aroclors at key locations in the system

STATUS: Completed, October 1982

REPORT: Dunn, D. Internal memorandum. Mass. DEQE Division of Water Pollution Control, Technical Services Branch, Westboro, MA, 5 October 1982.

ANALYSIS: Analyses provided full isomer scan (total PCBs). No flow measurements were taken. Sample composites were collected 16-25 June 1982 at 18 stations. Eight stations had 0-1 ppb total PCBs. Five stations receiving wastewater from the New Bedford Industrial Park had 0-5 ppb Aroclor 1248 (source unknown). One station near Cornell-Dubilier had 2-3 ppb Aroclor 1254 (source unknown). Three stations near Cornell-Dubilier had 23-120 ppb Aroclor 1242+1254. The New Bedford WWTP and Cove Road pump station receiving these flows had 5-10 ppb Aroclor 1242+1254 influent and effluent, <1 ppb WWTP sludge. The Fairhaven WWTP had <1 ppb PCBs.

Additional info was supplied by D. Dunn in phone conversation 4 November 1982. Work is part of Master's thesis. Other parameters analyzed: oil and grease, metals, solids, nutrients, BOD, chlorides, etc. Final report not yet available. WWTP flows during June study were 25-30 MGD, total PCBs 1.5-2 lb/day. An earlier study (March 1982) when flows were smaller showed 0.5-1 lb/day. Sewer lines just cleaned by C-D yielded about 50 barrels of sediments, 10,000-25,000 ppm PCBs. Barrels are in storage. Cornell-Dubilier has retained EG&G to clean up their property (consent decree). Source of PCBs from C-D may already have been eliminated - should be

determined in future testing. Minor PCB source at Industrial Park (Poloroid Corp?) may warrant further investigation. All other areas do not appear to have significant wastewater PCB problem.

Mass input of PCBs into bay from WWTP should be reevaluated following present clean-up operations. Results should be reviewed with respect to water quality criteria to determine need for further action.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Evaluation of PCB removal at the New Bedford incinerator

SPONSOR: USEPA (Contact No. 68-01-3154, Task 24)

PURPOSE: To evaluate the efficiency of PCB removal at the New Bedford wastewater sludge incinerator from mass balance determinations

DESCRIPTION: Brief description of wastewater treatment plant, incinerator, and waste streams; description of sample collection, handling, and analytical procedures; determination of PCB input/output concentrations, mass rates, and removal efficiencies.

STATUS: Completed, September 1977

REPORT: GCA Corporation. "PCB Compounds Emanating from the New Bedford Municipal Wastewater Incinerator." U.S. Environmental Protection Agency, Region I, Boston, MA, September 1977.

ANALYSIS:

Input	Sludge	220-590 mg/hr	(30-69%)	(100% of total)
	Scrubber water	260-710	(31-70)	
Output	Ash	50-120	(4-15)	(23-54% of total
	Scrubber Effluent	220-310	(16-37)	
	Flue gas	8-25	(2-3)	

The derivation of Aroclors in the scrubber effluent is unknown since primary effluent was the feed water. Additional testing is needed.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Quality assurance plan for incinerator study.

SPONSOR: USEPA (Contract No. 68-02-3168)

PURPOSE: To provide QA/QC in the sampling and analysis of PCB's and other chlorinated hydrocarbons for completing a mass balance on PCBs at the New Bedford WWTP sludge incinerator.

DESCRIPTION: Objectives (precision, accuracy, completeness), sampling procedures, sample custody, calibration procedures, analytical methods, data management and reporting, quality control and performance audits, corrective action, QA reports.

STATUS: Completed, August 1982.

REPORT: GCA Corporation. "Quality Assurance Project Plan for Sampling and Analysis Activities for the Multiple Health Sewage Sludge Incinerator at the New Bedford Municipal Wastewater Treatment Plant." USEPA, August, 1982.

ANALYSIS: Comprehensive. Should be applicable or adaptable to other sampling and analysis projects.

NEW BEDFORD PCB PROJECT
WORK INVENTORY AND STATUS BRIEF
OCTOBER 1982

ACTIVITY: Data Management

SPONSOR: USEPA (Contract No. 68-04-1009)

PURPOSE: To establish a data management system to consolidate all PCB-related data from all agencies and institutions involved.

DESCRIPTION: Cataloging all PCB data on water, sediments, air, land, sewer system, and biota; development of preliminry criteria for evaluating the usability of individual data sets (Phase I).

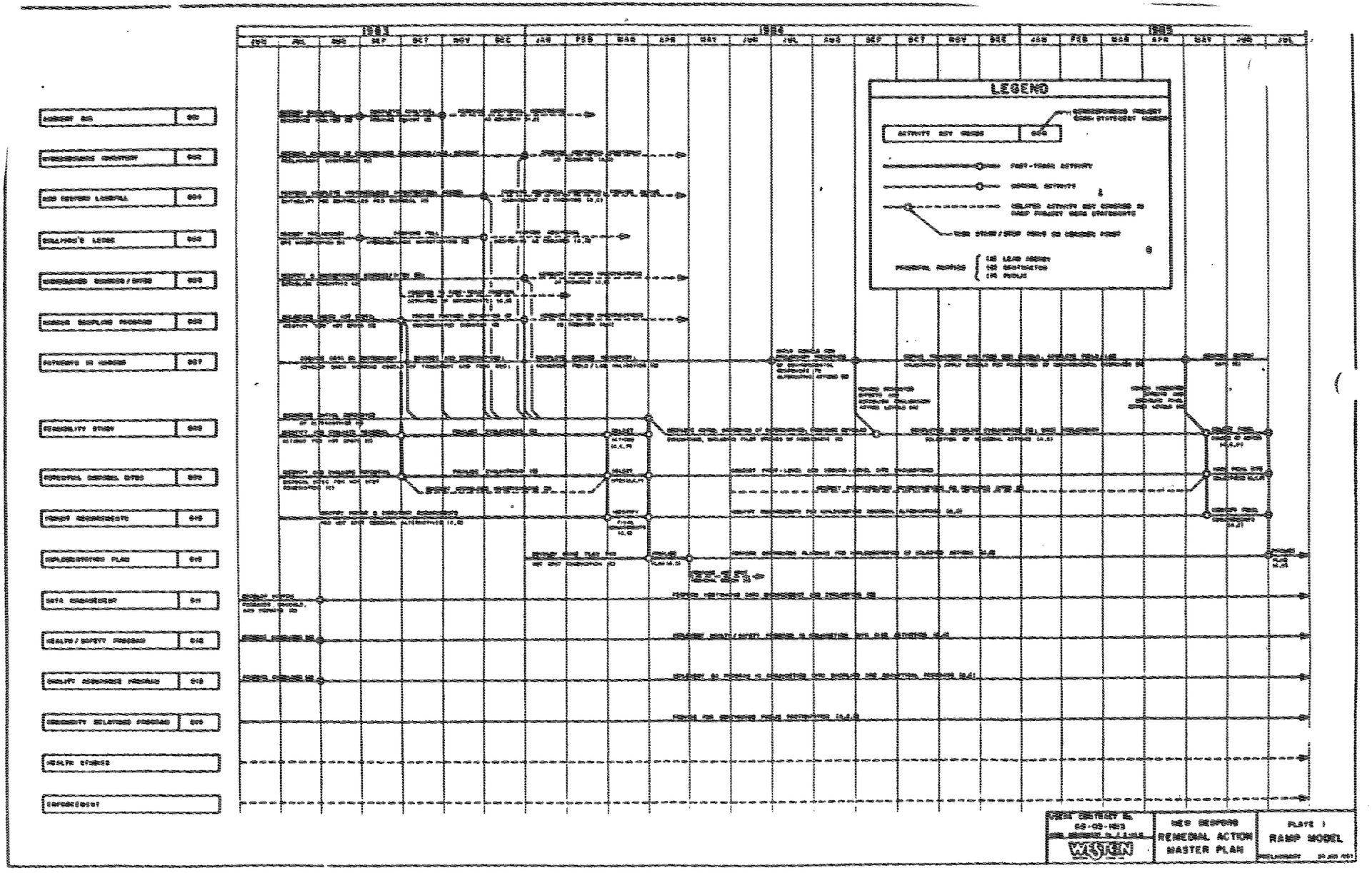
STATUS: Phase I completed, 1 September 1982.

REPORT: Metcalf & Eddy, Inc. "New Bedford PCB Data Management System." USEPA, 23 August 1982.

ANALYSIS: Comprehensive; includes all PCB data from all areas, plus metals and toxics data obtained in conjunction with PCB studies. System is user-interactive, has limited statistical capabilities, may input data into other computer programs.

Limited information available on sampling and analytical methods employed in any studies to date; no tide or time data. Needs include refinement and application of data evaluation criteria; determination of data needs; recommended program for filling data needs (Phase II).

PLATE 1


1983
1984
1985
LEGEND
WESTON
NEW BEDFORD
REMEDIAL ACTION
MASTER PLAN
PLATE 1
RAMP MODEL