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. Community Relations

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