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DECLARATION FOR THE RECORD OF DECISION
NEW BEDFORD HARBOR SUPERFUND SITE
UPPER AND LOWER HARBOR OPERABLE UNIT
NEW BEDFORD, MASSACHUSETTS

Statement of Purpose

The attached Record of Decision sets forth the selected remedial action for the Upper and Lower Harbors of the New Bedford Harbor Superfund Site in New Bedford, Massachusetts, developed in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended, 42 U.S.C. Sections 9601 et. seq. and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) as amended, 40 C.F.R. Part 300. The Administrator for EPA-New England has been delegated the authority to approve this Record of Decision (ROD). The Regional Administrator has redelegated this authority to the Director of the Office of Remediation and Restoration.

The Commonwealth of Massachusetts has concurred with the selected remedy.

Statement of Basis

This decision is based on the Administrative Record which has been developed in accordance with Section 113(k) of CERCLA and which is available for public review at the New Bedford Public Library in New Bedford, Massachusetts, and at the EPA-New England Records Center in Boston, Massachusetts. The Administrative Record Index (Appendix C to the ROD) identifies each of the items comprising the Administrative Record upon which the selection of the remedial action is based.

Assessment of the Site

Actual or threatened releases of hazardous substances from this Site, if not addressed by implementing the response action selected in this ROD, present an imminent and substantial endangerment to the public health or welfare or to the environment.

Description of the Selected Remedy

The major components of the selected remedy include the following:

- Approximately 450,000 cubic yards of sediment contaminated with polychlorinated biphenyls (PCBs) will be removed. In the upper harbor north of Coggeshall Street, sediments above 10 parts per million (ppm) PCBs will be removed, while in the lower harbor and in saltmarshes, sediments above 50 ppm will be removed.

- In certain shoreline areas prone to beach combing, sediments between the high and low tide levels will be removed if above 25 ppm PCBs. In areas where homes directly abut the harbor and where contact with sediment is expected, sediments between the high and low tide levels will be removed if above 1 ppm PCBs.

- Four shoreline CDFs will be constructed to contain and isolate the dredged sediments. Three of these facilities will be in the upper harbor, and one will be in the lower harbor. Archaeological surveys will be performed prior to construction of the CDFs and before dredging is started.

- Once the dredged sediments are placed in the CDFs, the large volumes of water brought in by the dredging process will be decanted and treated to low levels before discharge back to the Harbor.

- Once full, first an interim and then a final cap will be constructed at each CDF. Where possible, cleaner sediment from the harbor's navigational channels will be used as part of the interim caps.

- The capped CDFs will be monitored and maintained over the long term to ensure their integrity.

- Institutional controls, including seafood advisories, no-fishing signs and educational campaigns will be implemented to minimize ingestion of local PCB-contaminated seafood until PCBs in seafood reach safe levels. State fishing restrictions will also be in effect until such time as the Commonwealth deems it appropriate to amend them. Additional controls will protect the capped CDFs and allow for certain future uses.

- Once completed, the CDFs will be available for beneficial reuse as shoreline open space, parks or, in the case of the lower harbor CDF, a commercial marine facility.

- A review of the Site will take place every five years after the initiation of the remedial action to assure that the remedy continues to protect human health and the environment.

Special Findings

Issuance of this ROD embodies specific determinations made by the Regional Administrator pursuant to CERCLA and the Toxic Substance Control Act (TSCA). Under section 121(d)(4)(B) of CERCLA, the Regional Administrator hereby waives 40 CFR 122.4(i) of the Clean Water

Act (a regulation regarding discharges to polluted water bodies) and 21 CFR 109.30 of the federal Food, Drug and Cosmetic Act (a regulation regarding PCB levels in seafood). Due to the nature of the New Bedford Harbor site, full compliance with these requirements would result in greater risk to human health and the environment than non-compliance. Further, under TSCA, the Regional Administrator finds that the site meets the standards of 40 CFR 761.50(b)(3)(i)(A) for remediation and that the selected remedy will not pose an unreasonable risk of injury to health or the environment pursuant to 40 CFR 761.61(c) or 40 CFR 761.75(c)(4).

Declaration

The selected remedy is protective of human health and the environment, attains or waives federal and state requirements that are applicable or relevant and appropriate for this remedial action, and is cost effective. The selected remedy provides a permanent solution to the widespread and persistent PCB contamination in the upper and lower harbor sediments. While it does not satisfy the statutory preference for remedies that utilize treatment as a principal element to reduce the toxicity, mobility or volume of hazardous substances, it does permanently isolate these sediments from human and environmental receptors by containing them in shoreline CDFs in perpetuity in a safe and protective fashion. In addition, water decanted from the dredged sediments will be treated to meet stringent discharge standards.

As this remedy will result in hazardous substances remaining on site above health-based levels, site reviews will be conducted every five years after commencement of remedial action to ensure that the remedy continues to provide adequate protection of human health and the environment.

9/25/98
Date

Patricia L. Meaney, Director
Office of Site Remediation and Restoration
EPA-New England

9/25/98
Date

John P. DeVillars, Regional Administrator
EPA-New England

Record of Decision

for the

Upper and Lower Harbor Operable Unit

New Bedford Harbor Superfund Site

New Bedford, Massachusetts

September 1998

U.S. Environmental Protection Agency - Region I

New England

Abstract

After years of study, public debate and consensus-building for a solution to the widespread PCB contamination in and around New Bedford Harbor, EPA has selected a cleanup remedy for the entire upper and lower harbor areas. This remedy involves the dredging and containment of approximately 450,000 cubic yards of PCB-contaminated sediment spread over about 170 acres. In the upper harbor north of Coggeshall Street, sediments above 10 ppm PCBs will be dredged, while in the lower harbor and in saltmarshes, sediments above 50 ppm PCBs will be dredged. Intertidal sediments in specific areas adjacent to homes or in areas prone to beach combing will be removed if PCB levels are above 1 and 25 ppm, respectively. The overall goals of the remedy are to a) reduce health risks due to consumption of PCB-contaminated local seafood, b) reduce health risks due to contact with PCB-contaminated shoreline sediments and c) improve the quality of the Harbor's highly degraded marine ecosystem.

The dredged sediments will be placed in four shoreline confined disposal facilities (CDFs) and seawater decanted from these sediments will be treated before discharge back to the harbor. Upon reaching storage capacity, first an interim and then a final cap will be installed at each CDF and a long term maintenance and monitoring program will be implemented. Institutional controls, including the continuation of a state-sanctioned fishing ban, will be required until PCB levels in seafood reach acceptable criteria. The total present worth cost of the remedy is estimated to be between \$120 and \$130 million. Pursuant to 40 CFR 430(f)(5), this Record of Decision further describes the remedy and the rationale for it, as well as pertinent site characteristics and other cleanup alternatives considered.

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I. Site Name, Location and Description

The New Bedford Harbor Superfund Site (the Site), located in Bristol County, Massachusetts, extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbor of New Bedford and into 17,000 adjacent areas of Buzzards Bay (Figure 1). Industrial and urban development surrounding the harbor has resulted in sediments becoming contaminated with high concentrations of many pollutants, notably polychlorinated biphenyls (PCBs) and heavy metals, with contaminant gradients decreasing from north to south. From the 1940s into the 1970s two electrical capacitor manufacturing facilities, one located near the northern boundary of the site and one located just south of the New Bedford Harbor hurricane barrier, discharged PCB-wastes either directly into the harbor or indirectly via discharges to the City's sewerage system. The Site has been divided into three areas - the upper, lower and outer harbors - consistent with geographical features of the area and gradients of contamination (Figure 1). The Site is also defined by three state-sanctioned fishing closure areas extending approximately 6.8 miles north to south and encompassing approximately 18,000 acres in total (Figure 2).

The City of New Bedford, located along the western shore of the Site, is approximately 55 miles south of Boston. During most of the 1800s, New Bedford was a world renown center of the whaling industry and attracted a large community of immigrants from Portugal and the Cape Verde islands. As of 1990, approximately 27% of New Bedford's 99,922 residents spoke Portuguese in their homes (US Census Bureau, 1997). Including the neighboring towns of Acushnet, Fairhaven and Dartmouth, the combined 1990 population was approximately 153,000. New Bedford is currently home port to a large offshore fishing fleet and is a densely populated manufacturing and commercial center. By comparison, the eastern shore of New Bedford Harbor is predominantly residential or undeveloped. A large (approximately 70 acre) saltmarsh system has formed along almost the entire eastern shore of the upper harbor.

The Acushnet River's 16.5 square mile (43 km^2) drainage basin (VHB, 1996) discharges to New Bedford Harbor in the northern reaches of the Site, contributing relatively minor volumes of fresh water to the tidally influenced harbor. Its estimated mean annual flow of 30 cubic feet per second is only about 1% of the average tidal prism (the volume of water which flows into and out of the Harbor during the course of a complete flood/ebb tide cycle) (NUS, 1984). Numerous storm drains, combined sewer overflows (CSOs) and industrial discharges as well as smaller brooks and creeks also discharge directly to the Site. The upper and lower harbors are believed to be areas of net groundwater discharge and are generally described as a shallow, well-mixed estuary.

The upper harbor comprises approximately 187 acres, with current sediment PCB levels ranging from below detection to approximately 4,000 ppm. Prior to the removal of the most contaminated hot spot sediments in 1994 and 1995 as part of EPA's first cleanup phase (see below), sediment PCB levels were reported higher than 100,000 ppm in the upper harbor. The boundary between the upper and lower harbor is the Coggeshall Street bridge where the width of the harbor narrows to approximately 100 feet. The lower harbor comprises approximately 750 acres, with sediment PCB levels ranging from below detection to over 100 ppm. The boundary between the lower and outer harbor is the 150 foot wide opening of the New Bedford hurricane barrier. (The hurricane barrier was constructed in the mid-1960s). Sediment PCB levels in the outer harbor are generally low, with only localized areas of PCBs in the 50-100 ppm range near the Cornell-Dubilier plant and the City's sewage treatment plant's outfall pipes. The southern extent of the outer harbor and the Site is an imaginary line drawn from Rock Point (the southern tip of West Island in Fairhaven) southwesterly to Negro Ledge and then southwesterly to Mishaum Point in Dartmouth (Figure 1).

II. Site History and Enforcement Activity

Identification of PCB-contaminated sediments and seafood in and around New Bedford Harbor was first made in the mid 1970s as a result of EPA region-wide sampling programs. Total PCB usage in New Bedford at this time was around two million pounds per year (Nelson et al., 1996). In 1978, the manufacture and sale of PCBs was banned by the federal Toxic Substance Control Act (TSCA). In 1979, the Massachusetts Department of Public Health promulgated regulations prohibiting fishing and lobstering throughout the Site due to elevated PCB levels in area seafood (Figure 2). Elevated levels of heavy metals in sediments (notably cadmium, chromium, copper and lead) were also identified during this time frame. Due to these concerns, the Site was proposed for the Superfund National Priorities List (the NPL) in 1982, and finalized on the NPL in September 1983. Pursuant to 40 CFR 300.425(c)(2), the Commonwealth of Massachusetts (the Commonwealth) nominated the Site as its priority site for listing on the NPL. In 1982, the U.S. Coast Guard erected signs around the Site warning against fishing and wading. These signs have been maintained or replaced by EPA and the City of New Bedford as needed, most recently in 1997.

EPA's site-specific investigations began in 1983 and 1984 with the Remedial Action Master Plan (Weston, 1983) and the Acushnet River Estuary Feasibility Study (NUS, 1984). Site investigations continued throughout the rest of the 1980s and early 1990s, including a pilot dredging and disposal study in 1988 and 1989 (Otis et al., 1990), which field tested different dredging and disposal techniques for upper harbor sediments, and extensive physical and chemical computer modeling of the Site (Battelle, 1990). These Site studies are summarized in more detail in the Record of Decision (ROD) for the hot spot areas of the Site (USEPA, 1990) and in the 1990 Feasibility Study for the Site (Ebasco, 1990c).

Collectively, these investigations identified the Aerovox facility as the primary source of PCBs to the Site. PCB wastes were discharged from Aerovox's operations directly to the upper harbor through open trenches and discharge pipes, or indirectly throughout the Site via CSOs and the City's sewage treatment plant outfall. Secondary inputs of PCBs were also made from the Cornell Dubilier Electronics, Inc. (CDE) facility just south of the New Bedford hurricane barrier.

Based on the investigations' results, enforcement actions were initiated against both the Aerovox and CDE facilities as well as the City of New Bedford pursuant to the Comprehensive Environmental Restoration, Compliance and Liability Act (CERCLA) as well as other federal environmental statutes. These actions are summarized below.

In May 1982, Aerovox Incorporated signed an administrative consent order pursuant to section 106 of CERCLA regarding contamination on its property adjacent to the upper harbor. This order called for a cut-off wall and cap system to isolate contaminated soil, and for groundwater monitoring and maintenance. This containment system was completed in June 1984. As constructed, the groundwater cut-off wall consists of steel sheet piling keyed into a relatively impermeable peat layer (the sheet piling extends from 9 to 13 feet below grade) . The cap consists of a 2.5 inch thick hydraulic asphalt concrete cap over approximately 33,000 square feet of previously unpaved surfaces near the Acushnet River and near the main manufacturing building (Gushue and Cummings, undated).

Also in May 1982, CDE and EPA signed an administrative consent agreement and final order under TSCA. This agreement addressed PCB handling procedures, discharges, releases to the municipal sewer system and surrounding areas, and groundwater monitoring requirements. Subsequently, in September 1983, EPA issued an administrative order to CDE under section 106 of CERCLA requiring CDE to remove PCB-contaminated sediments from portions of the municipal sewer system downstream of the CDE plant. The removal and disposal of these sediments took place in the fall of 1984 (CDE, 1985). EPA also issued an administrative order to the City of New Bedford under section 106 of CERCLA in September 1983 requiring the City to assist CDE in the sewer line clean-up and to monitor PCB levels from the City's municipal wastewater treatment plant.

On December 9, 1983, the United States filed a complaint on behalf of the National Oceanic and Atmospheric Administration (NOAA) under section 107 of CERCLA seeking damages for injury to natural resources at and near the Site caused by releases of PCBs. The next day, the Commonwealth of Massachusetts (the Commonwealth) filed its own section 107 action. The cases were subsequently consolidated. In February 1984, the complaint was amended to include claims on behalf of EPA for recovery of response costs incurred, or to be incurred, under section 107, and for injunctive relief under section 106 of CERCLA and other environmental statutes. The United States brought this action against six companies which, at various times, owned and/or operated either of the two capacitor manufacturing facilities at the Site.

On December 31, 1985, the Commonwealth issued a notification of responsibility to the City of New Bedford pursuant to the state's hazardous waste regulations regarding the build-up of PCB-contaminated grit in one of the main interceptors of the City's sewerage system. Severe amounts of PCB-contaminated grit had accumulated within the interceptor especially in the area between Coffin Avenue and Campbell Street; PCB levels in this grit averaged 265 ppm on a dry weight basis (CDM, 1987). The City subsequently encased and abandoned approximately one and one-half mile of this sewer interceptor which ran from Hathaway Street (near the southern end of where CDF B is proposed; Figure 21a) to Pearl Street (near the southern end of where CDF D is proposed; Figure 21b).

In 1991 and 1992, the Unites States, the Commonwealth and five defendants in the litigation - Aerovox Incorporated, Belleville Industries, Inc., AVX Corporation, Cornell-Dubilier Electronics, Inc., and Federal Pacific Electric Company (FPE) - reached settlement regarding the governments' claims. The governments claims against the sixth defendant, RTE Corporation, were dismissed on jurisdictional grounds. The federal and state governments recovered a total of $99.6 million plus interest from the five settling defendants.

The terms of the settlements are set forth in three separate consent decrees. Under the first consent decree, Aerovox Incorporated and Belleville Industries, Inc. were required to pay a total of $12.6 million, plus interest, to the United States and the Commonwealth for damages to natural resources and for past and future Site response costs. The court approved and entered this consent decree in July 1991. Under the second consent decree, AVX Corporation was required to pay $66 million, plus interest, to the governments for natural resource damages and for past and future Site response costs. This decree was approved and entered by the court in February 1992. Under the third consent decree, CDE and FPE paid $21 million, plus interest, to the governments for natural resource damages and for past and future Site response costs. This decree was approved and entered by the Court in November 1992.

One of the settling defendants, AVX Corporation, has been involved during the remedial investigations, feasibility studies and remedy selection process. It submitted extensive comments during the public comment period for this ROD as well as for the hot spot ROD. A summary of its comments pertaining to this remedy and EPA's responses to them are included in the attached Responsive Summary (Attachment A). All of AVX's comments in their original form are included in the Administrative Record for this ROD, which is available for public review at the New Bedford Public Library and at EPA's public record center in Boston, MA.

In April 1990, EPA issued the ROD for the hot spot operable unit of the Site. The hot spot ROD called for dredging and on-site incineration of the Site's most highly PCB-contaminated sediments located adjacent to the Aerovox facility. The ROD specified a 4,000 ppm PCB level to define the sediments to be dredged (sediments below this 4,000 ppm threshold were to be left in place). Dredging of these sediments - about 14,000 cy in volume and 5 acres in area - began in April 1994 and was completed in September 1995. However, due to a vehement and congressionally-supported reversal in local support for on-site incineration during the initial mobilization stage, EPA suspended the incineration component of the hot spot remedy (USEPA, 1995). The dredged hot spot sediments are currently in interim storage in a shoreline confined disposal facility near Sawyer Street in New Bedford until EPA completes the process of selecting an alternate remedy for these sediments.

In 1997 and 1998, additional investigations of the Aerovox and CDE facilities revealed elevated levels of PCBs on various work surfaces and areas of these facilities. Discussions are currently underway between Aerovox, CDE and EPA to address these issues. EPA does not believe that the PCB-contamination of these facilities is impacting the Harbor.

III. <u>Community Relations</u>

Following the 1990 Feasibility Study, EPA published a Proposed Plan for the upper and lower harbor in January 1992. An Addendum to this Plan was published in May 1992 to specifically address the outer harbor following a Supplemental Feasibility Study of this area of the Site.

Informational public meetings were held on these Plans in January and May, 1992. Public hearings were held in March and June to accept formal comments on the January and May Plans, respectively. The public comment period on the January Plan ran for 164 days beginning March 5, 1992; for the May 1992 Addendum the public comment period ran for 61 days, beginning June 10, 1992. These two comment periods ran concurrently during the final 61 days concluding on July 13, 1992.

In December 1993 EPA and other site stakeholders initiated a professionally mediated Community Forum process as an effort to build lasting consensus for the Site's cleanup. Created to address public concerns raised by the hot spot incineration controversy, the Forum is made up of a wide variety of Site stakeholders, including citizen group leaders, local and state elected officials, business representatives, EPA, the MA DEP and other relevant state and federal agencies. The Forum continues to meet regularly and has expanded its scope to include virtually all Site related issues. The Forum meetings are taped and televised on local cable-access TV to reach as broad an audience as possible. All of the Forum's proceedings regarding ROD 2 - as well as much of those regarding the hot spots - have been documented in the Administrative Record for this second Site ROD.

The Forum turned its attention specifically to ROD 2 in April 1995. Throughout the remainder of 1995 and into the summer of 1996, a series of frequent Forum meetings were held to fully and publicly debate the difficult issues presented by the widespread and severe PCB contamination in the harbor. In July 1996, as a result of this comprehensive focus on ROD 2, all members of the Forum documented their consensus on a proposed cleanup approach for the upper and lower harbor. This consensus building with the Forum resulted in a reconfiguration of the conceptual CDF locations and an agreement by EPA to continue the evaluation of sediment treatment technologies, especially until such time as the final CDF caps are in place. The Forum's ROD 2 consensus agreement is also included in the Administrative Record.

In addition to these Community Forum efforts, an independent panel session on CDFs and the Site was assembled by a local non-profit organization, Sea Change, Inc. Sea Change held this public panel session in November 1995 in which six experienced panelists from academia and private consulting firms discussed the Site and CDFs in general as well as other remedial alternatives and answered questions from the audience. The panel generally supported a CDF-based cleanup of the site. As with the Forum's activities, the Sea Change meeting is described in the Administrative Record documents, and video tapes of the meeting are available.

EPA also held two well-advertized public informational meetings of its own in November 1995 and November 1996, both of which were immediately preceded by open house sessions where the general public was welcome to view informational posters about the site. At both these meetings the public was invited to ask questions pertaining to the Site. Based on comments from the 1992 Proposed Plans and input from the community Forum, EPA issued a revised Proposed Cleanup Plan for this operable unit in November 1996. A public hearing on this revised Plan was held on November 20, 1996 for the solicitation of formal oral comment on the Plan. The public comment period (for submission of formal written comments) ran until February 3, 1997. All formal comments on the 1996 Plan as well as those received on the earlier 1992 Plan and Addendum are summarized and responded to in the attached Responsiveness Summary (Appendix A). All original comments to the Proposed Plans are included in the Administrative Record.

IV. Scope and Role of Operable Unit

The New Bedford Harbor Site has been divided into three operable units, or phases of site cleanup: The hot spot operable unit, the upper and lower harbor operable unit (which this ROD encompasses) and the Buzzards Bay or outer harbor operable unit. As described above, the hot spot ROD was originally issued in April 1990. An amendment to that ROD is anticipated to replace the on-site incineration component originally included in the remedy. The operable unit three (outer harbor) ROD is currently unscheduled pending additional investigation in the outer harbor.

Although the hot spot sediments were removed from the harbor in 1994 and 1995, PCB-contaminated sediment below 4,000 ppm PCBs remains in these areas by definition of the hot spot cleanup objectives (i.e., only those sediments contaminated above 4,000 ppm PCBs were removed). In addition, one of the hot spot areas (Area B, see USACE, 1991) was not dredged during the hot spot dredging operations due to its proximity to submerged high voltage power lines serving the City of New Bedford. The remedy for the upper and lower harbor therefore includes these former hot spot areas in order to meet the more stringent target cleanup levels (TCLs) and remedial objectives of this ROD. See section XII for additional discussion regarding the cleanup approach for the submerged power line area.

Two localized areas of PCB-contaminated sediment located just south of the hurricane barrier are also included in this second ROD. While geographically just seaward of the operable unit and lower harbor boundary, these areas have been included in the remedy to the extent that they contain sediment above the 50 ppm TCL for the lower harbor. Further investigation of the outer harbor area of the Site will be undertaken as part of operable unit three to determine whether additional remediation is appropriate for this area.

This ROD 2 sets forth the final remedy for the contaminated sediments remaining in the upper and lower harbor areas. It is an interim remedy for the outer harbor portion of the Site. This remedy will protect human health and the environment by removing contaminated sediments from the harbor and permanently isolating them in shoreline CDFs. Containment of sediments above TCLs eliminates the threats to human health from direct contact with, and incidental ingestion of contaminated sediments. This remedial action will also reduce the availability of PCBs to the marine food chain, but it is uncertain when - or whether - PCB levels in seafood will reach levels that are safe for human consumption in all species in all areas. Thus, the remedy includes institutional controls to minimize unsafe seafood consumption and ensure protection of human health. This remedial action will significantly reduce the source of PCBs to surface water, thereby allowing for eventual attainment of PCB water quality criteria for protection of marine life.

EPA believes this second ROD to be consistent with the remaining remedy selections envisioned for the Site, namely the hot spot ROD amendment and the outer harbor ROD, since it removes sediments that act as a continuing source of PCBs to surrounding areas, and since it can be implemented in a way that will not interfere with remedial activities for these other areas.

V. Summary of Site Characteristics

Numerous investigations have been completed for the Site to describe the nature and extent of PCB and metals contamination, the location and functional values of saltmarsh areas, the fate and transport of PCBs in the environment, and the ecological and human health risks resulting from Site contamination. Some of the more important of these studies include the U.S. Army Corps of Engineers' engineering feasibility studies (a series of 12 reports published in 1988, 1989 and 1990), a wetland analysis (IEP, 1988), the August 1989 public health risk assessment (Ebasco, 1989), the April 1990 ecological risk assessment (Ebasco, 1990a), the August 1990 feasibility study (Ebasco, 1990c), the September 1990 PCB modeling report (Battelle, 1990), and the baseline long term ecological monitoring report (Nelson et al., 1996), among others. These references, as well as others included in the Site administrative record, should be reviewed for a more comprehensive description of Site characteristics.

The following discussion briefly summarizes the major findings of EPA's investigations to date, outlined by environmental media.

A. Sediment

PCBs

The estimated vertical and horizontal distributions of PCBs within the upper harbor sediments are presented in Figures 3, 4 and 5, using sediment layers of 0-12 inches, 12-24 inches and 24-36 inches beneath the sediment surface, respectively. These figures demonstrate the widespread extent of PCB contamination at the Site. With the exception of areas where PCBs were discharged directly into the upper harbor by manufacturing facilities or CSOs, however, these figures show that PCB concentrations decrease dramatically with depth. Note that extreme levels of PCBs (greater than 4,000 ppm) are known to have extended down to the 24-36 inch depth near the Aerovox plant. This finding is consistent with the hot spot dredging experience which required multiple passes of the dredge in this particular area to achieve the hot spot target cleanup level.

The wide areal extent of contaminated sediments in the upper harbor results in a net movement or flux of PCBs seaward, even though the upper harbor is a depositional area wherein sediments tend to settle out and accumulate (Teeter, 1988). Average measured values of this PCB flux from the upper harbor range from 1.23 kg per tidal cycle (kg/tc), based on individual daily measurements in the mid 1980s (Teeter, 1988), to 0.11 kg/tc averaged over the 16 month duration of the hot spot dredging in 1994 and 1995 (USEPA, 1997c).

Moving to the lower harbor, Figure 6 displays sediment PCB concentrations in the first six inches of sediment in this area. By contrast, these data demonstrate the steeply declining gradients in sediment PCB levels moving north to south within the Site. In the lower harbor, the only area exceeding 100 ppm PCBs is in the area adjacent to an old New Bedford railyard, where PCB shipments are known to have been transported. Three CSOs also discharge to this area. As explained above in section II, the main sewer interceptor for this part of the City, which extended up to the Aerovox facility, was once highly contaminated with PCBs. This interceptor was sealed off by the City and a new one installed as part of a state-mandated hazardous waste cleanup.

Other Contaminants

As an urbanized watershed, the harbor sediments are contaminated with a variety of other pollutants, notably heavy metals, as well as PCBs. Figures 7, 8, 9, and 10 illustrate the levels of Cd, Cr, Cu and Pb, respectively, in the top foot of sediments within the harbor. For information on metals levels at greater depths, see section 2.2 of the August 1990 feasibility study (Ebasco, 1990c). As with PCBs, these figures show the effect that specific discharge areas such as industrial outfalls, commercial areas and CSOs have in increasing sediment metal levels in localized areas. Metal levels also follow a decreasing north to south gradient, although the magnitude of the decline is lower than with PCBs (metals undergo a 100-fold drop; PCBs a 10,000-fold drop). The baseline long term ecological monitoring report (Nelson et al., 1996) illustrates that metals and PCBs are generally co-located. This is an important characteristic in terms of the overall environmental benefit of the selected remedy, since much of the metals-contaminated sediment will be dredged along with the PCB-contaminated sediment.

Various polyaromatic hydrocarbons (PAHs) are also found in New Bedford Harbor sediments at concentrations ranging from below detection to 930 ppm, with an average concentration of approximately 70 ppm (Ebasco, 1990c). Pruell et al. (1990) reported PAH levels ranging from 18 to 170 ppm (dry weight) in 13 stations within the upper and lower harbor, and noted that these levels were similar in magnitude to those in other northeastern urban estuaries including Black Rock Harbor (CT), Narragansett Bay (RI) and Quincy Bay (MA). Pruell et al. (1990) also reported concentrations of polychlorinated dibenzo-p-dioxins (PCDDs) and polychlorinated dibenzofurans (PCDFs) for four stations in New Bedford Harbor. Total PCDD levels ranged from 1.7 to 8.1 ng/g (0.0017 to 0.0081 ppm) dry weight, and total PCDF levels ranged from 0.14 to 9.0 ng/g dry weight.

B. Surface Water

Surface water quality within the Site reflects the impacts of local land use and the levels of underlying sediment contamination. The main, non-bacterial contaminants of concern in surface water are PCBs and copper. Annual average levels of these pollutants at the Coggeshall Street bridge, as measured in 1994 and 1995 during the hot spot dredging operations, exceed EPA chronic ambient water quality standards by factors of 10 and 2, respectively (Figures 11 and 12). Figure 13 displays water column PCB levels throughout the Site as measured in 1986 and 1987: Concentrations followed the same decreasing north-to-south gradient as in sediments, and ranged from 7.6 ug/l in the hot spot area to 0.005 ug/l near the southern Site boundary. For the outer harbor area, the only two samples of this data set to exceed EPA's 0.03 ug/l chronic AWQC were at the two stations (11 and 12) offshore from the CDE facility where underlying sediments exceed 50 ppm PCBs.

The water column data reflect the movement of PCBs from the sediment into the water column. Higher water column concentrations are found in locations with higher underlying sediment concentrations. As described in Battelle (1991), EPA's conceptual model of PCB migration at the Site involves migration of PCBs from the highly contaminated bottom sediments into the overlying water column as a result of a) desorption from fine-grained sediment particles and upward diffusion in sediment pore water, b) erosion and resuspension by boundary layer (sea floor) currents and c) sediment turbation or mixing by benthic organisms. Dissolved PCBs in the water column can then readsorb to "clean" fine grained suspended particles imported from Buzzards Bay and upland sources, or volatilize to the atmosphere. The ultimate fate of the readsorbed PCBs depends on subsequent tidal movement, diffusion or deposition of the newly contaminated particles within or beyond the harbor boundary. A dye-study performed in the mid 1980s showed that it took two days for the die to travel from the Aerovox facility to the hurricane barrier, under the weather and tidal conditions present during the study.

C. Biota

PCBs can bioaccumulate within tissues - especially fatty tissues - of marine organisms. Bioaccumulation occurs as organisms come in contact with contaminated sediment or sediment pore water, through ingestion of contaminated prey or sediment, or as the result of filtering contaminated surface water. PCBs can also be biomagnified (increased in concentration) as they are transferred through higher trophic levels of the food chain. This buildup of PCBs within marine - or avian - organisms can have adverse effects on the overall health of the ecosystem as well as on human consumers of PCB-contaminated seafood. Since Site seafood continues to contain elevated levels of PCBs, the MA DPH's fishing restrictions (Figure 2), originally promulgated through state regulations in 1979, remain in effect.

It is important to note that two different regulatory approaches exist regarding regulation of PCB-contaminated seafood. The MA DPH fishing restrictions rely on the U.S Food and Drug Administration's (FDA's) tolerance level of 2 ppm PCBs (wet weight), a standard which is based on national patterns of seafood consumption and which was developed based on assumptions that a) not all of an exposed person's diet is from the same source of contaminated food and b) not all of the contaminated food contains concentrations at the tolerance level (Ebasco, 1989). Consistent with CERCLA and the NCP, however, the selected remedy for the site (see section X) uses a health-based seafood criteria of 0.02 ppm PCBs based on local patterns of seafood consumption which involve more frequent consumption of local PCB-contaminated seafood than that used by the FDA standard. As discussed further in section X, should seafood tissue levels reach the FDA level and should the Commonwealth then lift their fishing restrictions (since these restrictions were originally implemented due to exceedences of the FDA level), EPA will continue to educate and inform local consumers to minimize their consumption of local seafood to safe levels.

Two long-running data sets exist as examples of seafood PCB contamination at the Site over time; one for mussels deployed in the upper and lower harbor (as well as a reference station near West Island) and one for native lobsters from MA DPH fishing closure Area 3. The mussel data, displayed in Figures 14, 15, and 16 shows the same decreasing PCB gradients moving north to south as with the sediment and surface water data, with mussels becoming contaminated above 2 ppm (2,000 ng/g) at both the Coggeshall Street and hurricane barrier locations within 28 days. Note that the only two statistically significant changes to these mussel PCB data sets has been a decrease in the reference area (West Island) samples during the hot spot remediation, and an increase in the hurricane barrier samples during the post-hot spot remediation period (through June 1997) (USEPA, 1997c).

The Area 3 lobster data, displayed in Figure 17, shows generally decreasing levels of PCB concentrations in edible tissue (including tomalley) over time with mean PCB concentrations leveling off below the 2 ppm FDA level since 1992. In addition, Table 1 lists PCB analyses of lobster, winter flounder and clams taken throughout the Site in 1987: this table shows decreasing PCB levels in edible tissue moving north to south from fishing closure Area 1 to Area 3. Note that, in contrast to the Figure 17 data, the Table 1 lobster data does not include tomally, a greenish-gray organ known to many as an edible delicacy and which more readily bioaccumulates PCBs compared to lobster muscle.

In addition to seafood contamination and as described further in section VII.B (as well as in Attachment A, the responsiveness summary), the Site poses risks to the overall health of marine organisms, especially in the upper harbor, due to excessive levels of PCBs in the sediments and water column. As discussed above, the concentration of PCBs in the water column at the Coggeshall Street Bridge regularly exceeds the EPA AWQC of 0.03 ug/l by a full order of magnitude (i.e., ten-fold). Surface water concentrations further north near the hot spot areas are typically even higher. As discussed below, sediment PCB levels in some Site locations exceed levels considered to be protective of marine organisms by up to three orders of magnitude (1,000-fold).

D. Air

For background areas away from PCB source areas, investigations have generally found ambient airborne PCB levels to be in the 10-15 ng/m^3 (nanograms per cubic meter) range (GCA, 1984; NUS, 1986). GCA (1984) noted that this level was consistent with values typically noted in other North American urban centers. The 1989 baseline human health assessment for the Site (Ebasco, 1989) concluded that these typical background airborne PCB levels did not result in significant risks to human health. For areas near the Aerovox facility and at other locations along the harbor shoreline, however, airborne PCB levels have historically been significantly higher than this. GCA (1984) reported levels in the 50-100 ng/m^3 range at locations near Aerovox and Marsh Island, while NUS (1986) reported levels between 196 and 471 ng/m^3 at low tide near the Aerovox facility. NUS (1986) also noted that measured airborne PCB levels were typically higher at low tide than at high tide, due to exposed PCB-contaminated mud flats contributing to the elevated readings.

As summarized in USEPA (1997c), the seven "dredge area" locations monitored extensively during the hot spot dredging operations averaged between 10 and 174 ng/m^3 (the number of sampling episodes was greater than 300 for each location). Not including the two locations within this data set most impacted by the dredging operations or PCB source areas (i.e., stations 11 and 13/13D), the long term averages ranged from 10 to 29 ng/m^3 per station. The large data set gathered during the hot spot operations also pointed to the hot spot CDF as having typically higher ambient PCB levels immediately around the CDF compared to the dredge area locations (USEPA, 1997c).

EPA believes that because of the inter-media transfer and transport of PCBs described above, sediments with concentrated levels of PCBs in the upper, lower and outer harbor areas will continue to act as a source of contamination to the water column, to other sediments, to the air and to biota throughout the Site until these sediments are remediated.

VI. Summary of Site Risks

A. Risks to Human Health

A baseline public health risk assessment was performed to estimate the probability and magnitude of potential adverse health effects, both carcinogenic and non-carcinogenic, from exposure to Site contaminants (Ebasco, 1989). In addition to PCBs, this evaluation also identified cadmium, copper and lead as contaminants that could potentially contribute to significant adverse health effects. The assessment was based on contaminant levels as they existed at the time, with the belief that decreases in sediment and biota PCB concentrations would not change significantly over the next ten year period. The likelihood of adverse human health effects associated with exposure to the contaminants of concern were estimated quantitatively or qualitatively through the development of several hypothetical exposure pathways. These pathways were developed to reflect the potential for exposure to hazardous substances based on the present uses, potential future uses, and location of the Site. The exposure pathways found to be of most concern were:

- ingestion of contaminated seafood

- direct contact with contaminated shoreline sediments, and

- (for children ages 1-5) incidental ingestion of contaminated shoreline sediment.

Exposure to PCBs and metals while swimming was not found to result in significant human health risk. Note, however, that consideration of adverse health effects from exposure to the raw sewage in CSO discharges was beyond the scope of this risk assessment. The assessment also concluded that inhalation of airborne PCBs near the Site area is unlikely to result in significant health risk.

Excess lifetime cancer risks were determined for each exposure pathway by multiplying the exposure level with the chemical specific cancer potency factor. These factors have been developed by EPA from epidemiological or animal studies to reflect a conservative "upper bound" of the risk posed by potentially carcinogenic compounds. That is, the true risk is unlikely to be greater than the risk predicted. The resulting risk estimates are expressed in scientific notation as a probability (e.g., $1x10^{-6}$ for a one in a million probability) and indicate - using this example - that an average individual is not likely to have greater than a one in a million chance of developing cancer over 70 years as a result of site-related exposure to the compound at the stated concentration.

Current EPA practice considers carcinogenic risks to be additive when assessing exposure to a mixture of hazardous substances. For each of the three exposure pathways listed above, both probable and conservative exposure scenarios were evaluated for carcinogenic risk. When the excess lifetime cancer risk estimate is below $1\text{x}10^{-6}$ (e.g., $1\text{x}10^{-7}$), EPA generally considers the potential human health risks to be below levels of concern. Remedial action is generally warranted where site related cancer risks exceed $1\text{x}10^{-4}$ (e.g., $1\text{x}10^{-3}$). At risk levels between 10^{-6} and 10^{-4} cleanup may or may not be selected, depending on individual site conditions and ecological concerns.

A hazard index was also calculated for each pathway as EPA's measure of the potential for non-carcinogenic health effects. First, a hazard quotient is calculated by dividing the exposure level by the reference dose (RfD) or other suitable benchmark for non-carcinogenic health effects for an individual compound. Reference doses have been developed by EPA to protect sensitive individuals over the course of a lifetime and they reflect a daily exposure level that is likely to be without an appreciable risk of an adverse health effect. RfDs are derived from epidemiological or animal studies and incorporate uncertainty factors to help ensure that adverse health effects will not occur. The hazard quotient is often expressed as a single value (e.g., 2.0) indicating the ratio of the stated exposure as compared to the reference dose value (in this example, the exposure as characterized is two times that of an acceptable exposure for the given compound). The hazard quotient is only considered additive for compounds that have the same or similar toxic endpoints and the sum is referred to as the hazard index (HI). For example, the hazard quotient for a compound known to produce liver damage should not be added to a second whose toxic endpoint is kidney damage. As with potential carcinogenic exposures, both probable and conservative exposure scenarios were developed to evaluate non-carcinogenic risks.

Tables 2 through 7 present a summary of cancer and non-cancer risks for those chemicals and exposure pathways which trigger a need for cleanup, as taken from Ebasco (1989). These tables are organized by Fishing Closure Area (see Figure 2) and type of exposure scenario; that is, Tables 2, 3 and 4 summarize health risks based on probable exposures in Areas I, II and III, respectively, and Tables 5, 6 and 7 summarize health risks based on conservative exposures in Areas I, II and III, respectively. For Areas I and II (tables 2, 3, 5 and 6), these tables list the estimated risks for seafood consumption, dermal contact and incidental ingestion of sediment. For Area III (tables 4 and 7), only seafood consumption risks are tabulated since dermal contact and incidental ingestion risks in this area were found to be insignificant.

For both probable and conservative exposure scenarios, Tables 2, 3, 5 and 6 show that the risks (both carcinogenic and non-carcinogenic) from consumption of local seafood were the greatest of the exposure pathways evaluated. For the probable exposure scenarios, consumption of local seafood resulted in total lifetime cancer risks of $4\text{x}10^{-3}$, $1.8\text{x}10^{-3}$ and $1.0\text{x}10^{-3}$ in Areas I, II and III, respectively; non-cancer organ-specific hazard indices exceeded 1.0 (and ranged as high as 25) in all three Areas. In comparison, again using probable exposures, dermal contact and incidental ingestion of sediment resulted in total lifetime cancer risks of $3.5\text{x}10^{-4}$ and $1.3\text{x}10^{-5}$ in Areas I and II, respectively; organ- specific hazard indices significantly exceeded 1.0 in Area I only. PCBs and lead were the compounds found to contribute significantly to the risk estimates. Tables 2 through 7 should be reviewed for a more complete summary of the 1989 risk assessment results.

For a more detailed account of the baseline human health risk assessment, the reader is encouraged to review that report (Ebasco, 1989) directly, especially its executive summary, as well as section 3.1 of the 1990 Feasibility Study (Ebasco, 1990c). Both documents have been included in the Administrative Record to facilitate review.

In the years since the 1989 baseline human health risk assessment was performed, new risk assessment protocols and new potency factors for PCBs have evolved. These developments generally serve to decrease the estimates of carcinogenic (but not non-carcinogenic) risks to human health from the Site as presented above. EPA nevertheless believes that ingestion of contaminated seafood and exposure to shoreline sediments in several areas still present an imminent and substantial endangerment to public health. For example, EPA's updated assessment of risks from consumption of contaminated seafood agrees with the conclusion originally made in the 1990 feasibility study - that is, 0.02 ppm PCBs in seafood is still an appropriate health-based target level for local residents (USEPA, 1997b). Site seafood continues to be contaminated at levels that are orders of magnitude above this standard (Nelson et al., 1996; MA DMF, 1996; USEPA, 1997c; Rusek, 1989). Similarly, existing shoreline PCB levels are significantly higher than those levels deemed protective in EPA's updated assessment of health risks due to exposure to PCB-contaminated intertidal sediments (USEPA, 1988). (These updated intertidal PCB cleanup levels are discussed further in section XIII, but to summarize, the PCB level deemed protective of beach combing is 25 ppm and the level deemed protective of young children whose residences abut the harbor is 1 ppm.) Also, as discussed further in sections VI.B and VII below, ecological concerns serve to drive the degree of cleanup as much if not more than that required for the protection of human health.

B. Risks to the Marine Ecosystem

The ecological risks presented by the Site are best summarized in three studies, among others - the 1990 Baseline Ecological Risk Assessment (Ebasco, 1990a), the 1990 feasibility study (Ebasco,1990c) and the currently on-going long term ecological monitoring program (see Nelson et al., 1996). These three investigations, as discussed more below, reached similar conclusions regarding the state of New Bedford Harbor, and in particular the upper harbor, as an area under high ecological stress.

The 1990 ecological risk assessment evaluated risk to aquatic biota using a joint probability analysis in which two probability distributions - one representing PCB, cadmium, copper and lead levels in various areas of the harbor and the second representing the ecotoxicity of these contaminants to marine biota - were combined to provide a comprehensive, probabilistic evaluation of risk. This joint probability analysis was supplemented by comparison of PCB levels in the harbor water column to AWQC, evaluation of site-specific toxicity tests, and examination of the benthic community structure in the harbor. The 1990 ecological risk assessment found that these various approaches, both together and independently, supported the conclusion that aquatic organisms are at significant risk due to exposure to PCBs in New Bedford Harbor. Some risk due to exposure to metals was also identified, but, consistent with Ho et al.'s (1996) later findings (see Appendix A, p.A-34) ecological risk from metals was found to be negligible compared to the risk from PCB exposure. The biggest concern regarding metals was believed to be the elevated copper levels in the water column, with crustaceans determined to be the taxon most likely at risk.

The 1990 ecological risk assessment also found that PCB concentrations in sediment and sediment pore water (the water in the small spaces between sediment particles) in many areas of the harbor were highly toxic to at least some members of all major taxonomic groups. In the upper harbor, the probability of pore water PCBs being toxic to marine fish, the most sensitive taxonomic group investigated, was found to approach certainty. Fish in the outer harbor were also found to be potentially impacted as well. Risk due to PCBs was also found to be substantial for mollusks and crustaceans, although the likelihood that chronic effects would be realized in typical crustaceans and mollusks in the southern half of the lower harbor (below the Route 6 bridge) was predicted to be less than 10%. The risk assessment noted that risks due to PCB exposure will vary depending on the migratory behavior (or lack thereof), foraging behavior and prey preferences of each specie, and that juvenile aquatic organisms using the upper harbor area as a nursery ground may be at an elevated risk given that this life stage is generally more sensitive to chemical insult than the adult stage. Overall, the study found "a high probability that PCBs are a significant contributing factor to the integrity of the harbor as an integrated functioning ecosystem." Ecosystem level disruptions were found to be less strongly indicated but nevertheless probable for fishing closure Area 2 outside the hurricane barrier (see Figure 2).

The 1990 feasibility study reviewed four other general approaches to evaluating ecological risk - equilibrium partitioning, apparent effects thresholds, screening level concentrations, and sediment quality triads. For this Site, the feasibility study found that these four approaches pointed to a 0.1 to 1.0 ppm range of sediment PCB levels that could be considered protective of marine resources. Comparison with existing sediment PCB levels (see Figures 3, 4, 5 and 6) showed large areas of the harbor above the upper bound of this estimate, with almost all of the upper harbor at least ten times higher than the 1 ppm threshold. Although the feasibility study recognized substantial uncertainty inherent in the fact that the ecologically protective PCB level was expressed as an order of magnitude range (0.1 to 1.0 ppm), the magnitude and extent to which the upper threshold of this range was exceeded was found to support the 1990 baseline risk assessment's conclusions.

In contrast to the 1990 ecological risk assessment and the 1990 feasibility study, the long term ecological monitoring program is intended to continue for roughly 30 years in order to quantitatively assess the effectiveness of EPA's cleanup activities over time. Full scale sampling of this program, which includes physical, chemical and biological measurements of the ecological health of the top 2-7 cm of sediment, will occur before and after major remedial activities or on a 3 to 5 year time frame when cleanup activities are concluded. Two sampling rounds of this program have been implemented; a baseline survey in fall 1993 and a survey taken immediately after the hot spot dredging in fall 1995. Example displays of three of the long term monitoring program indicators (dominant benthic invertebrates, benthic species richness, and sediment toxicity) are presented in Figures 18, 19 and 20, respectively, showing both the 1993 and 1995 results for the upper, lower and outer harbor areas. For those unfamiliar with these indicators: Dominant invertebrates are defined as those species that collectively account for 75% of the total abundance at each benthic community (abundance is the total number of each animal of every specie); species richness is a simple count of the total number of different benthic species present per station; and sediment toxicity is a measure of the lethality of the sediments to a test specie, in this case the amphipod *Ampelisca abdita*, under controlled laboratory conditions (sediments in which less than 80% of the test animals survive are generally considered toxic). For a more detailed description of these indicator parameters, see Nelson et al. (1996).

The baseline survey, while not differentiating between causitive agents (e.g., metals versus PCBs), found a highly stressed harbor ecosystem based on a number of different ecological indicators, with general gradients of decreasing stress from north to south (Nelson et al., 1996). The 1995 survey showed similar patterns of ecological injury, with increased contaminant concentrations and acute sediment toxicity levels primarily in the upper harbor compared to the 1993 baseline survey (Nelson et al., 1997). Species richness was on average the same for the upper harbor during the two surveys with a mean value of 16 benthic species per station (compared to average values of 20 and 41 species per station for the lower and outer harbors, respectively).

In conclusion, as summarized above in sections VI.A and VI.B and as elaborated in more detail in the Administrative Record, EPA has concluded that releases of PCBs at this Site present an imminent and substantial endangerment to public health, welfare and the environment.

VII. <u>Development and Screening of Alternatives</u>

A. Statutory Requirements and Remedial Action Objectives

Under its legal authorities, EPA's primary responsibility at Superfund sites is to undertake remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences, including: a) a requirement that EPA's remedial action, when complete, must comply with all federal and more stringent state environmental standards, requirements, criteria or limitations, unless a waiver is invoked; b) a requirement that EPA select a remedial action that is cost-effective and that utilizes permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and c) a preference for remedies in which treatment permanently and significantly reduces the volume, toxicity or mobility of the hazardous substances is a principal element over remedies not involving such treatment. For this operable unit, response alternatives were developed to be consistent with these Congressional mandates.

To assist in the development and screening of alternatives, and based on the contaminants at the Site, the environmental media of concern, and potential exposure pathways, remedial action objectives were developed to mitigate existing and potential future threats to public health and the environment. These remedial action objectives can be summarized as:

1. To reduce risks to human health by reducing PCB concentrations in seafood, by lowering PCB concentrations in sediment and in the water column;

2. To ensure that contact with shoreline sediments does not present excessive risks to human health as a result of dermal contact with or accidental ingestion of PCB-contaminated sediment in areas prone to beach combing or in areas where residences abut the Harbor; and

3. To improve the quality of the seriously degraded marine ecosystem by

   a) reducing marine organisms' exposure to PCB contaminated sediment while minimizing consequent harm to the environment, and

   b) reducing surface water PCB concentrations to comply with chronic AWQC by reducing PCB sediment concentrations.

B. Alternative and Technology Development and Screening

CERCLA and the NCP set forth the process by which remedial actions are evaluated and selected. In accordance with these requirements and the remedial action objectives listed above, a range of cleanup alternatives was developed for the upper and lower harbor. An important part of this process was the evaluation of target cleanup levels (TCLs). Because sediments in New Bedford Harbor are the major source of PCB and metals contamination in all media (e.g., water, biota, air), the focus of the TCL evaluation was on sediments.

Although the ecological risk assessment pointed to a 1 ppm sediment PCB threshold for protection of marine organisms (see section VI.B), achieving this TCL was believed to cause more harm than good due to the radical alterations to the harbor and adverse environmental impacts that would result given the widespread nature of the PCB contamination. Remediation to this 1 ppm level would entail the removal or capping of huge amounts of contaminated sediment (approximately 1,000 acres and 2.1 million cubic yards of sediment). Of particular concern was the destruction of valuable saltmarsh habitat that would result. Thus sediment TCLs of 10, 50 and 500 ppm PCBs (as well as a no-action alternative) were used to establish more realistic and less damaging categories of cleanup alternatives.

In addition, Chapter 5 of the 1990 Feasibility Study identified, assessed and screened remedial approaches and technologies for the upper and lower harbor based on effectiveness, implementability and cost. These included methods to a) remove contaminated sediment from the harbor, b) treat these removed sediments as well as water drained from these sediments to destroy or immobilize contaminants, c) dispose of the removed sediments without such treatment, and d) contain or treat contaminated sediments in place without removing them from the sea floor. The purpose of the initial screening was to narrow the number of remedial approaches and technologies carried forward for detailed analysis, while preserving a broad range of remedial approaches. Of the 104 remedial technologies screened in Chapter 5, 38 were retained for detailed analysis. Table 5-1 in the 1990 FS identifies these 104 technologies, and Figure 5-2 of the FS identifies the 38 technologies that were retained for detailed analysis within the generalized outline of the different remedial approaches available.

Using a 10 ppm TCL, Chapter 6 of the 1990 FS combined these 38 technologies with the overall response objectives to develop complete remedial alternatives for the upper and lower harbor. Chapter 7 of the FS then presents a detailed analysis of these alternatives (six for the upper harbor and six for the lower harbor), with the idea that any upper harbor alternative could be combined with any lower harbor alternative.

Using a 50 ppm TCL, Volume III of the 1990 FS developed three additional "site-wide" alternatives covering both the upper and the lower harbors. Volume III used remedial strategies which either left sediments in place for capping or removed them for containment or treatment. These alternatives were developed in order to supplement those using a 10 ppm TCL given the serious challenges and adverse impacts posed by a site-wide 10 ppm TCL: Approximately 400 acres would be affected involving roughly 926,000 cy of sediment at a cost of about $146-148 million.

Since computer modeling of the Site showed little benefit between the 500 ppm TCL and the hot spot remedy (Battelle, 1990, 1991), the 500 ppm TCL was not used to define specific cleanup alternatives. However, the 500 ppm PCB threshold was used to delineate areas within the 50 ppm TCL that would be handled differently within Alternatives #7 and #9 (see Section VIII below).

VIII. Description of Remedial Alternatives

This section summarizes each remedial alternative that was evaluated in detail during the feasibility study and remedy selection process. The range of alternatives includes a minimal no-action alternative, alternatives that do not remove the contaminated sediment from the harbor, and alternatives that do remove the contaminated sediments from the harbor - both with and without treatment prior to final disposal. As described above, TCLs of 10 and 50 ppm PCBs were used to define the extent of sediment requiring cleanup. As explained in the November 1996 Proposed Cleanup Plan (at page 8), costs associated with each alternative have been updated since initially estimated in the 1990 FS.

A. Non-Removal Options

Alternative 1: Minimal Action (EST-1/LHB-1)

- No dredging, treatment or capping of contaminated sediments would take place;

- Institutional controls (e.g., limits on shoreline use, fishing bans, warning signs, fencing etc.) would be used to limit potential exposure to site contaminants;

- Environmental monitoring and site reviews would take place to track site conditions over time;

- Development of this alternative is a standard practice and is used as a baseline for comparison with other remedial alternatives under consideration;

- Estimated net present worth cost: $9,510,000

Alternative 2: Capping (with some dredging of contaminated shipping channels) (EST-2/LHB-2)

- Sediments in both the upper and lower harbor with greater than 10 ppm PCBs (except for such sediments which exist within shipping channels) would be capped in place with three to five feet of clean sand. A geotextile would first be placed above the contaminated sediments prior to the addition of the cap material;

- Approximately 187 acres in the upper harbor and 170 acres in the lower harbor would be capped;

- Institutional controls would be required to minimize long term cap disturbance, especially in shallow and shoreline areas;

- Sediments with greater than 10 ppm PCBs within shipping channels would be dredged and disposed in CDFs B and C; water drained from these sediments would be treated prior to discharge to the Harbor;

- A long term monitoring and maintenance program would be implemented to ensure the integrity of the cap;

- Estimated net present worth cost: $147,600,000

B. Removal Options Using a 10 ppm PCB Action Level

Alternative 3 & 3d: Dredge, Dewater and Dispose On-site (EST-3/LHB-3 & EST-3d/LHB-3d)

- Sediments in both the upper and lower harbor with greater than 10 ppm PCBs would be dredged and disposed of in CDFs A - D, as well as in an additional large island CDF north of Popes Island. For alternative 3d, which includes a mechanical dewatering step that alternative 3 does not, a smaller additional CDF would be needed rather than the large island CDF (there are no Alternatives 3a, 3b or 3c - the "d" simply stands for dewatering);

- Discounting the contaminated sediments underlying the CDFs which EPA believes would not need to be dredged (since the CDFs would contain these sediments without the need for dredging), approximately 769,000 cy (for Alternative 3) or 744,000 cy (for Alternative 3d) would be dredged;

- Water drained from the sediments once in the CDFs would be treated to remove contaminants prior to discharge back to the harbor;

- The dredged sediments could be mechanically dewatered prior to final disposal to reduce the volume of disposal facilities required (again, this dewatering step is the characteristic which distinguishes Alternative 3 from 3d);

- After a three to five year period of initial settling, the CDFs would be capped with an impermeable cover system;

- A long-term CDF monitoring and maintenance program would be implemented to ensure the integrity of the CDFs over time;

- Institutional controls (e.g., fishing bans, no fishing signs, educational efforts) would be implemented

- Estimated net present worth cost: Alternative 3 - $145,900,000
  Alternative 3d - $184,500,000

Note: Parts of this alternative (i.e., the 10 ppm action level for the upper harbor, and CDF disposal in general) are incorporated into EPA's selected remedy.

Alternative 4: Dredging, Solidification, and On-Site Disposal (EST-4/LHB-4)

- Similar to Alternative 3, but treatment of the dredged sediments would take place using solidification (or cement-like) agents;

- The total volume of dredged sediments would increase due to the addition of the solidification reagents;

- New information from the 1996 hot spot treatability studies indicates that solidification might not be effective in minimizing PCB leakage, especially for higher concentrations of PCBs in sediment;

- Estimated net present worth cost: $305,700,000

Alternative 5: Dredging, Solvent Extraction, and On-Site Disposal (EST-5/LHB-5)

- Also similar to Alternative 3, but would include treatment of the dredged sediments using solvent extraction technology to remove PCB molecules;

- The extracted PCB mixture would be treated on-site to destroy the PCBs;

- If testing of the treated sediments determined that leaching of residual metals was excessive, the sediments would be solidified prior to disposal in onsite CDFs to immobilize the metals;

- Estimated net present worth cost: $533,400,000

Alternative 6: Dredging, Incineration and On-Site Disposal (EST-6/LHB-6)

- Also similar to Alternative 3, but would include treatment of the dredged sediments using on-site incineration to destroy the PCB molecules;

- As with alternative 5, if testing of the treated sediments determined that leaching of residual metals was excessive, the sediments would be solidified prior to disposal in onsite CDFs to immobilize the metals;

- Estimated net present worth cost: $575,900,000

C. Removal Options Using Other PCB Action Levels

Alternative 7: Capping (for areas between 50-500 ppm PCBs) and CDF Disposal (for areas with greater than 500 ppm PCBs) in the Upper Harbor; Minimal Action in the Lower Harbor (SW-7)

- Sediments in the upper harbor with 50-500 ppm PCBs would be capped with approximately three feet of sand;

- Sediments in the upper harbor greater than 500 ppm PCBs (approximately 112,000 cy) would be dredged and disposed of in CDFs A and B;

- Sediments in the lower harbor would be left in place untouched, and institutional controls and long-term monitoring would be implemented;

- As with the other CDF-based remedies, water drained from the sediments would be treated prior to discharge back to the harbor, the CDFs would in time be capped, and a long term monitoring and maintenance program would be implemented;

- Estimated net present worth cost: $81,700,000

Alternative 8: Site Wide Dredging at 50 ppm PCBs with CDF Disposal (SW-8)

- Sediments with greater than 50 ppm PCBs in both the upper and lower harbor (including two areas just south of the hurricane barrier) would be dredged and disposed of in CDF D;

- Approximately 360,000 cy of contaminated sediment would be dredged;

- As with the other CDF-based remedies, water drained from the sediments would be treated prior to discharge back to the Harbor, the CDF would in time be capped, and institutional controls and a long term monitoring and maintenance program would be implemented;

- Estimated net present worth cost: $85,400,000

<u>Note: As with Alternative 3, parts of this alternative (i.e., the 50 ppm action level for the lower harbor, and CDF disposal in general) are incorporated into EPA's selected remedy.</u>

Alternative 9: Dredging and CDF Disposal (for areas with 50-500 ppm PCBs), and Treatment (for areas with greater than 500 ppm PCBs) (SW-9)

- Sediments with between 50 to 500 ppm PCBs would be dredged and placed in CDFs, while sediments with greater than 500 ppm PCBs - which occur only in the upper harbor - would be dredged and treated on site. Both incineration and solvent extraction were deemed viable in the Feasibility Study (Ebasco, 1990), but the estimated cost listed below assumes solvent extraction would be used;

- An estimated 46 acres or 112,000 cy of sediment above 500 ppm PCBs would be treated;

- CDF D would be used for disposal of both the treated and untreated sediments;

- As with the other CDF-based remedies, water drained from the sediments would be treated prior to discharge back to the Harbor, the CDF would in time be capped, and institutional controls and a long term monitoring and maintenance program would be implemented;

- If testing of the treated sediments determined that leaching of residual metals was excessive, the sediments would be solidified prior to disposal to immobilize the metals;

- Estimated net present worth cost: $176,100,000

IX. Summary of the Comparative Analysis of Alternatives

Section 121(b)(1) of CERCLA presents several factors that EPA is required to consider in its assessment of alternatives. Building upon these specific statutory mandates, the National Contingency Plan articulates nine evaluation criteria to be used in assessing remedial alternatives, as described below.

Threshold Criteria

In accordance with the NCP, two threshold criteria must be met in order for the alternative to be eligible for selection:

1. **Overall protection of human health and the environment** addresses whether or not a remedy provides adequate protection, and describes how risks posed through each exposure pathway are eliminated, reduced or controlled through treatment, engineering controls or institutional controls.

2. **Compliance with applicable or relevant and appropriate requirements (ARARs)** addresses whether or not a remedy will meet all of the ARARs of state and federal environmental laws, and if not, provides the grounds for invoking a CERCLA waiver(s) for those requirements.

Primary Balancing Criteria

The following five criteria are used to compare and evaluate those alternatives which fulfill the two threshold criteria.

3. **Long-term effectiveness and permanence** assesses alternatives for the long-term effectiveness and permanence they afford, along with the degree of certainty that they will be successful.

4. **Reduction of toxicity, mobility or volume through treatment** addresses the degree to which alternatives employ recycling or treatment to reduce toxicity, mobility or volume, and how treatment is used to address the principle threats posed by the site.

5. **Short term effectiveness** addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation of the alternative until cleanup goals are achieved.

6. **Implementability** addresses the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement a particular option.

7. **Cost** includes estimated capital as well as operation and maintenance costs, on a net present-worth basis.

Modifying Criteria

The two modifying criteria discussed below are used in the final evaluation of remedial alternatives generally after EPA has received public comment on the RI/FS and Proposed Plan.

8. **State acceptance** addresses the State's position and key concerns related to the preferred alternative and other alternatives, and the State's comments on ARARs or the proposed use of waivers.

9. **Community acceptance** addresses the public's general response to the alternatives described in the remedial investigation, feasibility study and Proposed Plan.

Following the detailed analysis of each individual alternative in the 1990 feasibility study, a comparative analysis, focusing on the relative performance of each alternative against the nine criteria, was conducted. A summary of this comparative analysis can be found in Table ES-1 of Volume I and Table 3-1 of Volume III of the 1990 feasibility study. In addition, Chapter 8 of Volume II and Chapter 3 of Volume III of the 1990 feasibility study discuss how each alternative compares to the seven threshold and primary balancing criteria. Note, however, that due to the elapsed time spent working with the Community Forum on both hot spot and upper and lower harbor issues, the cost estimates as listed in the 1990 feasibility study were revised in 1996 to support the

1996 Proposed Plan. The total present worth costs presented for each alternative in section VIII above are based on this 1996 effort to update the estimated costs.

When comparing the alternatives against one another using the nine criteria, there are some generalities worth mentioning. The level of protection varies with the choice of sediment cleanup levels, either through dredging or capping. Adding treatment heightens the alternative's protectiveness by actually destroying or immobilizing PCBs and metals in the sediment. In addition, due to updated practices regarding the assessment of risks due to dermal contact with PCB-contaminated shoreline sediments, additional sampling and cleanup in targeted areas (above and beyond the areas specified for cleanup in each alternative) will be necessary to ensure that beach combers and children living in residences abutting the shoreline are not at risk (USEPA, 1998).

Also common to all alternatives are two ARAR waivers: The FDA's 2 ppm PCB standard for seafood (21 U.S.C. §§ 342, 346) and the Clean Water Act's National Pollutant Discharge Elimination System (NPDES) regulation which could be interpreted to prohibit new discharges into degraded waterbodies unless certain conditions are met (40 CFR 122.4(i)). See Page 14 of the November 1996 Proposed Plan for more details about these waivers. All other ARARs will be met as explained in section XII.B below.

With regard to short-term impacts, all alternatives except #1 immediately reduce site risks by removing or isolating PCB source material: The extent of the reduction depends on the TCL, with quicker recovery expected from alternatives using a 10 ppm TCL. The capping alternative (#2) and those consisting solely of dredging or a combination of both (#3,# 7, #8 and the selected remedy) have less short-term impact on workers and the community compared to those alternatives with a treatment component (#4, #5, #6 and #9), since these latter alternatives require additional sediment handling and increased possibility of direct contact and contaminated air emissions. On the other hand, those alternatives which include treatment generally offer greater reductions in toxicity, mobility and volume unless otherwise noted below, although capping and dredging alternatives do prevent physical contact and reduce the potential for movement of PCBs and metals through containment.

Even with an immediate reduction of risk, however, all alternatives leave some common and some unique residual long-term risks. The significance of these risks vary with the amount and levels of contaminated sediment unremediated below the TCL. These residual risks would be addressed in each alternative through institutional controls. For all alternatives, risks from consuming contaminated seafood would be addressed through continued fishing bans and educational programs.

Finally, implementation of all of these alternatives except #1 would cause some limited impact on shipping and other water-related activities during dredging or capping operations and would require close coordination with all relevant parties. Alternatives 3 through 9 and the selected remedy experience the administrative difficulty of resolving land use issues regarding locating and constructing CDFs, water treatment and/or dewatering facilities in this highly developed area.

The discussion below compares and contrasts each alternative to the nine evaluation criteria, with particular attention paid to the issues and concerns that led to the selection of the final remedy.

Alternative 1 (Minimal Action): This alternative failed to meet the two threshold criteria since it protects neither human health or the environment and does not meet ARARS. Sediment PCB levels would remain at least an order of magnitude higher than that deemed acceptable for beach combing or for the protection of children living adjacent to the Harbor, and up to three orders of magnitude higher than that deemed acceptable for a healthy marine ecosystem. Risks from consuming contaminated seafood would only be addressed through continuation of the state fishing bans and other institutional controls. In addition, this alternative would not meet AWQC or TSCA disposal requirements.

Similarly, this alternative did not compare well with the five primary balancing criteria, except that it would be relatively inexpensive, easy to implement and would not cause adverse short term environmental impacts. State and community acceptance for an option that would do nothing to directly address the remaining contaminated sediment would not be expected. Thus this alternative was not considered appropriate for the upper and lower Harbor areas and was not carried forward through the comparative analysis.

Alternative 2 (10 ppm TCL; capping with some dredging of contaminated ship channels): As with the other alternatives that use a sitewide 10 ppm TCL (i.e., alternatives #3 through #6), this alternative would be somewhat more protective of human health and the environment than the selected remedy since it uses a lower TCL in the lower harbor (10 versus 50 ppm PCBs). This alternative's TCL for the upper harbor, however, is the same as that used in the selected remedy. The 10 ppm TCL would approach if not achieve the 1 ppm threshold for full protection of benthic resources. Per EPA's updated assessment of risks from contact with shoreline sediments (USEPA, 1988), however, additional sampling and remediation will be necessary for alternatives that use a 10 ppm TCL to be protective of children who might play in sediments adjacent to shoreline homes.

Alternatives #2 - #6 and the selected remedy are all expected to achieve the 0.03 ug/l PCB AWQC within ten years of remedy completion throughout the Site (Battelle, 1990 at Figure 7.41). Likewise, achievement of the FDA tolerance level would be expected in most species within this time frame, although winter flounder PCB levels in some areas of the Harbor might be above the FDA threshold (Battelle, 1990 at Table 7.45). The site-specific safe seafood level of 0.02 ppm PCBs, however, would not be reached within ten years, and fishing limitations would need to continue.

This alternative could be fairly easily implemented, although the 1990 FS idealizes the complexities and costs associated with the many CSOs and storm drains in the areas to be capped (e.g., it assumes that all such outflows would be removed or plugged at no cost to the Superfund program). The true cost of this alternative could thus be tens if not hundreds of million dollars extra to deal with these CSOs and storm drains, if the outflow issues associated with this alternative could actually be solved at all given the elevation changes associated with capping.

Comparing this alternative to the balancing criteria, several factors make it less favorable than the selected remedy. First, the volume of contaminated sediment could increase if the clean cap material were to mix with the underlying contaminated sediment, although a synthetic geotextile would be applied between these two layers to minimize this commingling. Second, given the relatively shallow and urban nature of the Harbor (and thus the liklihood of cap disturbance), the difficulty in monitoring and repairing such a large underwater cap over time, and the fact that highly contaminated sediment would remain in place, this alternative is believed to be less permanent and protective in the long term compared to the selected remedy. Environmental impacts would be significant as well, since approximately 97 acres of new intertidal areas would be formed from former sub-tidal areas in the upper harbor as a result of cap placement (Ebasco, 1990c). By way of comparison, the selected remedy would convert approximately 44 acres of subtidal, intertidal and upland areas for use as CDFs.

State and community acceptance was considered to be less likely for this alternative since its permanence was questionable, since extensive controls on use of the harbor would be needed to protect the underwater cap and since the CSO and storm drain issues would be extremely problematic and expensive to resolve.

Alternative 3 & 3d (10 ppm TCL, dredging and CDF disposal with or without sediment dewatering): This alternative is similar to the selected remedy and #8 and #9 except that it uses a lower sitewide TCL, requiring much more dredging in the lower harbor and the need for additional disposal area volume. The selected remedy would remove 450,000 cy of sediment (as measured in place on the sea floor); this alternative would remove approximately 769,000 cy, an increase of more than 70 percent. Like alternative #2, this alternative would be more protective of human health and the environment than the selected remedy due to the lower cleanup level in the lower harbor. Concerns about the site-specific safe seafood level and the degree of protectiveness provided by this alternative against shoreline dermal contact risks would be addressed in the same fashion as in Alternative #2.

For the five balancing criteria, this alternative ranks closely to the selected remedy. However, short term impacts would be greater due to the greater volume of dredging resulting from a lower TCL. Implementability issues and time frames would also be longer and costs would be greater. The roughly 20 acre island CDF that would be required (in addition to the four selected CDFs) would result in a loss of significantly more subtidal habitat, and presents more difficult construction and maintenance challenges than shoreline CDFs due to its "offshore" location. As an obstruction in the harbor, surrounding communities may also disfavor this alternative. State acceptance might well be guarded as well due to the increased maintenance effort and the adverse impacts of the island CDF, as well as the significantly greater cost of the alternative compared to the selected remedy.

The evaluation of alternative #3d is the same as for alternative #3; the only difference between the two is that alternative #3d includes mechanical dewatering of the dredged sediments and involves a slightly less amount of dredging - 744,000 versus 769,000 cy - due to a greater amount of contaminated "footprint" sediments. Dewatering, then, a) reduces dredging and disposal volume requirements (a 134,000 cy CDF "3" would be required in place of the 435,300 cy island CDF for alternative #3); b) short term effectiveness and implementability concerns would be greater due to the added dewatering step; c) permanence would be somewhat greater (although the lower layer of sediments within the CDF would become saturated due to tidal pumping); and d) costs would be substantially higher than either alternative #3, the selected remedy, or any other dredging without treatment alternative.

Alternative 4 (10 ppm TCL, dredging and CDF disposal with solidification): The evaluation of this alternative against the nine criteria is similar to that for alternative #3, but with some significant differences due to the addition of sediment solidification. A reduction in the mobility of contaminants would be expected as a result of the solidification treatment, although recent information from the hot spot treatability studies (Foster Wheeler, 1997) indicates that solidification might not be effective at immobilizing high-concentration PCBs. The toxicity of the dredged sediments would not necessarily be decreased (the amount of PCBs would not be reduced), although the solidification agents would dilute contaminant levels within the sediment.

As with alternative #3, this alternative would require more disposal areas than the selected remedy (the island CDF north of Popes Island was also included in this alternative). The addition of the solidification step increases concerns about implementability and short term effectiveness compared to the selected remedy due to the extra materials handling and treatment activities that would be required. If solidification did prove to be successful in immobilizing PCBs, then the long-term effectiveness and permanence of the CDFs would be increased. Since the CDFs are believed to be protective even without treatment, however, this was not seen as a significant advantage, especially since solidification adds considerable expense. The cost of this alternative was approximately $160 million more than alternative #3. This amount reflects the added expense of solidification above and beyond that required for dredging and disposal using a 10 ppm PCB TCL.

Alternative 5 (10 ppm TCL, dredging and CDF disposal with solvent extraction): The evaluation of this alternative is similar to that for alternative #4, since it differs only in the type of treatment applied to the dredged sediments and in the volume of sediments needing ultimate disposal. In summary, it would be somewhat more protective of human health and the environment than the selected remedy and would reduce the toxicity, mobility and volume of the sediment contaminants, but it would have more short term issues regarding worker protection and treatment emissions, and would cost significantly more to implement than the selected remedy. Only CDFs C and D are envisioned for this alternative since the disposal volume would be significantly reduced once the water and organic fractions of the dredged sediment are removed.

Based on the updated hot spot treatability study results, the solvent extraction technology would be successful and solidification of the treated sediment would probably not be required (Foster Wheeler, 1997). Based on EPA's experience at other PCB sites in the region, however, vendors and equipment for the solvent extraction process could be limited.

Community acceptance for this alternative may be weaker than for alternative #4 since it was assumed that an on-site incinerator would be used to destroy the concentrated PCB product resulting from the PCB separation process (opposition to on-site incineration in 1993 and 1994 caused EPA to suspend that portion of the hot spot remedy). An off-site incinerator could be used instead, but at additional expense to the already high cost of $533 million for this alternative.

Alternative 6 (10 ppm TCL, dredging and CDF disposal with on-site incineration): The evaluation of this alternative is very similar to that for alternative #5; it differs only in the type of PCB destruction technology applied to the dredged sediments. As with Alternative #5, this alternative's lower cleanup level in the lower harbor would equate to greater protection for human health and the environment compared to the selected remedy. For this alternative too, it was assumed that only CDFs C and D would be required for disposal of the dewatered and treated sediment, resulting in less disposal-related impacts than the selected remedy.

Incineration is a proven technology for destroying PCBs and pilot scale tests performed on site sediments met incinerator performance standards. Full scale operation is expected to perform successfully as well. Metals treatment was not as complete and secondary treatment may be necessary. The availability of incineration equipment is believed to be better than that for solvent extraction, but the total cost of this alternative ($576 million) is more than that for solvent extraction.

Compared to the selected remedy, EPA views this alternative less favorably than alternative #3's comparison to the selected remedy, since the extra degree of long term protectiveness provided by having the sediment treated is not considered to be commensurate with the extra cost for that treatment. In addition, although a local community workgroup endorsed incineration for the hot spot remedy in 1990, given the hot spot remedial experiences in 1993 and 1994 this incineration-based alternative would not be expected to have community support.

Alternative 7 (capping for areas with 50-500 PCBs, CDF disposal for areas with >500 ppm PCBs; minimal action in the lower harbor): Aside from the minimal action alternative #1, this is the least protective of the alternatives carried through detailed analysis, because 1) no direct remediation would occur in the lower harbor and 2) it uses a higher upper harbor TCL (50 versus 10 ppm) than either alternatives #2 through #6 or the selected remedy. Although it reduces or eliminates the risk of physical contact with some contaminated sediments, it would not be fully protective of human health or the environment, nor would it be expected to reach AWQC in all areas at the end of ten years.

In terms of the five balancing evaluation criteria, this alternative is easily implementable and effective in the short term, except, as described above, the CSOs and storm drains in the area to be capped would be extremely problematic and expensive to resolve (this expense is not reflected in the $82 million estimated cost listed herein). This alternative would not reduce the mobility, toxicity or volume of the contaminants through treatment, although the cap would make the upper harbor sediment PCBs less mobile. Furthermore, disregarding the CSO issues, it would cost only slightly less to implement than alternative #8 (at $85 million), even though alternative #8 includes remediation of the lower harbor to 50 ppm PCBs as well as the same degree of cleanup in the upper harbor. Community and state acceptance is expected to be lower for this altenernative than for either alternative #8 or the selected remedy due to the lack of cleanup in the lower harbor.

Alternative 8 (site wide dredging and CDF disposal using a 50 ppm TCL): As described above, the selected remedy is a hybrid of this alternative and alternative #3. The selected remedy differs from this alternative only in that the selected remedy uses a lower cleanup level in the upper harbor (10 versus 50 ppm PCBs). As a result, this alternative would be less protective of both human health and the environment than the selected remedy due to its five-fold higher TCL in the upper harbor.

The time frames to meet AWQC under this alternative are expected to be somewhat longer than for the selected remedy. As with all the alternatives except #1, the removal or capping of large volumes of PCB-contaminated sediment is expected to improve the ecological health of the Harbor; although quicker long-term recovery is expected with alternatives using a 10 ppm TCL. This alternative's comparison to the five balancing criteria is similar to that for the selected remedy, except that it would cost less, would result in less dredging and CDF-related impacts, but would provide less long-term effectiveness and permanence (again, due to the higher upper harbor TCL). The required CDF area would be substantially lower than the selected remedy, since conceptually an enlarged CDF D would suffice.

Based on comments on the 1992 Proposed Plan, state acceptance of this alternative might be forthcoming; however, community and other stake holder opposition seems likely with many parties favoring a lower TCL with some also favoring treatment.

Alternative 9 (same as alternative #8, but sediments greater than 500 ppm PCBs would be treated): This alternative's comparison to the nine criteria is similar to alternative #8 above, except that it would reduce the toxicity of those sediments above 500 ppm PCBs through treatment (using either incineration or solvent extraction), would take longer and cost significantly more to implement and have more short term implementability and effectiveness issues to overcome due to the difficulties inherent with treatment. Alternatives like this one involving treatment offer a greater degree of long-term effectiveness and permanence than alternatives that do not include treatment, although, again, containment of sediments in CDFs is believed to be protective in the long term regardless of whether the sediments are treated.

Support for this alternative from the state and general public would most likely be mixed: While this alternative does include treatment which reduces the toxicity of PCBs, it only removes sediment with PCB concentrations of 50 ppm or above sitewide. Arguably, alternatives with a TCL of 10 ppm in all or a portion of the Harbor offer more protection to human health and the environment since the remaining sediments would then approach if not achieve the 1 ppm threshold discussed herein.

X. The Selected Remedy

After an extensive process of evaluating cleanup alternatives and developing consensus among Site stakeholders, EPA has selected the remedy described below as the best balance between the nine criteria and the best overall approach to the upper and lower harbor cleanup. The selected remedy for this operable unit represents a hybrid of two of the alternatives discussed above - alternatives #3 and #8 - since it calls for TCLs of 10 ppm PCBs in the upper harbor and 50 ppm PCBs in the lower harbor and saltmarshes. As discussed in section XIII.B, updated cleanup levels of 25 and 1 ppm PCBs will also be used for intertidal sediments in areas prone to beach combing and in areas adjacent to residential properties, respectively. The principle features of the selected remedy are:

A. Construction of CDFs and Water Treatment Facilities

The first step in the cleanup process will be to design and construct the CDFs and their associated water treatment facilities. The four CDFs shown in Figures 21a and 21b have been located in areas with PCB-contaminated sediments to avoid the need to dredge the sediments underlying these CDFs (which for the CDF configuration shown total approximately 126,000 cy). These CDFs have also been located near industrial areas to avoid potential impacts of CDF construction and operation (e.g., truck traffic, noise, air quality) on residential areas. Initiation of dredging need not wait until all four of the CDFs are constructed; cleanup can be staged such that dredging can begin once the first CDF is complete.

The side walls of these CDFs will be lined with a synthetic impermeable material, but not the bottom of the CDFs, since a) the existing sediments in these areas are naturally very impermeable; b) the integrity of a man-made impermeable liner constructed in saturated conditions cannot be guaranteed; and c) the dredged sediments themselves will compact into a highly impermeable material (USACE, 1997). Computer modeling indicates that leakage rates of PCBs and metals from the CDFs will be insignificant. The long term combined PCB leakage rate from all four CDFs - estimated to be 37 kg over thirty years (USACE, 1997) - represents approximately two one-hundredths of one percent (0.02%) of the estimated 239,000 kg of PCBs removed from the Harbor as a result of this remedy. Exposure to this amount of leakage over the long term is not believed to be harmful to marine organisms. Each CDF will include a perimeter groundwater monitoring program to verify that they are operating safely. In addition, during design of the CDFs, additional hydrodynamic analysis will be performed to verify that the CDFs do not adversely affect water circulation patterns, saltmarshes or flood water levels.

B. Dredging of Sediments With PCB Levels Above Cleanup Levels

Once the first CDF is complete, river sediments will begin to be dredged and placed in it. EPA expects to perform the dredging from north to south, in order to minimize the potential for recontamination of dredged areas. The dredging process will continue as the other CDFs are sequentially brought on line. Most of the dredging will be done by a cutterhead dredge or its equivalent, since a cutterhead dredge has twice before operated in compliance with project-specific control criteria - first during the pilot dredging study in 1988 and 1989 and then during the hot spot dredging in 1994 and 1995 (Otis et al., 1990 and USEPA, 1997c). A cutterhead dredge is barge-mounted, operates under vacuum, and uses a variable-speed rotating apparatus (the cutterhead) at the sediment surface to loosen the sediments for suctioning and pumping. The dredged material (which typically contains a large percentage of water) is then conveyed from the dredge to the CDFs via pipeline. As with the hot spot dredging operation, the cutterhead dredges will be customized as appropriate (e.g., with a vacuum shroud over the cutterhead, oil sheen containment booms and skimmer pumps to remove any sheen inside the booms) to minimize sediment resuspension and PCB volatilization. Contaminated sediment in deeper water and in saltmarshes may have to be removed by other methods (e.g., by clamshell bucket or land-based excavation) and transported separately to the CDFs.

For subtidal sediments, the target cleanup levels will be 10 ppm PCBs in the upper harbor and 50 ppm PCBs (dry weight) in the lower harbor and saltmarshes. The approximate areas to be dredged based on these two TCLs are shown in Figure 22. EPA believes that dredging to these standards when combined with the contaminated sediments underneath the four proposed CDFs will isolate, on a mass basis, approximately 96 percent of those PCBs which remain in the harbor (or approximately 239,000 kg PCBs isolated). In addition, since these sediments to be dredged include the areas of highest metals contamination, risks to human health from lead (section VI.A) and risks to ecological health from copper (section VI.B) will also be reduced. Other more limited areas where shoreline intertidal sediments will be removed to health-based cleanup levels are discussed in section XIII.B.

To ensure that residential areas near the areas being dredged are not impacted by airborne PCBs, air monitoring in offsite areas will be performed as appropriate throughout the dredging process. The water column will also be sampled during dredging operations to ensure that PCB transport and adverse biological effect levels are below pre-established control criteria.

The eastern shore of the harbor has been identified as an area of potential historic importance due to the recovery of Native American artifacts in this area (see section III.A.5 of the attached Responsiveness Summary). Pursuant to the National Historic Preservation Act, EPA will thus undertake a systematic archeological and historic resources reconnaissance of this area prior to dredging in this area. Appropriate safeguards will be formulated to protect these resources in consultation with the relevant agencies and interested local public.

C. Operation of the CDFs and Water Treatment

Once dredging commences, the typically large volumes of seawater that are brought in to the CDFs along with the sediments will need to be continually decanted and treated. This decanted seawater will have to be pumped from the CDF to one of the project's water treatment plants. For some CDFs this may mean that the decanted seawater will have to be pumped a distance of up to approximately 5,000 feet depending on where the new water treatment plants required for the remedy are located. The water treatment plant from the hot spot remedy will be reused, but three new similarly-sized plants are also planned due to the larger scale of the ROD 2 remedy. Similar to the process employed during the hot spot dredging, water treatment will consist of a series of physical and chemical processes to remove PCBs and heavy metals. This treated water will be discharged back to the Harbor after testing to ensure compliance with Site-specific discharge levels. For cadmium, chromium and lead, these discharge levels will be the respective AWQC; for PCBs and copper, these discharge levels will be at or below the current background concentrations of these contaminants.

To ensure the safety of Site and other workers nearby, air monitoring will be performed at all CDFs (in addition to the off-site areas discussed above) during the operation of the CDFs. To help control airborne PCB emissions from the CDFs, a two foot layer of water will be maintained above the dredged sediment during dredging operations. Appropriate freeboard (approximately 2 feet) will be maintained to ensure that this ponded water does not overflow the CDF sidewalls due to wave or wind action. Other airborne emission control methods (e.g., foam suppressants, floating covers) will be employed as necessary to keep airborne PCB levels below pre-established control criteria.

D. Saltmarsh Excavation, Restoration and Monitoring

Saltmarsh areas that are excavated to remove sediment PCBs above Site cleanup levels will be regraded and revegetated to approximate the original conditions of the area remediated. Erosion protection will be provided in these areas as appropriate to prevent bank scouring and erosion. The saltmarsh areas impacted will be monitored over time to ensure the success of the remedial saltmarsh restoration efforts. See sections X.B and XIII.B for discussion of the applicable saltmarsh cleanup levels.

E. Preliminary Capping and Sediment Consolidation

Once the CDFs have been filled with sediment, an interim cap (approximately six inches of soil or sediment) will be installed to prevent escape of PCB-dust or PCB volatilization and to allow for precipitation runoff while the underlying dredged sediment consolidates. Sediment consolidation is required to establish appropriate foundation conditions prior to construction of a final impermeable cap. The interim caps will also be designed to allow passive venting of gases formed due to the decay of organic material within the sediments.

Where manageable (e.g., CDF D), and if scheduling permits, cleaner dredged sediments from harbor shipping channels will be used to provide material for this preliminary cap. It is anticipated that approximately three years of sediment consolidation will be required before final capping can be initiated. Perimeter air monitoring around the CDFs will continue once the interim caps are in place, although on a more limited basis than during full operation of the CDFs.

F. Final Capping, Long-Term Monitoring and Maintenance, and Beneficial Reuse of the CDFs

Once the dredged sediment and interim caps have sufficiently consolidated, the final impermeable CDF caps can be constructed. These caps will consist of different layers to: a) promote surface drainage away from the underlying sediments, b) prevent infiltration of water that does not drain off the cap, and c) allow collection and venting of any gas emissions. Once capped, a long-term monitoring and maintenance program will be initiated to keep the CDFs in good repair and to monitor against excessive groundwater and airborne PCB emissions.

EPA will continue to work with the local communities to develop appropriate plans for beneficial reuse of each CDF. As one example, the City of New Bedford has expressed an interest in the reuse of CDF D as a commercial marine facility. As a result, the conceptual design of this CDF includes a sheet pile wall (rather than an earthen dike) on the seaward face of the CDF to promote docking and facilitate boat hauling. Similar design accommodations can be made to the other CDFs provided that the ultimate land use is developed in advance in conjunction with the surrounding communities and abutters and provided that the design is cost-effective, does not interfere with the integrity of the remedy or delay the remedy.

G. Long Term Site Wide Monitoring

Several long term monitoring programs will be undertaken to assess the effectiveness of the remedy over the long term. The long term ecological monitoring program begun in 1993 (Nelson et al., 1996) will be repeated every three to five years once remedial dredging is complete. This monitoring will also occur before and after major remedial dredging operations. The third round of this program is planned to take place just prior to construction of the first ROD 2 CDF. In addition, the twice yearly mussel bioaccumulation studies begun by EPA Narragansett in 1987 will be continued to assess food chain as well as water quality impacts of the cleanup, since the Site-specific relationship between mussel tissue PCB concentrations and dissolved water column PCB concentrations has been quantified (Bergen et al., 1993).

EPA will also initiate a long term local seafood sampling program to track PCB and metal levels in seafood and to assist in the implementation of institutional controls and seafood advisories for the Site. Commercially important species in all three of the fish advisory areas (Figure 2) will be included in this long term seafood sampling program.

Also, consistent with the phased TMDL approach for attaining ambient water quality standards for copper, water quality in the harbor will be monitored periodically to determine whether decreases in ambient copper levels have occurred due to removal of the estimated 255,000 kg (561,000 lbs) of copper from the harbor as a result of the ROD 2 dredging (USEPA, 1996b). This ambient monitoring will also include PCBs to complement and provide verification of the water column PCB levels predicted from the mussel bioaccumulation studies discussed above, and to further evaluate achievement of the ambient PCB water quality standard of 0.03 ug/l.

H. Seafood Advisories and Other Institutional Controls

Until such time as PCB levels in seafood reach the risk-based, Site-specific threshold of 0.02 ppm (or other level if this criteria is updated), the remedy will include institutional controls such as seafood advisories, no fishing signs and educational campaigns to minimize ingestion of local PCB-contaminated seafood. The state-sanctioned area-by-area fishing restrictions (Figure 2) will also be in effect until such time as the MA DPH deems it appropriate to amend them.

EPA's seafood advisories and educational campaigns will take advantage of updated seafood PCB data from the long term seafood sampling program discussed above. For example, if the sampling information were to consistently demonstrate that a certain specie reached safe levels before other species, then the seafood advisory could be tailored to reflect this new information.

Restrictions will also be applied to the CDF properties to ensure the integrity of the caps over time.

I. Review of the Completed Remedy

Because contaminated sediments will remain in CDFs at the site, the Superfund statute requires that EPA review the cleanup no less often than every five years after the cleanup begins to ensure that human health and the environment are protected. In addition, as agreed to in the New Bedford Harbor Superfund Site Community Forum agreement, EPA will conduct an ongoing literature review of treatment alternatives for the dredged sediments until the CDFs are capped. Once capped, this review will continue no less frequently than once every five years.

XI. The State-Enhanced Remedy

In addition to the selected remedy described above, the Commonwealth of Massachusetts has petitioned EPA to allow the inclusion of navigational dredging in New Bedford Harbor as an enhancement of the remedy. Such enhancements are envisioned in the implementing regulations of CERCLA at 40 CFR 300.515(f). The enhancement requested by the Commonwealth would link as appropriate the dredging and disposal of sediments dredged from the harbor's navigational channels (located in the lower and outer harbors) with CERCLA and the Superfund program. Although these navigational sediments fall below the 50 ppm lower harbor TCL (and thus do not overlap with sediments slated for remedial dredging), they are nevertheless contaminated with heavy metals and lower levels of PCBs. Thus these navigational sediments, approximately 1.7 million cy in volume, are most likely unsuitable for open water disposal (Maguire Group, 1997), and alternative disposal approaches are required if shipping channels are to be maintained to their federally-approved depths. As discussed further below, and provided consistency with 40 CFR 300.515(f)(1)(ii) as well as other dredging-related regulations is maintained, EPA accepts the Commonwealth's request to include navigational dredging as an enhancement of the selected remedy.

EPA believes that the primary benefits of linking the two dredging programs, while not sacrificing the normal regulatory review process for federal navigational projects, will be a streamlined permitting process for on-site navigational disposal facilities (if any), coordinated rather than separate environmental monitoring programs, where feasible, and increased overall coordination between the two dredging projects. In fact, the overall environmental benefit of the remedial CDFs is increased by using the CDFs to contain a portion of the navigational sediments (as part of the interim caps) as well as the more highly contaminated remedial sediments. Such a scenario should also reduce cleanup costs since at least some of the costs for the clean fill that would otherwise be required for the preliminary caps would no longer be necessary.

Incorporating the enhanced remedy shall not jeopardize or delay the overall implementation or funding of the selected remedy. Rather, implementation of the navigational dredging project, including solicitation of public comment on it, will be the responsibility of those parties normally involved in such projects, namely the MA Coastal Zone Management office, the US Army Corps of Engineers, the National Fisheries Management Service and other relevant state and federal regulatory programs. Consistent with 40 CFR 300.515(f)(1)(ii)(A), the EPA Superfund program will not be responsible for funding any part of the enhanced remedy.

XII. Statutory Determinations

The remedial action selected herein for implementation at the New Bedford Harbor Site is consistent with CERCLA and, to the extent practicable, the NCP.

A. The Selected Remedy is Protective of Human Health and the Environment

The selected remedy will be protective of human health and the environment through a combination of remedial action and institutional controls. Removal and permanent isolation of contaminated sediments above the remedy's cleanup levels will reduce human health risks from dermal contact with and incidental ingestion of these sediments to within EPA's acceptable risk range, and will reduce benthic organisms' exposure to PCBs to levels that approach if not achieve the 1 ppm ecologically-protective PCB level in the upper harbor. Achievement of this 1 ppm level Site-wide through direct remedial action is believed to cause more harm than good due to the radical alterations of the harbor and adverse environmental impacts that would result from such an effort. Naturally occurring sedimentation within the upper and lower harbor, estimated to average 3 mm per year for the upper harbor (Teeter, 1988), should assist in lowering residual PCB levels further over time.

Institutional controls will be required to protect human health against consumption of PCB-contaminated seafood until such time as edible seafood reaches safe, Site-specific risk-based PCB levels. These controls - consisting of seafood advisories, no-fishing signs, and educational campaigns - are necessary since it could take many years before certain seafood species reach safe levels, and since not all seafood species are expected to reach safe levels within the ten year time frame considered in Site modeling (Battelle, 1990). These institutional controls shall continue until protective levels in edible biota are consistently achieved throughout the Site. In addition to these controls, the continuation of the state-sanctioned fishing restrictions (Figure 2) will assist in the minimization of seafood consumption risks.

A key measurement of the ecological protectiveness of the remedy, in addition to the long term ecological monitoring program, will be achievement of the 0.03 ug/l PCB water quality standard for the protection of marine organisms. The Site modeling performed by Battelle

(1990) for Site-wide TCLs of 10 and 50 ppm indicates that the selected remedy, which incorporates both of these TCLs, should achieve this threshold throughout most if not all of the upper and lower harbor approximately ten years after completion of the ROD 2 dredging operations. As described in section X, the remedy will include long term monitoring to evaluate the effectiveness of the remedy in achieving ecological health, including the 0.03 ug/l water quality criteria. The other main indicator of protectiveness, in addition to the seafood, benthic and water quality sampling, will be post-dredging sediment PCB levels to ensure that the respective target cleanup levels have been achieved.

B. The Selected Remedy Attains or Appropriately Waives ARARs

This section briefly summarizes the most significant chemical, location and action specific ARARs for the remedy. It is important to note that EPA is not identifying ARARs for the state enhancement; that is, the navigational dredging project. EPA views that project as occurring simultaneously with but independent of the Superfund project. We do however, recognize some economies gained from coordinating the two projects and agree to work with all agencies involved (see Section XI). Table 8 summarizes the various environmental statutes and regulations discussed below, as well as their impact on remedial activities.

Chemical-Specific ARARs

Chemical-specific ARARs govern the extent of site cleanup and provide either actual clean-up levels or a basis for calculating such levels. These requirements are usually health- or risk-based numerical values or methodologies which, when applied to site-specific conditions, result in numerical values which help define the degree of cleanup.

While only environmental standards are typically identified as ARARs the FDA level has been adopted as a chemical-specific ARAR because the state health department based its fishing ban for the Site on this level. FDA levels are based on nationwide seafood consumption patterns of the general public and are balanced by economic considerations. Public health agencies typically use FDA levels in regulating seafood consumption. At Superfund sites, EPA assesses risk and derives target levels in seafood which are protective of public health by utilizing a site-specific risk assessment process. This process relies on reasonable assumptions about exposure and up-to-date scientific information about toxicity. Based on this approach, EPA developed a target level of 0.02 ppm for PCBs in fish. This target level is equivalent to a hazard index of 1.0 and a cancer risk level of $1x10^{-5}$. This meets both EPA and MADEP's target cancer risk levels and EPA's target non-cancer hazard index of 1. For seafood to meet both the FDA and site specific levels at the end of 10 years, EPA believes that a TCL for sediment dredging of 1 ppm would be necessary. However, dredging to that level would cause severe adverse environmental impacts to the Harbor. In order to balance both protection of human health and the environment, EPA has determined that using a slightly higher TCL together with institutional controls on seafood consumption allows the remedy to remain protective of human health yet does not impose as severe adverse impacts to the Harbor ecosystem. Therefore, the FDA level is waived pursuant to CERCLA Section 121(d)(4)(B). The selected remedy includes various institutional controls and a long term seafood monitoring program to keep the consumption of contaminated local seafood below safe levels.

Federal and state ambient water quality standards have been identified as both action-specific and chemical-specific standards for the remedy. As an action-specific standard, effluent discharged from the water treatment plants will meet the water quality standards for cadmium, chromium and lead. For copper and PCBs, water quality standards with be met through a phased TMDL approach. As a chemical-specific ARAR, the 0.03 ppb PCB AWQC will be used, along with the ecological long-term monitoring program and trends in seafood PCB levels to assess the overall effectiveness of the remedy. Although cleaning up surface water is not specifically within the scope of this remedial action, dredging and containment of approximately 450,000 cy of contaminated sediment to target cleanup levels is expected to allow the water column to reach the 0.03 ppb AWQC for PCBs within ten years of completion of dredging. The remedy significantly reduces the amount of PCBs in sediment and the water column available to aquatic life.

Finally, three federal guidances regarding the risks posed by PCBs to human health are cited as "To be Considered" in evaluating the potential carcinogenic and non-carcinogenic risks posed by contaminants at the site (see Table 8).

Location-Specific ARARs

Location-specific ARARs are restrictions relating more directly to the geographical or physical setting or position of the site. They are generally restrictions on the conduct of activities solely because of a site's particular characteristics or location. This remedy occurs in a coastal Harbor and floodplain which includes coastal wetlands and tidelands. It is also located along a riverfront area and is partially in a state-designated port area.

Federal and state location-specific ARARs address floodplain and wetlands management, protection of fish and wildlife and coastal zone management. The goal of these regulations is to protect resource areas as well as public rights and access to the water; they set performance standards for the level of protection needed to ensure the resource areas are unharmed or that any harm is minimized during the design and implementation of projects built in these areas and that water dependent uses are accommodated. A general description of the significant location-specific ARARs and how the remedy will meet the requirements is set out below.

Several regulations require a determination that no practicable alternative exists to the proposed action. EPA, after soliciting and receiving public comment, hereby makes the determination that the selected remedy is the best practicable solution for remediating New Bedford Harbor. Many regulations also require that EPA coordinate with appropriate agencies when activities may affect jurisdictional domains. EPA will continue to coordinate with the U.S. Fish and Wildlife Service, NOAA and the State Division of Marine Fisheries to accommodate dredging schedule impacts on wildlife, shellfish habitat, and identified fish runs in the Harbor. The Agency will also work with the appropriate agencies to consider measures to accommodate impacts remediation may have on the endangered roseate tern feeding grounds located within the Harbor and on areas where Indian artifacts have been found or are thought to be located. Finally, since the entire Site is located in a coastal zone management area, the federal Coastal Zone Management Act requires that the remedy be consistent with the state coastal zone management program. While EPA does not formally submit a federal consistency determination since this determination is procedural rather than substantive, the various Site investigations, feasibility studies and Proposed Plan fulfill the requirements of a consistency determination. Policies identified by Massachusetts CZM are listed in Table 8. They include protecting water quality, aquatic productivity and habitat, preserving and enhancing, if possible, public recreation sites and designated port areas, and preventing erosion and flooding from construction activities. These policies are implemented through the identified ARARs, particularly the Wetlands Protection Act and Waterways Law.

The state Wetland Protection Act identifies protected resource areas that occur on or adjacent to the Site and regulates activities in these areas. Power transmission cables and CSO relocation, dredging, and CDF construction are subject to the identified substantive portions of this regulation. Construction of water treatment plants are also subject to these regulations if located in resource areas. Best available measures will be used in relocating CSOs and cable transmission lines, and during dredging and construction of CDFs (and water treatment plants) throughout the Site to minimize adverse effects on marine wildlife and its habitat, to protect against storm damage and control flooding. Salt marsh areas destroyed during remediation will be replanted. Shellfish are expected to repopulate dredged areas 3 to 5 years after dredging occurs. Any harm to the wetlands will be minimized and actions such as replanting disturbed wetlands and salt marshes will be taken to restore and preserve natural and beneficial values of these areas.

Under the state Waterways law, the remedy is considered a water dependent use. To achieve the remedial goal of a cleaner Harbor, some unavoidable interference with public rights and access to the water will temporarily occur during implementation of the remedy. The public will have alternate access to the water. Once the CDFs are permanently capped, access across CDFs is feasible. Additionally, subject to institutional controls and community input, CDFs will be designed to accommodate and encourage future uses such as parks, recreational facilities, and, in the designated port area (i.e., CDF D), a commercial marine facility. Institutional controls would prohibit uses which would compromise the integrity of the cap (deep rooted plants; deep foundations). Neither construction activities nor the remedial (as opposed to navigational) dredging is expected to interfere with navigation.

Action-Specific ARARs

Action-specific ARARs are usually technology- or activity-based limitations or requirements that control actions at CERCLA sites. These requirements generally define acceptable treatment, storage and disposal procedures for PCB contaminated sediment, hazardous substances and solid waste during the response action, as well as the degree of treatment for the water decanted off the dredged sediment.

Wastes that contain greater than 50 ppm PCBs are managed in Massachusetts as a listed hazardous waste under 310 CMR 30.000, the Massachusetts Hazardous Waste Regulations. However, 310 CMR 30.501(3)(a) exempts facilities which store, manage, treat, or dispose of PCBs greater than 50 ppm provided that the facilities are properly managed under the federal Toxic Substance Control Act (TSCA). Massachusetts, through its concurrence on the ROD, agrees that the remedy is properly managed under TSCA.

TSCA regulates disposal of PCB contaminated sediments (i.e., PCB-remediated waste). TSCA allows for risk-based disposal of PCB-remediated waste if the Regional Administrator finds the disposal will not pose an unreasonable risk to health and the environment after a review of information concerning the Site contamination and cleanup plan. Based on the Administrative Record for this Site which contains the information required under TSCA, the Regional Administrator finds that disposal of the dredged sediments from New Bedford Harbor in confined disposal facilities does not pose an unreasonable risk to health or the environment. Issuance of this Record of Decision indicates approval.

Table 8 identifies certain TSCA chemical waste landfill standards such as liners, flood protection measures, monitoring requirements and supporting facilities for design and construction of the CDFs. EPA is using these standards to design CDFs in the most protective manner possible. Some of these TSCA chemical waste landfill standards such as hydrogeological conditions, leachate collection, and bottom liner requirements are not appropriate for shoreline CDFs; therefore, these requirements will be waived under TSCA. The conceptual CDF designs do include the sediment underlying the CDFs and a cover system both of which meet a drainage impermeability of 10^{-7} cm/sec. It also includes groundwater, surface water and air emission monitoring during operation, closure and post closure, and erosion and stormwater drainage controls. The cover will also include a drainage and gas venting layer and a vegetative layer on all except CDF D which is proposed to accommodate future use as a commercial marine facility. Based on these above considerations and information in the Administrative Record, by issuance of this ROD, the Regional Administrator finds that the TSCA standards waived are not necessary to prevent injury to health or the environment. Finally, substantive standards of all applicable TSCA decontamination requirements will be followed.

With regard to other possible hazardous substances in the sediment, existing toxicity characteristic leaching procedure (TCLP) data shows the sediment does <u>not</u> meet the definition of a Resource Conservation and Recovery (RCRA) characteristic waste. Toxicity characteristic (TC) constituent concentrations are below TC regulatory limits for hazardous waste; therefore, sediment disposal is subject to Massachusetts solid waste management regulations. The substantive requirements of the state Solid Waste Management Regulations that are more stringent than TSCA regulations for liners, covers, monitoring or post closure will be followed.

Sediments, process wastes, and discharges from monitoring, operations and/or maintenance will be tested for hazardous constituents. Any characteristic wastes identified will be stored, treated, and/or disposed of in compliance with state hazardous waste requirements.

Federal PCB policies and guidance regarding PCB releases for CERCLA remedial actions will be considered. Massachusetts guidelines to be considered include ambient air limits and noise levels. The Allowable Ambient Limits and Threshold Exposure Limits will be considered for air emissions from all site activities. Noise levels will be minimized to the extent practicable.

Water discharges are regulated under state and federal water quality ARARs. Water taken up during dredging will be directed to water treatment facilities constructed as part of the remedy and discharged to the Harbor after treatment. Operation of the treatment plants requires a waiver of a provision of the National Pollutant Discharge Elimination System requirements of the federal Clean Water Act (CWA), Section 402. The provision can be interpreted to prohibit new discharges into waters that do not meet applicable water quality criteria, unless certain conditions are met (40 CFR 122.4(i)). Harbor waters are presently degraded; it does not meet AWQC for copper and PCBs nor are conditions concerning pollutant load allocations and compliance schedules for river waters likely to be accomplished within a reasonable time before the remedy is implemented. A CERCLA waiver under Section 121(d)(4)(B) was invoked in the Proposed Plan and public comment specifically requested. The waiver was invoked since compliance would essentially prevent the cleanup of this Site, resulting in greater risk to human health and the environment. No comments were received on this particular waiver. Issuance of the ROD enacts the waiver.

Further, since New Bedford Harbor water quality is so degraded as to preclude dilution of any proposed discharge of PCBs and copper, Section 402 of the CWA requires that discharges of PCBs and copper meet the respective AWQC at the discharge point. Consistent with Section 303 of the CWA and its Total Maximum Daily Load (TMDL) approach, however, discharge limits for copper and PCBs will be below current background levels but above AWQC. This approach allows for attainment of the water quality standards for copper and PCBs throughout the waterbody in a phased or step-wise approach. The amount of copper and PCBs that will be discharged from the treatment plants will be more than offset by the permanent removal of copper and PCB contaminated sediments from the Harbor. Site modeling indicates that the PCB AWQC will be met within 10 years of the completion of dredging. It is expected that the treatment facilities can attain the AWQCs for cadmium, chromium and lead, the other contaminants of concern from a wastewater discharge standpoint.

Dredging activities trigger federal and state requirements designed to maintain the integrity of the waters of the United States and to protect navigable waters and harbor and river improvements. Section 404 of the Clean Water Act and 310 CMR section 9 (a state dredging regulation) require that the remedy be the best practical solution for cleanup of the Harbor and that adverse environmental impacts be minimized. For the reasons set out in the Site feasibility studies, Proposed Plan and this Record of Decision, this remedy is selected as the best alternative for remediating the Harbor. To minimize adverse impacts, measures such as varying target cleanup levels in wetland areas, replanting disturbed salt marshes, vegetating diked areas of CDFs, selecting dredging equipment which minimizes suspension of sediment, and controlling the rate of dredging will be incorporated into the remedy. As stated above, EPA will also coordinate with federal and state fish and wildlife agencies to accommodate concerns about impacts to fish runs and shellfish and roseate tern habitat. The USACE will also be involved in all dredging and CDF construction, operation and closure activities.

Other federal and state action-specific ARARs include air quality and air pollution requirements, which regulate the release of PCBs and other contaminants. Air emissions may result from dredging, construction and operation of the CDFs and water treatment facilities, cable and CSO relocations, final closure of CDFs, decontamination procedures and demolition, if necessary, of water treatment plants at completion of the remedy. Air emissions will be addressed through monitoring and engineering controls where necessary.

C. The Selected Remedial Action is Cost-Effective

The selected remedy is cost-effective since it provides overall effectiveness proportional to its costs. The remedy is effective since it provides protection against dermal contact risks immediately upon completion of dredging, and allows for eventual attainment (i.e., within approximately ten years) of water quality standards for the protection of marine organisms. It also is expected to allow for attainment of the FDA seafood PCB threshold in most commercially important species within this time frame (only winter flounder inside the hurricane barrier is estimated to be above the FDA's 2 ppm standard at year 10, see Battelle (1990) at pages 7-70 and 7-111). Moreover, these benefits will be obtained without the hundreds of millions of dollars that would be required for sediment treatment. The total present worth cost of the selected remedy as listed in the November 1996 Proposed Plan was estimated to be approximately $116 million (Table 9). As described below in section XIII, however, additional costs for a comprehensive solution to the cable crossing area (approximately $4.3 million) and for CSO relocations at CDFs B and C (roughly $10 million) have been identified. Costs associated with future land use for CDFs and water treatment facilities and for additional intertidal sampling and dredging have not yet been quantified. Thus total potential costs could be higher than the 1996 $116 million estimate if these or other additional costs exceed the contingency factors included in that estimate.

D. The Selected Remedy Utilizes Permanent Solutions and Alternative Treatment or Resource Recovery Technologies to the Maximum Extent Practicable

The selected remedy provides a permanent solution to the widespread and persistent PCB contamination in the upper and lower harbor sediments. It permanently isolates these sediments from human and environmental receptors by containing them in shoreline CDFs in perpetuity in a safe and protective fashion. Alternatives involving treatment of the large volumes of sediment were considered, but were determined to fail the cost-effectiveness criteria (see next subsection XI.E). Such treatment alternatives do not provide a significant increase in protection of human health and the environment compared to the selected remedy. Although the dredged sediments will not be treated, water decanted from them will be treated to meet stringent discharge standards.

E. The Selected Remedy Does Not Satisfy the Preference for Treatment as a Principle Element

The selected remedy does not use treatment of the PCB-contaminated sediments as a principle element of the remedy, although as described above the remedy does involve the extensive use of treatment for decanted seawater. Protection against the ecological and human health risks posed by these sediments is provided by removing and permanently isolating them in shoreline CDFs. Treatment of the dredged sediments is deemed to be unnecessary since a) the CDFs are protective whether or not the sediments contained within them are treated, b) treatment would add hundreds of millions of dollars in cost (Ebasco, 1990c; Foster Wheeler, 1997) and c) treatment would add additional short term risks due to the materials handling and emissions that would result. In short, given the current state of sediment treatment technology, the selected remedy would not be cost-effective if treatment of the sediments were added as a principle element.

XIII. The Selected Remedy is Not Significantly Different Than the Proposed Remedy in the November 1996 Proposed Plan

After consideration of all of the public comments received on the November 1996 Proposed Cleanup Plan, EPA does not believe that significant changes to the remedy described in that Plan are needed. Significant changes did occur to the proposed remedies presented in the January and May, 1992 Proposed Plan after EPA received voluminous public comments on that proposal. The 1992 Plan proposed dredging the entire Harbor, except fringe saltmarsh areas, to 50 ppm; saltmarsh areas would have been dredged to 500 ppm. The 1992 Plan also proposed to dredge areas south of the hurricane barrier (at the City's sewage treatment plant outfall and two areas near the Cornell-Dubilier facility). In general, comments favored a more protective target cleanup level than 50 ppm and a concern that EPA had not yet adequately characterized the nature and extent of contamination south of the hurricane barrier. The preferred remedy was modified based on these comments as well as those generated during discussion with the Community Forum and reproposed in the November 1996 Proposed Cleanup Plan. The attached Responsiveness Summary should be consulted for a more detailed discussion of the comments received on the Proposed Plans and EPA's responses to them. Three issues that will result in relatively minor modifications to the proposed remedy do warrant additional discussion, however, as described below.

A. High Voltage Submerged Power Cables

High voltage power lines exist submerged in the upper harbor sediments running generally east to west from the electrical substation on the Acushnet shore. The November 1996 cleanup plan proposed that, due to safety concerns, this cable corridor area would not be dredged entirely but would be narrowed to allow for as much dredging as possible. That Plan also proposed consideration of other remedies for this area, including reconstruction of the submerged power lines in such a way that would allow complete dredging of the area. Since issuance of the November 1996 Plan, and as documented in the attached Administrative Record, EPA has continued working with the Commonwealth Electric Company (COM/Electric) to resolve this issue more fully. As a result, EPA and COM/Electric now believe that the complete dredging approach discussed in the November 1996 Plan is a more protective yet still cost-effective solution to the cable corridor problem.

Complete dredging of this area would be accomplished by replacing the existing cables with new cables to be installed by tunneling beneath the Acushnet River. Such tunneling is also planned for a <u>new</u> high voltage cable which COM/Electric needs to install in this area to meet increased electrical demand. EPA believes that cost efficiencies can be achieved by implementing the two cable projects jointly. Installation of the subsurface replacement cables offers a greater degree of protection than simply narrowing the overall width of the cable corridor since such installation allows for complete dredging of the corridor which, if unaddressed, would act as a continuing source of contamination (this corridor includes some of the highest levels of remaining PCBs in Site sediments). In addition to allowing for complete dredging of the cable corridor, this solution eliminates safety and PCB migration concerns regarding maintenance of the existing cables in a highly PCB-contaminated environment, and potentially allows for remedial cost savings if CDFs A and B (Figure 21a) can be merged together. Such a merger, by enlarging the contaminated CDF footprint, could decrease the amount of sediments to be dredged and the associated cost of water treatment for those sediments.

The cost to EPA for installation of the replacement cables is estimated to add approximately $4.3 million to the cost of the remedy (COM/Electric, 1998). Costs related to installation of the <u>new</u> power line will not be borne by EPA.

B. New Risk Assessment Practices and Cleanup Levels for Intertidal Sediments in Areas Prone to Beach Combing and in Areas Where Residences Abut the Harbor

The practice of risk assessment, especially regarding risks due to dermal contact with wet, contaminated sediment, has continued to evolve as new information relevant to such exposures becomes available. As a result, EPA's updated review of risks from direct human contact with PCB-contaminated shoreline sediments concludes that cleanup levels for exposed (i.e., intertidal) sediments should be derived on an area by area basis to more accurately reflect the land use and exposure scenarios that apply (USEPA, 1998). These area-specific shoreline cleanup levels for the upper and lower harbor are outlined below, and Figure 23 shows the three shoreline locations in the upper harbor impacted by these new cleanup standards. Locations in the lower harbor impacted by these standards will have to be determined through additional intertidal sampling and are not illustrated except as described below. Note that these new shoreline cleanup levels apply only to intertidal sediments and saltmarsh areas between the high and low tide water levels. They do not apply to subtidal sediments; rather, the 10 and 50 ppm TCLs apply to subtidal sediments in the upper and lower harbor, respectively. Also, since these cleanup levels are intended to reduce the risk from human contact with contaminated sediment, they apply to the first twelve inches of sediment depth. The calculations supporting these updated shoreline cleanup levels are presented in Appendix B.

1. Coffin Avenue cove (Upper Harbor, New Bedford)

The cleanup level for the fringe saltmarshes along the shore of this cove will be 25 ppm PCBs as opposed to the Site-wide saltmarsh TCL of 50 ppm. This new level takes into account the playground and open space bordering the cove, as well as the currently proposed future use of the area as a large "Riverside" park (NBHTC, 1998). It assumes a frequency of exposure to the sediments of 32 days per year (twice per week during June, July, and August, and once per week during May and September). The overall upper harbor TCL of 10 ppm will still apply to the intertidal sediments (mudflats) in this area that are not characterized as saltmarsh.

2. Residential areas north of Wood Street (Upper Harbor, New Bedford)

The cleanup level for the intertidal sediments and fringe saltmarshes bordering the homes on the New Bedford side of the Acushnet River north of Wood Street will be 1 ppm PCBs. This level takes into account the close proximity of the homes to the sediment, and assumes a frequency of exposure to the sediment of 150 days per year (i.e., those days in which the ground is not frozen or snow covered). Saltmarsh areas further away from these homes will be covered by the 50 ppm saltmarsh TCL for the site.

3. Veranda Street inlet (Upper Harbor, Fairhaven)

The cleanup level for the intertidal sediments and fringe saltmarshes bordering the homes near the inlet in the vicinity of Veranda Street in Fairhaven will be 1 ppm PCBs. As with the residential area north of Wood Street discussed above, this level takes into account the close proximity of the homes to the sediment, and assumes a frequency of exposure of 150 days per year (i.e., those days in which the ground is not frozen or snow covered). Saltmarsh areas further away from these homes will be covered by the 50 ppm saltmarsh TCL for the site.

4. Upper Harbor and lower Harbor saltmarshes

For the upper and lower Harbor saltmarshes that are not included in any of the new area-specific locations or categories described in this subsection XIII.B, the cleanup level of 50 ppm PCBs called for in the 1996 Proposed Plan has not been changed. EPA's updated assessment of dermal contact risks calculated a cleanup level of 40 ppm for these saltmarsh areas using a non-carcinogenic target hazard quotient of 1 and assuming 20 days per year of exposure (USEPA, 1998). However, EPA will use the original 50 ppm saltmarsh TCL to minimize adverse environmental impacts to saltmarshes, since the 50 ppm PCB level represents only an increase from 1.0 to 1.25 in the target hazard quotient. EPA believes this to be a balanced cleanup approach that minimizes adverse impacts to ecologically sensitive areas and which is both protective and cost-effective.

5. Shoreline residential areas in the lower Harbor with beach-like access to sediments

The cleanup level for intertidal sediments in the lower Harbor which directly abut residential areas and which have beach-like conditions (i.e., those areas where human contact with the sediment is expected) will be 1 ppm PCBs. Not included in this category are intertidal sediments in residential areas where contact with the sediments is not expected due, for example, to the presence of rock or cement walls (see subsection XIII.B.7 below).

6. Non-residential shoreline areas in the lower Harbor where beach combing is expected

The cleanup level for intertidal sediments in non-residential or non-industrial areas of the lower Harbor which have beach-like conditions or where beach combing might occur (e.g., in sandy areas in an around boat yards) will be 25 ppm. EPA believes that it is unlikely that such areas currently exist in the lower Harbor above this 25 ppm threshold, but will nevertheless perform additional intertidal sampling to confirm this to be the case.

7. Shoreline areas in the lower Harbor where contact with sediments is not expected

In shoreline areas in the lower Harbor where contact with intertidal sediments is not expected, for example due to physical barriers such as rip-rap or cement walls or industrial land use, the 50 ppm TCL proposed in the 1996 Proposed Plan for both lower harbor sediments and saltmarshes has not been changed.

C. The Cost of CSO Relocations at CDFs B and C

Not explicitly mentioned in the 1996 Proposed Plan is the fact that three of the four proposed CDFs (CDFs B,C and D) will involve relocation of existing combined sewer overflows (CSOs) to make room for the CDFs. The estimated cost of relocating the two CSOs at CDF D (approximately $2 million in direct costs) was included in the $116 million overall cost estimate cited in the 1996 proposed plan. However, due to the reconfiguration of the CDF locations resulting from the Community Forum discussions, the cost of addressing the three CSOs at CDFs

B and C was inadvertently not included in the $116 million cost estimate. Although a final solution for the CSOs at these two CDFs has not been determined, the City of New Bedford has estimated that relocation costs could add roughly $10 million to the cost of the remedy. Combined with the $116 million cost estimate of the 1996 Proposed Plan and the $4.3 million cost estimate for the underwater power cable relocation discussed above, the total present worth cost for the remedy is estimated to be in the $120 to $130 million range.

Extension of the CSOs directly through the CDFs was considered but rejected because of the potential for cross-contamination or commingling of the sewage and PCB wastes. EPA will continue to coordinate with the City of New Bedford to reach cost-effective solutions for the CSOs impacted by the CDFs. If possible, EPA would prefer to work with the City towards elimination rather than relocation of the impacted CSOs, but understands this may be problematic due to the sewer separation and storm water drainage issues that would result.

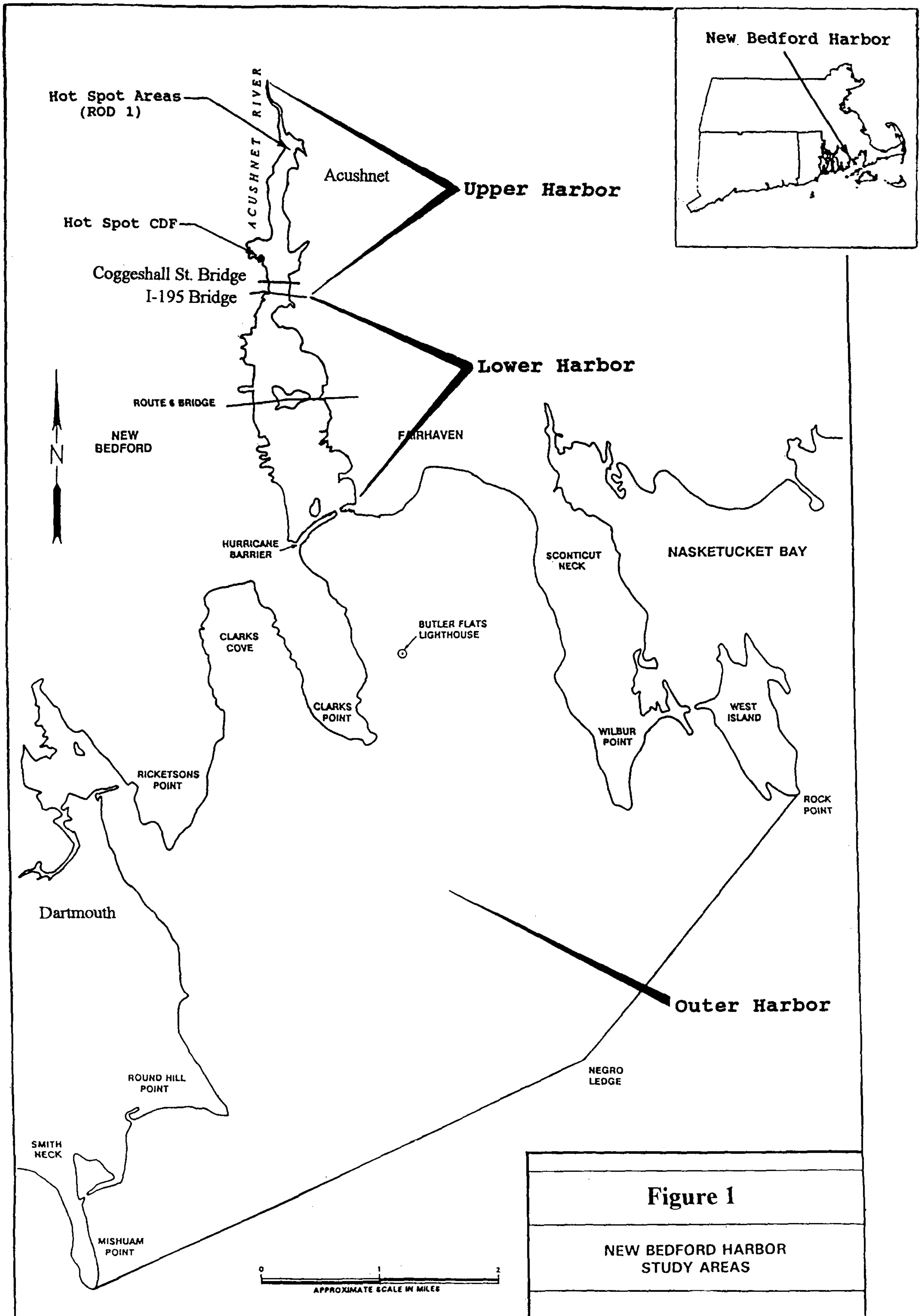


Figure 1

NEW BEDFORD HARBOR
STUDY AREAS

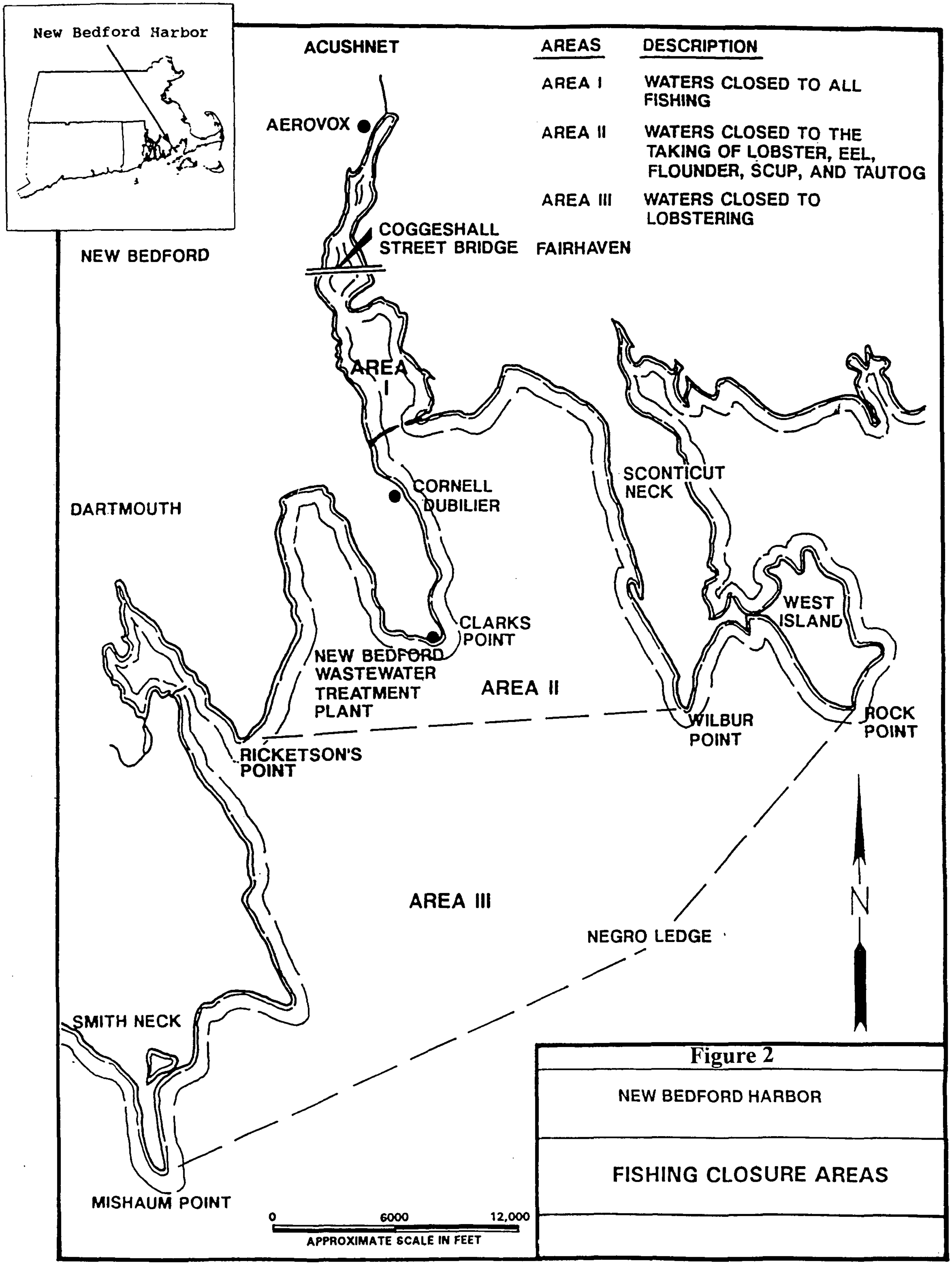
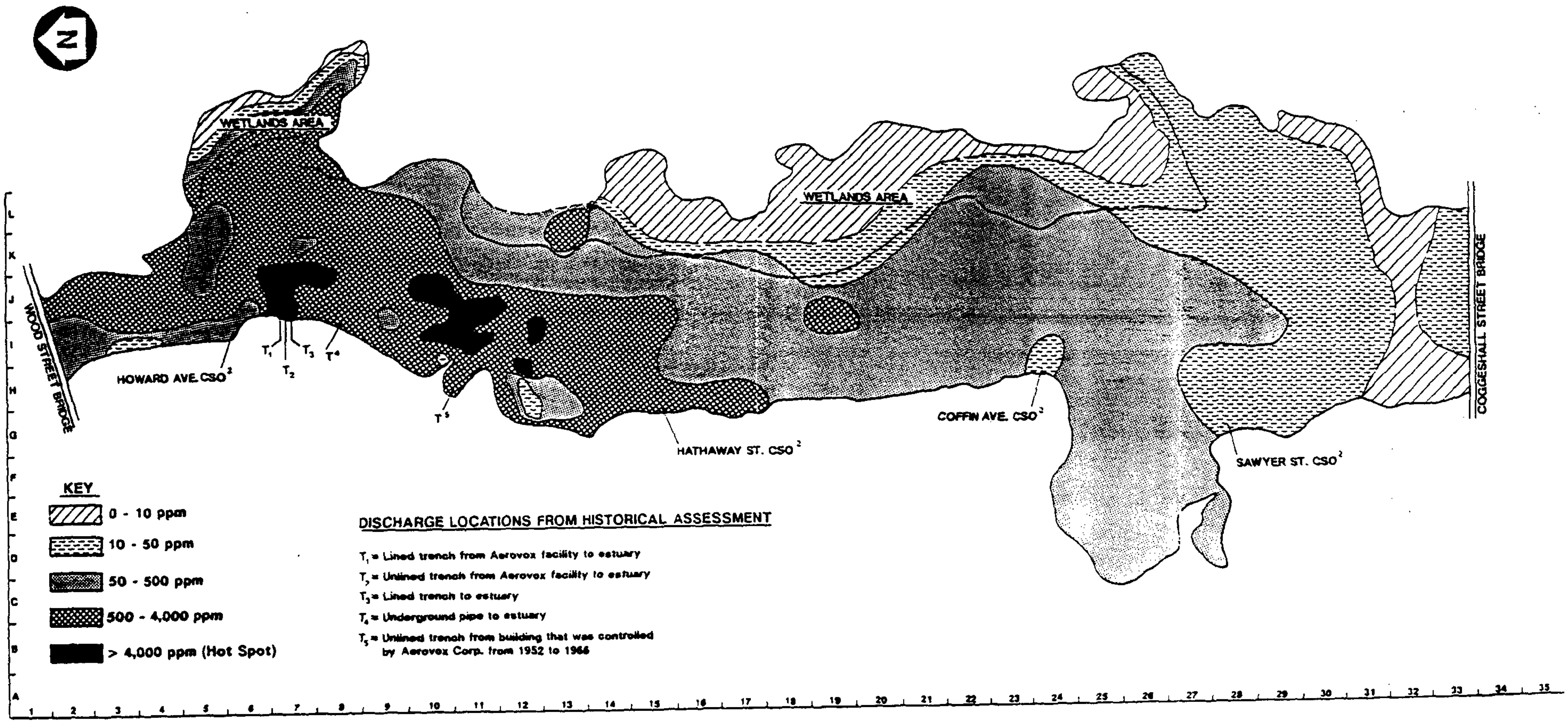


Figure 2

NEW BEDFORD HARBOR

FISHING CLOSURE AREAS



REFERENCES

1. Historical Assessment of Aerovox - PCB Related Facility - New Bedford, Massachusetts.
2. Combined Sewer Overflow (CSO) locations from City of New Bedford sewer system map.

0 400 800 1200 FEET

Figure 3

INTERPRETATION OF TOTAL PCB CONCENTRATIONS *
DEPTH: ZERO TO 12 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

* SUM OF AVAILABLE AROCHLOR DATA

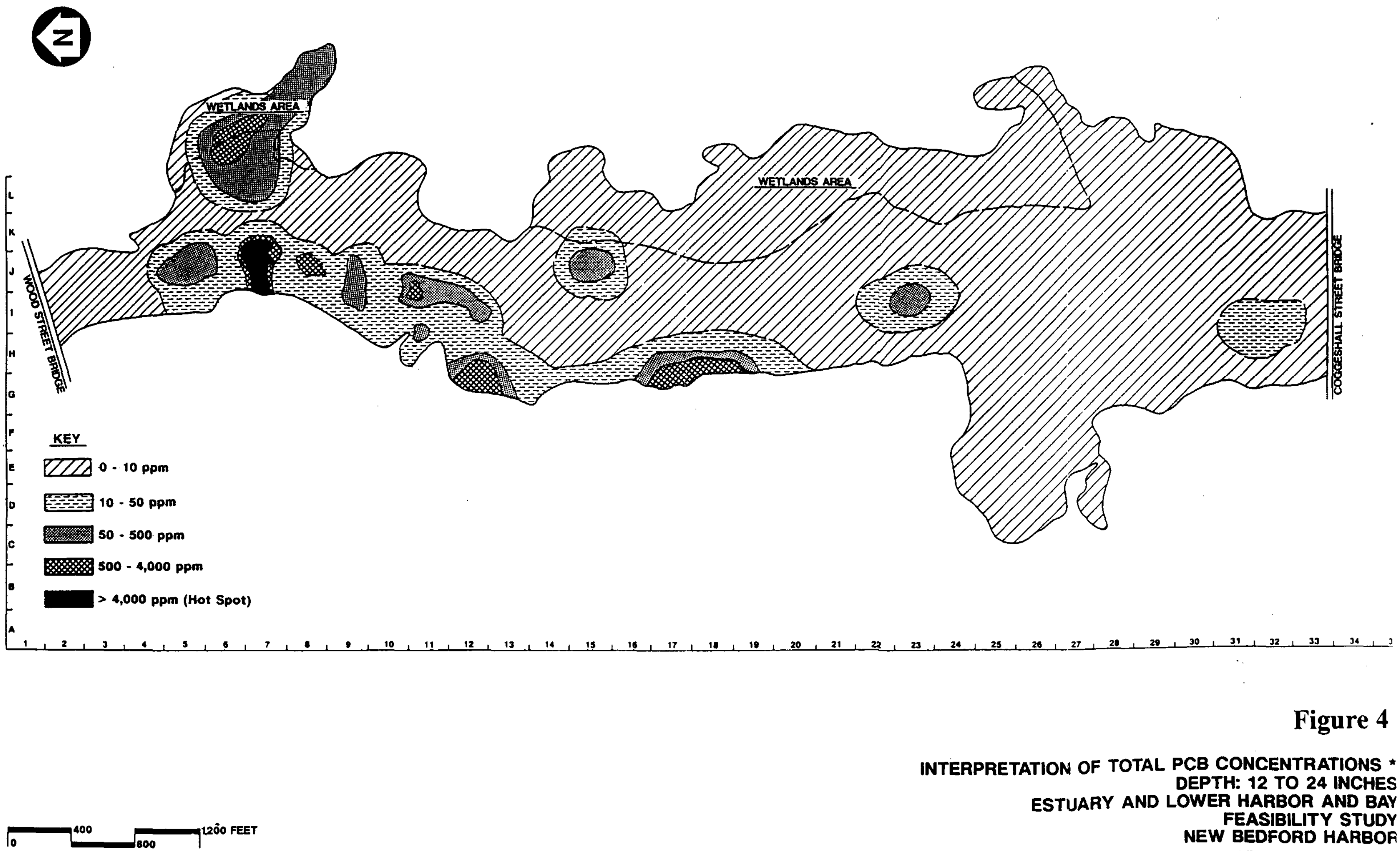


Figure 4

INTERPRETATION OF TOTAL PCB CONCENTRATIONS *
DEPTH: 12 TO 24 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR
* SUM OF AVAILABLE AROCHLOR DATA

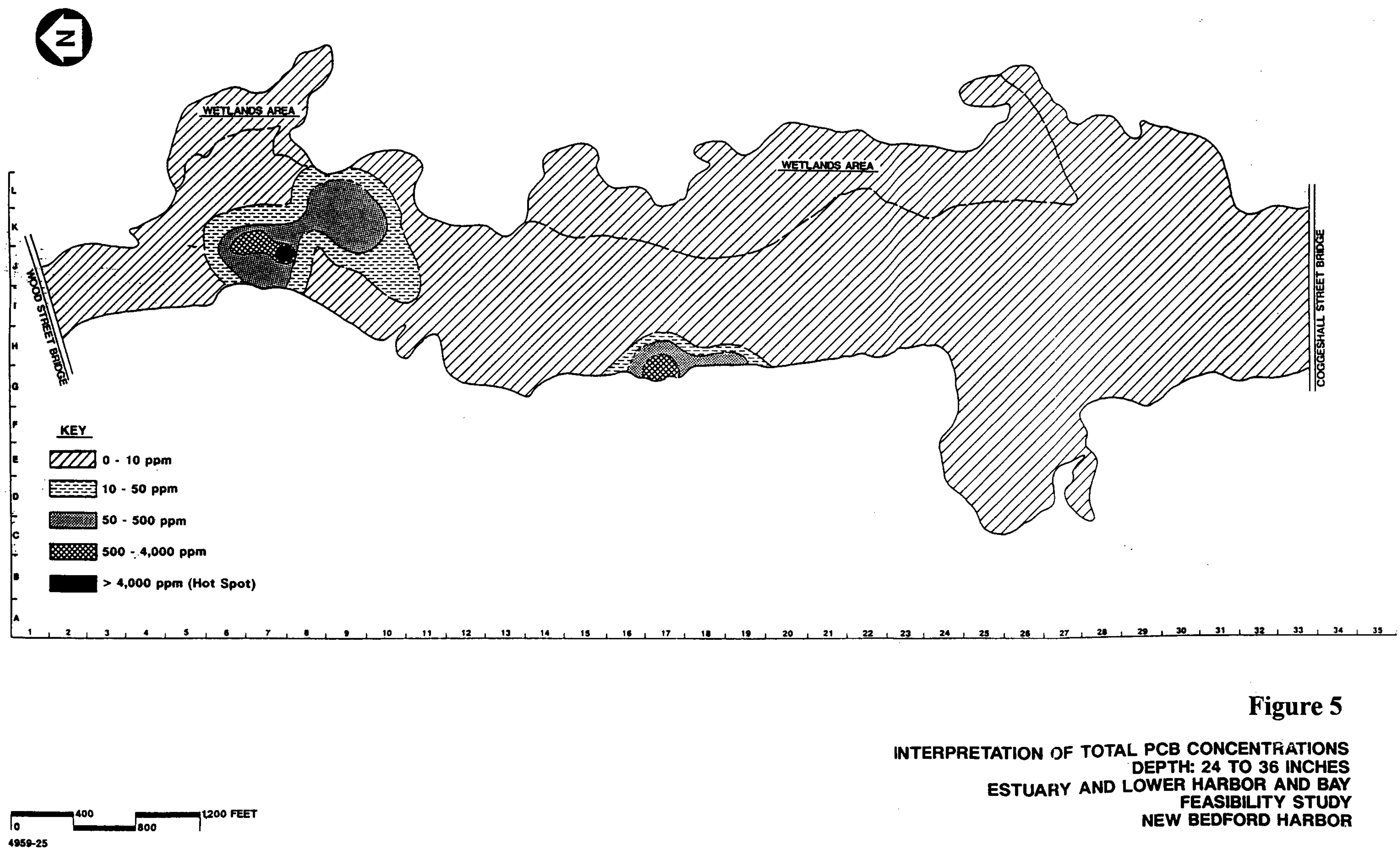


Figure 5

INTERPRETATION OF TOTAL PCB CONCENTRATIONS
DEPTH: 24 TO 36 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

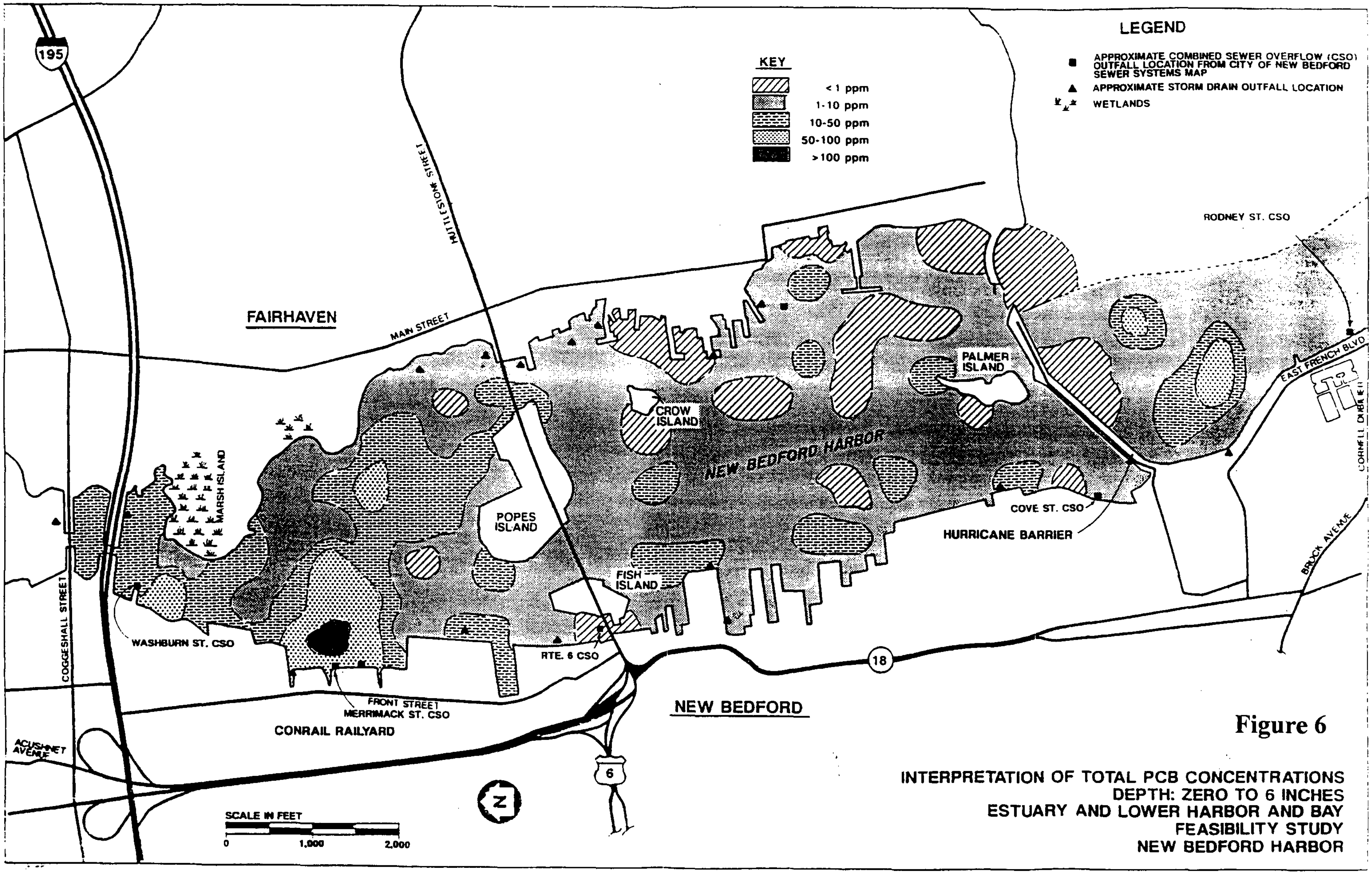
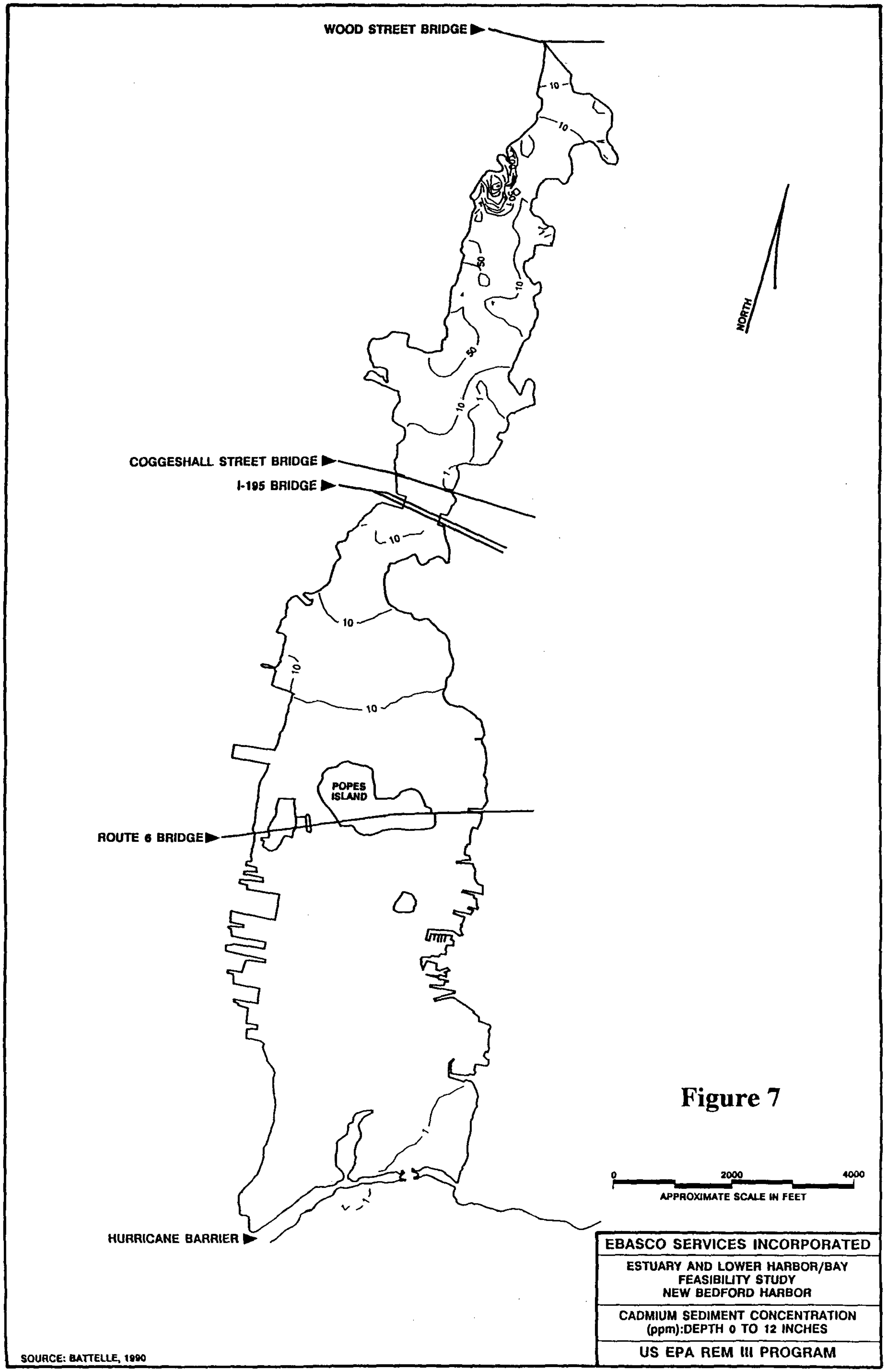


Figure 6

INTERPRETATION OF TOTAL PCB CONCENTRATIONS
DEPTH: ZERO TO 6 INCHES
ESTUARY AND LOWER HARBOR AND BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR



WOOD STREET BRIDGE
NORTH
COGGESHALL STREET BRIDGE
I-195 BRIDGE
POPES ISLAND
ROUTE 6 BRIDGE
0 2000 4000
APPROXIMATE SCALE IN FEET
HURRICANE BARRIER
EBASCO SERVICES INCORPORATED
ESTUARY AND LOWER HARBOR/BAY FEASIBILITY STUDY NEW BEDFORD HARBOR
CADMIUM SEDIMENT CONCENTRATION (ppm):DEPTH 0 TO 12 INCHES
US EPA REM III PROGRAM
SOURCE: BATTELLE, 1990

Figure 7

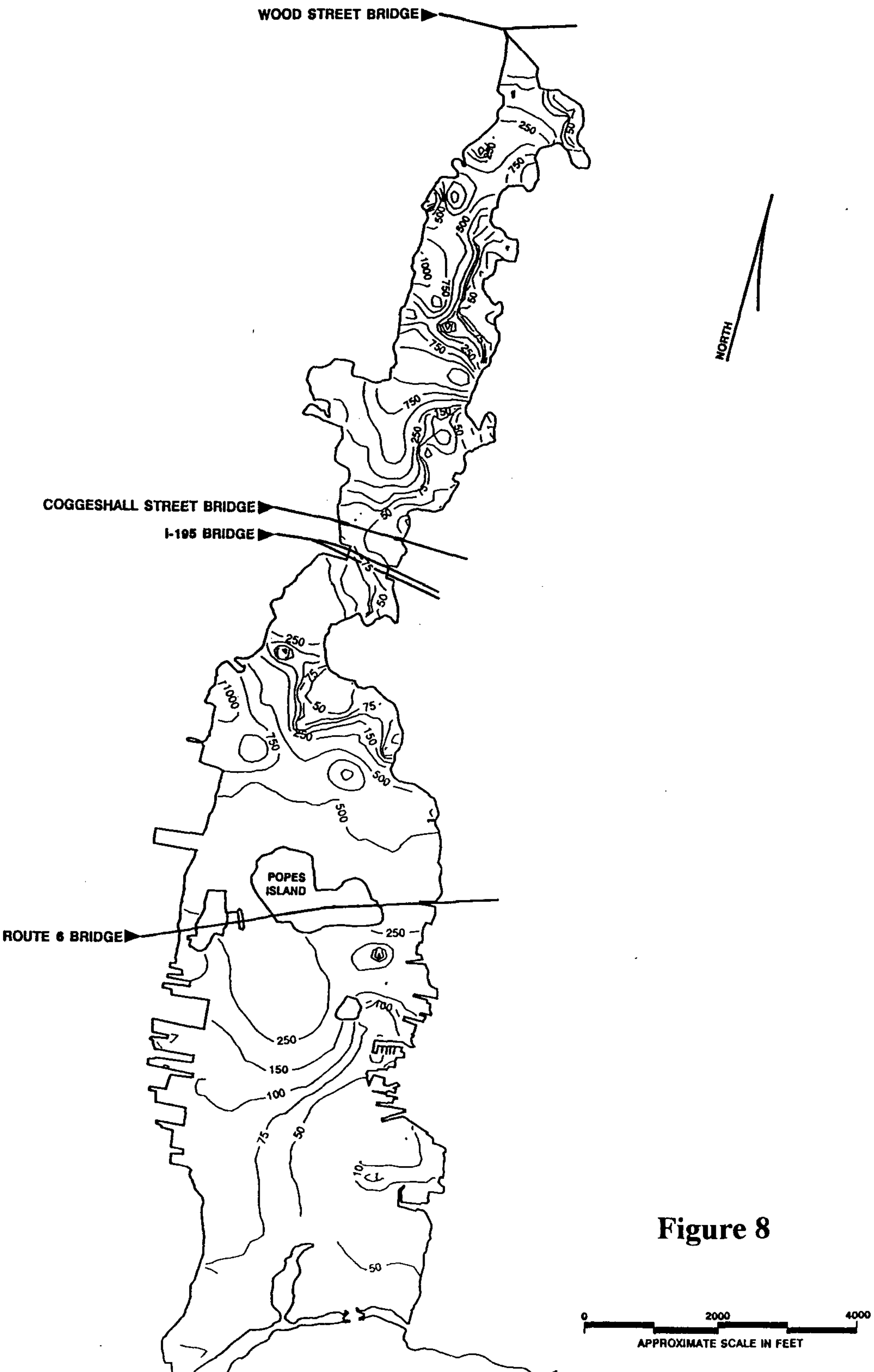


Figure 8

EBASCO SERVICES INCORPORATED

ESTUARY AND LOWER HARBOR/BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

CHROMIUM SEDIMENT CONCENTRATION
(ppm):DEPTH 0 TO 12 INCHES

US EPA REM III PROGRAM

SOURCE: BATTELLE, 1990

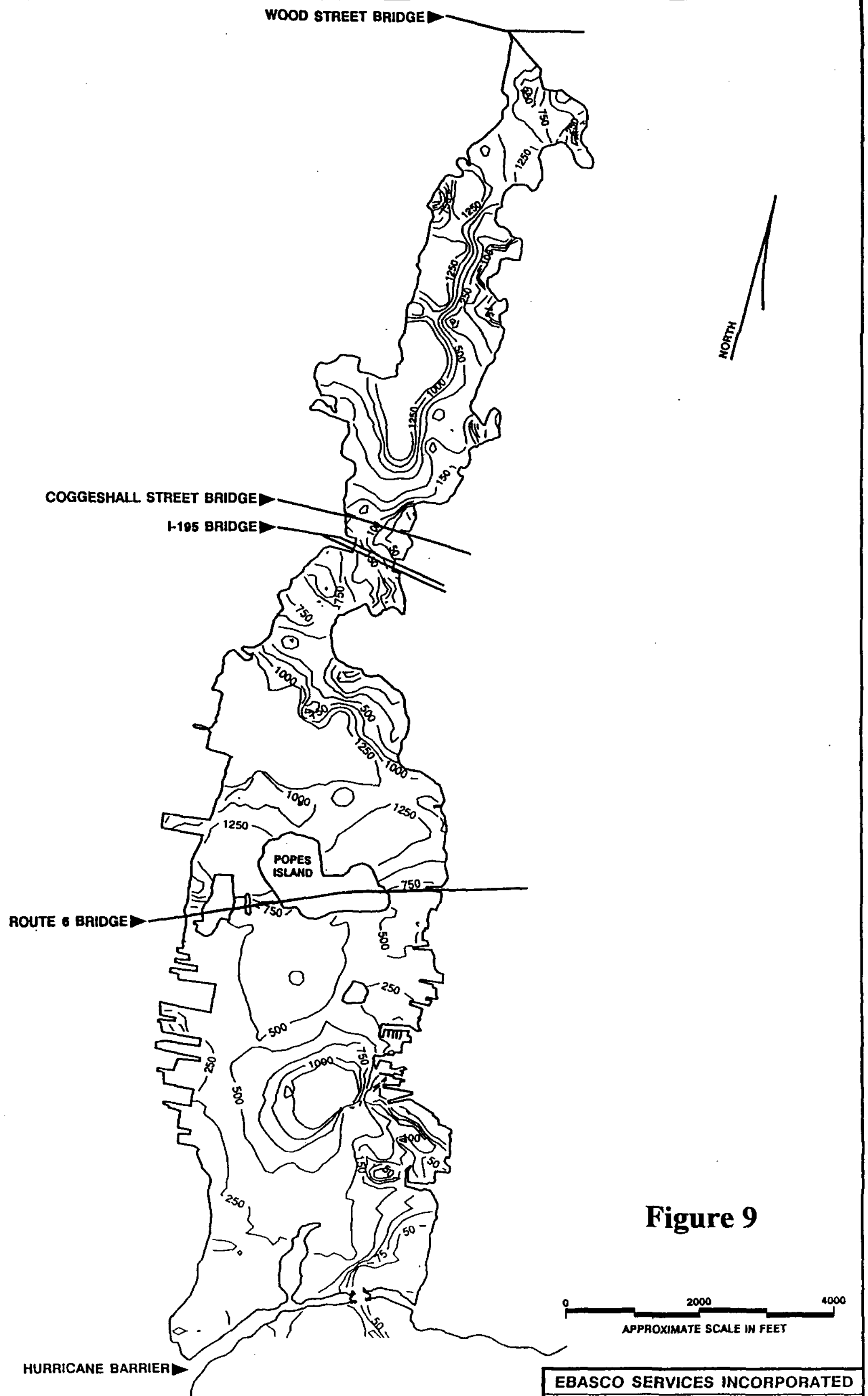


Figure 9

EBASCO SERVICES INCORPORATED

ESTUARY AND LOWER HARBOR/BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

COPPER SEDIMENT CONCENTRATION
(ppm):DEPTH 0 TO 12 INCHES

US EPA REM III PROGRAM

SOURCE: BATTELLE, 1990

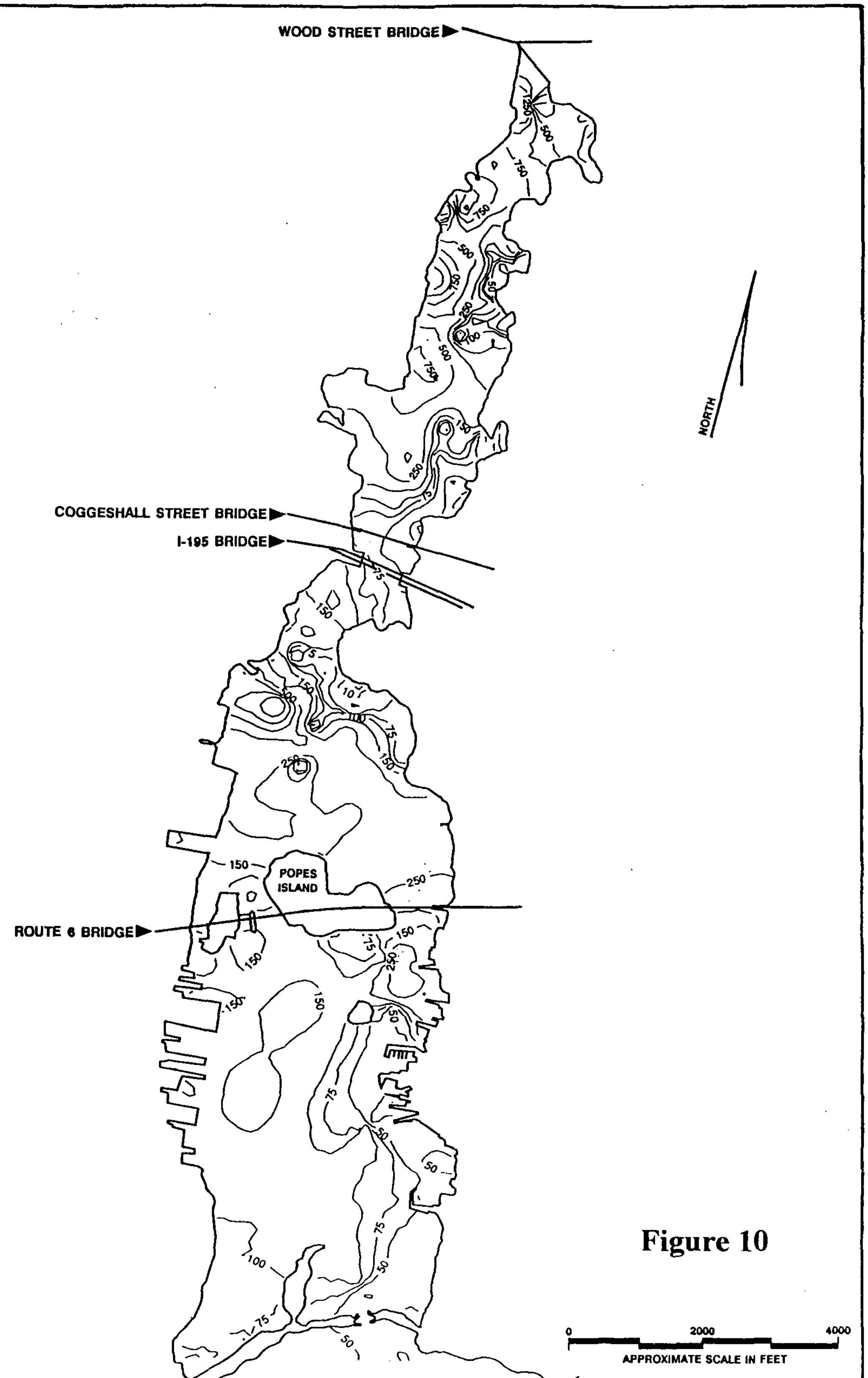


Figure 10

EBASCO SERVICES INCORPORATED

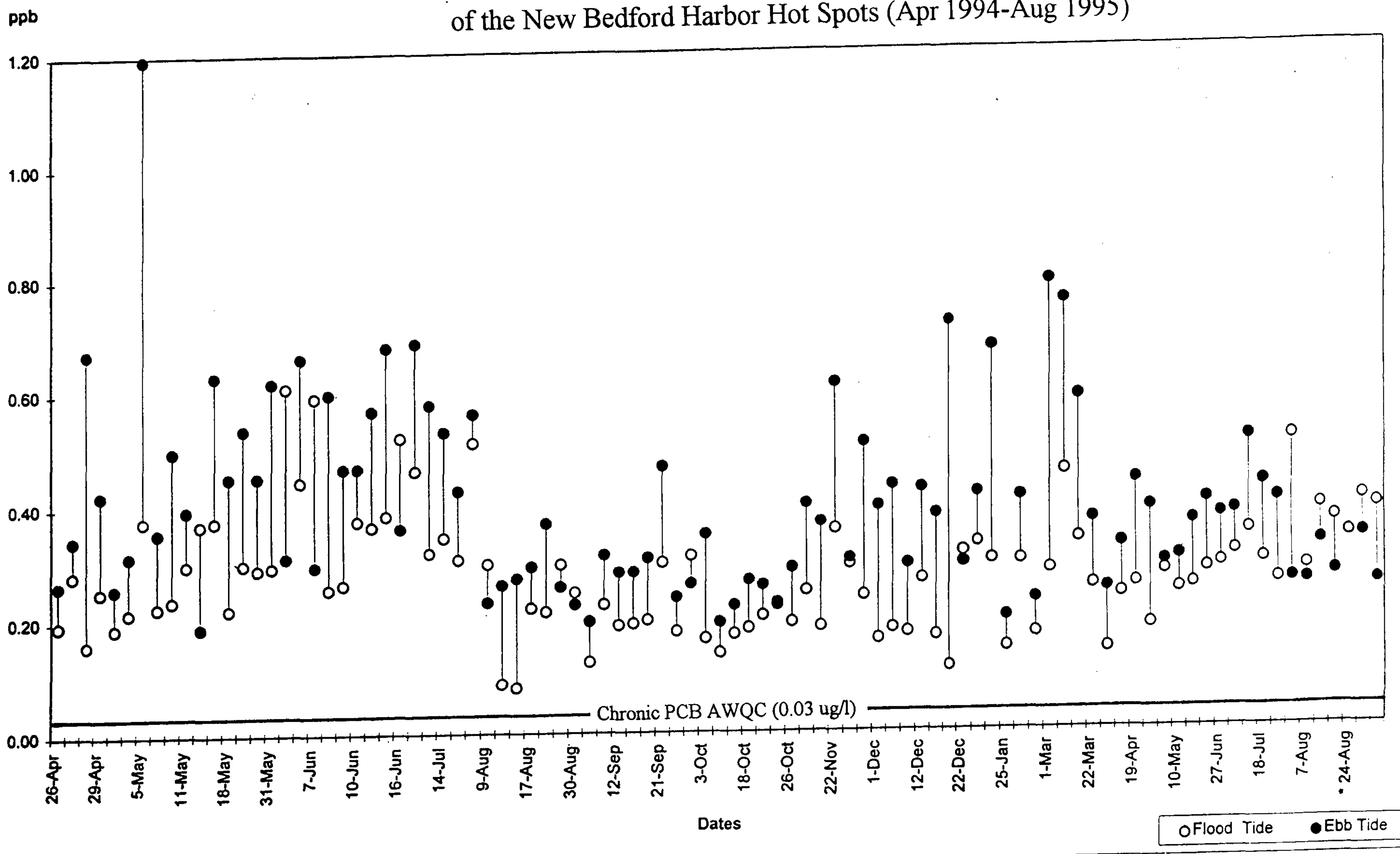
ESTUARY AND LOWER HARBOR/BAY
FEASIBILITY STUDY
NEW BEDFORD HARBOR

LEAD SEDIMENT CONCENTRATION
(ppm):DEPTH 0 TO 12 INCHES

US EPA REM III PROGRAM

SOURCE: BATTELLE, 1990

Figure 11 - Total PCB in the Water Column, Ebb v. Flood Tide Measured at the Coggeshall Street Bridge During Dredging of the New Bedford Harbor Hot Spots (Apr 1994-Aug 1995)



* No data for flood tide:

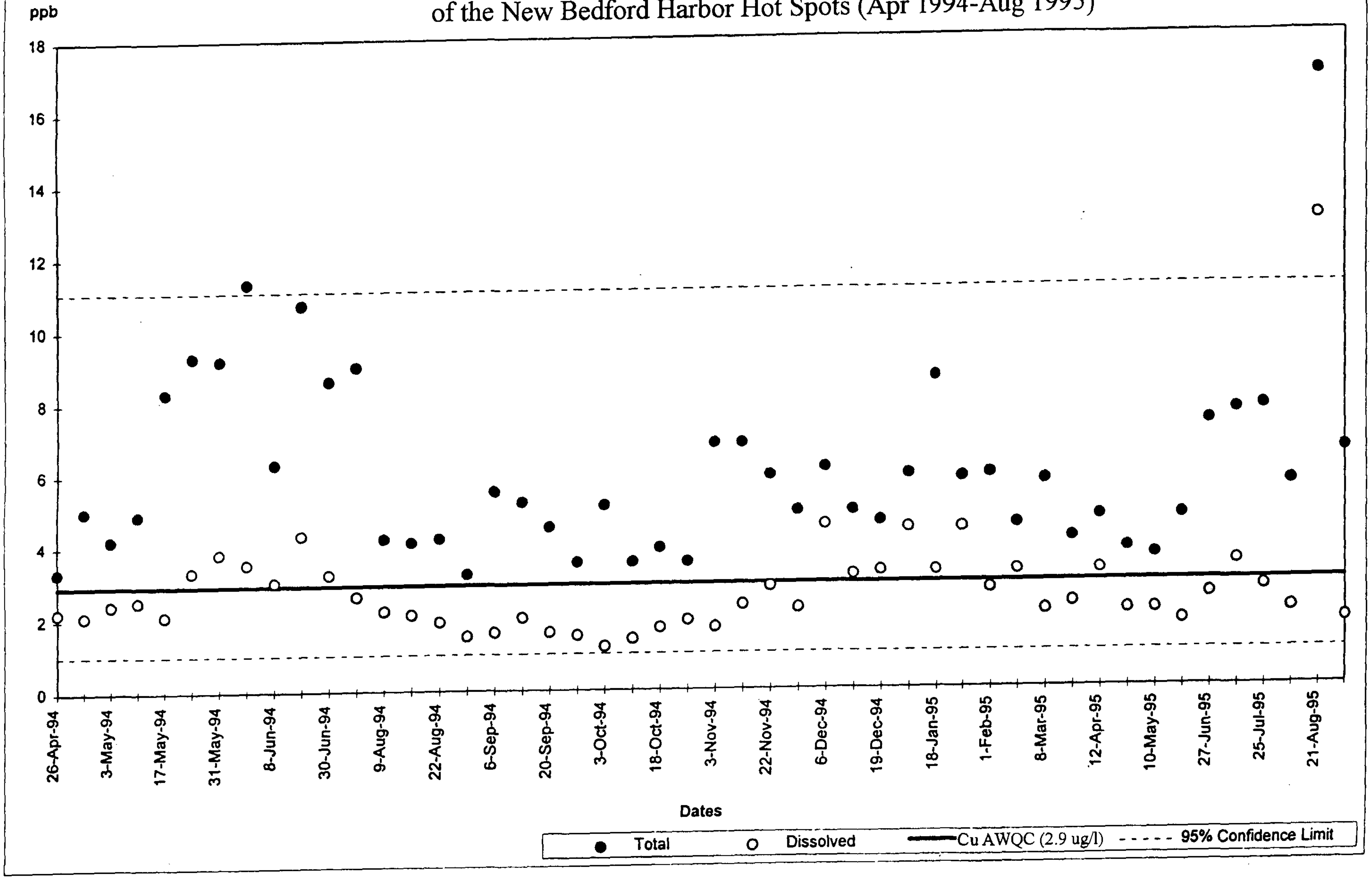
No dissolved data for 28-Apr-94

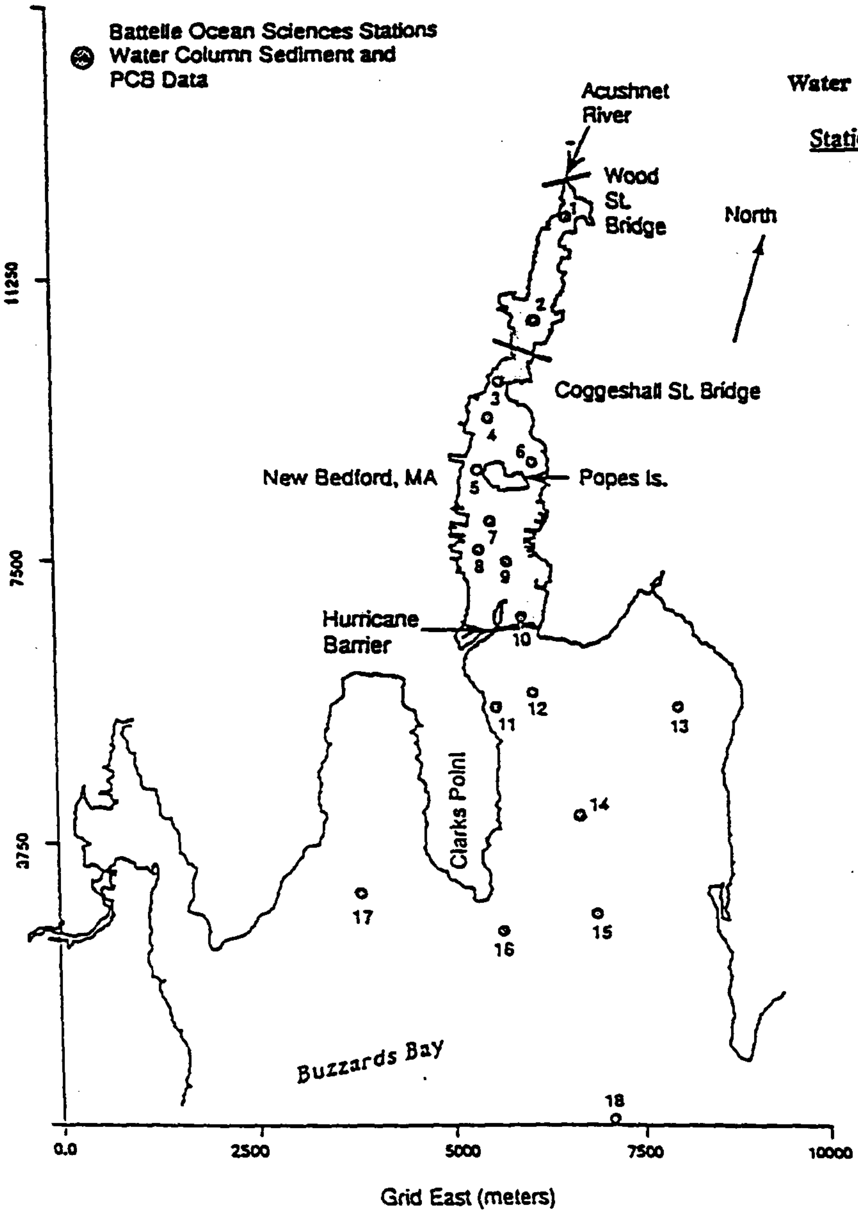
No particulate data for 10-Aug-94

No particulate data for 15-Aug-94

No flood samples taken on 24-Aug-95

Figure 12 - Total v. Dissolved Copper in the Water Column at Ebb Tide Measured at the Coggeshall Street Bridge During Dredging of the New Bedford Harbor Hot Spots (Apr 1994-Aug 1995)





Water Column PCB Concentrations

Station No.	PCB Conc. (ng/ℓ)[1]
1	7635
2	1021
3	269
4	209
5	170
6	318
7	93
8	142
9	91
10	111
11	90
12	46
13	15
14	26
15	14
16	25
17	12
18	5

Notes:

1. Water column PCB concentrations are based on the sum of geometric mean values for particulate and dissolved samples obtained from the respective sampling stations.

Reference:

"New Bedford Harbor Database," Battelle Ocean Sciences/Ebasco, 1989.

Figure 13 - Surface Water PCB Concentrations, 1987

Figure 14 - Mean PCB concentrations in blue mussels deployed for 28 days at the Coggeshall Street Bridge (values on 940808, 940916, 950907 and 951005 are for ribbed mussels)

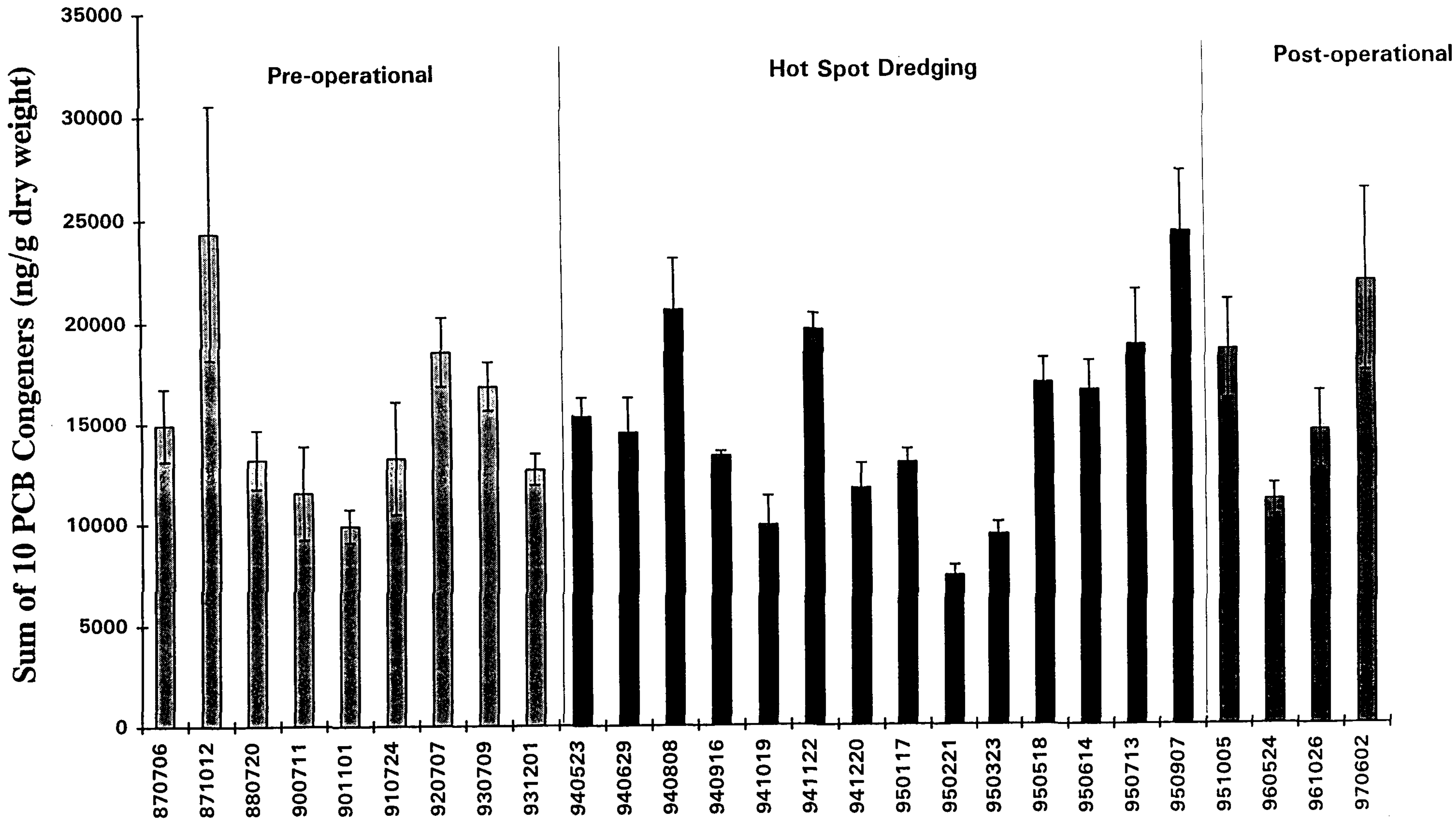


Figure 15 - Mean PCB concentrations in blue mussels deployed for 28 days at the hurricane barrier (values on 940808, 940916, 950907 and 951005 are for ribbed mussels)

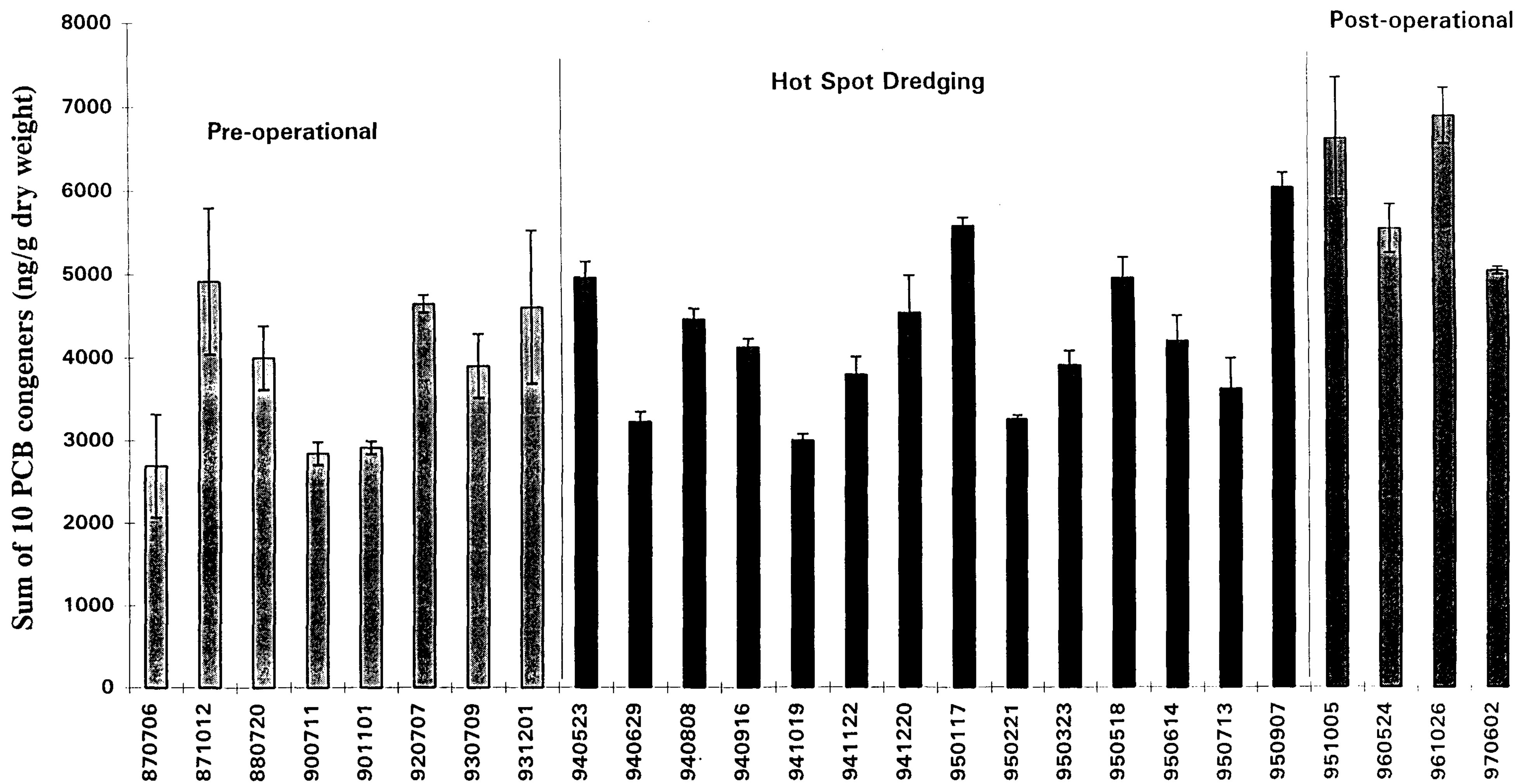


Figure 16 - Mean PCB concentrations in blue mussels deployed for 28 days at West Island (values on 940808, 940916, 950907 and 951005 are for ribbed mussels)

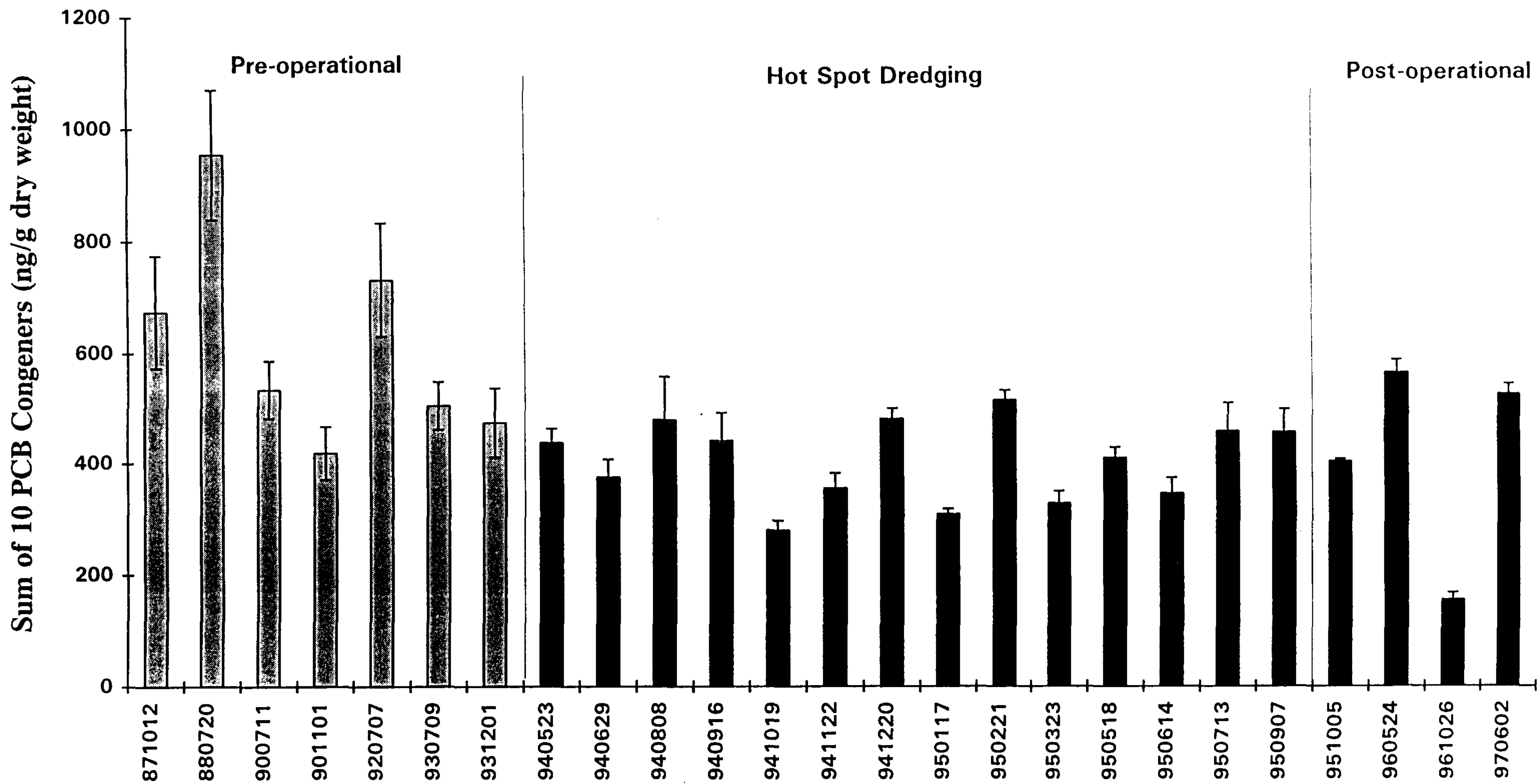
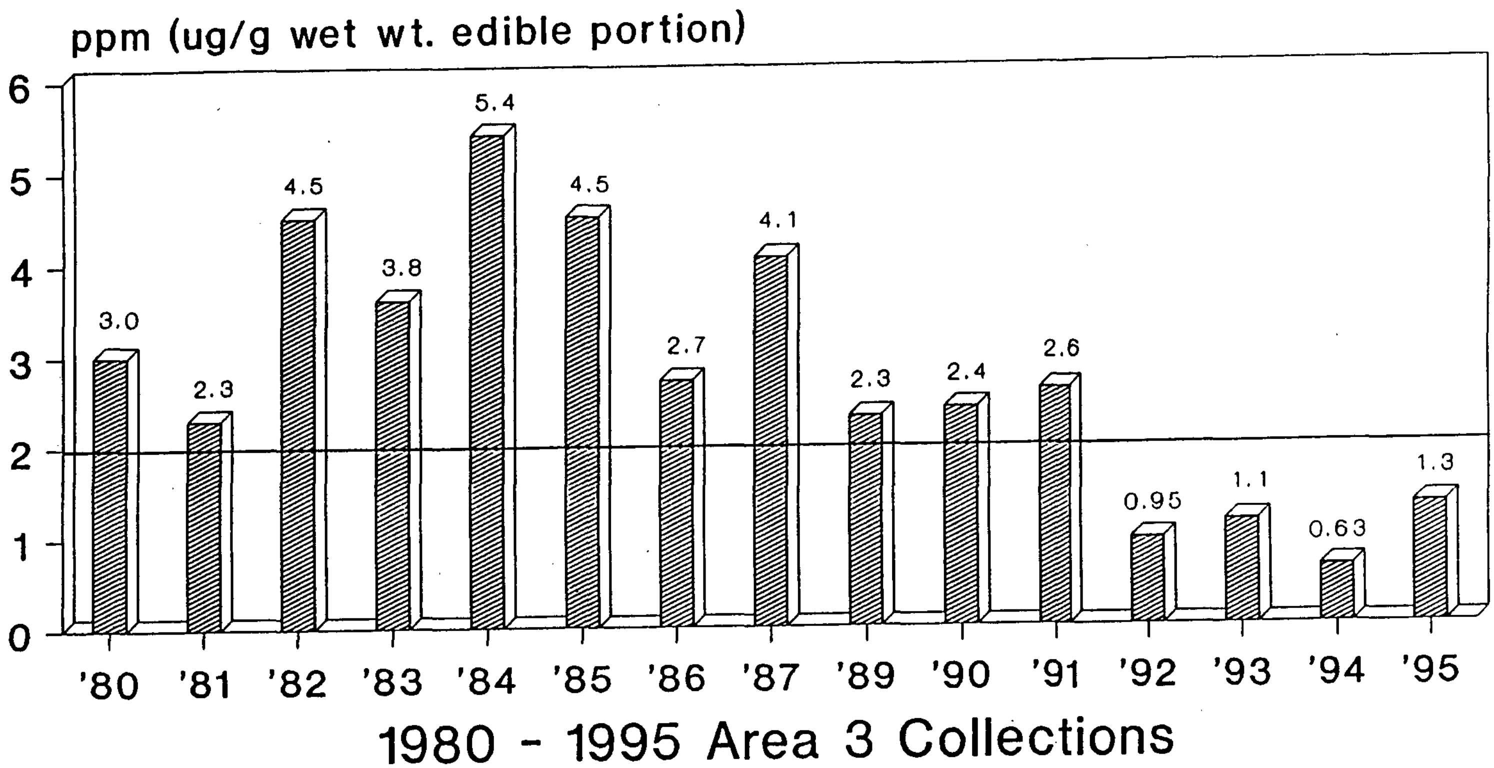


Figure 17

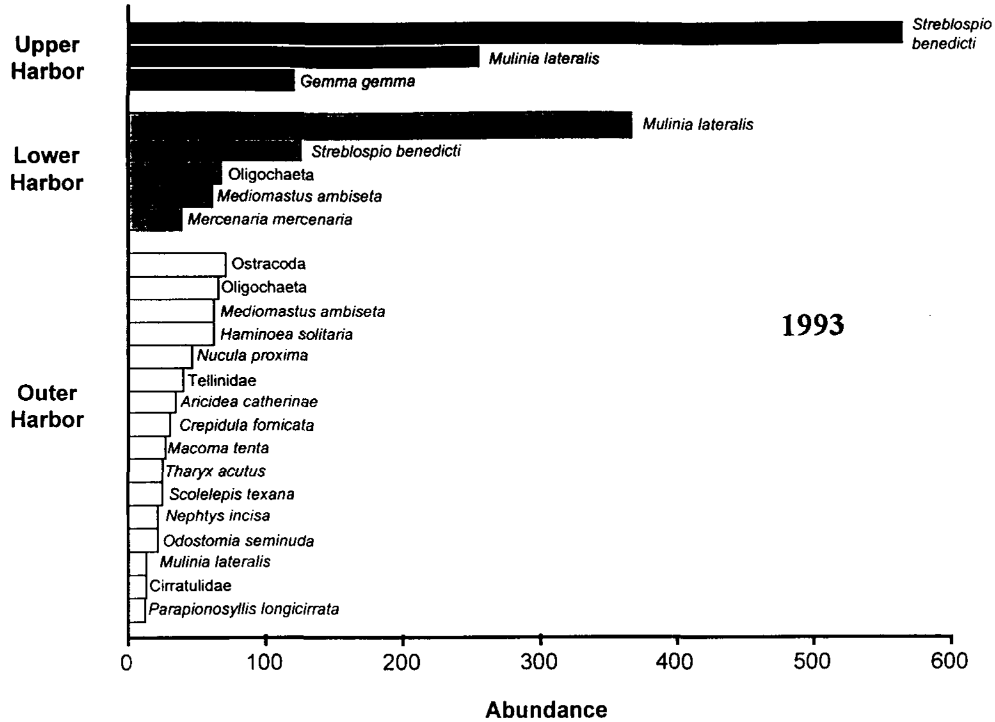
Mean Annual PCB Levels in American Lobster Outer New Bedford Harbor - Area 3



Source:
Division of Marine Fisheries
Cat Cove Marine Laboratory

Notes
1. From 1980-1990 PCBs were quantified as Aroclor 1254; from 1991-1995 PCBs were quantified as the sum of 18 congeners.

2. Includes tomally



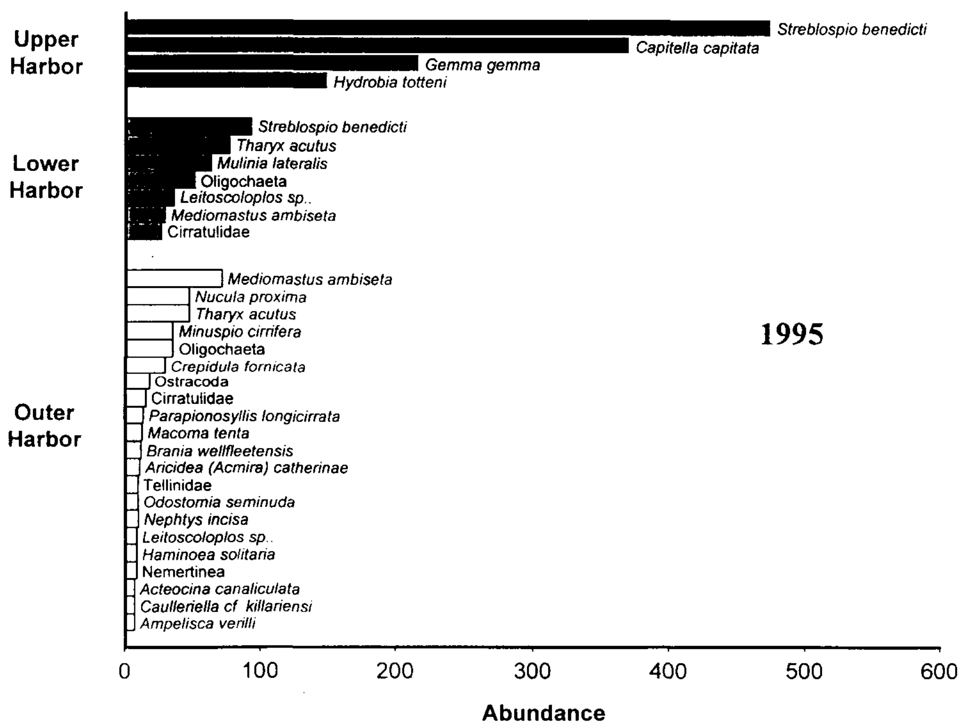


Figure 18 - Dominant benthic invertebrate species in New Bedford Harbor for 1993 (top) and 1995 (bottom) sampling. Abundances are averaged by grab for each station, then averaged for each harbor segment.

Figure 19a

Species Richness
Upper Harbor

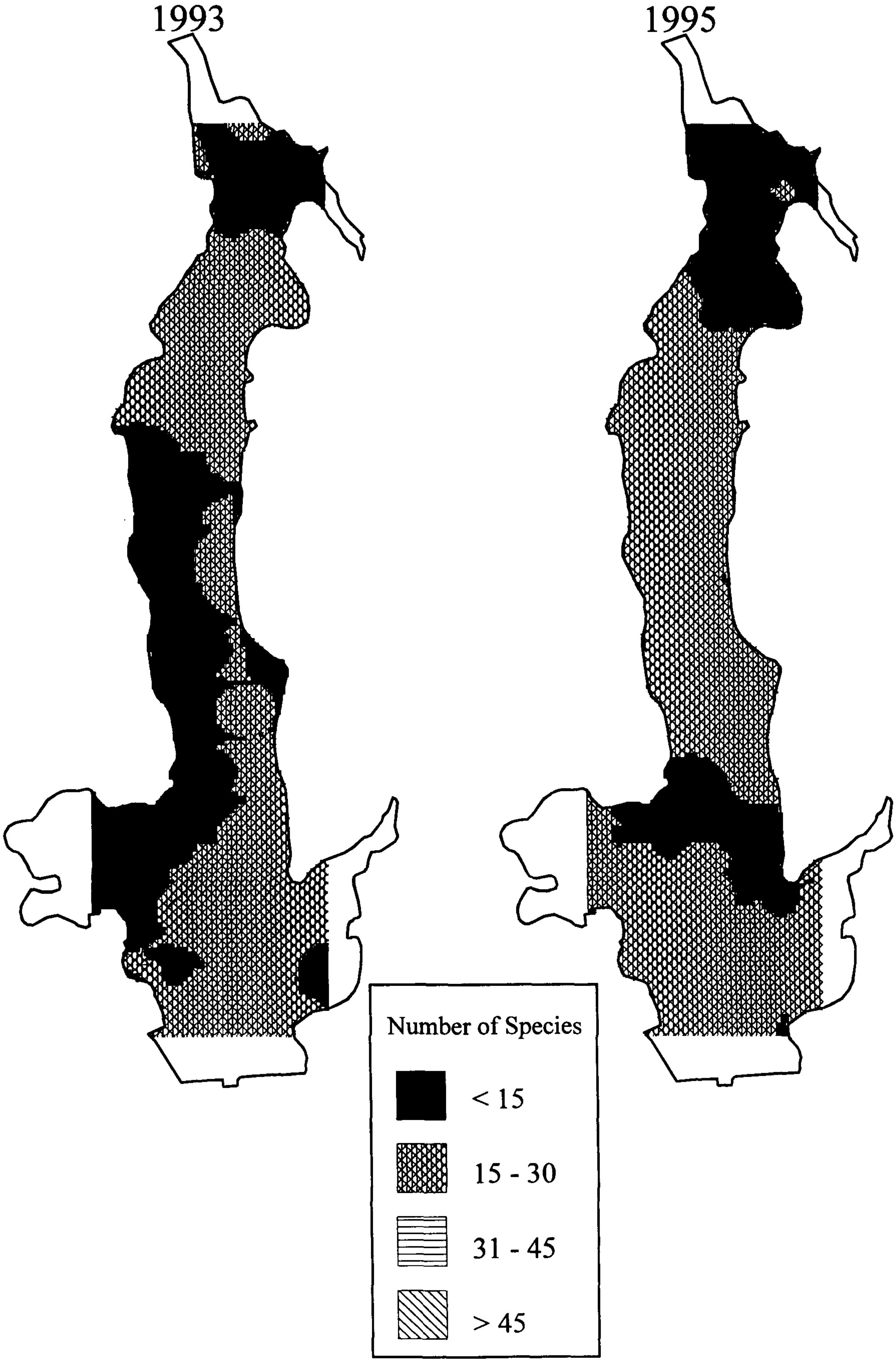


Figure 19b

Species Richness
Lower Harbor

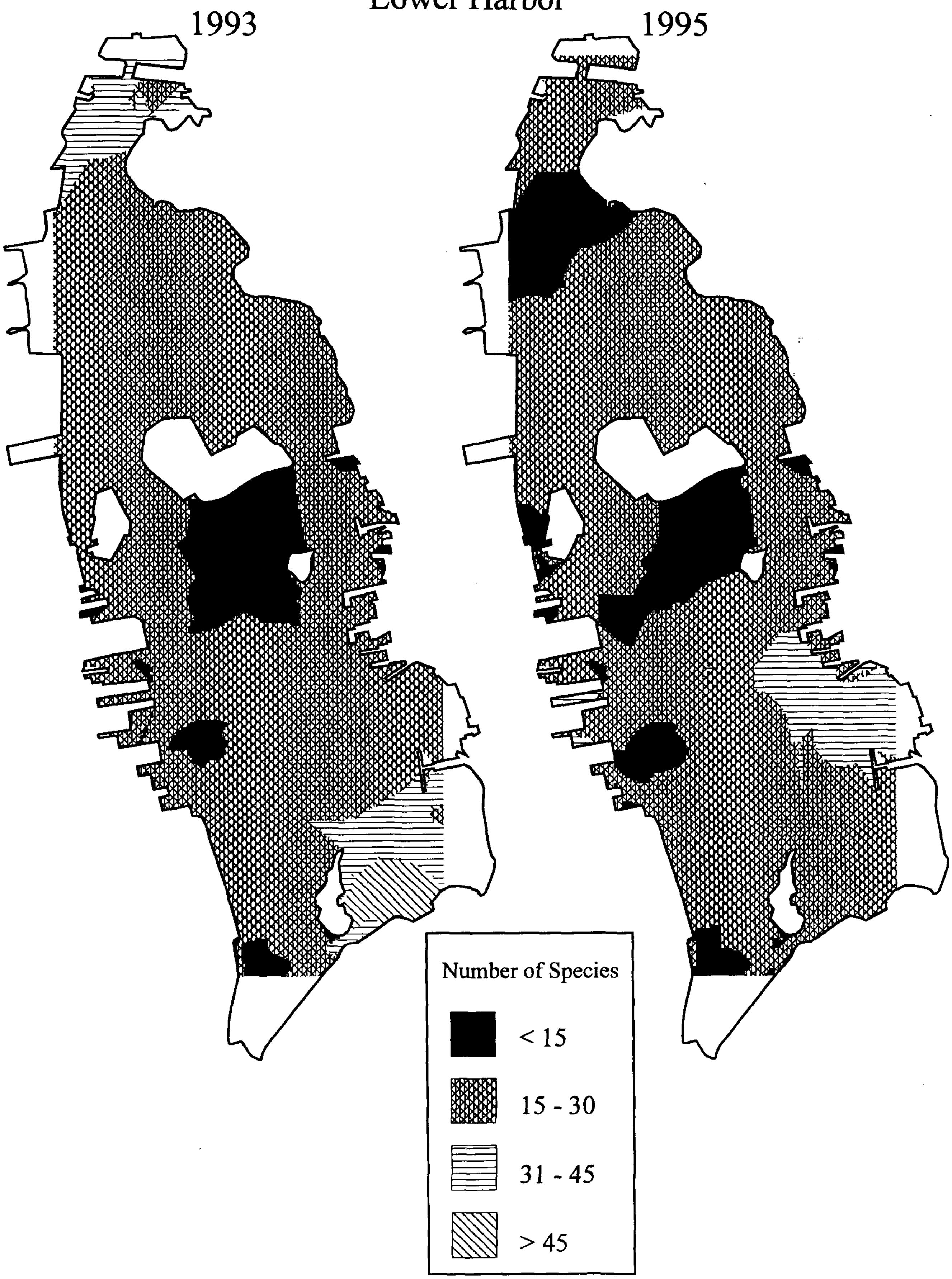


Figure 19c

Species Richness
Outer Harbor

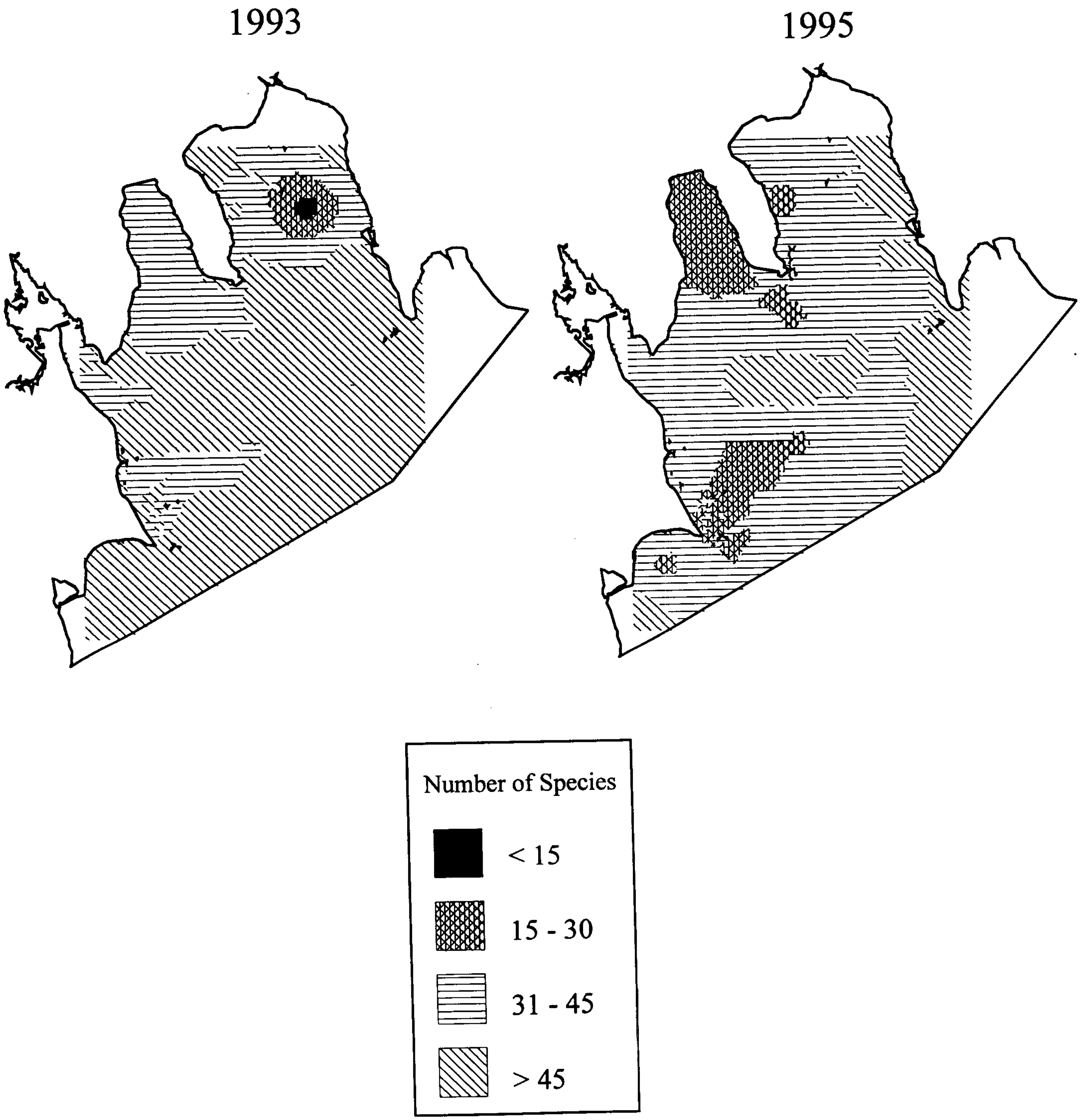


Figure 20a

Sediment Toxicity
Upper Harbor

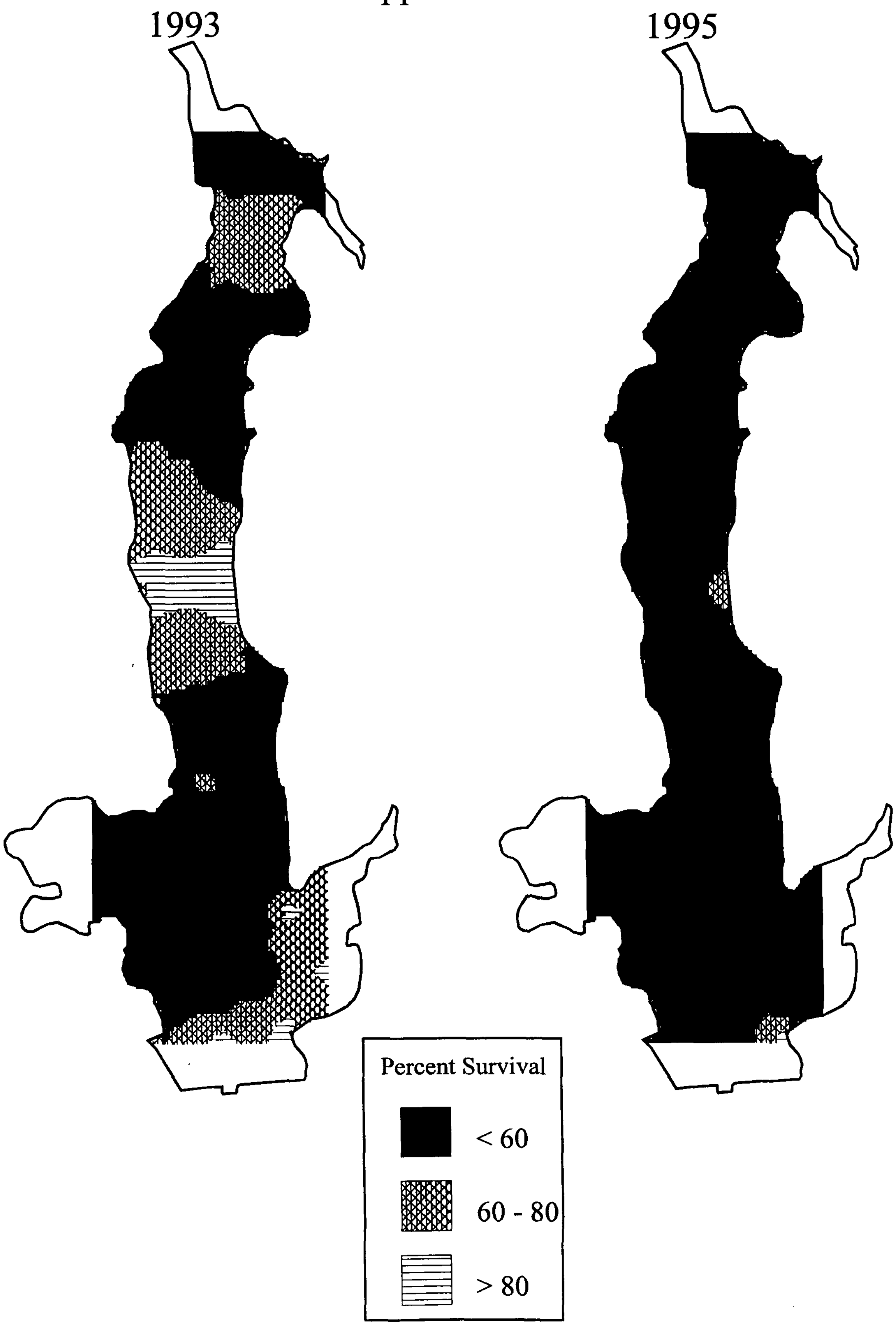


Figure 20b

Sediment Toxicity

Lower Harbor

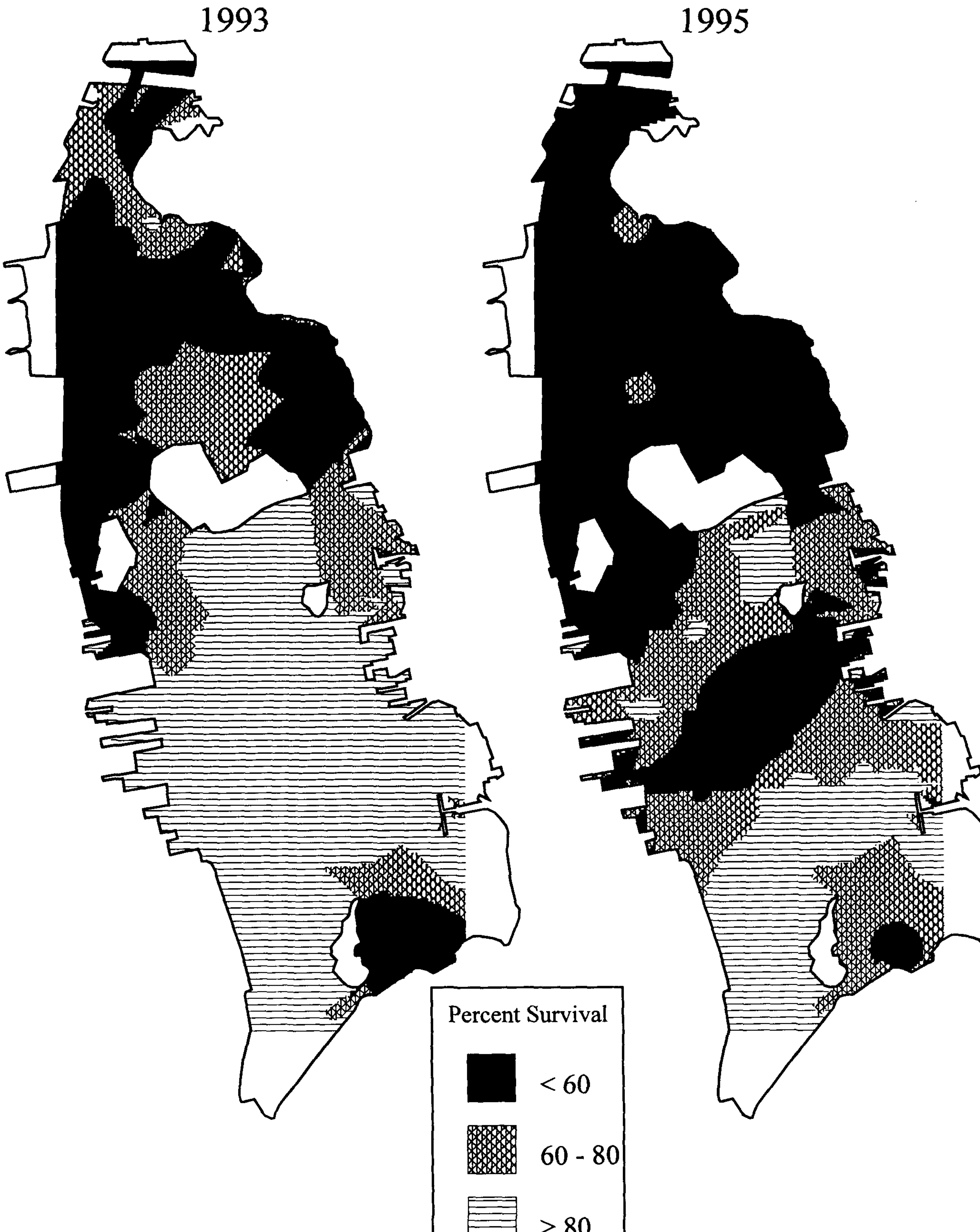
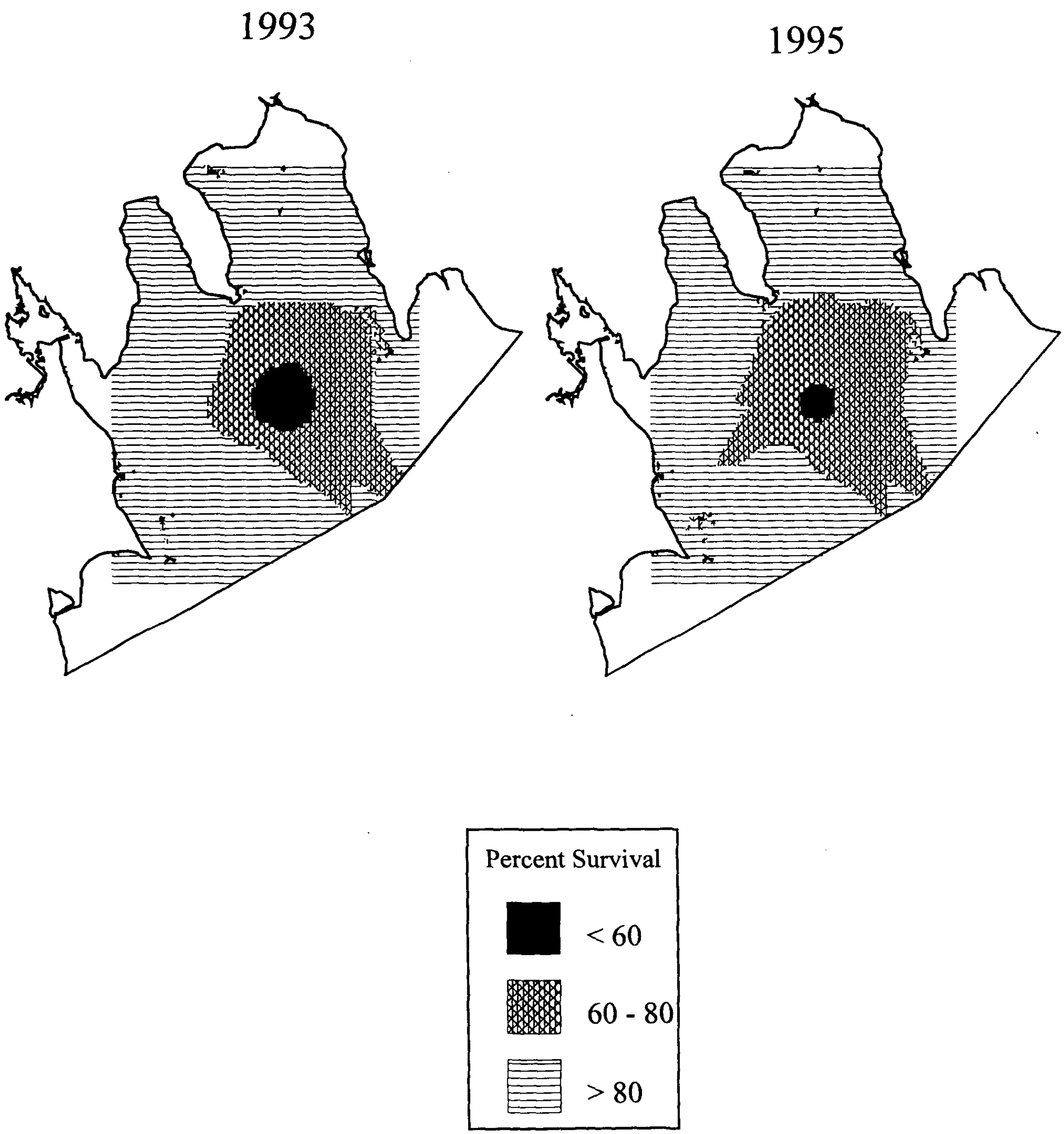


Figure 20c

Sediment Toxicity
Outer Harbor



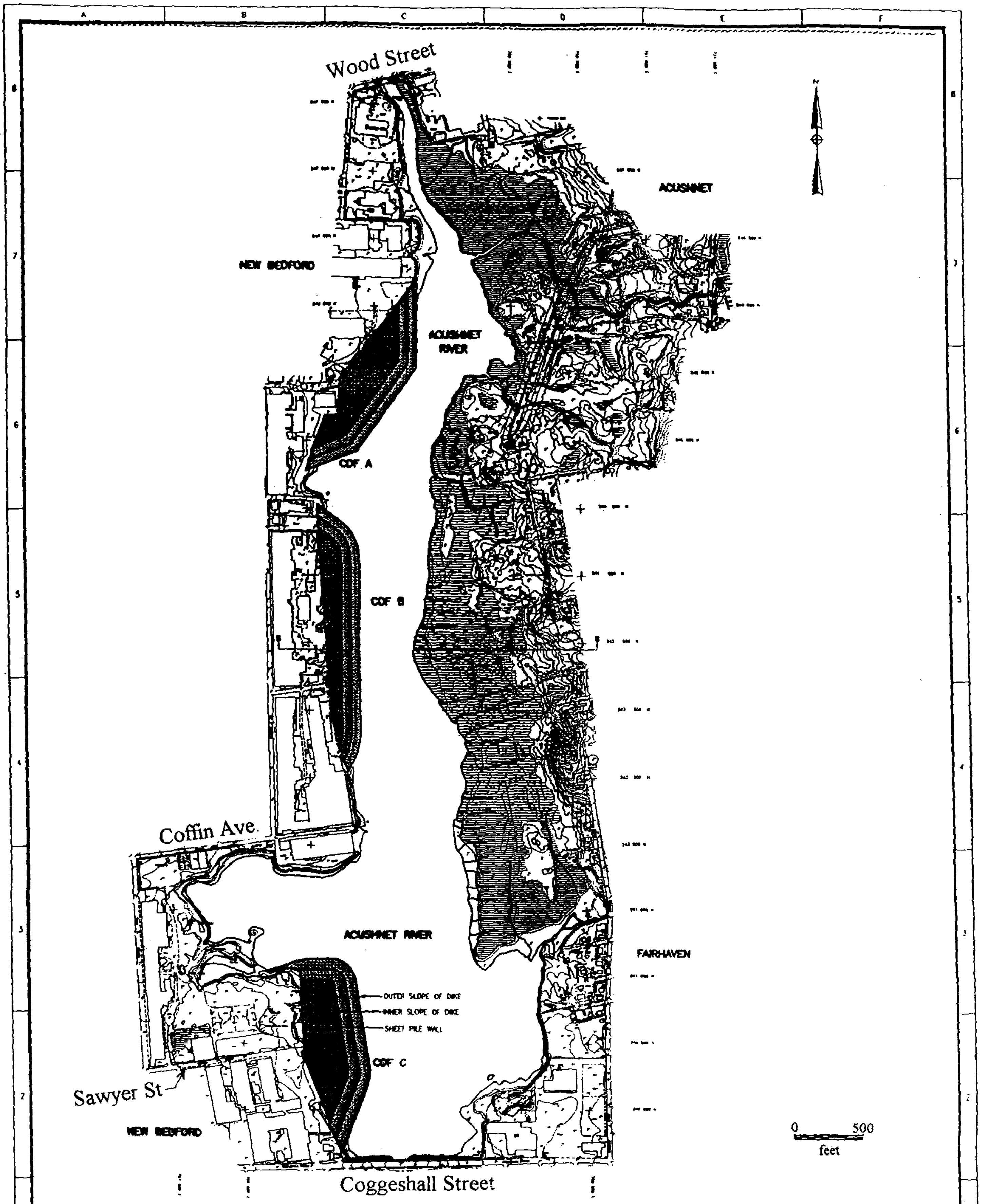


Figure 21a - Conceptual locations of upper harbor CDFs A, B and C
New Bedford Harbor Superfund Site, ROD 2

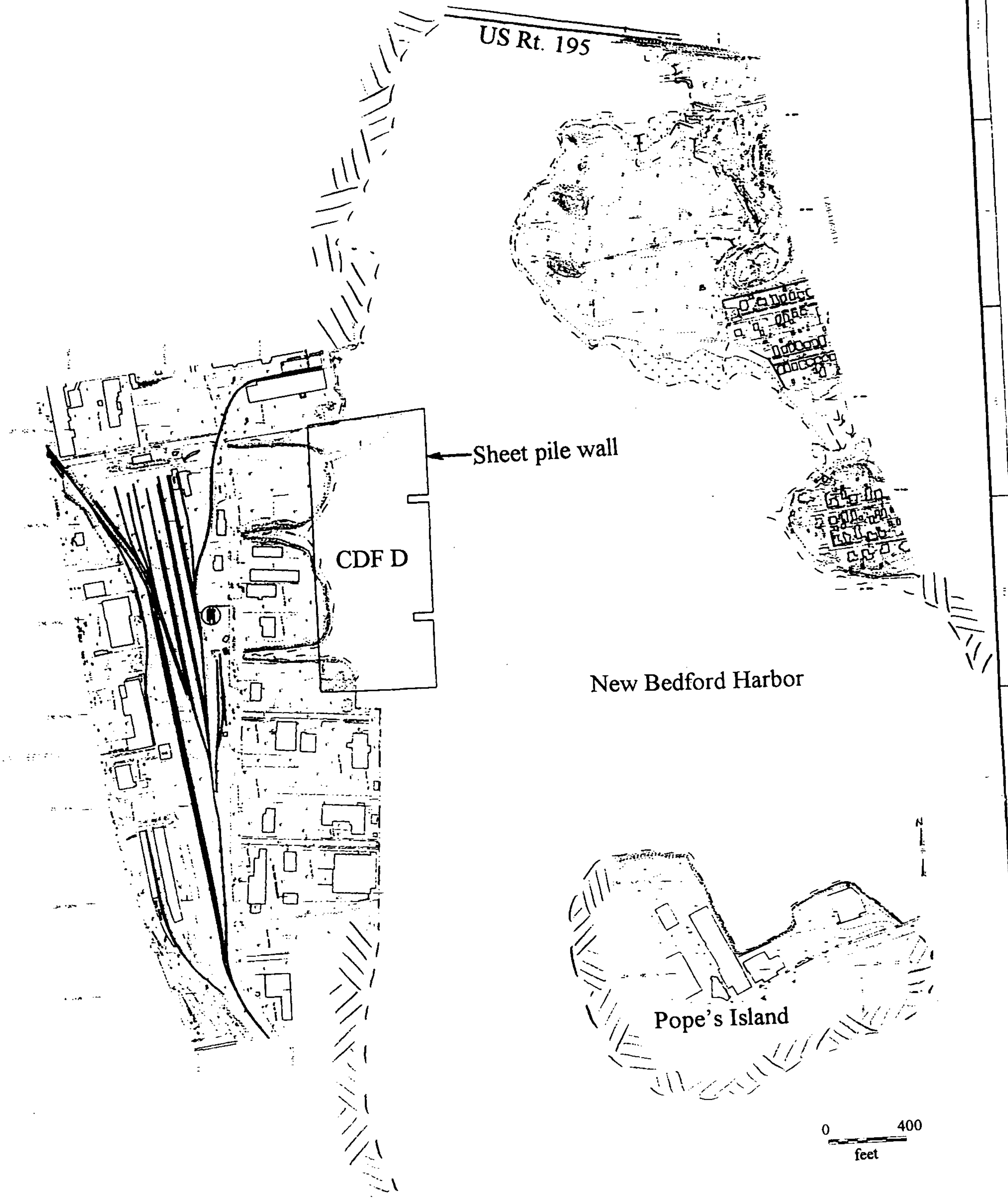


Figure 21b - Conceptual location of the lower harbor CDF D
New Bedford Harbor Superfund Site, ROD 2

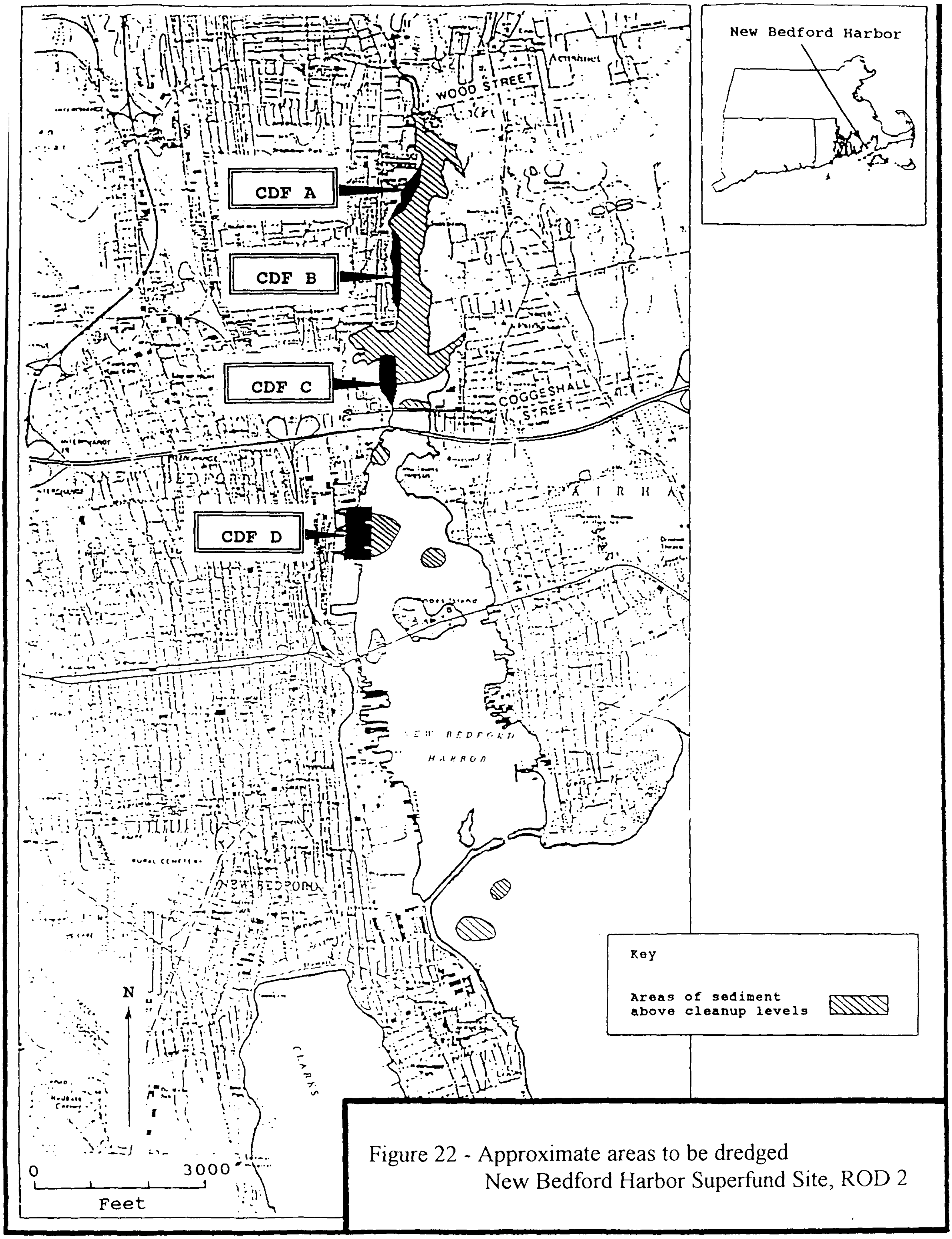


Figure 22 - Approximate areas to be dredged
New Bedford Harbor Superfund Site, ROD 2

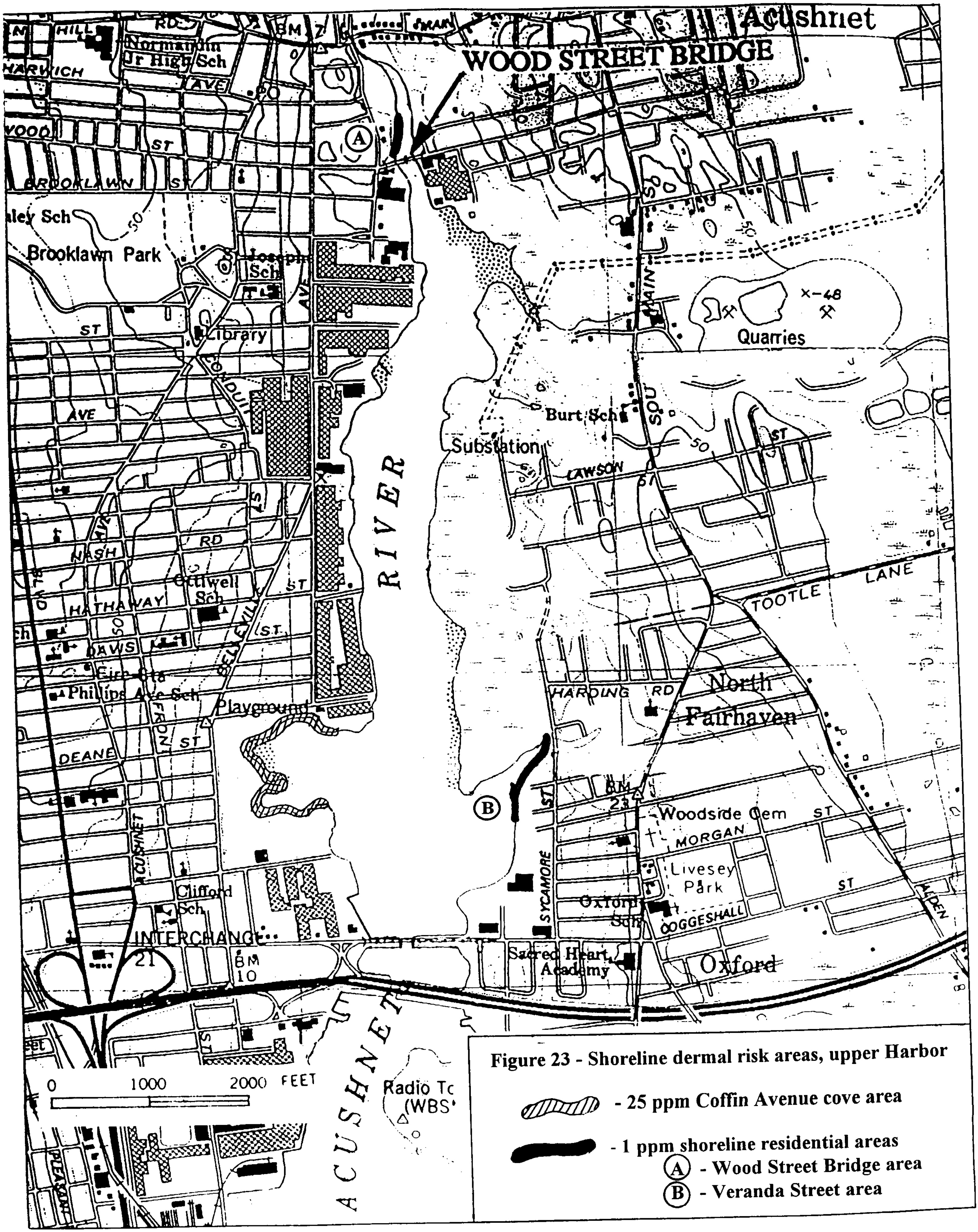


Figure 23 - Shoreline dermal risk areas, upper Harbor

TABLE 1

CONCENTRATIONS OF TOTAL PCBs (ppm) IN EDIBLE TISSUE OF BIOTA COLLECTED FROM NEW BEDFORD HARBOR NEW BEDFORD, MASSACHUSETTS

Species	Area I[1]	Area II[1]	Area III[1]	Outside of Closure Areas[1]
American Lobster[2]				
Mean	NC	0.568	0.231	0.064
Maximum	NC	1.234	0.351	0.176
Winter Flounder[3]				
Mean	1.039	0.371	0.278	0.101
Maximum	2.629	1.048	0.825	0.340
Clam				
Mean	0.689	0.231	0.156	0.039
Maximum	2.121	1.181	0.478	0.137

Notes:

1 = Areas refer to DPH Fishing Closure Areas.
2 = Lobster concentrations do not include tomalley.
3 = The edible tissue concentration was estimated using a whole body/edible tissue ratio of 0.13 (Batelle, 1987).
NC = Not Collected; lobsters were not collected from Area I.
Mean = Arithmetic mean value of all samples collected.
Maximum = Maximum value detected in each Area.

Reference:

"Draft Final Baseline Public Health Risk Assessment," EC Jordan/Ebasco, 1989.

Table 2
Human Health Risk Assessment Summary[1] - Fishing Closure Area I[2]
Probable Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal[5]	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal[5]	Exposure Route Total[6]
Seafood: Ingestion of	**PCBs**				**PCBs**				
flounder, clams or lobster[4]	- Adult[8]	$2.4x10^{-3}$	n/a	$2.4x10^{-3}$	- Adult	liver	4.0	n/a	4.0
(based on weekly ingestion	- Older Child	$7.7x10^{-4}$	n/a	$7.7x10^{-4}$	- Older Child	liver	7.0	n/a	7.0
risk results)	- Child	$7.7x10^{-4}$	n/a	$7.7x10^{-4}$	- Child	liver	14	n/a	14
	- Total[9]	$4.0x10^{-3}$	n/a	$4.0x10^{-3}$	PCBs Total		25	n/a	25
					Lead				
					- Adult	kidney	3.1	n/a	3.1
					- Older Child	kidney	5.4	n/a	5.4
					- Child	CNS	11	n/a	11
					Lead Total		20	n/a	20
					Copper				
					- Adult	blood	0.00[10]	n/a	0.00[10]
					- Older Child	blood	0.10	n/a	0.10
					- Child	blood	0.10	n/a	0.10
					Copper Total		0.20	n/a	0.20
					Cadmium				
					- Adult	kidney	0.10	n/a	0.10
					- Older Child	kidney	0.16	n/a	0.16
					- Child	kidney	0.27	n/a	0.27
					Cadmium Total		0.53	n/a	0.53
					Total Hazard Index (HI) Across Seafood Ingestion Pathway[11] =				45
					Total Liver HI =				25
					Total CNS HI[12] =				11
					Total Kidney HI[13] =				9.0
					Total Blood HI =				0.20

Refer to the footnotes following Table 7.

Table 2 (continued)
Human Health Risk Assessment Summary[1] – Fishing Closure Area I[2]
Probable Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal[5]	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal[5]	Exposure Route Total[6]
Sediment: Dermal contact and ingestion of sediment for current and future scenarios.	**PCBs**				**PCBs**				
	- Adult[8]	n/a	$2.2x10^{-4}$	$2.2x10^{-4}$	- Adult	liver	n/a	0.53	0.53
	- Older Child	n/a	$1.0x10^{-4}$	$1.0x10^{-4}$	- Older Child	liver	n/a	1.3	1.3
	- Child	$1.5x10^{-5}$	$1.2x10^{-5}$	$2.7x10^{-5}$	- Child	liver	0.57	0.27	0.84
	- Total[9, 14]	$1.5x10^{-5}$	$3.3x10^{-4}$	$3.5x10^{-4}$	PCBs Total		0.57	2.1	2.7
					Lead				
					- Adult	kidney	n/a	0.0070	0.0070
					- Older Child	kidney	n/a	0.018	0.018
					- Child	CNS	3.1	0.020	3.1
					Lead Total		3.1	0.045	3.1
					Copper				
					- Adult	blood	n/a	0.000055	0.000055
					- Older Child	blood	n/a	0.00014	0.00014
					- Child	blood	0.041	0.00030	0.041
					Copper Total		0.041	0.00050	0.041
					Cadmium				
					- Adult	kidney	n/a	0.000075	0.000075
					- Older Child	kidney	n/a	0.00020	0.00020
					- Child	kidney	0.042	0.00030	0.042
					Cadmium Total		0.042	0.00058	0.042
					Total Hazard Index (HI) Across Sediment Exposure Pathways[11] =				5.9
					Total Liver HI =				2.7
					Total CNS HI[12] =				3.1
					Total Kidney HI[13] =				0.067
					Total Blood HI =				0.041

Refer to the footnotes following Table 7.

Table 3
Human Health Risk Assessment Summary[1] - Fishing Closure Area II[2]
Probable Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Seafood: Ingestion of flounder, clams or lobster[4] (based on weekly ingestion risk results)	**PCBs**				**PCBs**				
	- Adult[8]	1.1×10^{-3}	n/a	1.1×10^{-3}	- Adult	liver	1.8	n/a	1.8
	- Older Child	3.4×10^{-4}	n/a	3.4×10^{-4}	- Older Child	liver	3.2	n/a	3.2
	- Child	3.4×10^{-4}	n/a	3.4×10^{-4}	- Child	liver	6.3	n/a	6.3
	- Total[9]	1.8×10^{-3}	n/a	1.8×10^{-3}	PCBs Total		11	n/a	11
					Lead				
					- Adult	kidney	2.8	n/a	2.8
					- Older Child	kidney	4.9	n/a	4.9
					- Child	CNS	9.7	n/a	9.7
					Lead Total		17	n/a	17
					Copper				
					- Adult	blood	0.00[10]	n/a	0.00[10]
					- Older Child	blood	0.10	n/a	0.10
					- Child	blood	0.20	n/a	0.20
					Copper Total		0.30	n/a	0.30
					Cadmium				
					- Adult	kidney	0.17	n/a	0.17
					- Older Child	kidney	0.34	n/a	0.34
					- Child	kidney	0.68	n/a	0.68
					Cadmium Total		1.2	n/a	1.2
					Total Hazard Index (HI) Across Seafood Ingestion Pathway[11] =				30
					Total Liver HI =				11
					Total CNS HI[12] =				9.7
					Total Kidney HI[13] =				8.9
					Total Blood HI =				0.30

Refer to the footnotes following Table 7.

Table 3 (continued)
Human Health Risk Assessment Summary[1] - Fishing Closure Area II[2]
Probable Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Sediment: Dermal contact and ingestion of sediment for current and future scenarios.	**PCBs**				**PCBs**				
	- Adult[8]	n/a	$5.5x10^{-6}$	$5.5x10^{-6}$	- Adult	liver	n/a	0.010	0.010
	- Older Child	n/a	$2.6x10^{-6}$	$2.6x10^{-6}$	- Older Child	liver	n/a	0.020	0.020
	- Child	$2.0x10^{-6}$	$2.7x10^{-6}$	$4.7x10^{-6}$	- Child	liver	0.11	0.050	0.16
	- Total[9, 14]	$2.0x10^{-6}$	$1.1x10^{-5}$	$1.3x10^{-5}$	PCBs Total		0.11	0.080	0.19
					Lead				
					- Adult	kidney	n/a	0.0014	0.0014
					- Older Child	kidney	n/a	0.0040	0.0040
					- Child	CNS	1.1	0.0070	1.1
					Lead Total		1.1	0.012	1.1
					Copper				
					- Adult	blood	n/a	0.0000090	0.0000090
					- Older Child	blood	n/a	0.000020	0.000020
					- Child	blood	0.0070	0.000050	0.0071
					Copper Total		0.0070	0.000079	0.0071
					Cadmium				
					- Adult	kidney	n/a	n/a	n/a
					- Older Child	kidney	n/a	n/a	n/a
					- Child	kidney	n/a	n/a	n/a
					Cadmium Total		n/a	n/a	n/a
					Total Hazard Index (HI) Across Sediment Exposure Pathways[11] =				1.3
					Total Liver HI =				0.19
					Total CNS HI[12] =				1.1
					Total Kidney HI[13] =				0.0054
					Total Blood HI =				0.0071

Refer to the footnotes following Table 7.

Table 4
Human Health Risk Assessment Summary[1] - *Fishing Closure Area III*[2, 15]
Probable Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Seafood: Ingestion of flounder, clams or lobster[4] (based on weekly ingestion risk results)	**PCBs**				**PCBs**				
	- Adult[8]	$6.0x10^{-4}$	n/a	$6.0x10^{-4}$	- Adult	liver	1.0	n/a	1.0
	- Older Child	$1.9x10^{-4}$	n/a	$1.9x10^{-4}$	- Older Child	liver	1.7	n/a	1.7
	- Child	$1.9x10^{-4}$	n/a	$1.9x10^{-4}$	- Child	liver	3.5	n/a	3.5
	- Total[9]	$1.0x10^{-3}$	n/a	$1.0x10^{-3}$	PCBs Total		6.2	n/a	6.2
					Lead				
					- Adult	kidney	2.4	n/a	2.4
					- Older Child	kidney	4.3	n/a	4.3
					- Child	CNS	8.5	n/a	8.5
					Lead Total		15	n/a	15
					Copper				
					- Adult	blood	0.10	n/a	0.10
					- Older Child	blood	0.20	n/a	0.20
					- Child	blood	0.40	n/a	0.40
					Copper Total		0.70	n/a	0.70
					Cadmium				
					- Adult	kidney	0.20	n/a	0.20
					- Older Child	kidney	0.34	n/a	0.34
					- Child	kidney	0.64	n/a	0.64
					Cadmium Total		1.2	n/a	1.2
					Total Hazard Index (HI) Across Seafood Ingestion Pathways[11] =				23
					Total Liver HI =				6.2
					Total CNS HI[12] =				8.5
					Total Kidney HI[13] =				7.9
					Total Blood HI =				0.70

Refer to the footnotes following Table 7.

Table 5
Human Health Risk Assessment Summary[1] - Fishing Closure Area I[2]
Conservative Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal[5]	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal[5]	Exposure Route Total[6]
Seafood: Ingestion of flounder, clams or lobster[4] (based on weekly ingestion risk results)	**PCBs**				**PCBs**				
	- Adult[8]	6.6×10^{-3}	n/a	6.6×10^{-3}	- Adult	liver	11	n/a	11
	- Older Child	2.1×10^{-3}	n/a	2.1×10^{-3}	- Older Child	liver	19	n/a	19
	- Child	2.1×10^{-3}	n/a	2.1×10^{-3}	- Child	liver	38	n/a	38
	- Total[9]	1.1×10^{-2}	n/a	1.1×10^{-2}	PCBs Total		68	n/a	68
					Lead				
					- Adult	kidney	8.5	n/a	8.5
					- Older Child	kidney	15	n/a	15
					- Child	CNS	30	n/a	30
					Lead Total		54	n/a	54
					Copper				
					- Adult	blood	0.10	n/a	0.10
					- Older Child	blood	0.20	n/a	0.20
					- Child	blood	0.50	n/a	0.50
					Copper Total		0.80	n/a	0.80
					Cadmium				
					- Adult	kidney	0.16	n/a	0.16
					- Older Child	kidney	0.31	n/a	0.31
					- Child	kidney	0.57	n/a	0.57
					Cadmium Total		1.0	n/a	1.0
					Total Hazard Index (HI) Across Seafood Ingestion Pathway[11] =				120
					Total Liver HI =				68
					Total CNS HI[12] =				30
					Total Kidney HI[13] =				25
					Total Blood HI =				0.80

Refer to the footnotes following Table 7.

Table 5 (continued)
Human Health Risk Assessment Summary[1] - Fishing Closure Area I[2]
Conservative Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal[5]	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal[5]	Exposure Route Total[6]
Sediment: Dermal contact and ingestion of sediment for current and future scenarios.	**PCBs**				**PCBs**				
	- Adult[8]	n/a	1.5×10^{-2}	1.5×10^{-2}	- Adult	liver	n/a	66	66
	- Older Child	n/a	4.3×10^{-3}	4.3×10^{-3}	- Older Child	liver	n/a	100	100
	- Child	1.9×10^{-3}	1.2×10^{-3}	3.1×10^{-3}	- Child	liver	96	51	150
	- Total[9, 14]	1.9×10^{-3}	2.0×10^{-2}	2.2×10^{-2}	PCBs Total		96	220	320
					Lead				
					- Adult	kidney	n/a	0.23	0.23
					- Older Child	kidney	n/a	0.35	0.35
					- Child	CNS	44	0.31	44
					Lead Total		44	0.89	45
					Copper				
					- Adult	blood	n/a	0.0023	0.0023
					- Older Child	blood	n/a	0.0034	0.0034
					- Child	blood	0.62	0.0050	0.62
					Copper Total		0.62	0.011	0.63
					Cadmium				
					- Adult	kidney	n/a	0.0024	0.0024
					- Older Child	kidney	n/a	0.0036	0.0036
					- Child	kidney	0.38	0.0030	0.38
					Cadmium Total		0.38	0.0090	0.39
					Total Hazard Index (HI) Across Sediment Exposure Pathways[11] =				370
					Total Liver HI =				320
					Total CNS HI[12] =				44
					Total Kidney HI[13] =				1.0
					Total Blood HI =				0.63

Refer to the footnotes following Table 7.

Table 6
Human Health Risk Assessment Summary[1] - Fishing Closure Area II[2]
Conservative Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Seafood: Ingestion of flounder, clams or lobster[4] (based on weekly ingestion risk results)	**PCBs**				**PCBs**				
	- Adult[8]	$3.2x10^{-3}$	n/a	$3.2x10^{-3}$	- Adult	liver	5.3	n/a	5.3
	- Older Child	$1.0x10^{-3}$	n/a	$1.0x10^{-3}$	- Older Child	liver	9.3	n/a	9.3
	- Child	$1.0x10^{-3}$	n/a	$1.0x10^{-3}$	- Child	liver	19	n/a	19
	- Total[9]	$5.3x10^{-3}$	n/a	$5.3x10^{-3}$	PCBs Total		34	n/a	34
					Lead				
					- Adult	kidney	9.7	n/a	9.7
					- Older Child	kidney	17	n/a	17
					- Child	CNS	33	n/a	33
					Lead Total		60	n/a	60
					Copper				
					- Adult	blood	0.30	n/a	0.30
					- Older Child	blood	0.40	n/a	0.40
					- Child	blood	0.90	n/a	0.90
					Copper Total		1.60	n/a	1.60
					Cadmium				
					- Adult	kidney	0.31	n/a	0.31
					- Older Child	kidney	0.54	n/a	0.54
					- Child	kidney	1.1	n/a	1.1
					Cadmium Total		2.0	n/a	2.0
					Total Hazard Index (HI) Across Seafood Ingestion Pathway[11] =				97
					Total Liver HI =				34
					Total CNS HI[12] =				33
					Total Kidney HI[13] =				29
					Total Blood HI =				1.6

Refer to the footnotes following Table 7.

Table 6 (continued)
Human Health Risk Assessment Summary[1] - Fishing Closure Area II[2]
Conservative Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Sediment: Dermal contact and ingestion of sediment for current and future scenarios.	**PCBs**				***PCBs***				
	- Adult[8]	n/a	$3.6x10^{-4}$	$3.6x10^{-4}$	- Adult	liver	n/a	0.59	0.59
	- Older Child	n/a	$1.0x10^{-4}$	$1.0x10^{-4}$	- Older Child	liver	n/a	0.93	0.93
	- Child	$2.9x10^{-5}$	$1.2x10^{-4}$	$1.5x10^{-4}$	- Child	liver	4.0	2.1	6.1
	- Total[9, 14]	$2.9x10^{-5}$	$5.8x10^{-4}$	$6.1x10^{-4}$	PCBs Total		4.0	3.6	7.6
					Lead				
					- Adult	kidney	n/a	0.022	0.022
					- Older Child	kidney	n/a	0.034	0.034
					- Child	CNS	10	0.078	10
					Lead Total		10	0.13	10
					Copper				
					- Adult	blood	n/a	0.00010	0.00010
					- Older Child	blood	n/a	0.00020	0.00020
					- Child	blood	0.060	0.00040	0.060
					Copper Total		0.060	0.00070	0.060
					Cadmium				
					- Adult	kidney	n/a	n/a	n/a
					- Older Child	kidney	n/a	n/a	n/a
					- Child	kidney	n/a	n/a	n/a
					Cadmium Total		n/a	n/a	n/a
					Total Hazard Index (HI) Across Sediment Exposure Pathways[11] =				18
					Total Liver HI =				7.6
					Total CNS HI[12] =				10
					Total Kidney HI[13] =				0.056
					Total Blood HI =				0.060

Refer to the footnotes following Table 7.

Table 7
Human Health Risk Assessment Summary[1] - Fishing Closure Area III[2, 15]
Conservative Scenario

Medium and Exposure Scenario that Trigger the Need for Cleanup	Chemical - Receptor	Carcinogenic Risk[3]			Chemical - Receptor	Non-Carcinogenic Hazard Quotient			
		Ingestion[4]	Dermal	Exposure Route Total[6]		Primary Target Organ[7]	Ingestion[4]	Dermal	Exposure Route Total[6]
Seafood: Ingestion of flounder, clams or lobster[4] (based on weekly ingestion risk results)	**PCBs**				**PCBs**				
	- Adult[8]	$1.5x10^{-3}$	n/a	$1.5x10^{-3}$	- Adult	liver	2.5	n/a	2.5
	- Older Child	$4.9x10^{-4}$	n/a	$4.9x10^{-4}$	- Older Child	liver	4.5	n/a	4.5
	- Child	$4.9x10^{-4}$	n/a	$4.9x10^{-4}$	- Child	liver	8.8	n/a	8.8
	- Total[9]	$2.5x10^{-3}$	n/a	$2.5x10^{-3}$	PCBs Total		16	n/a	16
					Lead				
					- Adult	kidney	8.0	n/a	8.0
					- Older Child	kidney	14	n/a	14
					- Child	CNS	28	n/a	28
					Lead Total		50	n/a	50
					Copper				
					- Adult	blood	0.60	n/a	0.60
					- Older Child	blood	1.1	n/a	1.1
					- Child	blood	2.2	n/a	2.2
					Copper Total		3.9	n/a	3.9
					Cadmium				
					- Adult	kidney	0.30	n/a	0.30
					- Older Child	kidney	0.51	n/a	0.51
					- Child	kidney	0.98	n/a	0.98
					Cadmium Total		1.8	n/a	1.8
					Total Hazard Index (HI) Across Seafood Ingestion Pathway[11] =				72
					Total Liver HI =				16
					Total CNS HI[12] =				28
					Total Kidney HI[13] =				24
					Total Blood HI =				3.9

Refer to the footnotes following Table 7.

FOOTNOTES AND ABBREVIATIONS FOR TABLES 2 THROUGH 7

n/a = not applicable
CNS = Central Nervous System
HI = Hazard Index = Sum of the chemical specific Hazard Quotients for a particular target organ.

1. Based on the 1989 Baseline Risk Assessment for the New Bedford Harbor Superfund Site (Ebasco, 1989). To provide a range of exposure doses, two exposure scenarios were considered in each analysis in the 1989 Baseline Risk Assessment: one based on "average" or probable or moderate exposure conditions, similar to what is currently referred to as "central tendency"; the other is based on "conservative" exposure conditions, similar to what is currently referred to as "RME".
2. See Figure 2 for the delineation of the Fishing Closure Areas. Fishing Closure Area I is from the Hurricane Barrier north to the Wood Street Bridge. Fishing Closure Area II extends from the Hurricane Barrier south to Ricketson's Point on the western shore and Wilbur Point on the eastern shore. Fishing Closure Area III extends from the southern points of Fishing Closure Area II to Mishaum Point, Negro Ledge and Rock Point, west to east, respectively. The 1989 Baseline Risk Assessment identified Sediment Areas separately from the Fishing Closure Areas. Sediment Area I includes the upper portion of the harbor from the Wood Street Bridge to the Coggeshall Street Bridge. Sediment Area II extends from the Coggeshall Street Bridge to the Hurricane Barrier. Sediment Area III extends to the south from the Hurricane Barrier. Sediment Areas I and II are equivalent to Fishing Closure Area I and Sediment Area III is equivalent to Fishing Closure Area II.
3. PCBs are the only carcinogenic contaminant of concern identified in the Baseline Risk Assessment.
4. Seafood risks presented are the arithmetic average of the risks calculated for each of the species evaluated (i.e., flounder, clams and/or lobster). Lobster ingestion risks do not include ingestion of the tomalley.
5. Where available, the appropriate area-wide average risk results from the 1989 Baseline Risk Assessment were used for these tables. Because area-wide risk values were not available for carcinogenic dermal contact risk in Sediment Area I (one subarea of Fishing Closure Area I), Fishing Closure Area I carcinogenic dermal contact risks were calculated by first averaging the PCB risk for the three Sediment Area I subareas and then averaging this value with the Sediment Area II area-wide PCB risk. Fishing Closure Area I dermal contact risks for the non-carcinogens were calculated by averaging the area-wide results for Sediment Areas I and II.
6. The potential risk associated with the inhalation of PCBs in sediments in Fishing Closure Area I was evaluated in the 1989 Baseline Risk Assessment using the available site data and background measurements. Conservative assumptions regarding the airborne concentration of PCBs and a range of possible exposure scenarios were used to quantitatively estimate potential inhalation risks for the purposes of judging the significance of this potential exposure pathway. Based on these evaluations, the risk calculated for the inhalation pathway was below EPA's target risk levels. Consequently, this pathway was judged to not contribute significantly to the site risk levels and was not further quantitatively evaluated in the 1989 Baseline Risk Assessment. Therefore, no quantitative air pathway risk estimates are included in the overall receptor or media totals in these tables.
7. Target organs were identified based on a June 1998 review of EPA's "Integrated Risk Information System (IRIS)", EPA's "Health Effects Assessment Summary Tables (HEAST)", and discussion with Dr. Harlal Choudhury, Director of the Superfund Technical Support Center at the USEPA's National Center for Environmental Assessment in Cincinnati, June 12, 1998.
8. Adult exposure duration assumed to be 55 years.
9. Total carcinogenic risks include 5 years of chronic exposure as a younger child, 10 years of chronic exposure as an older child and 55 years of chronic exposure as an adult.
10. As reported in the 1989 Baseline Risk Assessment.
11. The "Total Hazard Index" includes the contributions from each non-carcinogenic chemical (PCBs, lead, copper, and cadmium) relative to exposures to seafood or sediments, respectively, for all three age periods in the life of a possible receptor (i.e., younger child, older child and adult). For the seafood ingestion pathway, the total hazard index includes only the non-carcinogenic risks due to ingestion. For the sediment pathway, the total hazard index includes the non-carcinogenic risks from both dermal contact with and incidental ingestion of sediment. In addition, the total hazard index was broken down by primary target organ (liver, kidney, blood, central nervous system) for the overall receptor in consideration of potential exposure in all three age intervals.
12. Total central nervous system (CNS) HI consists of the HI for lead in the child.
13. Total kidney HI includes the HI for lead in the older child and adult in addition to the HI for cadmium.
14. Total carcinogenic risk estimates for the ingestion of sediment are based solely on child exposures (younger child).
15. Fishing Closure Area III risks are presented for the seafood ingestion pathway only. No sediment related risks were projected for Fishing Closure Area III in the 1989 Baseline Risk Assessment.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Chemical Specific ARARS

Requirement	Citation	Status	Requirement Synopsis	Action To Be Taken To Attain ARARS
Federal				
Cancer Slope Factors (CSFs)		To Be Considered	These are guidance values used to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Dredging and containment of PCB contaminated sediments in CDFs will minimize exposure to potential receptors.
Reference Doses (RfDs)		To Be Considered	These are guidance values used to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	Dredging and containment of PCB contaminated sediments in CDFs will minimize exposure to potential receptors.
PCBs: Cancer Dose -- Response Assessment and Application to Environmental Mixtures	EPA/600/P-96/001F, September, 1996	To Be Considered	Guidance as to Agency's reassessment of the carcinogenicity of PCBs. It includes revised slope factors for PCBs based on the pathway of exposure.	Dredging and containment of PCB contaminated sediments in CDFs will minimize exposure to potential receptors.
Federal Food, Drug and Cosmetic Act	21 USC 331, 342, 346; 21 CFR 109.30	Relevant and Appropriate	Prohibits the introduction of adulterated food into interstate commerce. Fish or shellfish containing greater than 2 ppm PCB concentration in tissue is considered adulterated. State fishing ban incorporates FDA level.	State fishing ban will continue, along with other institutional controls, to minimize consumption of local seafood. FDA level is waived pursuant to CERCLA Section 121(d)(4)(B).
Clean Water Act (CWA), Water Quality Criteria	33 USC 1313, 1314	Relevant and Appropriate	Federal surface water quality standards are incorporated into Massachusetts Surface Water Quality Standards	
Massachusetts				
Surface Water Quality Standards	21 MGL 27; 314 CMR 4. 04(1),(2); 4. 05(4)(a-b),(5)	Relevant and Appropriate	MADEP surface water quality standards incorporate the federal AWQC as standards for surface waters of the state. Standards establish acute and chronic effects on aquatic life for contaminants including PCBs, cadmium, chromium, copper, and lead.	AWQC are used as a measure of long-term performance and effectiveness of the remedy.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Location Specific ARARs

Requirement	Citation	Status	Requirement Synopsis	Actions To Be Taken To Attain ARARs
Federal				
Floodplain Management - Executive Order 11988	40 CFR Part 6, Appendix A	Applicable	Federal agencies are required to reduce the risk of flood loss, minimize impact of floods, and restore and preserve the natural and beneficial values of floodplains.	The remedy will occur within the 100-year coastal floodplain as there is no practical acceptable alternative location. The CDFs will be constructed to minimize potential harm to the floodplain and will be built in accordance with flood protection measures.
Wetland Protection - Executive Order 11990	40 CFR Part 6, Appendix A	Applicable	Federal agencies are required to avoid adversely impacting wetlands whenever possible, minimize wetland destruction and preserve the value of wetlands.	This is the best practical alternative for remediating the Harbor. The Agency will minimize the destruction, loss and degradation of wetlands as much as possible given the extent and location of contaminated sediment. Where ever possible, higher target cleanup levels were set in wetlands to minimize destruction. Replanting of dredged wetlands will occur.
Fish and Wildlife Coordination Act	16 USC Part 661 et seq.; 40 CFR 6. 302(g)	Applicable	Requires consultation with appropriate agencies to protect fish and wildlife when federal actions may alter waterways. Must develop measures to prevent and mitigate potential loss to the maximum extent possible.	Appropriate agencies will be consulted prior to implementation to find ways to minimize adverse effects to fish and wildlife from harbor dredging and from construction and maintenance of CDFs.
Endangered Species Act	16 USC Part 1531 et. seq.; 40 CFR 6. 302(h)	Applicable	Requires consultation with appropriate agencies if a threatened or listed species or their habitat may be affected by a federal action.	EPA will consult with appropriate agencies to consider mitigation measures for remedial activities affecting the identified feeding grounds for roseate tern.
Preservation of Historical and Archeological Data Act of 1974	16 USC 469 et. seq.	Applicable	Requires recovering and preserving significant historical or archeological data when such data is threatened by a federal action or federally licensed action which alters any terrain where such data is located.	An assessment of the Harbor for potential locations of historical or archeological data will be conducted. Located objects will be recovered in accordance with the substantive requirements.
Coastal Zone Management Act	16 USC Parts 1451 et seq.	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area. The remedy is consistent with the state coastal zone management program to the maximum extent possible.
Massachusetts				
Wetlands Protection Act	131 MGL 40; 310 CMR 10	Applicable	Standards regulate dredging, filling, altering, or polluting of coastal and inland wetland resource areas. Protected resource areas within and adjacent to the site include: Land Subject to Coastal Storm Flowage 10. 02(1)(d); Coastal Wetlands 10.24(7)(b), (c)(6); Land Under Ocean 10.25(5)(6); Designated Port Area 10. 26(3)(4); Coastal Beaches (including tidal flats) 10.27(6); Coastal Banks 10.30(6-7); Salt Marshes 10.32(5); Land Containing Shellfish 10.34(5)(7);	Best available measures will be used to minimize adverse effects on identified resource areas and associated 100 foot buffer zones during design and implementation of remedy. Dredged salt marshes will be replanted. DMF will be consulted for activities affecting fish and shellfish habitat..
Wetlands Protection Act (continued)			Banks..Land Under...Fish Runs 10.35 (3-4); and Riverfront Area 10.58(4)(a),(c)(1and3),(d)(2),(d)(5)(a-b and f-g).	
Coastal Zone Management	301 CMR 21. 00	Applicable	Requires that any actions must be conducted in a manner consistent with state approved management programs.	The entire site is located in a coastal zone management area. Actions taken will be consistent with substantive portions of identified policies of CZM.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Location Specific ARARs

Requirement	Citation	Status	Requirement Synopsis	Actions To Be Taken To Attain ARARS
Coastal Zone Management Policies	MCZM	To Be Considered	Statements of the state environmental policy for coastal zone areas which are implemented through identified ARARs, particularly the Wetlands Protection Act and the Waterways Law. Policies to be considered are Habitat 1; Water Quality 1; Coastal Hazard 2,3; Ports1, 2,3; Ports Management Principle 1; Protected Areas 3; Public Access1; Public Access Management Principle 2, 4; and Growth Management Principle 1.	These policies will be considered throughout construction, dredging and operation and maintenance of the remedy. Compliance with the identified substantive portions of the State ARARs will meet the intent of these policies.
Administration of Waterways Licenses Law	91 MGL 1.00 et. seq.; 301 CMR 9.00	Applicable	Criteria for work within flowed and filled tidelands. Focus on long term viability of marine uses and protecting public rights in tidelands. Applicable provisions are Restrictions on Fill and Structures 9.32(1)(a)(2,3)(b)(3,4); Preserving Water-Related Public Rights 9.35(1),(2)(a)(1 and 3 (a and b); Protecting Water-Dependent Uses 9.36 (2)(3)(4)(5)(a)(1,2)(5)(b); Engineering and Construction Standards 9.37(1)(c), (3)(a),(b)(4); and Dredging and Dredged Material Disposal 9.40(2),(3)(e).	Temporary unavoidable impacts to public access rights to water and to water dependent users will occur. Alternate access will be available. CDFs will be designed to accommodate future uses, subject to institutional controls, such as parks, sports fields, and in designated port areas, marinas.
Prohibition Against Certain Fishing in New Bedford Harbor	111 MGL 5 and 6; 94 MGL 186 and 192; 30A MGL 2; 105 CMR 260.005	Applicable	Prohibits taking or selling of contaminated lobsters and certain fish in designated areas of New Bedford Harbor.	State fishing ban in Areas I, II, and III will be incorporated into the remedy as an existing institutional control for protection of human health. State remains as enforcement authority.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Action Specific ARARs

Medium/Authority	Citation	Status	Requirement Synopsis	Actions to be Taken to Attain ARARs
Federal				
Toxic Substances Control Act (TSCA), PCB Disposal Requirements	15 USC 2601-2692; 40 CFR 761.50(a)(3); (b)(3)(i)(A)	Applicable	General PCB Disposal requirements for all actions and provides jurisdiction for EPA cleanup.	Discharges from water treatment plants will meet PCB AWQC through phased TMDL approach. The Regional Administrator finds the site poses an unreasonable risk to health and the environment and requires remediation.
TSCA PCB Remediation Waste	40 CFR 761. 61(c)	Applicable	Provides for a risk-based disposal method which will not pose an unreasonable risk of injury to human health or the environment.	Disposal of the contaminated dredged sediments in CDFs will not pose unreasonable risk and is approved by the Regional Administrator through issuance of the ROD.
TSCA Chemical Waste Landfill Standards	40 CFR 761. 75. See synopsis for specific citations.	Applicable	Standards for the construction, operation, and monitoring of facilities used to dispose of PCB's, unless a waiver is granted under Sec. 761.75(c)(4). Appropriate sections are 761.75(b)(1) soils; (b)(2) liner; (b)(4)(i) flood protection; (b)(5) topography ; (b)(6) monitoring; (b)(8)(i) operations; (b)(9) supporting facilities; and (c)(4) waivers.	CDFs will be constructed, operated and maintained to satisfy the substantive requirements. TSCA waivers required for specific requirements regarding soil (soil underlying CDFs will meet permeability standard of 10E-07 cm/sec); synthetic bottom liner (CDFs will have synthetic side liner); hydrogeologic conditions; and leachate collection. Regional Administrator finds CDFs will not present unreasonable risk of injury to health or the environment and approves of remedy without these specific features.
TSCA Decontamination	40 CFR 761. 79	Applicable	Sets decontamination standards for removal of PCBs from water, organic liquids, non-porous surfaces, concrete and nonporous surfaces covered with a porous surface. Allows for alternative methods of decontamination.	Equipment and personal protective gear will be decontaminated in accordance with these substantive requirements.
TSCA PCB Spill Cleanup Policy	40 CFR 761. 120 - .135	To Be Considered	Establishes criteria to determine adequacy of the cleanup of spills (occurring after 5/4/87) from the release of materials with > 50 ppm PCBs.	Although this policy is directed at electrical equipment-type spills, it will be considered to address any PCB leakage or spillage from the CDF.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Action Specific ARARs

Medium/Authority	Citation	Status	Requirement Synopsis	Actions to be Taken to Attain ARARs
Clean Water Act (CWA), Section 402, National Pollutant Discharge Elimination System (NPDES)	33 USC 1342; 40 CFR 122-125, 131	Applicable	These standards govern discharge of water into surface waters. Due to the degraded nature of New Bedford Harbor waters, discharges of Cu and PCBs into the waterway must meet ambient water quality criteria (AWQC) at the discharge point.	Discharge from the water treatment plants associated with the remedial dredging will meet AWQC for Cd, Cr and Pb. Copper and PCBs will meet AWQC through a phased Total Maximum Daily Load (TMDL) approach.
CWA, Section 402, NPDES, Prohibitions	40 CFR 122. 4(i)	Applicable	Prohibits new discharges into waters that do not meet applicable water quality criteria (AWQC) unless certain conditions are met.	Meeting this requirement will result in greater risk to human health and the environment since compliance would prevent cleanup of the Site until the Harbor waters reach water quality standards or until other conditions in the standard are met, neither of which can be accomplished in a reasonable time frame. Regulation is waived pursuant to CERCLA Section 121(d)(4)(B).
Total Maximum Daily Load (TMDL) Program Supplemental Guidance: The TMDL Concept	USEPA Draft 12/12/94	To Be Considered	Guidance clarifies TMDL concept's scope and flexibility.	TMDL guidance considered in phased TMDL approach to meeting AWQC for copper and PCB discharges from site treatment plants.
CWA, Section 404, Dredge and Fill Activities	40 CFR 230	Applicable	Control discharges of dredged or fill material in order to restore and maintain the chemical, physical and biological integrity of waters of the United States.	EPA finds that the remedy is the least damaging alternative to remediating the Harbor. Dredging of sediments and filling CDFs will be implemented so as to minimize to the maximum extent possible any adverse environmental impacts through engineering controls such as type of dredge used, rate of dredging, varying target cleanup levels in wetlands, and salt marsh revegetation.
Rivers and Harbors Act	33 USC 401-426m	Applicable	Requires coordination and approval of U.S. Army Corps of Engineers for dredging and for construction and future use of CDFs in navigable waters of the United States.	All dredging activities and remedial design, construction and future use decisons concerning the CDFs will comply with substantive requirements of this chapter that apply to the remedy. Remedy will be coordinated with and carried out with the approval and participation of the USACE.
Clean Air Act (CAA), National Emissions Standards for Hazardous Air Pollutants (NESHAPS)	42 USC 7401 et seq.; 40 CFR Part 63	Relevant and Appropriate	NESHAPS are a set of air emissions standards for specific chemicals, including PCBs, from specific production activities.	Monitoring of air emission from the CDFs during dredging and during temporary and final closure will be performed to assess compliance with these standards. Operation and maintenance activities will be carried out in a manner which will minimize potential air releases.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Action Specific ARARs

Medium/Authority	Citation	Status	Requirement Synopsis	Actions to be Taken to Attain ARARs
Guidance on Remedial Actions for Superfund Sites with PCB Contamination	OSWER Dir. 9355.4-01 (August 1990)	To Be Considered	Describes the recommended approach for evaluating and remediating CERCLA sites with PCB contamination.	This guidance was considered when setting remedial objectives and target cleanup levels and will be considered during remedial design and when implmenting long term management controls of the CDFs.
Massachusetts				
Hazardous Waste Management - Identification and Listing	21C MGL 4 and 6; 310 CMR 30.100	Applicable	Establishes standards for identifying and listing hazardous waste.	Testing as appropriate will assess whether hazardous wastes are present in discharges, process wastes or in material generated from cable or CSO relocation projects.
Hazardous Waste Management - Requirements for Generators of Hazardous Waste	21C MGL 4 and 6; 310 CMR 30.300	Applicable	Establishes standards for various classes of generators.	Any hazardous waste generated from the cable and CSO relocation projects or hazardous process wastes will be managed in accordance with the substantive requirements of these regulations and sent offsite to a hazardous waste disposal facility.
Hazardous Waste Management - Management Standards for all Hazardous Waste Facilities	21C MGL 4 and 6, 310 CMR 30 et. seq.	Applicable	Establishes standards for treatment, storage and disposal of hazardous waste. Sec. 30.501(3)(a) exempts facilities which treat, dispose or store hazardous waste containing 50 ppm or more of PCBs if they are adequately regulated under TSCA, 40 CFR 761.	Any hazardous waste generated from the cable and CSO relocation projects or hazardous process wastes will be managed in accordance with the substantive requirements of this section.
Supplemental Requirements for Hazardous Waste Management Facilities	21 MGL 27(12), 34 and 43; 314 CMR 8.03	Relevant and Appropriate	This regulation outlines the additional requirements that must be satisfied in order for a RCRA facility to comply with the NPDES regulation.	The water treatment facilities will meet these regulations through a monitoring program and engineering controls if necessary.
Solid Waste Management	21A MGL 2 and 8; 310 CMR 19.110-118; 19.130; 19.132-133; 19.143.	Relevant and Appropriate	Establishes rules and requirements for solid waste facilities; including cover systems; surface water and groundwater protection; monitoring and post-closure.	Disposal of sediments will meet the substantive requirements of these provisions if more stringent than TSCA regulations.
Surface Water Discharge	21 MGL 23(12) and 34; 314 CMR 3. 10(3)(4-6); (9)(a);(19)(3-6), (10),(12)(a-b); (13)	Applicable	This section outlines the requirements for obtaining a National Pollutant Discharge Elimination System (NPDES) permit in Massachusetts. The waters of New Bedford Harbor adjacent to the site are Classified as SB.	Discharge from waste treatment facilities will meet stringent effluent limitations. Discharges will be monitored in accordance with Site monitoring plans. Plants shall be properly operated and maintained; discharge will be reduced or halted if plants fail to function properly while corrective action undertaken.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Action Specific ARARs

Medium/Authority	Citation	Status	Requirement Synopsis	Actions to be Taken to Attain ARARs
Surface Water Quality Standards	27 MGL 27; 314 CMR 4. 03(1)(3)(c); 4. 04 (1)(2)(4)(6) ; 4.05(4)(a-b), (5)	Applicable	MADEP surface water quality standards incorporate the federal AWQC as standards for surface waters of the state. Standards establish acute and chronic effects on aquatic life for contaminants including PCBs, cadmium, chromium, copper, and lead.	Effluent discharged to the River from the water treatment plants shall meet ambient water quality criteria for cadmium, chromium and lead. Copper and PCB discharges will be at or below background pursuant to a phased Total Maximum Daily Load (TMDL) approach.
Rules for the Prevention and Control of Oil Pollution in the Waters of the Commonwealth	21 MGL 26-53; 314 CMR 15.03 (1),(3-5) ; 15.06(1-5)	Applicable	Regulates the discharge of oil or sewage, industrial waste or other material containing oil into waters of the Commonwealth. PCBs contain oil, some of which floats on surface water.	The remedy will comply with the substantive requirements of the provisions.
Operation and Maintenance and Pretreatment Standards for Wastewater Treatment Works and Indirect Dischargers	21 MGL 27(12 - 34; 314 CMR 12. 03(8); 12. 04(2), (3),(5), (8-12); 12. 05(1),(6),(12); 12.06(1-3)	Relevant and Appropriate	Establishes operation and maintenance standards for treatment works.	Water treatment facilities, although not "treatment works", will not allow waste to bypass system, will have an alarm system in place, and will be maintained properly and safely with adequate tools, equipment, parts, personnel, etc. Sampling and analysis will be conducted according to the site plan.
Certification for Dredging, Dredged Material Disposal and Filling in Waters	21 MGL 26-53; 314 CMR 9.06(1-2)	Applicable	Establishes procedures and criteria for the administration of Section 401 of the federal Clean Water Act for the discharge of dredged or fill material in waters of the United States within the Commonwealth.	The remedy represents the best practicable alternative for remediating the Harbor. Any adverse impacts will be minimized; replanting will occur where necessary.
Massachusetts Water Quality Standards Implementation Policy of Toxic Pollutants in Surface Waters (2/23/90)		To Be Considered	Recommends surface water quality standards for specified contaminants and implementation measures to achieve standards	This implementation policy and appropriate standards will be considered when evaluating impacts to surface water quality from the remedy.
Ambient Air Quality Standards	111 MGL 142D; 310 CMR 6.04(2)	Applicable	Establishes ambient air level for contaminants and particulates.	Emissions during construction and operation of CDFs will meet the particulate standard. Dust suppression will be used to reduce particulate emissions. Air monitoring is part of the site long-term monitoring plan.

Table 8 -- New Bedford Harbor Upper and Lower Harbor ROD -- Action Specific ARARs

Medium/Authority	Citation	Status	Requirement Synopsis	Actions to be Taken to Attain ARARs
Air Pollution Control	111 MGL 142A-J, 310 CMR 7.09(1-4); 7.10(1-2)	Applicable	Standards for, among other things, dust, odor and noise at construction sites. Pollution abatement controls may be required.	Dredging and CDF construction will be implmented so as to avoid air pollution. Engineering controls will be used as necessary.
MADEP - Recommended Threshold Effect Exposure Limits (TELs) and Allowable Ambient Limits (AALs)		To Be Considered	Establishes exposure concentrations for air contaminants developed and recommended by the Office of Research and Standards to protect public health.	Evaluation of air emissions will consider the TELs and AALs.
Allowable Sound Emissions	DAQC policy 90-001; 2/1/90	To Be Considered	Establishes guideline where source of new noise should not emit more than 10 decibels above the existing (background) level.	Site operations noise level will be minimized and will follow the suggested noise limit to the extent practicable.

Table 9 - Estimated Cost of the 1996 Proposed Remedy

ACTIVITY	COST
I. DIRECT COSTS	
A. Dredging	$22,320,348
B. Dewater/Water Treatment	$27,123,051
C. CDF Construction	$27,121,318
D. Air Monitoring	$2,148,800
TOTAL DIRECT COST (TDC)	$78,713,517
II. INDIRECT COSTS	
A. Health & Safety (@ 5% of TDC) Level D Protection	$3,935,676
B. Legal, Administration, Permitting (@ 10% of TDC)	$7,871,352
C. Engineering (@ 10% of TDC)	$7,871,352
D. Services During Construction (@ 10% of TDC)	$7,871,352
E. Turnkey Contractor Fee (@ 15% of TDC)	$11,807,028
TOTAL INDIRECT COST (TIC)	$39,356,759
SUBTOTAL COSTS	$118,070,276
CONTINGENCY (@ 20% of TDC + TIC)	$23,614,055
TOTAL CAPITAL COST	$141,684,331
PRESENT WORTH - 1996 (@ 7% for 8 years)	$105,754,956
O&M COST (CDFs) (Present Worth @ 7% for 30 years upon completion)	$1,095,795
MONITORING PROGRAM (Present Worth @ 7% for 30 years)	$8,695,122
TOTAL PRESENT WORTH COST	$115,545,872

Appendix A - Responsiveness Summary

New Bedford Harbor Superfund Site
Record of Decision for the Upper and Lower Harbor

1.0 Introduction

This responsiveness summary summarizes and provides EPA's responses to formal comments regarding the New Bedford Harbor Site received as a result of a) the January 1992 Proposed Plan, b) the May 1992 Addendum Proposed Plan and c) the November 1996 Proposed Cleanup Plan. These comments were received during two different comment periods, one spanning from January 31, 1992 through July 13, 1992 for the January and May 1992 Proposed Plans, and one spanning from November 7, 1996 through February 3, 1997 for the November 1996 Proposed Plan. Section 2 summarizes and responds to comments received during the most recent of these two comment periods, followed by Section 3 for the earlier of the two comment periods. The comments and responses are organized into the following categories:

2.0 Summary of Comments Received During the November 7, 1996 Through February 3, 1997 Public Comment Period, and EPA Responses

2.1 Citizen Comments

2.1.1 Mr. Berkal

Mr. Berkal commented that bioremediation should be given more attention as a potential treatment solution for the PCB contaminated sediment, especially in terms of additional research. He commented further to say that a CDF-based remedy would only be acceptable if it was combined with treatment should a technology be found that is "energy and cost-effective," and that to proceed otherwise would be an irresponsible "out-of-site, out-of-mind waste management approach." Mr. Berkal also expressed concern with sediment resuspension as a result of dredging, and wondered what preventative measures could be employed to prevent resuspension. He also wondered whether there would "be any effort to containerize the sediment prior to burial."

EPA Response

EPA both regionally and nationally has researched and reviewed the potential applicability of bioremediation for PCB-contaminated sediments, including potential site specific application (e.g., see section 2.4.2 of Ebasco, 1990c). EPA agrees that this research and review process for PCB bioremediation should continue, and has committed to review advances in sediment treatment technologies including bioremediation as part of the remedy. EPA believes, however, that even if PCB bioremediation was found to be effective on all the PCB species in New Bedford Harbor, the time frames involved to reach cleanup goals would be unacceptable.

EPA also has concerns about the effects that bioremediation would (or would not) have on the heavy metal contamination in the harbor. In other words, bioremediation would not address the problem of significant metals enrichment in the sediments, in contrast to the proposed dredging approach which would remove both PCBs and the worst areas of metal contamination. Furthermore, EPA believes that more research into the possible detrimental effects that bioremediation would have on metals is in order, since bioremediation could make the metals more bioavailable (Ford, 1995).

EPA rejects the characterization of the proposed remedy as irresponsible or "out-of-site, out-of-mind." Sediment treatment would obviously offer greater peace of mind to the public, but since such treatment is prohibitively expensive, and since CDF-based isolation of the PCB sediment is protective without treatment, EPA believes it would be irresponsible NOT to proceed with the proposed cleanup. Furthermore, the sediments may be out of site but they are certainly not out of mind. Comprehensive sampling of air, groundwater, biota and surface water will be performed to ensure that the PCBs remain sequestered within the CDFs, and physical inspections and maintenance of the CDFs will be performed on a routine basis to ensure their structural integrity.

The sediments will not necessarily be "containerized", but the walls of the CDFs will be lined with a hazardous waste liner material and the tops of the CDFs will ultimately be capped with a multi-layer landfill cover system. The silty, fine-grained sediments that will form the bottom of the CDFs are naturally highly impermeable, as is the dredged sediment itself, in effect forming an impermeable liner of naturally occurring materials. Additionally, a man-made bottom liner would be difficult if not impossible to build with any guarantee of reliability due to the existing soft and saturated sediments which would form the (unsound) foundation of a bottom liner.

Finally, sediment resuspension at the dredge head will be controlled in much the same manner as it was controlled during the hot spot dredging. Unless newer, more protective or cost-effective dredging technologies are developed, a protective cutter head type dredge will be employed at operating conditions that minimize resuspension (e.g., slow rotation and high vacuum). The dredge will also be equipped with protective measures such as a vacuum shroud over the cutter head, multiple oil booms around the dredge boat, and skimmer pumps inside the booms to remove any oil sheens created by dredging. As with the hot spot dredging operation (see USEPA, 1997c), frequent water quality and biological sampling will be performed to confirm that the dredging is done in an environmentally safe manner.

2.1.2 Mr. Bishins

As an owner of a large multi-level mill building near the Acushnet River, Mr. Bishins commented that he is concerned that the "placement of the project" (i.e., the locations of the CDFs) could "allow for an unrestrained release of airborne carcinogens and add a long term inability for [his] property to host any type of occupant."

EPA Response

EPA believes that the CDFs can be operated and monitored in such a way as to ensure the health and safety of surrounding workers and residents, and does not envision that any buildings surrounding the CDFs need lie dormant. Air emission controls such as, for example, a ponded water layer and floating covers will be used as appropriate to protect CDF workers as well as neighboring abutters. Air monitoring will be performed around the perimeter of each CDF to ensure that these workers and neighbors are protected. If the airborne PCB levels directly at the CDFs are below levels of concerns, then it follows that airborne PCB levels further away from the CDFs will also be below levels of concern. Air monitoring results from the hot spot dredging (USEPA, 1997c) support this conclusion.

It is anticipated that a series of "action levels" of increasing airborne PCB criteria will be used as a management tool to keep PCB levels below regulatory health and safety thresholds. Exceedances of these action levels, which would be set well below the regulatory thresholds, would trigger implementation of corrective measures. If in the unexpected event that the airborne PCB levels at the CDFs exceed appropriate regulatory threshold levels, than CDF operations would terminate until safe conditions returned. Even if such an unexpected event were to occur (where airborne PCB levels at the CDF exceeded regulatory levels), workers in surrounding properties would not be exposed to the CDF PCB levels due to atmospheric dilution along the distance to their location. Off-site air monitoring will be included in the remedy to verify that residents and workers are not placed at risk due to airborne PCBs.

2.1.3 Mr. DeMedeiros

Joe DeMedeiros commented that the proposed CDF-based remedy was a "band-aid solution that will not solve the problem." Mr. DeMedeiros also expressed concern that there is no guarantee that the CDFs would not leak at some point. Given these concerns, he also questioned the reasonableness (or cost-effectiveness) of the estimated $116 million cost of the remedy. Mr. DeMedeiros wondered whether there was a more effective or permanent solution to the PCB problem, and called for more research into other solutions not presented in the Proposed Plan.

EPA Response

EPA rejects the characterization of the remedy as a band-aid solution. Based on extensive site-specific laboratory research, worst case computer modeling on potential leakage, the geotechnical and geochemical technical aspects of the remedy, and operational experience with CDFs both in general and with the hot spot sediments, EPA believes that the remedy will be very protective in the long term (see EPA's response to Hands Across the Rivers Coalition's comment in section 2.6.2 below for additional detail on the leakage question). The high cost of the remedy is due to the great magnitude of the problem; EPA considers the remedy to be very cost-effective since sediment treatment, while not significantly increasing the protectiveness of the remedy, would add hundreds of millions of dollars in project cost.

EPA has researched, and has committed to continue to research potential treatment technologies that might detoxify the sediments once and for all. This research as well as experience with actual sediment treatment projects nationwide, however, consistently concludes that treatment of the 450,000 cy of PCB-contaminated sediment would be prohibitively expensive (on the order of $200 to $400 million more), without, again, adding a commensurate increase in the level of protectiveness.

2.1.4 Mr. Glowka

Arthur Glowka of Stamford, CT commented that the proposed cleanup plan for ROD 2 was a good one, and that it should be used as a model for the Hudson River PCB project.

EPA Response

EPA Region I appreciates Mr. Glowka's endorsement, and will relay his suggestion to use the proposed cleanup approach as a model for the Hudson River PCB project to EPA Region II in New York which has jurisdiction over the project.

2.1.5 Mr. Healey

Mr. Healey of Acushnet, MA commented that the proposed dredging poses a serious threat to the integrity of an important native American archeological site, including possible burial grounds, along the eastern bank of the Acushnet River. Mr. Healey made it clear that he in no way opposes the proposed cleanup, but served notice that he could not support it unless a total archeological reconnaissance was performed prior to the cleanup. He also expressed concern about the lack of action by the EPA in this regard during the two years since notification was made to EPA.

EPA Response

EPA appreciates Mr. Healey's identification of the archeological value of the upper harbor, and understands its responsibilities under Section 106 of the National Historic Preservation Act (36 CFR 800) regarding the potential effects of the remedy on significant historic or archeological resources in the area. EPA has had a preliminary dialogue with the Massachusetts Historical Commission (first writing to them in July 1996), and the MHC has recommended that EPA complete a systematic archeological and historic resources reconnaissance survey. EPA plans to implement such a survey, but this effort cannot be started until after the Record of Decision for the project is finalized. As with other remedial efforts at this site, EPA will invite the community to participate in the planning and analysis associated with this archeological survey.

2.1.6 Ms. Johns

Emily Johns of New Bedford commented that the locations of the containment areas (CDFs) appears to be the best possible given the "overall general health of the Harbor." However, she also voiced a concern about leaving the PCBs in the sediment, and urged that EPA treat the sediments (possibly with the Eco-Logic process) and return the sediments to worthwhile use.

EPA agrees that the locations of the four CDFs are the best possible and most viable given the magnitude of the PCB contamination problem in the harbor. EPA also understands that treatment of the sediments may offer additional peace of mind, but has to reiterate that a) treatment costs are prohibitively expensive, b) CDF-based containment or isolation is protective on its own, and c) treatment would present additional short term risks to workers and neighbors due to the extensive materials (contaminated sediment) handling that would be required.

Regarding the Eco-Logic process, EPA has evaluated its performance during the hot spot treatability studies and has compared it with the other treatment options included in that study (Foster Wheeler, 1997). EPA does not currently believe that the Eco-Logic process would be appropriate for the much larger ROD 2 project, but will continue to be open-minded about the communities' preference for treatment for the ROD 2 sediments. Regarding the CDFs, once they have a final cap, EPA believes they can be put to beneficial reuse as, for example, shoreline open space or commercial marine facilities.

2.1.7 Mr. Machado

Mark Machado of Swansea, MA commented that the Proposed Plan's "hybrid" target cleanup levels (TCL) of 10 ppm and 50 ppm does not provide adequate ecosystem protection, and that the next best alternative to a 1 ppm TCL (which he accepts as a "monumental" logistical and financial problem) would be a 10 ppm harbor-wide TCL. He did not agree that the upper harbor is more ecologically important from an ecological perspective than the lower harbor.

Mr. Machado also raised questions about the environmental effects of dredging, the permanence of CDFs in terms of potential PCB leakage and PCB breakdown products, the lack of an impermeable liner on the bottom of the CDFs, and the potential for reactive wall technology.

EPA Response

EPA agrees that a 10 ppm harbor-wide TCL would be closer to EPA's ecologically protective cleanup goal of 1 ppm, but reiterates its concerns regarding the scale of contamination and cost that such a TCL would entail (i.e., 926,000 cy and 400 acres of in-place contaminated sediment; approximately $147 million for either dredging or capping) as well as the adverse environmental impacts of such a TCL (e.g., additional filling of wetlands for CDFs, destruction of larger areas of saltmarsh). Also, in the case of a dredging-based remedy for a 10 ppm TCL, given the difficulties involved in locating the four proposed CDFs (to handle less than half this 926,000 cy volume) EPA is doubtful whether additional, viable CDFs could be sited for such a large volume of sediments, especially in light of other competing interests for shoreline land use.

Regarding the hybrid TCL approach, EPA's increased degree of cleanup in the upper harbor is consistent with the widely accepted ecological importance of saltmarshes and the regulatory definition of the lower harbor as a state-designated port area.

With regard to the environmental effects of dredging, EPA believes - and as exhibited during the hot spot dredging - that the ROD 2 dredging can be performed in a biologically safe manner (i.e., without any acute effects to marine organisms or adverse effects to human health). Once in the CDFs, the degree of PCB leakage is expected to be insignificant, even assuming worst case leakage scenarios (see EPA's response to Hands Across the River in section 2.6.2 below for additional detail). EPA further believes that over very long time frames, the PCB levels in the CDFs will reduce very gradually due to natural degradation processes (Myers, 1995).

As explained in the Proposed Plan and throughout this responsiveness summary, a synthetic bottom liner for the CDFs is not deemed necessary for a variety of technical reasons. A highly impermeable material will exist on the bottom of the CDFs, but it will be a naturally occurring one rather than a man-made one. The very fine grained, silty nature of both the underlying and dredged sediments combined with self-weight consolidation of the dredged sediments will serve to create a highly impermeable sediment matrix. The impermeability of this matrix has been shown in laboratory testing to be comparable to that of synthetic impermeable liners (Myers and Brannon, 1989). Furthermore, the quality of construction of a synthetic liner on the bottom of the CDFs given the unstable, saturated foundation conditions that would dominate would be suspect and most likely unreliable.

In terms of whether reactive wall technology would be applicable, EPA does not believe that such technology would be appropriate for the CDF berms. Reactive wall technology relies on a constant flow of fluid (e.g., groundwater) flowing through the wall in order to allow for chemical reactions between the fluid and the wall material to take place. In contrast, the CDFs are designed to minimize the flow of leakage or leachate out to the surrounding environment. Nevertheless, EPA will consider the reactive wall concept during the detailed design stage of the CDFs to see whether it might have a place in that design.

2.1.8 Mr. Moniz

Antone Moniz of New Bedford, MA commented that the contaminated sediments should be treated with heat (e.g., incinerated) using fireproof barges far off shore to reduce

the PCB levels to insignificantly low levels. (Mr. Moniz' may be referring to the hot spot rather than the ROD 2 sediments, however EPA will respond in the context of the Proposed Plan for ROD 2.)

EPA Response

EPA believes that treatment of the 450,000 cy of sediment is prohibitively expensive, and that a CDF-based remedy is protective of human health and the environment without the need for treatment (see EPA's response to Hands Across the River Coalition's comments in section 2.6.2 below for additional detail). Furthermore, of all the potential treatment technologies that may be applicable to the PCB- contaminated sediment, EPA believes that off shore incineration would rank poorly due to logistical and legal issues and due to risks from severe off-shore weather.

2.1.9 Ms. Marges

Ms. Susan Marges from North Dartmouth submitted comments on this remedy during the 1995 public comment period for the Explanation of Significant Differences for the Hot Spot ROD. EPA deferred its response until this time.

Ms. Marges commented that she would prefer to see EPA choose a remedy that "resolves the problem now and permanently" and would like the pollutants in the Harbor to be removed and disposed of at a licensed hazardous waste landfill. She is fearful that the CDFs will leak, that long-term storage of untreated sediments will result in future exorbitant costs for treatment and that the Harbor cannot flourish for future generations as long as CDFs are present.

EPA Response

EPA recognizes that this is not necessarily a perfect solution to the problem of widespread PCB contamination in the Harbor; however, we believe that long-term storage of the dredged sediment will effectively protect both human health and the environment. Our belief is based on extensive site-specific laboratory research, worst case computer modeling on potential leakage from the CDFs, the geotechnical and geochemical technical aspects of the remedy, and operational experience with CDFs both in general and with the Hot Spot sediments. (See EPA's response to Hands Across the River Coalition's comment in section 2.6.2 below for additional detail on the leakage question.)

Offsite disposal of the entire volume of dredged sediment was least favored due to the Superfund statutory bias against offsite land disposal of untreated waste, and because it was considered cost-ineffective to transport huge volumes of sediment long distances to appropriate disposal facilities. Such facilities do not exist in New England, and construction of new facilities, especially in Massachusetts, was deemed to be unrealistic.

The existence of the CDFs in the Harbor does not inhibit either ecological or economic

Harbor development. In fact, EPA believes that the remedy will allow the Harbor to flourish in both realms. The contaminated sediment above TCLs will be removed from the Harbor and consolidated into controlled, monitored storage facilities making it no longer available for dermal contact or biological intake. The CDFs themselves, once finally capped, will be available for future use such as shoreline open space or commercial marine facilities. EPA has committed to work with the local community to foster such use.

At the same time, EPA has also committed to review treatment technologies annually until the final CDF caps are in place; and after that, every five years. We will consider treatment if and when it becomes technically and economically feasible.

2.2 Comments From Concerned Businesses

2.2.1 Commonwealth Electric Company (COM/Electric)

COM/Electric comments relate to the underwater cable crossing area in the contaminated upper harbor. COM/Electric prefers a cleanup approach which provides a completely new system of power infrastructure, complete dredging of the area, and location of the new infrastructure outside of any contamination or CDFs. It further notes the difficulties in repairing the cables as they currently exist due to "the potential disturbance of contaminated sediments should any maintenance or repair of the cables be required." COM/Electric also commented that regardless of the specific remedy for this area, EPA, not COM/Electric, should fund it.

EPA Response

Since receipt of these comments, EPA has met regularly with COM/Electric in an attempt to find a cost-effective solution to the underwater cable crossing problem. The problem is exacerbated by the fact that a new, additional high voltage cable is required in the near future to serve the New Bedford area. EPA and COM/Electric are currently investigating underground "directional drilling" and microtunnelling approaches for all of the new and existing cables that would meet the general parameters of COM/Electric's comment. EPA believes that since such a solution would benefit both parties (e.g., EPA could dredge the entire area, and COM/Electric's equipment could be located in clean areas), a cost-sharing approach for the relocation of the existing cables is appropriate.

EPA agrees that any maintenance or repair of the currently submerged cables would create unacceptable disturbances of highly PCB-contaminated sediment since the cables have sunk into the silty, fine-grained sediments in the area. For this reason, EPA believes that the proposed new high voltage cable should NOT be placed in the current underwater cable corridor, and that EPA should not be responsible for funding an alternative route for this new cable. An underground directional drilling or microtunnelling approach also alleviates the problem of maintenance or repair of cables in contaminated sediments, since all of the new (and replacement) cables will be in a "clean" environment.

2.2.2 Coyne Textile Services

Coyne Textile Services expressed concern about the potential for odors during the dredging and disposal operations, since odors can apparently be adsorbed on to its clean, for-rent textile products (their facility is adjacent to the contaminated sediments north of CDF A). Its operating requirements produce a negative pressure which draws air into the building, thus the potential for product contamination.

EPA Response

EPA will coordinate the dredging and disposal activities with Coyne to ensure that their business activities are not negatively impacted. If significant odors are encountered as a result of dredging, one corrective measure would be to schedule the dredging during times when the Coyne facility is not operating at all or when it is not operating under negative pressure.

2.2.3 General Electric

Extensive comments were submitted on behalf of General Electric Company (GE) by the Washington, D.C. law firm Sidley & Austin. The reader is encouraged to read GE's comments directly since, consistent with the NCP, only significant comments are summarized and responded to in this responsiveness summary.

GE Comment #1

GE criticized the Proposed Plan for not presenting enough information to allow one to assess whether the proposed remedy would reduce risks to human health or the environment faster than would occur naturally or would occur using alternative cleanup approaches. GE further commented that the high cost and intrusive nature of remedial dredging cannot be justified if the project will not significantly advance the course of natural~~ly~~ recovery nor attain risk-based objectives.

EPA Response

Consistent with CERCLA and the NCP, the selection of a remedy must take into account nine Superfund criteria, not just which particular remedy achieves results in the least amount of time. EPA believes that, based on all of the information contained in the ROD 2 Administrative Record, the remedy strikes the best balance between these nine criteria. EPA rejects the no-action approach since existing risks to both human health and the environment would remain unmitigated. Importantly, in the approximately 20 years since site discovery, PCB levels in fish tissue, in the water column and in sediments remain orders of magnitude higher than relevant standards and acceptable levels for these environmental compartments.

EPA disagrees that the remedy will not significantly advance the course of natural recovery. Computer modeling indicates significant improvements over no-action in terms of net PCB flux, water column concentration, bed sediment level and aquatic tissue level (Battelle, 1990 at 7-125 through 7-132). EPA also disagrees that the remedy will not attain risk-based cleanup objectives. Immediately upon completion of the proposed dredging, the remedy will provide protection to human health against dermal contact risks, and will provide sediment quality that - at least for the upper harbor - approaches if not achieves the 1 ppm ecologically protective level for marine organisms. Consistent with site-specific hydrodynamic and food chain computer modeling, EPA believes that the remedy will, within ten years, attain water quality standards and, for many commercially important species, FDA standards for seafood consumption. In addition, if seafood PCB levels decrease, but not all the way to the site-specific health-based standard of 0.02 ppm PCBs within this time frame (which would otherwise allow unrestricted seafood consumption), then one option would be to issue a seafood advisory allowing reduced seafood consumption as opposed to an outright seafood ban. Until protective levels are achieved, the remedy includes educational programs and other institutional controls to help minimize local seafood consumption by the local population.

GE Comment #2

GE commented that the Proposed Plan appears to equate the removal of PCB mass from the harbor with risk reduction, and noted that this is not necessarily the case.

EPA Response

The remedy does not necessarily equate the removal of PCB mass with risk reduction; rather, the remedy is designed to deal with the risk posed by PCB concentrations in sediment (and the water column). That is, in no way does the Proposed Plan stipulate that x tons or kilograms of PCBs are to be removed. Instead, it defines areas to be remediated based on the concentration of PCBs in sediment. Again, these concentrations (10 ppm in upper harbor subtidal sediments, 50 ppm in lower harbor subtidal sediments, 25 ppm in areas prone to beachcombing and 1 ppm in shoreline residential areas) provide immediate protection of human health due to risks from dermal contact with sediments, and eventual attainment of applicable water quality and fish tissue PCB standards. Cleanup to the proposed TCLs also immediately reduces the sediment PCB concentration that benthic organisms are exposed to by orders of magnitude. Thus EPA believes that in this case the removal of PCBs based on concentration will in fact result in reduced short and long term risks to both human health and the environment. Certainly removal and isolation of an estimated 96% of the remaining mass of PCBs in the harbor contributes to the overall effectiveness of the remedy, but the remedy itself is defined by PCB concentration, not PCB mass.

GE Comment #3

GE commented that the brevity of the Proposed Plan suggests that EPA has not considered adequately either the technical challenges involved in remedial dredging or the viability of capping the contaminated sediments. GE maintains that EPA has understated the technical difficulty of remedial dredging, and that based on experience at this and other sites, EPA's faith in the success of the proposed remedy is unwarranted. Conversely, GE

commented that EPA overstates the problems of remedial capping.

EPA Response

EPA disagrees that the Proposed Plan is too brief and notes that the Proposed Plan is meant to be a summary document accessible to the general public as well as the corporate community. EPA refers the commentor to the extensive Administrative Record available for this site for further documentation of the selected remedial approach.

To argue that EPA has ignored the technical challenges involved with dredging ignores both EPA's New Bedford Harbor pilot dredging and disposal study in 1988 and 1989 and EPA's experience with the New Bedford Harbor hot spot dredging and storage operations in 1994 and 1995.

EPA recognizes that there are technical challenges involved with dredging and CDF disposal: we have experienced them first hand at this site since 1988 beginning with the pilot study. These challenges to date have been overcome, however, and have been accounted for in the planning and cost estimating for ROD 2. For example, consistent with the pilot study's conclusion that two passes of the dredge would be required to achieve a 10 ppm residual PCB concentration (USACE, 1990 at i), EPA has planned on removing the top two feet of sediment throughout the entire upper harbor. This is a conservative approach when compared to the interpretation of total PCBs in the 12-24" sediment strata in the upper harbor (see Figure 4 of the attached ROD). In other words, more dredging than potentially necessary has been assumed, since some of the sediments in the second foot of sediments, especially in the southern portion of the upper harbor, may not be contaminated above 10 ppm. Similarly, EPA has accounted for a lower dredging production rate and thus a longer time frame for dredging based on the actual dredging experience from the hot spot operations. EPA recognizes that new issues will arise due to the larger scale of ROD 2, but the agency has taken advantage of the lessons learned to date and is confident that new problems can be similarly overcome.

EPA also recognizes that capping of contaminated sediments is an appropriate remedy for certain applications and site conditions. That capping was carried forward through detailed analysis in the 1990 FS testifies to its potential as a remedial option. Given the scale of contamination, the physical nature and the high commercial and recreational usage of New Bedford Harbor, however, EPA has concerns about the reliability and permanence of a sediment cap at this site. Having the PCB-contaminated sediment sequestered in well defined shoreline disposal areas where it can be easily monitored in perpetuity is preferred to a solution that leaves the PCBs capped in place, vulnerable to a variety of remobilization processes including disruption by boats or people, and which is difficult to monitor over such a large underwater area.

EPA also has concerns with capping regarding the many combined sewer overflows (CSOs) and storm drain outfalls in highly contaminated areas, as well as with the very shallow nature of the northern half of the upper harbor. GE does not address how these problem areas would be handled under a remedial capping scenario. For example, if the various CSOs and storm drains cannot be raised above the cap level to allow for free drainage, it is likely that dredging would have to be performed in the contaminated areas around the outfalls, an activity which combined with the required CDF(s) would add significantly to the cost of a capping remedy. Similarly, a 2 to 3 foot thick cap in the northern half of the upper harbor would prevent a free flowing Acushnet River, thus an alternative remedial approach would be required in this area.

GE Comment #4

GE commented that the Proposed Plan does not clearly define the levels of PCBs in sediment, in the water column and in aquatic biota that are protective of human health and the environment. GE gives as an example the conflicting regulatory PCB levels for edible seafood that are discussed in the Plan. GE concludes that without a clear objective of target PCB levels in seafood one cannot make a reasoned judgement of the various remedial alternatives. GE urged EPA to clearly state the project goals regarding the consumption of PCB-contaminated seafood.

EPA Response

EPA recognizes, as discussed in the Proposed Plan, that there is regulatory inconsistency regarding the safe level of PCBs in seafood. EPA disagrees, however, that the Proposed Plan does not clearly define protective levels of PCBs in sediment and in the water column. The Plan describes that from an ecological perspective, a range of sediment PCB levels between 0.1 and 1 ppm PCBs would be considered protective of marine organisms, and that the water quality standard for protection of marine life is 0.03 ug/l. EPA believes that evaluation of the various remedial alternatives must consider the degree of PCB reductions in all three of these compartments, not just in fish tissue.

Regarding the confusion over safe seafood PCB levels, the Plan explains that the FDA uses a threshold value of 2 ppm based on assumptions about national seafood consumption patterns (see also section V.C of the attached ROD), while the Superfund program's site-specific human-health based value is 0.02 ppm (based on consumption of local seafood exclusively, see USEPA, 1997b). EPA believes that these two differing thresholds can be used to manage risk, as well as to manage the fishery resources at the site.

For example, once the 2 ppm threshold is consistently reached in any one specie, EPA believes that it would be appropriate for the Massachusetts Department of Public Health to revisit their current fishing ban for that specie (since FDA exceedances were the basis for promulgation of the fishing ban), and to allow for at least partial opening of that fishery. This reopening would have to be carefully managed, however, to inform and educate the local public to nevertheless restrict their consumption of locally caught seafood to safe levels. This safe level would be reevaluated at the time of reopening of the fishery based on the latest risk information on PCBs. Such recommendations on restrictions of local seafood consumption would be consistent with the way that EPA and state environmental agencies have handled contaminated seafood issues at other sites (e.g., elevated PCBs in Boston Harbor lobster). Once a specie were to consistently reach the site-specific 0.02 ppm threshold, then restrictions on that specie could be dropped entirely. EPA has added a safe seafood educational campaign as an institutional control element of ROD 2, and will coordinate with all the relevant state agencies in its implementation (e.g., MA DPH, MA DMF, MA DEP).

GE Comment #5

GE commented that spending any money at all on a project that approaches but ultimately does not attain an objective is not cost-effective because it is not effective, and is arbitrary, capricious and a waste of money.

EPA Response

EPA acknowledges that the great scale of the PCB problem in New Bedford Harbor does not allow for an ideal solution in terms of immediate attainment of all risk-based objectives. EPA disagrees, however, that vast reductions in risk that come close to but that may not necessarily meet quantitative objectives (e.g., ecological sediment TCLs) should be discounted as a waste of money. Indeed, EPA believes the remedy to be highly cost-effective in that it avoids the need for hundreds of millions of dollars for sediment treatment without sacrificing protectiveness. EPA believes that due to the vast magnitude of the PCB problem in New Bedford, the actions necessary to provide achievement of all risk-based objectives within the ten year window (i.e., a 1 ppm TCL) would cause more harm than good. Instead, as described above in response to GE's comment #1, the remedy will attain many of the risk-based objectives either immediately upon completion of the remedy or within approximately ten years thereafter.

EPA also disagrees that the remedy selection is arbitrary or capricious. In fact, the remedy evaluation and selection process for ROD 2 has been exhaustively evaluated. EPA has spent years performing laboratory-scale sediment assessments, pilot dredging and disposal studies, hydrodynamic, PCB fate/transport and food chain modeling, human health and ecological risk assessments, and feasibility studies to answer questions first raised about various remedial approaches in 1984. Since that time and up through the present, these (and additional) questions have been answered and the value of the remedy endorsed by the vast majority of Site stakeholders. As further testimony to the widespread acceptance of the remedy, endorsements have also come from two independent groups unaffiliated with EPA Region I - the November 1995 Sea Change, Inc. public review panel and the August 1996 National Remedy Review Board.

GE Comment #6

GE commented that EPA does not address whether and how it intends to measure the success of the project in achieving its cleanup objectives. In this regard, GE urged EPA to conduct verification sampling of sediments after dredging to determine if sediment TCLs have been met, and to institute a long-term monitoring program to determine whether cleanup objectives have been achieved.

EPA Response

EPA has already started (in 1993) a long term ecological monitoring program for the harbor (see Nelson et al., 1996). Interestingly, GE quotes from the baseline report of this long term monitoring effort as part of their comments, and it is therefore somewhat surprising that they maintain that EPA has not clarified "how it intends to measure the success of the remedy and whether it intends...to establish a rigorous and detailed monitoring program." GE at 7. The details and degree of rigor of EPA's long term monitoring program are spelled out very clearly in the baseline report.

Also, although not specifically described in the Proposed Plan, EPA does plan to institute a confirmational sampling program as part of the ROD 2 dredging program. This program, which would be similar to the one used by EPA during the hot spot dredging program, will determine post-dredging sediment PCB levels in areas that have been dredged. If this confirmational sampling shows areas with residual PCB levels that are statistically above TCLs, then such areas will be redredged as appropriate.

GE Comment #7

GE noted that even with implementation of the proposed remedy, it could be at least 18 years before PCB levels in the water column and in certain biota reach acceptable levels, and commented that the Proposed Plan does not state how long it would take to reach these same levels in water and seafood if other alternatives were selected or no action were taken. They also maintained that a thorough comparative analysis is necessary to justify the proposed $116 million investment. GE went on to note that a comparative analysis at another site, Buffalo River in New York, concluded that sediment remediation including dredging would NOT have a significant impact on reducing water column contamination.

EPA Response

EPA agrees that it could be roughly 18 years from now (assuming the dredging is completed in eight years) before PCB levels in the water column and in some species reach acceptable levels. Risks to human health from dermal contact with PCB-contaminated sediment, however, would be mitigated immediately upon the completion of dredging. Based on computer modeling and the fact that PCB levels in sediment, water and seafood remain orders of magnitude higher than acceptable levels after 20 years of no-action, however, EPA does not expect that a no-action approach would meet these goals for decades if not hundreds of years beyond this time frame. The Proposed Plan does not list time frames for alternative (i.e., non-dredging) remedies, since the model results were based on various residual sediment PCB levels only at the year ten mark after remediation.

One might assume, however, that the time frames for achievement of acceptable PCB levels for a capping-based remedy would be more like those estimated by the model for the 1 ppm cleanup scenario. Once again, though, the time frame for achievement of these levels is only one of many Superfund considerations. The August 1990 FS (Ebasco, 1990c) thoroughly evaluates each of the most promising remedial approaches, including capping, against the nine Superfund criteria. EPA reiterates its belief that capping is not as reliable or permanent as the proposed remedy, which permanently removes and sequesters the contaminated sediment from the marine environment in easily monitored facilities using technology that has been used twice before in New Bedford Harbor.

EPA Region I does not necessarily disagree with the Buffalo River study, but notes that, consistent with the NCP, alternatives analysis is highly site-specific. In fact, the short, three sentence portion of the Buffalo River study cited by GE points to one fundamental difference between the two sites, since it describes the potential for exacerbated water quality in the Buffalo River due to exposing deeper, more highly contaminated sediments. This is exactly the opposite of that proposed for the New Bedford ROD 2: highly contaminated layers will be removed down to predefined sediment PCB concentrations as opposed to predefined sediment depths. For example, in the northern part of the upper harbor, the post-dredging sediment PCB levels would be two orders of magnitude or more less than current levels. Furthermore, EPA's monitoring efforts (USEPA, 1997c, and Battelle, 1990) clearly show that water column PCB gradients follow sediment PCB gradients, providing strong empirical evidence that water column PCB concentrations are directly related to sediment PCB concentrations.

2.2.4 Marine Hydraulics Inc.

Marine Hydraulics Inc. commented, through counsel, that it was opposed to the proposed remedy to the extent that CDF D is located on or in the vicinity of its leased property. Since Marine Hydraulics' business is water dependent, including boat hauling and servicing, it voiced concern that unless the design and construction of CDF D accommodates its business activities, the adverse impacts to the Company would be very substantial. It also noted concern about the ability to further develop or finance development of its leased property as a result of the contaminated sediments contained in CDF D. Marine Hydraulics also demanded that, should EPA locate CDF D as proposed, the Company be consulted with to determine ways to mitigate adverse impacts on its property interests and business.

EPA Response

EPA notes Marine Hydraulics' concerns and will consult with it as necessary during design and construction of CDF D to mitigate adverse impacts on its business.

2.2.5 Petnel Properties L.L.C.

Petnel Properties commented that they support the proposed cleanup plan, since "not only will the harbor's ecosystem benefit, but land along the harbor would become available." Since Petnel is an abutter of CDF C, they requested that EPA coordinate ultimate land use of the CDF with them.

EPA Response

EPA is committed to working with all stakeholders involved with the beneficial reuse of the various CDFs. Thus EPA will work with Petnel as well as the City of New Bedford and other abutters in defining the ultimate land use of CDF C. As a partial mitigation effort for filling in tide lands, however, EPA believes that portions of the upper harbor CDFs (especially the shoreline portions) should be used for habitat and natural resource enhancement to the extent possible. Thus EPA will also consult with the natural resource trustees during the process of defining ultimate use for the CDFs.

2.3 Comments From Local Government

2.3.1 Mayor Rosemary S. Tierney

Mayor Tierney commented that she supports the proposed cleanup plan, with the recognition that it "is not a perfect solution to the problem" but one that "permits further consideration of a better remedy." She encouraged EPA to continue studies of treatment alternatives prior to final capping of the CDFs, as well as to work with the City to determine the best future uses and engineering design for the proposed CDFs. She also expressed full support for the enhancement of the remedy to include navigational dredging, provided neither project delays the other. Should that occur, the Mayor noted that both projects should proceed separately.

EPA Response

EPA appreciates Mayor Tierney's comments and has agreed to pursue literature reviews of potential advances in and implementation experiences with sediment treatment technologies, especially prior to final capping of the CDFs. EPA's engineering design for the CDFs will be done with full openness and coordination with not only the City but the Community Forum and natural resource trustees as well. EPA will also work with the City and other CDF abutters to determine the best future uses of the CDFs once they are completed. EPA will cooperate with the Commonwealth in its efforts to implement an effective and timely navigational dredging program.

2.3.2 City Council President George Rogers

City Council President Rogers commented that the proposed plan "deserves the support of all affected," and that he endorses all the comments made by Mayor Tierney in this regard.

EPA appreciates Councilor Rogers support and notes the response to Mayor Tierney's comments above on the issues he references.

2.3.3 Ward 2 City Councilor Paul Koczera

Councilor Koczera commented that he supports the proposed CDF-based plan but added that the Record of Decision should require that EPA evaluate available permanent treatment technologies prior to final capping of the CDFs. He also commented that the CDFs should be monitored regularly, with an immediate plan of action to correct any problems that

might arise. He also supported the navigational dredging enhancement project, since the *navigational dredging will involve "sediment with PCB deposits above federal action levels"* and since such dredging could offer temporary cover material for the remedial CDFs.

EPA Response

EPA appreciates Councilor Koczera's support and comments. As explained above, EPA has agreed to continue reviewing sediment treatment technologies, especially until the final CDF caps are in place.

The CDFs will be routinely monitored for all pathways in which PCBs could potentially migrate from the CDFs (e.g., groundwater, air, and surface water). EPA will share these monitoring results with the local community, and will take appropriate corrective measures should a problem be detected. Such corrective measures include gradient control of contaminated groundwater migration, a process which lowers the water table in the CDF(s) causing contaminated groundwater to flow into the CDF rather than away from it, and the use of activated carbon canisters for any escaping air emissions above acceptable levels.

In terms of Councilor Koczera's support for the navigational dredging enhancement, EPA is unsure what is meant by the phrase "PCB deposits above federal action levels." It is true that some residual contamination in terms of both metals and PCBs exists in the navigational sediments, but we are unaware of any federal regulatory (e.g., TSCA or RCRA) levels that are exceeded in the sediments where navigational dredging will occur. We agree that the navigational sediments may be appropriate for interim cover material in the CDFs, provided that logistical and schedule issues can be resolved.

2.4 Comments From State Government

2.4.1 Representative Robert M. Koczera

Representative Robert Koczera comments were essentially the same as Ward 2 City Councilor Paul Koczera's described above. Those comments included concern for sediment treatment, CDF monitoring, potential corrective measures for the CDFs if needed, and support for the enhanced navigational dredging remedy. Given this submittal of comments, EPA assumes the prior formal comments submitted by Representative Koczera concerning this remedy are withdrawn. (See comments submitted during the 1995 public comment period on an Explanation of Significant Differences for the Hot Spot ROD.)

EPA Response

See EPA's response to Councilor Paul Koczera's comments above.

2.4.2 Representative William Straus

Representative Straus commented orally at the November 20, 1996 Public Hearing that the phase two cleanup proposal enjoys a greater degree of public support because the community was involved in the discussions and overall decision making process. He made reference to the Community Forum's agreement with the EPA for this remedy, and noted that the remedy is not a perfect one but one that does contribute greatly to the public health and offers other enhancements for the harbor.

Representative Straus also commented that the proposed enhanced remedy linking navigational dredging would, in addition to an economic benefit, provide benefits to public health and natural resources due to the removal of lower levels of PCBs. With regard to the remedy enhancement, the Representative noted that although the proposed plan conditions navigational dredging on available state funding, the U.S. Army Corps of Engineers may be able to contribute some funding for this dredging (as opposed to disposal) project as well, and that that possibility should be explored.

Finally, Representative Straus commented that the proposed remedy does offer the possibility for eventual treatment of the contaminated sediments should technologies develop further. However, if treatment remains cost-prohibitive, the Representative noted that the remedy could nevertheless provide an enhancement to the community through inclusion of the CDFs in the harbor development process.

EPA Response

EPA appreciates Representative Straus' support of the remedy and participation in the consensus building Community Forum process, and notes the clarification regarding funding for navigational dredging. Since the main channels in the harbor are federally authorized, it is possible that dredging (as opposed to disposal) of navigational sediments could be at least partially financed by the Corps of Engineers. Since the Commonwealth requested the enhancement, it has taken the lead in pursuing additional funding. The Corps' dredging, however, cannot be implemented absent a viable disposal alternative. EPA recognizes the interplay between the two projects and will continue to work with the Commonwealth in their efforts to implement an effective navigational dredging program.

2.4.3 Massachusetts Executive Office of Environmental Affairs (EOEA)

Secretary Coxe representing EOEA commented both orally at the November 20, 1996 Public Hearing and in writing on a number of issues, noting the site "presents one of the most complex remediation challenges in Massachusetts" and crediting the Community Forum participants with the hard work required to "craft an effective and workable solution." In summary, the Secretary commented that both EOEA and Governor Weld support the proposed plan because it "will remove the vast majority of PCBs from the site" and since it "greatly reduces the risks to human health and the marine ecosystem." The Secretary gave this support with the understanding that it "is not the perfect solution, because it does not destroy the PCBs, (but) it is the best solution technology will currently allow."

Secretary Coxe encouraged EPA to continue the review of potential treatment technologies, and in the event that a method to destroy the PCBs is not found, to consider the maximum beneficial uses of the CDFs. Noting "that marine economic development of New Bedford Harbor has been impeded by the presence of PCBs and metals" she identified as perhaps the biggest opportunity for water related economic reuse to be the proposed CDF D. Secretary Coxe also underscored the importance of the Commonwealth's commitment to long term monitoring of the CDFs, and the consequent importance of building high quality CDFs that will effectively contain the PCBs.

Secretary Coxe also commented that the dredging and disposal operations be completed with as little environmental damage as possible, and addressed three specific areas of concern regarding the dredging operations: a) escape of contaminants and particulate matter must be minimized, b) impacts to fisheries must be limited and c) the continued function of the saltmarshes must be ensured. She added that the ROD should specify that the area north of Wood Street and in the ditches, creeks and mosquito control channels of the saltmarshes be investigated further and included in the remedy if above TCLs.

Secretary Coxe also gave support for the proposed enhanced remedy for inclusion of navigational dredging, saying that benefits of such a linkage could include permit streamlining, cost-effectiveness and ultimately "improved environmental and economic conditions" of the harbor. She made clear that this proposed enhancement would be contingent on state funding, and that if a non-Superfund approach to navigational dredging could be implemented faster then that approach would be pursued.

Finally, Secretary Coxe requested that EPA include additional dredging of areas near the Cornell Dubilier plant outfall above 10 ppm PCBs as part of this remedy (areas above 10 ppm near the plant and the old sewage treatment plant outfall were included in the May 1992 proposed plan addendum). Citing a preference for removing these sediments "sooner rather than later" after proposed additional investigation of the outer harbor area, she added that funding for this additional remediation could be secured from a portion of the funds specifically set aside for the harbor cleanup and/or restoration as part of the legal settlement for the site.

EPA Response

EPA appreciates the Commonwealth's support, and agrees with Secretary Coxe's comments (except as noted herein). EPA will continue its review of potential treatment technologies and will work with the Commonwealth as well as the Community Forum to ensure that the CDFs are designed and constructed to effectively contain PCB migration.

All sediments above the relevant TCL in the upper or lower harbor will be remediated including those above the Wood Street bridge and in the ditches, creeks and mosquito control channels in the upper harbor saltmarshes. EPA will implement this remediation in a manner that minimizes short term environmental damage (note EPA response to MA DMF below).

EPA plans to coordinate with all stakeholders throughout the remedial design and construction of the project, particularly in defining the maximal beneficial reuse of the CDFs and in coordinating with the navigational dredging project. EPA does believe that some parts of CDFs A, B and C (e.g, the shoreline and intertidal areas) should be targeted as natural resource enhancements.

The Commonwealth's concern about contamination near the Cornell Dubilier plant beyond those addressed in the remedy are noted. After reviewing comments on the May 1992 Addendum Proposed Plan EPA concluded that we had insufficient information about the nature and extent of contamination in the upper Bay to determine an effective remedy. EPA also believes that the possible effects of the ROD 1 and 2 cleanups should be evaluated before a final remedy decision is made for the entire outer harbor area. EPA will continue to study this area in consultation with the Commonwealth and will issue another decision document when those studies are complete.

2.4.4 Massachusetts Division of Marine Fisheries (DMF)

The Massachusetts DMF commented in a letter to EOEA Secretary Coxe that they strongly support the proposed dredging since they believe that the marine resources of the upper and lower harbor will benefit in the long run as a result. They also voiced support of the proposed enhancement of the remedy for harbor navigational dredging since it would provide benefits to the New Bedford commercial fishing industry. They also cautioned that anadramous fish and shellfish be protected during dredging operations and stated their belief that a dredging plan could be devised to accommodate these concerns.

EPA Response

EPA will work with the MA DMF during development of the ROD 2 dredging plans to establish acceptable and reasonable dredging procedures for the protection of anadramous fish and shellfish. However, complete protection of these resources may be impractical given the overall objectives of this remedial dredging (i.e., short term loss of benthic community for long term benefit of all harbor marine resources). We will strive to devise a dredging plan that causes the least amount of disruption to fisheries yet still maintains the cost-effectiveness of the remedy.

2.5 Comments From Federal Government

2.5.1 National Oceanic and Atmospheric Administration (NOAA)

NOAA commented that it generally agrees with the proposed remedy, but disagrees with several specific technical issues discussed below. NOAA supports the hybrid TCL approach "due to the implementability problem of moving below 10 ppm" and the fact that, as explained in the Proposed Cleanup Plan, the lower harbor is a state designated port area and is predominantly lined with industrial and commercial facilities.

NOAA disagreed with the criteria evaluation for the sitewide 50 ppm TCL on pages 10

and 11 of the Proposed Cleanup Plan, noting that "in no way does a uniform 50 ppm cleanup level protect the environment." NOAA also voiced concern regarding the saltmarsh cleanup strategy: It recognizes the objective of using a 50 ppm TCL to minimize the amount of saltmarsh destruction, but is unconvinced that a 50 ppm TCL would necessarily protect biota that use the saltmarsh. NOAA requested that EPA monitor effects on living resources in and near the saltmarshes, and to entertain additional remediation should unacceptable bioaccumulation levels be found.

NOAA also expressed an interest "in including a comprehensive cleanup in the outer harbor in this remedy rather than putting it off" until phase three (for the outer harbor). Assuming that a 10 ppm PCB TCL would be selected for phase three, NOAA speculated that given the time required to close the proposed phase two CDFs, sediments above 10 ppm PCBs in the outer harbor could be identified, removed and placed in the phase two CDFs.

Finally, NOAA's National Marine Fisheries Service (NMFS) expressed concern about "the significant lack of detailed information regarding the request by the state to include navigational dredging as an enhancement of the remedy." It urged that "a thorough alternatives analysis that identifies the least environmentally damaging practicable alternative" be performed for the navigational dredging and disposal needs. Given the large size of the envisioned navigational dredging project, without such an evaluation and additional information, NOAA/NFMS commented that it would not be able to concur with the proposed remedy enhancement.

EPA Response

EPA appreciates NOAA's support for the remedy and understanding of the difficulties presented by site cleanup. EPA understands that a sitewide 50 ppm TCL is not completely protective of ecological resources; the reduction of the TCL from 50 to 10 ppm in the upper harbor reflects this understanding that a greater degree of ecological protectiveness was appropriate. EPA further believes that, coupled with institutional controls to combat contaminated seafood consumption, the remedy is protective of human health. Regarding the 50 ppm saltmarsh TCL, EPA realizes that coordination with NOAA and other resource agencies is critical to development of a saltmarsh monitoring program that will effectively measure the ecological integrity of these areas. EPA expects that bioaccumulation will be one of many monitoring parameters used to measure the success of the saltmarsh restoration as well as the overall site cleanup.

In terms of NOAA's interest in a comprehensive outer harbor cleanup approach at this point, EPA reiterates the need for additional sediment sampling and data gathering before this additional cleanup can take place. EPA will consider NOAA's hypothetical remedial sequence for the outer harbor operable unit, but notes that phase two CDF capacity may be more critical than the phase two schedule for CDF closing.

EPA also appreciates NOAA's concern about the preliminary nature of the discussion regarding the Commonwealth's request for a navigational dredging enhancement of the remedy.

EPA's understanding of the Commonwealth's approach in this regard is that any such enhancement would NOT obviate the normal substantive regulatory review process for such a navigational dredging project.

2.6 Comments From Other Organizations

2.6.1 Coalition for Buzzards Bay

The Coalition for Buzzards Bay commented that they support the proposed CDF-based cleanup plan, since it will remove "more than 90% of the PCBs" from the site. They gave this support with the caveat that EPA remain open to the review and consideration of new, cost-effective sediment treatment technologies. They also encouraged EPA to make a final decision on the cleanup plan so that cleanup action could begin, noting the importance to both public health and the marine environment in removing the contaminated sediments from the upper and lower harbor.

EPA Response

EPA agrees with the Coalition, and notes EPA's agreement to continue the review of sediment treatment technologies, especially prior to final capping of the CDFs.

2.6.2 Hands Across the River Coalition (HARC)

HARC commented that the local community would not accept a dredging solution that did not involve treatment of the contaminated sediments. HARC references a CDF leakage estimate for PCBs of 300 pounds per year, and compares the CDFs to unacceptable leaky hazardous waste dumps. HARC noted its willingness to work with EPA to find a treatment method before the CDFs are capped, particularly for the most highly contaminated sediments.

EPA Response

HARC's comment on the amount of CDF leakage is incorrect; the estimated leakage rate for a long term, worst case scenario is about 3 pounds of PCBs per year, not 300 pounds per year. Important points pertaining to this worst case leakage estimate are:

a - the current "flux" of PCBs leaving the upper harbor on average is approximately 0.5 pounds per day (180 pounds per year), based on measurements taken in 1994 and 1995 during the hot spot dredging operations (USEPA, 1997c);

b - for the first two or three years after completion of the ROD 2 CDFs, the worst case PCB leakage rate is estimated to be approximately 0.36 pounds per day (approximately 130 pounds per year) as the pore water gets squeezed out of the sediments during settling (Averett et al., 1989 at Table D5);

c - after this initial period, the estimated worst case PCB leakage rate is considerably smaller, approximately 0.008 pounds per day or 3 pounds per year (Averett et al., 1989). Perhaps contrary to intuition, the PCB leakage rates get smaller and smaller with time. Finally, by way of comparison, this 3 pound per year long term leakage rate is more than 98% less than the current flux rate of 180 pounds per year referenced above.

More recent estimates (USACE, 1997) confirm the reasonableness of the above leakage assessment. For example, USACE (1997) estimated that a total of 37 kg (81 pounds) of PCBs would leak from the four proposed CDFs over the first 30 years of service. On an averaged basis this works out to be 0.007 pounds per day (including both the initial and long term periods). Similarly, USACE (1997) estimated that 2.4 kg of copper would leak from the four CDFs over the first 30 years. EPA believes that these levels of contaminant loss over these time frames are insignificant and acceptable.

Finally, EPA appreciates HARC's commitment to work with EPA in the continuing investigation of potential treatment technologies for use prior to final CDF capping. EPA supports HARC's idea that if a cost-effective technology is found, then the most contaminated sediments should be the focus for treatment.

2.6.3 New Bedford Harbor Trustee Council

The New Bedford Harbor Trustee Council (the Trustees) commented that they support the proposed target cleanup levels, and encouraged EPA to implement the proposed remedy as soon as possible to provide much needed protection to human health and the environment. The Trustees noted that "post-remediation PCB levels will approach, but are still likely to exceed, FDA acceptance levels for edible tissues in fish and shellfish," and recognized that "increased costs, time and disruption make further reduction in TCLs infeasible." The Trustees also urged continued coordination with EPA during implementation of the remedy, particularly regarding dredging and monitoring in the Fairhaven saltmarsh, dredging of the Coffin Avenue cove, and the phasing of potential restoration work as remediation moves forward.

Regarding the use of CDFs for the remedy, the Trustees suggested that impacts on the aquatic environment could be partially offset if appropriate habitat enhancement(s) were worked into the CDF design. As examples, the Trustees listed the provision of fringe marsh or shellfish habitat as potential enhancements. The Trustees also voiced concern regarding any increase in CDF size to account for "non-Superfund" navigational dredging, as well as the "serious policy implications" that this filling of aquatic areas would have regarding compliance with §404 of the Clean Water Act and §10 of the Rivers and Harbors Act.

Finally, the Trustees requested EPA to reconsider the proposal to postpone comprehensive PCB cleanup of the outer harbor area. The Trustees commented that it would be more efficient to complete the outer harbor dredging now as opposed to later (per a third operable unit), and suggested that the additional sampling required for this area could be accomplished during the design phase for the upper and lower harbor cleanup.

EPA Response

EPA appreciates the Trustees' support for the remedy, and will continue to coordinate with them during its implementation. EPA understands the increased sensitivity and need for coordination regarding saltmarsh restoration, and anticipates that it will need the assistance of the Trustees in developing successful salt marsh replanting and monitoring programs. EPA is also aware of the Trustees desire to arrange phased restoration activities as remediation moves forward, especially the proposed Riverside Park restoration in the Coffin Avenue cove area of the upper harbor. EPA will certainly work to accommodate the timing of remedial activities to meet the needs of the Trustees' restoration efforts to the extent that this coordination is consistent with the selected remedy and does not incur significant delay or extra cost.

EPA believes that joint efforts with the Trustees makes sense in terms of planning and implementing future uses of CDFs, including the potential end use of the hot spot CDF as a park. For example, when permanently closing any CDF, EPA and the Trustees might share the costs of landscaping or upland habitat construction that would go beyond the usual design of a CDF cap. Similarly, EPA believes more discussion with the Trustees is in order regarding potential intertidal or subtidal enhancements that might be included in the CDF designs as partial mitigation for the filling required to implement the CDF-based remedy.

EPA agrees that the radical alterations of the harbor required to achieve FDA seafood levels in the near future will cause more harm than good. For instance, to achieve the 1 ppm PCB TCL, almost the entire upper and lower harbor would have to be either dredged or capped. If dredged, CDF disposal volume for approximately 2.1 million cy of sediment (not counting the 17,000 acre outer harbor area) would be required. This represents a 4 to 5 fold increase in CDF size and in impacts to the aquatic environment compared to the proposed remedy. Similarly, a capping-based remedy of this magnitude, in addition to concerns about long term reliability and protectiveness, would completely change the hydrodynamic and habitat structure of the harbor.

In terms of navigational dredging and any CDFs that may be used for the navigational sediments, EPA must first clarify that the Commonwealth of Massachusetts is the lead party for funding and implementation (except for USACE-funded federal channel dredging) of this project. EPA agrees that the Commonwealth's implementation of the navigational dredging program should satisfy the requirements of the usual regulatory process for such a dredging project.

Finally, regarding the Trustees' request that the outer harbor be included in this phase of the cleanup, EPA notes Secretary Coxe's comments above. EPA, based on extensive comments received during the 1992 comment period, believes it premature to define a remedy for this area until additional studies are completed. With substantial remedial efforts underway, EPA does not believe it is cost effective to expand the scope of our remedy without the benefit of either further sampling or continued review of incoming data from our long term monitoring (LTM) program. To date, although the LTM's outer harbor sampling locations are widely spaced, this monitoring has indicated a generally healthy benthic ecosystem in the outer harbor area. More narrowed sampling expected for the additional operable unit three investigations will help clarify the need for any additional remedial work in this area.

2.6.4 Stripers Unlimited

Stripers Unlimited submitted extensive material regarding various studies on striped bass (Morone saxitilis), including PCB bioaccumulation in Acushnet River striped bass and reproductive and developmental effects from chemical contamination. The study on Acushnet River striped bass (a 1989 Masters of Science Thesis by Tom Frank Rusek) showed elevated levels of PCBs in fish caught in the Acushnet River (mean concentration of 16.5 ug/g) as opposed to those caught in South Dartmouth (mean of 1.12 ug/g) and Westport (mean of 0.144 ug/g). Stripers Unlimited also commented that the harbor has been a major source of striped bass contamination, and that the solution to stopping this contamination involves the dredging and storing of the contaminated sediment in non-permeable areas. They also recommended a better understanding of the microbial processes that "convert the non-soluble dense, electron-negative PCBs into a water soluble hormone-like chemical that triggers the immune response in fish, wildlife and humans.

EPA Response

EPA appreciates the information forwarded by Stripers Unlimited and agrees with the main points of their comment letter having to do with the New Bedford Harbor site. EPA especially appreciates the information regarding elevated PCB levels in Acushnet River striped bass. This information is consistent with EPA's and others' studies of unacceptable PCB bioaccumulation within the New Bedford Harbor area, including the sharp bioaccumulation gradients in shellfish and finfish that are consistent with sediment PCB gradients. EPA believes this striped bass bioaccumulation information further reinforces the need for cleanup.

In terms of furthering the understanding of the microbial processes that may contribute to the role that PCBs may play as a so-called hormone disrupter, EPA agrees that research in this area is important but notes that it is beyond the scope of the New Bedford Harbor cleanup process.

2.7. Comments of AVX Corporation

AVX Corporation, one of the settling parties involved in Site-related litigation, submitted comments on February 3, 1997 which addressed the November 1996 Proposed Cleanup Plan. These comments consisted of three parts: Part I contained comments which addressed legal and procedural issues; Part II contained technical overview comments; and Part III contained separate sets of technical comments from six AVX consultants. EPA's response to these comments are presented according to these three parts of AVX's comments.

2.7.1 Part I of AVX's Comments (Legal and Procedural Issues)

Note: for the sake of clarity and brevity, only those comments and issues not included in the technical comments in Part II or Part III below will be included here in Part I.

AVX Comment #1

AVX commented that given the history of remedial activities at the New Bedford Harbor Site, there is no reason to believe that the proposed remedy will be protective or will remain unchanged. (Part I, pp. 2-3)

EPA Response

As discussed throughout section 2 and section 3 below, EPA believes the selected remedy to be protective as a result of removal and isolation of contaminated sediments as well as through the use of institutional controls to minimize consumption of PCB-contaminated seafood. In fact, the remedy is even more protective than that proposed by EPA in 1992 and that proposed by AVX, since it should result in a five-fold decrease in upper harbor sediment PCB levels compared to those earlier cleanup approaches.

In speculating that EPA is likely to change the remedy in the future, AVX disregards the nationally recognized efforts that EPA has undertaken with the New Bedford Harbor Superfund Site Community Forum ("the community Forum" or "the Forum") to avoid such a remedy reversal. The Forum consists of federal, state and local officials, as well as representatives of several community groups of New Bedford and the surrounding areas. The broad-based support for the remedy that resulted from those efforts, as illustrated by the signed ROD 2 Forum agreement, should enlighten AVX that the remedy, while not necessarily perfect (since it uses containment as opposed to treatment for PCB-contaminated sediments), is nevertheless protective and will not be prone to dismantling due to lack of federal, state or local support.

AVX Comment #2

AVX commented that the record does not reveal that EPA considered other sites nationwide involving contaminated sediments. (Part I, p.7)

EPA Response

EPA disagrees, and notes that this issue was specifically addressed with the community Forum. For example, see the minutes of the September 5 and September 20, 1995 Forum meetings, as well as the handout for the September 5, 1995 Forum meeting (Question #14) and the material mailed to the Forum members between these two Forum meetings, all of which are included in the Administrative Record.

AVX Comment #3

AVX commented that EPA failed to make the community Forum aware of the changes in its approach to risk assessment that have occurred since 1990. (Part I, p.8)

EPA Response

The widespread and severe degree of contamination at the Site overshadows the issue of risk assessment refinements over time. The ecological risks and contaminated seafood consumption risks presented by the Site predicate the "ideal" degree of cleanup; that is, these risks pointed - and continue to point - to a 1 ppm PCB sediment cleanup level were it not for the radical alterations to the harbor and adverse environmental effects that would result from achievement of such a standard. EPA's internal review of these ecological and seafood risks since the 1989 and 1990 risk assessment studies (e.g., USEPA, 1997b; USEPA,1998) showed that the proposed target cleanup levels remain appropriate. EPA would have been happy to explain its findings with the Forum, as it did with all the other ROD 2 issues that came up during the Forum ROD 2 proceedings.

AVC Comment #4a

AVX commented that "(t)he 1996 Plan envisions the CDFs as a temporary measure, implicitly acknowledging that there is an insufficient degree of certainty that the preferred remedy, without more, will prove successful." (Part I, pp.11-12)

EPA Response

EPA disagrees that the 1996 Plan envisions the CDFs as temporary. Even if sediment treatment is someday found to be technically and economically feasible, the CDFs would still be required for the ultimate disposal of the treated sediments.

EPA is unclear what is meant by AVX's phrase "without more". If "more" refers to more CDFs, then EPA disagrees that more CDFs will be required. A considerable amount of time and effort, including use of CAD (computer aided design) software, was extended to ensure that sufficient CDF volume was accounted for. If on the other hand "more" refers to an alleged need for more certainty that the remedy will be successful, then EPA also disagrees that more certainty is required to ensure success of the remedy. As demonstration of this, EPA points to the endorsement of the remedy by two review panels independent from EPA Region I: the 1995 Sea Change panel and the 1996 National Remedy Review Board.

AVX Comment #4b

AVX commented that EPA did not apply the balancing criteria in a reasoned and meaningful way in its decision-making process to support its selection of the preferred alternative of dredging over the other alternatives such as capping.

EPA Response

In addition to the discussion regarding capping included in this responsiveness summary, the 1990 Feasibility Study (Ebasco, 1990c) and the Record of Decision include a detailed comparative analysis of all alternatives using the NCP balancing criteria to explain the basis for selecting dredging over all other alternatives.

EPA included in this analysis all available information received from the hot spot dredging, including dredging production rates, cost, success in meeting TCLs as well as long and short term impacts (USEPA, 1997c; Bergen et al., 1997, Nelson et al., 1997). As explained herein, EPA continues to believe that dredging is a more protective and cost-effective remedy to address the harbor contamination than capping.

AVX Comment #5

AVX commented that "it is incredulous that EPA's evaluation of cost could conclude that the preferred remedy is cost effective." AVX went on to add that the costs from the hot spot dredging operation were not evaluated until December 1996. (Part I, p.12)

EPA Response

Consistent with the NCP's definition of cost-effective (e.g., see 40 CFR 300.430(f)(5)(ii)(D): cost-effectiveness equates to a remedy providing overall effectiveness proportional to its costs), EPA believes the remedy to be highly cost-effective. It avoids the hundreds of millions of dollars that would be required for sediment treatment, or, if a capping remedy were pursued (as discussed below in Parts II and III) the extensive costs for CSO and storm drain modifications. As the Administrative Record reflects, once the CDF locations had been finalized, EPA in 1996 directed that the cost estimates for the various ROD 2 alternatives (as well as the proposed remedy) be updated to reflect the experience of the hot spot remedy, among other factors. This cost updating was performed and finalized prior to the release of the Proposed Plan and invitation for public comment in November 1996. EPA was in receipt of these cost updates and had reviewed the first draft of them as early as June 1996 (see section 4.4 of the Administrative Record).

AVX Comment #6

AVX commented that the costs for sheet piling for one CDF (presumably CDF D) as well as the costs for navigational dredging should not be recoverable cleanup costs. (Part I, pp.12-13)

EPA Response

EPA agrees that navigational dredging costs should not be the responsibility of the Superfund program nor counted towards recoverable cleanup costs. EPA disagrees, however, that costs for sheet piling are not appropriate cleanup costs. Sheet piling is included in the conceptual design of all four of the CDFs because it is an entirely appropriate design feature (it allows for more storage volume and is more easily adapted to the "tight fit" nature of the landward face of the CDFs). Sheet piling was included in the design for use on the seaward wall at CDF D to help attain the required overall sediment storage volume as well as to fit the designated-port-area nature of the lower harbor (it interferes less with navigation and can be used as a docking facility).

AVX Comment #7

AVX commented that EPA over-weighted the community acceptance criteria through the New Bedford Harbor Superfund Community Forum process. (Part I, pp.13-16)

EPA Response

In criticizing EPA for its efforts at building consensus and local support for the ROD 2 remedy, EPA notes a conflicting position in AVX's overall comments. Citing the hot spot remedy experience, AVX claims that the remedy will fail based, in part, on lack of community acceptance. At the same time, however, AVX claims that EPA gave excessive consideration to community acceptance of the proposed ROD 2 remedy.

While there never was or is any question that EPA is the ultimate decision-maker for remedy selection, the Forum discussions moved from hot spot issues to ROD 2 issues in spring 1995 precisely to avoid having the much more costly ROD 2 remedy reversed as happened with the hot spot remedy. The Forum was and is viewed as a process for educating the local community about all the available alternatives through facts, presentations, consultants, and in combination with technical advisory grants by which community groups can perform their own analysis as they see fit. Representatives from several state and federal agencies are always available to answer questions. The goal of providing this flow of information is to create a sophisticated community which will understand the impacts of each alternative on their lives. EPA believes the Forum Agreements symbolize the success of this effort in that it reflects consensus regarding difficult but important issues impacting the community and the governments.

Each Forum meeting is open to public viewing and is taped for replaying by the local cable station. In addition, several widely advertized public meetings were held in 1995 and 1996 to enlarge and open the Forum to the opinions of other Site stakeholders. AVX apparently elected to neither view the Forum meetings nor attend the public meetings.

AVX Comment #8

AVX accused EPA of "patent manipulation of the Forum" in the way that EPA asserted that funding was limited and in the timing of the updating of the ROD 2 cost estimate. (Part I, pp.16-17)

EPA Response

AVX's groundless accusation against EPA in this regard exemplifies its futile attempt to create a record of arbitrary and capricious decision making by the Agency. In discussing costs with the Forum, indeed as AVX itself points out, EPA made clear that the original $40 million cost estimate for the preferred remedy was dated and in need of updating. The assertions about limited funding were directed at the issue of sediment treatment: EPA maintained and continues to maintain that the $200 to $400 million that would be required for sediment treatment was out of the question. EPA waited to update the cost estimate until after consensus for the remedy had solidified and the CDF locations reconfigured (due to community concerns) in order to not waste money estimating the cost of a "moving target" and to maximize the accuracy of the cost estimate by using the exact CDF locations and sizes. Rather than patent manipulation of the public, this was efficient use of public funds.

AVX Comment #9

AVX commented that EPA failed to update the site administrative record in a timely fashion, and that the administrative record is improperly maintained and is incomplete. (Part I, p.19)

EPA Response

Two versions of the draft administrative record were available to the public at all times (one version located in New Bedford and one in Boston), and these records contained the most critical documents that EPA relied on its decision making. EPA agrees that some newer information and analysis were not immediately included in the Record at the start of the comment period, but notes that the public comment period was extended twice after the documents were inserted to allow the public, including AVX, additional time review and comment on the proposed plan. AVX had adequate time to review this material as part of its comments. Also, had AVX elected to follow the Forum proceedings contemporaneously, it would have had the same access to the information handed out and discussed at those meetings as those on the Forum did.

The administrative record for this Site remedy has been expanded and revised as shown in Appendix C to this ROD (the administrative record index).

AVX Comment #10

AVX commented that it should have been afforded the opportunity to participate in the remedy review board process, and its exclusion could only have resulted from EPA's fear that AVX would have caused the board to question the preferred remedy. (Part I, p.22)

EPA Response

EPA categorically rejects the allegation that it was afraid to entertain AVX's participation in the remedy review board process. First, AVX refers to a September 26, 1996 memorandum from EPA's Director of the Office of Emergency and Remediation and Response regarding PRP involvement in the Remedy Review Board Process; the New Bedford Harbor Site review by the Board occurred on August 14, 1996, predating this memorandum by more than one month.

Second, and more importantly, AVX's opinion about the preferred remedy was adequately represented. The Remedy Review Board briefing materials, pre-meeting reviews and the meeting itself all contained discussions of the pros and cons of the range of remedial alternatives, including capping, informed by the information in EPA's possession at the time. This included AVX's extensive comments regarding capping received as a result of the 1992 Proposed Plan and

Addendum.

AVX Comment #11

AVX commented that the remedy review board failed to exercise its responsibility to rigorously evaluate the remedial alternatives and the remedy selection process. (Part I, pp.24-25)

EPA Response

EPA disagrees that the remedy review board's evaluation process was insufficient to meet the overall intent and goals of the national remedy review process. EPA believes that the amount of briefing material, pre-meeting reviews as well as the actual peer review meeting itself were sufficient to explain the issues presented by the site and to reach a well informed conclusion about the overall worthiness of the remedy.

AVX Comment #12

AVX commented that EPA did not allow sufficient time for AVX to comment on the 1996 Proposed Plan. (Part I, p.27)

EPA Response

EPA agrees that additional records were placed in the Administrative Record after the beginning of the public comment period; but also notes that the Administrative Record remains open until the Record of Decision is signed. However, in an effort to solicit the most informed scope of public comments, EPA did provide two extensions beyond the initial 30 days. In fact, after the additional records were placed in the Administrative Record on December 20, 1996, an additional 45 days were added to the public comment period.

EPA believes that the 89 day comment period from November 7, 1996 through February 3, 1997 more than satisfies the minimum time required for a public comment period.

AVX Comment #13

AVX commented that EPA did not respond to comments AVX submitted on the 1992 Proposed Plan. (Part I, p.28)

EPA Response

The responses to AVX's previous comments are included below in section 3.0 of this responsiveness summary. Again, EPA notes AVX's choice not to attend or view Forum meetings nor attend the public informational meetings held throughout the Forum during the last three years.

2.7.2 Part II of AVX's Comments (Technical Overview Issues)

AVX Comment #1

AVX commented that the proposed cleanup plan misrepresents the risks to human health and, therefore, any risk reduction that may be gained by the preferred remedy. AVX claims that a 50 ppm cleanup level would be protective of human health, thus implying there is no need to use a lower TCL in the upper harbor. (Part II, I.A, pp.1-2)

EPA Response

Since AVX does not give any specific examples of the "misrepresentations" in the proposed plan, it is difficult to respond directly to this allegation.

EPA is statutorily obligated to protect both human health and the environment. As explained in the proposed plan, EPA believes that a TCL for ideal protection of the environment should be in the 0.1 to 1 ppm PCB range, more than ten times lower than the 50 ppm threshold advocated by AVX.

Furthermore, EPA disagrees that a 50 ppm TCL would be protective of human health. As discussed in section XIII.B of the ROD, such a TCL would not provide adequate protection against shoreline dermal contact risks. It would also be ineffective (absent institutional controls) in protecting against consumption of PCB-contaminated local seafood.

AVX Comment #2

AVX commented that "the purported foundation for decision-making, the hydrodynamic, PCB transport and fate and food chain models, is seriously flawed and has not been improved since 1992." AVX objected to both the quantitative and qualitative use of the model results, and points out that the model indicates no significant differences between the 10 ppm and 50 ppm TCL scenarios. They also maintain that the new proposed cleanup plan will not provide any additional measure of risk reduction. (Part II, I.B, pp.2-6)

EPA Response

EPA refers to section 3.5.2.2 of this responsiveness summary for a discussion of the technical merits of the hydrodynamic, PCB transport and fate, and food chain modeling used at this site. Regarding AVX's objections to references to the model results in the proposed plan, EPA was simply relaying to the public the best information at hand that addressed these issues, and was careful to reflect the fact that the model results were not viewed as absolute but rather as estimates. EPA agrees that the model predicts only modest additional benefits at year 10 for the 10 ppm (upper harbor only) cleanup scenario compared to the site wide 50 ppm scenario, but notes that the model does not specifically reflect the roughly five fold improvement in sediment quality that would be achieved at "year 0" in the upper harbor under the revised cleanup approach. EPA views this as a significant improvement given the large saltmarsh area in the upper harbor and the fact that sediment quality in this area would then approach if not attain the 1 ppm ecological threshold.

AVX Comment #3

AVX commented that the ecological risk assessment fails to address the true risk to ecological receptors and cannot differentiate between the outcomes of the various remedial alternatives in terms of ecological risk reduction. AVX also commented that EPA should have refined the ecological risk assessment by performing more in-depth analyses. (Part II, I.C, pp.6-13)

EPA Response

EPA disagrees that the baseline ecological risk assessment (Ebasco, 1990a) is flawed, and notes that additional and scientifically rigorous ecological analyses of the harbor have in fact been implemented since the 1990 FS was released. For example, the baseline long-term ecological monitoring report (Nelson et al., 1996) established clear gradients of benthic ecologic stress that mirrored sediment PCB gradients, and additional investigation into the specific toxicants causing biological stress established PCBs as the acute toxic agent in New Bedford Harbor pore waters (Ho et al., 1996).

These studies are consistent with the baseline ecological risk assessment's conclusions that New Bedford Harbor, and especially the upper harbor, is an ecosystem under stress, and that PCBs are a major contributor to its ecological dysfunction. Furthermore, the baseline ecological risk assessment is in general agreement with other studies (e.g., Long et al., 1993; Ho et al., 1996) in terms of the range of sediment PCB concentrations that would be protective of aquatic organisms. As summarized in the 1996 Proposed Cleanup Plan, EPA recognizes this range to be between 0.1 and 1 ppm PCBs. Thus the baseline ecological risk assessment does provide a benchmark for evaluating different remedial alternatives, and this benchmark is not arbitrary or capricious but rather consistent with other scientific investigations. EPA believes that the revised cleanup approach will result in upper harbor sediment quality that approaches if not attains the 1 ppm PCB benchmark for ecological protectiveness, a clear improvement over previous approaches that used substantially higher PCB TCLs for the upper harbor.

AVX Comment #4

AVX commented that the conclusions drawn in the Long-Term Monitoring Report (Nelson et al., 1996) are not necessarily representative of the underlying data. AVX maintained that other factors or toxicants besides PCBs could be responsible for the adverse biological effects seen in New Bedford Harbor. In addition, AVX commented that "there is no evidence in the literature that there is any cause and effect relationship between bioaccumulation of PCBs in New Bedford Harbor and any toxic effect to the species bioaccumulating the PCBs." (Part II, I.D, pp.13-14)

EPA Response

AVX appears to misunderstand the conclusions of the Long Term Monitoring Report. Although other research (e.g., Ho et al., 1996) does conclude that PCBs are the overwhelming toxic agent in sediments taken from the upper harbor, Nelson et al. (1996) did not set out to unequivocally identify which particular pollutant (PCBs, metals, etc.) was the cause of the ecological stress in New Bedford Harbor. Rather, the point of the baseline report was to document that ecological stress in order to compare it with future conditions so that the effectiveness of remediation could be assessed over the long term. In fact, the baseline report concludes exactly the opposite of what AVX claims it does: "Because these contaminants (i.e., PCBs and metals) are collocated, it is not possible to attribute causality to a single contaminant" (Nelson et al., 1996 at 27, parenthetical added). Thus AVX's comment in this regard has absolutely no basis in fact.

EPA agrees that other contaminants in addition to PCBs in site sediments could be causing toxicity, but believes that any such toxicity is dwarfed by that from PCBs. This understanding is consistent with independently refereed scientific literature on the subject. For example, Ho et al. (1996) performed a toxicity identification and evaluation (TIE) to determine the causal toxic agent(s) in pore waters from New Bedford Harbor sediments to amphipods and mysid shrimp. They found that pore water toxicity was organic in nature, and that PAHs as well as metals and ammonia were not major contributors to the toxicity. They determined the range of PCB LC_{50s} (the concentration of PCBs lethal to 50 percent of the test organisms) to fall between 10 and 110 ppb for *Mysidopsis bahia* and *Ampelisca abdita*, measured PCBs in their experiments at levels within this range, and "concluded that PCBs are responsible for the acute toxicity observed in these pore waters" (Ho et al., 1996). It should be noted that this research was performed completely independent from the regional Superfund program.

Another example of independent research which reinforces EPA's belief that PCBs are the overshadowing contaminant of concern at the Site is Long et al., 1993. Long et al. established three screening tiers of sediment contaminant levels using two thresholds, an ERL (effects range- low) and an ERM (effects range-medium). These thresholds are based on observed levels of adverse biological effects together with the sediment contaminant levels causing such effects. Sediment contaminant levels above the ERM represent a probable effects range within which adverse biological effects would frequently occur (Long et al., 1993, emphasis added). The ERM for total PCBs determined by Long et al. is 180 ppb (dry weight): Existing PCB levels in the Harbor range up to four orders of magnitude (10,000 times) higher than this threshold. In comparison, levels of cadmium, chromium, copper and lead in Site sediments are typically less than one order of magnitude higher than the respective ERM (Ebasco, 1990c, Appendix A).

In terms of risk from bioaccumulation of PCBs within the marine food chain, EPA is most concerned about the resulting risk to human health from consumption of contaminated local seafood. Such risks include both carcinogenic and non-carcinogenic effects. At this Site, the degree of bioaccumulation in seafood has greatly exceeded the FDA criteria for allowable PCBs in seafood, has resulted in the MA DPH restricting various types of fishing and shellfishing in 18,000 acres of the site, and has exceeded the 0.02 ppm site specific and risk-based safe seafood threshold by orders of magnitude.

AVX Comment #5

AVX commented that in recommending the preferred remedy, EPA ignored new information on the risk posed by PCBs, thus misrepresenting the effect of the preferred remedy. AVX claims that this new information confirms their assessment that cancer risks associated with PCBs in New Bedford Harbor or in PCB-contaminated seafood is within the acceptable range, and that this new information raises the question of whether EPA has correctly evaluated the risk to the environment or to human health due to the presence of PCBs in New Bedford Harbor. (Part II, p.14)

EPA Response

During the development of the 1996 proposed plan EPA did consider emerging information about risks posed to human health from PCBs, as well as reviewed the science regarding ecological risks from PCBs. From that review, EPA concluded that site risks were such that the proposed cleanup levels were still appropriate. Importantly, as outlined in USEPA (1998), non-cancer adverse health effects rather than carcinògenic effects from PCBs can be the predominating factor in determining cleanup levels. EPA disagrees that health risks from contaminated seafood are within acceptable health risk ranges, since even the most recent lobster data from Area III (MA DMF, 1996) shows PCB contamination above the 0.02 ppm level that represents risk levels of $1x10^{-5}$ and HQ=1 for local residents (USEPA, 1997b). Note that risks to local fishermen is estimated to be even greater than that for local residents.

The January 1997 comments of AVX's human health risk expert, TERRA, Inc. (TERRA) states that "the present risk assessment demonstrates that a 50 ppm cleanup level would be acceptably safe for Areas I, II and III of New Bedford Harbor." TERRA at 3. (TERRA's analysis does not include the entire issue of ecological risk discussed in prior comments.) Thus, inexplicably, since current PCB levels range up to 100 times higher than this 50 ppm level, AVX's conclusions about the overall risks to human health in New Bedford Harbor are inconsistent with that of their own experts!

AVX Comment #6

AVX commented that EPA has failed to adequately consider the hot spot dredging experiences and failed to systematically evaluate the risks to the environment resulting from the proposed dredging. AVX also claims that the hot spot dredging experience cannot compare with the proposed ROD 2 dredging due to the large difference in scale.

EPA Response

EPA disagrees with AVX's criticism that the potential for adverse effects from the proposed dredging were not considered by EPA. Based on EPA's experience with the hot spot dredging operations and the broad margin of safety documented by the project's comprehensive biological and chemical monitoring (USEPA, 1997c), EPA believes that the ROD 2 dredging can be managed in a similarly safe fashion. Obviously ROD 2 encompasses a much larger spatial scale, but the PCB contamination will be at a much lower concentration scale. EPA believes that these lower PCB levels combined with the hot spot's broad margin of safety indicates that the ROD 2 dredging can be accomplished in compliance with PCB remobilization and biological effects-based control criteria. EPA Region I has also reviewed the conclusions of Bergen et al. (1997) and Nelson et al. (1997) regarding PCB compositions and redistributions from the first and second long term monitoring program sampling rounds (as well as an advance manuscript describing this work for a refereed technical journal), and believes that their conclusions (e.g., "analysis of total PCB data and PCB congener distributions showed no extensive migration of dredged material to the lower or outer harbors" - Bergen et al., 1997) supports these beliefs.

EPA has also updated the estimates of leachate quantity and quality that can be expected from the four proposed CDFs (USACE, 1997), using some of the most recent modeling programs available. This analysis confirms prior assessments that leakage of PCBs and metals will be insignificant over the long term.

EPA also disagrees with AVX's comments regarding the effectiveness of the hot spot dredging effort. In stark contrast to AVX's emphatic but incorrect summary of the hot spot objectives (AVX at 17), the 4,000 ppm hot spot criteria WAS intended to be the target cleanup level. In a few instances, multiple passes of the dredge were required to achieve this level, but EPA attributes this to the deeper levels of severe PCB contamination near the Aerovox manufacturing facility (see Figures 4 and 5 of the attached ROD). This view is consistent with the pilot study's conclusions that two passes of the dredge will be sufficient to attain a 10 ppm TCL in less severely contaminated areas (USACE, 1990 at i).

AVX also demonstrates an important misunderstanding of the PCB flux criteria that was used during the hot spot dredging. The 240 kg PCB net transport criteria was not meant to keep PCB transport below background levels, but rather to keep it at levels that would not cause detectable increases in sediment PCB levels nor the need for additional remediation in the lower harbor. As discussed in USEPA (1997c), the actual net flux during the hot spot operations was only 24% of this transport criteria. This result suggests that the rate of dredging for ROD 2 could be increased by a factor of at least four from that used in the more highly contaminated hot spots.

AVX Comment #7

AVX commented that EPA's record with implementation of the hot spot remedy is not encouraging with respect to cost control for ROD 2. It claims that costs for the hot spot remedy rose substantially and that EPA changed the remedy mid-way. AVX commented that EPA may also change the ROD 2 remedy half way through its implementation, and that costs could rise substantially for a wide variety of reasons in areas such as the dredging production rate, dredging costs, water treatment, long term monitoring, CDF siting, and CDF dike subsidence. (Part II, p.19)

EPA Response

EPA agrees that costs for the hot spot remedy increased dramatically, and notes that the congressionally supported reversal in local support for incineration was the biggest factor for this increase. EPA disagrees, however, that this scenario will be repeated for the ROD 2 remedy. In fact, EPA's extensive and nationally recognized efforts with the public Forum in building and documenting consensus for the ROD 2 remedy was done precisely to avoid a repeat of the hot spot remedy reversal. EPA has also used the lessons learned from the hot spot dredging experience as a basis for recalculating estimated costs for ROD 2. This cost updating resulted in substantially higher estimates for CDF construction, dredging, water treatment, and air monitoring.

EPA also recognizes that costs for certain remedial elements could eventually be greater than those estimated at the conceptual stage. However, costs for other remedial elements have the potential to be lower than currently estimated if technological advances (for example, in dredging and air monitoring technology) can be incorporated into the remedy. It is for these types of reasons that the actual cost of a remedy is recognized to be within 50% above or 30% below the estimated cost developed at this conceptual stage of the remedy (USEPA, 1988b). EPA believes that the assumptions used in generating the estimates for the various remedial elements are reasonable, and that any cost bias up or down is carried evenly through the various alternatives such that the analysis of alternatives is not unreasonably skewed.

AVX Comment #8

AVX commented that "there would be far less contaminant loss and potential for environmental impact under AVX's Proposed Capping Plan (AVX 1990) than under a *dredging remedy." AVX claimed that the cap thickness EPA used in its analysis is far too* thick than necessary, thus unfairly biasing the comparison of alternatives. AVX concluded that a cap-based remedy compares quite favorably to the proposed remedy, since it would not be prone to erosion any more than a CDF would be, would cost far less than the proposed remedy, would lead more quickly to AWQC and tissue residual goals, and would not impose the adverse impacts of CDFs. (Part IV.A, pp.23-25)

EPA Response

As explained above in EPA's responses to GE's comments, EPA recognizes that capping of contaminated sediments can be an appropriate remedy for certain sites. For this site, however, given the great scale of contamination and the physical nature, setting and usage of the site, EPA's concerns about the reliability and permanence of a capping remedy overshadow any benefits that it otherwise might have. Having the contaminated sediment isolated in perpetuity in clearly defined confinement areas is preferred to a solution that leaves the PCBs capped in place, vulnerable to a variety of remobilization processes (including human disruption), and which is difficult to monitor over such a large underwater area.

EPA also disagrees with AVX's assertion that remedial capping would cause less contaminant loss than remedial dredging. To EPA's knowledge, AVX has not tried to estimate the degree of sediment resuspension and PCB loss that would be associated with the act of placing geofabric and cap material upon the soft, silty sediments of the harbor. These concerns were first brought to AVX's attention in 1989.

EPA also disagrees that an eighteen inch cap would be sufficiently protective, since it provides for only one of four fundamental factors that should define underwater cap depths. From a theoretical perspective, cap thickness should include additional thickness above and beyond that required for contaminant isolation to account for a) the depth of bioturbation, b) the depth of anticipated cap settlement, and c) the depth of expected long-term erosion of the cap. These design elements are all additive, such that a cap thickness that only accounts for only one of these four elements (chemical isolation) is clearly undersized to a significant degree.

EPA also has deep concerns about the apparent lack of consideration in AVX's capping plan regarding the many CSOs and storm drains in the harbor. Even the addition of an undersized eighteen inch cap would have serious ramifications on the ability of the City's storm water runoff and combined sewer overflow systems to drain effectively. A cap of properly designed thickness would have even more serious consequences. Furthermore, the flow rates from these discharge pipes would likely erode any unarmored cap sections in the surrounding area.

The cost of an effective response to these storm- and CSO-drain problems within a capping-based remedy could very easily be in the tens if not hundreds of millions of dollars, if they could even be resolved at all. AVX's budget for a capping remedy includes only $354,000 for CSO control. AVX's public presentation of their capping approach in 1989 highlights the fact that they seriously underestimated the severity of this problem: In response to questions, AVX's consultants estimated that "there is one or two CSOs" (AVX, 1989 at 135), while in fact the upper harbor alone contains nine CSOs and thirteen storm drains (CDM, 1989). Thus EPA believes that there is a very real implementability problem with AVX's capping proposal, and that the cost estimate for it is vastly underestimated.

AVX Comment #9

AVX commented that the contaminant loss during filling of the CDFs and from the completed CDFs has not been adequately evaluated, and that the PCB leaching calculations performed to date are "simplistic." (Part IV.B, p.25)

EPA Response

EPA disagrees that the issues of leakage and contaminant loss from the CDFs has not been fully assessed, and that these efforts have been simplistic. Most recently, EPA has updated earlier leakage estimates using some of the most recent advances in leakage modeling (USACE, 1997; see page A-86 below). This effort confirms earlier conclusions that the loss of PCBs (approximately 37 kg) and metals (approximately 2.4 kg of copper) over the first thirty years via leakage will be minimal and acceptable.

In terms of losses from the CDF during filling (i.e., as a result of effluent discharge), EPA during the course of developing stringent effluent discharge limitations for ROD 2 performed an analysis to ensure that discharge levels would not adversely affect water quality, and to demonstrate the amounts of copper and PCBs removed through dredging compared to the amounts of copper and PCBs lost through effluent discharge (USEPA 1996b, USEPA 1996c). This analysis showed that the loss of PCBs via CDF effluent discharges (estimated at 20 kg) is insignificant compared to the amount of PCBs removed from the harbor (estimated at 239,000 to 262,000 kg). A similar comparison was shown to exist for copper (116 kg discharged versus 255,000 kg removed). Also, based on the performance of the hot spot treatment plant, EPA anticipates that the discharge levels of contaminants will be either at or below background levels (for PCBs and Cu) or below respective AWQC for other metals (USEPA, 1997c).

In terms of airborne losses of PCBs during CDF filling, EPA also points to the hot spot dredging experience. The comprehensive airborne PCB monitoring that was performed during that project indicates that airborne PCB levels will be less than the NIOSH REL (National Institute of Occupational Safety and Health recommended exposure level) greater than 99% of the time, even when comparing total airborne PCB values to the Aroclor-specific REL (USEPA, 1997c). For perspective, this NIOSH REL is 500 times lower than the lowest Aroclor-specific OSHA PEL (Occupational Safety and Health Administration permissible exposure level), the more enforceable of the two standards (NIOSH, 1994). Certainly the ROD 2 CDFs will be larger than the hot spot CDF, but the PCB levels in them will be markedly lower. EPA believes that airborne PCB levels can be controlled to the same degree that they were controlled during the hot spot project through a combination of careful operational practices and effective engineering controls.

AVX Comment #10

AVX commented that "EPA has misrepresented the cost of the preferred remedy because it has not considered that, in effect, this remedy is an interim remedy and significant additional cost will be required to further treat the contaminated sediments and de-mobilize the CDFs." (Part IV.C, p.26)

EPA Response

EPA acknowledges that if sediment treatment is someday found to be economically and technically feasible, then final cleanup costs could be substantially higher than currently estimated. However, based on the huge volume of contaminated sediments covered by ROD 2 and the current state of sediment treatment technology (e.g., Foster Wheeler, 1997), EPA does not believe that future treatment of the ROD 2 sediments will be a likely scenario. Also, EPA disagrees that the proposed remedy is an interim remedy; this is a final remedy for this operable unit of the site. Should treatment become economically and technically feasible, the NCP provides for subsequent changes to a final remedial decision through a ROD amendment, which is subject to public comment.

AVX Comment #11

AVX criticized EPA for cutting the air monitoring cost estimate by 80% as a result of the Board's review, and questioned how the remedy could remain protective as a result. (Part IV.D, p.27)

EPA Response

EPA takes exception with AVX's characterization of the Remedy Review Board's review, and notes that the Board did support the proposed remedy. The Board did have some comments on the cost of certain elements of the remedy, but they also warned that setting a TCL any higher than 10 ppm in the upper harbor could result in areas of high metals contamination being unaddressed (USEPA, 1996a). AVX fails to mention this aspect of the Board's review.

As explained in EPA's response to the Remedy Review Board (USEPA, 1997a), the reason for the large decrease in estimated air monitoring costs was due to the fact that the original estimate was based on the assumption that the ROD 2 air monitoring program would be modeled after the hot spot's air monitoring program. That hot spot program was very extensive, due in large part to community concerns and the precedential nature of the hot spot project. Per the Board's recommendations, and consistent with the results of the hot spot air data which clearly show seasonally dependent airborne PCB levels (USEPA, 1997c), EPA reduced the ROD 2 air monitoring scope accordingly. EPA disagrees that the ROD 2 remedy will be any less protective as a result. Indeed, if EPA had retained the originally costed air monitoring program, AVX would probably have objected that its scope was overly broad!

AVX Comment #12

AVX commented that it is unclear from the 1996 Plan how the navigational dredging will be separated from the preferred remedy for operable unit 2. (Part IV.E, p.28)

EPA Response

EPA agrees that costs from the navigational dredging project should be completely separate from costs for the ROD 2 remedy. EPA believes that the specific methods of accomplishing this separation will emerge as the navigational project develops beyond the conceptual stage. That is, at this point in time, it is premature to be specific about the navigational dredging program since it is far from being defined with sufficient detail. As both dredging projects move forward into implementation, EPA will work with the other involved parties to ensure that remedial funds are not jeopardized by the navigational dredging project.

EPA also notes that the linkage of the two projects does have the potential to reduce remedial costs. For example, use of navigational dredging spoils as an interim cap in CDF D would serve to decrease costs, since EPA would therefore not have to buy and import the interim cap material itself.

AVX Comment #13

AVX commented that "limiting the dredging in the upper estuary to periods of high tide is inefficient and results in unnecessary costs." AVX maintained that it would be easy to dam the upper harbor thereby allowing deeper water depths and longer daily (if not round the clock) dredging operations. AVX also commented that a shorter overall dredging time frame would equate to less environmental impact. (Part IV.F, p.28)

EPA Response

EPA does not necessarily agree that damming the Acushnet River to allow a shorter dredging schedule results in less environmental impact. Such a dam would itself cause negative impacts such as reduced flushing, stagnation of CSO flows (and thus possibly hypoxia or dangerously low dissolved oxygen levels), and interruption of fish migration patterns including a herring run. Nevertheless, EPA will consider this practice and discuss it with the relevant local, state and federal resource agencies to determine if there are certain times each year that damming could be considered.

2.7.3 Part III of AVX's Comments (Technical Consultant Comments)

In the interest of clarity and brevity, only those comments by AVX's consultants that have not been addressed above will be addressed here.

a. Comments Prepared by TERRA, Inc. (TERRA)

TERRA commented that EPA's 1989 public health risk assessment (Ebasco, 1989) adopted overly conservative exposure assumptions from which the risks associated with direct exposure to Site sediments and seafood were estimated. TERRA maintained that this lead to an exaggeration of exposure levels and an overestimation of the lifetime risks associated either with present Site conditions or any proposed remedial alternatives.

TERRA also submitted extensive comments on the state of scientific research regarding the risk of PCBs generally as opposed to the Site specifically. TERRA concluded that a 50 ppm PCB cleanup level for the Site would be protective of human health against both direct contact and contaminated seafood exposures.

EPA Response

The 1989 baseline risk assessment (Ebasco, 1989) was based on the most current science and practices of risk assessment at the time. Since 1989, many advances have been made in the areas of toxicology and risk assessment; EPA continuously reviews and incorporates, if appropriate, this information in its risk assessments. Prior to issuance of the 1996 Proposed Plan, EPA internally reviewed the latest information on PCB risks and concluded that the magnitude of estimated carcinogenic health risks from the 1989 risk assessment were such that, even if revised to reflect the recent revisions in risk assessment methodology, the estimated risks would remain greater than that deemed acceptable by EPA.

As a result of recent risk-related information regarding the adherence of wet sediment to the human body which EPA considered after the Proposed Plan was issued, and to assist in responding to TERRA's comments, EPA has recalculated intertidal sediment cleanup levels for protection of direct contact risks in the upper and lower harbors (USEPA, 1998). This recalculation is detailed in Appendix B. In summary, this recalculation concludes that 25 ppm, not 50 ppm PCBs would be protective of beach combing activities in non-residential areas, and that 1 ppm PCBs would be protective of young children whose homes directly abut the Harbor. Importantly, this analysis found that non-carcinogenic (as opposed to carcinogenic) health effects determined the final cleanup levels. These non-carcinogenic effects were completely unaddressed in TERRA's analysis.

TERRA's comments also failed to address the level of PCB cleanup that would be appropriate for the protection of ecological risks. EPA is required by CERCLA to address ecological as well as human health risks presented by a site. As discussed herein, Site-specific studies and independently performed research indicate that a cleanup level in the 0.1 to 1 ppm PCB range would fully protect the marine ecosystem (although achievement of such residual PCB levels would in and of itself involve adverse environmental impacts believed by EPA to cause more harm than good).

In addition, EPA's updated analysis of risks due to contaminated seafood confirmed the appropriateness of the 0.02 ppm seafood PCB level deemed protective for local residents (USEPA, 1997b). This 0.02 ppm seafood tissue standard was originally calculated as part of the 1989 baseline risk assessment (Ebasco, 1989) and 1990 Feasibility Study (Ebasco, 1990c) efforts.

Much of Terra's comments include discussion about human and animal carcinogenicity data for PCBs and impacts of this data on development of a PCB cancer slope factor. In 1996, EPA released its reassessment of the carcinogenicity of PCBs which includes recommended slope factors for PCBs based on the pathway of exposure[1]. This document and recommended cancer slope factors have gone through extensive internal and external peer review and are now in IRIS, the Agency's toxicity consensus data base. Thus this responsiveness summary will not address TERRA's non-Site-specific comments related to derivation of a PCB cancer slope factor since most of these issues have been resolved in this PCB guidance document.

TERRA identified six exposure variables for which it believes EPA used overly conservative values. As a result, TERRA commented that the exposure and risks estimated by EPA for oral and dermal contact to sediments are overestimated by factors of 15 to 42. The six exposure variables are;

- the sediment deposition factor
- the sediment ingestion rate
- the fish consumption rate
- the oral and dermal bioavailability factor for PAHs

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[1]PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures, EPA/600/P-96/001F, September, 1996"

- the duration of exposure for young children, and
- the frequency of exposure.

All of these except the fish consumption rate (which does not directly relate to sediment exposure) are discussed below. For each exposure variable, three tiers of analysis are compared - the 1989 baseline risk assessment (Ebasco, 1989), EPA's updated dermal contact risk assessment (USEPA, 1998) and TERRA's analysis as provided to AVX.

Cancer slope factor

Ebasco, 1989: 7.7mg/kg-dy^{-1} (1989 slope factor for PCBs);
USEPA (1998): 2.0mg/kg-dy^{-1} (current cancer slope factor for PCBs, IRIS, 1998);
TERRA: Proposes three value, 7.7. 1.0, 0.42 (old PCB slope factor, new PCB slope factor for central tendency estimates, slope factor derived by TERRA from epidemiological studies).

USEPA (1998) used a slope factor of 2.0 (mg/kg-dy)$^{-1}$ since this is the current Agency consensus value for a cancer slope factor for PCBs. This is the value EPA recommends be used for food chain exposures, ingestion of soils and sediments and inhalation of dust and aerosols. This upper bound slope is recommended when estimating risk or setting exposure standards to protect public health.

Sediment deposition factor

Ebasco, 1989: 1.5 mg/cm^2 (best available data at time)
USEPA (1998): for a young child an area weighted average of 1 mg/cm^2 was used assuming exposure to the hands, forearms, lower legs, feet, and head. This value was derived from data from Kissel et al. (1998) on skin adherence factors for wet soil on children. For older child 0.23 mg/cm^2 was used based on Kissel (1996) (weighted skin adherence factor representative of reed gatherers)
TERRA: Does not recommend any specific value but cites Kissel et al. (1996) as good source of data.

Sediment ingestion rate

Ebasco, 1989: 500 mg/day - young child only (best available data at time)
USEPA (1998): Young child - 100 mg/day [calculated as 200mg/day (EPA default ingestion rate for young child) x 0.5 (the fraction of total daily ingestion of soil/sediment which comes from sediment in NBH)]
Older child - 50 mg/day [calculated as 100mg/day (the EPA default ingestion rate for an older child) x 0.5 (the fraction of total daily ingestion of soil/sediment which comes from sediment in NBH)]
TERRA: Reasonable maximum exposure (RME) value for young child is 65 mg/day, RME value for older child - 50 mg/day

Oral and dermal bioavailability factor for PAHs

Ebasco, 1989: oral absorbency = 100%, dermal absorbency = 7% (best available data at time)

(based on recent review of the literature)
USEPA (1998): oral absorbency = 100%, dermal absorbency = 14% (From Wester et al., 1993)
TERRA: none presented, just that 1989 values are an overestimate

Duration of exposure for young children

Ebasco, 1989: 5 years
USEPA (1998): 6 years (for children up to age 6)
TERRA: 4 years

Frequency of exposure

Ebasco, 1989: Area I RME values for young child and older child are 20 and 100 dys/yr, respectively. The Area II RME value for both a young child and an older child is 100 dys/yr.
USEPA (1998): residential - 150 dys/yr, beach combing - 32 dys/yr, industrial shoreline and remote wetlands - 20 dys/yr
TERRA: Area 1, older child only, RME value - 24 dys/yr
Area 2, young child only, RME value - 54 dys/yr

b. Comments Prepared by Drs. D.Reible and L.Thibodeaux

Reible and Thibodeaux Comment #1

Reible and Thibodeaux reviewed the PCB transport data from the hot spot cleanup operations and made a number of observations. Two that they highlighted included "the single most important indicator of air and water concentrations was season" and "the seaward flux per tidal cycle during the last two days of a dredging period were always higher than the two days at the beginning." (Part III, pp.1-11)

EPA Response

EPA believes that conclusions based on the PCB transport data should be limited to the original environmental questions that this data was meant to address. In this case, the intended use of the data was to compare with the project's maximum cumulative transport criteria of 240 kg (USEPA, 1997c). In this respect, the 57 kg of total PCBs transported as documented by project monitoring demonstrates that the hot spot cleanup was performed well within acceptable criteria, and indicates that ROD 2 dredging rates could be safely increased by roughly a factor of four. EPA believes that other conclusions drawn from the PCB transport data are somewhat incomplete, since this data was not gathered to answer other questions. EPA recognizes that the overall average flux rate for the hot spot (57 kg/240 dredging days/2 tidal cycles per day = 0.12 kg/tc) is roughly an order of magnitude lower than flux measurements taken over much shorter time frames in the mid-1980s, but notes that this difference in time frame (as well as in methods) may significantly skew the sample results.

EPA agrees with the commentors that season and ambient temperature play a significant role in air concentrations, but EPA and USACE did not note a significant seasonal variation in the project's PCB water quality data base.

Reible and Thibodeaux Comment #2

Reible and Thibodeaux commented that "the current rate of reduction in PCB release and seaward flux by natural processes is estimated to be about 3% per year." They went on to comment that "the planned remedy will significantly disturb the long-consolidated bed-sediment and slow the currently observed rate of natural recovery of the sediment." (Part III, p.7; Executive Summary p.1))

EPA Response

EPA does not disagree that PCB flux may be decreasing over time, but notes that this does not necessarily equate to natural recovery. At issue is unacceptable verses acceptable risk to human health and the environment due to PCBs, not unacceptable verses acceptable levels of PCB transport. The 0.5 pounds per year flux rate discussed in the 1996 proposed plan was included to give the interested lay person a very basic sense of the conditions at the site and to help emphasize the point that additional remediation beyond the hot spot remedy is required.

While dredging obviously will impact the sediment layer, EPA will limit sediment resuspension and potential adverse biological impacts to levels in compliance with project control criteria established before dredging begins, much as it did during the hot spot remedy. Upon completion of the remedy, sedimentation of "clean" sediments may help dilute residual sediment PCB levels even further.

Reible and Thibodeaux Comment #3

Reible and Thibodeaux commented that "the results of the hot-spot dredging suggest that the effectiveness of a dredging based remedial alternative remains unproven." (Executive Summary p.ii)

EPA Response

Based on the results of both the 1988-1989 pilot dredging and disposal study and the 1994-1995 hot spot cleanup operations, EPA disagrees that dredging-based remedies are unproven. EPA acknowledges that dredging remedies present challenges, but believes that these challenges can be overcome. The hot spot monitoring report (USEPA, 1997c) documents that little if any adverse impacts to water quality were incurred as a result of the hot spot cleanup, and that exceedances of the NIOSH REL were extremely limited (0.25% of sample data). Although three passes of the dredge were required in a few instances during the hot spot operations where PCB contamination was deep, the pilot study demonstrated that in less severely contaminated areas two passes of the dredge should be sufficient to reach a 10 ppm TCL.

Reible and Thibodeaux Comment #4

Reible and Thibodeaux commented that "the proposed dredging will extend well beyond the current expectation of about 10 years. Workplace exposure standards (e.g., 1000 ng/m^3) should not be applied to nearby residents and the ecosystem in such a situation." (Executive Summary p.ii)

EPA Response

Since the four proposed CDFs have been sited in industrial areas, EPA believes that use of worker exposure standards is appropriate when applied to the immediate areas around each CDF. For offsite residential areas, EPA agrees that a risk-based rather than an occupational-based standard is appropriate. EPA plans to develop such a standard during the remedial design stage based on the latest information on PCB inhalation risks.

Reible and Thibodeaux Comment #5

Reible and Thibodeaux commented that "(I)n the short term, dredging activities should affect PCB concentrations in the water column and, through volatilization, in the air surrounding the estuary. Post-dredging, however, the sediment concentrations and the resulting air and water column concentrations should be reduced." (Introduction, p.1)

EPA Response

EPA agrees in general with this comment, although based on the hot spot experience we expect the CDFs rather than the entire upper harbor to be the focus of air quality issues (and control measures). EPA will nevertheless monitor air quality both at the CDFs as well as around the dredging operation(s). Similarly, EPA also believes that any water quality effects during dredging can be limited using engineering controls. Again, biological effects and net transport criteria will be established to keep project impacts below acceptable thresholds.

Reible and Thibodeaux Comment #6

Reible and Thibodeaux commented that "(t)he multiple dredging passes required in some locations indicates that significant sediment redistribution and mixing was occurring instead of simple removal. Resuspension and redistribution of the sediment was likely to occur both during dredging and as a result of destabilization of the sediment by dredging." (Introduction, p.1)

EPA Response

EPA disagrees with this conclusion since the only areas requiring three passes of the dredge during the hot spot dredging were in Area G. This area was closest to the original source of contamination (the Aerovox facility), and had the deepest depth (> 3 ft) of PCB contamination above

4,000 ppm (Ebasco, 1990c, Figure 2-3). EPA believes it was this depth of contamination that required multiple passes rather than sediment redistribution or destabilization.

Reible and Thibodeaux Comment #7

Reible and Thibodeaux commented that "(a)fter several years of dredging, the bottom sediments will have been disturbed to the degree that a fluffy layer exists throughout. Under these hypothesized events the contamination release and exposure may be as high or higher than any time previously." They went on to comment that they did not believe sufficient data had been collected to perform a credible risk analysis for the remedy, and that the lack of statistically significant reductions in air or water quality as a result of the hot spot cleanup points to the limited effectiveness of dredging as a remedial option. (Conclusion p.7)

EPA Response

In similar fashion as was done during the hot spot dredging operations, sediment resuspension and contaminant release will be closely monitored and controlled during dredging operations in order to limit any adverse impacts to pre-determined acceptable limits. EPA disagrees that insufficient information has been collected to demonstrate that dredging can be effectively and safely implemented. In addition to the volumes of feasibility and laboratory-based information included in the site's Administrative Record, EPA points to the pilot study summary report (Otis et al., 1990), the pilot study air monitoring report (Ebasco, 1990b) and the hot spot monitoring report (USEPA, 1997c) which summarize data collected in the field during actual dredging operations which serve to support dredging as an effective remedial option.

c. Comments Prepared by Dr. W.F. Bohlen

Bohlen Comment #1

Bohlen commented that the benthic stress evident in New Bedford Harbor could be caused by contaminants other than PCBs, notably metals, and pointed to Black Rock Harbor near Bridgeport, CT as an example where such stress exists in the absence of PCBs. He went on to comment that "simple emphasis on PCBs without consideration of the factors affecting metal supplies and/or overall water quality (including nutrient inputs and dissolved oxygen) may do little to improve the environmental quality of New Bedford Harbor." (p.2)

EPA Response

EPA has not disregarded the many other contaminants known to be located in the Harbor. Contrary to Dr. Bohlen's comments, all of EPA's critical site investigations, risk assessments and remedial alternatives analysis have included non-PCB contaminants of concern. This is readily apparent in the site's Administrative Record. Although Dr. Bohlen makes sweeping criticisms of the Administrative Record, it appears based on his specific comments that he has not sufficiently reviewed it, or at least sections 3 and 4 of that Record.

EPA points to two studies that have distinguished PCBs as the overriding causative agent of toxicity in the Harbor: The 1990 baseline ecological risk assessment (Ebasco, 1990a) and a toxicity evaluation and identification study by Ho et al. (1996). Ho et al.'s work is summarized above in response to AVX's comment #4. Other non-site related research studies also indicate PCBs as the overshadowing ecological toxicant. For example, again as discussed in response to AVX's comment #4, existing PCB levels in the Harbor are up to four orders of magnitude higher than the ERM for PCBs listed by Long et al. (1993), while those for cadmium, chromium, copper and lead are typically less than one order of magnitude higher than the respective ERM. Levels above the ERM represent a probable effects range within which adverse biological effects would frequently occur (Long et al., 1993).

EPA recognizes that other contaminants, especially metals, contribute to sediment toxicity, and has factored this into its remedial decision making. In fact, the proposed dredging-based remedy removes and sequesters the highest levels of metals along with the highest levels of PCBs (Nelson et al., 1996; Averett et al., 1989; and USACE, 1997). The national remedy review board noted this feature in its assessment of the proposed remedy, warning that any relaxation of PCB cleanup levels should be examined for the effect on the degree of metals remediation (USEPA, 1996a). Finally, EPA will monitor for potential impacts to the Harbor from nutrient overloading, including the potential for low dissolved oxygen levels.

Bohlen Comment #2

Bohlen commented that "EPA's own studies show no elevation in serum PCB in the population of the New Bedford area." (pp. 2-3)

EPA Response

The study to which Dr. Bohlen refers is the Massachusetts Department of Health's (DPH's) Greater New Bedford PCB Health Effects Study, 1984-1987. That study did find that the general prevalence of elevated serum PCB levels among residents of Greater New Bedford is low (see Section 3 below for more discussion). The Health Effects Study also recommended continuation of the fishing ban previously enacted by the DPH. EPA agrees with this recommendation, and as discussed above, will incorporate site-specific risk-based seafood consumption thresholds as well as the FDA's 2 ppm PCB criteria into its risk management and institutional control decisions.

Bohlen Comment #3

Bohlen commented that EPA's analysis of the permanence and long term reliability of an underwater cap is flawed, and that "cap disruption in this system protected by a hurricane barrier, shore side sheltering and limited fetch is no more likely for a cap than for a CDF." (p.3)

EPA Response

This issue is addressed in greater detail above, but EPA disagrees that an underwater cap would be no more prone to disruption than a CDF. EPA believes that disruption by human activity over such a large underwater area within a heavily populated area is a significant concern, especially combined with the difficulty of monitoring such disruption compared to the ease of monitoring CDFs. EPA also has concerns with impacts from storm drains and CSOs on the long term durability of an underwater cap, especially during storm events, and reiterates its belief that AVX has not realistically dealt with the implementability and cost problems that CSOs and storm drains would present for an underwater cap. Other evaluators have listed long term disadvantages of capping as well: For the Manistique River and Harbor (Michigan) Area of Concern, Palermo and Miller (1995) concluded that dredging was more effective than capping in the long term (i.e., beyond 100 years) and that "overall, there is a much greater level of confidence in the performance of [the dredging] alternative than the capping/stabilization alternative."

Bohlen Comment #4

Bohlen commented that dredging would disrupt near-equilibrium sediment conditions and create a high water content, generally unstable habitat which would favor mobile opportunistic species. Bohlen commented that this would substantially alter the existing benthic community structure, and that a capping based remedy might not cause such a shift in community structure. (p.3)

EPA Response

EPA does not necessarily agree that low quality communities will dominate the post-dredging benthic environment in the long term. EPA notes the currently degraded benthic community structure, especially in the upper harbor (Nelson et al., 1996), and expects improvements in this structure in the long term based on the orders of magnitude decrease in PCB and metal contaminant levels that will result from dredging. EPA will confirm this expectation through continued implementation of the long term ecological monitoring program.

EPA expects that small, shallow-penetrating opportunistic species would be the initial sediment colonizers regardless of whether a dredging or capping-based approach were to be pursued, and that over time a higher quality, more diversified equilibrium benthic structure will evolve.

Bohlen Comment #5

Bohlen commented that "the proposed dredging has the potential to significantly alter circulation and sediment transport with the New Bedford Harbor system." Bohlen went on to suggest that this, along with his comments above, could adversely affect the benthic community and fisheries habitat. (p. 4)

EPA Response

Potential hydrodynamic effects will be evaluated in more detail during the design stage of the remedy, although more from the standpoint of potential impacts from the upper harbor CDFs than from impacts of dredging. Only two feet of dredging is deemed necessary for the upper harbor, with only one foot necessary for the lower harbor. Initial assessments of before and after cross-sectional areas of the Acushnet River at potential CDF "choke points" were deemed acceptable by both EPA and the community Forum. EPA believes that the endorsement of the proposed remedy by both state and federal fisheries management agencies (e.g., MA DMF, NOAA, NFMS) demonstrates the positive impacts the remedy will have, especially in the long term, on the condition of benthic communities and local fisheries. EPA considers these long term ecological benefits to outweigh the initial destruction of (low quality) benthic communities caused by dredging.

Bohlen Comment #6

Bohlen commented that "the utility of and need for the proposed remedial scheme cannot be evaluated using available information." He also criticized the lack of supporting documentation in the summary memo that EPA prepared to brief the national remedy review board, and commented that the proposed remedy "is not based on scientific or engineering data but rather represents a political product developed in consultation with the community." (p.5)

EPA Response

EPA acknowledges that there is no one single document that addresses every issue presented by the 18,000 acre site, its extraordinary levels of contamination and the years of investigation and Site analysis. Rather, EPA relies on a number of critical studies within the Administrative Record to provide the necessary information for remedial decision making. These include the 1988-1990 USACE Engineering Feasibility Studies, the 1989 baseline public health risk assessment, the 1990 baseline ecological risk assessment, the 1990 feasibility study of remedial alternatives, the 1990 system modeling efforts, and the 1996 baseline long term ecological monitoring study, among others. EPA disagrees that the information covered by these various studies is insufficient for well-reasoned decision making. Many other parties unaffiliated with EPA Region I, including the community Forum, the Sea Change, Inc. CDF panel and the national remedy review board have reviewed the existing site information and support the proposed remedy.

In terms of the remedy review board brief, that brief was meant to summarize what the region believed to be the most salient issues within the context of a briefing memo. The facts in it were checked for accuracy using the extensive library of Site investigations, but as a summary briefing document, it did not contain the technical references that would normally appear in a technical or scientific journal. The fact that EPA used this body of information to build consensus for a remedy which did not include the communities' desire for sediment treatment points to the quality of the information and the effectiveness of the remedy rather than to a flawed political process.

d. Comments Prepared by Spaulding Environmental Associates (SEA)

SEA Comment #1

SEA commented that EPA's discussion of TCLs and land use around the harbor failed to mention the existing industrial character of the upper harbor and the likelihood that this land use will continue. (p.2)

EPA Response

Much of the New Bedford shore of the upper harbor is obviously industrial in nature. This is in dramatic contrast, however, to the eastern, Acushnet and Fairhaven upper harbor shore which is made up almost entirely of a large, continuous saltmarsh which borders an extensive residential and open space area. EPA believes it is appropriate to consider both sides of the upper harbor in its remedial analysis, including the value of this eastern shore saltmarsh and the surrounding land use.

In terms of future land use around the upper harbor, SEA is apparently unaware of the recent razing of Pierce Mill, a large mill along the western shore of the cove between Sawyer Street and Coffin Avenue in New Bedford, and the fact that the City of New Bedford had this demolition performed with an eye toward creation of a large "Riverside" park in this area. In addition, alternative uses of some of the upper harbor mill facilities have been proposed, including conversion to residential health care facilities for the elderly. Thus, although future use of the upper New Bedford Harbor shore will clearly include a large industrial component, EPA believes that over time a more diversified land use mix could emerge. For example, the ultimate use of the CDFs could be a mix of commercial (e.g., parking), recreational (e.g., soccer fields) or conservation-oriented (e.g., bird sanctuaries).

SEA Comment #2

SEA commented that EPA's modeling efforts showed only small differences in surface water and bed sediment benefits between the 10 ppm (upper harbor only) and 50 ppm (Site-wide) alternatives. (p.3)

EPA Response

As noted above, EPA recognizes that the model results indicate only small differences at year ten to surface water and bed sediment PCB levels between these two alternatives. EPA also acknowledges that the final recommendations of the modeling effort grouped these two remedial approaches (along with the "Lower Harbor" approach) into the same "middle ground" group of simulations - between a 1 ppm scenario on the one hand and the hot spot and 500 ppm scenarios on the other (Battelle, 1991). EPA would emphasize, however, that the remedy goes beyond the scope of these two scenarios, since it includes cleanup of the lower harbor (which the 10 ppm upper-harbor-only model scenario does not) and since the remedy includes cleanup of the upper harbor at 10 ppm (which is five times lower than the TCL used in the 50 ppm Site-wide model scenario). This should serve to increase the benefits of the selected remedy in terms of water quality and bed sediment PCB levels at year ten compared to either of these two model scenarios. In addition, the remedy by definition would bring about a five-fold increase in sediment quality in the upper harbor at year "0" compared to the 50 ppm site wide approach. EPA believes this to be important since the year 0 upper harbor sediment quality would then approach, if not - when combined with future sedimentation of "clean" sediment - attain, EPA's 1 ppm threshold for ecological acceptability.

SEA Comment #3

SEA commented that "As of 1986, winter flounder and lobster data collected from upper Buzzards Bay (the outer harbor) both had body burdens of total PCBs below the FDA limit of 2 ppm (Schwartz, 1988)." SEA went on to note that "(I)t is likely that body burdens have decreased further since Schwartz's (1988) analysis of samples collected in 1986. Battelle's (1990) model indicates that both lobster and winter flounder will approach the NCP limit of 0.2 ppm PCB after 10 years under the 50 ppm scenario." (p.4)

EPA Response

EPA acknowledges that the PCB data for lobsters produced by the MA DMF (Mr. Schwartz works at the DMF) indicate generally decreasing levels in the edible portion of the animal (see Figure 17 of the ROD). However, EPA notes that this data shows that PCB levels in the edible portion of lobster have been below the FDA standard since 1992, not 1986. EPA also notes that the data at least through 1995 (the most recent data available) indicate more of a leveling off than a continued downward trend of PCB body burden. EPA also emphasizes that this data is for Area 3 only, and does not include the more highly contaminated Areas 1 and 2 covered by the selected remedy. Because the MA DMF's sampling program does not typically cover areas 1 and 2, EPA will include a long term seafood sampling program for these areas as an element of the remedy's institutional control program.

EPA also notes that the NCP standard for seafood referenced by SEA is not necessarily appropriate. Based on a revised 1997 analysis, this 0.2 ppm PCB level represents a $1x10^{-4}$ incremental cancer risk level and a non-carcinogenic hazard quotient of 10 for a local resident (USEPA, 1997b). Risks to local fisherman were estimated to be greater than those for local residents. This updated analysis also reinforced the safe seafood value of 0.02 ppm as the more appropriate threshold that would meet the NCP standards for carcinogenic and non-carcinogenic risk as well as the state MCP standard for carcinogenic site risk (10^{-5}). This 0.02 ppm level was first identified in the 1990 FS (Ebasco, 1990c at 4-21).

EPA also disagrees that the 50 ppm Battelle scenario indicates that flounder body burden at year ten would approach 0.2 ppm; as shown in Figure 7.63 of Battelle (1990) such burdens approach 1 ppm (not 0.2 ppm) for 2 and 5 year old flounder and slightly lower levels (approximately 0.8 ppm) for newborn flounder at year ten.

SEA Comment #4

SEA commented that a publication by Cullen et al. (1996) reported elevated levels of PCB congeners "in tomatoes (but not other produce) grown downwind of the hot spot during dredging of the hot spot in 1994. The presence of contaminants in tomatoes was attributed to

volatilization of PCBs and subsequent atmospheric transport." (p.5)

EPA Response

EPA is aware of the results of this study, and believes that more investigation of PCB levels in tomatoes is needed before conclusions can be drawn about impacts from dredging operations on local produce. For example, the authors acknowledged "that with data from only two growing seasons we are unable to evaluate season to season variability."

e. Comments Prepared by Dames & Moore, Inc.

Dames & Moore Comment #1

Dames and Moore commented that if the dredging production and down time rates from the hot spot dredging are used to estimate ROD 2 costs, an increase in capital and operation and maintenance costs will occur. (pp. 1-2)

EPA Response

EPA believes that the cost estimating assumptions regarding increases in dredging efficiency as dredging moves into deeper water and into areas of lower contamination are reasonable. These two factors hampered dredging efforts during the hot spot project, and EPA believes it appropriate to take this experience into consideration in the cost estimating for ROD 2. For example, and as explained more fully in USEPA (1997c), the extreme contamination levels of the hot spot sediments resulted in a reduced dredge arm swing speed and a slower rate of dredging in order to minimize airborne PCB levels.

Dames & Moore Comment #2

Dames & Moore commented that the cost estimate inconsistently applies the USACE assumptions regarding dredging production rates. Dames & Moore noted that the production rates used by EPA's consultant Foster Wheeler to generate the dredge operating costs were lower than those assumed appropriate by the USACE. (p.2)

EPA Response

EPA acknowledges that Foster Wheeler used lower assumptions of dredging efficiency than the Corps, but notes that this serves to increase the estimated cost of dredging operations. Overall, this provides for a more conservative estimate of remedial costs, and serves to mitigate other Dames & Moore criticism that the remedial cost estimates are biased low. EPA also notes that the dredging efficiency assumptions were used consistently between all remedial alternatives that require dredging as a remedial component.

Dames & Moore Comment #3

Dames & Moore commented that "the cost of construction of the CDFs does not account for the *material that will be needed as a result of settlement.*" *(p.3)*

EPA Response

EPA understands that some degree of settlement of the in-water CDF dikes should be expected considering the generally soft, silty foundation sediments of the upper harbor. The amount of dike length that could experience settlement has been minimized, however, by the inclusion of a full sheet pile wall in lieu of earthen dikes around the perimeter of CDF D, the largest of the four CDFs. EPA and the USACE will take appropriate steps to account for any settlement experienced in the upper harbor CDFs, such as the placement of additional fill and the conduct of water quality and biological effects monitoring during construction of the CDF dikes.

EPA believes that the cost of any extra fill material required as a result of dike settlement is adequately accounted for in the 20% contingency factor (on both direct and indirect costs) included in the cost estimates, and by the recognition that actual costs of a remedy can be expected to be within 50% above or 30% below the FS-stage cost estimate.

Dames & Moore Comment #4

Dames & Moore commented that the cost of purchasing land for CDFs was not included in the cost estimate, and that the land area requiring purchase has increased. (p.4)

EPA Response

EPA does not agree that substantial land purchases will be required for the CDFs. Other alternatives to outright land purchase exist, and CDF abutters have expressed an interest in working cooperatively with EPA. Also, much of the land area at issue is owned by the City of New Bedford: EPA believes that outright purchase of these parcels will not be required since the City has actively supported the remedy, has a vested interest in streamlining the cleanup process, and since the City should be able to reuse the CDF portions impacting their land. Thus EPA disagrees that the land area "requiring purchase" has increased. Land acquisition costs were not included in the cost estimate since the degree of such acquisition costs is very unclear.

Dames & Moore Comment #5

Dames & Moore commented that the costs for the proposed water treatment are underestimated, and that EPA inappropriately used an average of two widely varying estimates of water treatment capital costs. Dames & Moore also commented that there "does not appear to be any documentation provided by EPA on the design or the performance of the plant built for (the) Hot Spot." (pp. 4-5)

EPA Response

EPA believes that the averaging of the two capital cost estimates (from the 1990 FS and from the Corps' analysis of the hot spot project) is a reasonable attempt to improve the accuracy of the water treatment cost estimate. EPA did not believe that use of actual cost factors from the hot spot project (which were higher than Foster Wheeler's estimates) without modification was prudent, since that project experienced a radical change in scope as a result of the local incineration controversy and since that project was significantly smaller than ROD 2.

EPA has documented the design and performance of the hot spot water treatment plant in the hot spot monitoring report (USEPA, 1997c), and has used the performance history of that plant in its evaluation of water treatment needs and costs for ROD 2. EPA also notes that the cost estimate for water treatment includes a conservative estimate of the total daily treatment capacity required (2.016 million gallons per day (mgd) versus 1.728 mgd). Thus, EPA believes that the water treatment costs have been reasonably estimated, and disagrees that "the cost estimates for water treatment are just a guess."

Dames & Moore Comment #6

Dames & Moore commented that "(c)onsistent and complete cost information apparently is unavailable, or has not been provided to the public in the administrative record to date. The amount of uncertainty in the costs for the alternatives overshadows the variability between alternatives. Therefore, cost comparisons between alternatives, and between the various cost estimates are sketchy at best and an analysis of the cost benefit of the preferred alternative is pure speculation."

EPA Response

EPA acknowledges that there is uncertainty in the cost estimates, as there is in virtually every cost estimate developed at the conceptual stage of a remedial alternative. EPA believes, however, that the cost estimates incorporate this uncertainty in a consistent manner across all alternatives, thereby allowing for a fair comparison during remedy selection. Furthermore, EPA has incorporated cost information from the hot spot as appropriate to improve the predictiveness of the cost estimates, and notes that cost is but one of nine criteria established by the NCP for use during the selection of Superfund remedies. EPA has also made all of the pertinent cost estimating information available to AVX, in response to their Freedom of Information Act request.

Dames & Moore Comment #7

Dames & Moore presented an assessment of potential total costs for ROD 2 using the unit costs from the hot spot dredging project. Admitting that this approach was "undeniably simplistic" and using capital costs rather than net present worth costs as a basis, Dames & Moore commented that total ROD 2 costs could amount to $857,995,000. They also commented that on a unit cost basis, the 1996 Proposed Plan was six times less expensive than the hot spot project.

EPA Response

EPA believes that this approach is overly simplistic, and notes that cost comparisons, especially for longer term projects such as ROD 2, should be performed on a net present worth basis. EPA also emphasizes that it recognizes that the final cost of the remedy, consistent with the -30% to +50% cost accuracy of conceptual stage estimates, could be as high as $174,000,000 (i.e., $116,000,000 x 1.5). EPA also believes that the ROD 2 project will be less costly than the hot spot project on a per cubic yard basis for a variety of reasons, including, among others, a) economies of scale, b) purchase rather than rental of dredges, c) reuse of the hot spot water treatment plant, d) bottom liner-less CDF designs and e) lessons learned from the hot spot project.

Dames & Moore Comment #8

Dames & Moore questioned why the ROD 2 cost estimate for dredging operational costs *of $9600 per day was almost half the rate that would be predicted using the actual costs* experienced during the hot spot dredging operations. Dames & Moore believes that use of this $9600/day factor significantly underestimates the total ROD 2 costs.

EPA Response

The difference between the two approaches is due to the fact that the hot spot dredge was rented, while for ROD 2 it is assumed that the dredges will be purchased. Thus the daily operational costs for the hot spot dredging included rental fees, while those for ROD 2 will not. The ROD 2 cost estimate does, however, include purchase costs for 4 dredges at $400,000 each. EPA therefore believes that the cost estimating approach for ROD 2 dredging operations is reasonable and not significantly underestimated.

Dames & Moore Comment #9

Dames & Moore commented that "the cost estimate for the preferred alternative also omits various required costs for long-term monitoring. The only monitoring of the CDFs is for inspection and erosion control. There is no ground water or long-term air monitoring. The only environmental monitoring is for water, sediment and biota at 50 locations 4 times a year. What is the relationship between this environmental monitoring and the long-term monitoring study which includes some 90 stations? There is no monitoring for performance of the wetland restoration or for resedimentation of the excavated mudflats." (p.8)

EPA Response

EPA believes that the assumed amount of sampling for long term monitoring, while not necessarily mirroring precisely the actual sampling that will be undertaken, adequately represents the overall scale of the long term sampling efforts. For comparison, AVX's long term monitoring program was significantly smaller in scope and cost. AVX's program included only "a 20 year sampling period with quarterly monitoring in the first 5 years and a 60% reduction in the monitoring for the last 15 years" (Table 3, Part II of AVX's 1996 comments), with only 10 surface water and 20 biota samples. EPA's assumed program, on the other hand, which included 50 sampling locations, quarterly sampling events, and biota, surface water and sediment sampling at each location and event, is much more conservatively estimated.

Furthermore, it is likely that EPA Narragansett's semi-annual mussel deployment will continue for the foreseeable future. This activity is funded through EPA's research budget rather than through the remedial budget, although the data is shared with the Superfund program. EPA Narragansett has also found the mussel monitoring to be a valuable and cost-effective assessment tool for water quality monitoring, since it integrates PCB levels over a longer time frame (rather than taking only specific "snapshots") and since the PCB tissue levels become higher via bioaccumulation and thus more easily quantifiable. Long term surface water monitoring may therefore not be required, or at least not at the frequency assumed by the cost estimate. Should the mussel deployment program be discontinued EPA will review the surface water monitoring needs.

In addition, EPA's long term ecological monitoring program will only take place once every three to five years, since benthic recovery is not believed to be measurable within shorter time frames. The seafood sampling program discussed above will take place approximately once every year. These programs, together with EPA Narragansett's semi-annual mussel monitoring efforts, are expected to be the main long term ambient monitoring programs for the ROD 2 remedy. Groundwater and air monitoring programs will be implemented around each CDF, but - as AVX assumed in its proposal - the frequency of these CDF monitoring efforts are expected to decrease significantly over time as steady state and predictable conditions are reached. The five year reviews of the remedy will include review of this CDF data to ensure that decreased monitoring frequencies are appropriate.

Costs for resedimentation of dredged areas were not included because this activity is not required as part of the remedy. Costs for wetland restoration are believed to be within the general magnitude of the long term monitoring cost estimate and overall contingency factor.

Dames & Moore Comment #10

Dames & Moore commented that "(t)he (CDF) cover system is designed to be impermeable, and does not account for any gas collection or treatment after capping. Does EPA believe that the cover system for the CDFs will be the functional equivalent to the cover required for a RCRA/TSCA landfill. (sic) Does EPA plan to waive the Land Disposal Restrictions that should apply to the sediment?"

EPA Response

EPA recognizes that the CDF caps will need to provide for gas venting. However, based on EPA's experience to date with the interim storage of the more highly contaminated hot spot sediments at the Sawyer Street CDF, EPA does not believe that treatment of the vent gas will be required. This assumption will be confirmed through air monitoring once the CDF caps are in place, and appropriate remedial action taken if airborne PCB levels exceed acceptable levels.

EPA does believe that the CDF covers will be the equivalent of RCRA/TSCA covers. Hydraulic conductivity values for these covers will be in the 10^{-7} cm/sec range or lower. EPA does not believe that the RCRA Land Disposal Restrictions apply to this response action, since all dredged sediments will be disposed of within the existing area of contamination.

f. Comments Prepared by Applied Environmental Management, Inc (AEM).

AEM submitted tables of other contaminated sediment sites across the country, without providing specific comments on the proposed remedy for New Bedford Harbor.

EPA Response

Since AEM did not offer any specific comments regarding the Site or the proposed remedy, EPA cannot offer any Site-specific responses. EPA does note, however, that the proposed remedy is consistent with the other PCB sites tabulated by AEM both in terms of cleanup levels and cost: AEM lists six other sites nationwide with PCB cleanup levels of 10 ppm or less, and the estimated overall unit cost for ROD 2 ($116,000,000/450,000 cy = $258/cy) is within AEM's reported unit cost range for completed sites to date. AEM reported this overall unit cost range to be between $115 and $1,430 per cubic yard.

3.0 Summary of Comments Received During the January 31, 1992 Through July 13, 1992 Public Comment Periods, and EPA Responses

3.1 Citizen Comments

This section presents the comments submitted to EPA by citizens of the New Bedford area during the 1992 comment period, and the corresponding EPA responses. The comments themselves are either excerpted directly or summarized to indicate what EPA believes to be the substance of each comment. These excerpts or summarizations are bolded to distinguish them from the responses that follow. Comments submitted orally at the March 5, 1992 and June 10, 1992 public meetings are discussed separately from those submitted in writing.

3.1.1 Citizen Comments From the March 5, 1992 Public Hearing

The comments below were presented to EPA during the March 5, 1992 public hearing on the Proposed Plan for the New Bedford Harbor Site. The comments and associated EPA responses are organized as presented in the public hearing transcript.

3.1.1.1 Mr. Hammond

The comments presented by Mr. Hammond of Hands Across the River and the associated EPA responses are provided below.

Comment No. 1

Mr. Hammond believes EPA should include a treatment component as a part of the cleanup. Mr. Hammond believes EPA should further investigate PCB treatment technologies including gas phase thermal reduction (Eco Logic) and dechlorination (GRC-APEG) that have been introduced since EPA completed its Feasibility Study in 1990.

EPA Response

EPA has evaluated the two innovative technologies identified by Mr. Hammond, including Site-specific pilot scale treatability studies of the Eco Logic process. The results of EPA's evaluation indicate that the reported effectiveness and costs for these technologies is similar to solvent extraction, an innovative treatment technology included in the 1990 Feasibility Study and the January 1992 Proposed Plan.

The results of EPA's evaluations of solvent extraction indicate that costs associated with the implementation of this technology (and by analogy those technologies suggested by Mr. Hammond) would be prohibitively expensive. For example, EPA estimates that the costs of treating the ROD 2 sediments would be on the order of \$200 to \$400 million above and beyond the estimated \$116 million to implement the remedy without treatment. Given that CDF-based isolation of the phase 2 sediments is believed to be protective on its own, EPA believes that these extraordinarily high costs for treatment, even if funding were to be realistically available, are unwarranted.

Comment No. 2

Mr. Hammond believes treatment is necessary because the PCBs will leach from the CDFs into the Harbor.

EPA Response

EPA believes that shoreline disposal of the PCB contaminated sediment in CDFs will successfully isolate the PCBs, and that the potential amounts of PCB leakage is insignificant. As described above, treatment costs given the great scale of the PCB-sediment problem in New Bedford Harbor would be prohibitively expensive. However, EPA will continue to review advances in sediment treatment technology - especially until the final CDF caps are constructed - to determine whether any technologies advance to a point that would be economically and technically feasible.

As part of the remedy, the Agency will implement an extensive program of groundwater, surface water, biota and ambient air monitoring to confirm that the CDFs have successfully contained the PCBs. This monitoring program will be developed in cooperation with the community Forum, and will also include periodic evaluations of the physical integrity of the CDFs.

The technical information that supports EPA's belief that CDF-based disposal is protective and that leakage will be insignificant is summarized in EPA's response to Hands Across the Rivers comments in section 2.6.2 above.

3.1.1.2 Mr. Dow

The comments presented by Mr. David Dow on behalf of the Sierra Club and the associated EPA responses are provided below.

Comment No. 1

Mr. Dow believes EPA inappropriately used the model results to support the decisional process.

EPA Response

EPA did not use the model results as the sole basis for the selected remedy as the commentor suggests. Rather, EPA has viewed the results of the modeling efforts as one of many studies considered during our remedy selection process. Other studies, to name a few, include the public health and ecological risk assessments, the feasibility study evaluations and the long term monitoring (LTM) program.

Comment No. 2

Mr. Dow believes results from the physical/chemical and food chain models developed by EPA for the Site are meaningless because total PCB was modeled. Mr. Dow believes it would have been more appropriate to model the individual PCB compounds (called congeners).

EPA Response

EPA recognizes that the individual PCB congeners do vary in environmental fate and transport characteristics as well as in toxicity. In developing the model, EPA attempted to incorporate the range of fate and transport properties by modeling the PCBs in the sediment, water and biota on a level of chlorine basis (i.e., the 10 homolog groups). While the fate and transport properties within these homolog groups vary for the individual PCB congeners, the range of variation is much smaller than the overall range associated with all 209 possible PCB congeners. The food chain model was successfully calibrated on a homolog group basis and for total PCB as the sum of the homolog groups. However, only the total PCB results were used to conduct the long term modeling runs.

During the calibration phase of the physical/chemical model, it became apparent that the sediment PCB concentrations governed the overlying surface water PCB concentrations. Thus, it was desirable in the modeling effort to utilize as much sediment PCB concentration data as was available in order to reflect PCB concentrations throughout as much of the 10,000 acre area as possible. To accomplish this, all available sediment PCB data was utilized to develop the initial model conditions prior to calibration. The data was successfully used to calibrate the model as demonstrated by the reasonable correlations of the modeled and observed water PCB concentrations which were obtained. In using all of the available sediment PCB data, the model output was in the form of total PCB since much of the sediment input PCB data was quantified on an Aroclor basis only. Accordingly, the input and output from the food model were also on a total PCB basis. While EPA recognizes that the original goal of modeling on a level of chlorine basis was not achieved, EPA believes the additional resources and time necessary to obtain the quantity of sediment data to accomplish this task were beyond those available to the project. EPA also believes that the results of the model were appropriately used as a tool to evaluate the relative effectiveness of various remedial alternatives.

Comment No. 3

Mr. Dow believes the model results are suspect because the model did not include the movement of PCBs in the surface water biota from one geographic region of the model to another.

EPA Response

Mr. Dow is correct that inter-area transfer of PCBs by biota was not included in the model.

However, EPA does not believe that migration is a dominant PCB transport process since spatial gradients in the biota parallel those of the water and sediment.

Comment No. 4

Mr. Dow believes the model results are suspect because the model did not include the movement of sediments from offshore to the inshore.

EPA Response

EPA disagrees and notes that it did include inshore transport of sediment as evidenced by model results which reproduced the depositional character of the upper and lower Harbor areas.

Comment No. 5

Mr. Dow believes that the proposed remedy is not protective of human health since the FDA Tolerance Limit of 2 ppm PCB has been waived as an ARAR.

EPA Response

As EPA described in its November 1996 Proposed Cleanup Plan, attainment of the FDA tolerance limit in all species in all areas of the Site is believed to cause more harm than good, due to the staggering amount of dredging and disposal volume or capping that would be required. Rather, EPA will protect human health through a combination of remedial action and institutional controls. One of these institutional controls is a state-imposed fishing ban which will remain in place until PCB concentrations in fish tissue reach the FDA level. In addition, even after the FDA level is met, due to the prevalence of local fishing in New Bedford, EPA will maintain a public education and awareness campaign designed to minimize the consumption of locally caught seafood until PCB tissue concentrations reach the site-specific health based standard of 0.02 ppm.

Comment No. 6

Mr. Dow believes the standards used by EPA to determine whether the seafood consumed by residents is safe do not incorporate the fact that biota tend to accumulate the more highly chlorinated (and more toxic) congeners. Mr. Dow is concerned that the toxicity of these more highly chlorinated congeners is not adequately reflected in EPA's PCB cancer potency factor (CPF).

EPA Response

EPA has updated its analysis of the risks to human health posed by consumption of PCB-contaminated seafood using the most recent, peer-reviewed information on PCB risk and CPF published nationally by EPA (USEPA, 1997b). This updated evaluation points to a site-specific health-based value of 0.02 ppm PCBs as a safe threshold for unrestricted consumption of local seafood.

Comment No. 7

Mr. Dow believes a 50 ppm PCB cleanup on a Site-wide basis is inappropriate as it will not result in compliance with the FDA Tolerance Limit for all species in all areas of the Site. Mr. Dow believes a 1 to 5 ppm cleanup level would be more appropriate. Mr. Dow also believes a long term monitoring program should be included to validate EPA's modeled system recovery estimates.

EPA Response

EPA acknowledges Mr. Dow's concerns and has modified the remedy to incorporate a 10 ppm TCL for subtidal sediments in the more contaminated upper Harbor portion of the Site. Consistent with its updated review of risks from dermal contact with contaminated shoreline sediment, EPA has also selected cleanup levels of 25 and 1 ppm PCBs for selected areas of intertidal sediment (see ROD section XIII). While EPA believes that a 1 ppm PCB Site-wide cleanup would result in the attainment of the FDA Tolerance Limit and be protective of all aquatic species, the extreme if not insurmountable implementability problems, as well as the adverse environmental impacts of such an undertaking, argue against such an approach.

Consistent with Mr. Dow's comment about the need for effective long term monitoring, EPA has implemented a comprehensive, statistically rigorous long term monitoring program designed to assess the effectiveness of the remediation and the ecological recovery of Site over the long term. The first round of this monitoring effort occurred in the fall of 1993 prior to the start of the hot spot dredging operations; the second round occurred in the fall of 1995 just after the completion of the hot spot dredging. Subsequent monitoring will occur at significant milestones of the harbor cleanup or approximately every three to five years. As expected, the first two rounds of the long term monitoring program demonstrate the high ecological stress of the harbor, especially in the upper harbor (see Nelson et al., 1996). Note that this long term monitoring is a separate program than the more frequent monitoring designed to ensure that dredging and CDF disposal remain protective.

Comment No. 8

Mr. Dow does not believe that shoreline CDFs will effectively contain the PCB contaminated sediment and recommends the material be placed in a RCRA or upland facility.

EPA Response

EPA believes shoreline disposal in CDFs that are properly designed, constructed and monitored will be highly effective in isolating the PCBs from the environment. To that end, EPA's conceptual design of the CDFs incorporates the naturally occurring, low permeability sediments located beneath the CDF and includes low permeability geotextile materials as part of the side-wall liner and cover systems. In addition, the hydrophobic (water repelling) nature of the PCBs promotes adsorption to the highly organic silty sediment which will minimize the leaching of PCBs back into the Harbor. For a more detailed response to this issue, see EPA's response to Hands Across the River Coalition comments in section 2.6.2 above. Importantly, CDF-based disposal of these sediments as a remedial solution for New Bedford Harbor has been endorsed by two different panels independent from EPA Region I - the Sea Change panel of experts convened in November 1995 and EPA's national remedy review panel in August 1996.

With regard to potential upland disposal, the Commonwealth of Massachusetts has indicated that it would not permit construction of a new hazardous waste facility within any part of the state. Further, the possibility of disposal of the sediment in a TSCA-permitted secure chemical waste landfill was considered but eliminated during the initial screening of alternatives in the Feasibility Study. The extremely high costs of TSCA disposal was not justifiable given the only minimal increase in performance benefits that was expected compared to the cost of shoreline CDFs with similar performance merits.

3.1.1.3 Ms. Days

The comment presented by Ms. Angela Days of Hands Across the River and the associated EPA response is provided below. Ms. Days is commenting as a resident of Fairhaven.

Comment No. 1

Ms. Days questions exactly where the three CDFs will be located and who owns the land and how much will they be paid.

EPA Response

At the time of Ms. Days comments in 1992, two of the proposed CDFs (CDFs 1 and 1a) had been located along the New Bedford shore of the upper Harbor, and a third (CDF 3) had been located on the Fairhaven shore of the upper Harbor. A fourth proposed disposal facility at that time (CDF 7) had been located along the New Bedford shoreline in the lower Harbor portion of the Site, adjacent to the North Terminal area. Through the process of fine-tuning the proposed remedy with the community Forum and other stakeholders, however, these CDF locations have been changed to the four locations shown in Figures 21a and 21b of the Record of Decision.

EPA and the Commonwealth of Massachusetts expect to work with the land owners and abutters of each CDF to reach mutually acceptable agreements for access and/or future land use. While the federal and state governments have the legal authority to take property through eminent domain proceedings, EPA and the State believe mutually acceptable resolutions with the land owners can be reached. The Record of Decision will, however, make note of the fact that the estimated cleanup cost does not include any land acquisition costs.

3.1.1.4 Mr. Rusinowski

The comment presented by Mr. Rusinowski and the associated EPA response is provided below.

Comment No. 1

Mr. Rusinowski believes EPA should construct a sheet pile walled CDF in the lower Harbor area of the Site. Mr. Rusinowski believes this type of facility could be used to isolate the contaminated sediment and provide a pier for the local marine industry.

EPA Response

EPA agrees with Mr. Rusinowski and has included such a facility (CDF D) in the lower Harbor area of the Site. The conceptual design of CDF D is a lined, sheet pile walled bulkhead that will support future commercial marine activities.

3.1.1.5 Mr. T. Rose

T. Rose Comment No. 1

Mr. Rose is concerned that EPA's PCB cleanup level of 50 ppm will not be totally effective.

EPA Response

EPA has modified its preferred plan and has selected a PCB cleanup level of 10 ppm for subtidal sediments in the upper Harbor portion of the Site to increase the protectiveness of the remedy. In addition, cleanup levels of 25 and 1 ppm PCBs have been included in the remedy for select shoreline areas where dermal contact with PCB-contaminated sediments is expected (see section XIII of the attached ROD). However, institutional controls including the State fishing ban, fishing advisories, and a public education and awareness program will still be required as necessary to provide complete protection. EPA will conduct regular monitoring and evaluate when it will be safe to eat seafood from the affected areas. See response to comment #5 to Mr. David Dow above for further explanation of institutional controls.

T. Rose Comment No. 2

Mr. Rose is concerned with the long term integrity and performance of the CDFs.

EPA Response

CDFs in general are a common technology for disposal of dredged sediments. For this remedy, CDF technology is being improved upon with extensive water treatment, sidewall liners and an impermeable cover to account for the toxic nature of the sediments. As described above, especially in the response to Hands Across the River Coalition's comments in section 2.6.2, EPA believes that shoreline disposal of the PCB contaminated sediment in CDFs will successfully isolate the contaminants from the environment.

T. Rose Comment No. 3

Mr. Rose is concerned that the incinerator originally proposed as part of the Hot Spot remedy will be used to treat sediment from other areas of the Site.

EPA Response

This will not be the case.

T. Rose Comment No. 4

Mr. Rose questions why EPA is not spending more time and money investigating biodegradation of PCBs.

EPA Response

EPA has expended significant resources evaluating PCB biodegradation at both the national level and for the New Bedford Harbor Site. This includes extensive chemistry evaluations and bench scale tests with New Bedford Harbor sediment. The results of EPA's studies show that PCB biodegradation is occurring in some areas of the Site at a very slow rate. However, it will not provide a Site-wide cleanup that is protective of human health and the environment within an acceptable time-frame.

Biodegradation was also evaluated as a remediation tool for PCBs by the independent panel of scientists asked to review the remedy by Sea Change, Inc., an independent body unaffiliated with EPA-New England. That panel also concluded that biodegradation would not effectively remediate this Site within an acceptable time frame, and indicated that biodegradation could make the heavy metals in the sediments more bioavailable and thus more toxic (Ford, 1995). See also EPA's response to comment No.4 in section 3.1.6

T. Rose Comment No. 5

Mr. Rose is concerned with the long term performance of the CDF for the 100 to 200 year time-frame.

EPA Response

For CDFs A, B and C, the widespread use of earthen materials and a storm-resistant design will ensure their integrity over the long term. Over time, some relatively minor repairs of the dike surfaces and the vegetated cover may be required (and have been included in the cost estimate), but the overall integrity of the CDFs should not fail. CDF D, on the other hand, has been conceptually designed to include a full perimeter sheet pile wall to allow for beneficial reuse as a commercial marine facility. This design will require more sophisticated requirements to ensure long term integrity, and the seaward sheet pile wall will likely require more frequent maintenance. The EPA will continue to work closely with the MA DEP and the City of New Bedford (as well as the community Forum) to ensure that an effective maintenance and/or capital improvement program is in place for this CDF for the long term.

The routine physical and chemical monitoring of the CDFs will be designed to verify that the CDFs do not fail and that they successfully contain the PCBs. Appropriate corrective measures will be implemented in the unlikely case of a problem. The final impermeable caps will be constructed in much the same manner as hazardous waste landfill caps, which are designed to be effective over very long time frames. Finally, institutional controls will be imposed to prevent future uses of the CDFs which are inconsistent with their designed use for the remedy.

The maintenance and monitoring program for the CDFs will remain in effect as long as the CDFs exist. One year after construction is complete and the CDFs are operational and functional, the State assumes the responsibility for operation and maintenance. The State may choose to delegate all or a portion of this responsibility to a qualified entity.

T. Rose Comment No. 6

Mr. Rose believes EPA should do no further action at this time in order to further evaluate alternative treatment technologies including the two presented during the March 5, 1992 forum sponsored by Congressman Studds.

EPA Response

EPA notes that the 1990 Feasibility Study evaluation and the 1996 field pilot studies of treatment technologies for PCB contaminated-sediment make up one of the most thorough and comprehensive evaluations ever undertaken by the Agency for a particular Superfund site. As a result of the Community Forum process, EPA has also agreed to continue reviewing potential treatment technologies as we move into the design stage. To date, however, these studies clearly indicate that treatment of the sediments is not cost-effective, especially given that the CDF-based approach is protective on its own. To wait indefinitely to see whether a technology develops which is both technically and economically feasible is to essentially ignore a serious ongoing environmental injury to the Harbor and surrounding communities. The CDF-based approach allows for the start of large scale correction to this injury, while also allowing for time to continue the evaluation of potential advances in sediment treatment technologies (especially until the final CDF caps are in place).

3.1.1.6 Mr. P. Rose

P. Rose Comment No. 1

Mr. Rose is concerned that the sediment treated through incineration of the Hot Spot sediments will still be a hazardous waste.

EPA Response

EPA clarified to Mr. Rose at the March 5, 1992 public hearing that only questions pertaining to the upper and lower Harbor were being received. However, EPA further clarified that any Hot Spot sediments that undergo PCB treatment, yet fail EPA's Toxicity Characteristic Leaching Procedure (TCLP), would require further treatment such as solidification prior to disposal in a shoreline CDF. Of course, since on-site incineration is no longer a viable option for the hot spot sediments, this point is moot.

P. Rose Comment No. 2

Mr. Rose is concerned that a shoreline CDF constructed as a part of a Superfund cleanup could be used to dispose of hazardous wastes from other areas of the country.

EPA Response

EPA 's plans only envision using the CDFs to contain sediment from the New Bedford Harbor Site.

P. Rose Comment No. 3

Mr. Rose commented that during dives conducted as a member of a volunteer first aid team in the Acushnet River and lower Harbor, he has seen considerable aquatic life.

EPA Response

EPA recognizes that there is aquatic life inhabiting the Site. EPA also recognizes that there may be some localized short term disruptions for certain benthic populations during remediation. However, as explained in the 1990 ecological risk assessment and as emphasized most recently in EPA's October 1996 Long Term Monitoring Report (Nelson et al., 1996), the upper Harbor, and to a lesser extent the lower Harbor, are very damaged ecological systems based on a variety of ecological assessment methods. EPA believes that remediation of PCB contaminated sediments will be a significant long term benefit to the ecological health of the Harbor and has instituted a comprehensive long term monitoring program to verify the expected improvements from the cleanup.

3.1.1.7 Mr. Darwin

Mr. Darwin, a conservation commissioner for Fairhaven, is concerned EPA will not

comply with the Massachusetts Wetland Protection Act.

EPA Response

EPA will comply with the substantive requirements of all applicable or relevant and appropriate state and federal wetlands regulations which are identified in the Record of Decision. In order to streamline the cleanup process, Section 121 of CERCLA, 40 U.S.C. § 9621 (the Superfund statute) requires that EPA comply with the substantive, but not procedural, aspects of all applicable or relevant and appropriate environmental requirements (ARARs) for all onsite remedial activities.

3.1.1.8 Ms. Kirk

Comment No. 1

Ms. Kirk is concerned with potential risks in the Fort Phoenix area during cleanup activities and requests that EPA keep the local residents informed.

EPA Response

Based on the nature of the cleanup activities in the lower Harbor area and on EPA's operational experience with the Hot Spot remedy, EPA believes that the cleanup activities will not present additional risks to individuals in the Fort Phoenix area. To ensure the public is protected during the cleanup, EPA will conduct appropriate monitoring of the water column and atmosphere. EPA intends to work closely with the local communities during the design, construction and operational stages of the cleanup. EPA anticipates frequent meetings to keep the local communities informed of ongoing work and to receive their input. In addition, the Corps of Engineers will have an office at the project Site which will be staffed on a full-time basis.

Comment No. 2

Ms. Kirk is concerned about the long term integrity of the CDFs.

EPA Response

The CDFs will be designed to withstand the physical forces present in the area including wave action and the potential for earthquakes. The CDFs will essentially be designed to last indefinitely, provided that a proper maintenance program is in place. See EPA's response to Mr. T. Rose's comment #5 above for additional information in this regard.

3.1.2 John M. Chaplick

Mr. Chaplick commented that upland disposal may be more appropriate since the current conceptual design of the CDFs places them within the 100 year flood plain.

EPA Response

Although theoretically technically feasible, EPA has eliminated upland disposal of contaminated sediments from consideration as a remedy component for several reasons. First, CERCLA (also known as the Superfund statute) favors onsite remedies over offsite remedies. In addition, there are currently no existing disposal facilities in New England that would be appropriate for this type of waste (i.e., TSCA-approved), and the Commonwealth of Massachusetts has indicated that it would not permit construction of any NEW offsite hazardous waste disposal facilities within Massachusetts. Moreover, the cost to dispose of the sediment at upland sites is markedly higher than other disposal options (e.g., shoreline disposal) that offer a similar level of protectiveness without the inherent dangers of overland transport. EPA therefore believes that a more appropriate solution is to isolate or sequester the contaminated sediments in shoreline facilities where the contamination will remain in a secure location within the boundaries of the Superfund Site.

In terms of impacts from a 100 year flood, this should not be an issue as long as the hurricane barrier remains in operation and is consistently maintained by the Army Corps of Engineers. In the event of flooding upstream of the barrier (i.e., in the upper and lower Harbor) during instances when the barrier is closed, the CDFs will have a very insignificant impact on increased flood water levels due to their relatively small footprint (compared to the rest of the Harbor) and because of the relatively small flow rates of the Acushnet River.

Even in the unlikely event that the hurricane barrier becomes inoperable and large scale flooding occurs which submerges the CDFs, the CDFs are expected to retain their overall structural integrity. Some minor repairs to vegetated surfaces and dike walls may well be required after such an event, but the PCBs and heavy metals would remain physically isolated from the environment. There will be many layers of protection built into the CDF caps, such that EPA believes there is no danger that the sediments would "float away" during a severe flood event. During normal operating conditions a portion of the sediments within a CDF remain saturated due to tidal conditions, so that a severe flood event should only increase this degree of saturation for a relatively short period of time.

3.1.3 Angela Days

Comment No. 1

The commentor wants EPA to cleanup the Site and treat the sediment instead of disposing of the sediment in shoreline CDFs without treatment. The commentor also supports the use of two treatment technologies identified by Congressman Studds.

EPA Response

See response to Mr. Hammond's comments #1 and #2, and Mr. Dow's comment #8 in section 3 above.

Comment No. 2

The commentor questioned the proposed locations of the CDFs, how much money EPA will spend to purchase the land and who will benefit from the sale of the properties.

EPA Response

See response to Ms. Days's oral comment #1 in section 3.1.1.3 above.

3.1.4 Citizen Comments made at the June 10, 1992 Public Hearing

The comments below were presented to EPA orally during the June 10, 1992 public hearing for the Addendum Proposed Plan for Upper Buzzards Bay. The comments and associated EPA responses are organized as presented in the public hearing transcripts.

3.1.4.1 Mr. Dow

The comments presented by Mr. Dow are on behalf of the Massachusetts Sierra Club.

Comment No. 1

The Sierra Club believes the PCB cleanup level of 50 ppm is too high; rather, it should not exceed 5 ppm, and preferably be closer to 1 ppm if possible.

EPA Response

EPA acknowledges the Sierra Club's concerns, and agrees that from an ecological standpoint, and absent the severe negative environmental consequences and implementation difficulties that would be inherent in it, a 1 ppm Site-wide cleanup level would be more protective. In response to the Sierra Club's concerns as well as those of a number of other commentors regarding the ecological importance of the upper Harbor and its large saltmarsh areas, the Agency has modified its proposed remedy to incorporate a 10 ppm cleanup for subtidal sediments in the upper Harbor. (See also section XIII.B of the attached ROD).

Comment No. 2

The Sierra Club does not support sediment disposal in shoreline CDFs. Rather, the Sierra Club "prefers either an upland disposal option or disposal in a RCRA certified hazardous waste landfill."

EPA Response

EPA believes that shoreline disposal in CDFs that are properly designed, constructed, maintained and monitored will be highly effective in isolating the PCBs from the environment. To that end, EPA's conceptual design of the CDFs includes use of the naturally occurring low permeability sediments beneath the CDF, and low permeability geotextile materials as part of the side-wall liner and cover systems. These geotechnical considerations, combined with the hydrophobic (water repelling) and relatively non-mobile nature of the PCBs adsorbed to the organic silty sediment, will minimize the leaching of PCBs back into the Harbor. Evaluations by the Army Corps of Engineers indicate that the CDFs will be effective in containing PCBs. These evaluations indicate that long-term leaching from the CDFs should be minimal and orders of magnitude less than the amount of PCBs that currently migrate out of the upper Harbor in the surface water.

See also EPA's responses to Mr. Hammond's comment #2 and Mr. Chaplick's comment #1 in section 3 above, as well as EPA's response to Hands Across the River Coalition's comment in section 2.6.2 above.

Comment No. 3

The Sierra Club does not believe institutional controls will be effective in preventing PCB exposure through the ingestion of locally caught seafood. They are also concerned that the seasonal migration of species such as the winter flounder could potentially expose individuals who consume seafood caught in areas outside of the closure zones.

EPA Response

EPA acknowledges that institutional controls do not provide complete prevention of PCB exposure through the ingestion of contaminated seafood. In this regard, the Agency considers the limitations of institutional controls to be an important argument against pursuing a policy of no-action at New Bedford Harbor.

EPA will work with the Commonwealth of Massachusetts in order to maximize the effectiveness of institutional controls. EPA plans to implement educational programs to increase local awareness of the potentially adverse effects associated with ingestion of contaminated fish and shellfish.

Comment No. 4

The Sierra Club believes "the migratory nature of fish make it difficult to correlate their physical location and their exposure to toxic pollutants." This conclusion is based on their interpretation of the results of a study evaluating mixed function oxidase activity in winter flounder from Buzzards Bay and Nantucket Sound. The results of this study indicate that both the mixed function oxidase activity and the content of mixed function oxidase enzyme were higher in the winter flounder from Nantucket Sound than those in Buzzards Bay in spite of the fact that the PCB levels in the sediments were 250 times higher in Buzzards Bay than in Nantucket Sound."

The Sierra Club believes that among these far field impacts of the PCB contaminated

sediments from New Bedford Harbor are that the rosiette and common terns from the Massachusetts Audubon Bird Refuge at Bird Island exhibit heavy metal and organic chemical contamination as a consequence of feeding on fish from New Bedford Harbor.

EPA Response

EPA's data for a variety of species (winter flounder, blue mussels, lobster, and clams - see Table 1 and Figures 14, 15 and 16 of the ROD) is contrary to the Sierra Club's assertion that biota PCB concentrations do not correlate with the physical location of the contaminated sediment. While the biota data from within the different geographic regions do exhibit a wide range of concentrations, the data suggest that migration is not a dominant process relative to PCB tissue levels since the concentration gradients in the biota tend to parallel those of the water and sediment.

With regard to the bird populations mentioned by the Sierra Club, EPA believes that the lowered cleanup levels in the selected remedy will help lower the PCB body burdens for these species. This lower PCB cleanup level also provides for cleanup of additional areas of very high heavy metal contamination. EPA agrees that uptake of contaminants by birds as a result of feeding on contaminated fish or shellfish is an important aspect of the ecological impacts from this Site, and is an additional rationale for cleanup. Ultimately the cleanup should reduce fish tissue PCB levels thereby lessening any impact ingestion may be having on fish-eating birds.

3.1.4.2 Mr. Hampson

Mr. Hampson requested EPA increase the level of awareness and enforcement for the fishing closure areas.

EPA Response

EPA shares Mr. Hampson's concerns and recognizes the inherent difficulties associated with enforcing the fishing closure of the 18,000 affected acres. Again, this difficulty is an additional rational against an "institutional control only" approach to site cleanup. EPA nevertheless believes that public education and awareness programs will help reduce the number of people who fish in these areas. EPA has and will continue to coordinate with the various state agencies who have direct authority to enforce the fishing closure (the closure is based on state, not federal regulations).

3.1.4.3 Mr. Rusinowski

Mr. Rusinowski commented that the CDFs should be covered during the period following dredging, yet prior to final capping. Mr. Rusinowski is concerned that bird populations that will use the newly created mudflat areas within the CDFs will be exposed to PCBs and transfer the contamination away from the Site through their droppings.

EPA Response

EPA agrees, and notes that the manner in which the dredging and sediment disposal activities will be conducted will minimize the potential for this problem to occur. While in active use, a layer of ponded water will be maintained in the CDFs that will minimize the birds' contact with the contaminated sediment. Other CDF cover systems may be implemented as well to control airborne odors or PCBs; these controls would further minimize the amount of contact. Once at capacity, an interim cover of clean material or less contaminated navigational dredged material will be placed over the contaminated sediment while the sediment consolidates. This interim cover will also prevent contact between birds and the contaminated sediments.

3.1.5 David Dow on behalf of the Sierra Club

Comment No. 1

The Sierra Club believes the PCB cleanup level should not be above 10 ppm and closer to 5 ppm.

EPA Response

See EPA's response to the Sierra Club's oral comment #1 above.

Comment No. 2

The Sierra Club believes the PCB contaminated sediment should be disposed in a RCRA or upland facility. This is based on their belief that the CDFs are not an effective means of isolating the PCBs from the environment.

EPA Response

See EPA's response to the Sierra Club's oral comment #2 above.

Comment No. 3

The Sierra Club believes a 5-10 ppm cleanup range would be more appropriate for the saltmarsh areas of the Site. They further believe bioremediation of these saltmarsh areas through non-intrusive means would be the appropriate way to achieve these levels.

EPA Response

After further review of conditions in the saltmarsh areas, and in order to prevent a continuing source of PCBs after remedial dredging, EPA has lowered the proposed cleanup level for these areas from 500 ppm to 50 ppm PCBs. Existing saltmarsh contamination information indicates that, as one might expect, the vast majority of excessive PCB levels in the saltmarshes exist along the outer fringe of the saltmarshes. Thus, cleanup to the lower 50 ppm level should result in a minimal amount of saltmarsh destruction. While EPA recognizes that PCB biodegradation does occur on a selective basis throughout the Site over long periods of time, EPA is unaware of a particular biodegradation technique or technology that could be implemented in a non-intrusive manner in the saltmarsh area to effect a lower cleanup level within a reasonable time frame.

In addition, as discussed in section XIII.B of the attached ROD, selected areas of intertidal sediment and saltmarsh will be remediated using cleanup levels of 25 and 1 ppm PCBs.

Comment No. 4

The Sierra Club does not believe that institutional controls will be protective of human health as fishermen currently frequent the fishing closure areas.

EPA Response

EPA shares the Sierra Club's concerns and recognizes the inherent difficulties associated with enforcing the fishing closure of the 18,000 affected acres. This is another rationale for implementing an active rather than passive cleanup program. EPA believes that public education and awareness programs could help reduce the number of people who fish in these areas, but these by themselves will not necessarily prevent illegal seafood consumption. EPA intends to conduct these programs on a regular basis and to integrate the process with updates of the results of the long-term monitoring and seafood monitoring programs. EPA will also continue to coordinate with the relevant state agencies to ensure an appropriate overall strategy for this difficult issue. EPA believes this combined approach of active remediation, education and interagency coordination will be protective of human health.

Comment No. 5

The Sierra Club questions EPA's focus on the carcinogenic end point for potential human health risks associated with PCB exposure.

EPA Response

EPA notes the existence of a significant body of literature pertaining to the carcinogenicity of PCBs in humans and laboratory animals. Numerous human studies have reported statistically significant increases primarily in malignant melanomas and liver and biliary (i.e., bile related) cancers. EPA has classified PCBs in Group B2 - Probable Human Carcinogen - based on the occurrence of hepato cellular carcinomas in three strains of rats and two strains of mice and suggestive evidence of excess risk of liver cancer in humans by ingestion, inhalation or dermal contact exposure routes using scientifically accepted risk assessment methods.

EPA also notes that its updated assessment of risks to human health posed by contact with shoreline PCB-contaminated sediments concludes that it is the non-carcinogenic risks which determine the appropriate level of cleanup for protection of dermal contact risks (USEPA, 1998).

Comment No. 6

The Sierra Club agrees with EPA's plan to conduct long-term monitoring but requests the PCBs be evaluated on a congener-specific basis, not as total PCB.

EPA Response

EPA agrees and has implemented the first two rounds of its long term monitoring program by using a congener-specific analytical approach. For more information on this program, see the October 1996 Long Term Monitoring Assessment Report (especially pages 12-13 for PCB chemistry).

Comment No. 7

The Sierra Club believes EPA should include a treatment component for the PCB contaminated sediment.

EPA Response

EPA is required by CERCLA §121(a) to select a remedy for Superfund sites that provides a cost-effective response and that uses permanent solutions and alternative treatment to the maximum extent practicable. Identifying the preferred alternative and, ultimately, the final remedy, occurs by evaluating the major trade-offs among the alternatives in terms of the nine evaluation criteria.

The results of EPA's extensive evaluations of sediment treatment technology indicates that given the effectiveness of the CDFs in isolating the PCB contaminated sediment from the environment, the significant additional costs to treat the sediment prior to disposal would provide only minimal performance benefits at a very significant additional cost.

Also refer to EPA's response to Hands Across the River Coalition's comments in section 2.6.2 above.

3.1.6 Dr. John Farrington

Comment No. 1

Dr. Farrington commented that the order of the four proposed cleanup objectives presented in the May 1992 Proposed Plan reflect EPA's priorities. The commentor's specific concern relates to the potential risks from direct contact with the sediment as compared to the potential risks associated with the ingestion of PCB contaminated biota. The commentor believes consumption of PCB contaminated biota is more significant.

EPA Response

EPA views all four of the proposed cleanup objectives to be equally important. EPA agrees that, as concluded in the 1989 Baseline Public Health Risk Assessment (Ebasco 1989), the greatest risk to human health posed by this Site is from ingestion of PCB-contaminated seafood.

Comment No. 2

Dr. Farrington commented that EPA should not evaluate the PCB contamination at the Site as total PCB, thereby assuming that the 209 distinct PCB compounds have the same physical, chemical and toxicological properties. The commentor believes that this practice may in some cases underestimate the potential risks, and in other cases, may overestimate the potential risks.

EPA Response

EPA recognizes that the toxicological properties of the multitude of distinct PCB compounds which may be present at the Site can vary significantly. However, until recently the analytical data which has been collected for the New Bedford Harbor Site consists largely of measurements of concentrations of the principal PCB Aroclors, A1248, A1254, A1260, etc. The amount of congener or isomer specific data for the Site has been traditionally insufficient to allow detailed site assessments and evaluations on this basis.

In the 1989 risk assessment for the Site, the assumption is made that all PCBs detected in sediment and biota samples would be equivalent in their cancer causing activity to that exhibited by the Aroclor 1260 mixture in a bioassay study on rats. The carcinogenicity of other PCB mixtures has also been evaluated in a number of animal studies, and the general pattern of findings is that Aroclor 1260 and similar mixtures containing high proportions of higher-chlorinated PCB congeners tend to be more potent carcinogens in animals than less chlorinated mixtures. Comparative studies of the carcinogenic potencies of different PCB mixtures or individual congeners in humans are not available.

EPA acknowledges that these findings suggest that the risk assessment results might overestimate the carcinogenic potency of PCB mixtures found in environmental samples from New Bedford Harbor. Nonetheless, this conservatism has been adopted by EPA as the preferred approach to evaluating PCB toxicity in the absence of more definitive data.

Comment No. 3

The commentor notes that in EPA's glossary definition of PCB's, the only potential human health risks identified are liver damage and cancer.

EPA Response

EPA provided a toxicological evaluation of PCBs in Appendix B of the Baseline Human Health Risk Assessment (Ebasco, 1989). The evaluation summarized the toxicological properties of PCBs, particularly with respect to risk to public health from contamination at New Bedford Harbor. The toxicological evaluation was not intended to be a comprehensive evaluation of primary scientific studies. Rather, it was meant to be an overview of information gleaned from review articles and summary documents regarding the nature and extent of the toxicity of PCBs. The evaluation focused on the potential health effects that could result from exposure via the anticipated exposure routes for the New Bedford Harbor population. Therefore, this evaluation emphasized routes of exposure (oral, dermal, and inhalation) in presenting toxicity information. Furthermore, information on the actual health effects previously observed in humans was presented when available. The toxicological evaluation included the following sections: (1) Background Information, (2) Toxicokinetics, (3) Overview of Health Effects Observed in Humans, (4) Toxicity, (5) Interactive Effects, (6) High Risk Subpopulations, and (7) Summary.

Comment No. 4

Dr. Farrington believes that the Proposed Plan did not adequately address PCB biodegradation in the New Bedford Harbor system. The commentor believes this is important relative to evaluating the potential role of biodegradation through decades of no action.

EPA Response

EPA has included summary level information on PCB biodegradation and its role in the New Bedford Harbor system in Section 2.4.2 of the 1990 Feasibility Study (Ebasco, 1990c). The summary is based on other technical reports contained within the Administrative Record. A reiteration of this information including the references is provided below.

Natural biodegradation of the PCBs in New Bedford Harbor sediments has been investigated as a fate and transport mechanism. Natural (or in situ) biodegradation is a process by which contaminants are degraded by indigenous micro-organisms without removing the contaminated medium from its location. The micro-organisms may operate in either an aerobic (oxygen) or anaerobic (oxygen-free) environment.

Studies conducted by General Electric Corporation on Hudson River sediment suggest that selective, reductive dechlorination of PCB congeners is occurring slowly via anaerobic microorganisms (Brown and Wagner, 1986). However, the bacterial strains capable of degrading the heavily chlorinated PCB congeners have not been isolated. Researchers at the EPA Gulf Breeze Laboratory reviewed Brown's work and found his conclusions for anaerobic degradation of PCBs in sediment to be reasonable explanations of the data.

There is somewhat conflicting evidence to suggest that anaerobic degradation of PCBs is occurring in New Bedford Harbor sediment. Studies conducted by the EPA-Environmental Research

Laboratory (ERL) in Narragansett, Rhode Island, on sediment cores collected from the pilot dredging study area (with PCB concentrations in the 100 ppm range) suggested that anaerobic dechlorination of PCBs is not a significant process at this location (Pruell, 1988). However, other studies conducted by EPA-ERL on estuary sediment samples with PCB concentrations of 500 ppm and higher suggested that significant reductive dechlorination of highly chlorinated PCB congeners was occurring in a manner consistent with Brown's data supporting anaerobic processes (Pruell, 1988).

These findings suggest that anaerobic degradation of sediment PCBs may be occurring more readily in highly contaminated sediment (i.e., greater than 500 ppm). Research conducted by Brown and Wagner focused on the comparison of congener composition in commercial PCB products (e.g., Aroclors) with the congener distributions in New Bedford Harbor sediment as a means of supporting their contention for anaerobic degradation (Brown and Wagner, 1986). It should be noted, however, that depletion and shifts in congener distributions can also result from various physical and chemical processes, such as differential adsorption, volatilization, hydrolysis, and photo-oxidation.

Although biodegradation of PCBs in New Bedford Harbor sediment appears to be occurring, the studies conducted to date have not provided sufficient data for a reliable estimation of biochemical decay rates or half-lives, or quantitative evaluations of the toxicity of the specific decay products. More information is needed to evaluate the length of time that would be required for removal of PCBs from New Bedford Harbor sediment by natural biological processes. Brown suggested that the half life of anaerobic degradation of heavily chlorinated PCBs may range from seven to 50 years (Brown and Wagner, 1986). Based on this estimate the time required for biodegradation to reduce a sediment PCB concentration of 4,000 ppm to 10 ppm may be on the order of 65 to 400 years. However, this estimate does not account for the apparent lack of anaerobic degradation of PCBs within sediments contaminated below 500 ppm as noted by Pruell.

Comment No. 5

Dr. Farrington believes that EPA did not adequately address the potential risks associated with other compounds including polycyclic aromatic hydrocarbons. He expressed concern about the potential for synergistic and antagonistic effects. The commentor also expressed concerned that potentially elevated levels of polychlorinated dibenzofurans (PCDFs) in upper Buzzard's Bay could significantly contribute to the risks in this region of the Site.

EPA Response

Specific PAH- or PCDF-based cleanup is beyond the scope of cleanup for this Superfund Site, although it is anticipated that within the upper and lower harbor areas of the Site, the 10 ppm and 50 ppm PCB cleanup levels for these regions will also remove the majority of PAHs and PCDFs.

For the upper Buzzard's Bay or outer harbor area, EPA will evaluate Dr. Farrington's concerns during the additional Site investigations for this operable unit.

Comment No. 6

Dr. Farrington is concerned that capping in the upper Buzzard's Bay region of the Site would be prone to erosional forces.

EPA Response

EPA agrees with the commentors concerns and included the requisite stone armorment as part of the conceptual design of this alternative. As a result of comments received, however, EPA will conduct further studies in this area (now termed the outer harbor) and release a new proposed plan once additional information gathering and evaluations are complete. That plan will include a similar capping concept as a remedial alternative for the outer harbor area during the third operable unit studies, if appropriate.

Comment No. 7

Dr. Farrington believes a decision to cap in the vicinity of the City of New Bedford's outfall is premature.

EPA Response

EPA agrees with the commentor and will re-examine this alternative during the third operable unit studies for upper Buzzard's Bay.

Comment No. 8

Dr. Farrington cautions that incineration of extracted PCB- contaminated oils generated during sediment treatment with solvent extraction could pose risks unless properly operated and monitored.

EPA Response

Solvent extraction is not part of this remedy. However, if selected as part of a subsequent operable unit for the Site, the incineration of PCB-contaminated oil produced during solvent extraction would only be accomplished at a facility meeting all applicable state and federal requirements.

Comment No. 9

Dr. Farrington does not agree with EPA's conclusion that cleanup of distinct areas of upper Buzzard's Bay would only result in the lowering of PCB water concentrations in these immediate areas, and *not* the Bay as a whole. He commented that "concentration gradients of PCBs in the water column should be alleviated by mixing forced by tidal exchange, wind driven circulation, exchange of PCBs to the atmosphere, and sorption of PCBs on particulate

matter in the water column followed by desorption."

EPA Response

EPA's water column data for the upper Buzzard's Bay region of the Site demonstrates that the areas with locally elevated sediment PCB concentrations also have locally elevated PCB water column concentrations. Thus, EPA believes its conclusion regarding the limited response of the water column to cleanup of these areas is correct.

Comment No. 10

Dr. Farrington has the following questions regarding the long-term monitoring program to be implemented by EPA at the Site:

- ***What are the key pollutants and their action levels?***
- **Who will obtain and evaluate the data?**

EPA Response

For a complete discussion of the long-term monitoring program, the reader is referred to the October 1996 Baseline Sampling Report of this program (Nelson et al., 1996). In summary, the key pollutants and other endpoints measured by the program include acid volatile sulfide (AVS), arsenic, cadmium, chromium, copper, mercury, nickel, lead, selenium, zinc, PCBs (18 individual congeners), total PCBs, total organic carbon (TOC), PCB bioaccumulation in blue mussels and mummichog minnows, species richness, EMAP benthic index, species dominance, sediment toxicity tests, and sediment grain size and texture. Levels of pollutants expected to cause toxicity are also addressed in this report.

The majority of the field collection and analytical efforts are typically performed by contractors of the Army Corps of Engineers, with direction and oversight performed by a variety of agencies including EPA's research team in Narragansett. EPA-Narragansett also performs some of the field collection and analytical chemistry efforts (especially for the blue mussel bioaccumulation effort), and is the principle evaluator of the long-term monitoring data.

Eventually, once the remedy is completed and deemed operational and functional, implementation of the long term monitoring program may be turned over to the State. For sites such as this where waste is left in place, however, EPA will also perform five year reviews to determine if the remedy remains protective.

Comment No. 11

Dr. Farrington suggests EPA should use the terminology "economically not feasible" instead of "technically impracticable" as the rationale for not choosing a 1 ppm PCB sediment

cleanup level.

EPA Response

In order to avoid misinterpretations of the term, the "technically impracticable" waiver was not invoked in the reissued Proposed Plan. Rather, the 1996 Proposed Plan uses the "more harm than good" waiver (40 CFR 300.430(f)(1)(ii)(C)(2))for not choosing a Site-wide 1 ppm TCL, based on the radical alterations of the Harbor environment and adverse environmental effects which would result from a Site-wide 1 ppm cleanup level. Briefly, approximately 1,000 acres and/or 2.1 million cy of sediments must be dredged or capped to meet a 1 ppm cleanup level, including at least 47 acres of wetland areas and salt marsh. This would result in very damaging side effects and would, it is believed, have profound negative effects on the Harbor ecosystem. See page 14 of the 1996 Proposed Plan for further discussion of this subject.

3.1.7 Greater New Bedford Community Work Group (CWG)

Comment No. 1

The CWG believes the CDF locations as originally proposed would "hinder forever any other use, be it recreational or commercial, of the land surrounding and underneath each container."

EPA Response

The reissued proposed plan outlines the new locations for the CDFs. However, regardless of where the CDFs are located, EPA does not agree that they would completely hinder beneficial use of the property or surrounding properties. Air emissions and groundwater from the final CDFs will have to be carefully monitored to verify that reuse is appropriate, but EPA's experience to date with the more highly contaminated Hot Spot CDF suggests that these new ROD 2 CDFs could be beneficially reused. For example, CDF D can be designed to allow for future use as a commercial marine facility. Other potential uses include wildlife sanctuaries or recreational areas.

In addition, as a result of facilitated discussions with the community Forum concerning the various alternatives, the suggested locations for the four CDFs were purposely sited in commercial and industrial areas, as far as possible away from residential areas.

Comment No. 2

The CWG is unsure the CDFs would be "constructed such that they can withstand the effects of the types of weather unique to this area on a very long term basis."

EPA Response

See EPA's responses to Mr. T. Rose's comment #5 and Ms. Kirk's comment #2 under section 3.1.1 above, as well as Mr. Chaplick's comment #1 in section 3.1.2 above

Comment No. 3

The CWG "would like some assurances that the CDF's will not now or in the future ever be used for storage of anything but the material dredged from New Bedford Harbor."

EPA Response

EPA will not allow the four CDFs identified in the proposed plan to be used for the disposal of any material other than material from the Superfund remedy or, for purposes of providing appropriate preliminary cap material, sediments dredged as part of the Harbor's navigational dredging. It should be noted that the harbor navigational dredging program may (or may not) eventually include CDFs for dredged material disposal: Some small amount of any such CDF may be used for sediments dredged as part of the Superfund remedy.

3.1.8 Angela Days

The comments were provided by Angela Days on behalf of the Lupus Foundation.

Comment No. 1

Ms. Days raised a concern regarding possible links between the presence of chemical contaminants such as PCBs in the environment and lupus. The commentor also emphasizes the desirability of conducting appropriate epidemiological studies to determine whether there is an unusually high incidence of lupus in the area.

EPA Response

As part of its detailed evaluation of the New Bedford Site, EPA has performed a comprehensive human health risk assessment (Ebasco, 1989). This assessment was performed to evaluate potential health risks arising from the presence of PCBs in the sediments of New Bedford Harbor. The results of this assessment confirmed that the presence of PCBs in the sediments of New Bedford Harbor did pose potential risks to human health through direct contact with sediments or through ingestion of PCB-contaminated seafood. Risk assessment calculations indicated that for PCBs, the cumulative risks from multiple exposure pathways significantly exceeded the 10^{-4} to 10^{-6} risk range for carcinogenic effects. EPA uses this risk range as guidance in evaluating the appropriateness of undertaking remedial actions at Superfund sites. EPA has therefore developed a cleanup plan for contaminated sediments coupled with a program of institutional controls. Such remediation will reduce carcinogenic health risks from direct contact with PCB contaminated sediment to less than 10^{-4}. Over the longer term, EPA anticipates remediation of PCB-contaminated sediment will result in reductions in PCB levels in edible fish and shellfish; however, until safe seafood levels are reached, institutional controls such as no-fishing signs, fishing-bans as well as a local educational program about the risk to area residents from ingesting locally caught seafood will be required.

EPA notes that a separate study, the Greater New Bedford Harbor Health Effects Study (GNBHHES, 1987), was performed to evaluate possible health effects related to environmental contamination in New Bedford Harbor. The results of this epidemiological study did support a link between the frequency of ingestion of locally caught fish and shellfish and blood serum PCB levels in New Bedford area residents.

EPA acknowledges that these studies did not specifically focus on links between environmental contamination and lupus. Such studies are beyond the scope of EPA risk assessments for Superfund sites. Overall, however, the Agency does believe that the implementation of its selected remedy for the New Bedford Harbor Site will reduce overall health risks by reducing PCB contamination in sediments, in the water column and in local seafood to which area residents may be exposed.

3.1.9 Robert B. Pond on behalf of Stripers Unlimited

Comment No. 1

Stripers Unlimited believes EPA's remedy will do more harm than good, and that biodegradation should be further investigated as a means of accomplishing Site cleanup.

EPA Response

EPA disagrees and believes the selected remedy can be implemented in a manner that is safe to both the public as well as marine life. EPA's operational experience and extensive monitoring data gained during the Hot Spot remedial work provides further assurance that the remedy can be implemented in a safe and effective manner. The time frames for recovery of the Harbor to levels below EPA's PCB water quality criteria for the protection of marine organisms is estimated to be on the order of ten years for the proposed remedy, compared to an estimated minimum of 65 to 400 years for a biodegradation-based remedy.

EPA recognizes that PCB biodegradation is occurring within the sediments. However, it does not appear to be occurring at all locales and throughout the range of PCB concentrations found at the Site. Furthermore, the apparent rates seem so slow that the contamination would continue to impact the ecosystem for a very long time. While research into ways of enhancing the biodegradation process has progressed, it is currently not available at a stage of development sufficient to eliminate the potential human health and ecological risks at the Site within an acceptable time frame. See also EPA's response to Comment No.4, section 3.1.6.

3.2 Local Government Comments

EPA received comments from the City of New Bedford and the Town of Fairhaven. Comments from the City were submitted by the Mayor and the Harbor Development Commission. The Town of Fairhaven's comments were submitted by the Board of Health and a member of the local Conservation Commission.

3.2.1 Town of Fairhaven Board of Health

Comments submitted by the Board of Health included a number of questions and comments regarding the design, construction, performance and monitoring of the proposed CDFs along with several overall questions on short- and long-term monitoring and how this information will be communicated to the Town and the public. The responses to these questions and comments are structured on a subject basis.

3.2.1.1 Time to Achieve the AWQC

Board of Health Question No. 1

The January 1992 Proposed Plan indicates attainment of AWQC 10 years after remediation to 50 ppm. Indicate the studies used to develop this 10 year estimate.

EPA Response

EPA's estimate that the AWQC would be attained approximately 10 years following cleanup is based on the physical/chemical fate and transport model developed by Battelle for EPA (Battelle, 1990 and 1991). A summary of this report is in the 1990 Feasibility Study (Ebasco, 1990c). All of these reports are located in the Administrative Record.

3.2.1.2 Design, Construction and Operation of Proposed CDFs

Board of Health Question No. 2.a.

What leachate treatment is proposed?

EPA Response

The only water treatment that will take place during the remedy will be for the seawater that is pumped into the CDFs by the dredge along with the dredged sediments (although very minimal amounts of water from the COM/Electric tunneling project may also be treated along with this decanted seawater). This water will be drained off the top of the sediments in the main cell(s) of each CDF and sent to treatment before being discharged back to the Harbor. The treatment process for this decanted water will most likely include initial settling, flocculation, secondary settling, sand filtration, ultra-filtration and UV-light/hydrogen peroxide treatment.

Once the CDFs are filled with sediments and capped, no other water or leachate treatment is proposed or envisioned at this time. The conceptual design of the CDFs does not include a leachate collection or treatment system, since in this case such systems are unnecessary. The low permeability Harbor sediments underneath the structures and the impermeable sidewall liners will minimize the production of leachate to an insignificant amount (see EPA Response to Hands Across the River Coalition's comments in section 2.6.2 for more discussion on this issue).

Board of Health Question No. 2.b.

Estimate the amount of leachate released from the confined disposal facilities (CDFs) at years 1, 2, 5, 10, 20 and 30.

EPA Response

At EPA's request, the Army Corps of Engineers updated their estimates of contaminant loss from each of the four conceptual CDFs included in the 1996 Proposed Cleanup Plan (USACE, 1997). That report should be reviewed to best answer the Board's question. As a summary, however, the amounts of PCBs and copper estimated for each individual CDF are listed below. Note that each CDF will most likely be brought on line one at a time, such that the last CDF to be built may be at "year 0" when the first CDF built is at "year 4." For the earlier Corps leakage estimates, see Report #11 of the Corps' Engineering Feasibility Study (Averett et al.,1989) in the Administrative Record. The updated leakage estimates, in kilograms per year, are as follows:

	CDF A	CDF A	CDF B	CDF B	CDF C	CDF C	CDF D	CDF D
Year	PCBs	Cu	PCBs	Cu	PCBs	Cu	PCBs	Cu
1	1.0	0.07	0.9	0.06	1.1	0.07	1.9	0.1
2	1.0	0.07	0.9	0.06	1.1	0.07	1.9	0.1
5	0.5	0.03	0.5	0.03	0.6	0.04	1.0	0.07
10	0.4	0.02	0.3	0.02	0.4	0.02	0.6	0.04
20	0.02	0.001	0.02	0.001	0.02	0.001	0.1	0.007
30	0.01	0.001	0.01	0.001	0.01	0.001	0.06	0.005

Board of Health Question No. 2.c.

What is the back-up method for the (leachate water) treatment facility?

EPA Response

As discussed in EPA Responses to the Board's Question 2.a. above, EPA does not believe treatment of the small volume of leachate potentially migrating from the CDFs will be required. Seawater brought in to the CDFs along with the dredged sediment will be treated as described above. While there is no "backup" treatment at each facility for this decanted seawater, there will be several separate water treatment facilities. Should one facility fail, the others would be available to accept the decanted seawater as long as they meet their performance standards. Very sensitive chemical monitoring of the effluent discharge will take place. This effluent will be subjected to stringent discharge standards for both PCBs and metals.

The CDF design will also include monitoring wells which will be sampled regularly to verify that the CDFs are operating as expected.

Board of Health Question No. 2.d., e., and f.

Who will operate the (leachate water) treatment facility? What operation and management reports will be required? Who determines the (design) capacity? Who reviews operation and how frequently?

EPA Response

EPA will construct the water treatment facilities to treat the water generated during dredging. The design capacities of the required treatment facilities will be determined during the design stage of the cleanup by design engineers under the direction of EPA and the Corps of Engineers. In developing the estimated costs of the remedy, it was assumed that a capacity of approximately 2 million gallons per day of treatment would be required in total. Again, this capacity will most likely be provided by two or more treatment facilities.

The operation of the water treatment plants will most likely be by a private contractor under the direction of the EPA and the Corps of Engineers. Specific pollutant discharge requirements established by EPA will be part of the contractual requirements for that contractor, as well as proper operating procedures and reporting requirements. At a minimum, monthly reporting of the discharge quality will be required. This data will be reviewed regularly by the project team and will be made immediately available to the local communities.

Board of Health Question No. 2.g.

What if the (leachate) treatment facility needs to be upgraded, will there be funds available? Who would make a determination of need?

EPA Response

If the water treatment plants were to not meet their discharge requirements, EPA - in consultation with the project team as well as the local community - would direct the Corps of Engineers to take the appropriate action to achieve compliance. This could include a variety of approaches other than strictly building an upgraded facility. Other options could include changes in the method or pace of dredging activities or the addition of pretreatment practices within the main cell(s) of each CDF. (As discussed above a facility to treat CDF leachate after the CDFs are capped is not part of the remedy.) Funding for any upgrades required during remedial action will come from the special account specifically set up for the New Bedford Harbor Site, or once that account is depleted, the national Superfund trust fund. Funding to operate and maintain the CDFs following implementation of the remedy will be the responsibility of the Commonwealth of Massachusetts.

Board of Health Question No. 2.h.

Will a trust fund amount or some other financial security plan be in place to maintain (ensure) success of remedial action after EPA "leaves"?

EPA Response

Under the provisions of CERCLA and the NCP, the state is responsible for operation and maintenance of facilities or controls remaining at completion of the remedial action. Some of the money recovered from the litigation at this Site has been set aside for this purpose in a Superfund special account.

Board of Health Question No. 2.i.

The proposed plan indicates quarterly sampling for the CDF and Harbor after remedial action. For how many years? What will be the frequency of testing (sampling) during those years?

EPA Response

EPA has estimated quarterly sampling as part of long-term monitoring for a period of 30 years following cleanup. EPA used this duration for costing purposes because the net present worth of costs beyond 30 years become negligible. While EPA will formally establish the monitoring requirements for the Site as a part of the remedial design process, EPA believes the initial monitoring of the CDFs will be conducted quarterly for the first several years. Monitoring of the Harbor as part of the long-term ecological monitoring program may be less frequent, depending on the timing of major remedial events (see EPA's response to Mr. Dow's comment #7 in section 3.1.1.2). EPA and the Commonwealth will evaluate the required frequency of monitoring on an ongoing basis based on the trends and values of the data collected. (See also EPA's response to Dames & Moore's comment #9 on behalf of AVX Corp. in section 2.7.3 above.)

Board of Health Question No. 2.j.

Who will do the sampling? How long before the results are returned? To whom are the results reported and are they available to the public?

EPA Response

EPA, or a representative of EPA, such as the Corps of Engineers or a contractor, will perform the sampling. The time it takes for the data to become available depends on the nature of the monitoring activity and the type of analysis. Some data may be available in a matter of days, and others may not be available for months. In any case, all data will be made available to the public, upon request, as soon as possible. Certain key data (e.g., air monitoring, effluent monitoring) will be made public as a matter of routine.

Board of Health Question No. 2.k.

If thresholds are exceeded, how long will it be before (EPA) (responds and) corrects the problem? Explain how this would be implemented (i.e., procedures for notification, coordination, etc.).

EPA Response

In similar fashion to the Hot Spot dredging operation, EPA and the Corps will respond to exceedances in a manner appropriate to the nature, frequency and magnitude of the problem. The time it takes to implement corrective action will depend on these factors and the nature of the corrective action. If a situation were to arise that posed an immediate threat to public safety or the environment, EPA and the Corps of Engineers would act accordingly. This would include notification and coordination with local public safety departments. All data will be available to the public and will be reported to the various federal, state and local agencies who have expressed an interest in receiving it.

Board of Health Question No. 2.l.

"Should a steady rise in the test results be observed, but thresholds not exceeded, will this trigger a response from DEP or EPA and to whom will this information be immediately and consistently available?"

EPA Response

EPA agrees that pre-emptive action should be taken in the hypothetical case of data pointing to a forthcoming problem. There will be extensive monitoring of air, water, sediment and biota both during and after the remedial action. This data will be evaluated as it becomes available for compliance with regulatory requirements and for long term trends. Any indication that there is, or may be, a threat to human health or the environment will be evaluated by EPA and DEP and the appropriate corrective action implemented. Again, all key monitoring data will be made available to local government agencies and the public, and other data will be made available upon request.

Board of Health Question No. 2.m.

How will the monitoring wells be configured in relation to the CDFs?

EPA Response

The conceptual approach is that a number of monitoring wells would be installed along the perimeter of each CDF. The monitoring of these wells would start prior to the filling of each CDF to allow "before" and "after" assessments of potential contaminant migration.

Board of Health Question No. 2.n.

What will be the loss or migration of metals from the CDFs?

EPA Response

See EPA's response to comment No. 2.b directly above. Loss of lead through CDF leakage should be similar in scale to that for copper listed above (USACE, 1997).

In terms of metals discharged as part of the CDF dewatering operations, the discharge levels will be either at the lowest AWQC (for cadmium, chromium and lead) or at the existing background level (for copper).

Board of Health Question No. 2.o.

Will the metals bioaccumulate like the PCBs? Won't the CDFs leak metals and produce a health risk?

EPA Response

EPA does not believe that the leaching of metals from the CDFs and any subsequent bioaccumulation poses a significant concern for the Site. The results of the Corps of Engineers' studies indicates that the leaching of metals from the CDFs is not a major concern, especially considering the vastly greater amount of metals that will be isolated from the environment within the CDFs.

The tendency of a contaminant to bioaccumulation can be inferred from the bioconcentration factor (BCF), which is the ratio of concentration found in the tissue of an organism to the concentration in the water to which the organism was exposed. High BCFs indicate that an organism may concentrate a "large" amount of contaminant in its body relative to the concentration of the contaminant in the water. Conversely, low BCFs indicate little concentration or uptake of a contaminant in the body as a result of exposure.

Reported BCFs for PCBs and metals in fish are: 45,000 for PCBs; 200 for copper; 81 for cadmium; 49 for lead; and 16 for chromium. These demonstrate that PCBs will bioaccumulate to a much greater degree (up to three orders of magnitude) than any of the four metals. The high BCF for PCBs is consistent with the "lipophilic" or "fatty-tissue-loving" nature of these compounds, meaning that PCBs tend to partition to organic material (e.g., body tissue) rather than water.

Based on the lower flux of metals from the CDFs and low BCFs for these analytes, the migration of cadmium, copper, lead and chromium is not expected to result in a health risk.

Board of Health Question No. 3.a.

What is the exact location of CDF 3? What are the current PCB levels in this area? To what depth will the area be filled?

EPA Response

The historically-labeled CDF 3 was proposed to be located just north of Coggeshall Street on the Fairhaven side of the estuary. However, CDF 3 is no longer part of the selected remedy. Only CDFs A, B, C and D (all located along the New Bedford shoreline) are part of the current plan.

Board of Health Question No. 3.b.

Who determines when (or which) wetlands will be mitigated? What criteria are used?

EPA Response

Consistent with the 50 ppm PCB target cleanup level for saltmarshes and wetlands, EPA in consultation with other state and federal resource agencies will determine which wetlands will be mitigated. The criteria used will be the substantive standards set forth in federal and state standards, including 40 CFR Part 230 and 310 CMR 10.00. Vegetated wetlands altered by the remedial dredging will be replanted. Dredged intertidal areas immediately adjacent to vegetated wetlands will be regraded or armored as appropriate to reduce the potential for erosion of the wetlands.

Board of Health Question No. 3.c.

Will wetland mitigation resuspend or disturb sediments in such a way as to create an additional health risk?

EPA Response

EPA will conduct the sediment cleanup activities in a manner that will minimize the resuspension of sediment in the surface water and the associated downstream migration of contaminants bound to these sediments. Wherever possible, a cutterhead dredge - a type of dredge that has been found to be environmentally safe - will be used. In salt marsh areas where this type of dredge won't work, other methods such as clamshell bucket or land-based excavation would be used. In all cases, the minimization of resuspended sediments and the prevention of additional health risk will be the top priority of the cleanup operation. EPA expects that, as was done during the Hot Spot remediation, acceptable maximum threshold levels of PCBs in the water column and in the atmosphere, as well as biological effects thresholds, will be established before the cleanup starts. If these levels are approached or exceeded, appropriate corrective measures will be put in place until compliance with these thresholds is achieved.

Board of Health Question No. 3.d.

How will the existing wetlands be protected during dredging and CDF construction? How long will this be necessary?

EPA Response

In general, remedial activities (dredging, CDF construction) will be carried out in a manner designed to minimize impacts to the environment, including the existing wetlands. CDF dike construction will be carried out such that the disturbance of contaminated sediments will be minimized. This involves placing dike material in shallow lifts with specially designed equipment. Silt curtains may also be used if appropriate to minimize the movement of any resuspended material. Dredge operations will follow the procedures developed during the pilot study and Hot Spot operations to minimize the resuspension of sediments. Extensive and frequent monitoring of Harbor water quality will be performed during construction and dredging operations. If the monitoring indicates a threat is posed from sediment resuspension and migration, remedial activities will be re-evaluated and modified accordingly.

In terms of remedial work in the wetlands themselves, EPA will only be removing wetland sediment that exceeds the 50 ppm PCB TCL (unless in areas covered by the 25 and 1 ppm PCB cleanup levels - see section XIII.B of the ROD). In general, this limits the wetland areas that are impacted to only those fringe areas bordering the harbor. Mechanical excavation rather than cutterhead dredging will likely be required for these areas. EPA will consider doing this excavation from a barge rather than from land in order to avoid physical impacts to the saltmarsh. In areas where access through wetland areas is essential, vehicles with low-pressure tires can be used to minimize such impacts. Finally, any wetland area remediated will be revegetated.

Board of Health Question No. 3.e. and Comment No. 7

Will groundwater mounding occur during dredging and sediment disposal activities that could impact upland areas including the low-lying areas of Sycamore Street?

EPA Response

Any impacts on groundwater flow will be addressed in the design of the specific facilities. Additional Site investigations will be carried out at each CDF location and each facility will be designed to meet the Site specific requirements. In concept, the facilities have been sized (in terms of elevation) to generally match existing topography so significant impacts to existing groundwater movement is not anticipated. As previously indicated, CDF 3 is no longer included in the proposed remedy and, therefore, will not impact local groundwater movement on Sycamore Street.

Board of Health Question No. 3.f.

Are there any plans to protect the existing flocks of geese, swans and other wildlife during construction?

EPA Response

There are no specific plans to protect waterfowl and other wildlife at this time, simply because the dredging activities are not expected to impact these animals. Construction of the CDFs, on the other hand, could potentially impact these animals if nests are disturbed, for example. Prior to construction, EPA will work with relevant resource agencies to determine if this is the case, especially for any endangered species, and make appropriate adjustments to the construction program where necessary.

Board of Health Question No. 3.g.

What are possible uses for the CDFs after the final cap has been installed?

EPA Response

Although care would have to be taken to preserve the integrity of the final caps and to verify that air emissions are at a safe level, a variety of potential end uses for the CDFs have been suggested. At CDF D for example, the City of New Bedford has indicated a desire for ultimate use as a commercial marine facility. Other potential end uses could be as wildlife refuges or recreational areas. EPA will continue to work with the local communities to develop appropriate and timely plans for beneficial reuse.

Board of Health Comment No. 3.h

Will the CDFs be vented? Will this be monitored? How often?

EPA Response

It is likely that venting of the CDFs will be necessary since the normal decay process for organic material in the sediments will cause gases to form. This issue will need to be studied in more detail during the design stage of the cleanup effort to determine the exact details of the CDF venting system. These systems would most likely be monitored on a quarterly basis for the first few years to adequately characterize the gas emissions over all seasons. After that, the vents could be monitored on an annual or as-needed basis.

3.2.1.3 Local Agency Input to Design and Permitting Activities

Board of Health Question No. 4 and Comment Nos. 1. and 2.

Will local boards have input into the design? Will local permits be required? Please indicate the time frame for coordination with local agencies.

EPA Response

EPA's proposed remedy has already been modified in response to comments from local government agencies and other interested parties as part of the community Forum process. EPA will also present local agencies and the public with updates of the design throughout the course of its development, and will continue to work with the Community Forum to share information as much as possible. EPA will incorporate feedback from these meetings into the design to the extent appropriate.

The Superfund law specifically exempts all onsite remedial activities from permit requirements. See 42 U.S.C. § 9621(e).

3.2.1.4 Availability to Monitoring - Data Reporting on a Timely Basis

Board of Health Comment Nos. 4., 5. and 6.

The Town of Fairhaven should have access to the monitoring data from the construction aspects of remediation, and the long-term monitoring data to evaluate the effectiveness and performance of the remedy. A point person or office within the Town should be contacted with the data on a timely basis so the Town can maintain an informed position relative to EPA's actions and decisions.

EPA Response

EPA will provide access to all monitoring data to ensure that all interested parties remain informed of the cleanup's progress. EPA agrees with the Town that an individual point of contact is the most effective method of communication. In addition, data can be made available at the Town library or similar location.

EPA intends to work closely with the local communities during the design, construction and operation periods. EPA anticipates frequent meetings to keep the local communities informed of ongoing work and to receive their input. During construction/operations, the Corps of Engineers will have an office at the project Site which will be staffed on a full time basis.

3.2.1.5 Rodent and Mosquito Control

Board of Health Comment Nos. 8. and 10.

Will there be rodent/mosquito control during the remedial action?

EPA Response

At this time, no rodent or mosquito controls are believed to be necessary during the dredging operations. If needed, however, such controls could easily be added to the program. Once capped, an important aspect of the CDF inspection and maintenance program will be to ensure that rodents do not damage the impermeable cap or CDF dikes as a result of borrowing.

3.2.1.6 Construction Impacts

Board of Health Comment No. 9.

Times of dredging and construction must be geared to residential life, keeping noise, lights and other construction impacts at an acceptable level.

EPA Response

Construction activities will be carried out within reasonable working periods. Importantly, all four CDFs have been relocated to industrial and commercial areas. Dredging in some areas of the Site will be limited to times of high tide which may occur outside of usual hours of business. Therefore, in order to complete the remediation in a timely manner, EPA will work with the local communities to develop mutually agreeable dredging schedules for residential areas impacted by this high tide limitation.

3.2.2 Fairhaven Conservation Commission

This comment was presented by a Conservation Commissioner from the Fairhaven Conservation Commission at the March 5, 1992 Public Hearing.

Comment

Will the cleanup and the construction of the CDFs have to comply with the Massachusetts Wetlands Protection Act?

EPA Response

The Massachusetts Wetlands Protection Act is considered an Applicable or Relevant and Appropriate Regulation (ARAR) for the Site as is the Federal Wetlands Protection Executive Order. EPA will comply with the substantive standards set forth in these regulations. (CERCLA does not require compliance with the procedural - as opposed to substantive - requirements of identified environmental regulations for activities conducted onsite.)

3.2.3 City of New Bedford Harbor Development Commission

Comment

The Harbor Development Commission requests that EPA construct the sediment disposal facility (construct CDFs) in areas that would promote economic development. They specifically recommend CDF construction in the North Terminal area of the Harbor.

EPA Response

EPA has and will continue to work directly with the City of New Bedford and other local stakeholders in an effort to ensure the CDFs used in the remedy can be integrated into the City's development plans to the maximum extent possible. CDF D, which is in the North Terminal area, has been incorporated into the proposed remedy, and could be designed to promote economic development once completed. EPA will continue to work with the City through the remedial design process to ensure that this CDF D is consistent with their overall plan(s) for economic development around the harbor.

3.2.4 City of New Bedford

Comment No. 1 - PCB Contaminated Grit

The Main (sewer) interceptor and Belleville Avenue Collector (sewer) currently contain approximately 10,000 cy of PCB contaminated grit. The City's preferred alternative for remediation is to permanently seal the interceptor, install monitoring wells and bypass the contaminated area with the installation of a 8,700 foot force main interceptor, with modifications to three existing pump stations. Work has already begun on the force main interceptor and the modifications to the pump stations, at an approximate cost of $1.8 and $2.6 million dollars, respectively.

In the event that the City is mandated to remove and dispose of any PCB contaminated grit, the City requests that space within the proposed Contained Disposal Facilities (CDF's) be reserved for any such mandated disposal.

EPA Response

Since the grit at this locale is regulated under Massachusetts Hazardous Waste Law, Chapter 21E and is beyond the scope of the Superfund cleanup action, EPA believes the City of New Bedford should develop a remedial solution directly with the Commonwealth of Massachusetts.

Comment No. 2 - Future Pier Expansion, Marina Development and Navigational Dredging

Pier expansion projects, marina developments and navigational areas of the Harbor may require future dredging. These areas and the volume of material to be dredged will be identified in the Master Plan for New Bedford Harbor.

The City requests that the disposal of the non-Superfund dredged material as proposed in the Harbor Master Plan be combined with the disposal of the Superfund dredged sediments in the CDF's. This suggestion was made in preliminary discussions concerning the disposal of dredged Harbor material with the U.S. Army Corps of Engineers.

The growing concern is that the disposal of contaminated dredged material is too costly or no longer possible, resulting in a hardship for the City. Future dredging is a necessary tool for navigational purposes, pier extension, marina maintenance and development. It is in light of these concerns, that the City requests that EPA provide and ensure future disposal capacity for dredged material within the CDF's.

EPA Response

In order to ensure the viability of the selected remedy, the four proposed remedial CDFs (A, B, C and D) must be reserved for those sediments above the Site's cleanup levels. However, there is the potential that less contaminated navigational dredged spoils could be used for the preliminary, interim caps that will be required at the CDFs. In addition, as part of the state's request for an enhancement of the remedy pursuant to 40 CFR 300.515(f), EPA has agreed to cooperate with the navigational dredging program to the maximum extent possible, and allow the state to make use of the enhanced remedy provisions where it makes sense to do so.

Comment No. 3 - CDF Siting Procedures and Land Acquisition

The siting of the CDF's may be beneficial to harbor development. Areas such as pier and bulkhead extensions may require filled areas. CDF's, if properly located, may be the base of such extensions and developments. These areas of expansion and development are to also be identified in the Master Plan for the Harbor.

The siting of CDF's as the base for harbor development may also simplify the legal ramifications of land acquisition for proposed CDF sites. The Harbor Master Plan Committee, consultant and city officials would like an opportunity to discuss the coordination of the two projects with EPA.

EPA Response

EPA plans to continue to work directly with City officials on land acquisition and harbor development issues, and notes that CDF D has been conceptually designed to dovetail with the City's harbor master planning efforts.

Comment No. 4 - Capping of the area at the Wastewater Treatment Plant (WWTP) Outfall

Should effluent analysis determine the need for a diffuser to be placed at the end of the outfall, the proposed cap area may require dredging. The dredging, if required, should take place before the area is capped. The City requests the opportunity to discuss the coordination of these two projects with EPA.

EPA Response

After careful consideration of comments from the City of New Bedford and others, EPA has decided to postpone the remedial work at the outfall area pending further study of the area. A Remedial Investigation and Feasibility Study for the phase three, Buzzard's Bay area of the Site will be available for public comment prior to finalizing a decision on remedial action in this area. In adopting this strategy, the Agency has given consideration to comments relating to the need to carefully consider and integrate technical and administrative issues associated with the City of New Bedford's sewage treatment plant outfall and anticipated future upgrades.

3.3 Commonwealth of Massachusetts Comments

This section includes comments raised by the Commonwealth of Massachusetts and EPA's responses. The comments were submitted by the Department of Environmental Protection (DEP), Coastal Zone Management (CZM), and the Department of Public Health (DPH)

3.3.1 Attainment of Water Quality Standards

The Commonwealth expressed concern "that the preferred alternative will not meet a number of existing water quality standards."

EPA Response

EPA anticipates the preferred alternative will attain the applicable water quality standard for PCBs within approximately 10 years following completion of cleanup activities. This estimate was based on the results of the physical/chemical model prepared for EPA and the existing Site data that indicate the standard is largely met in the upper Buzzards Bay portion of the Site. EPA recognizes the uncertainties associated with modeling and its concurrent predictions, and therefore will be conducting regular monitoring to establish the effectiveness of the remedy through time. EPA will be evaluating this data on a regular basis and will include all interested parties in the review process. If the results of this review indicate the remedy is not performing to the expected standards, EPA will evaluate and implement additional actions as appropriate.

The only other non-bacterial water quality standard not being met in the Harbor is the copper AWQC. Consistent with §303 of the Clean Water Act and its Total Maximum Daily Load approach, EPA will use discharge limits for the CDF water treatment plants that are at or below current background levels of copper, but above the EPA water quality criteria. This approach allows for attainment of ambient WQC throughout the waterbody in a phased or step-wise approach, since roughly 2,000 times more copper will be removed by the remedial dredging than will be discharged during CDF dewatering (255,000 kg versus 116 kg; USEPA, 1996b).

EPA's remedy will also comply with the substantive requirements of the State's regulations for the discharge of process waters pursuant to 314 CMR 3.00.

3.3.2 EPA's Preferred Alternative

The Commonwealth of Massachusetts, through comments submitted by DEP, recommended that EPA modify the preferred alternative and treat sediments contaminated at concentrations above 500 ppm PCBs, prior to disposal in CDFs. The Commonwealth feels PCB concentrations above 500 ppm constitute the principal threat at the Site. The Commonwealth's position is based in part on their concern for the long term ability of the CDFs to effectively isolate the PCBs from the environment. The Commonwealth has raised specific concerns relative to the potential for PCBs to leach from the CDFs. However, the Commonwealth has indicated their willingness to modify their position and concur with EPA's preferred alternative, "provided the EPA clarifies, justifies, and defines a reasonable maximum allowable loss of PCBs from the CDFs into the harbor."

EPA Response

During 1994 and 1995, EPA dredged the most highly PCB-contaminated sediments from the Harbor. These "Hot Spot" sediments ranged in concentration from 4,000 ppm to over 200,000 ppm PCBs, and contained a significant amount of the total mass of PCBs in the Harbor. EPA has not classified the waste as either principal or low threat waste although certainly levels above 4,000 ppm are highly toxic and a significant source of contamination. Instead, EPA is guided by the NCP's preference for treatment of hazardous substances. As such, in accordance with the NCP, the alternatives being evaluated to address these sediments include permanent treatment technologies. A subsequent decision document is expected to be issued to address these Hot Spot sediments in the near future.

In contrast, the amount of PCB contaminated sediment to be dredged in accordance with ROD 2 totals approximately 450,000 cubic yards. The NCP does not require treatment if, among other things, there is an extraordinary volume of material and containment options are protective and cost effective. EPA believes that the CDFs are an appropriate containment technology for sediments with PCB contamination levels less than 4,000 ppm since they will be effective in isolating the PCBs from human receptors and from contaminating the surface water and biota. See also EPA's response to Hands Across the River Coalition's comments in section 2.6.2 above.

EPA notes that the Corps of Engineers in maintaining and improving waterways and harbors routinely utilizes confined disposal facilities (CDFs) for the disposal of dredged material. Approximately 90 million cubic yards of dredged material (30% of the total volume dredged) is placed in CDFs annually. This figure includes the majority of the ACOE maintenance dredging material for major ports along the Atlantic and Gulf coasts and numerous harbors on the Great Lakes. The objectives inherent in the design and operation of CDFs are to provide adequate storage capacity for meeting dredging requirements and to attain the highest possible efficiency in retaining solids during dredging operations. The design procedures associated with meeting these objectives are well developed and the Corps of Engineers has extensive experience in the design of CDFs, their construction and operation. Moreover, the conceptual CDF design has been improved upon to take into account the toxic nature of the sediments.

EPA guidance documents are general guidelines which recognize that circumstances at a specific site may be sufficiently different from the circumstances used to develop the guidance as to make the application inappropriate. EPA believes that the increase in costs to provide treatment of sediments with PCB concentrations over 500 ppm is not warranted because there is only a negligible increase in protectiveness when compared to isolation in CDFs without treatment.

EPA proposes that, if monitoring data collected after completion of the remedial action indicate that the CDFs are contributing to an increase in PCB concentrations in the waters of the Harbor, an evaluation of corrective actions will be undertaken.

3.3.3 Capping at the WWTP Outfall

The Commonwealth, again through DEP, supports the 10 ppm sediment cleanup level in the upper Buzzards Bay portion of the Site. However, DEP does not support a component of EPA's preferred alternative that includes capping the contaminated area surrounding the City of New Bedford's Wastewater Treatment Plant (WWTP) Outfall. DEP would prefer disposal of this sediment in a CDF. DEP does not believe the integrity of an underwater cap at this location (WWTP Outfall) can be maintained. DEP also expressed concern regarding EPA's ability to integrate a capping remedy with a potential diffuser that the City of New Bedford may be required to construct at the Outfall.

EPA Response

See EPA's response to the City of New Bedford's comment #4 above.

3.3.4 Predesign Sampling Program

Both the Massachusetts DEP and CZM submitted comments indicating additional data must be obtained before final decisions are made regarding cleanup of upper Buzzards Bay. CZM expresses interest in having sampling conducted in the following locations: Clark's

Cove, portions of Apponagansett Bay, Mishaum Point and West Island. CZM further suggests this data be gathered "prior to making decisions regarding remedial actions."

The Department of Environmental Protection expresses a similar comment, with the exception that DEP appears to prefer to establish in advance (i.e., prior to completing the ROD and predesign sampling), an upper-bound limit to the volume of contaminated sediment from upper Buzzards Bay that would be addressed as part of the remedy.

EPA Response

The EPA has considered in detail the concerns of the Massachusetts DEP and CZM regarding limitations in the extent of currently available information on PCB contamination in the upper Bay area. Based upon these and similar concerns expressed by other commentors, EPA has decided to supplement the existing data base for the upper Bay through the implementation of additional investigations to be performed under a third Operable Unit. These additional investigations and associated sampling efforts will focus on better defining the extent of PCB contamination in the upper Bay area. Based upon the results of these investigations, the Agency will further evaluate the appropriateness and need for potential remediation measures to be undertaken in the outer Harbor area.

3.3.5 Local Area Dredging Projects

The Commonwealth of Massachusetts, through comments submitted by DEP and CZM requested EPA to conduct additional dredging in the Harbor (CZM), or to identify a location for dredge sediment disposal that the City, State or other private parties can use to contain PCB-contaminated sediment generated through local dredging activities.

EPA Response

See EPA's response to the City of New Bedford's comment #2 in section 3.2.4 above.

3.3.6 Development of Monitoring Plans

The Commonwealth of Massachusetts, through comments submitted by the DEP and CZM, requested EPA to refine the details of its short and long-term monitoring programs for the Site. Specifically, the DEP has requested information on the frequency and duration of the monitoring, and identification of the entity responsible for conducting the monitoring. The DEP also commented that long-term monitoring for the CDFs is an appropriate state function, yet "monitoring the Harbor for the purpose of determining remedy protectiveness and compliance with the 5-year provisions of CERCLA should not be considered an O&M cost." CZM's comments indicate concerns primarily involving the need for the establishment of a long-term monitoring plan that includes biological sampling and that the plan be implemented as soon as possible to establish an appropriate pre-cleanup baseline.

EPA Response

EPA will develop the details of the phase two operational monitoring program during the remedial design stage of the phase two cleanup. The focus of this program will be to monitor against unacceptable environmental impacts as a result of CDF construction and dredging activities. EPA anticipates that this phase two operational program will likely be similar in nature to the phase one (or Hot Spot) operational monitoring program.

With regard to long-term monitoring, EPA has designed and implemented two rounds of the long-term ecological monitoring program for this Site. This program includes biological as well as chemical and physical parameters (see EPA's response to Dr. Farrington's comment #10 in section 3.1.6 above for additional detail).

With regard to responsibility for the long-term monitoring program and the 5-year review provisions of CERCLA, EPA has been and will continue to work with representatives of the Commonwealth to develop a comprehensive plan that addresses the concerns raised in the comment.

3.3.7 City of New Bedford's Sewer Grit

The Massachusetts DEP commented that "a list of criteria to be met and issues which must be resolved by the City should be clearly stated so the City may make decisions regarding remediation of the grit."

EPA Response

See EPA's response to the City of New Bedford's Comment #1 in section 3.2.4 above. EPA believes this issue is not within the scope of the Superfund remedy, and rather is addressed through the Commonwealth's Hazardous Waste Law, Chapter 21E.

3.3.8 CDF Operations

The Massachusetts DEP commented that EPA should place the dredged sediment in the CDF in the following manner. "The most contaminated sediment should be placed in the middle and near the back of each CDF. The most contaminated sediments should be placed in CDF #1 at the farthest point from the water. The least contaminated sediments should be placed at the edges, bottom, and top of the CDFs."

EPA Response

The specific details of which sediments will be contained in each CDF will be developed during the remedial design process. Where the sediments are actually placed in each CDF is likely to be more of a construction/operations issue (i.e., there may not be much flexibility in the exact location of the dredge pipeline). Moreover, given the insignificant worst-case leakage estimates, EPA does not believe that it makes a significant difference as to where the various sediments are placed.

3.3.9 Capping Costs

The Massachusetts DEP requested an explanation for the $2.9 million decrease in capping costs associated with using a marine source to obtain capping material, as opposed to the land-based source of capping material presented in Alternative Bay-4 of the Supplemental Feasibility Study (SFS). The DEP questions how the costs can decrease by $2.9 million when the cost presented in the SFS for capping the Outfall area are $2.5 million.

EPA Response

EPA notes that the potential cost reduction associated with the use of marine sediment is not simply the result of the removal of the cost to cap the Outfall area as DEP has apparently assumed. The potential savings for Alternative Bay-4 as a whole include both the direct and the indirect capital costs to obtain the land-based capping material, the associated contingencies, and reductions in potential O&M costs. A decision about remediation of upper Buzzards Bay has been deferred until additional information can be gathered and evaluated.

3.3.10 Residual Metals Concentrations

The Massachusetts DEP and DPH requested that EPA provide information about the residual metals remaining after the implementation of the remedy. Specifically, DPH is concerned with the potential ingestion of biota contaminated with cadmium and lead. DPH requests EPA to include these metals in the long-term monitoring program to determine the effectiveness of the remedy in reducing the potential human health risks.

EPA Response

EPA has provided estimates of existing sediment concentrations for several metals, specifically, cadmium, copper, chromium and lead in Appendix A of the 1990 Feasibility Study. EPA has modified these figures to reflect the areas affected by a 10 ppm TCL cleanup in the estuary and a 50 ppm TCL in the lower Harbor. These results are presented in Exhibits 3-1 through 3-4, immediately following this page, and indicate the residual concentrations of these metals after dredging is completed. Furthermore, EPA has included metals monitoring in the long term monitoring program.

3.3.11 Operation and Maintenance (O&M) Costs

The Massachusetts DEP requested EPA to "specify more details on O&M requirements, the costs involved, and present worth in order for the State to make an educated decision on the remedy." DEP also wanted clarification as to why the O&M costs for CDF Number 1 did not increase in the 1992 Supplemental Feasibility Study, when the document indicated that the conceptual facility was being enlarged.

Exhibit 3-1

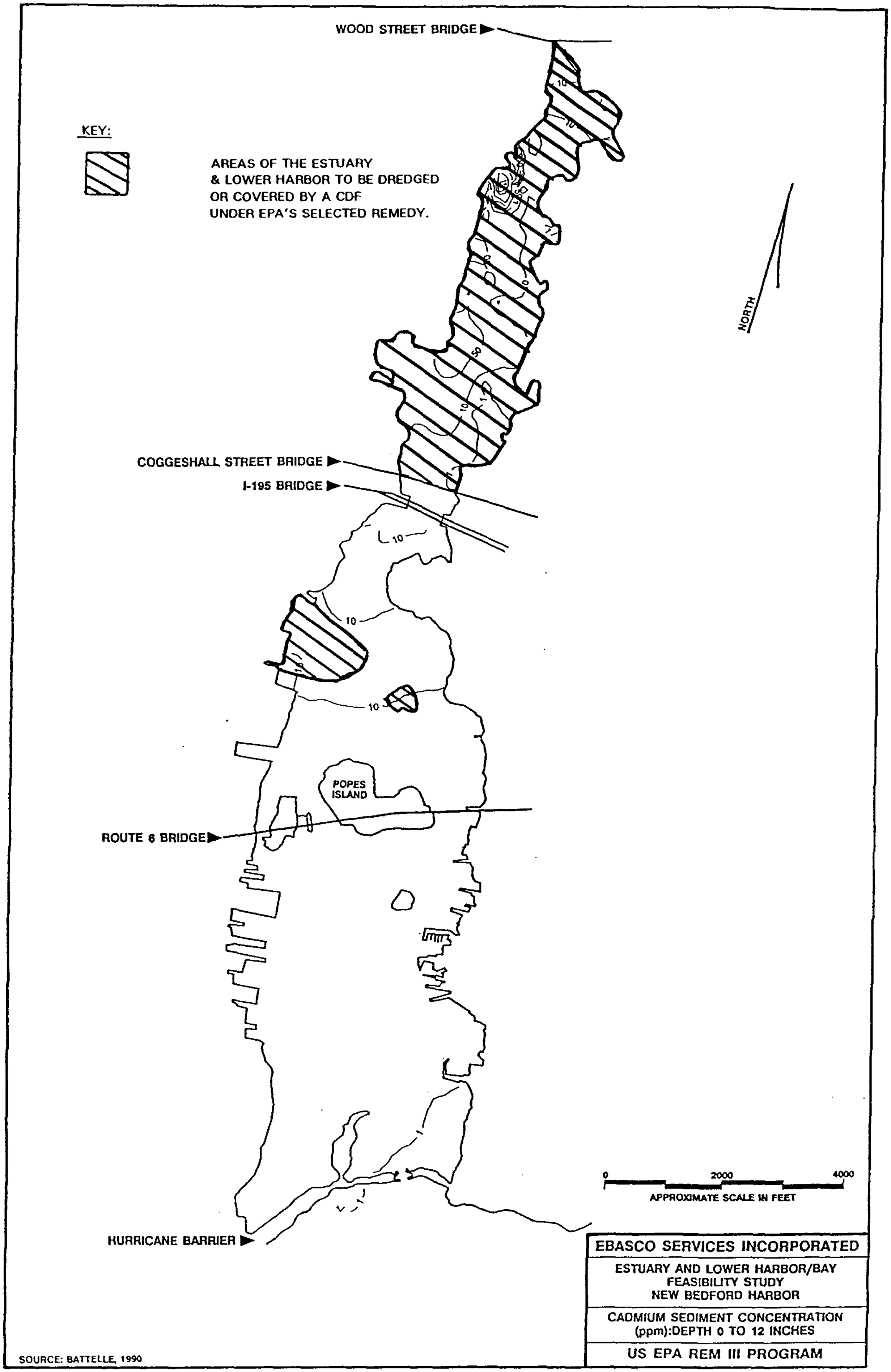
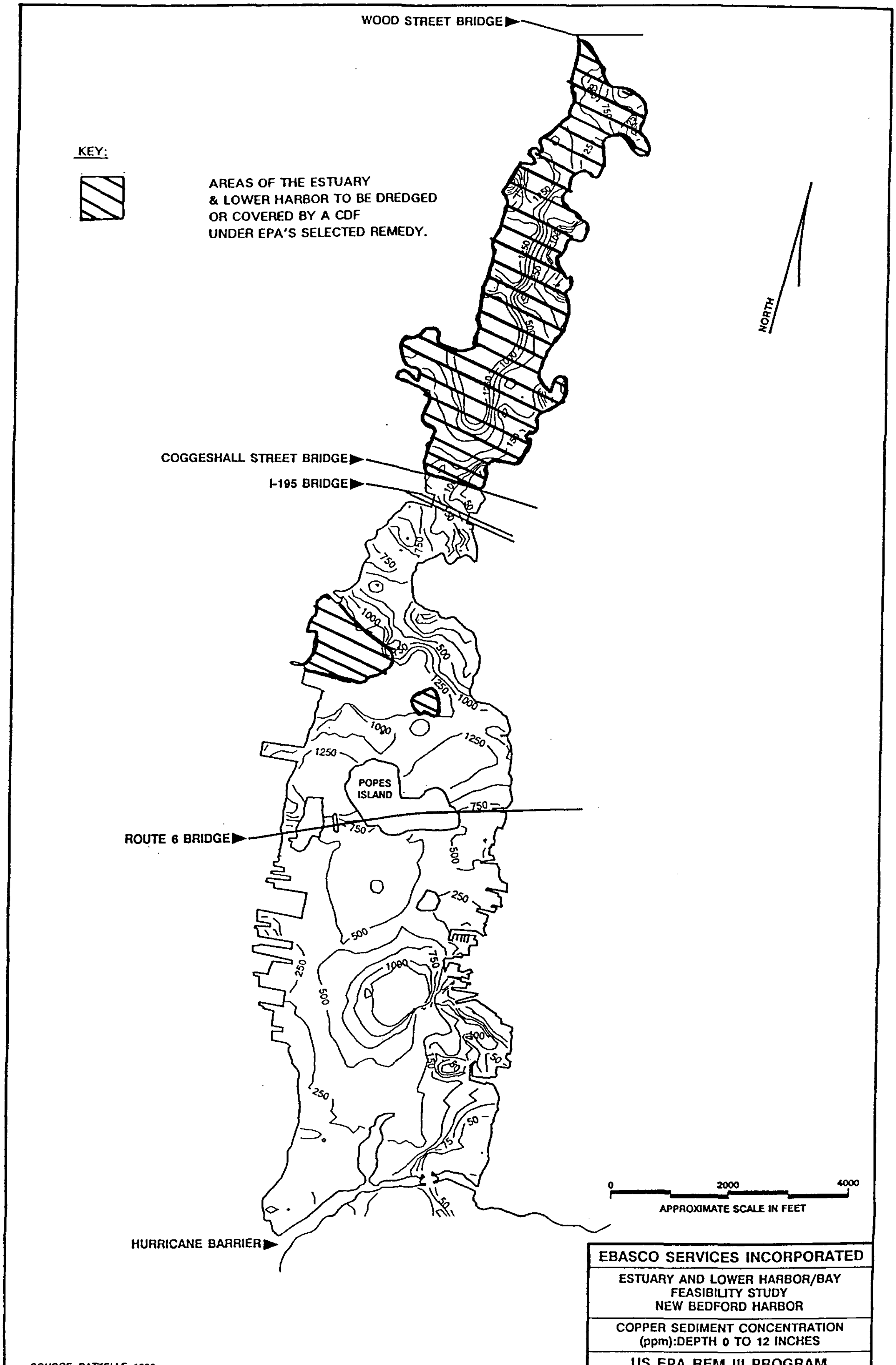
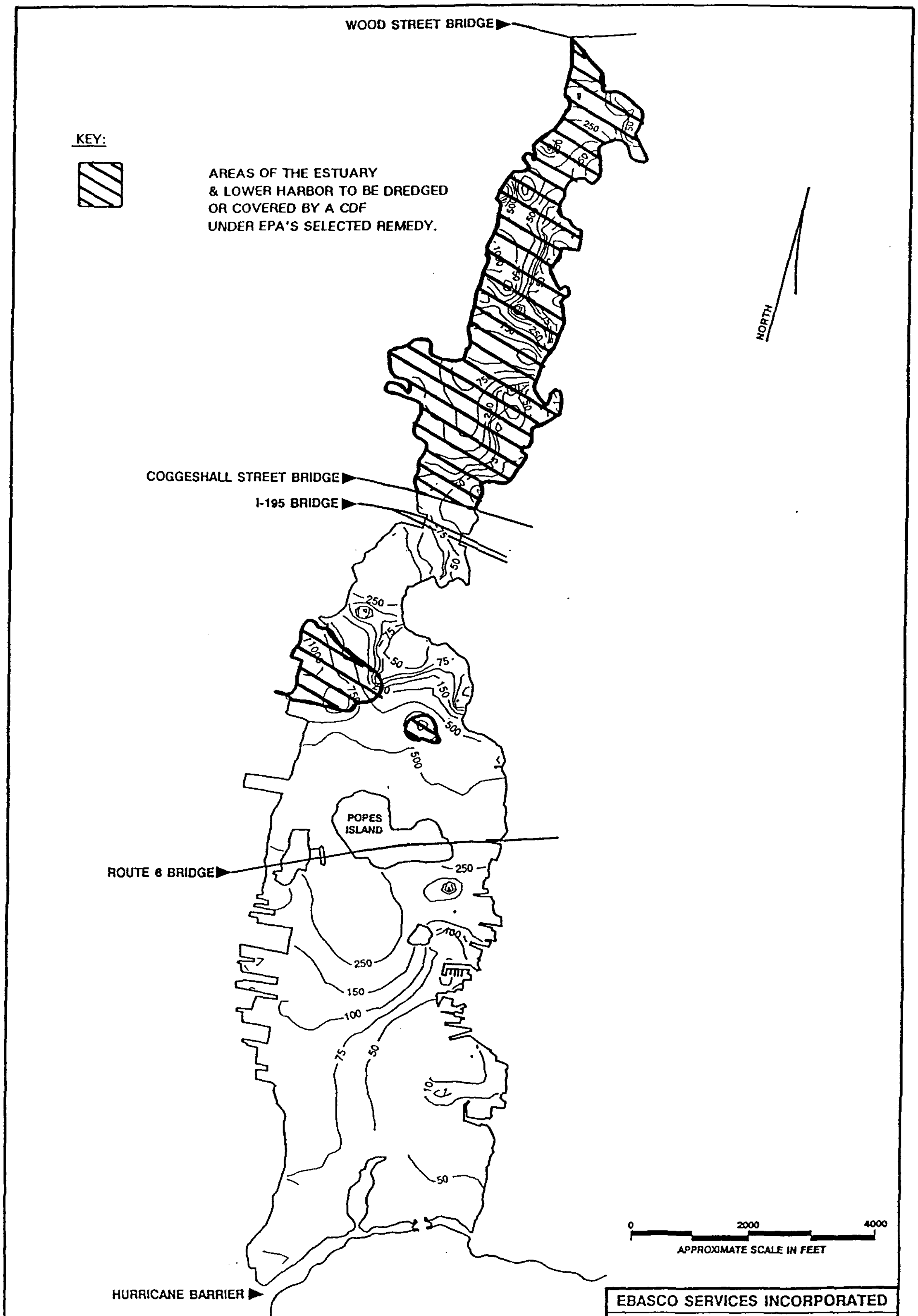

WOOD STREET BRIDGE
KEY:
AREAS OF THE ESTUARY & LOWER HARBOR TO BE DREDGED OR COVERED BY A CDF UNDER EPA'S SELECTED REMEDY.
NORTH
10
10
50
10
COGGESHALL STREET BRIDGE
I-195 BRIDGE
10
10
10
POPES ISLAND
ROUTE 6 BRIDGE
0
2000
4000
APPROXIMATE SCALE IN FEET
HURRICANE BARRIER
EBASCO SERVICES INCORPORATED
ESTUARY AND LOWER HARBOR/BAY FEASIBILITY STUDY NEW BEDFORD HARBOR
CADMIUM SEDIMENT CONCENTRATION (ppm):DEPTH 0 TO 12 INCHES
US EPA REM III PROGRAM
SOURCE: BATTELLE, 1990

Exhibit 3-2



EBASCO SERVICES INCORPORATED
ESTUARY AND LOWER HARBOR/BAY FEASIBILITY STUDY NEW BEDFORD HARBOR
COPPER SEDIMENT CONCENTRATION (ppm):DEPTH 0 TO 12 INCHES
US EPA REM III PROGRAM

Exhibit 3-3



EBASCO SERVICES INCORPORATED

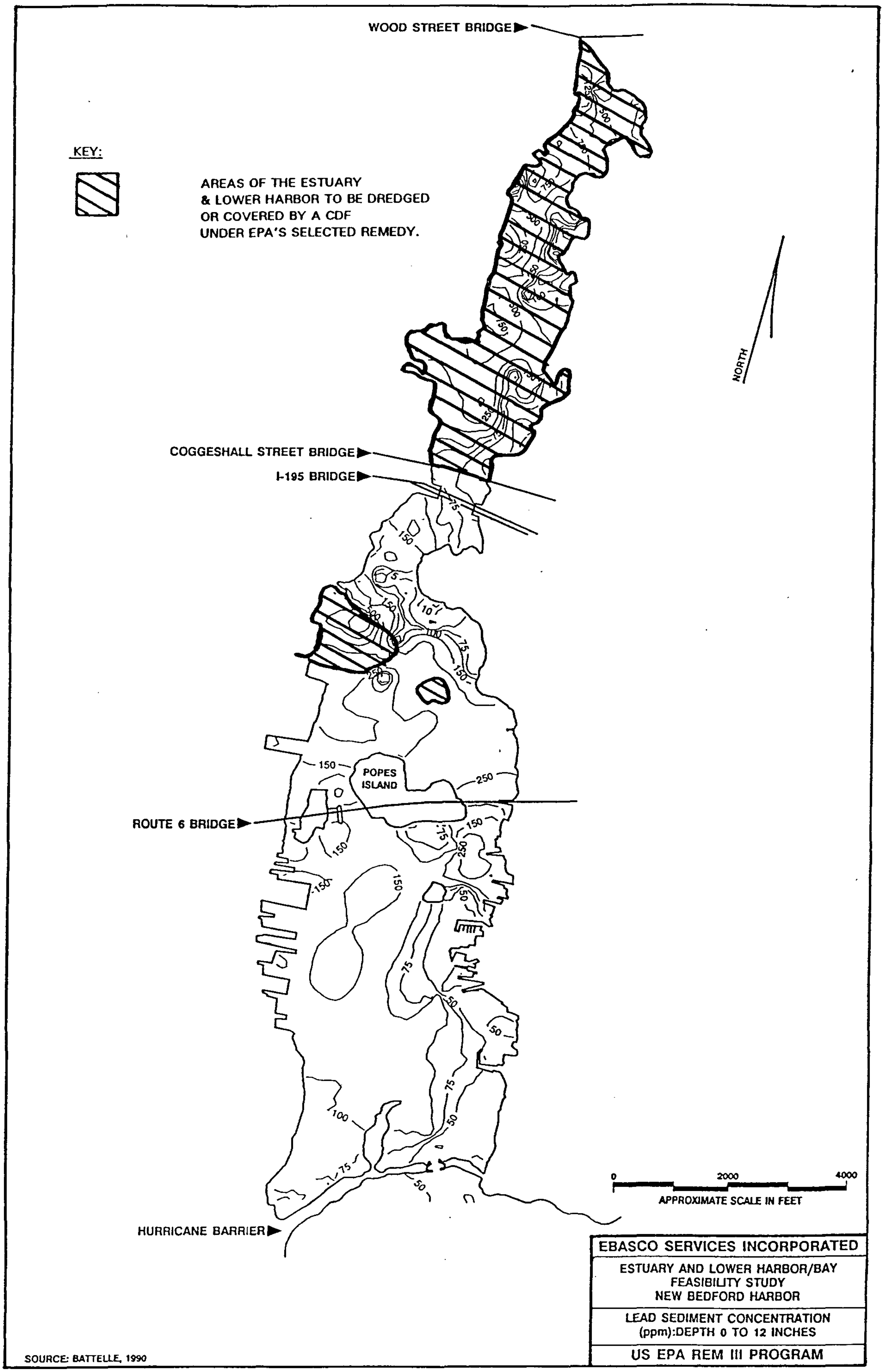
ESTUARY AND LOWER HARBOR/BAY FEASIBILITY STUDY NEW BEDFORD HARBOR

CHROMIUM SEDIMENT CONCENTRATION (ppm):DEPTH 0 TO 12 INCHES

US EPA REM III PROGRAM

SOURCE: BATTELLE, 1990

Exhibit 3-4


WOOD STREET BRIDGE
KEY:
AREAS OF THE ESTUARY & LOWER HARBOR TO BE DREDGED OR COVERED BY A CDF UNDER EPA'S SELECTED REMEDY.
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POPES ISLAND
ROUTE 6 BRIDGE
HURRICANE BARRIER
0
2000
4000
APPROXIMATE SCALE IN FEET
EBASCO SERVICES INCORPORATED
ESTUARY AND LOWER HARBOR/BAY FEASIBILITY STUDY NEW BEDFORD HARBOR
LEAD SEDIMENT CONCENTRATION (ppm):DEPTH 0 TO 12 INCHES
US EPA REM III PROGRAM
SOURCE: BATTELLE, 1990

EPA Response

For the selected remedy, EPA's 1996 cost estimate update estimated the present worth for CDF O&M costs at $1,095,795, and the present worth for ambient monitoring costs at $8,695,122. It should be noted, however, that the actual requirements for O&M and ambient monitoring will be refined during the design and implementation periods.

EPA did not increase the estimated O&M costs for CDF Number 1 Alternative Bay-4 in the 1992 Supplemental Feasibility Study, because the two foot increase in the height of the wall of the CDF did not substantially change the surface areas of protective stone, the surface area for mowing, or the number of groundwater wells that would be installed. Note that this issue is now moot since CDF 1 is no longer proposed as part of the remedy.

3.3.12 Cost Estimates Update

The Commonwealth commented that EPA should update the cost estimates for the remedial alternatives which have been evaluated, if appropriate.

EPA Response

EPA has updated the cost estimates as part of the 1996 Proposed Cleanup Plan process. EPA believes its estimated costs in the 1996 Proposed Plan are within the accuracy range required to support the Feasibility Study process (i.e., actual costs could be within +50% or -30% of the estimated cost). EPA will continue to refine the estimated cleanup costs during the remedial design process when more information will be available to refine items such as CDF foundation conditions, access requirements and ultimate land-use needs.

3.3.13 Wetland Mitigation

The Massachusetts DEP requested EPA to provide mitigation plans for shellfish beds, salt marsh, tidal areas and water-dependent uses displaced by the project. As a part of this plan, the DEP recommends that EPA should provide compensatory wetlands on the ratio of 2 to 1 to replace the salt marsh areas that will be excavated as a part of the Site cleanup.

The DEP also expressed concern regarding the potential impacts to wetland and waterway resources from both dredging and the CDFs. Specifically, the DEP has requested that EPA minimize the extent of filling for the tidal areas during CDF construction.

EPA Response

EPA expects to prepare a wetlands mitigation plan during the remedial design process. While the specific details of the plan remain to be worked out, EPA anticipates rebuilding wetlands to resurrect the salt marsh areas excavated during the cleanup activities on a ratio of 1 to 1. DEP is expected to play an active role in developing the overall mitigation plan for the Site through direct involvement in the remedial design process. In addition, EPA notes that the natural resource trustees for the Harbor are also planning restoration projects for shellfish beds and wetlands in the area.

EPA recognizes the importance of the tidal areas and the need to minimize the extent of filling. EPA elected not to select a Site-wide 1 ppm PCB cleanup level for precisely these reasons, among others. In addition, the locations of CDFs A, B, C and D in contaminated areas near commercial and industrial zones will serve to reduce the amount of dredging and potential resuspension of contaminated sediments.

Construction of CDFs A, B and C will not displace any current water dependent uses but rather, if thoughtfully designed, could enhance future water related uses. For CDF D, EPA will continue to work with the impacted businesses there to minimize impacts to their operations.

3.3.14 Potential PCB Contamination North of the Wood St. Bridge

The Massachusetts DEP requested EPA to evaluate the potential for PCB sediment contamination above the Wood Street Bridge and remove the material during cleanup activities if appropriate.

EPA Response

EPA has evaluated sediment PCB contamination north of the Wood Street Bridge, and will include in its cleanup sediment exceeding the 10 ppm cleanup level in this area. In addition, as discussed in section XIII.B of the attached ROD, limited intertidal sediments near the homes on the New Bedford side of the river north of Wood Street will be removed using a 1 ppm PCB cleanup level.

3.3.15 Potential Remedy Failure for the CDFs

The Massachusetts DEP requested EPA to define failure of the proposed remedy in a quantitative manner. Specifically, the Commonwealth requested EPA to estimate the amount of PCBs that could "leach back into the Harbor over a long period of time (e.g., 30 years)" and then identify a "maximum PCB loss rate, [that] if exceeded could be used to clearly define remedy failure for each CDF." The Commonwealth has also requested clarification of the respective roles of the State and EPA in the event of remedy failure.

EPA Response

See EPA's response to Hands Across the River Coalition's comments in section 2.6.2 for long-term CDF leakage estimates. Overall, EPA believes the most effective way to assess CDF leakage rates is to monitor overall PCB levels in the water column and in seafood. Failure of the remedy would be failure to make progress towards (and eventual attainment of) the PCB AWQC, as well as failure to make progress towards better ecological LTM assessments and lowered seafood consumption risks.

Should this Site experience remedy failure, the Commonwealth would be required to finance 10% of the necessary work to provide a protective remedy; EPA would finance the remaining 90%. This money may come from the Superfund or through enforcement activities, or a combination of both.

3.3.16 Potential RCRA Requirements

The Massachusetts DEP submitted a preliminary list of State regulations which they believe are appropriate for the design, construction and operation of the CDFs.

EPA Response

The ROD includes a list of ARARs for the remedial action at the Site. The list contained therein identifies those state and federal regulations which EPA considers to be ARARs as well as additional state and federal regulations which are "to be considered" (TBCs) for the Site. The list also includes a brief synopsis of the regulation and a description of how the remedy will meet (or waive) the ARAR.

3.3.17 Potential PCB Air Emissions

The Massachusetts DEP commented that "it may be necessary through monitoring and air quality modeling to demonstrate that the remedial action activities will not cause a significant negative impact on air quality, TELs and AALs". The Commonwealth further suggests, "Monitoring and Best Available Control Technology" may be required to control possible air release from the CDFs in exceedence of AALs.

EPA Response

EPA agrees with the Commonwealth that a combination of air quality monitoring and modeling may be required to demonstrate worker health and safety and protection of the surrounding community. EPA will work with DEP to evaluate and develop Site-specific standards during remedial design. EPA notes that the AAL criteria are already generally exceeded at the Site under current conditions. Removal of the contaminated sediments from the estuary and Harbor should help reduce PCB concentrations in the ambient air of nearby areas.

3.3.18 CDF Capping

The Massachusetts DEP and DPH requested EPA "to specify the type of cap required for the CDFs and the permeability criteria which will be required."

EPA Response

EPA will specify the type of material for the CDF cap during the remedial design process. However, the conceptual design for the cap developed by the U.S. Army Corps of Engineers includes a preliminary cap layer (for use until the dredged sediments consolidate to a sufficiently firm foundation material), a 6 to 12 inch thick "bedding" layer to provide a relatively flat and smooth surface, a flexible membrane liner system, and a vegetated top soil layer. The specific cap design for each CDF may vary somewhat but the intent is to install an impermeable barrier that will shed precipitation, prevent infiltration, allow gas venting as appropriate and require minimal maintenance. The cap for each CDF will not be designed until that facility has been filled with dredged material and the actual physical constraints and layout are known. The final caps will not be in place until approximately 3 years after the facilities have been filled with dredged material to allow sufficient time for the material to settle.

3.3.19 Enforcement of Institutional Controls

The Massachusetts DEP commented that "enforcement of the fishing ban and other institutional controls should be accelerated". DEP also recommends enforcement costs be included with the institutional controls component of the O&M costs. DPH further comments that the results of their studies indicate that institutional controls are only partially effective in preventing hazardous exposures via ingestion of contaminated seafood.

EPA Response

Since the fishing ban restrictions are already codified in Massachusetts regulations, EPA is not including them as new institutional controls. Enforcement of these state regulations is the Commonwealth's responsibility. EPA will continue to work with DEP and DPH to develop appropriate educational programs and seafood consumption advisories until the risk from ingestion of contaminated seafood is reduced to a level acceptable under the NCP.

3.3.20 Coordination of Sewer System Modifications

The Massachusetts DEP requested EPA to coordinate with the City of New Bedford all remedial design and construction activities that interface with the local sewer system.

EPA Response

EPA agrees with the Commonwealth and plans to work directly with the City of New Bedford during the design and construction of the Superfund remediation. EPA anticipates working with the City on a number of potential design and construction issues such as relocation of storm water drains and CSOs, traffic impacts (marine and land-based), property easements and access, institutional controls, and public education.

In particular, EPA, with the City's help, will examine the potential for elimination rather than relocation of CSOs impacted by CDF construction.

3.3.21 Cap Implementability

The Massachusetts DEP and DPH have requested EPA to clarify "who is responsible for any additional remedial actions required for the cap" as discussed in the Supplemental Feasibility Study.

EPA Response

As has been discussed herein, EPA will conduct further study of the appropriateness of potential remedial measures for the Outfall area as part of the investigations to be conducted under a separate Operable Unit for the outer harbor.

3.4 Federal Comments

Federal comments were submitted by Congressman Studds, the New Bedford Harbor Trustee Council (Trustee Council), the National Oceanic and Atmospheric Administration (NOAA) and the Buzzards Bay Project.

3.4.1 National Oceanic and Atmospheric Administration

Comment No. 1

NOAA commented that EPA should implement a 50 ppm cleanup in the saltmarsh areas of the Site.

EPA Response

EPA agrees and has modified the proposed remedy to include a 50 ppm PCB cleanup level for the saltmarsh areas.

Comment No. 2

NOAA commented that it would prefer a PCB cleanup level closer to the 0.1 to 1 ppm range yet recognizes the significance of the implementability issues associated with such a cleanup. To this end, NOAA has requested EPA to highlight the Site-specific nature of EPA's PCB cleanup goals for the New Bedford Harbor Site.

EPA Response

EPA acknowledges NOAA's concerns and the potential precedent setting nature of the New Bedford Harbor Record of Decision (ROD). To address NOAA's concerns relative to environmental protection, EPA has modified the proposed remedy to include a 10 ppm sediment PCB cleanup in the upper Harbor. As NOAA notes, a TCL in the 0.1 to 1.0 ppm range would provide for ideal ecological protectiveness. However, at the New Bedford Harbor Site, adoption of such a level would cause significant adverse ecological side effects (e.g., widespread saltmarsh destruction, loss of aquatic habitat due to disposal facilities, extreme amounts of dredging or capping) and severe implementability problems (e.g., spatial extent of cleanup, volume of contaminated sediments, disposal space limitations, cost). Given these impacts , at this specific Site, EPA prefers to use the cleanup levels discussed in the attached ROD.

Comment No. 3

NOAA commented that EPA should minimize the potential impacts on wetland areas and provide mitigation if appropriate.

EPA Response

EPA will work directly with the Commonwealth of Massachusetts and federal agencies including NOAA during the design phase to develop the specific techniques and practices to be employed during cleanup to minimize wetland disturbance. Wetland areas excavated for cleanup will be replanted.

Comment No. 4

NOAA commented that it supports additional Site investigations in upper Buzzards Bay prior to conducting cleanup activities.

EPA Response

EPA will conduct additional Site studies in this region as a part of a third Operable Unit. This information will be evaluated by EPA to determine the potential extent of remediation in Buzzards Bay, beyond the 50 ppm PCB cleanup of the two areas just south of the Hurricane Barrier included in the 1996 Proposed Plan.

Comment No. 5

NOAA commented that it believes a comprehensive monitoring plan must be developed to determine the effectiveness of the remedial actions to the recovery of the natural resources.

EPA Response

The long-term monitoring effort is designed to do just that - to assess the effectiveness of the cleanup actions from a physical, chemical and biological standpoint over the long term.

3.4.2 <u>Congressman Studds</u>

Comment No. 1

Congressman Studds commented that EPA should address the public health risks associated with the potential failure of a CDF used to contain sediment contaminated at PCBs levels below and above 500 ppm. Congressman Studds also requested EPA identify the incremental cost to treat sediment contaminated at PCB levels of 50 and 500 ppm.

EPA Response

EPA recognizes that should massive CDF failure occur and be allowed to continue unchecked, risks to public health could potentially ensue. However, the Agency regards the likelihood of CDF failure as remote, and the CDF design and construction will be focused to prevent this from occurring. In addition, EPA will institute a comprehensive monitoring program at each of the CDFs in order to identify any significant migration of PCBs prior to the development of any adverse risks to the environment or public health. EPA does not believe that the degree of PCB contamination (i.e., above or below 500 ppm) has significant bearing on potential risks posed by CDFs.

The additional cost of treating the 50 to 500 ppm PCB contaminated sediment instead of confining it in a CDF is on the order of $100 million. This estimate is based on the use of solvent extraction technology to treat the 196,000 yd^3 of sediment within this concentration range.

Comment No. 2

Congressman Studds commented that EPA should evaluate the most recent information regarding PCB treatment technologies.

EPA Response

As part of the Hot Spot treatability studies, throughout 1996, EPA evaluated and in fact field tested the most promising advances in sediment treatment technology for this Site (Foster Wheeler, 1997). Also, consistent with the ROD 2 Community Forum Agreement, EPA will continue literature searches of advances in the sediment treatment field.

The Agency notes that the 1990 Feasibility Study evaluation of treatment technologies for PCB-contaminated sediment was one of the most thorough and comprehensive evaluations ever undertaken by EPA. Over forty (40) treatment technologies were considered for use on New Bedford Harbor sediments. Based on the results of this technology screening, EPA conducted five Site-specific bench scale evaluations during the 1980s using sediment from the Harbor. Three of the technologies were innovative treatment technologies that focused on permanent destruction or detoxification of the PCBs. In addition, EPA conducted a Site-specific pilot scale test of a critical fluid extraction technology as a part of the Superfund Innovative Technology Evaluation (Site) Program. The results of these studies were presented in the 1990 Feasibility Study and considered by EPA in developing the remedy for the New Bedford Harbor Site. Even with the benefit of all of the above studies, EPA continues to believe that the selected remedy is the appropriate selection for the Site.

Comment No. 3

Congressman Studds commented that EPA should prepare a cost-benefit analysis of the potential public health risks associated with the failure of a CDF versus the cost to treat the sediment.

EPA Response

The National Contingency Plan (NCP) does not require that EPA perform a strict cost-benefit analysis for potential remedy failure as part of EPA's remedy selection process. However, the NCP does require that EPA select remedies which are cost-effective and protective of human health and the environment. A remedy is cost-effective if it provides overall effectiveness proportional to its costs (40 CFR 300.430(f)(5)(ii)(D). EPA believes the cost of the selected remedy is proportional to its overall effectiveness while the cost of the treatment alternatives are not (i.e., CDFs even without treatment are protective, and treatment does not bring a commensurate degree of improved protectiveness given the cost involved).

Shoreline disposal of the PCB-contaminated sediment in CDFs will successfully isolate the contaminants from the environment. Regular monitoring will be conducted to ensure that the CDFs do not leach unacceptable quantities of PCB's into the Harbor. The regular monitoring program will also include evaluation of the physical integrity of the CDFs. In the unlikely event of a structural failure, EPA will take all steps necessary to mitigate the situation in a timely fashion.

EPA recognizes that treatment of the sediments may provide a greater level of protection and peace of mind than the selected remedy over the long term. However, EPA does not consider the increased level of protection to be very significant. In the short term, the treatment alternatives appear to be less protective of human health and the environment because of the increased material handling required for treatment, the increased potential for air emissions and the increased duration of the remedial action.

For the New Bedford Harbor Site, the dramatic increases in overall remediation costs required to treat all of the PCB-contaminated sediments are not justified in light of the minimal risks to public health presented by the CDFs. The treatment alternatives are significantly more expensive than the selected remedy. Treatment increases the cost of a remedy upwards by a factor of five, especially since the contaminated sediments underneath the CDFs (which do not have to be dredged with the selected cleanup approach) would have to be removed and treated along with the other sediments above TCLs.. For this second phase of cleanup, EPA does not believe that the overall effectiveness of treatment is proportional to its cost.

Comment No. 4

Congressman Studds requested clarification regarding the land acquisition costs associated with the CDFs and the potential loss of income associated with the CDFs located on potentially valuable shoreline property.

EPA Response

EPA will work with the Commonwealth and the CDF abutters to reach mutually acceptable agreements for land that may be required to support the CDFs and other construction-related activities. While EPA and the Commonwealth have the authority to take the property through eminent domain proceedings, EPA and the Commonwealth believe mutually acceptable resolutions with the existing landowners can be reached.

EPA does not believe that the CDFs will inhibit the economic growth of the New Bedford Area. Rather, EPA believes that cleanup of the New Bedford Harbor Site will be a strong positive growth step for the area and will help eliminate a well publicized environmental stigma. In addition, EPA believes construction of CDF D will promote economic growth by offering the City of New Bedford an expanded area to support future marine-based industry.

3.4.3 Trustees Council

The comments submitted by the Trustee Council and the corresponding responses are provided below. In general, the Trustee Council supports EPA's proposed remedy, yet has highlighted several specific concerns that it believes EPA should address as part of the remedy.

Comment No. 1

The Trustee Council requested EPA to "minimize potential injury that could require additional mitigation to meet state and federal applicable or relevant and appropriate standards, requirements, and criteria or limitations."

EPA Response

Under CERCLA, EPA must select a remedy that complies with or waives all ARARs. The selected remedy will meet all ARARs with the exception of the FDA (21 U.S.C. §342,346) tolerance limit for PCBs and the NPDES (40 CFR 122.4(i)) prohibition on new discharges to water bodies not in compliance with water quality criteria. In accordance with CERCLA, and as explained in the November 1996 Proposed Cleanup Plan, EPA has waived these two ARARS.

See also EPA's response to comment 3.3.13 and 3.4.1 (#2) above.

Comment No. 2

The Trustee Council noted its concern that the remedy "ensure appropriate target cleanup levels in wetlands (especially in the upper Harbor) and open waters (including upper Buzzards Bay)."

EPA Response

EPA has developed sediment PCB cleanup levels for various geographical areas of the Site after extensive consideration of the potential human health and ecological risks and future use of these areas. For subtidal sediments in the upper Harbor, EPA has selected a sediment PCB cleanup level of 10 ppm. For subtidal sediments in the saltmarsh areas, the lower Harbor, and the two areas of elevated PCB concentrations in Buzzards Bay just south of the hurricane barrier, EPA has selected a sediment PCB cleanup level of 50 ppm. In addition, as discussed in section XIII.B of the attached ROD, EPA has selected cleanup levels of 25 and 1 ppm for limited areas of intertidal sediments where dermal contact with sediments is expected. Given the magnitude of the PCB problem and the associated implementation issues, EPA believes these cleanup levels to be an appropriate, well-balanced and resource-focused approach to Site cleanup.

Comment No. 3

The Trustee Council requested EPA to "consider a schedule for reviewing the protectiveness of the remedies more frequently than required by law."

EPA Response

EPA believes a five year review cycle as called for in CERCLA is appropriate for the Site. However, EPA will allow access to all O&M and LTM data on an ongoing, informal basis to allow for more frequent independent assessments of the remedy's effectiveness.

Comment No. 4

The Trustee Council commented that it believes EPA should "include in the Record of Decision (ROD) firm commitments to prepare peer-reviewed monitoring plans and protocols during the remedial design phase to establish a baseline for evaluating the effectiveness of remedial actions and restoration."

EPA Response

This process has in fact already been accomplished during development and implementation of the Long-Term Monitoring (LTM) program (see Nelson et al., 1996). EPA will note in the ROD that continuation of the LTM program will be a critical part of the remedy evaluation process.

Comment No. 5

Trustee Council believes EPA should "prepare contingency plans in the event that pre-design sampling reveals high polychlorinated biphenyl (PCB) levels, especially in the outer Harbor area addressed by the SFS."

EPA Response

EPA has evaluated concerns expressed by the Trustee Council and other parties regarding the current level of understanding of the nature and extent of PCB contamination in the upper Buzzard's Bay portion of the Site. Based upon the results of this evaluation, EPA will conduct the requisite studies as part of a third operable unit to evaluate potential cleanup measures for the Bay, beyond remediating the sediment adjacent to the Cornell-Dubilier facility at a 50 ppm cleanup level.

3.4.4 Buzzards Bay Project

Comments on behalf of the Buzzards Bay Project were received from Dr. Joseph E. Costa. These included comments on the January 1992 Proposed Plan and the May 1992 Proposed Plan Addendum. The summarized comments and EPA's responses are presented below in the general order contained in Dr. Costa's comment letter.

Comment No. 1

The commentor does not believe a Site-wide 50 ppm PCB cleanup will be protective of potential human health risks associated with direct contact with the sediment. The commentor requested EPA implement a 10 ppm sediment cleanup to protect this potential exposure pathway.

EPA Response

EPA acknowledges the commentor's concerns and has lowered the TCL for subtidal upper harbor sediments from 50 to 10 ppm PCBs as part of the 1996 Proposed Cleanup Plan. In addition, EPA's updated review of human health risks presented by the Site due to dermal contact with and incidental ingestion of contaminated sediments (USEPA, 1998) concludes that, for limited areas where beach combing would occur and near homes which abut the shore, cleanup levels of 25 and 1 ppm PCBs should be used, respectively, in intertidal areas (see also section XIII.B of the attached ROD).

Comment No. 2

The commentor believes a Site-wide 50 ppm PCB cleanup will not eliminate potential human health and ecological risks. The commentor is specifically concerned with the potential human health risks associated with the consumption of the herring that migrate up the Acushnet River and the potential ecological risks to the Roseate tern, given the dietary

significance of the herring to this endangered species.

EPA Response

EPA acknowledges the commentor's concerns and has modified its proposed remedy to include a 10 PCB cleanup in the upper Harbor (for subtidal sediments) as a part of the selected remedy. In addition, as discussed in section XIII.B of the attached ROD, the selected remedy includes cleanup levels of 25 and 1 ppm in shoreline areas where dermal contact with sediments is expected. In doing so, an additional measure of risk reduction will be provided for both potential human health and ecological risks at the Site. However, EPA does not expect PCB levels in all species of locally caught seafood to decline to acceptable levels until some time after the remedial actions are complete. Therefore, EPA will continue to conduct monitoring and recommend that the local fishing ban remain in effect until PCB measurements in biota decline to acceptable standards. Additionally, EPA will work with the Commonwealth to develop appropriate educational programs and seafood consumption advisories until the risk from ingestion of contaminated seafood is reduced to a level acceptable under the NCP.

Comment No. 3

The commentor believes a 10 ppm PCB cleanup is more appropriate to protect bluefish and striped bass which frequent the lower Harbor region of the Site.

EPA Response

For subtidal sediments, EPA has selected a 10 ppm PCB TCL for the upper Harbor and a 50 ppm TCL for the lower Harbor and two areas of Buzzards Bay just south of the Hurricane Barrier and adjacent to Cornell Dubilier. EPA will be evaluating potential additional remedial actions in Buzzards Bay as a part of a third Operable Unit. As EPA explained in the November 1996 Proposed Cleanup Plan (USEPA, 1996d), the sediment volumes generated by a Site-wide 10 ppm cleanup (approximately 1 million cubic yards) present several serious implementability and adverse impact problems. EPA's decision to select 10 ppm in the upper Harbor as opposed to the lower Harbor was in part based on the ecological significance of the upper Harbor as well as the designated port area and industrial/commercial nature of the lower Harbor. In addition, EPA is required by CERCLA to formally evaluate the performance and protectiveness of the selected remedy at least once every five years based on sediment, water and biota data that, for this Site, will be gathered regularly.

Comment No. 4

The commentor questioned the potential for PCB migration through groundwater and stormwater/sewer lines from PCBs still remaining at the Cornell-Dubilier site.

EPA Response

Pursuant to previous EPA enforcement actions, Cornell-Dubilier has been required to treat any water that floods their facility's basement to remove PCBs, and to clean the sewer lines running from their facility to the City of New Bedford's Wastewater Treatment Plant. EPA is now re-reviewing the facility to determine whether any further assessments or actions are necessary to protect human health or the environment.

Comment No. 5

The commentor questions whether EPA has evaluated potential sediment PCB contamination in the drainage canal behind the Hurricane Barrier. The commentor believes the unrestricted nature of the area could represent a potential human health risk.

EPA Response

EPA has evaluated the sediment PCB levels in the outlet area of this drainage canal and found them to be below the cleanup level for this region of the Site (i.e., levels were approximately 3 ppm). Although this is below the cleanup level, during remedial design EPA will conduct additional sampling along the reach of the drainage canal to confirm that sediment PCB concentrations in this area are consistent with the selected remedy.

Comment No. 6

The commentor believes EPA should incorporate the developmental needs of New Bedford and Fairhaven into the selected remedy. The commentor suggests docking space, mooring areas, boat ramps and additional public access.

EPA Response

EPA recognizes these needs of the area and is currently working directly with the City of New Bedford to coordinate cleanup activities with the City's developmental plans to the extent practicable. One result of these efforts is that EPA has located CDF D in the lower Harbor adjacent to the North Terminal area, and has conceptually designed it to support commercial marine needs such as docking.

In addition, EPA is working with the City and the Commonwealth to coordinate the navigational dredging project in the Harbor with the Superfund cleanup, and to resolve issues surrounding the many derelict vessels in the area around CDF D.

Comment No. 7

The commentor believes EPA should reevaluate PCB contamination in areas of Buzzards Bay including Clark's Cove.

EPA Response

In evaluating potential remedial actions for the outer harbor, EPA has considered in detail the concerns regarding limitations in the extent of currently available information on PCB contamination in this area. Based upon these and similar concerns expressed by other commentors, EPA has decided to supplement the existing data base for the outer harbor through the implementation of additional investigations to be performed under a third Operable Unit. These additional investigations and associated sampling efforts will focus on better defining the extent of PCB contamination in this area. Based upon the results of these investigations, the Agency will further evaluate the appropriateness and need for potential remedial measures to be undertaken in the outer harbor including Clark's Cove.

Comment No. 8

The commentor believes capping at the existing City of New Bedford Wastewater Treatment Plant (WWTP) Outfall could be problematic.

EPA Response

EPA acknowledges the concerns and issues raised by the commentor regarding remediation in upper Buzzards Bay, particularly in the area of the WWTP Outfall. The Agency recognizes the complexity of the technical and administrative issues which need to be addressed and integrated into any remedial action in the Outfall area. Therefore, EPA intends to postpone any cleanup at the Outfall area and further evaluate these issues in detail during additional studies to be conducted as part of a third Operable Unit for the Site.

Comment No. 9

The commentor requested that EPA provide additional details of the long-term monitoring program. In addition, the commentor believes the monitoring program should include monitoring of lobsters, flounder and herring roe (egg masses).

EPA Response

The commentor is referred to the October 1996 Long-Term Monitoring Report discussed previously (Neslon et al., 1996) for specific details of the long-term monitoring program. In addition, as noted in section X.G of the ROD, EPA will initiate a long term seafood sampling program to augment any seafood sampling performed by the state. EPA will continue to cooperate with all agencies involved to allow for clear communication of information to the public in this regard.

3.5 Potentially Responsible Party Comments

EPA received two general documents containing comments from the PRPs during the public comment period. These documents were submitted on behalf of the AVX Corporation (AVX). The first document contains a compilation of AVX comments prepared by a number of contributors. These comments encompass the 1992 Proposed Plan, the 1992 Addendum Proposed Plan and the supporting documentation contained in the Administrative Record. Comments from this document are presented in two major sections; overview comments and technical comments. Since many of the overview comments summarize multiple technical comments, EPA has addressed these overview comments first. The detailed technical basis for the Agency's overview responses is further amplified in the discussions and responses to the individual PRP technical comments. The second document received by EPA was a compilation of individual Request for Admission (RFA) documents presenting numerous comments relating to technical issues which have emerged during past studies and litigation related to the New Bedford Harbor Site. EPA has reviewed the RFA comments and addressed the principal issues to which the RFA's relate.

The RFAs are pleadings produced under the unique circumstances and litigation in United States, et al. v. AVX Corporation et al. Civil Action No. 83-3882-Y. Each RFA contains a fact or opinion which AVX would have attempted to establish during the trial of its liability for response costs at the New Bedford Harbor Site. AVX contends that the RFAs constitute comments submitted pursuant to its public participation rights under CERCLA, and that the RFAs contain facts and opinions that the government ought to take into account in its remedial decision making process.

EPA has placed all of the RFAs received from AVX during the comment period into the Administrative Record. EPA has read through the numerous RFAs and attempted to cull the significant facts and opinions within them. EPA has also endeavored to respond to these significant facts and opinions. However, based on its review of the RFAs, EPA has concluded that the vast majority of them do not constitute significant comments which should be taken into account in EPA's decision making process. As AVX admits, some of the RFAs are "framed in an argumentative format". EPA finds these and many other of the RFAs difficult to respond to and inappropriate to respond to as comments. Moreover, a significant number of the RFAs do not present facts or opinions which are relevant to the preferred alternative, other alternatives set forth in the feasibility studies, or other issues relating to remedy selection. Nonetheless as stated above, EPA has attempted to extract the truly relevant and significant facts and opinions from the universe of RFAs and respond to them below.

3.5.1 Comments on Proposed Plan, Addendum Proposed Plan, 1990 Feasibility Study and 1992 Supplemental Feasibility Study

3.5.2.1 Overview Comments

PRP Overview Comment No. 1

AVX believes EPA should adopt capping as the remedy of choice for the New Bedford Site and to only cap areas of the upper Harbor exceeding 50 ppm. The PRP contends this is more sensible based on the following reasons:

(a) **the Government has underestimated the resuspension of sediments and the release of sediment contamination associated with dredging,**

(b) **there is good reason to be concerned that containment of contaminated sediment in Harbor side CDFs will cause continued PCB flux to the Harbor waters due to tidal pumping,**

(c) **there is a risk of significant PCB loss due to volatilization to the air both during dredging and during filling and storage in a CDF, and**

(d) **the Government continues to vastly underestimate costs. The disadvantages of CDFs also include their encroachment into the wetlands, problems with long-term maintenance and monitoring, and the reduced potential for biodegradation.**

EPA Response

EPA disagrees with the commentor regarding the estimate of resuspension and contaminant release associated with hydraulic dredging. EPA's conclusions are based on the results of the Corps of Engineers Engineering Feasibility Study and Pilot Dredging Study, as well as experience gained during the Hot Spot dredging operations (USEPA, 1997c, Bergen et al., 1997, Nelson et al., 1997).

EPA believes that shoreline disposal in CDFs that are properly designed, constructed and maintained will be highly effective in isolating the PCBs from the environment. To that end, EPA's conceptual design of the CDFs includes use of the naturally occurring low permeability sediments beneath the CDF, and low permeability geotextile materials as part of the side-wall liner and cover systems. Updated estimates of contaminant loss from CDF leakage over the long term (USACE, 1997) confirm earlier conclusions that this loss will be insignificant and orders of magnitude less than current estimates of the amount of PCBs that migrate out of the upper Harbor in the surface water under the current no-action conditions.

EPA recognizes the potential for PCB volatilization during sediment dredging and disposal and will take the appropriate steps to ensure worker and community safety. Accordingly, EPA will include air monitoring adjacent to the dredging operations as well as the CDFs to evaluate the degree of PCB volatilization. Engineering controls such as specialized dredging operations (e.g., high vacuum, low RPMs, suction hood over the cutter head, double oil booms, floating skimmer pumps) and CDF disposal practices (maintenance of overlying water layer, floating covers) will be used as appropriate to minimize potential emissions. EPA will also repeat the program of openly communicating all air monitoring data to the surrounding community on a fast turn-around basis as was practiced during the Hot Spot cleanup. Given that the sediment PCB levels will be considerably lower than those encountered during the Hot Spot cleanup, EPA believes that potential PCB air emissions can be controlled and contained.

EPA believes the construction cost estimates for the CDFs and other project elements are appropriate for this stage of the remedy development. As FS-stage estimates, the costs are believed to be accurate within a range of -30% to +50% for each alternative, and are suitable for the remedy comparison and selection process. While cost-effectiveness is an extremely important consideration in remedy selection, CERLCA and the NCP recognize cost as only one of nine criteria that must be considered. Furthermore, in order to improve the accuracy of the cost estimates, EPA has updated the cost estimates for all alternatives using actual costs from the Hot Spot operations, as appropriate.

EPA has also selected the location of the CDFs to minimize potential impact to wetland areas. As a result, the four planned CDF locations are in areas that are currently impacted by PCB contamination and that are considered to have low functional values when compared to other wetland areas of the Site.

Compared to a capping-based remedy, EPA believes that the CDFs offer clear advantages in terms of maintenance and monitoring (and thus also in long term permanence). Contaminated sediment will be consolidated within the four CDFs, which allows for ease in monitoring and maintenance of the remedy rather than monitoring and maintaining capped sediments which would remain spread over a wide area of the Site.

While EPA recognizes that biodegradation does occur in both aerobic and anaerobic environments over long periods of time, EPA does not agree that placement of the PCB-contaminated sediment within the CDFs will necessarily eliminate the potential for biodegradation.

PRP Overview Comment No. 2

"The present record provides no justification for EPA to adopt the combined remedies set forth in the Proposed Plan and its Addendum,"

EPA Response

EPA disagrees with the commentor. The existing record for New Bedford Harbor, including information summarized in the Feasibility Study (Ebasco, 1990c), documents the widespread presence of PCB contaminated sediments. The results of evaluations presented in the Baseline Public Health Risk Assessment (Ebasco, 1989) and the Baseline Ecological Risk Assessment (Ebasco, 1990a) indicate that the concentrations of PCBs in Harbor sediments, surface water and biota pose unacceptable public health and ecological risks. More recent evaluations of health risks posed by the site confirm these earlier conclusions (e.g., USEPA, 1997b and USEPA, 1998).

EPA does agree with the commentor that the existing body of information on the outer Harbor, including information on sediment PCB contamination, is relatively limited. Therefore, EPA will defer decisions regarding potential remedial actions for this area pending the results of further studies to be completed under a third operable unit.

PRP Overview Comment No. 3

AVX believes the results of EPA's risk assessment to be overly conservative and that

"the adoption of the 50 ppm cleanup guideline for the estuary, Harbor and Bay sediments will provide a demonstrably safe remediation goal for this area."

EPA Response

EPA does not believe that a Site-wide cleanup at 50 ppm will protect the public from exposure to PCB contaminated seafood, nor provide protection against risks from dermal contact of PCB-contaminated shoreline sediments (USEPA, 1998). Moreover, a 50 ppm TCL will not address risks to the marine ecosystem as required by statute. For these reasons, EPA has selected a reduced 10 ppm TCL for subtidal upper Harbor sediments as well as cleanup levels of 25 and 1 ppm for selected shoreline areas where dermal contact with PCB-contaminated sediments is likely to occur. EPA will maintain institutional controls regarding seafood consumption until PCB concentrations in fish tissue reach acceptable levels.

PRP Overview Comment No. 4

AVX believes the results of EPA's risk assessment are not supported by the findings of the Greater New Bedford Health Effects Study (GNBHES).

EPA Response

The exposure scenarios developed in the Risk Assessment are not intended to predict the actual number of individuals exposed to PCBs. The scenarios are intended to reflect the possible exposures received by hypothetical individuals in order to assess risks posed by the Site. The GNBHES had an entirely different purpose. The primary focus of the GNBHES was to determine the prevalence of serum PCB levels among residents of the Greater New Bedford area. However, the results of the GNBHES do show that individuals who eat locally caught seafood have elevated PCB serum levels. This supports the overall remedial goal of reducing seafood PCB levels as a means of reducing risks to human health.

PRP Overview Comment No. 5

AVX believes the reliable data for biota indicate only the lobster with the tomalley included is in excess of the FDA tolerance limit; that this exceedence is only minimal and that "the record demonstrates that the FDA level will be achieved within a 10-year period." Consequently, they contend (1) institutional controls should be limited to "advisories such as that issued for Quincy Bay" to account for the fact that most of the PCB is associated with the tomalley; and (2) the point of departure should be the FDA 2 ppm tolerance limit.

EPA Response

See EPA's response to General Electric's Comment #4 above in section 2.2.3

EPA also notes information provided by Stripers Unlimited in response to the 1996 Proposed

Plan regarding striped bass caught in the Acushnet River with a mean PCB concentration of 16.5 ppm, considerably higher than either the FDA level or the site-specific level. In addition, the long running blue mussel bioaccumulation data set (see section V of the attached ROD) demonstrates consistent exceedances well above the FDA and site-specific seafood target levels at both the Coggeshall Street and Hurricane barrier locations.

PRP Overview Comment No. 6

The PRP contends that the uncertainties associated with the Ecological Risk Assessment methodology compromise its ability to support remedial decision making.

EPA Response

EPA disagrees and believes the conclusions in the ecological risk assessment are appropriate and may be used to assist in the selection of a remedy for this Site. EPA believes the joint probability approach used in the ecological risk assessment is appropriate because it provides a method to utilize all of the data available, in contrast to the more standard approach of using one or more conservative point estimates. As described above in section 2, other independent scientific evaluations of PCB risk support the overall conclusions of this study.

PRP Overview Comment No. 7

The PRP believes the results of the Battelle modeling efforts are questionable and that EPA has evaluated them in an arbitrary and capricious manner.

EPA Response

EPA disagrees and believes the results of the Battelle model were evaluated in an appropriate manner. Contrary to the PRP's assertion, EPA does not rely solely on the results of the Battelle model to support its remedial decision. Rather, EPA views the results of the modeling efforts as but one of many elements which support the remedy selection process.

PRP Overview Comment No. 8

The PRP believes EPA's selection of 10 ppm as a PCB cleanup level in upper Buzzard's Bay is without basis because the Site has not been adequately characterized from a nature and extent of PCB contamination perspective.

EPA Response

EPA agrees with the PRP that the nature and extent of PCB contamination in Buzzard's Bay is not currently defined to a level that supports a final cleanup decision. Therefore, EPA will conduct the requisite studies as part of a third operable unit to evaluate potential cleanup measures for the Bay, beyond those outlined in the ROD for the interim remediation of the sediment adjacent to the Cornell-Dubilier facility at a 50 ppm cleanup level.

PRP Overview Comment No. 9

AVX contends that because of the uncertainties involving Site characterization in upper Buzzard's Bay, EPA is attempting to pursue an unspecified level of incremental protectiveness above the AWQC and FDA based on intuition, rather than science.

EPA Response

EPA will evaluate a variety of TCLs for the outer Harbor as part of a third operable unit. EPA believes this evaluation will greatly reduce the Site characterization uncertainties associated with Buzzards Bay. However, EPA also believes that ultimately the complexity of ecosystems such as Buzzards Bay requires the consideration of both qualitative and quantitative factors in evaluating decisions related to remedial action. EPA recognizes the limitations of the model and cautions that the model estimates should not be viewed as absolute predictions.

Other elements which enter into EPA's remedial decision include, among others, the public health and ecological risk assessments, EPA's risk management policy, EPA's evaluation of Site-specific ARARs, the site specific feasibility evaluations, and the long term ecological monitoring program.

PRP Overview Comment No. 10

The PRP believes EPA should segment upper Buzzard's Bay as a separate Operable Unit.

EPA Response

EPA agrees with the commentor and will evaluate potential cleanup measures in Buzzards Bay as a *third operable unit. These potential cleanup measures will be in addition to those outlined* in the ROD for the 50 ppm cleanup in the Bay just south of the Hurricane Barrier and adjacent to the Cornell-Dubilier facility, where PCB concentrations in the overlying water have exceeded the chronic AWQC.

PRP Overview Comment No. 11

The PRP contends EPA has inappropriately identified the AWQCs as ARARs for the New Bedford Harbor Site.

EPA Response

EPA disagrees and notes that the selected remedy includes the discharge back into the Harbor of treated decant water from the CDFs. Consistent with the Clean Water Act, EPA has determined that ambient water quality criteria is an ARAR for this discharge as well as for the ambient waters of the site after the remedial dredging is completed. Levels of PCB and Cu in the water column at the Coggeshall Street bridge exceed AWQC by a factor of 10 and 2, respectively.

EPA notes that Massachusetts has adopted the water quality criteria established by EPA pursuant to Section 304(a)(1) of the Clean Water Act as a regulatory standard. The Massachusetts Surface Water Quality Standards, 314 CMR 4.05(5)(e), which are also identified as an ARAR for the discharge, state in part,

> All surface waters shall be free from pollutants in concentrations or combinations that are toxic to humans, aquatic life or wildlife. Where the Division determines that a specific pollutant not otherwise listed in these regulations could reasonably be expected to adversely effect existing or designated uses, the Division shall use the recommended limit published by EPA pursuant to Section 304(a) of the Federal Act as the allowable receiving water concentration for the affected waters unless a Site specific limit is established.

PRP Overview Comment No. 12

EPA fails to present fully, and to take into account, the extreme adverse environmental impact its proposed remediation will have on highly protected, healthy and productive wetlands.

EPA Response

EPA believes remediation of saltmarsh areas to 50 ppm (and to lower levels in certain limited areas - see section XIII.B of the ROD) is warranted to protect against direct contact human health risks, to reduce risks to the species that frequent this area, and to prevent the area from becoming a source of future PCB contamination to the harbor. Following cleanup, EPA will restore those sections of wetlands excavated. EPA has selected the 50 ppm wetland TCL (as opposed to the 10 ppm TCL used elsewhere in the upper Harbor for subtidal sediments) as a way to minimize adverse impact, especially since only the fringe areas of the wetlands are believed to exceed this standard. Cleanup of all saltmarsh areas to a level of 10 ppm would result in an unacceptable impact because it would require removal of approximately 43 acres of saltmarsh, or over two-third's of the area's saltmarsh habitat.

EPA has also located the four CDFs in industrial areas with only fringe saltmarsh present. EPA believes that the CDF shoreline areas (with the exception of CDF D's sheetpile wall) will serve to replace this lost fringe saltmarsh to some extent. The primary saltmarsh resource on the eastern shore of the Acushnet River has been left intact, except for the removal of the contaminated areas along the shoreline fringe (which will be reestablished). The overall filling required by the four CDFs is deemed necessary to overcome the severe and wide spread damage caused by the presence of contaminated sediments throughout the Harbor.

PRP Overview Comment No. 13

AVX contends that Sediment Quality Criteria (SQC) are not ARARs or TBCs, and therefore, is unclear why they are discussed within the Feasibility Study and Supplemental Feasibility Study.

EPA Response

EPA evaluated Sediment Quality Criteria as one of several approaches to evaluating the degree of sediment cleanup that would be protective of ecological receptors. Because there are no ARARs for sediment cleanup, EPA wanted to rely on as much information as possible in its evaluation of ecological risk. Since this method has some limitations, EPA did not use the results in an absolute manner. Rather, EPA used the SQC results in conjunction with other scientific information to develop the recommended Site-wide ecological TCL of 1 ppm, a level believed to be protective of all ecological receptors. As described herein, EPA later determined that implementation of a Site-wide1 ppm TCL would cause more harm than good for the New Bedford Harbor Site.

PRP Overview Comment No. 14

The PRP believes that a substantial number of the Requests for Admissions (RFAs) prepared and served on the United States and the Commonwealth of Massachusetts should be considered as part of the Administrative Record and responded to as comments. The PRP commented that all of the AVX RFA's should be included in the Administrative Record because (1) the RFAs are an integral part of AVX's comment; (2) the RFAs contain, among other things, a detailed critique of the numerous studies which EPA relied on as a basis for remedial decision making; and (3) the RFAs contain information which EPA ought to take into account.

EPA Response

EPA has incorporated a substantial number of RFAs which were submitted to it during the public comment period into the administrative record. However, EPA disagrees that each and every RFA requires a written response. Under CERCLA and the National Contingency Plan EPA is required to respond to <u>significant</u> comments, criticisms, and any new and relevant information submitted to the Agency during the comment period. Each and every RFA simply fails to qualify as a significant comment or a presentation of new and relevant information.

EPA has reviewed the RFAs and determined that in certain instances significant issues are raised which merit a response over and above an admission or denial of the fact alleged by the particular RFA as required by court rules. The responses to these RFAs are contained in Section 3.5.3 of this Responsiveness Summary.

PRP Overview Comment No. 15

The PRP "has requested the inclusion in the Administrative Record of all QA/QC data."

EPA Response

A general discussion of the quality assurance and quality control information associated with the analytical data collected during various studies at the Site is presented in Section 3.5.3 of this Responsiveness Summary, as well as in many of the various Site reports. EPA does not believe that inclusion of the huge amounts of raw QA/QC data is appropriate for the administrative record.

PRP Overview Comment No. 16

Not all documents created or obtained by the government concerning the New Bedford Harbor Superfund Site are contained in the Administrative Record. Rather, EPA has excluded from the Administrative Record certain materials which it has instead segregated into what is known as the "Site File." EPA has declined to permit AVX to obtain access to the Site File.

EPA Response

In fact, EPA has allowed AVX to access the Site File. Under the National Contingency Plan, 40 CFR Part 300.800, EPA is required to establish an Administrative Record that contains the documents that form the basis for the selection of a response action. Under 40 CFR Part 300.810(b), EPA is not required to include documents which do not form a basis for the selection of a response action. This would only serve to overwhelm the record and dilute the real rationale for the remedy selection.

The New Bedford Harbor Site has generated an enormous volume of documents not all of which form the basis for the response action. EPA believes it has placed into the Administrative Record all relevant decision-making documents. Those documents which relate to the Site, but which do not form the basis for the response action, are contained in the Site File. Included in the Site File are various documents prepared during the New Bedford Harbor litigation which are not only irrelevant to the selection of the remedy but which are also confidential. EPA is willing to provide the PRP or any other member of the public with any documents contained in the Site File pursuant to an appropriate request under the Freedom of Information Act, and provided that the documents sought under the request are releasable in accordance with that statute.

PRP Overview Comment No. 17

The fishery closure is an unnecessarily drastic step which has not been effective. EPA's concerns about fish ingestion can be addressed in a far more reasonable way, such as an educational program designed to educate consumers to refrain from eating lobster tomalley.

EPA Response

EPA agrees that education programs designed to educate consumers to limit their local seafood intake is an important and reasonable approach to risk reduction, and has incorporated this institutional control approach as part of the remedy. Comments concerning the State-sanctioned fishery closure, however, must be addressed to the State rather than EPA, as EPA does not have the relevant jurisdiction over these regulations. EPA recognizes that violations of the fishing ban have occurred, and that enforcement of the ban is difficult. The Greater New Bedford Health Effects Study, Massachusetts Department of Public Health (June 1987), does suggest, however, that the fishing closure contributed to reductions of exposure to PCBs via the food chain.

3.5.2.2 Technical Comments

3.5.2.2.1 Battelle Hydrodynamic and HydroQual Food Chain Models

PRP Comment No. 1 on Battelle Model

The application of the Battelle hydrodynamic and sediment transport model (Tempest/Flescot) to marine systems has been minimal. In fact, the implementation of a time varying free surface was a new feature added to the hydrodynamic model to perform this study. It is probably not surprising that the attempt to apply it to a shallow estuary was doomed to failure.

EPA Response

EPA disagrees with the comment and believes the TEMPEST/FLESCOT models have an extensive history of successful applications to marine and estuarine systems. Some examples of such application are:

- Strait of Juan De Fuca and Sequim Bay, Washington State
- Beaufort Sea and Prudhoe Bay, Alaska
- Pacific Coast, California
- Hudson River Estuary, New York
- Japan Coast off Tokyo
- New Bedford Harbor, MA (study for the City of New Bedford)

The free surface option was added as an improvement to the model for the New Bedford Harbor application. As with all components of the TEMPEST/FLESCOT models, the free surface option was thoroughly tested, verified with analytical solutions, and validated with benchmark problems.

PRP Comment No.2 on Battelle Model

The model as applied to the New Bedford Harbor Site is effectively two dimensional, vertically averaged in the upper estuary, (north of Coggeshall Street Bridge) because only one grid layer was used in the vertical.

EPA Response

As many as four vertical layers were used in the upper harbor north of the Coggeshall Street Bridge (see Figures 5.16-5.22 of Battelle, 1990).

PRP Comment No. 3 on Battelle Model

The model spatial (horizontal) resolution is generally quite poor and inadequate to represent the topography in mid to upper New Bedford Harbor. The authors note that poor grid configuration and coarse resolution are the primary reasons for poor model calibration. For example, wind driven flows are poorly represented because of poor grid resolution.

EPA Response

EPA believes the model's horizontal resolution is adequate for the New Bedford Harbor study. In the upper and lower Harbor, over two hundred surface grid cells were used to represent the horizontal extent (i.e., "topography") and over seven hundred grid cells were used to represent the water column. Therefore, EPA believes the spatial resolution and grid configuration in the New Bedford Harbor was appropriate for the purposes of this study. Comparisons between model results and field data confirmed that the calibrated model reproduced the complex flow and transport processes observed in New Bedford Harbor. Observed discrepancies between computed and measured velocities are more likely due to the comparison of bulk model results with point observations. Discrepancies such as these are typical with any model calibration effort.

PRP Comment No. 4 on Battelle Model

***The Battelle model completely ignores transport processes within the sediment.* These processes are important since mixing and sedimentation processes strongly influence the transport of PCBs from the sediments to the water column.**

EPA Response

EPA does not agree with the commentor and notes that Battelle's model includes bed erosion, sediment deposition, and bioturbation to effectively maintain a continuously reworked sediment at the water-sediment interface. The model also includes concentration changes due to mixing of contaminated and cleaner sediments associated with soil erosion and sediment deposition.

PRP Comment No. 5 on Battelle Model

The model assumes a continuously, well-mixed, 4 cm thick bed layer. This approximation overestimates the releases of PCBs to the sediments because the actual mixing times in the top 4 cm are <u>not</u> instantaneous. The technique also minimizes the natural capping effects due to sedimentation which are known to be occurring in the Harbor.

EPA Response

The use of the well-mixed, 4-cm bed layer is fully justifiable for this study. In New Bedford Harbor, bioturbation is active primarily in the top 3 to 4 cm (Rhoads, 1987). In selecting the bed layer to be 4 cm, bioturbation mechanisms which are built into the model code as an option were not explicitly invoked. Rhoads states in his report that laboratory experiments have shown that complete sediment reworking can take place on a time scale of just a few hours. When compared with simulation periods of months to years, the time scale of hours is practically instantaneous. Natural capping by sediment is known to occur, especially immediately after storms; however, this is generally a temporary condition because, as stated by Rhoads, the top several centimeters of sediment are effectively mixed by bioturbation.

EPA believes that this position is supported by the results of a thin layer sampling program conducted by Balsam (1989). In this study, sediment PCB profiles for the 0-2 foot horizon were evaluated at two locations within the upper Harbor. The study demonstrates that the vertical concentration profile is generally uniform within the 0-4 cm horizon. This is also consistent with the results of the vertical sediment PCB profile reported in Brownawell and Farrington (1985).

PRP Comment No. 6 on Battelle Model

There is no definition given or procedure outlined to determine when cohesive versus noncohesive sediment erosion and deposition formulas are used.

EPA Response

Cohesive sediment transport formulas are used for silt and clay sediment fractions; noncohesive sediment transport formulas are used for the sand sediment fractions. The erosion and deposition equations used for noncohesive sediment transport are equations 20 and 21 on page 5-37 of the Battelle modeling report (Battelle, 1990). Equation 22 on page 5-38 of the Battelle report was used to calculate cohesive sediment erosion and deposition.

PRP Comment No. 7 on Battelle Model

Calibration of both the hydrodynamic and transport models is extremely poor. As an example, errors in tidal current speeds are often larger than the maximum tidal currents. The

temporal behavior of the model-predicted tidal currents also show little resemblance to observations.

EPA Response

EPA disagrees with the conclusions reached by the PRP. The calibrated model reproduced complex flow and transport phenomena occurring in the study area with a level of accuracy consistent with the amount of available data. Comparisons of measured and predicted distributions of dissolved, sediment-sorbed, and total PCBs, for example, show excellent agreements (see Figures 5.74, 5.75 and 5.76 of the 1990 Battelle report). EPA believes isolated discrepancies between computed and measured values do not significantly detract from the overall ability of the model to accomplish the goals of this study.

PRP comment No. 8 on Battelle Model

The model is unable to reproduce the flushing time of New Bedford Harbor observed in a large scale dye release program (ASA, 1987). Model predicted flushing times are at least twice as long as were observed in the dye study.

EPA Response

EPA disagrees with the PRP's conclusion because the purpose of the model tracer release calculation was to assess the capability of the model to simulate typical dispersion processes in New Bedford Harbor. No attempt was made to use the specific tide and wind conditions that were present during the large scale dye release program conducted by the PRP (ASA, 1987). Due to the differences in hydrodynamic conditions associated with the storms during the PRP dye study and the general-case hydrodynamic conditions used by Battelle during the tracer release simulation, any comparisons between the model study and the dye release program are qualitative at best. EPA also believes it is important to note the weather conditions during the PRP's dye release study were "characterized by two major rainfall events" (ASA, 1987).

EPA notes that Dr. Wayne Geyer of the Woods Hole Oceanographic Institution suggests that the actual flushing time for New Bedford Harbor is nine to 30 days depending on wind conditions (ASA, 1986). Dr. Geyer further suggests that storm periods with strong winds would decrease flushing times, while calm periods would result in longer times. For the hydrodynamic conditions that were used in the Battelle modeling study, predicted tracer concentrations would approach 0 at 15 days after the release was stopped. This is consistent with the range of flushing times suggested by Dr. Geyer, and confirms the adequacy of the model calibration.

PRP comment No. 9 on Battelle Model

The model ignored wave-current interaction during the calibration phase but included this process in the application phase. This violates one of the most fundamental principles of model application.

EPA Response

EPA does not agree with the commentor. During the model calibration and testing period, summer and winter flow conditions were simulated with and without wave-current interactions. Computed flow fields, bottom shear stresses and resulting sediment concentrations were examined for sensitivity to this mechanism. Grant et al. (1984) reported that boundary shear stresses under the combination of wave and current could increase to three to seven times the shear stress associated with the current alone. The model results were consistent with Grant's observations: Depending upon the wave conditions and water depth, the model was able to produce three to five times greater bed shear stresses (and resulting higher sediment concentration) when the wave-current interaction option was invoked.

PRP Comment No. 10 on Battelle Model

Assumptions employed either in the model's governing equations or in the application have precluded the ability to represent two layer estuarine flow and stratification.

EPA Response

The model's governing equations and the approach to its current application are fully capable of representing estuarine flow and stratification. The governing equations are the Navier-Stokes equation, coupled with equations of state and continuity, to handle estuarine flow and stratification. As evidenced by the model's successful applications to many estuarine and marine environments (See EPA Response to PRP Comment No. 1 on Battelle Model above), the model formulations have been validated for these conditions. As applied to New Bedford Harbor and the Acushnet River Estuary, the model produced large-scale density driven flow in the study area with the temperature and salinity distribution used in the study prior to imposing tide and wind forcing. With the tide and wind superimposed on it, the model successfully generated two-layer residual flows induced by the density stratification and wind, as evidenced by the seaward movement of dissolved contaminant and the landward movement of sediment. This is consistent with observations reported by the Corps of Engineers (Teeter, 1988).

PRP Comment No. 11 on Battelle Model

The model ignores the Acushnet River flow and density induced flows, hence it is impossible to simulate the estuarine circulation that dominates transport in the upper estuary.

EPA Response

EPA disagrees with the commentor. EPA notes that the annual average discharge of the Acushnet River is on the order of 0.85 m^3/s (ASA, 1986). This flow is orders of magnitude smaller than the tidal discharge of the study area and therefore, was not explicitly modeled.

Although the Battelle model did not explicitly include the Acushnet River discharge, the density effect of the Acushnet River freshwater inflow was implicitly incorporated in the model by imposing measured water temperature and salinity distributions as the initial conditions for the short term hydrodynamic simulations. Distributions for flow, water temperature and salinity included the density effects on the flow circulation. Because the hydrodynamic results from a single tidal cycle were repeated to create longer term transport scenarios, the Acushnet River freshwater inflow effects were incorporated in the long term transport simulation.

PRP Comment No. 12 on Battelle Model

The parameterization of turbulence in the model is extremely simplistic and does not account for the principal sources of turbulence generation of stratification.

EPA Response

EPA disagrees with the commentor. The turbulence parameterization in the Battelle model is a standard approach documented in many contemporary coastal and estuary models, e.g., Blumberg et al. (1989) and Vermulaknoda and Butler (1989). Eddy viscosities were selected on the basis of sensitivity studies and are well within accepted physical ranges. The New Bedford Harbor system is weakly stratified; consequently, the effect of stratification on turbulence will be small.

PRP Comment No. 13 on Battelle Model

The procedure and justification for specifying the tidal conditions at the open boundary of the model domain in Buzzards Bay are not specified.

EPA Response

The tidal conditions were specified at the open boundary as time-varying water surface elevations. A nonreflective wave formulation is incorporated to prevent internal waves from reflecting back into the modeling domain. The technical details of this formulation are presented in Section 5.3.2.2.1 of the Battelle modeling report (Battelle, 1990).

PRP Comment No. 14 on Battelle Model

The sequence of hydrodynamic scenarios used to drive the sediment and contaminant transport model are totally contrived. They show little resemblance to actual conditions in the area. For instance, in most analyses of this type the modeler performs a sensitivity study to help determine how many scenarios are sufficient to achieve a desired level of accuracy. In the Battelle model they have assumed one normal wind plus tide scenario and one storm plus tide scenario. The storm is supposedly representative of a once or twice per month event. Battelle's wind records were not selected to necessarily represent prevailing conditions at the Site (p.5-128). Battelle assembles a ninety-five (95) day record incorporating 31 days of normal wind plus tides followed by one day of storm winds plus tides repeated three times. This record is used repeatedly for the long term simulations. As one can clearly see this procedure

may correctly represent the mean tide condition but does a poor job of representing the variability of wind forcing. The approach, because of its structure, does not include any events with an occurrence rate longer than one month and hence misses all the important major storm systems (northeasters, hurricanes, etc.) which likely are more significant in determining net transport.

EPA Response

EPA disagrees with the commentor. The sequence of the hydrodynamic scenarios were not contrived. EPA believes the simulation methodology used in the Battelle model provides a reasonable representation of mean conditions. As for storm events, the estuary and lower Harbor, which contain the majority of PCBs, are effectively protected from the effects from large storms by the hurricane barrier. Coast Guard measurements inside of the Hurricane Barrier during a large storm (up to 60 mph winds) show that suspended sediment concentrations were about 30 mg/l. This concentration is still only 5 to 10 times higher than normal.

Also, there are some mechanisms which suppress the resuspension of bottom sediments, such as bed armoring occurring during a storm and increasing critical shear stress for erosion as more bed sediment is eroded. Note that bed armoring is eliminated by bioturbation after a storm event.

In summary, EPA disagrees with the PRP's comment that simply because the largest storms were not included in the analysis, the results are invalid. While there is some uncertainty of the various impacts on the long term sediment and contaminant transport by imposing only a monthly storm event, EPA believes a combination of the average and monthly storm condition used for this study provides a good basis to compare the various remediation options, including the no-action option.

PRP Comment No. 15 on Battelle Model

As a result of these greatly simplified scenarios and the computation limits (see below), Battelle's methodology for extrapolating a 95-day model run to a ten-year projection is inappropriate and results in substantial uncertainty. The procedure used to generate long term model results is not supported by any reference to the literature or analysis and, while simple and convenient, ignores the variability in environmental forcing, e.g., wind, tides, river flow rates.

EPA Response

EPA disagrees with the commentor and believes the extrapolation methodology was appropriate for the purpose of comparing remediation options, as stated in our response to the PRP's Comment No. 14. Furthermore, the precedent for this technical approach is found in the literature under the work of McAnally et al. (1988) who successfully used the extrapolation procedure to estimate long term sediment transport in an estuary.

PRP Comment No. 16 on Battelle Model

The selection of parameters used in calibrating the sediment contaminant models are arbitrary. Model calibration as a whole is extremely poor.

EPA Response

Sediment transport parameters were carefully selected through an extensive calibration process. The calibrated model reproduced complex sediment transport behavior observed in New Bedford Harbor. The selected values for model parameters were calibrated with sediment data from laboratory studies performed by the Corps of Engineers (Teeter, 1988) and field studies. All parameters were within acceptable physical ranges for similar physical settings.

PRP Comment No. 18 on Battelle Model

There were insufficient field data to accurately calibrate and verify the hydrodynamic and sediment and contaminant models.

EPA Response

EPA acknowledges that "more data" will undoubtedly assist in calibrating any model. However, EPA believes a sufficient data set was used to calibrate the model as evidenced by the model's ability to reproduce the major trends in the flow and in sediment and contaminant transport. Furthermore, the model produced excellent agreements with measured water column results for dissolved, sediment-absorbed and total PCB distributions in the study area (see EPA Response to PRP Comment No. 7). In summary, the model results were in general agreement with the available field measurements and are appropriate for comparisons of the relative effectiveness of modeled remedial actions.

PRP Comment No. 19 on Battelle Model

The suggestion that even though the model lacks rigorous calibration it is acceptable to use as a tool to perform comparative analyses is without support either by reference to the literature or by independent analysis presented in the report. This "trust me" attitude is entirely inappropriate either scientifically or socially when so much is at stake.

EPA Response

EPA disagrees with the commentor as the Battelle modeling study was based on a scientific approach, not a "trust me" attitude. EPA acknowledges that strict "model validation" as defined by the American Society for Testing of Materials (ASTM) was not possible because it would have required several more years and significant resources to complete. However, EPA believes that because the model was able to reproduce sediment and contaminant transport trends, sediment accumulation/depletion patterns and water column PCB distributions, the model results can appropriately be used for comparative evaluations of remedial alternatives. EPA also believes that it is important to note that the model results are not the sole basis for EPA's selection of a cleanup plan for New Bedford Harbor, as it was only one of several technical evaluations used to support the decision process.

PRP Comment No. 20 on Battelle Model

The authors never present enough information nor provide the benefit of a sensitivity analysis to assess the concentrations predicted by the model. Where data are presented, they are generally presented without regard to variability or significance of differences predicted. The lack of error bars on the figures in Section 7-6.2, which summarize the substance of the report, render any legitimate comparison, <u>even a qualitative one</u>, an exercise in speculation. On the basis of what is presented, the "no action" scenario may well be as effective as any of the remediation scenarios.

EPA Response

EPA believes the commentor has correctly indicated a limitation of the modeling effort (i.e., the uncertainty bounds of the projected concentrations are not known). EPA also believes this limitation does not invalidate the estimates of mean concentrations computed by the model. A full uncertainty analysis of the coupled physical-chemical and bioaccumulation models would allow a statistical evaluation of the difference between concentrations projected for the various remedial actions, but such an analysis was not practical because of technological limitations. The comparison of mean concentrations was the only available basis for contrasting the various actions and does represent a best estimate of system response.

PRP Comment No. 1 on Food Chain Model

Terms having precise physiological meaning are not defined throughout the text. For example, "assimilation efficiency" is used to refer to the fraction of ingested food converted to biomass by an organism (the physiological meaning of the term) and to assimilation of contaminants. The latter process is sometimes called "chemical assimilation efficiency" in the text. The term "excretion rate", physiologically the rate of elimination of liquid waste, is used to describe what is really a depuration rate. Hence, the document is difficult to make sense of, even for a physiological ecologist. It must be impenetrable to a lay person.

EPA Response

EPA disagrees with the commentor as the report does use the term assimilation efficiency as the descriptor of both the fractions of ingested food and contaminant that are assimilated by an animal. However, the former is consistently referred to as food assimilation efficiency and the latter is referred to as chemical assimilation efficiency. Precedence for the use of this terminology lies in its appearance in numerous peer-reviewed journal articles.

One dictionary definition of excrete is "to throw off or eliminate (waste matter or noxious material) by normal discharge from an organism or any of its tissues." EPA believes the use of the term excretion rate to describe the rate at which an animal eliminates a chemical is consistent with this definition. EPA does, however, recognize that highly technical documents of this type are difficult for the general public to understand, and will strive to make future documents as clear and concise as possible.

PRP Comment No. 2 on Food Chain Model

Averaging procedures applied to water column and sediment contaminant concentrations are vague and appear to be arbitrary. For example:

> **The data were first screened to determine specific stations or data points that would incorrectly bias an area average. This judgement was made by visual inspection of log normal probability distributions of the PCB and metals data from the four cruises. Data points that deviated significantly from the distribution indicated in the plot (i.e., values that were either unreasonably high or unreasonably low) were not included in subsequent data averaging.**

This is an extremely vague statement, with no stated and objective criteria for statistical significance. The terms unreasonably high and unreasonably low are not defined. What is "unreasonable" variation? One standard deviation? Two standard deviations? Points which fall outside of the 95 percent confidence interval?"

EPA Response

The reviewer has appropriately noted the limitations in the discussion of the determination of outlying data points. For PCBs, only two dissolved and two sediment samples were excluded from the data averages. In all of these cases the outlying data fell outside the 99 percent confidence intervals of the data distributions defined with all measurements included.

Outlying data was more of an issue for the dissolved and sediment metals measurements. For cadmium, 13 dissolved measurements and 4 carbon normalized bulk sediment measurements were excluded from the averages. For copper, six dissolved measurements and four carbon normalized bulk sediment measurements were excluded. For lead, six dissolved and three carbon normalized bulk sediment measurements were excluded. Twenty-three of the 25 dissolved metals excluded data fell outside the 95 percent confidence intervals with all measurements included. All excluded dissolved metals data fell outside the 90 percent intervals, while 17 of the 25 data points fell outside the 99 percent confidence intervals. Ten of the 11 excluded carbon normalized bulk sediment data fell outside the 95 percent confidence intervals with all measurements included. All excluded carbon normalized sediment data fell outside the 90 percent confidence intervals, while 7 of the 11 data points fell outside the 99 percent confidence intervals. No PCB or metals biota measurements were excluded from the data averages.

It should also be noted that the data base was evaluated for determination of outlyers through a two step screening process. The first step involved visual inspection of log-normal probability plots of all data. Data points that deviated significantly from the distributions indicated in the plots were then evaluated to determine if they were outside specified confidence intervals. If a data value was outside of the 90 percent confidence interval of the distribution defined with the value included, or outside of the 95 percent confidence interval of the distribution with the value excluded, it was judged to be an outlyer.

PRP Comment No. 3 on Food Chain Model

Within-cruise averages of water column and sediment toxicant levels were computed for each area. Areas were then averaged over all cruises. This procedure is justified by the *undocumented statement that the biota are not sensitive to short term variations in exposure* concentrations (page 6-13). The averaging process renders homogeneous distributions of material that obviously vary spatially, and in the case of water column contaminants, temporally. Any time variation in contaminant levels is eliminated from the model by this process. Yet seasonal variation and episodic events such as storms may exert a profound impact on the dilution/distribution of contaminants in the New Bedford Harbor area (Table 6-5; area 1).

EPA Response

EPA acknowledges that the temporal and spatial contaminant concentration variations exist on scales smaller than those incorporated in the model. However, EPA believes that these scales are generally not relevant to the purpose of the model. The model is directed to predicting the long term (year-to-year) response of the biota to changing exposure concentrations. Thus, seasonal and daily variations in exposure concentrations are only important to the extent that they affect the long term average concentrations of the biota. The low excretion rates of PCBs tend to minimize the responsiveness of the biota to the daily fluctuations in concentration that might be associated with storm induced resuspension. Such fluctuations would only be important if the amplitude of the fluctuation was large, as may be the case for a rare storm event. Such events were not evident in the historical PCB database and no basis exists for presuming that the observed biota concentrations reflect prior exposure to an extreme event. Since the project data indicate little seasonal variability in exposure concentrations (cruise-to-cruise differences in mean concentrations were generally not significant as discussed in Section 6.2.3.2 of the report) it is reasonable to assume that the observed biota concentrations are consistent with the long term average exposure conditions.

The spatial averaging of the model attempts to, in part, account for the mobility of the animals within specific geographic areas and reflects a desire to reproduce the major spatial gradient from inner Harbor to bay rather than the small scale spatial variation that probably exists due to the patchiness of the PCB contamination.

PRP Comment No. 4 on Food Chain Model

The data are selectively and inconsistently sieved. For example, measurements of water and sediment contaminant concentrations from station 16 in area 2 (located near a wastewater treatment plant) are higher than at other stations in area 2. On the basis that they are higher, they are not included in the area 2 average. Why not? The target apex predators, lobster and winter flounder, are mobile organisms and can move within and between areas.

EPA Response

EPA excluded station 16 from the exposure concentration averages because the data would have significantly increased the unweighted average of the outer Harbor. EPA believes the localized character of the elevated concentrations at this station minimizes its contribution using a volume weighted average for the full outer Harbor. However, EPA did not develop a volume weighted averaging scheme because of the spatial limitations of the PCB data in the outer Harbor and because a volume weighted average likely would have only marginally altered the averages.

PRP Comment No. 5 on Food Chain Model

Water column and sediment contaminant concentrations are not presented in the same manner and are thus difficult to compare. The water column data are given more or less in their entirety. The sediment data are not presented at all. The text states that these data are presented in Appendix I (Battelle, 1990). However, Appendix I contains only probability plots. Without being able to examine the unaveraged data from the individual cruises, it is not possible to get a feeling for the variance, which is, presumably, large.

EPA Response

EPA disagrees with the PRP as the presentations for the water column and sediment data are similar. The only information given for the water column data that is not provided for the sediment data is the individual cruise averages. Because of the slowly-changing character of the sediment contamination, the sediment data were never analyzed on a cruise basis. Although the PRP implies that a statistical analysis of the individual cruises is needed to assess temporal variability, cruise-to-cruise differences in sediment concentrations do not reflect temporal variability. Rather, they reflect near-field spatial variability. The estimates of spatial variability were determined by analysis of all of the data. The results are presented in both graphical (Figures 6.8 to 6.10) and tabular form (Tables 6.7 and 6.8) in the 1990 Battelle report.

PRP Comment No. 6 on Food Chain Model

Field sampling of the biota is woefully inadequate. For example, the numbers of flounder sampled are ludicrously low, less than 5 fish per age class in each area (Figure 6-17). Because so few fish were sampled, Figure 6-19 (percent of total caught per age class) is totally meaningless and misleading.

EPA Response

EPA disagrees with the conclusions reached by the PRP. EPA does acknowledge that more data would be helpful; however, the number of biota captured and analyzed for contaminants was limited by capture success and project constraints. Since the number of replicates for each age class is low, only species averages were used in data analysis and model calibration. While it would have been desirable to reduce the standard error of the means by having larger sample sizes, EPA believes the data still provide estimates of mean and variability that are valid for model calibration.

EPA notes that the study conclusions drawn about migration of flounder must be viewed as somewhat speculative because of the limited number of fish caught. However, EPA disagrees with the PRPs contention that these conclusions are meaningless. EPA believes the data do indicate trends that are interpretable and consistent with tagging studies cited in the report.

PRP Comment No. 7 on Food Chain Model

A great deal of effort (and presumably money) was expended on experiments which measured rates of chemical assimilation efficiency and excretion/depuration directly. However, the measured values (which are extremely variable) are not employed in the model but are used only as "guidance for model calibration" page 6-63). Instead, literature values for unrelated, mostly non-marine, species (carp, sandworms, rainbow trout, goldfish and guppies) are used in the model without justification.

EPA Response

EPA disagrees with the PRP and notes that the commentor is incorrect in stating that literature values of chemical assimilation efficiency and depuration (excretion) for non-marine species were used in the model in place of data obtained from lab studies conducted as part of this project. As stated in the theory and calibration sections of the report, depuration (excretion) rates used in the model were derived from well accepted equations that relate transport across the gill to bioenergetics and lipid-partitioning. Chemical assimilation efficiency was determined through the calibration exercise (as discussed in the calibration section). The project lab study data and literature data were used only to establish limits on reasonable values for this parameter. Although the project lab studies provide values of assimilation efficiency, the variability of the experimental results precluded their use in a more definitive manner.

PRP Comment No. 8 on Food Chain Model

The measured chemical assimilation efficiencies are not presented in the text. The reader sees only whole body concentrations. The measured rates are said to be discussed in Chapter 6-2. They are not. The chemical assimilation efficiency rates finally appear in Table 6-23, which presents only averages. The reader has no idea of the variance.

EPA Response

EPA disagrees with the PRP as the commentor has confused the assimilation efficiency experimental results and the assimilation efficiency values used in the calibrated model. The values presented in Table 6-23 are, as stated, the values "...used in PCB calibrations." They are not means of measured values.

PRP Comment No. 9 on Food Chain Model

The measured bioconcentration factors and excretion/depuration rates for PCB do not appear anywhere in the document. Table 6-20 gives values for metals only.

EPA Response

EPA notes that data from which the bioconcentration factors and excretion/depuration rates for PCB were calculated appear in Tables 2.24 through 2.29 (Pages 2-54 through 2-59 of the Battelle Modeling Report). Tables 2.24 and 2.25 show whole body PCB concentrations for adult and juvenile lobster, respectively. Tables 2.26 and 2.27 show whole body PCB concentrations for adult and juvenile winter flounder, respectively. Whole body PCB concentrations in pooled polychaete tissue are shown in Table 2.28. Mean tissue PCB concentrations in individual hard clams are shown in Table 2.29.

PRP Comment No. 10 on Food Chain Model

Calibration of the food chain model is, overall, inadequate. The observed and calculated PCB concentrations for mussels, crabs and polychaetes do not agree well in area 1 and 2. Points for mussels in area 2 are missing from a number of the figures (Figure 6-28 to 6-33). On the basis of the data presented, agreement with calculated values is, presumably, poor.

EPA Response

EPA disagrees with the PRP's conclusion, yet recognizes the adequacy of the calibration is a subjective assessment. While the commentor believes the comparison of predicted and observed PCB concentrations is poor, this calibration has been published in a peer reviewed journal (Connolly, J.P. 1991. Environ. Sci. Technol. 25:760) and thus judged to be reasonable.

The model was calibrated for homologues 3 to 6 and for total PCBs. The figures presented in the report illustrate generally good agreement between the observed data and the calculated concentrations. This level of predictive ability was achieved with realistic and consistent definitions of the biological and chemical processes. The bioenergetics of each species does not vary between homologues or locations. Variations in the chemical related parameters are in agreement with laboratory measurements and are consistent across species.

The adequacy of the calibration must be viewed both in terms of the agreement between observed and computed concentrations and the above mentioned scientific credibility of model structure. While the model does not go through every data point, it successfully reproduces the variations in body burdens that are observed across the homologues and over the entire food chain. It also reasonably reproduces the spatial gradients evident in the data. As a result, the model does have demonstrated predictive capabilities that are adequate for the task of estimating the long term response of the biota to changes in water column and sediment PCB concentrations.

PRP Comment No. 11 on Food Chain Model

No sensitivity analysis for the various food chain model parameters is present anywhere in the document.

EPA Response

A sensitivity analysis was not included in the report because such an analysis was not within the scope of the project. However, a sensitivity analysis was performed and is discussed in the journal article cited above (Connolly, 1991). This analysis indicated that the factors that most controlled the PCB accumulations computed by the model were the assimilation efficiency of ingested PCBs and the growth rates of the animals. Assimilation efficiency was the dominant factor and its effect is presented in Figure 13 of the Connolly (1991) publication.

PRP Comment No. 12 on Food Chain Model

A steady state assumption for toxic uptake/release is applied to the <u>lower</u> trophic levels of the food chain model. No bases for the assumption are cited. Voluminous literature exists on selective uptake of dissolved nutrients by phytoplankton and bacteria. If the lower trophic levels discriminate in favor of, or against, contaminants, then contaminant turnover by the biota may be faster or slower than the steady state assumption dictates. This factor could be examined in a sensitivity analysis of the food chain model.

EPA Response

It is well known that the rates of uptake and depuration of contaminants increase with decreasing size because of the allometric dependencies of weight specific metabolic and growth rates. As a result, the time to steady-state for small animals (e.g., zooplankton) exposed to PCBs or other hydrophobic contaminants is on the order of days to weeks. This time scale is much shorter than that of the long term concentration decline in New Bedford Harbor and the smaller animals are essentially always at steady-state with their exposure concentrations.

PRP Comment No. 13 on Food Chain Model

The food chain structures are simplistic and some of the trophic links are incorrect (Section 6-4). Both crabs and winter flounder are bottom feeders. They do not consume

phytoplankton except in their larval states, which inhabit the water column. The juvenile and adult (i.e., post-larval) stage of these organisms are simply not constructed morphologically to feed on items as small as plankton. The structure of each food chain will affect the amounts of contaminants transferred to lobster and flounder: If the model has them consume even some plankton, they are likely to accumulate less contaminant than if they consume only benthic organisms. It is not clear whether the model includes larval stages of lobster and flounder in its size/age classes.

EPA Response

The food chain structures are purposely simplistic. Since animals of the same position in the food web tend to have similar contaminant concentrations, it is necessary only to include a single animal from each position in the food web as representative of all prey within the group.

The reviewers comments about the diets of bottom feeding crabs and winter flounder are consistent with the structure of the model. In Section 6.4.1 of the model report, the assumptions about feeding are discussed. Only the first age class of flounder is presumed to ingest any plankton, dividing its diet between plankton and polychaetes. The older flounder are presumed to ingest polychaetes only. The crabs included in the model are the smaller animals that are part of the diet of the lobster and flounder. These include the larval stages that would consume some plankton in addition to benthic animals.

PRP Comment No. 14 on Food Chain Model

The well documented temperature-driven on-shore/off-shore migration of adult winter flounder is ignored in the model. It is stated that the fish do not move far from the New Bedford Harbor area. In fact, they move at least as far as Nantucket Shoals (Howe and Coats 1975) during summer, a phenomenon which is certain to alter the environmental concentration of contaminants to which they are exposed. Likewise, lobsters, while migrating less than flounder, often move sufficiently to migrate in and out of areas where the sediment is contaminated (Fogarty, et al. 1980).

EPA Response

The report includes a detailed explanation of the reasons for not including migration for the less than five year old flounder being modeled. The reviewer has not provided any information that would require a modification of that explanation.

EPA acknowledges that lobsters do undergo some migratory movements. However, the contaminant data suggest that migration is not a dominant process impacting PCB body burden since the spatial gradients in lobster contaminant concentrations parallel those in the water and sediment.

3.5.2.2.2 Baseline Ecological Risk Assessment

PRP Comment No. 1 on the Baseline Ecological Risk Assessment

The PRP claims that the scientific basis for the Baseline Ecological Risk Assessment is flawed and believes the document was not prepared in accordance with the standard of practice used by EPA researchers and/or applicable EPA guidance manuals. Specifically:

a) The commentor highlights the lack of Site-specific toxicity testing.

b) The PRP believes the equilibrium partitioning technique was inappropriate to evaluate potential ecological risks.

c) The commentor argues that the use of total PCB rather than specific congener data for conducting the risk assessment analysis is inappropriate.

d) The commentor believes EPA did not adequately address the potential for exposure concentrations to change due to fate and transport processes.

EPA Response

EPA disagrees with the conclusions reached by the commentor. However, EPA acknowledges that (as in any assessment of ecological risk) various simplifying assumptions were made regarding both potential exposure conditions and toxicological impacts associated with those estimated exposures as part of the ecological risk assessment. In part, the specific methodologies and assumptions made in that assessment reflect the somewhat unique and complex nature of PCB's and their biological impacts, as well as the limitations inherent in the available data and the special conditions associated with this ecosystem. However, EPA believes that the methodologies employed are sound and consistent with standard practice and applicable EPA guidance manuals. The use of joint probability methods was made to explicitly address, and quantify, the uncertainties inherent in the risk assessment process. These techniques are a straightforward application of methodologies presented in the User's Manual for Ecological Risk Assessment (Barnthouse et al., 1986).

Contrary to the PRPs assertion, EPA did use the results of Site-specific toxicity testing in evaluating ecologic risks at the Site. EPA believes that the results of the Site-specific sediment toxicity testing support the conclusions of the Baseline Ecological Risk Assessment and contribute to the "weight of evidence."

EPA believes that the sediment-water equilibrium partitioning (EP) approach used in this risk assessment, while not without controversy, is a valid method. A more expanded technical defense of the use of this methodology is provided below in EPA's Response to PRP Comment No. 3 on the Baseline Ecological Risk Assessment. EPA agrees that although a quantitative assessment of risk incorporating all mechanisms is an ideal goal, this was not possible because of the lack of relevant toxicological data. EPA stresses that the consequence of these data gaps is to potentially underestimate the potential ecological effects associated with PCB exposure in this ecosystem, and they certainly do not obviate the overall conclusions. Equilibrium partitioning was only one of many risk estimating techniques employed for this Site assessment.

EPA agrees that use of total versus congener PCB data does reflect a practical compromise; however, this was necessary in order to allow utilization of the available PCB toxicological and Site characterization data. Although recent work has indicated variability among congeners with regard to toxicity, most toxicity studies have used congener mixtures. It is probable that a wide variety of toxicities is represented in both the test mixtures and the mixture occurring in New Bedford Harbor. Therefore, the use of risk probabilities in a relative sense would have considerably greater validity, even if absolute risk probabilities were questionable.

EPA acknowledges that fate and transport processes can modify exposure concentrations introducing uncertainty into the concentration values applied. To address this uncertainty, EPA used a joint probability analysis rather than a more standard quotient method. The cumulative distribution of expected exposure concentrations were utilized to account for the potential fate and transport dynamics that undoubtedly occur.

PRP Comment No. 2 on the Baseline Ecological Risk Assessment

The PRP believes the exposure assessment does not represent a realistic assessment of the ecosystem and feel it is based on incomplete information and simplifying assumptions. Specifically, the PRP believes EPA inappropriately developed the distribution of Expected Environmental Concentrations (EEC) by utilizing data of questionable quality; by eliminating zero values, thereby biasing the data upwards; and presenting the probability distribution of the EEC on a log scale, despite the fact the data were not normally distributed.

EPA Response

In general, all ecological risk assessments are based on incomplete information and simplifying assumptions (Bartell et al., 1992; USEPA, 1992). Use of such assumptions is unavoidable in that current ecological risk assessment methods rely heavily on relatively simple models developed to describe complex physical, chemical, and biological processes. Incomplete information is also inherent in the process and the evolving state-of-the-art. EPA believes that, despite these constraints, the models and input data used as well as the results are consistent and appropriate. In fact, the joint probability approach utilized in this assessment represents an advancement in bringing more realism into the ecological risk assessment process. It avoids the overly simplifying approach that uses discrete (and usually worst case) point estimates for parameters that are known to vary.

a. EPA acknowledges that the development of the distribution of EECs could be biased upwards by the elimination of zero values. However, EPA does not feel that analytical data reported as "zeros" necessarily imply that contaminants were not present in the particular samples. EPA believes that the procedure of replacing analytical values reported as "zero" or below detection levels with 0.1 times the specified detection level (or lowest reported value when no detection level was specified) is an appropriate and realistic approach to estimating potential exposure concentrations.

b. The commentor believes the use of a log transformation to attempt to normalize EEC data for use in the probability model is problematic since an examination of the transformed data indicated that they were not normally distributed. EPA noted that although the log-transformed data were examined and some distributions found to deviate from normality, the examination of moment statistics indicated that the distributions were leptokurtotic (with values tending to fall more regularly around the mean or in the "tails" of the distribution than in a normal distribution) rather than being skewed on one side of the mean response. EPA believes that the consequences of this type of deviation from normality are of little significance in conducting the joint probability analysis due to the fact that the distributions were symmetrical around the mean response.

PRP Comment No. 3 on the Baseline Ecological Risk Assessment

The PRP believes EPA's use of equilibrium partitioning (EP) to estimate pore water concentrations is inappropriate for the Site. PRP concerns regarding this approach include the following:

a. The EP approach should have utilized congener specific data rather than total PCB data. Also the dynamic physical conditions at the Site likely preclude the attainment of equilibrium conditions.

b. The potential pore water exposure pathway ignores potential exposure through ingestion.

c. ***The complex nature of PCB bioavailability is not addressed by this method.***

d. The assumption that benthic organisms have the same sensitivity as water column species is untested

EPA Response

EPA disagrees with the PRP and believes the equilibrium partitioning (EP) approach is one of several appropriate approaches to evaluating potential ecological risk for the New Bedford Harbor Site. While EPA acknowledges that there are constraints associated with the EP approach, the results of the EP evaluation compare well with the results from other approaches in establishing adverse effect levels, as well as inferences from benthic surveys and Site-specific sediment bioassays.

EPA believes that the EP method is an appropriate method for evaluating sediment toxicity and can be adjusted for Site-specific conditions. A number of different effects-based approaches have been used to develop sediment criteria, including the apparent effects threshold (AET) approach and the co-occurrence analyses (COA) approach. When these methods were compared using data from many different studies, the results offered a surprising degree of convergence despite the multitude of potential sources of variability (Long, 1992). In addition, earlier data evaluated by Long and Morgan (1990) also indicated relatively good agreement among the various approaches and data sets. The EP-based marine chronic Sediment Quality Criteria (SQC) (assuming 1% total organic carbon) is 420 ppb with a lower 95% confidence interval of 82.9 ppb. These values are in very good agreement with the Effects Range-Mean (ER-M) and Effects Range-Low (ER-L) values for PCBs presented in Long and Morgan (1990), 400 ppb and 50 ppb, respectively. Because the latter values were developed based on numerous results from a number of different approaches and involved a variety of different benthic marine organisms, it is unclear to EPA how the commentor can suggest that the use of the SQC does not have general applicability to the evaluation of marine impacts associated with exposure to PCB-contaminated sediments.

The sediment-water equilibrium partitioning (EP) method was used to estimate pore (interstitial) water concentrations. The EP method is particularly useful when, as in this case, there is limited toxicity data available for species of concern. This approach assumes that during equilibrium conditions, the ratio of contaminant concentrations in the bed sediments and interstitial waters remains constant if one corrects for organic carbon content. Although dynamic physical conditions in the estuary episodically disturb chemical conditions, the equilibrium values represent a conservative measure that is used to approximate conditions averaged over time.

The EP approach does assume that biota are primarily affected by sediment contamination of the surrounding water, rather than by direct contact with and ingestion of the sediments or food chain organisms. EPA recognizes that a variety of biological processes and characteristics can influence the transfer of contaminants from sediments. These include behavior, feeding modes and rates, source of water for respiration (interstitial versus overlying water) and organism size and life stage. These parameters vary with the species involved and the use of interstitial water only is a simplifying assumption. However, even though some organisms don't ventilate interstitial water, bioturbation will tend to expose organisms which live near the sediment surface to greater concentrations of desorbed contaminants by introducing interstitial water to the overlying water (Landrum and Robbins 1990).

EPA believes that the concerns relating to the issue of PCB bioavailability, although complex in nature, are overstated. The empirical data used to develop the ER-L and ER-M values are based on a large number of studies of various organisms exposed to a variety of PCB congener blends encompassing the range of environmental conditions expected to influence the bioavailability of PCBs at New Bedford Harbor.

The assumption that water column organisms have the same or similar sensitivity as benthic organisms is supported by the fact that the EP approach results in threshold effect levels that parallel those resulting from bioassays with marine benthic organisms using COA and AET approaches.

PRP Comment No. 4 on the Baseline Ecological Risk Assessment

The PRP states, "the use of toxicity data for chemicals that have different acute/chronic ratios than PCBs, LC_{50}s corresponding to a wide range of exposure times, the use of total PCB toxicological data instead of congener data (an acknowledged compromise in scientific accuracy), and MATCs with a variety of biological endpoints, some not even ecologically meaningful, as well as taxonomic and procedural compromises that EPA has repeatedly made, further erodes the value of this evaluation and reflects negatively on the "weight of evidence" (p. 1-10) rationale upon which EPA rests its case."

EPA Response

EPA believes that the type of toxicological data utilized in the evaluation and the techniques employed in determining the taxon-specific MATC distributions are appropriate and follow accepted practices in conducting ecological risk assessment. While EPA acknowledges that insufficiencies in the available toxicological data do present a problem for assessing impacts, the uncertainties associated with these data were explicitly evaluated in the joint probability analysis.

Responses to individual concerns raised by the PRP are addressed below.

- The use of all relevant LC_{50} data was necessitated by the limited amount of data available with which to evaluate potential toxicological impacts. Although the introduction of test duration as an additional variable may increase the variance of the extrapolated MATC estimates, EPA feels that this merely mimics the variability in natural exposure durations.

- EPA believes that the endpoints used (Table B-2 and B-5) directly or indirectly do relate to survival, growth, or reproduction. Survival of these domesticated organisms that have gone wild depends on many behavioral and physiological parameters that can influence the primary ecological endpoints. Survival can be affected by avoidance, lethargy, or altered behavior. While avoidance of contaminated areas may reduce initial exposure, it also reduces habitat availability and increases competition for remaining habitat or food resources. Lethargy, osmotic stress, or altered metabolic rates may reduce the ability to avoid predation.

  Individual and population growth rates are another measurement endpoint of potential ecosystem relevance. Inhibited molting and reduced cell division can certainly influence growth. Liver pathogenesis, impaired bone development, and osmotic stress/altered metabolic state can also effect growth. Reproduction can also be affected by molting inhibition, stress due to pathology etc. Species ratio changes, alterations in species compositions and decreased diversity are all indicators of potential ecological stress.

PRP Comment No. 5 on the Baseline Ecological Risk Assessment

The PRP believes EPA's use of the joint probability analysis to draw conclusions

concerning ecological risk is inappropriate given what they feel to be the high level of uncertainty associated with the MATCs and EEC curves.

EPA Response

EPA believes that the joint probability analysis approach is appropriate because it incorporates stochastic uncertainty and was used specifically to address the uncertainty inherent in developing the MATCs and EEC curves. The expected distribution of a taxonomic group response to a contaminant was estimated by extrapolating the responses of individual organisms to larger groups. This methodology involved the summarization of the available toxicological data using errors-in-variables regression models and the quantification of uncertainty as the combined variances through the various extrapolations used in the risk assessment model.

The more standard approach would have been to use one or more conservative point estimates in the ecological risk model. This discrete analytic solution using conservative values would have resulted in a greater estimate of ecological risk.

The probabilistic approach uses the entire distribution of available values instead of only one or more discrete (and conservative) point estimates for model parameters. The probabilistic approach applies Monte Carlo simulation methods to run the model repeatedly, each time randomly sampling the distributions of variables and computing model output. The results are presented in a cumulative frequency distribution curve which provides an evaluation of probability of effect at various contaminant concentrations. This resulting distribution explicitly reflects the uncertainty or variability in the model parameters. This is a realistic approach when variable model input data exist and one which fully utilizes all the data available to describe the probability distribution of the entire range of possible outcomes.

PRP Comment No. 6 on the Baseline Ecological Risk Assessment

The PRP believes EPA inappropriately concluded that aquatic organisms are potentially at risk because the AWQC for PCBs is exceeded in some areas of the Site. The PRP states that the AWQC has no explicit relationship to aquatic toxicity.

EPA Response

The wording of the PRP comment gives the impression the PCBs are not that toxic which is misleading. PCBs do cause significant chronic effects. The AWQC for PCBs incorporates extensive data on both the acute and chronic toxicity of PCBs and should be utilized as a source for documenting these effects.

The way that AWQC are established is based on a number of factors including acute and chronic toxicity, bioaccumulation potential, FDA action levels, etc. Each factor is considered and the one that is most sensitive is selected. Two-thirds of all AWQC are based on toxicity as the most sensitive parameter. The AWQC for PCB is based on bioaccumulation potential. This simply means that the potential for accumulation is greater than the potential for acute toxicity.

PRP Comment No. 7 on the Baseline Ecological Risk Assessment

The PRP believes EPA's conclusions on ecological risk are inappropriate because the conclusions are based on the results of a Site specific sediment toxicity test which the PRP contends was seriously flawed. The PRP also believes EPA's conclusion that the results of a benthic survey conducted by the Corps of Engineers support the findings of the Baseline Ecological Risk Assessment is inappropriate since the benthic survey was in their view deficient.

EPA Response

EPA disagrees with the commentor and believes that despite some shortcomings in the sediment toxicity study and benthic survey, the results from Site-specific toxicity tests, laboratory studies, benthic surveys, and biomonitoring all indicate that there is stress to ecological receptors as a result of exposure to PCBs and other chemical contaminants at the Site. Furthermore, there is also clear indication that the level of stress at both the organism and community level is correlated with the level of contamination found at various zones within the Site. More recent studies by EPA (Nelson et al., 1996; Ho et al., 1996) corroborate these findings.

EPA believes that the results of Site specific sediment toxicity tests were appropriately used and that the test method and implementation were sound. The results are consistent with the theoretical predictions from the risk assessment findings as well as the USACE benthic survey. In particular, the solid-phase sediment bioassay (Hansen, 1986) reported significant reduction in the survival of sheepshead minnow (*Cyprinodon variegatus*), their progeny (i.e. embryos or hatched fish), and in amphipods (*Ampelisca abdita*). These responses (ranging up to 100% mortality in Zone 1) are correlated with the spatial gradient of contaminants in the Harbor sediment. Again, the overwhelming weight of evidence indicates that PCB contamination is a major factor in explaining these results.

In the Site specific sediment toxicity tests, a variety of test organisms representing a broad taxonomic range as well as a diversity of trophic levels and habitats were used. All organisms examined exhibited some evidence of stress. These results are consistent with the EP results.

EPA believes that the benthic survey conducted by the USACE (Bellmer, 1986) was appropriately implemented and that the results do support the Baseline Ecological Risk Assessment. EPA recognizes that the study was based on limited data from one sampling period and hence is preliminary in nature. However, the approach and analysis were generally sound. The results clearly indicate that PCB concentrations correlate significantly with decreases in species numbers, community diversity, and community evenness. The results are consistent with Gray (1989) which concluded that reduced diversity was one of the changes that usually occurred in response to stress and that this reduction usually occurred late in the impact sequence. The results are also consistent with the baseline long term monitoring report's findings (Nelson et al., 1996).

PRP Comment No. 8 on the Baseline Ecological Risk Assessment

The PRP believes the results of the biological monitoring conducted during the pilot study demonstrate no toxic effects to test organisms under ambient conditions.

EPA Response

EPA believes that, while the results of the biological monitoring conducted during the pilot study did demonstrate the absence of additional significant risk associated with the pilot, the results did demonstrate toxic effects. Biological and chemical analyses of water collected immediately adjacent to the dredging site suggests that the biological tests were sufficiently sensitive and that adverse biological effects did occur to the sea urchin, *Arbacia punctulata*, the red alga, *Champia parvula*, and the mysid, *Mysidopsis bahia* immediately adjacent to the dredging site (Nelson and Hansen, 1991) where the mean PCB concentration was 1.43 ug/l.

Most of the biological tests conducted during the pilot study were related to acute rather than chronic toxicity. It is true that there was little or no acute toxicity either before or during the dredging operation, except at the station in the immediate vicinity of the dredge. The rationale for using these tests during the pilot study was to limit any acute effect to the upper Harbor (i.e., acute impacts to the upper Harbor but not the lower Harbor could be acceptable). The fact that toxicity was observed in the immediate vicinity of the dredging operation indicated that the tests were sensitive when concentrations were elevated. However, these elevated concentrations were localized and not transported down the Harbor. This fact reinforces both the rationale for using these tests and the results of the AWQC document for PCBs.

Data collected from the pilot study also support the AWQC point that PCBs, while not necessarily acutely toxic, do bioaccumulate in marine organisms. Mussels deployed in the upper Harbor bioaccumulated PCBs from the water column to approximately 100 ppm within one month from an initial concentration of <1 ppm.

3.5.2.2.3 The Effects of a Dredging Remedy

PRP Comment No. 1 on Dredging

The PRP believes the location of the pilot study was inappropriate. Extrapolating the results of the pilot dredging study to the Proposed Plan is also inappropriate because of differences in the sediment PCB concentration, water depth, hydrodynamic conditions, and duration.

EPA Response

The pilot study was designed to evaluate dredging in the upper Harbor area of New Bedford Harbor. The water depths, physical characteristics of the sediment to be dredged, and depth of PCB contamination in the cove where the pilot study was carried out are all representative of conditions found in the upper Harbor. Therefore, a cutterhead dredge operating in the upper Harbor by the guidelines developed during the pilot study would be expected to attain similar sediment resuspension rates as occurred during the pilot study.

EPA recognizes that PCB concentrations and hydrodynamic conditions vary throughout the estuary. The Corps of Engineers, as part of the Engineering Feasibility Study, performed laboratory testing on a sediment sample approximating the average PCB concentration in the upper Harbor (1,500 ppm). Information on contaminant release was obtained through this laboratory work (elutriate tests) and confirmed in the pilot study. The Corps of Engineers also used a two-dimensional numerical model to calculate tidal currents for the estuary and predict the movements of sediments within and out of the upper Harbor during dredging. This information was combined with information on dredge operation acquired during the pilot study in order to make the predictions of contaminant release from the upper Harbor that appear in the Feasibility Study.

PRP Comment No. 2 on Dredging

The PRP commented that the proposed dredging will ultimately remove, displace, and/or kill the benthic organisms living in areas where dredging is planned. Although the area that is dredged will be subsequently recolonized by opportunistic species, it will take some time before the structure and function of the benthic community will return to the physically modified benthic habitat. Therefore, the PRP believes EPA cannot appropriately evaluate these potential short and long term impacts.

EPA Response

EPA recognizes that dredging will result in the loss of the existing benthic community in those areas targeted for remediation. However, EPA believes the existing high levels of sediment PCB contamination significantly impact the health and diversity of the benthic community, and thus considers it necessary for the health of the ecosystem in the long run to remove the vast majority of the source of contamination. In the long term, with the contaminated sediment removed, EPA expects that a more highly diversified, less biologically damaged benthic community will establish itself. The time frame for recolonization is estimated to be approximately 3 to 5 years based on experience at various marine dredged material disposal sites throughout New England.

PRP Comment No. 3 on Dredging

The PRP believes EPA did not adequately evaluate the change of several acres of intertidal habitat into subtidal benthic habitat through dredging. The PRP contends dredging in these areas will eliminate or destroy habitat which supports shellfish beds, e.g., the soft shell clam, *Mya arenaria*, or which serve as important feeding areas for shorebirds and waterfowl.

EPA Response

EPA acknowledges that extensive dredging in the upper Harbor will change some of the intertidal areas, and that organisms currently inhabiting these areas will be destroyed by the remediation process. However, the levels of contamination in these intertidal areas are such that EPA believes the long term benefits of remediating the areas far outweigh the short term impacts. Shellfish and other benthic species will be able to recolonize the post-dredging sediments through larval and adult recruitment. Mature communities of uncontaminated benthic assemblages would be established on these less contaminated sediments in approximately 3 to 5 years.

PRP Comment No. 4 on Dredging

The proposed plan for the upper and lower Harbor will involve the destruction of several acres of saltmarsh, a valuable wetland, by dredging and by placement of confined disposal facilities in wetland areas. The ramifications of this action are insufficiently addressed in the FS and there is no attempt to quantify this impact or to suggest that anything will be done to mitigate it.

EPA Response

EPA disagrees that the destruction of saltmarsh wetland was insufficiently addressed in the FS. EPA notes that its preferred plan for remediation has, in fact, been modified based on public comments relating to wetland and other impacts. The eastern side of the estuary is bordered by an extensive saltmarsh which will remain undisturbed by the remedial operations except for its contaminated outer fringe. The currently proposed CDF locations include areas where only a narrow band of saltmarsh vegetation exists along the shoreline. These areas abut the heavily developed New Bedford shoreline. The filling of limited wetland areas to protect the entire Harbor is considered an overall benefit based on the seriously degraded nature of the entire upper Harbor. Furthermore, EPA will explore whether the seaward faces of the CDFs can be designed as ecologically important habitat during remedial design (e.g., EPA's experience to date with the Hot Spot CDF is that the CDF berms are actively used as nesting areas for a variety of bird species). Finally, support for the proposed CDF-based remedy by the various wetland and resource regulatory agencies (e.g., USEPA, MA DEP, MA DMF, USFWS) shows the general acceptance of the idea that the relatively limited impacts from the CDF structures are appropriate in order to provide a vastly improved benthic and marine environment for the Harbor as a whole.

PRP Comment No. 5 on Dredging

The PRP believes the physical modification of the estuarine habitat through dredging will result in long term indirect effects by changing circulation patterns (erosion of saltmarsh). From a qualitative perspective, the changes to the hydrography and physiography of the upper estuary may ultimately result in a different estuarine community. These impacts have not been evaluated.

EPA Response

EPA disagrees with the PRP as the potential change in tidal hydraulics resulting from dredging was specifically evaluated as a component of the Corps' Engineering Feasibility Study (Teeter, 1988). This study utilized a two-dimensional numerical model to calculate tidal currents for the estuary and predict the movements of sediments within and out of the upper Harbor during dredging. Post-remediation setting was also evaluated. The study's conclusion was that estuary tidal hydraulics will not be altered appreciably by large scale dredging. In addition, saltmarsh emergence is expected to continue as sediments are deposited in quiescent areas.

It should also be noted that saltmarsh fringe areas to be removed primarily along the eastern shore will be restored to elevation, revegetated and, if needed, armored to protect against erosion.

PRP Comment No. 6 on Dredging

In a Journal article not specifically focused on New Bedford, Palermo states that the primary objectives in dredging contaminated sediment are to minimize resuspension, maximize precision so over-dredging and therefore dredged volume is minimized, and maximize productivity so as to minimize the time that sediments are resuspended and organisms are exposed to released contaminants (Palermo, 1991). The PRP believes EPA has failed to discuss how dredge productivity and precision can be balanced or has failed to present an associated cost benefit analysis. The PRP believes that maximizing precision and productivity are competing objectives, especially when working in a shallow estuary.

EPA Response

One specific focus of the pilot dredging study was to evaluate the dredging equipment's ability to remove the contaminated sediment while minimizing over-dredging, sediment resuspension and contaminant releases. Also, in the case of the upper Harbor remedial dredging, precision will not be the same type of problem as it is with typical navigational dredging since almost the entire area will be dredged. EPA believes that a key objective will be to avoid the need to dredge any area more than once, as well as to keep air and water quality impacts to acceptable levels. Further details relative to specific operating parameters and procedures for the dredges will be developed during the design process.

PRP Comment No. 7 on Dredging

The PRP believes EPA will have to dredge pilot channels at least adequately enough for the dredge to be floated in, and perhaps deep enough to allow operation of small tugs to move the barges. The PRP believes this will result in the need to dredge a substantial amount of uncontaminated bottom sediment and contaminate it in the process by mixing it during the dredging process.

EPA Response

EPA disagrees with the PRP's conclusion. As was done with the Hot Spot dredging, a small cutterhead dredge will be utilized in the upper Harbor portion of the Site. This equipment can operate in as little as 2 feet of water and can be moved about and positioned by small work boats (outboards). The dredging will be scheduled around periods of high tide when necessary. There are no plans to dredge access channels, and the need to remove excessive quantities of uncontaminated material is not anticipated.

PRP Comment No. 8 on Dredging

The PRP believes EPA has not adequately addressed the potential for, and magnitude of the transport of suspended solids resulting from dredging operations.

EPA Response

EPA disagrees with the PRP on this issue. Studies conducted by EPA and the Corps of Engineers were specifically designed to address these concerns, and have been referenced nationally as models for remedial dredging evaluations. Work specifically done to address this issue is documented in the Engineering Feasibility Study (EFS) (Averett et al., 1989) and the Pilot Study Report (Otis et al., 1990). The hot spot monitoring report (USEPA, 1997c) also addresses issues of dredging-related impacts or lack thereof. The technical approach included laboratory and modeling studies combined with a field verification program to validate the laboratory and modeling studies under actual operating conditions. The pilot study specifically focused on quantifying the sediment resuspension rate of various types of operating dredges, and monitoring the movement of contamination/resuspended sediment away from the point of dredging. During the EFS, the Corps of Engineers utilized a two-dimensional numerical model to calculate tidal currents for the estuary and to predict the movements of sediments within and out of the upper Harbor during dredging. The EFS also included laboratory studies conducted to evaluate contaminant release from sediments of varying levels of PCB contamination (elutriate tests). By combining the information obtained from these three sources, EPA has been able to develop realistic estimates of contaminant release which focus on the estuary portion of the Site where the majority of dredging will be carried out.

Furthermore, the net PCB transport (or flux) measurements from the hot spot dredging operations support EPA's belief that the proposed ROD 2 dredging can be performed within acceptable limits for PCB resuspension and transport. The 57 kg of PCB transported seaward from the Coggeshall Street Bridge during that dredging program was less than 25% of the amount deemed allowable at the start of the program (USEPA, 1997c). This 57 kg amount includes both naturally occurring PCB flux as well as any caused by the hot spot dredging, which adds additional support to EPA's belief that the dredging can be performed safely.

PRP Comment No. 9 on Dredging

The PRP believes EPA has not adequately addressed the potential long term effects of hydraulic dredging that could result in the entrainment of meroplanktonic larvae for some of the endemic species, e.g., the soft shelled clam and the lobster. The PRP is also concerned that during hydraulic dredging, there is a high probability that successive cohorts of estuarine species may experience high mortality rates through entrainment.

EPA Response

EPA does not agree with the PRP's conclusion, but acknowledges that the proposed dredging will have a significant short term impact on those areas dredged. EPA believes that these temporary impacts are acceptable given the long term objective of remediating the severely ecologically damaged Harbor. Larval entrainment should not be significant for most pelagic plankters, since the cutterhead will be operating at the benthic boundary (sediment/water interface) layer. It should also be noted that organisms with planktonic larvae generally reproduce in such prolific numbers that the overall impact of dredging should be minimal.

PRP Comment No. 10 on Dredging

The PRP believes the hydraulic dredging operations will impede or interfere with use of the estuary as a feeding or nursery area for migratory fish and the planned operation of the dredges will essentially preclude use of the entire area for extended periods.

EPA Response

EPA believes the potential negative impacts from dredging to the surface waters of the Site will be spatially very limited at any one point in time. EPA further believes these potential short term impacts including increased suspended sediment and contaminant concentration, are an acceptable trade-off for the long term objective of remediating the upper and lower Harbor. The potential impacts will be limited by virtue of the dredging schedule which will be restricted to periods of high water due to the shallow water conditions and a maximum of two or three relatively small dredges operating at any one time. Therefore, EPA has concluded that these conditions will not significantly impact use of the Harbor by marine life.

EPA recognizes that the removal of up to two feet of sediment through dredging will eliminate all of the benthic biota from this strata in the upper Harbor. However, EPA believes that these areas will recolonize relatively quickly and should result in a more diverse and biologically healthy benthic community.

PRP Comment No. 11 on Dredging

The PRP believes EPA has not adequately addressed the effects associated with the potential increase in biological oxygen demand (BOD) resulting from exposure of reduced sediments to oxygenated water during dredging and discharge from the CDF. The PRP believes this rapid increase in BOD will reduce the amount of oxygen in the water column and could have significant effects, including death, on organisms in the estuary.

EPA Response

EPA disagrees with the commentor. During the pilot study and Hot Spot dredging, EPA and the Corps of Engineers conducted an extensive monitoring program to address the potential adverse biological impacts from dredging and CDF disposal. The monitoring included the determination of specific contaminant levels in the water column, biological monitoring designed to evaluate cumulative and synergistic impacts, and impacts caused by compounds that were not directly measured (i.e., PAHs, heavy metals and nutrients). The biological monitoring detected no significant impacts that could be attributed to the dredging operations (USEPA, 1997c). In addition, EPA measured dissolved oxygen (DO) levels during the pilot study. The results of these measurements did not indicate that the dredging activities suppressed the DO levels in the adjacent surface waters.

PRP Comment No 12. on Dredging

The PRP believes EPA has not adequately addressed the potential effects of the release of sediment-associated contaminants through dredging. The PRP believes the dredging will significantly increase the bioavailability and subsequent uptake and bioaccumulation of contaminants as the remedial action (dredging) is carried out over several years.

EPA Response

EPA disagrees with the conclusions reached by the PRP in light of the results of the biological monitoring conducted over the years at this Site. This monitoring specifically evaluated any increases in the rate of bioaccumulation of PCBs that could be attributed to the dredging activities. The results of this effort did not indicate any impacts which could be attributed to pilot study or Hot Spot dredging. EPA acknowledges that remedial activities in the estuary could result in an increased flux of contaminants to the lower Harbor over the short term and has provided estimates of this increased flux in the Feasibility Study. The focus in designing and implementing the proposed dredging will be to minimize this flux to pre-determined acceptable levels. Extensive chemical and biological monitoring programs will be in place to track and monitor dredging related impacts. EPA believes that the proposed remediation can be implemented without significantly increasing the movement of PCBs to areas of the lower Harbor and bay.

PRP Comment No. 13 on Dredging

The PRP also believes the topography of the upper and lower Harbor will be changed and the existing sediment bed equilibrium will be modified and, therefore, will result in increased flux of contaminants in other areas of the estuary.

EPA Response

EPA also disagrees with the PRP's conclusion for post-remediation PCB flux. The intention of the remediation effort is to improve conditions in New Bedford Harbor by dramatically reducing the PCB flux or transfer from the sediments to the water column. EPA believes the benefits associated with reducing total PCB concentrations through the planned cleanup activities far outweigh the potential redistribution of remaining PCBs.

PRP Comment No. 14 on Dredging

The PRPs believe that EPA has not adequately addressed the potential degree of PCB volatilization.

EPA Response

As a result of the Hot Spot dredging experience, EPA acknowledges that remedial activities have the potential to increase airborne PCB levels, especially near the CDFs (USEPA, 1997c). However, elevated PCB levels above the NIOSH recommended exposure level during the hot spot cleanup were extremely rare, occurring approximately in only 0.25% of over 4,000 samples. Accordingly, EPA believes that by properly conducting the work there will be no increased risk to workers, the general public, or the environment. Importantly, an air monitoring program will be implemented to guard against such potential risks. The detailed project components, monitoring and contingency plans associated with minimizing PCB volatilization will be developed during the design phase of the project. They will likely be similar to those used for the Hot Spot dredging, and will include proper dredge operation, discharge of the dredged material through a diffuser below water, use of a 2 foot standing water layer in the CDFs, reducing the turbulence on the water surface within the CDFs, contingency plans to cover the CDFs, and air monitoring.

PRP Comment No. 15 on Dredging

The PRP believes EPA did not adequately address the potential for PCB releases associated with dredging and disposal in a CDF, relative to the potential PCB release following another 5-10 years of no-action. The PRP believes this analysis should take into account the effect of natural processes such as capping through sedimentation and degradation of PCBs through microbial action.

EPA Response

EPA disagrees with the commentor and notes that PCB levels in the Harbor even after decades of no-action remain orders of magnitude above levels deemed acceptable to EPA for the protection of both human health and the environment. EPA acknowledges that natural sedimentation and biodegradation does occur at the Site. However, the Agency believes that reliance on slow, uncertain, uncontrollable and potentially non-permanent natural processes is an inadequate and unreliable remediation approach.

3.5.2.2.4 Outer Bay Proposed Plan

PRP Comment

The PRP believes EPA's proposed 10 ppm PCB cleanup plan for upper Buzzards Bay is premature and without basis. These concerns primarily involve the following three assumptions used by NOAA in preparing the underlying rationale for the 10 ppm upper Bay

cleanup: (1) PCB biota concentrations are directly related to sediment PCB levels; (2) PCB contaminated sediments in the upper Bay are the primary source of PCB to area biota; and (3) the sediment PCB distribution used in the analysis accurately represents the nature and extent of PCB contamination in the upper Bay.

In addition, the PRP believes there is a high degree of uncertainty surrounding EPA's estimated costs for the upper Bay cleanup because of the uncertainty associated with the nature and extent of the sediment PCB contamination. The PRP therefore concludes that EPA should segment the upper Bay as a separate operable unit and perform a remedial investigation for the area prior to making a cleanup decision.

EPA Response

Based upon a detailed consideration of comments from the PRPs and others, EPA has adopted the request that further investigations be conducted under a third operable unit for the outer Harbor area prior to finalizing a decision on remedial action. In adopting this request, the Agency has given consideration to comments relating to potential limitations in the existing database for the upper Bay.

3.5.2.2.5 Engineering Feasibility and Cost Estimation

PRP *Comment on* Dredging Costs

The PRP believes EPA has underestimated the costs associated with the dredging component of the proposed remedy by overestimating the daily production rate for the cutterhead dredge.

EPA Response

EPA has updated the cost of the dredging operations by using the experience gained about dredging production rates from the hot spot cleanup operation. For the upper two-thirds of the upper harbor, EPA has assumed the same production rate as was accomplished during the hot spot operations (13.4 cy/hr). For the remainder of the dredging areas, which have deeper water and can thus support longer daily dredging times, EPA has assumed a higher production rate (20 cy/hr). EPA believes these production rate assumptions are reasonable and appropriately well-grounded for use in estimating future dredging costs. The updated cost for the dredging work required by ROD 2 is approximately $22 million.

PRP Comment on CDF Construction Costs

The PRP believes EPA has underestimated the cost to construct the CDFs due to the additional dike material that will be required to compensate for dike settlement.

EPA Response

See EPA's response to Dames & Moore's comment #3 in section 2.7.3 above. EPA believes that the conceptual designs and cost estimates for the remedy are appropriate for this stage of the project's development.

PRP Comment on CDF Siting Costs

The PRP believes EPA has underestimated the cost for the proposed remedy by not including the land acquisition costs for the shoreline areas necessary to support CDF construction.

EPA Response

See EPA's response to Dames & Moore's comment #4 in section 2.7.3 above. EPA believes that any costs associated with future land use issues will not be a significant percentage of the cost of remediating the Site and that the cost estimates and contingency factors contained in the ROD are appropriate for this stage of project development. EPA will continue to work with the affected landowners to achieve mutually agreeable arrangements for land use.

PRP Comments on Water Treatment Costs

The PRP believes EPA has underestimated the costs for water treatment during the proposed cleanup. The PRP concerns include the potential for organics associated with sewage in the New Bedford Harbor sediment to reduce the proposed treatment facility's ability to meet the requisite effluent criteria; and, that EPA has not conducted bench or pilot scale testing of the proposed system.

EPA Response

EPA disagrees, and notes that the proposed treatment system will be very similar to that used in the hot spot dredging operations. EPA has conducted both bench and pilot scale studies of applicable water treatment technologies. Elutriate and batch leachate tests of estuary and hot spot sediment samples were conducted to evaluate the worst case and median PCB concentrations anticipated in the dewatered sediment effluent (Averett, 1989). The Corps of Engineers also conducted settling tests to determine the most effective coagulants (cationic and inorganic polymers) to reduce the suspended solids content of the effluent (Wade, 1988). Different filtering (coarse sand filters, micro filters) and treatment technologies (carbon adsorption, UV/peroxide) have also been evaluated. These efforts included field scale studies evaluated during the Pilot Dredging and Disposal Study under actual operating conditions.

All of the water treatment technologies were tested with Site-specific sediment and thus, undoubtably contained levels of sewage from past discharges. This Site-specific data from both the bench and the field studies did not indicate the organic material associated with sewage wastes would be a problem.

In support of the hot spot cleanup activities, EPA conducted additional bench scale studies to refine the specific unit process technologies and operating parameters to cost-effectively treat the effluent (ERM, 1991). These studies were designed to evaluate which inorganic chemical was most suitable in removing suspended solids, to determine whether better suspended solids control would enhance the performance of carbon adsorption or UV/oxidation, and to determine which polishing system (carbon adsorption or UV/oxidation) would be most effective at achieving effluent goals. These studies demonstrated the effectiveness of the selected treatment technologies.

Also, see EPA's response to Dames & Moore's comment #5 in section 2.7.3 above.

3.5.2.2.6 PRP Comparison of EPA Proposed Plan for Remediation of Estuary and Lower Harbor/Bay and Dredging and Capping the Outer Bay and the In-Place Containment Remedial Plan Proposed by AVX in 1989

PRP Comment

The PRP compared EPA's proposed cleanup plan for the Site with a cleanup proposal it submitted in 1989. The comparison was completed by the PRP using the nine criteria used by EPA to evaluate potential remedies for Superfund sites. The PRP believes that its proposed capping remedy is as protective of human health and the environment as EPA's plan, is less costly, more implementable, and provides greater protection against potential short term impacts.

EPA Response

EPA disagrees with the PRP's conclusion that a capping remedy for the estuary portion of the Site contaminated at greater than 50 ppm PCB is equally protective, less costly and more implementable than the Agency's proposed remedy. To begin with, EPA has improved the protectiveness of the proposed remedy by lowering the target cleanup level for the upper Harbor subtidal sediments from 50 to 10 ppm PCBs (a level that approaches the 1 ppm PCB level deemed by EPA to be ecologically protective). In addition, the PRP's 1989 capping proposal was limited to the upper harbor sediments only; it did not include highly contaminated sediments greater than 50 ppm PCBs in the lower and outer Harbor areas. Clearly the greater areal scope and lower cleanup levels of EPA's proposed remedy make it more protective than the PRP's proposal.

EPA also believes that the PRP has underestimated the cost of an effective capping alternative, even for a cleanup approach that does not include a 10 ppm upper harbor TCL. The PRP assumes that 2 feet (24 inches) of capping material would be required, whereas EPA assumed that 3 feet (36 inches) of material would be required. Although 22 inches (55 cm) is the minimum cap thickness recommended by the Corps of Engineers (Sturgiss and Gunnison, 1988), EPA assumed that 36 inches of material would have to be planned for in order to ensure actual attainment of the minimum thickness during placement in the field. Any cap thickness above the minimum depth would also offer a greater safety factor against long term erosion due to storms, human activity, or bioturbation as well as against chemical breakthrough. Additionally, the PRP's capping proposal does not address the costs to modify, relocate or eliminate the many storm drains and combined sewer overflows in the upper Harbor that would be impacted by a raised riverbed elevation of 2 to 3 feet.

EPA disagrees with the PRP on the number and magnitude of the implementability issues surrounding dredging and shoreline disposal. EPA believes these technologies to be readily implementable and that potential impacts associated with construction and operations can be minimized through available engineering controls. EPA further believes that impacts will be short term in nature and are significantly outweighed by the long term benefits associated with Site cleanup.

Capping also has short and long term negative impacts that must be considered. Short term impacts include burial of the existing benthic community, the need for damming to provide sufficient water depth during ship-based placement of the cap (i.e., impacts to fish runs during implementation), and potential resuspension of PCBs as a sandy cap material is placed on the existing soft, silty in-place sediments. Long term concerns include the potential for remobilization of PCBs over time, the ability to effectively monitor and repair a large underwater cap, the ability to guard against inappropriate human activity at a large underwater cap within an urban harbor, and at this Site, the fact that much of the upper Harbor subtidal area would become intertidal.

For example, the hydrographic surveys performed by the Corps (USACE, 1991) demonstrate that at low tide almost the entire northern-most one-third to one-half of the upper Harbor would be out of water with a 2 to 3 foot cap in place. With just a 2 foot cap, even the channelized area of the river would be above the mean low tide level from the Hot Spot areas north. Thus a 2 foot cap would not be able to be maintained in this area while simultaneously providing for passage of the Acushnet River. The adverse impacts from such capping problems could include permanent elimination of anadramous fish runs in the area.

3.5.3 <u>PRP Request for Admissions Pertaining to Technical Issues Associated with Studies Performed at the New Bedford Harbor Site</u>

PRP RFA Comment #1

The PRP claims that a significant amount of the analytical data which has been gathered on the New Bedford Harbor and included within the analytical database is of suspect quality. The PRP also suggests that it is potentially inappropriate to rely on this database in the development of technical studies relating to PCB contamination in New Bedford Harbor. The PRP RFAs have claimed that data quality concerns exist relating to a number of quality assurance and quality control (QA/QC) issues involving both field sampling and laboratory analysis methods. Concerns which have been identified include issues such as:

- **appropriateness of analytical methodologies for certain analytical data sets**

including PCB quantitation approaches, and

- **sufficiency and use of quality control samples during both field sampling and laboratory analysis.**

EPA Response

The analytical data sets for New Bedford Harbor were gathered by various federal and state agencies and private organizations in conjunction with numerous past environmental investigations of chemical contamination in the Harbor. The investigations were conducted from the late 1970's to the late 1980's. EPA acknowledges that among the numerous studies which have been performed on New Bedford Harbor there exist variations in analytical data quality. These variations reflect a number of factors, including the overall goals of the individual studies and time frames over which the studies were conducted.

EPA notes that over this time frame, technical advances occurred in both the nature of the analytical instrumentation typically utilized for environmental analyses of PCBs and the rigorousness of associated analytical quality assurance and quality control (QA/QC) and data review practices. The Agency acknowledges that some, although not all, of the analytical data collected during early New Bedford Harbor studies may suffer certain QA/QC deficiencies. However, the Agency believes that the nature of QA/QC limitations and their severity vary depending upon the specific studies in question. EPA disagrees that the existence of any QA/QC limitations in a given data set necessarily invalidates the use of the entire data set for all evaluation purposes. EPA notes that minor analytical QA/QC limitations typically have only limited impacts on reported quantitative concentration results. EPA also notes that many valuable qualitative and semi-quantitative conclusions regarding the presence and extent of PCB contamination in New Bedford Harbor were discerned from early analytical studies possessing certain QA/QC limitations.

EPA points out that the principal data sets which were utilized in the development of the Feasibility Study (Ebasco, 1990c) and Supplemental Feasibility Study (Ebasco, 1992) for New Bedford Harbor included sampling and analytical programs conducted by GZA (1986) and Battelle (1987), both of which included extensive laboratory QA/QC programs. In addition, the results from these analytical programs underwent external QA/QC data validation reviews. The results of the external data validation (DV) reviews indicated that some of these data sets possessed certain QA/QC limitations. This generally resulted in DV recommendations that the reported PCB concentrations for a number of groups of samples should be considered as estimated rather than exact values. However, it should be noted that this is not an uncommon finding with regard to environmental analytical data. In a few instances, results for certain individual samples were rejected based on QA/QC deficiencies. EPA duly noted that some of the analytical data used in Site evaluations were estimated values and treated the data accordingly during its evaluations of Harbor contamination.

EPA believes that it is important to recognize that the sediment PCB concentrations detected in many samples collected during the GZA and Battelle studies were very high and range into the hundreds of parts per million in certain areas in the lower Harbor, and into the thousands of parts per million in areas of the upper Harbor. It should also be noted that for some data, analytical QA/QC limitations may result in underestimates of actual sediment PCB concentrations. Therefore, EPA believes that while uncertainties in the exact PCB concentrations in some individual samples may be introduced by data estimations as a result of QA/QC deficiencies, the fundamental analytical conclusions regarding PCB contamination in New Bedford Harbor do not change. Overall, EPA believes that the existing database for the upper and lower Harbor areas contains data of acceptable quality with which to evaluate both PCB contamination and potential remedial measures.

Finally, EPA recognizes that the existing databases contain only a limited amount of data of appropriate quality with which to evaluate the extent of PCB contamination and potential remedial measures in the outer Harbor portion of the New Bedford Harbor Site. Therefore, the Agency will undertake a supplemental sampling program for this area as part of its third Operable Unit RI/FS investigations.

PRP RFA Comment #2

The PRP presented multiple RFAs suggesting that biologically mediated dechlorination processes are naturally occurring mechanisms by which PCBs may be degraded. It is claimed that such processes are ongoing in New Bedford Harbor. The PRP implies that the presence of such processes minimizes the need for any remediation actions in New Bedford Harbor.

EPA Response

EPA acknowledges that information does exist in the scientific literature to indicate biologically mediated degradation of PCB compounds can occur under certain laboratory and field conditions. EPA agrees that the rates at which these processes can occur are likely to be strongly influenced by many variables, including:

- the specific chemical structure of the PCBs in question (i.e., the amount and position of the chlorine substitutions),
- the concentration of the PCBs in the sediment
- the nature of the micro-organisms available to perform dechlorination reactions,
- the availability of the proper chemical nutrients and carbon sources to sustain the required micro-organisms,
- the existence of appropriate physical conditions to support microbial growth, such as appropriate temperature ranges and oxygen contents.

EPA acknowledges that limited evidence does exist to indicate that some degradation of various PCB congeners may be occurring in sediments within New Bedford Harbor. EPA also agrees that those variables which influence PCB degradation in general (see above) are also likely to influence the extent of any degradation processes in New Bedford Harbor sediments. EPA believes that significant uncertainties exist regarding the rates at which PCBs may be degraded in Harbor sediments, and regarding the likelihood of achieving adequate reductions in sediment PCB levels within acceptable time frames. EPA is also concerned that some potential degradation products of PCBs may themselves be of health concern, and that biodegradation may increase the bioavailability of certain metals (Ford, 1995).

EPA notes that PCB degradation does not appear to be occurring at all locales nor throughout the range of PCB concentrations found at New Bedford Harbor. Furthermore, available information suggests that the actual rates may be quite slow, such that the contamination would continue to impact the ecosystem for a long time. While research into ways of enhancing the biodegradation process has progressed, it is currently not available to EPA at a state of development sufficient to eliminate the potential human health and ecological risks at the Site in an acceptable time frame.

See also EPA's response to Dr. Farrington's Comment No.4 in section 3.1.6 above.

PRP RFA Comment #3

The PRP RFAs claim that many organisms have a significant ability to depurate or remove PCBs from their systems implying that the potential toxicity and ecological impacts of *PCBs* to biota in New Bedford Harbor may be overestimated. *It is further claimed that PCB* uptake and depuration rates vary depending upon the specific PCB Aroclor or congener.

EPA Response

EPA acknowledges that scientific literature does indicate that marine organisms appear to display varying abilities to depurate PCBs. EPA also acknowledges that PCB uptake and depuration in marine organisms may be influenced by the specific PCB congener(s) or Aroclor in question. EPA believes, however, that the specific biochemical mechanisms whereby PCBs may adversely impact the health of marine organisms are not completely characterized. Therefore, the Agency believes the fact that organisms may be capable of depurating PCBs at varying rates and quantities does not ensure that organisms' health is not adversely impacted by exposure to PCBs.

EPA also notes that biological depuration rates are typically measured under "clean" environmental or laboratory conditions wherein the contaminant of concern exists only in the test animals' tissue, as opposed to its surrounding environment. These conditions would not apply to the contaminated conditions in New Bedford Harbor where ambient chemical gradients favoring depuration would not exist. However, the possibility for substantive depuration by certain marine organisms further supports EPA's position that overall improvements in the health and viability of marine communities in the Harbor will result from removal of PCB contaminated sediments.

PRP RFA Comment #4

The PRPs present RFAs which claim that certain past saltmarsh and/or saltmarsh-related studies of New Bedford Harbor are flawed. This includes the U.S. Army Corps of Engineers report entitled "A Wetland Analyses in a Highly Polluted Harbor - New Bedford Harbor" (USACE-NED, 1989). The RFAs further imply that these studies do not provide a technical basis for decisions to remediate New Bedford Harbor sediments.

EPA Response

The main objectives of the various saltmarsh studies were not to provide the technical basis for sediment cleanup decisions. Rather, their main purpose was to investigate the nature and extent of contamination in the saltmarsh areas, as well as the productivity and functional values of these areas. The technical rationale for the sediment remediation is included in many other documents in the administrative record, including among others the 1989 Baseline Public Health Risk Assessment (Ebasco, 1989) and the 1989 Baseline Ecological Risk Assessment (Ebasco, 1990a).

PRP RFA Comment #5

The PRPs present RFAs which suggest that the ongoing natural deposition of clean sediments throughout New Bedford Harbor is in effect a natural sediment capping process which will retard the migration of PCBs from contaminated Harbor sediments. The PRPs imply that the existence of this natural deposition process eliminates the need for remedial actions in New Bedford Harbor.

EPA Response

EPA acknowledges that sediment deposition is an ongoing natural process in New Bedford Harbor. However, EPA regards the process as implied by the PRP RFAs to be a potential oversimplification of the relatively complex transport processes which occur. EPA believes that the results of physical-chemical modeling efforts (Battelle, 1990) indicate that the complex mixing processes which occur in New Bedford Harbor are likely to act to diminish the potential impacts of natural sediment deposition processes. Specifically, clean sediments entering New Bedford Harbor from Buzzards Bay or upland areas are likely to become contaminated with PCBs during transport as a result of contact (adsorption) with dissolved phase PCBs present in the Harbor water column. These sediments may subsequently become further contaminated during deposition through contact with dissolved phase PCBs in interstitial water near the sediment-water interface. Therefore, new sediments entering the Harbor are likely to become contaminated with PCBs during transport and deposition within the Harbor.

EPA also notes sediment physical transport and deposition processes are quite variable across New Bedford Harbor and are not uniform. Therefore, the amounts of new sediment which are deposited may vary significantly across the Harbor with some contaminated areas potentially receiving minimal new sediment yearly. In addition, rather than formation of a discrete layer of "clean" new sediments, many naturally occurring processes (e.g., bioturbation, storm induced erosion) will facilitate mixing of new sediment with existing contaminated sediment.

Based upon the variability and uncertainties associated with sedimentation processes, EPA remains concerned that risks to human health and the environment through direct contact exposure to PCB contaminated sediments and indirect exposure through ingestion of contaminated biota will continue in the absence of more well defined remedial measures. After all, sediment PCB levels remain orders of magnitude above levels considered acceptable by both the PRPs (e.g., TERRA, 1997) and EPA even though decades have passed since the Site was first discovered.

Any clean sediments deposited over remediated areas will serve to dilute residual PCB levels, which, especially in the upper harbor, over time could facilitate achievement of the 1 ppm ecologically protective PCB level.

PRP RFA Comment #6

The commentor believes the results of EPA's estimates of PCB transport or flux from the estuary to the lower Harbor are incorrect. The commentor believes EPA's measurements of PCB concentration and tidal stage at the Coggeshall Street Bridge are flawed, and thus so are their estimates of PCB transport to the lower Harbor.

EPA Response

EPA disagrees with the commentor's conclusions. EPA has undertaken several efforts to measure and estimate the PCB flux from the estuary to the lower Harbor since the early 1980s. The results of these studies have shown a wide range of results and a high degree of variability. However, this is to be expected due to the inherent variabilities associated with the Harbor dynamics and the scientific methodology used in measuring the physical and chemical parameters. Although the level of scientific sophistication has increased over the years, the results of all studies support the conclusion that significant quantities of PCB are exported from the upper to the lower Harbor on a daily basis.

The environmental significance of this transport is twofold. First, a component of the waterborne PCBs may be transported directly into Buzzards Bay, an estuary of national importance as recognized by the USEPA's National Estuaries Program. Second, those waterborne PCBs which are not directly transported as far as Buzzards Bay will serve to increase the sediment PCB concentrations in the lower Harbor area. In addition to potentially impacting sediment-dwelling and other organisms in the lower Harbor, the increase in sediment PCB concentrations will increase PCB movement into the overlying surface waters. The impacts of this subsequent chemical transport includes increased surface water PCB concentrations, additional water borne PCB transport into Buzzards Bay and increased bioaccumulation within the marine food chain.

The fact that significant quantities of PCBs are transported from the upper to the lower Harbor is explicitly acknowledged by the commentor's own studies. The commentor estimates that approximately 2.6 lbs of PCB are transported from the upper to the lower Harbor daily. Extensive PCB flux monitoring performed during the hot spot dredging operations in 1994 and 1995 revealed an average PCB flux of 0.5 lbs per day.

APPENDIX B

CALCULATIONS SUPPORTING UPDATED SHORELINE CLEANUP LEVELS

NEW BEDFORD HARBOR SUPERFUND SITE - ROD 2

1. **Coffin Street cove, New Bedford:** This area contains three subareas; the Coffin Street playground area, a recently cleared waterfront property and the hot spot CDF area.

a. Coffin Street playground: This is a well established playground with swings, a playset, ballfield, hockey court and an old outdoor shower. Adjacent and very close to this area is the shoreline bordered by a narrow strip of saltmarsh. There is currently a fence between the playground and shoreline although there is evidence that individuals can trespass over the fence. In addition, well worn paths are present within the fenced area to the shoreline. The playground is surrounded by homes. It is reasonable to assume that an older child aged seven to eighteen could access the shoreline and saltmarshes two times per week during the summer months of June, July and August and one time per week during May and September.

b. Vacant waterfront property: This area was cleared of an old (Pierce) mill complex in 1997. The City of New Bedford has proposed use of at least part of this area as a "Riverside" park. Since the fringe saltmarsh conditions are very similar to those bordering the Coffin Street playground, the potential exposures and receptor are assumed to be the same as for the playground area.

c. CDF: It is reasonable to assume that the hot spot CDF could be converted into a recreational or park area in the future to match the land use of the other properties bordering the cove. As with the playground and vacant waterfront property, it is likely that the fringe saltmarsh in this area would remain and act as a buffer limiting complete access to the shoreline. Based on this future scenario, a future exposure scenario and receptor could be the same as for these other waterfront properties bordering the cove.

d. Proposed cleanup level: All three areas of the Cove have the same receptor and exposure pathways, thus the same cleanup level should be attained in all three areas. The 95% Upper Confidence Level on the arithmetic mean of exposed sediments in these areas should meet the cleanup goal derived below since this is the statistic utilized in assessing exposure in risk assessments.

CLEANUP LEVEL FOR PCBS IN SEDIMENTS IN AREAS OF BEACHCOMBING ACTIVITIES

$$C_s\ (\text{mg/kg}) = \frac{THQ \times BW_c \times AT_{nc}}{FxD\left[\left(\frac{1}{RfD_o} \times \frac{IR_c}{10^6\ \text{mg/kg}}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times RAF_d}{10^6\ \text{mg/kg}}\right)\right.}$$

C_s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient = 1
BW = average body weight of child 7-18 years of age = 47 kg
AT_{nc} = averaging time, noncarcinogen = (12yrs x 365dys/yr) = 4,380 days
F = exposure frequency = 2dys/wk x 4wks/mo x 3mos/yr + 1dy/wk x 2 mos/yr = 32 days per year
D = duration = 12 years
RfD = reference dose for PCBs = 2×10^{-5} mg/kg-dy (IRIS, 10/1/96)
IR = sediment ingestion rate = [100mg/dy (soil ingestion rate for older child) x 0.5 (fraction of total soil/sediment from source)] = 50 mg/day
SA = surface area of an older child exposed (head, hands, lower arms and lower legs) = 4,380 cm^2
AF = skin adherence factor = 0.61 mg/cm^2; derived by averaging adherence factor of 1 mg/cm^2 for age groups 7 - 12 exposed to wet sediment (Kissel et al., 1996) with adherence factor of 0.23 mg/cm^2 for age groups 13 - 18 exposed to wet sediments (Kissel et al., 1996)
RAF_{dermal} = dermal relative absorption factor = 14% = amount absorbed in the blood via the dermal route from the site divided by the amount absorbed in the blood from the toxicity study which is the basis of the RfD or CDF (From Wester et al., 1993)

Substituting the above values into the equation:

$$C\ (\text{mg/kg}) = \frac{(1)(47)(4380)}{32 \times 12\ \left[\frac{(1)}{2\times10^{-5}} \times \frac{(50)}{10^6} + \frac{1 \times 4380 \times 0.6 \times 0.14}{2\times10^{-5} \quad 10^6}\right]}$$

$$= \frac{(205{,}860)}{384\left(\frac{50}{20} + \frac{374}{20}\right)}$$

= 205,860/8141.8 = 25.2 or 25 ppm

2. Industrial area north of Coffin Street playground continuing to Wood Street Bridge: A heavily industrialized area extends north from the Coffin Street playground to the Wood Street Bridge. This area is unlikely to be visited on a regular basis by children or adults since it is on private property, not very accessible and not very attractive. It is assumed that an older child, aged 7-18, *might visit this area one time per week for five months per year* (about 20 days per year).

Proposed Cleanup Goal

$$C_s \text{ (mg/kg)} = \frac{THQ \times BW_c \times AT_{nc}}{FxD\left[\left(\frac{1}{RfD_o} \times \frac{IR_c}{10^6 \text{ mg/kg}}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times RAF_d}{10^6 \text{ mg/kg}}\right)\right.}$$

C_s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient = 1
BW = average body weight of child 7-18 years of age = 47 kg
AT_{nc} = averaging time, noncarcinogen = (12 yrs x 365 dys/yr) = 4,380 days
F = exposure frequency = 20 days per year
D = duration = 12 years
RfD = reference dose for PCBs = $2x10^{-5}$mg/kg-dy (IRIS, 10/1/96)
IR = sediment ingestion rate = [100mg/dy (soil ingestion rate for older child) x 0.5 (fraction of total soil/sediment from source)] = 50 mg/day
SA = surface area of an older child exposed (head, hands, lower arms and lower legs) = 4,380 cm^2
AF = skin adherence factor = 0.61 mg/cm^2; derived by averaging adherence factor of 1 mg/cm^2 for age groups 7 - 12 exposed to wet sediment (Kissel et al., 1996) with adherence factor of 0.23 mg/cm^2 for age groups 13 - 18 exposed to wet sediments (Kissel et al., 1996)
RAF_{dermal} = dermal relative absorption factor = 14% = amount absorbed in the blood via the dermal route from the site divided by the amount absorbed in the blood from the toxicity study which is the basis of the RfD or CDF (From Wester et al., 1993)

Substituting the above values into the equation:

$$C \text{ (mg/kg)} = \frac{(1)(47)(4380)}{20 \text{ x} 12 \left[\frac{(1)}{2x10^{-5}} \text{ x } \frac{(50)}{10^6} + \frac{1}{2x10^{-5}} \text{ x } \frac{4380 \text{ x } 0.6 \text{ x } 0.14}{10^6}\right]}$$

$$= \frac{205{,}860}{240\left(\frac{50}{20} + \frac{374}{20}\right)}$$

= 205,860/5088 = 40.4 or 40 ppm

3. **Houses just north of Wood Street Bridge (New Bedford):** There are three houses just north of the Wood Street bridge which abut the west shore of the Acushnet River. Paths lead from each home through a thin band of saltmarsh to the river. Due to the close proximity of the river and the easy access to the river and sediment, the cleanup goal for all sediment areas adjacent to these homes should be consistent with a "residential cleanup goal" (see below).

SEDIMENT CLEANUP LEVEL FOR RESIDENTIAL EXPOSURES

The following cleanup level applies to residential properties which abut areas of the harbor with exposed sediments. This cleanup level is protective of a young child (ages 0-6) who would access these sediments as if they were an extension of their backyard. This cleanup level should be attained in surface soils, (i.e., 0-1ft). The following calculation assumes two potential exposure pathways from soil; accidental ingestion of soil and dermal absorption of soils. The inhalation pathway is not expected to contribute significantly to the total risk from contaminated soils.

$$C_s\ (\text{mg/kg}) = \frac{THQ \times BW_c \times AT_{nc}}{FxD\left[\left(\frac{1}{RfD_o} \times \frac{IR_c}{10^6\ \text{mg/kg}}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times RAF_d}{10^6\ \text{mg/kg}}\right)\right.}$$

C_s = PCB concentration in soil = soil cleanup level
THQ = target hazard quotient = 1
BW = average body weight of child 0-6 years of age = 15 kg
AT_{nc} = averaging time, noncarcinogen = (6 yrs x 365dys/yr) = 2,190 days
F = exposure frequency = 150 days per year (amount of time that ground is not frozen or covered with snow)
D = duration = 6 years
RfD = reference dose for PCBs = $2\text{x}10^{-5}$ mg/kg-dy (IRIS, 10/1/96)
IR = sediment ingestion rate = 200 mg/day (soil ingestion rate for young child)
SA = surface area of a young child exposed (head, hands, lower arms and lower legs) = 2,900 cm^2
AF = skin adherence factor = 1 mg/cm^2 (Kissel et al., 1996, for young children)
RAF_{dermal} = dermal relative absorption factor = 14% = amount absorbed in the blood via the dermal route from the site divided by the amount absorbed in the blood from the toxicity study which is the basis of te RfD or CPF (from Wester et al., 1993)

Substituting the above values into the equation:

$$C\ (\text{mg/kg}) = \frac{(1)(15)(2190)}{150 \times 6\ \left[\frac{(1)}{2\text{x}10^{-5}} \times \frac{(200)}{10^6} + \frac{1 \times 2900 \times 1 \times 0.14}{2\text{x}10^{-5} \quad 10^6}\right]}$$

$$= \frac{(32{,}850)}{900\left(\frac{200}{20} + \frac{406}{20}\right)}$$

= (32850)/27,270 = 1.2 or 1 ppm

4. **South of the Wood Street Bridge (Acushnet Side):** Just south of the Wood Street bridge on the Acushnet and Fairhaven shore of the Acushnet River is a small industrial area bordered to the south by a continuous and extensive saltmarsh system. These saltmarshes extend inland quite a bit before meeting houses or roads and are difficult to get to. It is likely that only an older child or adult would access these marshes on a regular basis. Thus the most reasonable exposure pathway is for an older child (7-18 years of age) who would visit this area one time per week for five months per year. The cleanup level would be the same for #2 above; the industrial area north of the Coffin St. playground (i.e., 40 ppm).

5. Veranda Street inlet (Fairhaven)

This area contains many homes whose lawns extend right down to the river. There is very little slope and the river is essentially at the level of the lawn. Thus the river can be considered an extension of the backyards of these residences. The cleanup goal for exposed sediments adjacent to and extending into residential backyards in this area should attain the residential cleanup level of 1 ppm (as derived in #3 above).

Appendix C - Administrative Record Index

INTRODUCTION

This document is the index to the Administrative Record compiled for the Record *of Decision for the Upper and Lower Harbor Operable Unit of the* New Bedford Harbor Superfund Site. The index cites site-specific documents that were relied upon in formulating the selected remedy for this operable unit. Although not expressly listed in this index, all documents contained in the Administrative Record for the New Bedford Harbor NPL Site Hot Spot Operable Unit Record of Decision and Amendments are incorporated by reference herein, and are expressly made a part of this administrative record.

The Administrative Record, consisting of 18 three-ring binders of the documents listed herein, is available for public review, by appointment, at the EPA Region I OSRR Records Center, Boston, MA, (617-573-5729) and at the New Bedford Public Library, 613 Pleasant Street, New Bedford, Massachusetts, 02745. (Tel. 508-991-6281).

Questions concerning this Administrative Record should be addressed to the EPA Region I site manager.

An Administrative Record is required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA).

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3.0 Remedial Investigation (RI)

3.2 Sampling and Analysis Data

1. Letter from Michael J. Moore, Wood Hole Oceanographic Institute to Mary C. Sanderson, EPA Region I (April 17, 1990) with attached National Oceanic and Atmospheric Administration (NOAA) map of the site area. Concerning an upcoming preliminary study of Fundulus heteroclitus histopathology.
2. Letter from Michael J. Moore, Wood Hole Oceanographic Institute to Mary C. Sanderson, EPA Region I (June 29, 1990) with attached National Oceanic and Atmospheric Administration (NOAA) map of the site area. Concerning an upcoming preliminary study of Fundulus heteroclitus histopathology.
3. Letter from Michael J. Moore, Wood Hole Oceanographic Institute to Mary C. Sanderson, EPA Region I (November 14, 1990), concerning a summary of Fundulus heteroclitus histopathological studies of the Acushnet River.

3.10 Endangerment Assessment

1. "Draft Final Baseline Ecological Risk Assessment - New Bedford Harbor Site Feasibility Study," E.C. Jordan Co. for EBASCO Services Inc. (April 1990).
2. Cross Reference: The Draft Baseline Public Health Risk Assessment, (E.C. Jordan for EBASCO), August 1989 is filed and cited under 3.10.12 in the April 6, 1990 Hot Spot Operable Unit Administrative Record.

4.0 Feasibility Study (FS)

4.1 Correspondence

1. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Mary C. Sanderson, EPA Region I (March 30, 1990), concerning transmittal of the attached target cleanup levels for the New Bedford Harbor site.
2. Cross-reference: Letter from Mark J. Otis, U.S. Army Corps of Engineers to Mary C. Sanderson, EPA Region I (May 29, 1990) with attached Mailing List including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group, concerning transmittal of the May 1990 "New Bedford Harbor Superfund Pilot Study Evaluation of Dredging and Dredged Material Disposal," U.S. Army Corps of Engineers [Filed and cited as entry number 3 in 11.5 Site Level - General Correspondence].

4.1 Correspondence (continued)

3. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Kenneth Finkelstein, U.S. Department of Commerce National Oceanic and Atmospheric Administration (October 23, 1990), concerning the attached detailed cost estimate and discussion related to remediation of several areas within the New Bedford Harbor site located outside the hurricane barrier.
4. Memorandum for the Record, Mark J. Otis, U.S. Army Corps of Engineers (April 8, 1991), concerning the technical impracticality of attaining a 1 ppm residual PCB concentration at the New Bedford site.
5. Memorandum from Mary Sanderson, EPA Region I to the file concerning The New Bedford Harbor Feasibility Study and Proposed Plan; dredging depths September 10, 1991).
6. Letter from Lewis M. Horzempa, EBASCO Services Inc. to Mary C. Sanderson, EPA Region I (September 24, 1991) with the attached Memorandum from Alan S. Fowler, EBASCO Services Inc. to Lewis M. Horzempa, EBASCO Services Inc. (September 10, 1991), concerning engineering estimates for the Feasibility Study footprint adjustments.
7. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Alan S. Fowler, EBASCO Services Inc. (March 16, 1992), concerning transmittal and content of the attached cost estimate for the remedial alternatives developed for the bay portion of the New Bedford Harbor Superfund Site.
8. Letter from Jeffrey Benoit, Commonwealth of Massachusetts Executive Office of Environmental Affairs to Gayle Garman, EPA Region I (March 29, 1992), concerning preliminary state views on a supplemental proposed remedial action plan for the outer harbor.
9. Letter from Lewis Horzempa, EBASCO Services Inc. to Gayle Garman, EPA Region I, (April 23, 1992) with attached Memorandum from Alan S. Fowler, EBASCO Services Inc., (April 23, 1992), concerning supplemental feasibility study support task assessing cost implications on Alternative Bay - 4 if remedial volumes are increased.
10. Memorandum to Mark Otis, U.S. Army Corps of Engineers from Daniel E. Averett concerning Confined Disposal Facility (CDF) leachate losses, (October 28, 1992).
11. Memorandum to Mark J. Otis, U.S. Army Corps of Engineers from Daniel E. Averett, concerning hydraulic conductivity and consolidation data for New Bedford sediment, (February 9, 1993).
12. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Gayle Garman, EPA Region I concerning estimates of contaminant loss from confined disposal facilities (February 12, 1993).
13. Letter from Lewis Horzempa, EBASCO to Gayle Garman, EPA Region I, (March 11, 1993) with attached Feasibility Study Cost Estimate for EPA's proposed remedy.

4.1 Correspondence (continued)

14. Letter, with attachments, from Mark J. Otis, U. S. Army Corps of Engineers to Gayle Garman, EPA Region I responding to questions about leachate received during the proposed plan comment period (April 13, 1993).
    A. Memorandum to Mark J. Otis, U.S. Army Corps of Engineers from Daniel E. Averett concerning The New Bedford Harbor Superfund Site/Confined Disposal Facility (CDF) Leachate Losses (March 19, 1993).
    B. Figures labeled "Typical Cross Sections - CDF #1 & #1b (2 views) and CDF #7 , computed by Mark J. Otis, U.S. Army Corps of Engineers, (February 10, 1993)
15. Memorandum from Lewis Horzempa, EBASCO Services, Inc. to Alan S. Fowler, EBASCO Services, Inc. (August 27, 1993) concerning Ion Exchange as an Effluent Polishing Step, with transmittal letter from Lewis Horzempa, EBASCO Services, Inc. to Gayle Garman, EPA Region I (August 26, 1993).
16. Handwritten notes by David Dickerson, EPA Region I on CDF-7 (Confined Disposal Facility-7) meeting (April 5, 1995).
17. Handwritten notes, by David Dickerson, EPA Region I on CDF-7 (Confined Disposal Facility-7) meeting (October 5, 1995).
18. Handwritten notes by David Dickerson, EPA Region I on Phase 2 Cost Estimate Meeting (March 7, 1996).
19. Letter from David Dickerson, EPA Region I to Thomas K. Neyhart, ComElectric concerning possibilities for underwater cable crossings, and including three (3) figures (April 25, 1996).
20. Revised FS Cost Estimate Summary - New Bedford Harbor, Foster Wheeler, June 21, 1996.
21. Letter from David Dickerson, EPA Region I to Dennis Perry, ComElectric concerning Submerged Power Cables at the New Bedford Harbor Superfund Site (December 31, 1996).
22. Letter from Dennis M. Perry, ComElectric to David Dickerson, EPA Region I concerning aerial photo showing extremes of cable crossing in the Acushnet River (February 18, 1997). Photo may be reviewed by appointment at the EPA Records Center, 90 Canal St., Boston, MA.
23. Letter from Dennis M. Perry, ComElectric to David Dickerson, EPA Region I requesting a meeting to discuss EPA's Proposed Cleanup Plan (March 27, 1997).
24. Letter from David Dickerson, EPA Region I to Dennis Perry, Commonwealth Electric Company memorializing the April 16, 1997 meeting with representatives from EPA, ComElectric, Army Corps of Engineers and Foster Wheeler (April 28, 1997).
25. Letter from Dennis M. Perry, ComElectric to David Dickerson, EPA Region I summarizing the meeting regarding ComElectric's submerged power cables, on May 21, 1997 (July 7, 1997).
26. Memorandum from Anne-Marie Burke, EPA Region I to Dave Dickerson, EPA Region I, concerning target levels for PCBs in fish for the New Bedford Harbor Site (September 22, 1997).

4.1 Correspondence (continued)

27. Letter from David Dickerson, EPA Region I to Dennis Perry, Commonwealth Electric Company containing minutes of the July 9, 1997 meeting with representatives from EPA, ComElectric, Army Corps of Engineers, MA DEP and Foster Wheeler (October 2, 1997).
28. Letter from David Dickerson, EPA Region I to Dennis Perry, Commonwealth Electric Company, concerning EPA's share of the cost of replacing submerged power cables in the Acushnet River (December 9, 1997).
29. Agenda for meeting between EPA and ComElectric held March 18, 1998. [Cost estimates for cables relocation are cited and filed in 4.4.6].
30. Letter from Chester Janowski, EPA Region I to Dennis Perry, Commonwealth Electric Company concerning sharing the cost of Belleville Road intersection work (April 7, 1998).
31. Letter from Lawrence D. Worden, Department of Public Works, City of New Bedford to David Dickerson, EPA Region I concerning Combined Sewer Overflows (CSOs) near the proposed Confined Disposal Facilities (CDFs) (May 5, 1998).
32. Memorandum from Ann Marie Burke, EPA Region I to David Dickerson, EPA Region I concerning area specific cleanup levels for New Bedford Harbor (June 30, 1998).

4.2 Sampling and Analysis Data

1. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Mary C. Sanderson, EPA Region I (April 16, 1991), concerning the attached:
   A. "Well Sampling," U.S. Army Corps of Engineers (October 9-10, 1990).
   B. "Sediment (CDF) Sampling," U.S. Army Corps of Engineers (November 15, 1990).
2. Memorandum from Paul Craffey, Commonwealth of Massachusetts Department of Environmental Protection to Gayle Garman, EPA Region I (January 6, 1992), concerning transmittal and content of the attached PCB data on bird, fish, and sediment analysis.
3. Memorandum for the Record, Gayle Garman, EPA Region I (January 13, 1992) with attached "Table 4-10 trace Metals Analysis Results" from the "Pilot-Scale Incineration of PCB-Contaminated Sediments from the Hot Spot of the New Bedford Harbor Superfund Site," (November 1991), concerning TLCP data on composited sediment sample.
4. "Analytical Data Report - New Bedford - Wells (3/11/92)," U.S. Army Corps of Engineers New England Division Environmental Laboratory (April 29, 1992).
5. Letter Report from Lewis M. Horzempa, EBASCO Services Inc. to Gayle Garman, EPA Region I (June 25, 1992) , concerning PCB concentration and location data sources supporting the attached table.
6. Sample Results for Sediments Sampling North of Wood Street, with Transmittal Slip from Mark Otis, U.S. Army Corps of Engineers to Dave (Dickerson) U.S. EPA Office of Site Remediation and Restoration (July 10, 1995).
7. *Preliminary TCLP and Compressive Strength Data, March 26, 1996.*

4.4 Interim Deliverables

1. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Mary C. Sanderson, EPA Region I (January 25, 1990), concerning transmittal of the attached "Upper Estuary Capping Alternative," U.S. Army Corps of Engineers.
2. "Final Air Monitoring Report - Volume I - New Bedford Harbor Pilot Dredging and Disposal Study - New Bedford Harbor Feasibility Study - Task 26," EBASCO Services Inc. (July 1990).
3. "Final Air Monitoring Report - Volume II - New Bedford Harbor Pilot Dredging and Disposal Study - New Bedford Harbor Feasibility Study - Task 26," EBASCO Services Inc. (July 1990).
4. Draft Phase 2 Cost Estimates received from Foster Wheeler June 14, 1996.
5. Memorandum from Mark J. Otis, U.S. Army Corps of Engineers to David Dickerson, EPA Region I concerning enclosed Memorandum for the Record with attachments regarding the estimated quantity and quality of CDF leachate. (October 17, 1997)
6. New Bedford Supply Cables Relocation Estimates and Schedules prepared by ComElectric (March 18, 1998). [Meeting agenda for meeting held March 18, 1998 is filed and cited as 4.1.30].

4.5 Applicable or Relevant and Appropriate Requirements (ARARs)

1. "Draft Final Regulation Assessment (Task 63) for New Bedford Harbor," E.C. Jordan Co. for EBASCO Services Inc. (March 1990).
2. Memorandum from Gary Gonyea, Massachusetts Department of Environmental Protection, Division of Wetlands and Waterways to Helen Waldorf, Bureau of Waste Site Cleanup concerning Division of Wetlands and Waterways Applicable or Relevant and Appropriate Requirements (ARARs) for the New Bedford Harbor Superfund Site (July 8, 1992).
3. Memorandum from John Carrigan, DEP/BSWC - Boston to Paul Craffey, DEP/BWSC - Boston, concerning review of the documents supplied concerning proposed cleanup of the New Bedford Harbor Site (July 15, 1992).
4. Memorandum from Lawrence Gill, MA DEP to Helen Waldorf, BWSC outlining the Division of Water Pollution Control's Applicable or Relevant and Appropriate Requirements (August 8, 1992).
5. Letter from Helen Waldorf, Massachusetts Department of Environmental Protection to Gayle Garman, EPA Region I concerning Estuary/ Harbor/ Bay Operable Unit - State ARARs (January 4, 1993).
6. Letter from Helen Waldorf, Department of Environmental Protection to Mark Lowe, EPA Region I Office of Regional Counsel concerning ARARs for Estuary/Harbor/Bay Operable Unit for The New Bedford Harbor Superfund Site (January 6, 1993).

4.5 Applicable or Relevant and Appropriate Requirements (ARARs) (continued)

7. Letter from Jeffrey Benoit, Massachusetts Executive Office of Environmental Affairs to Helen Waldorf, Massachusetts Department of Environmental Protection concerning the review of the Proposed Remedial Action Plan and the May 1992 Addendum by Massachusetts Coastal Zone Management Office (February 6, 1993). Relevant Regulatory policies and a Summary of ARARs are included.
8. Memorandum from Edward Reiner, EPA to Gayle Garman, New Bedford Harbor Project Manager concerning wetlands values in New Bedford Harbor (April 27, 1993).
9. Letter from Mark A. Lowe, EPA Region I, Office of Regional Counsel to Richard Lehan, Massachusetts Department of Environmental Protection concerning applicability of 310 CMR 9.35 to Estuary/Harbor/Bay Operable Unit (May 18, 1993).
10. Letter from Richard Lehan, Massachusetts Department of Environmental Protection to Mark A. Lowe, EPA Region I, Office of Regional Counsel concerning department position of State waterways and hazardous waste ARARs (August 11, 1993).
11. Letter, with attachments, from Amanda Dickerson, Massachusetts Hazardous Waste Facility Site Safety Council to Paula Fitzsimmons, EPA Region I summarizing action taken with respect to the applicability of MGL chapter 21D to the proposed incinerator (June 30, 1994).
    A. Memorandum: Report of the Applicability Committee Regarding CERCLA /21E Remediation and Clean-up Activities (Including Proposed New Bedford PCB Incinerator), and Clean Harbors of Natick, Inc.'s License Renewal (May 9, 1994).
12. Letter from David Dickerson, EPA Region I to Brona Simon, Massachusetts Historical Commission requesting any information on any known or potential historic resources within the proposed dredging area or the proposed CDF areas (July 25, 1996).
13. Letter from Brona Simon, Massachusetts Historical Commission to David Dickerson, EPA Region I concerning identification of historic and archaeological properties that might be affected by proposed dredging and disposal actions at New Bedford Harbor (October 11, 1996).
14. Letter from Victor Mastone, Massachusetts Executive Office of Environmental Affairs to David Dickerson, EPA Region I to follow up on October 11, 1996 letter from Brona Simon (November 5, 1996). Massachusetts Board of Underwater Archaeological Resources Statute and Related State Laws are attached.
15. Letter from Helen Waldorf, Commonwealth of Massachusetts DEP to David Dickerson, EPA Region I concerning State ARARs, with attached tables of ARARs (August 27, 1997).

4.6 Feasibility Study (FS) Reports

1. "New Bedford Harbor Superfund Pilot Study - Evaluation of Dredging and Dredged Material Disposal," U.S. Army Corps of Engineers (May 1990).

4.6 Feasibility Study (FS) Reports (continued)

2. Memorandum from Robert W. Whalin, U.S. Army Corps of Engineers to Mary Adolf, U.S. Army Corps of Engineers (August 31, 1990), concerning transmittal of the attached "New Bedford Superfund Project Evaluation of Carbon and UV/Hydrogen Peroxide Treatment of Confined Disposal Facility ," Peroxidation Systems Inc. for the U.S. Army Corps of Engineers (July 1990).
3. "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay - Volume I," E.C. Jordan Co. for EBASCO Services Inc. (August 1990).
4. "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay - Volume II," E.C. Jordan Co. for EBASCO Services Inc. (August 1990).
5. "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay - Volume III," E.C. Jordan Co. for EBASCO Services Inc. (August 1990).
6. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Volume I," Battelle for EBASCO Services Inc. (September 21, 1990).
7. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Volume II," Battelle for EBASCO Services Inc. (September 21, 1990).
8. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Volume III," Battelle for EBASCO Services Inc. (September 21, 1990).
9. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Appendices A-D," Battelle for EBASCO Services Inc. (September 21, 1990).
10. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Appendices E-F," Battelle for EBASCO Services Inc. (September 21, 1990).
11. " Final Report - Modeling of the Transport, Distribution, and Fate of PCBs and Heavy Metals in the Acushnet River/New Bedford Harbor/Buzzards Bay System - Appendices G-M," Battelle for EBASCO Services Inc. (September 21, 1990).
12. "Overview of the New Bedford Harbor Physical/Chemical Modeling Program," Battelle for EBASCO Services Inc. (April 1, 1991).
13. "Draft Final Supplemental Feasibility Study Evaluation for Upper Buzzards Bay - New Bedford Harbor RI/FS," EBASCO Services Inc. (May 1992).

Comments

14. Comments dated September 12, 1990 from Leonard C. Sarapas, Balsam Environmental Consultants, Inc. for AVX Corp. on the August 1990 "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay," E.C. Jordan Co. For EBASCO Services Inc.

4.6 Feasibility Study (FS) Reports (continued)

15. Comments dated October 30, 1990 from Kenneth Finkelstein,. U.S. Department of Commerce National Oceanic and Atmospheric Administration on the August 1990 "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay," E.C. Jordan Co. For EBASCO Services Inc..
16. Comments dated November 1, 1990 from Helen Waldorf, Commonwealth of Massachusetts Department of Environmental Protection on the August 1990 "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay," E.C. Jordan Co. for EBASCO Services Inc. with attached:
    A. Memorandum from John A. Carrigan, Commonwealth of Massachusetts Department of Environmental Protection to Helen Waldorf, Commonwealth of Massachusetts Department of Environmental Protection (October 23, 1990). , concerning Applicable or Relevant and Appropriate Requirements (ARARs): 21C Hazardous Waste Regulations.
    B. Comments dated October 24, 1990 from Christy Foote-Smith, Commonwealth of Massachusetts Department of Environmental Protection on the August "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay," E.C. Jordan Co. for EBASCO Services Inc..

Responses to Comments

17. Response October 5, 1990 from Mary C. Sanderson, EPA Region I to Comments Dated September 12, 1990 from Leonard C. Sarapas, Balsam Environmental Consultants, Inc. For AVX Corp..

4.9 Proposed Plans for Selected Remedial Actions

1. "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I (January 1992).
2. "Summary of EPA's Preferred Alternative for Addressing Contamination at the New Bedford Harbor Superfund Site - Estuary and Lower Harbor/Bay Operable Unit," with attached "Resumo da Alternativa Preferida de EPA Relativa a Contaminacao do Porto de New Bedford no Sitio do Superfund - Estuario e Parte Baixa Operativa do Porto/Baia," EPA Region I (January 1992).
3. "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I (May 1992).
4. Letter from Jeffrey Benoit Massachusetts Executive Office of Environmental Affairs to Gayle Garman, EPA Region I commenting on the Proposed Remedial Action Plan dated January 1992 and the Addendum dated May 1992 (July 13, 1992).
5. Memorandum from Richard Cavagnero, EPA Region I Office of Site Remediation and Restoration to Remedy Review Board concerning attached information package (July 10, 1996).

4.9 Proposed Plans for Selected Remedial Actions (continued)

6. Memorandum from David Dickerson, EPA Region I Office of Site Remediation and Restoration to National Remedy Review Board (July 25, 1996), concerning additional material for review.
7. Memorandum from Bruce Means, National Remedy Review Board to Linda M. Murphy, EPA Region I Office of Site Remediation and Restoration (September 11, 1996), concerning National Remedy Review Board recommendations on the New Bedford Harbor Superfund Site.
8. Letter from David Dickerson, EPA Region I to Lewis Horzempa and Alan Fowler, Foster Wheeler Environmental Corp. (September 11, 1996), concerning New Bedford Harbor ROD 2 Proposed Plan Cost Estimates: New assumptions for calculating air monitoring costs.
9. Memorandum from David Dickerson, EPA Region I and Cindy Catri, EPA Region I ORC to David Pincumbe, Ann Williams, Jane Downing, Larry Brill, Frank Ciavattieri and Paul Craffey, EPA Region I (October 11, 1996), concerning the proposed TMDL for copper, and other issues related to the Proposed ROD 2 water treatment plants for the New Bedford Harbor Superfund Site.
10. Memorandum from David Dickerson, EPA Region I to File (October 23, 1996), concerning ROD 2 PCB limits for The New Bedford Harbor Superfund Site.
11. U.S. EPA Superfund Program, Proposed Cleanup Plan, Upper and Lower New Bedford Harbor, (November 1996).
12. Programa "Superfund" do EPA dos E.U. "Proposto Plano de Limpeza Areas Superior e Inferior do Porto de New Bedford", Novembro de 1996.
13. Letter from Alan S. Fowler, Foster Wheeler Environmental Corp. to David Dickerson, EPA Region I (November 1, 1996), concerning the attached tables including revised feasibility study cost estimates for eleven remedial alternatives.
14. Letter from David Dickerson, EPA Region I to New Bedford Harbor Abutters, requesting comments on the Proposed Cleanup Plan and including 2 maps showing locations of the four CDFs (Confined disposal facilities) (December 4, 1996). List of abutters to whom letter was sent is also attached.
15. Letter from David Dickerson, EPA Region I to New Bedford Harbor Abutters, requesting comments on the Proposed Cleanup Plan and including 2 maps showing locations of the four CDFs (Confined disposal facilities) (December 12, 1996). List of abutters to whom letter was sent is also attached.
16. Memorandum from Larry Brill, EPA Region I to Ron Manfredonia, Jane Downing, Dave Pincumbe , Dave Dickerson , EPA Region I summarizing the meeting held to discuss the Superfund cleanup of New Bedford Harbor and the discharge of supernatant from the Confined Disposal Facilities (CDFs) (January 3, 1997).
17. Letter from Linda M. Murphy, EPA Region I to Bruce Means, National Remedy Review Board, OSWER concerning the board's recommendations for the New Bedford Harbor Superfund Site (May 22, 1997).

4.10 Interagency Agreements (IAGs)

1. Scope of Work for U.S. Army Corps of Engineers for cost estimate to replace ComElectric's submerged power cables (November 19, 1997).

5.0 Record of Decision (ROD)

5.3 Responsiveness Summary

1. Comments dated January 24, 1992 from the LUPUS Foundation of America, Inc.,on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.
2. Comments dated February 5, 1992 from George Walmsey, Edward J. Mee, and Frank Barcellos Jr., Town of Fairhaven Board of Health on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site,'' EPA Region I.
3. Cross Reference: Transcript, Proposed Plan Public Hearing for the New Bedford Harbor Superfund Site (March 5, 1992) [Filed and cited as entry number 2 in 13.4 Public Meetings].
4. Comments dated March 29, 1992 from Jeffrey Benoit, The Commonwealth of Massachusetts Office Coastal Zone Management (MCZM) on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.
5. Comments dated April 30, 1992 from John M. Chaplick, New England Sierra Club on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.
6. Comments dated May 15, 1992 from Gerry E. Studds, U.S. House of Representatives on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.
7. Comments dated May 22, 1992 from Helen Waldorf, Commonwealth of Massachusetts Department of Environmental Affairs on the January 1992 "EPA Proposed Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the August 1990 "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay - Volumes I-III", E.C. Jordan Co. for EBASCO Services Inc..
8. Comments dated June 3, 1992 and revised comments dated June 9, 1992 from John W. Farmington, Woods Hole Oceanographic Institution on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.

5.3 Responsiveness Summary (continued)

9. Comments dated June 9, 1992 from David Dow, Sierra Club on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.
10. Cross Reference: Transcript, Proposed Expanded Cleanup Plan for Upper Buzzards Bay, New Bedford Harbor Superfund Site (June 10, 1992) [Filed and cited as entry number 3 in 13.4 Public Meetings].
11. Comments dated June 14, 1992 from Martin S. Manley, City of New Bedford Harbor Development Commission on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.
12. Comments dated July 8, 1992 from Jacqueline Duckworth, Greater New Bedford Citizens Work Group on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.
13. Comments dated July 9, 1992 from Rosemary S. Tierney, Mayor of the City of New Bedford on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region 1.
14. Comments dated July 10, 1992 from Susan Tierney, William Patterson, and Richard B. Roe, New Bedford Harbor Trustee Council on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region 1.
15. Comments dated July 10, 1992 from Helen Waldorf, Commonwealth of Massachusetts Department of Environmental Affairs on the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region 1.
16. Comments dated July 10, 1992 from Joseph E. Costa, The Buzzards Bay Project on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.

5.3 Responsiveness Summary (continued)

17. Comments dated July 13, 1992 from John Lindsey and L. Jay Field, U.S. Department of Commerce National Oceanic and Atmospheric Administration on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site." EPA Region I.
18. Comments dated July 13, 1992 from Mary K. Ryan, Nutter, McClennen & Fish, for AVX Corp. on the August 1990 "Draft Final - Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay - Volumes I-III," E.C. Jordan Co., for EBASCO Services Inc.; the May 1992 "Draft Final - Supplemental Feasibility Study Evaluation for Upper Buzzards Bay - New Bedford Harbor RI/FS," EBASCO Services Inc.; the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I with Attached:
    A. "PCB Cleanup Guidelines for the Estuary and Lower Harbor/ Bay Sediments: Evaluation of a 50 ppm Cleanup Level " Terra, Inc. (July 10, 1992).
    B. "A Theoretical Evaluation of the Effects of Dredging on PCB Emissions from New Bedford," K. T. Valsaraj and D.D. Reible, Department of Engineering and Hazardous Waste Research Center, Louisiana State University for Balsam Environmental Consultants, Inc. (September 1991).
    C. Memorandum to Weldon Bosworth, Balsam Environmental Consultants, Inc. from K.T. Valsaraj and D.D. Reible, Department of Engineering and Hazardous Waste Research Center, Louisiana State University (July 10, 1992), concerning evaporation of PCBs from the proposed CDFs at New Bedford Harbor.
    D. "Review of EPA (1992): Addendum Proposed Plan. EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," SEA.
    E. Requests for Admissions (RFAs)

Documents submitted as attachments to Attachment E, Requests for Admissions (RFAs) may be reviewed, by appointment only, at EPA Region I, Boston, Massachusetts.

    F. Miscellaneous Attachments
        1. Comments dated March 2, 1992 from Gordon D. Strickland, John McKenzie, and Douglas Bannerman, PCB Consensus Group on the Proposed Rule to Promulgate Numeric Sediment Cleanup Criteria for Priority Toxic Pollutants in Sediment.
        2. FOIA Correspondence
        3. N.J.A.C. 7:15-18A

5.3 Responsiveness Summary (continued)

18.f. 4. "New Bedford Harbor Wastewater Treatment Plant Outfall Outer Harbor Sediment Sampling Program 1990 Sampling Protocol" Balsam Environmental Consultants, Inc. for Nutter, McClennen & Fish (March 9, 1990), concerning TPO Data with attached Chromatograms submitted under separate cover from laboratory.

5. Expert Affidavits on the Effect of Hurricane Carol on Transport and Circulation.

6. Region I Superfund NPL and Removal Site File Structure.

7. Excerpt from Court Transcript of February 7. 1990.

8. "Public Health and Environmental Risk Assessment for the New Bedford Harbor Superfund Site." E.C. Jordan Co.

G. Resumes.

19. Comments dated July 13, 1992 from Jeffrey Benoit, The Commonwealth of Massachusetts Office Coastal Zone Management (MCZM) on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site." EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup) to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.

20. Comments dated July 13, 1992 from Suzanne K. Condon and William C. Strohsnitter, Commonwealth of Massachusetts Department of Public Health on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/ Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site." EPA Region I..

21. Comments from Angela Days, Member of Public on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I.

22. Comments from Robert B. Pond, Stripers Unlimited on the January 1992 "EPA Proposes Cleanup Plan to Address Contamination in the Estuary and Lower Harbor/Bay at the New Bedford Harbor Site," EPA Region I and the May 1992 "Addendum Proposed Plan - EPA Proposes Expanded Cleanup to Address Contamination in Parts of Upper Buzzards Bay, New Bedford Harbor Superfund Site," EPA Region I.

23. Letter from Susan Marges to David Dickerson, EPA Waste Management Division concerning her concerns about removal and storage of PCBs from the Acushnet River and New Bedford Harbor (May 8, 1995).

24. Letter from Robert M. Koczera, Massachusetts House of Representatives to David Dickerson, EPA Region I concerning opposition to long-term storage of PCB contaminated sediments (May 26, 1995).

25 Public Meeting Transcript of Information Session on the Proposed Cleanup Plan for the Upper and Lower New Bedford Harbor, New Bedford, Massachusetts, (November 20, 1996).

5.3 Responsiveness Summary (continued)

26. Comments on the 1996 Proposed Plan dated November 22, 1996 from Joe Medeiros, New Bedford resident.
27. Comments on the 1996 Proposed Plan dated December 5, 1996 from Kenneth Finkelstein, NOAA.
28. Letter from Craig H. Campbell, Mintz, Levin, Cohn, Glovsky and Popeo to David Dickerson, EPA Region I commenting on behalf of Marine Hydraulics, Inc. on EPA's 1996 Proposed Remedy (December 5, 1996).
29. Comments on the 1996 Proposed Plan dated December 10, 1996 from Mark W. Machado, resident.
30. Comments on the 1996 Proposed Plan dated January 3, 1997 from Rosemary S. Tierney, Mayor, City of New Bedford.
31. Comments on the 1996 Proposed Plan dated January 6, 1997 from Antone Moniz, resident.
32. Letter from Philip G. Coates, MA Division of Marine Fisheries to Trudy Coxe, MA Executive Office of Environmental Affairs commenting on the 1996 Proposed Cleanup Plan (January 7, 1997).
33. Comments on the 1996 Proposed Plan from Robert M. Koczera, Commonwealth of Massachusetts House of Representatives dated January 7, 1997.
34. Comments on the 1996 Proposed Plan dated January 11, 1997 from George Rogers, New Bedford City Council.
35. Comments on the 1996 Proposed Plan from Robert B. Pond, Stripers Unlimited dated January 14, 1997.
36. Letter from Stephen Healey, Acushnet Historical Society to David Dickerson, EPA Region I commenting on the planned second phase of dredging within the Acushnet River as a threat to an archaeological site, with attachments (January 14, 1997).
    - A. Letter to Representative Barney Frank from the Wampanoag Tribe of Gay Head concerning the archaeological site (February 17, 1995).
    - B. Letter from Stephen Healey, Acushnet Historical Society to Brona Simon, State Archaeologist, Massachusetts Historical Commission concerning the proposed river dredging as a threat to the Lawson Site.(Undated).
    - C. Memorandum from Irwin Marks, Acushnet Historical Commission to Roland Pepin, Steve Healey, Kathy Pepin concerning information about the Lawson Archaeological Site (February 27, 1997).
    - D. Archaeological Survey Form (September 6, 1994)
    - E. Attendance sheet for NBH Indian Artifact Notification meeting, (February 24, 1995).
37. Comments on the 1996 Proposed Plan dated January 15, 1997 from Robert B. Schaffer, Coyne Textile Services.
38. Comments on the 1996 Proposed Plan dated January 20,1997 from Felix Petrarca, Petnel Properties.
39. Comments from Irwin Bishins, Bedford Limited Partnership on the 1996 Proposed Plan.

5.3 Responsiveness Summary (continued)

40. Comments on the 1996 Proposed Plan dated January 21, 1997 from Pamela S. Truesdale, the Coalition for Buzzards Bay.
41. Comments on the 1996 Proposed Plan dated January 27, 1997 from Paul Koczera, New Bedford City Council.
42. Comments on the 1996 Proposed Plan dated January 30, 1997 from Dennis M. Perry, ComElectric.
43. Comments on the 1996 Proposed Plan dated February 1, 1997 from Emily Johns, New Bedford resident.
44. Comments of AVX Corp. on the 1996 Proposed Cleanup Plan for the Upper and Lower New Bedford Harbor released to the public for comment on October 30, 1996 (February 3, 1997), with cover letter from Mary K. Ryan, Nutter, McClennen & Fish.
45. Comments on the 1996 Proposed Plan dated February 3, 1997 from Jack Terrill, New Bedford Harbor Trust Council on "EPA's Proposed Cleanup Plan for Upper and Lower New Bedford Harbor."
46. Letter from Trudy Coxe, MA Executive Office of Environmental Affairs to David Dickerson, EPA Region I commenting on the 1996 Proposed Cleanup Plan for the New Bedford Harbor Superfund Site (February 3, 1997).
47. Letter from Angus McBeth, Sidley & Austin to David Dickerson, EPA Region I commenting on behalf of General Electric Company on the Proposed Phase II Cleanup Plan for Upper and Lower New Bedford Harbor dated November 1996 (February 3, 1997).
48. Undated comments on the 1996 Proposed Plan from James B. Simmons, Hands Across the River Coalition.
49. Undated comments on the 1996 Proposed Plan on the Proposed Plan from Arthur Glowka, Stamford, CT.
50. Undated comments on the 1996 Proposed Plan from Michael Berkal, Buzzards Bay Project.

5.0 Record of Decision

5.4 Record of Decision

1. Record of Decision for The New Bedford Harbor Superfund Site, Upper and Lower Harbors Operable Unit, September 25, 1998.

7.0 Remedial Action

7.1 Correspondence

1. Memorandum from Michael Grasso, CIH to Peter Bumpus, AGM concerning dredge air monitoring, results table attached (June 1, 1994).

7.1 Correspondence (continued)

2. Memorandum from Mark Otis, U.S. Army Corps of Engineer to David Dickerson, EPA Region I concerning Hot Spot after dredge sediment sampling (April 19, 1995).

7.2 Sampling and Analysis

1. Perland Memorandum from Michael Grasso to Mark Pelson concerning CDF (confined disposal facilities) (August 16, 1994), with attached analytical report from Inchcape Testing Systems dated August 11, 1994.
2. "New Bedford Harbor Remediation", U.S. Army Corps of Engineers Environmental Laboratory, (October 6, 1994) concerning TCLP analysis of the Hot Spot sediments.
3. "Hot Spot 'Flux' Monitoring", FAX Copies of Data From EPA ERL, December 20, 1994 through September 21, 1995.
4. Letter from Bette L. Nowack, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached summary tables of groundwater sampling results (January 22, 1996).
5. Letter from James S. Chow, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - first quarter 1996 (April 29, 1996).
6. Letter from James S. Chow, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - second quarter 1996 (July 25, 1996).
7. Tables - "New Bedford Harbor Superfund Site Ambient Air Monitoring PCB Concentrations (Arochlors)" (September 18, 1996).
8. Letter from James S. Chow, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - third quarter 1996 (October 21, 1996).
9. Letter from James S. Chow, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - fourth quarter 1996 (February 5, 1997).
10. Letter from David C. Crispo, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - first quarter 1997 (June 2, 1997).
11. Letter from David C. Crispo, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - second quarter 1997 (September 10, 1997).
12. Letter from David C. Crispo, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - third quarter 1997 (December 11, 1997).
13. Letter from David C. Crispo, Roy F. Weston, Inc. to Maurice Beaudoin, U.S. Army Corps of Engineers concerning attached quarterly groundwater sampling results - fourth quarter 1997 (February 6, 1998).

7.5 Remedial Action Reports

1. Report on the Effects of the Hot Spot Dredging Operations, New Bedford Harbor Superfund Site, New Bedford, Massachusetts, EPA Region I, (October 1997).

8.0 Site Closeout

8.4 Long Term Response Monitoring

1. "New Bedford Harbor Long Term Monitoring Assessment Report: Baseline Sampling", U.S. Environmental Protection Agency, (October 1996).
2. Memorandum from David Dickerson, EPA Region I to File concerning Round 2 of Long-Term Ecological Monitoring (January 28, 1998).
3. "Remediation at a Marine Superfund Site: Surficial Sediment PCB Concentrations, Composition and Redistribution", USEPA Atlantic Ecology Division, Narragansett, RI, et al. Copy of a poster presented at the Fall 1997 SETAC (Society of Environmental Toxicologists and Chemists) meeting.

9.0 State Coordination

9.1 Correspondence

1. Letter from Jeffrey Benoit, Massachusetts Executive Office of Environmental Affairs to Gayle Garman, EPA Region I concerning supplemental proposed remedial action plan (March 29, 1992).
2. Letter from Mark A. Lowe, EPA Office of Regional Counsel to Helen Waldorf, Massachusetts Department of Environmental Protection (May 13, 1992), concerning institutional controls at the site.
3. Letter from Harish Panchal, Massachusetts Department of Environmental Protection to Suzanne Condon, Department of Public Health concerning institutional controls of fish market monitoring (June 15, 1994).
4. Letter from Thomas Powers, Massachusetts Department of Environmental Protection to Jim Cabot, EPA Region I concerning enclosed application and proposal for consideration in 1995 Environmental Technology Initiative funding package (September 7, 1994).
5. Letter from Cynthia Catri, EPA Office of Regional Counsel to George Wyeth, EPA Headquarters (July 25, 1996), concerning the proposed enhancement to the remedy at New Bedford Harbor, with response dated July 28, 1996.
6. FAX from Jack Schwartz, Department of Marine Fisheries Cat Cove Laboratory to David Dickerson, EPA Region I with PCB Summary sheet and graph title "Mean Annual PCB Levels in American Lobster - Outer New Bedford Harbor - Area 3" attached (September 12, 1996).

9.1 Correspondence (continued)

7. Letter from David B. Struhs, Commissioner, Massachusetts Department of Environmental Protection to John DeVillars, Regional Administrator, EPA New England and Linda M. Murphy, Director Office of Site Remediation and Restoration (October 10, 1996), concerning DEP request that navigational dredging be included as an enhancement of the remedy in the upcoming second ROD for the New Bedford Harbor Superfund Site.
8. Letter from Harley Laing, EPA Office of Site Remediation and Restoration to Arthur Pugsley, MA Executive Office of Environmental Affairs concerning ComElectric's proposed 115kV transmission line (July 8, 1997).

9.8 State Contractor Documents

1. Excerpts from "Dredged Material Management Plan Phase I, Volume I ," Maguire Group, Inc.(September 1997).

10.0 Enforcement

10.3 State and Local Enforcement Records

1. Letter from Mark J. Begley, Commonwealth of Massachusetts Department of Environmental Protection to Lawrence D. Worden, City of New Bedford Department of Public Works (December 13, 1990), concerning suggested additions to draft sampling plan for overflow locations.
2. Letter from Lawrence D. Worden, City of New Bedford Department of Public Works to Mark J. Begley, Commonwealth of Massachusetts Department of Environmental Protection (December 24, 1990), concerning receipt of and response to December 13, 1990 letter.

10.8 Consent Decrees

1. Consent Decree, United States v. AVX Corp., et al; Commonwealth of Massachusetts v. AVX Corp., et al., United States District Court for the District of Massachusetts, Civil Action No. 83-3882-Y (December 27, 1990). Consent Decree with Aerovox Inc. and Belleville Industries, Inc.
2. Consent Decree, United States v. AVX Corp., et al; Commonwealth of Massachusetts v. AVX Corp., et al:, United States District Court for the District of Massachusetts, Civil Action No. 83-3882-Y (February 3, 1992). Consent Decree with AVX Corp..
3. Consent Decree, United States v. AVX Corp. et al; Commonwealth of Massachusetts v. AVX Corp., et al., United States District Court for the District of Massachusetts, Civil Action No. 83-3882-Y. (November 24, 1992). Consent Decree with Federal Pacific Electric Company and Cornell Dubilier Electronics, Inc.

11.0 Potentially Responsible Party (PRP)

11.5 Site Level - General Correspondence

1. Memorandum from Mary C. Sanderson, EPA Region I to Addressees including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group (March 19, 1990) concerning transmittal of the March 1990 "Draft Final Regulation Assessment (Task 63) for New Bedford Harbor, " E.C. Jordan Co. For EBASCO Services Inc..
2. Memorandum from Mary C. Sanderson, EPA Region I to Addressees including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group (April 17, 1990) concerning transmittal of the April 1990 "Draft Final Baseline Ecological Risk Assessment - New Bedford Harbor Site Feasibility Study, " E.C.Jordan Co. for EBASCO Services Inc..
3. Letter from Mark J. Otis, U.S. Army Corps of Engineers to Mary C. Sanderson, EPA Region I (May 29, 1990) with attached Mailing List including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group, concerning the transmittal of the May 1990 "New Bedford Harbor Superfund Pilot Study Evaluation of Dredging and Dredged Materials Disposal," U.S. Army Corps of Engineers.
4. Memorandum from Mary C. Sanderson, EPA Region I to Addressees including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group (June 8, 1990), concerning transmittal of the June 1990 "Draft Air Monitoring Report - New Bedford Harbor Pilot Dredging and Disposal Study - Task 26," EBASCO Services Inc..
5. Memorandum from Mary C. Sanderson, EPA Region I to Addressees including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group (August 2, 1990), concerning transmittal of the July 1990 "Final Air Monitoring Report - New Bedford Harbor Pilot Dredging and Disposal Study - Task 26," EBASCO Services Inc..
6. Memorandum from Mary C. Sanderson, EPA Region I to Addressees including Richard J. Hughto, Rizzo Associates, Inc. for the Joint Defense Group (August 21, 1990), concerning transmittal of the August 1990 "Draft Final Feasibility Study of Remedial Alternatives for the Estuary and Lower Harbor/Bay," E.C. Jordan for EBASCO Services Inc.

11.9 PRP-Specific Correspondence

1. Letter from Mary K. Ryan, Nutter, McClennen & Fish for AVX Corp. to Gayle Garman, EPA Region I (May 22, 1992), concerning a request for a 90 day extension of the public comment period for the proposed plan and addendum.
2. Letter from Mary K. Ryan, Nutter, McClennen & Fish for AVX Corp. to Gayle Garman, EPA Region I (July 2, 1992), concerning contents of the Administrative Record.
3. Letter from Mark Lowe, EPA Region I to Mary K. Ryan, Nutter, McClennen & Fish (July 9, 1992), concerning contents of the Administrative Record.
4. Letter from Benedict Rosen, AVX to Paul Keough, EPA Region I regarding the New Bedford Harbor remediation (December 8, 1993).

11.9 PRP-Specific Correspondence (correspondence)

5. Letter from Harley Laing, EPA Region I to Benedict Rosen, AVX Corp. responding to letter dated December 8, 1993 to Paul Keough (December 23, 1993).
6. Letter from Mary K. Ryan, Nutter, McClennen & Fish to David Dickerson, EPA Waste Management Division (November 19, 1996), concerning EPA proposed cleanup plan for Upper and Lower New Bedford Harbor.
7. Letter from Benedict P. Rosen, President, AVX Corp. to John P. DeVillars, Regional Administrator, EPA Region I (November 26, 1996), concerning changes to Target Cleanup levels in the latest EPA proposal for remediation of the New Bedford Harbor.
8. Letter from Cynthia E. Catri, EPA Office of Regional Counsel to Mary K. Ryan, Nutter, McClennen & Fish (November 27, 1996), concerning New Bedford Harbor Superfund Site Proposed Plan -- Upper and Lower Harbor.
9. Letter from Gary L. Gill-Austern, Nutter, McClennen & Fish to David Dickerson, EPA Region I concerning an extension of the public comment period for the Proposed Plan (January 3, 1997), with correction letter (January 6, 1997).
10. Letter from Cindy Catri, EPA Region I to Gary L. Gill-Austern, Nutter, McClennen & Fish granting a 15 day extension to the comment period (January 8, 1997).
11. Letter from Benedict P. Rosen, AVX Corp. to John P. DeVillars, EPA Region I (February 14, 1997) requesting that he review the comments on the Proposed Cleanup Plan sent to Dave Dickerson on February 3, 1997.
11. Letter from John P. DeVillars, EPA Region I to Benedict P. Rosen, AVX Corp. (February 21, 1997) responding to concerns in Mr. Rosen's comment letter.
12. Letter from John P. DeVillars, EPA Region I to Benedict P. Rosen, AVX Corp. (March 25, 1997) with attached response to comments on the Proposed Plan.

13.0 Community Relations

13.1 Correspondence

1. Letter from Lydia L. Van Hine, Greater New Bedford Environmental Community Work Group to Mary C. Sanderson, EPA Region I (September 18, 1991), concerning request for a minimum 60 day period to comment on the upcoming Proposed Plan.
2. Letter from Rosemary S. Tierney, Mayor of New Bedford to Gayle Garman, EPA Region I responding to October 27, 1992 letter attached concerning EPA's Preferred Alternative for the City of New Bedford's Estuary/Lower Harbor (December 24, 1992).
3. Letter from Rosemary S. Tierney, Mayor, City of New Bedford to Julie Belaga, EPA Region I clarifying the City's comments on EPA's proposed plan (March 4, 1993).
4. Letter from Martin S. Manley, New Bedford Harbor Development Commission to Gayle Garman, EPA Region I concerning the Commission's vote to deny EPA's proposal for construction of confined disposal facilities (May 19, 1993).
5. Letter from Gayle Garman, EPA Region I to Martin S. Manley, City of New Bedford Harbor Development Commission concerning possible construction of confined disposal facilities in North Terminal area (July 22, 1993).

13.1 Correspondence (continued)

6. Memorandum from Jane H. Wells, Commonwealth of Massachusetts Office of Dispute Resolution to New Bedford Harbor Forum Project Participants (November 5, 1993) confirming a meeting on November 10, 1993 and listing the agenda.
7. Memorandum from Harley Laing, EPA Office of Regional Counsel to William A. White, Enforcement Counsel for Superfund (November 24, 1993), concerning nomination of New Bedford Harbor Superfund Site Hot Spot Operable Unit for Non-Binding Alternative Dispute Resolution.
8. Memorandum from Diana Cobbold to Michael Keating concerning proposal of a plan that would delay dredging (January 9, 1994).
9. Memorandum from Hands Across the River Coalition, Concerned Parents of Fairhaven, Downwind Coalition and Other Concerned Parties to New Bedford Superfund Forum concerning remediation methods offered as alternatives to incineration (January 26, 1994).
10. Letter from Kenneth Finkelstein, National Oceanic and Atmospheric Administration to Jane Wells, Massachusetts Office of Dispute Resolution concerning issues discussed at the February 9, 1994 public meeting which would delay dredging (February 15, 1994).
11. Letter from Harley F. Laing, EPA Region I Office of Regional Counsel to David Hammond, Hands Across the River and Charles Lord and William Shutkin, Boston College Law School concerning future decisions on the New Bedford Harbor cleanup (June 14, 1994).
12. Letter from George Rogers, City of New Bedford, Councilor at Large to John DeVillars, EPA Region I concerning PCB air monitoring readings at the dredge site (June 22, 1994).
13. Letter with attachments, from John P. DeVillars , EPA Region I to George Rogers, City of New Bedford, Councillor at Large concerning the circumstances of a PCB measurement recorded on June 16, 1994 (July 14, 1994).
    A. Memorandum from Gayle Garman, EPA Region I to Frank Ciavattieri, EPA Region I concerning PCB measurement of 1800 mg/m on June 16 (July 7, 1994).
    B. EPA/U.S. Army Corps of Engineers Progress Report for June 23, 1994.
    C. EPA/U.S. Army Corps of Engineers Progress Report for June 30, 1994.
14. Letter from J. Michael Keating, Jr, Tillinghast Collins and Graham to Members of the Core Committee concerning rescheduling of a meeting to August 24, 1994 to allow the citizens' group time to address aspects of the TAG grant (August 12, 1994).
15. Letter from John T. McNeil, EPA Office of Regional Counsel to J. Michael Keating, Jr. Tillinghast, Collins & Graham (September 29, 1994), concerning attached signatures to Forum Agreement.
16. New Bedford Harbor Superfund Site Community Forum Agreement concerning issues related to removal and treatment of Hot Spot sediments signed by Forum Members (November 1994).
17. Memorandum from Alternatives for Community and Environment, Inc. (ACE) and Hands Across the River Coalition (HARC) to New Bedford Forum Members (January 24, 1995), discussing concerns about CDF-1.

13.1 Correspondence (continued)

18. Letter from J. Michael Keating, Commonwealth of Massachusetts Office of Dispute Resolution, with attached press release "New Bedford Community Forum Invites New Members to Join" (April 13, 1995).
19. Letter from Peter W. Koczera, Everett L Hardy, Jr. and Robert J. St. Jean, Town of Acushnet to John DeVillars, EPA Region I concerning the fact that the Board of Selectmen voted unanimously to send a letter opposing placement of Confined Disposal Facilities on the banks of the Acushnet River (August 8, 1995).
20. Letter from Alan H. Cass, Fisherman's Legal Action Committee (FLAC) to John DeVillars, Regional Administrator, US EPA (September 14, 1995), concerning proposed containment of sediments dredged from New Bedford Harbor.
21. Letter from Joseph B. McIntyre, Massachusetts House of Representatives to John DeVillars, EPA Region I concerning opposition to the use of confined disposal facilities located along the Acushnet River (September 15, 1995).
22. Letter from Antonio Cabral, Massachusetts House of Representatives to John DeVillars, EPA Region I expressing concerns about long term disposal of PCB-contaminated sediments (September 15, 1995).
23. Letter from Rosemary S. Tierney, Mayor, City of New Bedford to Joseph B. McIntyre, State Representative concerning plans for the cleanup of New Bedford Harbor (September 20, 1995).
24. Letter from Antonio Cabral, Massachusetts House of Representative to Rosemary S. Tierney, Mayor, City of New Bedford stating that he expressed concern but not opposition to the confined disposal facilities as reported to John DeVillars, EPA Region I Administrator (September 27, 1995).
25. Letter from John P. DeVillars, Regional Administrator, EPA Region I to Robert M. Koczera, Massachusetts House of Representatives (September 28, 1995) in response to attached September 12, 1995 letter to Carol Browner, Administrator, US EPA Headquarters concerning opposition to long term storage of untreated PCB-contaminated sediments.
26. Letter from John P. DeVillars, EPA Region I to Rosemary S. Tierney, Mayor, City of New Bedford concerning her support of EPA's efforts to work with local officials and with the public on the New Bedford Harbor plan (October 2, 1995).
27. FAX from Diana Cobbold, Sea Change, Inc. to David Dickerson, EPA Region I containing a list of Sea Change Program 1 Scientists and their addresses (October 23, 1995).
28. Letter from David Dickerson, EPA Region I to Dr. Philip Brown, Brown University Department of Sociology containing a list of documents being distributed to all six of the Sea Change, Inc. review panelists (October 24, 1995).
29. Letter from Denis J. Hanks, North End Business Association to Jim Simmons, Hands Across the River concerning EPA's planned confined disposal facilities along the Acushnet River in New Bedford's north end (November 24, 1995).

13.1 Correspondence (continued)

30. Letter from John P. DeVillars, Regional Administrator, EPA Region I to James B. Simmons, Hands Across the River Coalition (March 1, 1996) in response to attached letters to President Clinton and EPA Administrator Carol Browner concerning applicability of treatment process for Hot Spot sediments.
31. Letter from James C. Colman, Massachusetts Department of Environmental Protection to Monique M. Frechette (March 25, 1996) in response to a letter concerning the New Bedford Harbor Superfund Site.
32. Letter from John P. DeVillars, Regional Administrator, EPA Region I to Monique M. Frechette (April 25, 1996) in response to a February 8, 1996 (attached) letter to Senator Edward M. Kennedy concerning the second phase of the New Bedford Harbor cleanup.
33. FAX from Joseph M. Forns, Applied Marine Ecology Lab to Jane Wells, Office of Dispute Resolution (May 15, 1996), concerning suggested changes to the Phase II Community Forum Agreement.
34. Memorandum from Michael Keating and Jane Wells to Members of New Bedford Harbor Superfund Forum (June 4, 1996), concerning the attached final Community Forum agreement on the Phase 2 ROD.
35. Letter from Harley Laing, EPA Office of Regional Counsel to J. Michael Keating (June 20, 1996) with attached signature page of the Community Forum's Final Agreement on ROD 2 for New Bedford Harbor.
36. Letter from J. Michael Keating to Kristen Conroy, EPA Region I (July 25, 1996), concerning attached copy of the final Phase 2 Forum agreement and all signature pages.
37 Letter from John P. DeVillars, Regional Administrator, EPA Region I to Janice A. Davidian, Clerk of the City Council, New Bedford, MA (September 23, 1996) in response to an August 26, 1996 letter (attached) proposing a coastal park.
38. Letter from Cynthia Catri, EPA Region I to Irene Schall, Stanford and Schall, concerning the potential future use of the Herman Melville Shipyard for locating a Confined Disposal Facility (May 1, 1997).
39. Letter from Cynthia Catri, EPA Region I to Martin Manley, Harbor Development Commission, addressing the concerns of Irene Schall about the future use of the Herman Melville Shipyard (May 1, 1997).
40. Letter from Frederick M. Kalisz, Jr. , Mayor, City of New Bedford to Cynthia Catri, EPA Region I (March 10, 1998) concerning future of development of former Herman Melville Shipyard, with attached summary of site.
41. Letter from Harley Laing, EPA Region I , Director of OSRR to Frederick M. Kalisz, Jr., Mayor , City of New Bedford (March 23, 1998) concerning future development of Harbor Shoreline.
42. Letter from Martin S. Manley, New Bedford Harbor Development Commission to David Dickerson, EPA Region I (March 26, 1998) concerning former Herman Melville Shipyard site.
43 Memorandum from George Rogers, New Bedford City Councilor at Large concerning possible next steps to Hot Spot remediation, (Undated).

13.3 News Clippings/Press Releases

1. "Environmental News - EPA Releases Study for New Bedford Harbor Cleanup, " EPA Region I (August 21, 1990).
2. "Environmental News - United States Announces $66 Million Agreement in Principle with Defendant in New Bedford Harbor PCB Superfund Case," EPA Region I (September 4, 1990).
3. "Environmental News - EPA Postpones Meeting on New Bedford Harbor," EPA Region I (September 14, 1990).
4. "Environmental News - New Bedford Harbor Superfund Defendants Agree to $12.6 Million Settlement," EPA Region I (December 20, 1990).
5. "Environmental News - EPA Proposes Cleanup for Second Portion of New Bedford Harbor Superfund Site," EPA Region I (January 17, 1992).
6. "Harbor Dredging Planned", New Bedford Standard Times, January 21, 1992.
7. "The United States Environmental Protection Agency invites Public Comment on the Proposed Plan for Cleanup of the New Bedford Harbor Superfund Site (Estuary, Lower Harbor, Upper Bay Operable Unit)," The Standard Times - New Bedford, MA) (January 22, 1992).
8. "The United States Environmental Protection Agency Solicita Comentario Publico Acerca do Plano Proposto de Limpeza da Baia de New Bedford 'Superfund Site' (Estuarion, Parte Baixa da Baia, Parte Alta da Baia) - New Bedford, Massachusetts," Portuguese Times - New Bedford, MA (23 de Janeiro de 1992).
9. "Agency Checked 8 Alternative Plans, New Bedford Standard Times, January 26, 1992.
10. "EPA Weighs PCB Danger Against Money", New Bedford Standard Times, January 26, 1992.
11. "2 Meetings Set on Aspects of Harbor Cleanup - EPA Plans Public Hearings on 2nd Phase", New Bedford Standard Times, March 2, 1992.
12. "2 Meetings Set on Aspects of Harbor Cleanup - Workshop to Explore Phase 1 Alternatives", New Bedford Standard Times, March 2, 1992.
13. "The United States Environmental Protection Agency Invites Public Comments on the Proposed Plan for Cleanup of the Upper Buzzards Bay Portion of the New Bedford Harbor Superfund Site - New Bedford, Massachusetts," EPA Region I (May 12, 1992).
14. "EPA Environmental News - EPA Proposes Plan to Addresses Contamination in Upper Buzzards Bay," EPA Region I (May 1992).
15. "EPA Environmental News - EPA Extends Comment Period for New Bedford Harbor Cleanup," EPA Region I (June 5, 1992).
16. Media Advisory: "Massachusetts Office of Dispute Resolution Announces Appointment of Neutral in New Bedford Superfund Cleanup" (November 19, 1993).
17. "The Massachusetts Office of Dispute Resolution Announces Agenda for New Bedford Harbor Superfund Site Public Forum", Commonwealth of Massachusetts Office of Dispute Resolution, February 3, 1994.
18. "The Massachusetts Office of Dispute Resolution Announces Agenda for the New Bedford Harbor Superfund Site Public Forum", Commonwealth of Massachusetts Office of Dispute Resolution, February 23, 1994.

13.3 News Clippings/Press Releases (continued)

19. "New Bedford Forum to Decide on Method for Handling PCBs", Commonwealth of Massachusetts Office of Dispute Resolution, May 31, 1994.
20. "New Bedford Forum Reaches Incineration Accord" (November 21, 1994)
21. "Harbor Cleanup Drags On", New Bedford Standard Times, April 26, 1995.
22. "Key Committee OKs Harbor Improvements", New Bedford Standard Times, May 26, 1995.
23. "EPA, Again, Dumps on New Bedford", New Bedford Standard Times, July 4, 1995.
24. Article on Dredging (no title), New Bedford Standard Times, August 26, 1995.
25. "Last Remains of PCB Hot Spots Sludge Removed", New Bedford Standard Times, September 8, 1995.
26. "Varied Views, But Desire to Cooperate", New Bedford Standard Times, September 24, 1995.
27. "Foes Aim at Burial of PCBs", New Bedford Standard Times, September 25, 1995.
28. "Area Citizens Honored for Battle Against PCBs", New Bedford Standard Times, September 26, 1995.
29 "Can Two Dredging Projects be Linked?", New Bedford Standard Times, October 22, 1995.
30. "A Marriage Proposal: Commerce and Cleanup", New Bedford Standard Times, October 22, 1995.
31. "City Vows to Block PCB Plan", New Bedford Standard Times, October 23, 1995.
32. " 'Married' Dredging Projects May Rescue Harbor Economy", New Bedford Standard Times, October 23, 1995.
33. "The New Bedford Harbor Community Forum Invites the Public to an Open Meeting on the New Bedford Harbor Cleanup", (November 29, 1995).
34. "EPA Will Poll Local Panel on PCB Disposal", New Bedford Standard Times, November 30, 1995.
35. "Fall River Firm Gets PCB Test Permit", New Bedford Standard Times, November 30,1995.
36. "Further Delays Unacceptable in Restoration of the Harbor", New Bedford Standard Times, December 1, 1995.
37. "Acushnet Selectmen Don't Want River PCBs Stored in Their Town", New Bedford Standard Times, December 1, 1995.
38. "Opposition to Permanent PCB Storage is Growing", New Bedford Standard Times, December 7, 1995.
39. "State Official: Lack of Open Minds Could Sink City Harbor Cleanup", New Bedford Standard Times, January 25, 1996.
40. "Greenpeace Offers Aid to Local Group's Fight Against EPA Plan", New Bedford Standard Times, January 25, 1996.
41. "Satisfactory Solutions Elude Planners of Harbor Cleanup", New Bedford Standard Times, (no date).
42. "North End Throws PCB Sludge Plan Back in EPA's Face", New Bedford Standard Times, (February 12, 1996).

13.3 News Clippings/Press Releases (continued)

43. "Compromise in the Works", Plymouth Advocate, February 15, 1996
44. "Residents Object to Disposal Site", Plymouth Advocate, February 15, 1996
45. "'Battle of the Lagoon' nearing Final Round", New Bedford Standard Times, February 28, 1996.
46. "EPA Gives Up Bid to Store PCB Sludge in City Lagoon", New Bedford Standard Times, February 29, 1996.
47. "Lagoon Neighbor Recalls Fond Memories", New Bedford Standard Times, March 1, 1996.
48. "Lagoon is Spared, and EPA Preserves Good Relationship", New Bedford Standard Times, March 2, 1996.
49. "Superfund Forum May Have Found a Solution", Plymouth Advocate, March 14, 1996.
50. "Acushnet Officials Appoint New Member of Harbor Forum", New Bedford Standard Times, April 11, 1996.
51. "New Bedford Harbor Community Forum Reaches Accord on Second Phase of the Harbor Cleanup", Commonwealth of Massachusetts Office of Dispute Resolution, August 1, 1996.
52. "Fishing in Closed Areas Continues Despite Ban", New Bedford Standard Times, August 15, 1996.
53. Invitation of Public Comment on the Proposed Plan for Cleanup of the Upper and Lower New Bedford Harbor, New Bedford Standard Times, October 20, 1996.
54. Environmental News, "EPA Proposed Cleanup Plan for Upper and Lower New Bedford Harbor", EPA Region I, October 27, 1996.
55. Noticias Sobre o Meio Ambiente (Environmental News), "O EPA Propoe Plano de Limpeza das Zonas Superior e Inferior do Porto de New Bedford", 30 de Outubro de 1996.
56. "EPA Wants to Bury PCB Sludge at Four Sites", New Bedford Standard Times, October 31, 1996.
57. Invitation of Public Comment on the Proposed Plan for Cleanup of the Upper and Lower New Bedford Harbor, New Bedford Standard Times, November 3, 1996.
58. "New Bedford Waterfront to Get $145m Cleanup", Boston Globe, November 3, 1996.
59. "New Bedford Waterfront to Get $145 Million Cleanup", Taunton Daily Gazette, November 3, 1996.
60. "New Bedford Waterfront to Get $145m Cleanup", Gloucester Daily Times, November 4, 1996.
61. "Weld Supports Plan to Bury PCB Sludge", New Bedford Standard Times, November 21, 1996.
62. "Public Comment Period Extended for Upper and Lower New Bedford Harbor Superfund Site", New Bedford Standard Times, December 5, 1996.
63. "Deadline for Comments on PCB Plan Now Jan. 23", New Bedford Standard Times, December 17, 1996.
64. "Upper and Lower New Bedford Harbor Public Comment Period Extended Again", New Bedford Standard Times, January 10, 1997.

13.3 News Clippings/Press Releases (continued)

65. "Harbor Dredging, PCB Cleanup Tie Urged by Officials", New Bedford Standard Times, August 22, 1997.
66. "Environmental News: EPA Issues Cleanup Decision for Upper and Lower New Bedford Harbor," EPA Region I (September 25, 1998).

13.4 Public Meetings

1. Summary of the Public Informational Meeting on EPA's Proposed Plan and Feasibility Study on January 30, 1992.
2. Transcript of Proposed Plan Public Hearing held March 5, 1992.
3. Transcript of Proposed Plan Public Hearing held June 10, 1992.
4. Memorandum from Michael Keating, Massachusetts Office of Dispute Resolution to Forum Participants/New Bedford Harbor Superfund Site concerning confirmation of first joint meeting on December 7, 1993 (December 2, 1993).
5. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, December 7, 1993
6. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, January 5, 1994.
7. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, January 12, 1994.
8. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, January 26, 1994.
9. Meeting Minutes for New Bedford Harbor Superfund Site Meeting, February 9, 1994.
10. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, March 1, 1994.
11. Handouts for New Bedford Forum, March 1, 1994.
12. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, March 9, 1994.
13. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, March 30, 1994.
14. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, April 6, 1994.
15. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, April 13, 1994.
16. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, April 26, 1994.
17. Agenda and Meeting Minutes for New Bedford Harbor Superfund Site Meeting, May 18, 1994.
18. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, June 6, 1994.
19. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, June 14, 1994.

13.4 Public Meetings (continued)

20. Meeting Summary for New Bedford Harbor Superfund Site Meeting, July 12, 1994.
21. Meeting Summary for New Bedford Harbor Superfund Site Meeting, with videotape of August 9, 1994 meeting.
22. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, with videotape of November 21, 1994 meeting.
23. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, February 6, 1995, with videotape of February 6, 1995 meeting..
24. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, March 28, 1995.
25 Agenda, Meeting Summary, and presentation material for the New Bedford Harbor Superfund Site Meeting, with videotape of April 25, 1995 meeting.
26. Agenda and Meeting Summary for New Bedford Harbor Superfund Site Meeting, June 13, 1995.
27. Agenda, Meeting Summary, and presentation material for the New Bedford Harbor Superfund Site Meeting, July 25, 1995.
28. Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, August 22, 1995.
29. Agenda, Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, September 5, 1995.
30. Agenda, Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, September 20, 1995.
31. FAXed list of questions "Questions for Sea Change on the Proposed Remedy for Phase 2 of the New Bedford Harbor Cleanup", October 3, 1995.
32. Agenda, Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, October 11, 1995.
33. Agenda, Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, October 25, 1995.
34. Agenda for Round Table Discussion, with Information Sheet on Panel Members, for discussions held November 14 & 15, 1995, including videotape of November 14, 1995 meeting.
35. Meeting Summary and presentation material for the New Bedford Harbor Superfund Site Meeting, November 29, 1995.
36. Agenda, Meeting Summary, and presentation material for the New Bedford Harbor Superfund Forum Meeting, December 7, 1995.
37. Agenda, Meeting Summary, and presentation material for the New Bedford Harbor Superfund Forum Meeting, January 24, 1996.
38. Invitation and Agenda for Ward 2 Residents Meeting on New Bedford Harbor Cleanup, with videotapes of February 11, 1996 meeting.
39. Meeting Summary, and presentation material for the New Bedford Harbor Superfund Forum Meeting, February 28, 1996.
40. Agenda, Meeting Summary, and presentation material for the New Bedford Harbor Superfund Forum Meeting, March 26, 1996.

13.4 Public Meetings (continued)

41. Agenda, Meeting Summary , and presentation material for the New Bedford Harbor Superfund Forum Meeting, May 1, 1996.
42. Agenda for New Bedford Harbor Superfund Forum Meeting, September 25, 1996.
43. Summary of New Bedford Forum Meeting held December 11, 1996.
44. Minutes of the New Bedford Harbor Superfund Forum Meeting held February 12, 1997.
45. Summary of New Bedford Forum Meeting held March 26, 1997.
46. Summary of New Bedford Forum Meeting held May 21, 1997.
47. Minutes of the New Bedford Harbor Superfund Forum Meeting held July 30, 1997.
48. Meeting minutes for the New Bedford Forum Meeting of October 20, 1997.
49. Summary of the New Bedford Harbor Forum meeting of November 6, 1997.
50. Minutes of the Sea Change Panel meeting evaluating the use of Confined Disposal Facilities for storing contaminated sediments (November 14, 1995), with transmittal letter dated November 22, 1997.

13.5 Fact Sheets

1. "Common Questions About Dredging and Air Monitoring", EPA/U.S. Army Corps of Engineers, April 1994.
2. New Bedford Harbor site information and description fact sheet, (January 1996).
3. "PCB Contamination in New Bedford Harbor and the Acushnet River Estuary Area: A Fact Sheet", Massachusetts Department of Public Health, (November 6, 1996), with attached transmittal letter from Jeffrey Purvis, Department of Public Health to David Dickerson, EPA Region I.

13.9 Work Plans and Progress Reports

1. Fifty-four EPA/US Army Corps of Engineers Progress Reports for New Bedford Harbor Superfund Site (March 16, 1994 through January 11, 1996).

14.0 Congressional Relations

14.1 Correspondence

1. Letter from Barney Frank, United States House of Representatives to John DeVillars, Regional Administrator, EPA Region I (September 25, 1995) , concerning the disposition of PCBs at New Bedford.
2. Letter from John P. DeVillars, Regional Administrator, EPA Region I to Barney Frank, Member, U.S. House of Representatives (November 1, 1995) , concerning storage and treatment of PCBs .

14.1 Correspondence (continued)

3. Memorandum from Claudia Kirk and Roland Pepin, New Bedford Harbor Forum to Barney Frank, United States House of Representatives concerning facts sheet to be discussed at the February 28, 1996 New Bedford Harbor Forum meeting (February 26, 1996).
4. Letter from John F. Kerry, United States Senate to John DeVillars, EPA Region I concerning attached letter from a constituent (March 5, 1996).
   A. Letter from Monique M. Frechette, resident to Senator John F. Kerry, United States Senate discussing her concern over the decision to bury PCBs in Ward 2 (February 8, 1996).
5. Letter from John P. DeVillars, Regional Administrator, EPA Region I to Barney Frank, Member, U.S. House of Representatives (March 11, 1996) responding to attached undated letter from residents and officials concerning use of confined disposal facilities (CDFs) .
6. Letter from John P. DeVillars, Regional Administrator, EPA Region I to John Kerry, Member , U.S. Senate (April 25, 1996) responding to letter on behalf of a constituent concerning the second phase of the cleanup at the New Bedford Harbor Superfund Site.
7. Letter from William M. Straus, Commonwealth of Massachusetts House of Representatives to Barney Frank, Member, U.S. House of Representatives (April 26, 1996) , concerning the proposed Record of Decision (ROD) for the New Bedford Harbor Superfund Site.
8. Letter from John P. DeVillars, Regional Administrator, EPA Region I to Barney Frank, Member, U.S. House of Representatives (June 17, 1996) responding to attached letter to Carol Browner, EPA Administrator, dated May 6, 1996.
9. Letter from Barney Frank, Member, U.S. House of Representatives to the National Remedy Review Board, U.S.EPA (August 21, 1996) supporting the proposed Record of Decision (ROD) for the New Bedford Harbor Superfund Cleanup.

16.0 Natural Resource Trustee

16.1 Correspondence

1. Letter from Kenneth Finkelstein, NOAA to Mary Sanderson, EPA Waste Management Division (May 14, 1990) commenting on the Draft Feasibility Study for the Estuary and Lower Harbor/Bay for the New Bedford Harbor Superfund Site.
2. Letter from Kenneth Finkelstein, National Oceanic and Atmospheric Administration (NOAA) to Mary Sanderson, EPA Waste Management Division (June 4, 1990) commenting on the selection of alternatives proposed for the remediation of contaminated sediments.
3. Letter from Susan F. Tierney, MA Executive Office of Environmental Affairs, William Patterson, Office of Environmental Affairs and Richard B. Roe, Regional Director, National Marine Fisheries Service to Julie Belaga, Regional Director, EPA Region I (July 10, 1992) commenting on the Proposed Remedial Action Plan.

16.1 Correspondence (continued)

4. Letter from Kenneth Finkelstein, NOAA to David Dickerson, EPA Office of Site Remediation and Restoration, (December 5, 1996), concerning the Proposed Cleanup Plan for New Bedford Harbor.
5. Letter from Elizabeth A. Higgins, EPA Region I to John Terrill, NOAA, National Marine Fisheries Service, concerning the draft Restoration Plan Environmental Impact Statement/ Environmental Impact Review for the New Bedford Harbor Environment (July 2, 1997).

16.5 Technical Issue Papers

1. Letter from Kenneth Finkelstein, U.S. Department on Commerce National Oceanographic and Atmospheric Administration to Mary C. Sanderson, EPA Region I (January 31, 1991), concerning transmittal of the attached "Analysis and Comparison of Remedial Alternatives Recommended by the Natural Resource Trustees for the Upper Buzzards Bay Section of the New Bedford Harbor Superfund Site," U.S. Department of Commerce National Oceanographic and Atmospheric Administration (January 1991).
2. Letter from John A. Lindsey for Jay Field, U.S. Department of Commerce National Oceanographic and Atmospheric Administration to Mary C. Sanderson, EPA Region I (September 20, 1991), concerning the attached "New Bedford Harbor Site - Cost Estimate for Remedial Action (Dredging Option) Off Cornell-Dubillier Facility," U.S. Department of Commerce National Oceanographic and Atmospheric Administration.
3. Letter from John A. Lindsey, U.S. Department of Commerce National Oceanographic and Atmospheric Administration (NOAA) to Gayle Garman, EPA Region I (April 22, 1992), concerning transmittal and content of the attached "Evaluation of Effectiveness: Relative Exposure Model," U.S. Department of Commerce National Oceanographic and Atmospheric Administration (NOAA)

17.0 Site Management Records

17.4 Maps/Photographs

1. Photo Simulation of Upper Harbor Proposed CDFs. (Undated).

17.7 Reference Documents

1. "A Study of Winter Flounder Movements," Saul B. Saila, University of Rhode Island Narragansett Marine Laboratory (1968).
2. "Avoidance of Arochlor 1254 by Shrimp and Fishes," D.J. Hansen, S.C. Schimmel, and E. Matthews, Gulf Breeze Environmental Research Laboratory (1974).
3. "Report of Industrial Hygiene Study for Aerovox Industries, Inc., New Bedford, Massachusetts", with transmittal letter from Harold Bavley, Commonwealth of Massachusetts Division of Occupational Hygiene to Norman Butterworth, Aerovox Industries (December 17, 1976).

17.7 Reference Documents (continued)

4. "Fine-grained Sediment and Industrial Waste Distribution and Dispersal in New Bedford Harbor and Western Buzzards Bay, Massachusetts," Colin P. Summerhayes, Jeffrey P. Ellis, Peter Stoffers, Scott R. Briggs, and Michael Fitzgerald, Woods Hole Oceanographic Institution for the Department of Commerce National Oceanic and Atmospheric Administration (NOAA) (April 1977).
5. "Polychlorinated Biphenyl (PCB) Analyses of Marine Organisms in the New Bedford Area, 1976 - 1980," Andrew Kolek and Russell Ceurvels, Commonwealth of Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles Division of Marine Fisheries (January 1981).
6. "Metabolic and Health Consequences of Occupational Exposure to Polychlorinated Biphenyls," A.B. Smith, et al,. U.S. Department of Health and Human Services (December 9, 1981).
7. "PCB Pollution in the New Bedford Harbor, Massachusetts Area: A Status Report", Massachusetts Coastal Zone Management, (June 1982).
8. "A Retrospective Mortality and Cancer Incidence in Capacitor Manufacturing Workers," Judith A. Zack and David C. Musch, Department of Ophthalmology, University of Michigan Medical School (February 1983).
9. "Statistical Observations about the Causes of the Death of Patients with Oil Poisoning," Matsuo Amano, et al., Kenwa Labor and Hygiene Laboratory (April 1984).
10. "Mortality of Workers Exposed to Polychlorinated Biphenyls - an Update", David P. Brown, National Institute for Occupational Safety and Health (NIOSH), April 1985, with transmittal letter from David P. Brown, NIOSH to Aerovox Industries, Inc. (May 22, 1985).
11. "Short Term Mortality and Cancer Incidence in Capacitor Manufacturing Workers Exposed to Polychlorinated Biphenyls (PCBs)," Per Gustavson, Department of Occupational Medicine, Karolinska Hospital, Christer Hogstedt, Section of Occupational Medicine, Research Department, National Board of Occupational Safety and Health, and Christopher Rappe, Department of Organic Chemistry , University of Umea (April 21, 1986).
12. "Analysis of Deaths Seen Among Patients with Yusho," Kooiti Nakamura, et al., Department of Public Health, Faculty of Medicine, Kyushu University and Masanori Kuratsune , Nakamura Gakuen College (June 30, 1986).
13. "Cancer Mortality of Capacitor Manufacturing Workers," Pier Alberto Bertazzi, et al., Institute of Occupational Health, University of Milan (August 4, 1986).
14. "The Effect of Inherited Contamination of Egg and Larval Winter Flounder, *Pseudopleuronectes americanus*," Diane E. Black, Donald K. Phelps, and Richard L. Lapan, Environmental Research Laboratory (ERLN) (March 30, 1987).
15. "Methodology for Chemical Fixation of Inorganic Sludges," Rodney R. Bartchy Jr., Envirosafe Management Services, Inc. (October 21, 1987).

17.7 Reference Documents (continued)

16. "Mortality of Workers Exposed to Polychlorinated Biphenyls - An Update," David P. Brown, National Institute of Occupational Safety and Health and U.S. Department of Health and Human Services Center for Disease Control (November/December 1987).
17. "Lost Harvest: Sewage, Shellfish, and Economic Losses in the New Bedford Area," Conservation Law Foundation of New England (January 1988).
18. "Draft Report - Distribution and Concentration of Polychlorinated Biphenyls in Lobster, Winter Flounder, and Quahogs from Buzzards Bay, Massachusetts," Jack P. Schwartz, Commonwealth of Massachusetts Department of Fisheries, Wildlife, and Recreational Vehicles Division of Marine Fisheries for EPA Region I (September 1988).
19. "Hazard Assessment - Equilibrium Partitioning and Bioaccumulation of Sediment-Associated Contaminants by Infaunal Organisms," James L. Lake, et al., Environmental Research Laboratory (ERLN) (April 4, 1989).
20. Memorandum from Cheryl L. Siegel Scott, EPA Headquarters to Renate Kimborough, EPA Headquarters (June 13, 1989), concerning concordance of liver and gallbladder cancer coding between hospital diagnosis and death certificates.
21. "PCB Movement, Dechlorination, and Detoxification in the Acushnet Estuary," John F. Brown Jr. and Robert E. Wagner, General Electric Company (August 8, 1989).
22. "Geochemical Study of Sediment Contamination in New Bedford Harbor, Massachusetts," Richard J. Pruell, et al., Environmental Research Laboratory (ERLN) (August 21, 1989).
23. "Nonconstant Polychlorinated Biphenyl Partitioning in New Bedford Harbor Sediment During Sequential Batch Leaching," James M. Brannon, Tommy E. Meyers, Douglas Gunnisoni, and Cynthia B. Price, U.S. Army Engineer Waterways Experiment Station (WES) (June 1990).
24. "Ambient Air Monitoring of Dredging and Disposal of PCB Contaminated Sediment at a Marine Superfund Site: New Bedford Harbor, Massachusetts," Alan S. Fowler and Mark R. Hanson, EBASCO Services Inc. (July 1990).
25. "CF Systems Organics Extraction Process, New Bedford Harbor, MA: Applications Analysis report," (EPA/540/A5-90/002) EPA Office of Research and Development Risk Reduction Engineering Laboratory (August 1990).
26. "Research and Development Program for the Destruction of PCBs: Ninth Progress Report, June 1, 1989 -- July 31, 1990," General Electric Company Corporate Research and Development (August 1990).
27. "Buzzards Bay Caged Mussel Pilot Biomonitoring Study 1987 - 1988," Christine L. Duerring, Commonwealth of Massachusetts Department of Environmental Protection for EPA Region I (October 1990).
28. "ARARs Q's & A's: The Find-Balancing Waiver", EPA Office of Solid Waste and Emergency Response, 1991.
29. "Application of a Food Chain Model to Polychlorinated Biphenyl Contamination of the Lobster and Winter Flounder Food Chains in New Bedford Harbor," John P. Connolly, HydroQual, Inc. (April 1991).

17.7 Reference Documents (continued)

30. "Guidance for Water Quality-Based Decisions: The TMDL Process", U.S. EPA Office of Water, (April 1991).
31. "Bioaccumulation of P,P'-DDE and PCB 1254 by a Flatfish Bioindicator from Highly Contaminated Marine Sediments of Southern California," David R. Young, Alan J, Mearns, and Richard W. Gosset (1991).
32. "Development and Use of Site-Specific Chemical and Biological Criteria for Assessing New Bedford Harbor Pilot Dredging Project," William G. Nelson and David J. Hansen, Environmental Research Laboratory (ERLN) (1991).
33. "Draft Protocol: A Study of Cancer Incidence and Mortality Among Workers Exposed to Polychlorinated Biphenyls (PCBs) in Electrical Capacitor Manufacturing Plants", Karen E. Davis-King et al., NIOSH; David P. Brown, National Institute for Environmental Health Sciences; and Philip Taylor, National Cancer Institute, (July 27, 1992), with transmittal letter from Karen E. David-King, National Institute for Occupational Safety and Health (NIOSH) to Philip Fox, Aerovox, Inc.
34. "Partitioning of Polychlorinated Biphenyls Congeners in the Seawater of New Bedford Harbor, Massachusetts", Barbara Bergen, Science Applications International Corp. and William G. Nelson and Richard J. Pruell, EPA Environmental Research Laboratory (1993).
35. "Incidence of Adverse Biological Effects within Ranges of Chemical Concentrations in Marine and Estuarine Sediments", Edward R. Long, NOAA, Donald D. MacDonald, MacDonald Environmental Sciences, Ltd., Sherri L. Smith, Environment Canada and Fred D. Calder, Florida Department of Environmental Protection (October 15, 1993).
36. "TMDL Program Supplemental Guidance: The TMDL Concept", U.S. EPA (Draft of December 12, 1994).
37. "Polychlorinated Biphenyl Congener Distributions in Winter Flounder as Related to Gender, Spawning Site, and Congener Metabolism", Adria A. Elskus, et al., Woods Hole Oceanographic Institution, and Dianne E. Black et al., EPA Environmental Research Laboratory, (1994).
38. "Comparison of PCB and Trace Metal Bioaccumulation in the Blue Mussel, *Mytilus Edulis*, and the Ribbed Mussel, *Modiolus Demissus*, in New Bedford Harbor, Massachusetts", William G. Nelson, EPA Environmental Research Laboratory; Barbara J. Bergen, Science Applications International Corp.; and Donald J. Cobb, North East Laboratory (1994).
39. "Comparisons of Patterns of Polychlorinated Biphenyl Congeners in Water, Sediment, and Indigenous Organisms from New Bedford Harbor, Massachusetts", J. L. Lake, EPA Environmental Research Laboratory; R. McKinney and F. A. Osterman, Science Applications International Corp., and J. Heltshe, University of Rhode Island Department of Computer Science and Statistics, (Received July 16, 1994; revised January 23, 1995).

17.7 Reference Documents (continued)

40. "Women's Occupational Health Study: Breast Cancer Incidence in Occupational Cohorts Exposed to Ethylene Oxide and Polychlorinated Biphenyls", Elizabeth A. Whelan and Kyle Steenland, National Institute for Occupational Safety and Health (NIOSH), December 5, 1994, with transmittal letter from Elizabeth A. Whelan, NIOSH to Philip Fox, Aerovox Inc. (March 10, 1995).
41. "Fate and Transport of PCBs at the New Bedford Harbor Superfund Site", Laurie S. Garton, James S. Bonner, Andrew N. Ernest and Robin L. Autenrieth, Texas A & M University, Civil Engineering Department, Environment, Ocean and Water Resources Engineering College Station, Texas (1995).
42. "Environmental Effects of Dredging - Technical Notes" U.S. Army Engineers Waterways Experimental Station, Vertical Strip Drains to Increase Storage Capacity of Confined Disposal Facilities" (March 1996).
43. "Environmental Effects of Dredging - Technical Notes" U.S. Army Engineers Waterways Experimental Station, Natural Processes for Contaminant Treatment and Control at Dredged Material Confined Disposal Facilities", (March 1996).
44. "PCBs: Cancer Dose-Response Assessment and Application to Environmental Mixtures" National Center for Environmental Assessment, Office of Research and Development, U.S. EPA , (September 1996).
45. "Influence of Harbor Contamination of the Level and Composition of Polychlorinated Biphenyls in Produce in Greater New Bedford, Massachusetts" Alison C. Cullen, et al., Harvard School of Public Health (1996).
46. "Identification of Acute Toxicants in New Bedford Harbor Sediments", Kay T. Ho, et al., EPA Atlantic Ecology Division, (1996).
47. "Feminization of Male Common Tern Embryos is not Correlated with Exposure to Specific PCB Congeners", I.C.T. Nisbet, I.C.T. Nisbet & Company; D.M. Fry, Department of Avian Sciences, University of California; J. J. Hatch, Department of Biology, University of Massachusetts, Boston; and B. Lynn, Mississippi State Chemical Laboratory, Mississippi State University (1996).
48 "Results of Treatment Evaluations of Contaminated Soils," Pat Esposito et al., PEI Associates, Inc. and Robert Thurnau et al., Hazardous Waste Engineering Research Laboratory. (Undated)
49. "An Assessment of Materials that Interfere with Stabilization/Solidification Processes," M. John Cullinane Jr., R. Mark Bricka, and Norman X. Francingues Jr., U.S. Army Engineer Waterways Experiment Station (WES).(Undated)
50. "Interactions of Stabilized Incineration Residue with the Marine Environment," Frank J. Roethel and Vincent T. Breslin, Marine Sciences Research Center, State University of New York. (Undated)
51. "A Cohort Study on Mortality of 'Yusho' Patients: A Preliminary Report," Masanori Kuratsune, et al., Nakamura Gakuen College. (Undated)
52. "Polychlorinated Biphenyl Induction of Hepatocellular Carcinoma in the Sprague-Dawley Rat," D.H. Norback and Robert H. Weltman, Department of Pathology and Laboratory Medicine, University of Wisconsin. (Undated)

17.7 Reference Documents (continued)

53. "Food Chain Exposure Assessments: A Multi-Species Approach", Michael J. Donato and Andrew H. Baldwin, E.C. Jordan. (Undated).
54. "Long-Term Fate of PCB Contamination in the New Bedford Harbor, Massachusetts, System", M.C. Richmond, L.F. Hibler, T.E. Michener, M.L. Kemner, D.S. Trent and Y. Onishi, Battelle Pacific Northwest Laboratories. (Undated).
55. "Mortality and Industrial Hygiene Study of Workers Exposed to Polychlorinated Biphenyls", David P. Brown and Mark Jones, U.S. Department of Health, Education and Welfare, NIOSH. (Undated).
56. "On-Site Containment of PCB-Contaminated Soils at Aerovox, Inc., New Bedford, Massachusetts", John Joseph Gushue and Robert Steven Cummings. (Undated)

17.8 State and Local Technical Records

1. "Final - Phase 2 Facilities Plan - Volume IV - Effluent Outfall, " Camp, Dresser & McKee, Inc. for the City of New Bedford (January 1990).
2. "City of New Bedford -- Phase II Facility Plan - Volume VII - Supplemental Environmental Impact Report: Effluent Outfall - Section 4.0 - Assessment of Effluent Discharge on Marine Life and Harbor Uses," Camp, Dresser & McKee, Inc. (March 1991).

Appendix D - State Concurrence Letter

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
ONE WINTER STREET, BOSTON, MA 02108 617-292-5500

ARGEO PAUL CELLUCCI
Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

September 24, 1998

Ms. Patricia Meaney, Director
Office of Site Remediation and Restoration
U.S. EPA
JFK Federal Building
Boston, MA 02203

Re: State ROD Concurrence Letter
Upper and Lower Harbor Operable Unit #1
New Bedford Harbor Superfund Site

Dear Ms. Meaney:

The Department of Environmental Protection (DEP) has reviewed the preferred remedial action alternative recommended by the EPA for the cleanup of the Upper and Lower Harbor Operable Unit at the New Bedford Harbor Superfund Site. The DEP concurs with the selection of the preferred alternative for this operable unit.

The DEP has evaluated the EPA's preferred alternative for consistency with M.G.L. Chapter 21E, and the Massachusetts Contingency Plan (MCP). The preferred alternative addresses a continuing source of surface water and sediment contamination in the estuary, harbor, and bay of the site. This Operable Unit's remedial action has four components:

1) Removal by hydraulic dredging/transport by floating pipeline;
2) Water treatment;
3) Sediment consolidation in Confined Disposal Facilities (CDFs); and
4) Capping of the CDFs.

The DEP as determined that the preferred alternative for this Operable Unit is a remedial action on a portion of the disposal site which would be consistent with a future permanent or temporary solution for the entire disposal site. M.G.L. Chapter 21E allows the implementation of remedies on portions of a disposal site. Once the remedial actions are developed for the remainder of this disposal site, the DEP will evaluate the reduction of total site risk, in conformance with the MCP.

The DEP appreciates that the EPA included in this ROD the Enhancement of Remedy requested by DEP. The Enhancement of Remedy will be used to link the Navigational Dredging to the Superfund process. The State will be managing the Navigational Dredging. The ability of the State to complete the Navigational Dredging will depend on adequate funding.

You should be aware that the EPA's current project manager, Dave Dickerson; and past project managers, Mary Sanderson and Gayle Garman, should be commended for a superb job in managing this complex project. Their efforts to include the State in the Superfund process at this site have been greatly appreciated.

The Department looks forward to working with you in implementing the preferred alternative. If you have any questions, please contact Paul Craffey at 292-5591.

Very truly yours,

Robert Donovan,
Acting Assistant Commissioner

DBS/BWSC /pc

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