

**PROPOSED
SIXTH EXPLANATION OF SIGNIFICANT DIFFERENCES
FOR THE
NEW BEDFORD HARBOR SUPERFUND SITE
UPPER AND LOWER HARBOR OPERABLE UNIT 1 (OU1) AND THE OUTER HARBOR OPERABLE
UNIT 3 (OU3)
NEW BEDFORD, MASSACHUSETTS
JUNE 2017
EPA REGION 1**

I. INTRODUCTION TO THE SITE AND STATEMENT OF PURPOSE

Site name and Location: New Bedford Harbor Superfund Site (Site), Bristol County, Massachusetts

Lead Agency: United States Environmental Protection Agency

Support Agency: Massachusetts Department of Environmental Protection

Statement of Purpose:

Section 117(c) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), 42 U.S.C. § 9617(c), and Section 300.435(c)(2)(i) of the National Contingency Plan (NCP), 40 CFR § 300.435(c)(2)(i), require that, if any remedial action is taken after adoption of a final remedial action plan, and such action differs in any significant respect from the final plan, the United States Environmental Protection Agency (EPA) shall publish an Explanation of Significant Difference (ESD). The ESD must describe the significant difference(s) between the selected remedial action and the modified remedial action, including an explanation of why such changes were made.

Summary of Proposed Explanation of Significant Differences:

EPA documented the selected remedy for the Upper and Lower Harbor Operable Unit of the Site (Operable Unit 1 or OU1) in a Record of Decision (OU1 ROD or the 1998 ROD) which was signed on September 25, 1998. Since that time, EPA has gathered additional site information and refined the cleanup approach for the Upper and Lower Harbor areas through five prior ESDs. The cleanup plan selected in the OU1 ROD called for dredging of sediment in the Upper Harbor and Lower Harbor contaminated with polychlorinated biphenyls (PCBs) above the selected cleanup levels.¹ The OU1 ROD also included the remediation of two localized areas of PCB-contaminated sediment that exceeded OU1 cleanup standards, located in the Outer Harbor just south of the Hurricane Barrier.² In the OU1 ROD,

¹The New Bedford Harbor Superfund Site is divided into the Upper, Lower, and Outer Harbors. The boundary between the Upper/Lower Harbors and the Outer Harbor is the New Bedford Harbor hurricane barrier (Figure 1).

²These areas have been the subject of a pilot capping study and are subject to long-term monitoring.

EPA noted that further investigation of the Outer Harbor area (Operable Unit 3 or OU3) would be undertaken to determine whether any future remediation would be appropriate.

EPA performed a Remedial Investigation (RI) of the Outer Harbor from 2009 to 2015. The investigation resulted in a 2017 RI Report including a risk assessment of potential risks to both human and ecological receptors.

Based on the RI, EPA determined that:

1. PCB concentrations in OU3 Outer Harbor sediment are generally low; approximately 80% of the OU3 sample results were below a concentration level of 1 ppm. Sediment concentrations have been decreasing over time;
2. PCBs from OU1 contribute a measureable amount of PCBs to OU3 by tidally driven surface water flux and;
3. There is an unacceptable risk to human health due to potential consumption of PCB contaminated seafood in OU3; however, the PCBs in the seafood are due to exposure to PCBs originating in surface water flowing from OU1. There is also an unacceptable risk to ecological receptors exposed to PCBs through the diet or direct contact with PCB-contaminated media.

The implementation of the OU1 Remedy is expected to continue to reduce the overall PCB sediment concentrations at the Site, which is expected to address the PCB flux that is the cause of the contamination in OU3. Based on modeling performed in 2017, EPA estimates that PCB flux in surface water from the Upper and Lower Harbors through the Hurricane Barrier and out to the Outer Harbor will be reduced significantly after the OU1 Remedy is complete (Hayter, 2017).

For these reasons, through this proposed sixth ESD to the OU1 ROD, EPA is proposing to modify the OU1 Remedy to expand the OU1 area to include the OU3 area and eliminate the designation of "OU3." This ESD is not changing any of the remedial components of the OU1 Remedy. EPA will continue to perform the OU1 Remedy, implement institutional controls on seafood consumption (seafood advisories, signage, and educational campaigns), and EPA will continue to perform long-term seafood monitoring already being conducted under the OU1 Remedy. EPA will continue to monitor the effect of the completion of the OU1 Remedy on the entire Site, including the Outer Harbor. The goal of these fish consumption institutional controls is to minimize ingestion of locally-caught PCB-contaminated seafood until PCBs in seafood reach safe levels. State fishing restrictions are also in effect.

Public Comment Period:

This draft ESD is being issued for public comment. A formal public comment period on this draft ESD will run from June 28, 2017 through July 27, 2017. A public informational meeting will be held on this Draft ESD on Tuesday, June 27, 2017. EPA is accepting written and e-mailed comments on this ESD which will be included in the administrative record. Submit your comments by mail, hand delivery/courier, to:

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New Bedford Harbor Superfund Site
EPA Region 1, Office of Site Remediation and Restoration

MC: OSRR-07-1
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Comments may also be submitted electronically to white.kimberly@epa.gov with the SUBJECT LINE: "COMMENTS ON NBH PROPOSED ESD6".

EPA will consider and respond to all formal comments received during the comment period before issuing the final ESD. The final ESD will include a copy of all comments received during the comment period, along with EPA's responses to those comments and a description of any changes to the ESD since the issuance of the draft ESD. EPA's responses to these comments will be included in the final ESD. The public comments and EPA's responses to them will be made part of the public administrative record for the Site.

Availability of Records and Public Notice

The documents supporting this proposed ESD have been compiled into an administrative record file which will become part of the Administrative Record (AR) for the New Bedford Harbor Superfund Site, as required by the NCP 300.825(a)(2). The Administrative Record file for this ESD is being developed in accordance with Section 113 (k) of CERCLA and a copy of the files associated with the AR are available for public review at the following information repositories:

New Bedford Free Public Library
613 Pleasant Street, 2nd Floor Reference Department,
New Bedford, MA 02740
(508) 961-3067

EPA Region 1
OSRR Records and Information Center, 1st Floor
5 Post Office Square, Suite 100 (HSC),
Boston, MA 02109-3912
(617) 918-1440

EPA's website: <https://www2.epa.gov/new-bedford-harbor>

Attachment A to this document identifies the items contained in the Administrative Record file for this ESD.

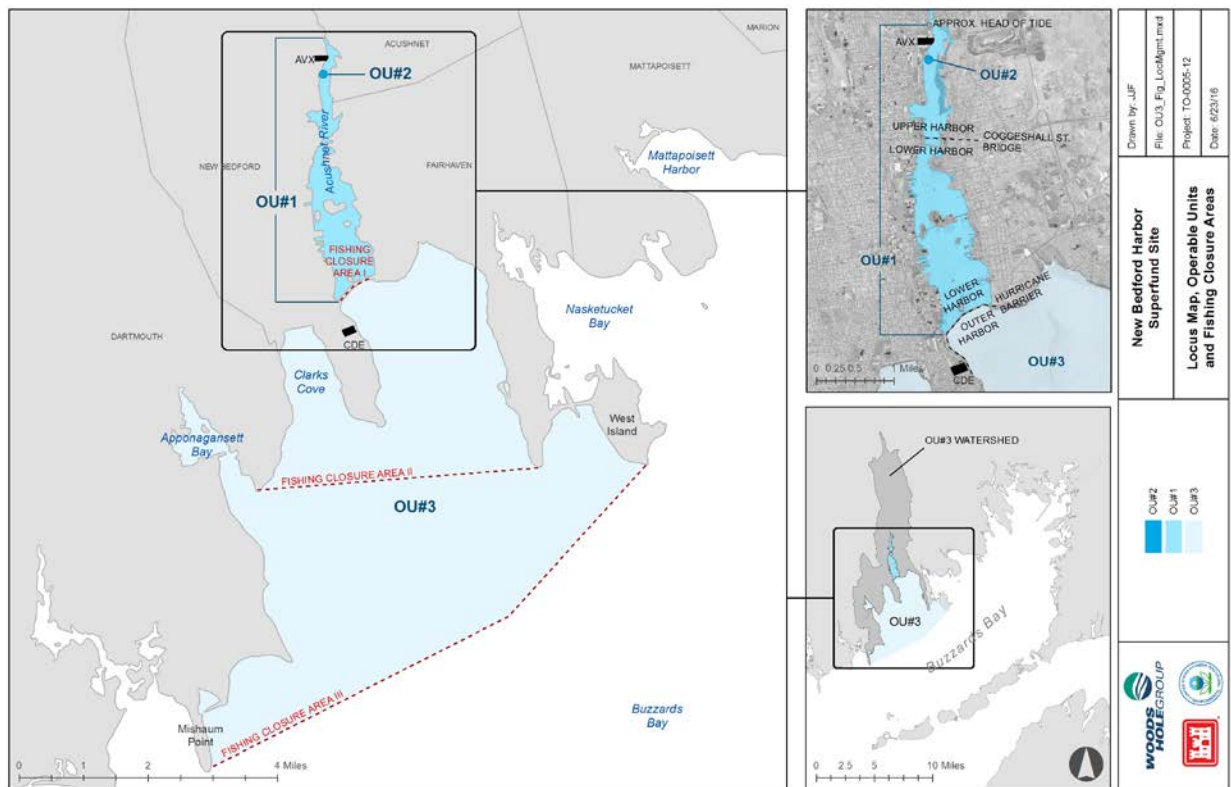
Section 117(d) of CERCLA, 42 U.S.C. §9617(D), requires public notification of the ESD in a newspaper of general circulation. **Attachment B** includes a copy of the notice published in New Bedford Standard Times. The notice includes information about the formal public comment period for this draft ESD.

II. SITE HISTORY, CONTAMINATION, AND SELECTED REMEDY

Summary of Contamination Problems and Site History

The New Bedford Harbor Superfund 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 acres of Buzzards Bay. The Site has been divided into three areas consistent with geographical features of the area and gradients of contamination. The Upper Harbor comprises approximately 200 acres. 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. The boundary between the Lower and Outer Harbor is the 150-foot-wide opening of the New Bedford hurricane barrier (constructed in the mid-1960s). The Outer Harbor is comprised of approximately 17,000 acres with its southern extent (and the Site's boundary) formed by 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. The Site is also defined by three fishing closure areas, promulgated by the Massachusetts Department of Public Health (MassDPH) in 1979, extending approximately 6.8 miles north to south and encompassing approximately 18,000 acres in total. (See Figure 1 below, also Figure 2.1-2 of the 2017 RI.)

Figure 1. Locus Map with Operable Units and Fishing Closure Areas



Identification of PCB-contaminated sediment and seafood in and around New Bedford Harbor was first made in the mid-1970s as a result of EPA region-wide sampling programs. Elevated levels of heavy metals in sediment (notably cadmium, chromium, copper and lead) were also identified during this time frame. The manufacture and sale of PCBs was banned by the Toxic Substances Control Act (TSCA) in 1978. In 1979, the Massachusetts Department of Public Health promulgated regulations prohibiting

fishing, shellfishing and lobstering within the Site due to elevated PCB levels in area seafood. 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 (Commonwealth) nominated the Site as its priority site for listing on the NPL.

EPA's site-specific investigations began in 1983 and 1984. Site investigations continued throughout the rest of the 1980s and early 1990s, including a pilot dredging and disposal study in 1988 and 1989, a baseline public health risk assessment in 1989, and computer modeling of site cleanup options and an updated feasibility study for the Site completed in 1990. Thousands of additional environmental samples have been taken since then to support the implementation of the remedy.

Collectively, these investigations identified the former Aerovox facility on Belleville Avenue in New Bedford, an electrical manufacturing plant located on the western shore of New Bedford Harbor, as the primary source of PCBs to the Site. PCB wastes were discharged from the facility's operations directly to the Upper Harbor through drainage trenches and discharge pipes, or indirectly throughout the site via CSOs (combined sewer overflows) and the City's sewage treatment plant outfall. PCBs were also released to the Harbor from the Cornell Dubilier Electronics, Inc. (CDE) facility just south of the hurricane barrier in New Bedford.

Based on the results of these investigations, state and federal enforcement actions were initiated against parties who owned and/or controlled both the Aerovox and CDE facilities, as well as the City of New Bedford (though the City is not a Potentially Responsible Party for this Site), pursuant to CERCLA, Massachusetts General Law c.21E, and other federal and state environmental statutes. For a summary of early enforcement actions and resulting settlements, please see Section II of the 1998 ROD (<http://www.epa.gov/region1/superfund/sites/newbedford/38206.pdf>). In September 2013, the U.S. District Court for the District of Massachusetts approved a landmark \$366.25 million, plus interest, cash-out settlement with AVX Corp., whose corporate predecessor, Aerovox Corp., owned and operated the Aerovox facility (through "reopeners" of a 1992 settlement with AVX). With this settlement, the pace of the Harbor cleanup has been accelerated. For more information on the 2013 settlement, see EPA's website, including the 2015 Five Year Review, which includes references to the 2013 settlement with AVX: <https://www.epa.gov/sites/production/files/2015-10/documents/583507.pdf>.

In April 1990, EPA issued a ROD for the Hot Spot Operable Unit of the Site (OU2). The Hot Spot ROD called for dredging and on-site incineration of sediment above 4,000 ppm (parts per million) PCBs in the vicinity of the Aerovox facility. Dredging and temporary disposal of this sediment—about 14,000 cubic yards in volume and 5 acres in area—into a storage cell built at EPA's Sawyer Street facility (Cell #1) began in April 1994 and was completed in September 1995. Pursuant to an April 1999 amendment to the 1990 Hot Spot ROD, the contaminated sediment was removed from the storage cell, dewatered, and transported to an offsite landfill for permanent disposal. This final offsite disposal phase of the Hot Spot remedy was completed in May 2000.

As described above, EPA issued the OU1 ROD for the cleanup of the Upper and Lower Harbor areas in September 1998. The Site cleanup is being managed by EPA, in partnership with the Massachusetts Department of Environmental Protection (MassDEP). The U.S. Army Corps of Engineers (USACE) is implementing the work under EPA's oversight.

Contamination Problems

The main Site concern is the widespread PCB contamination in New Bedford Harbor sediment. PCB levels in sediment generally decrease from north to south from the Upper Harbor to the Lower Harbor and out into the Outer Harbor. Because of this sediment contamination, PCBs are also found in elevated levels in the water column and in local seafood. In addition to the PCB contamination, Harbor sediment also contains high levels of other contaminants, including heavy metals (e.g., cadmium, chromium, copper and lead). High levels of solvents (e.g., trichloroethylene) have also been identified in sediment adjacent to the Aerovox facility. However, because many of these other contaminants are co-located with PCBs, the OU1 ROD contains action levels only for PCBs.

As described more completely in Sections V and VI of the 1998 ROD, EPA found the PCB contamination to result in unacceptable risks to human health and the environment. The biggest human health risk was found to be from frequent (e.g., weekly) ingestion of local seafood, although unacceptable risks were also found from frequent human contact with, or incidental ingestion of, PCB-contaminated shoreline sediment. Ecologically, EPA's investigations concluded that the Harbor's marine ecosystem is severely damaged from the widespread sediment PCB contamination. As a result, EPA issued fish consumption guidelines which can be found at: <https://www.epa.gov/new-bedford-harbor/fish-consumption-regulations-and-recommendations>.

EPA performed a Remedial Investigation of the Outer Harbor from 2009 to 2015, resulting in a 2017 Remedial Investigation Report (2017 RI Report). The 2017 RI Report indicated that PCB concentrations in OU3 Outer Harbor sediment are generally low, ranging from 0.0003 ppm to a high of 19.5 ppm; approximately 80% of the OU3 sample results were below a concentration level of 1 ppm. The median and mean sediment concentrations found were 0.166 ppm and 1.33 ppm respectively. Sediment concentrations have been decreasing over time, based on Long Term Monitoring (LTM) sampling.

The unacceptable risk in the Outer Harbor is due to PCB flux from OU1 and the accumulation of PCBs in seafood tissue. The results of the 2017 RI Report and the contamination in the Outer Harbor are discussed in more detail below.

Summary of Selected Remedy

OU1 Remedy - Dredging

The OU1 ROD called for the dredging of approximately 450,000 cubic yards of *in situ* PCB-contaminated sediments in the Upper and Lower Harbors to meet cleanup levels as presented below.

For subtidal areas, the cleanup levels are:

- 10 ppm PCBs for subtidal and mudflat sediment in the Upper Harbor, which has most of the PCB contamination
- 50 ppm PCBs for subtidal and mudflat sediment in the Lower Harbor

For the shoreline intertidal areas other than mudflats, the cleanup levels, aimed at reducing risk from human contact with contaminated sediment, are:

- 1 ppm PCBs for areas bordering residential areas
- 25 ppm PCBs for shoreline areas bordering recreational areas

- 50 ppm PCBs for other shoreline areas with little or no public access, including saltmarshes

The OU1 ROD called for the construction of four shoreline confined disposal facilities (CDFs) (A, B, C, and D) to contain and isolate the dredged sediment, associated water treatment, capping of the CDFs, long-term monitoring and maintenance, and institutional controls. The CDFs were conceptually located in PCB-contaminated areas to avoid the need to dredge an additional approximately 126,000 cubic yards of *in situ* sediment, which instead would have been contained within the footprint of the CDFs. The ROD also required that institutional controls, such as the state-mandated fish closure areas and fish consumption guidelines, be in place until PCB levels in seafood reach acceptable levels for human consumption. The OU1 ROD also authorized the Commonwealth of Massachusetts to conduct additional navigational dredging and on-site disposal of sediments contaminated with PCBs below the OU1 ROD cleanup levels as part of an enhanced remedy under CERCLA, known as the “State Enhanced Remedy”.

Based on additional information and refinements of the cleanup approach for OU1, EPA has issued five ESDs modifying the OU1 ROD Remedy. These ESDs are summarized below:

- In September 2001, EPA issued ESD1, which set forth five changes to the OU1 Remedy, including: the use of mechanical dewatering of dredged sediment to reduce the volume of processed sediments needing disposal, incorporation of a rail spur, the revision of the dike design at CDF D, ongoing use of the pilot CDF at EPA’s Sawyer Street facility, and identification of additional intertidal cleanup areas near residences.
- In 2002, EPA issued ESD2, which eliminated CDF D, the largest of the four CDFs, and instead sent the dredged sediment that would have gone to CDF D to an offsite landfill.
- In 2010, EPA issued ESD3, which documented the temporary storage of PCB- and VOC-contaminated sediments in the former Hot Spot sediment disposal cell (“Cell 1”) at EPA’s Sawyer Street facility.
- In 2011, EPA issued ESD4, which modified the remedy to include the construction and use of a confined aquatic disposal (CAD) cell in the Lower Harbor (the Lower Harbor CAD Cell or LHCC) for disposal of approximately 300,000 cy of dredged sediments with PCB concentrations above the OU1 ROD action levels.
- In 2015, EPA issued ESD5, which eliminated the three remaining originally planned CDFs (A, B, and modified C), and selected off-site disposal of sediment slated for disposal in those planned CDFs. Through this ESD, EPA also confirmed that the Sawyer Street pilot CDF is protective and made it a permanent TSCA disposal facility.

As of April 2017, EPA has dredged the following quantities of sediment from the Upper and Lower Harbor:

- 433,570 cubic yards of contaminated intertidal and subtidal sediment from the Upper Harbor followed by off-site disposal;
- approximately 40,000 cubic yards of contaminated sediment from the Upper Harbor followed by LHCC disposal;
- approximately 84,000 cubic yards from the Lower Harbor followed by disposal in the LHCC.

With the \$366.25 million, plus interest, cash-out settlement with AVX Corporation approved by the U.S. District Court in September 2013, dredging currently continues at an accelerated pace. In addition to the EPA dredging, various navigation-related projects authorized under the State Enhanced Remedy

component of the OU1 ROD have led to the dredging and CAD disposal in a State-designated Dredged Material Management Plan (DMMP) area of an additional approximately 550,000 cubic yards of less contaminated sediment from the Site.

OU1 Remedy - Outer Harbor Cap

OU3 was created in response to comments received regarding the OU1 Proposed Plan issued in January 1992. A supplemental investigation and feasibility study concluded that there were 3 locations within OU3 with relatively high PCB concentrations. Two areas were found to be adjacent to the Combined Sewer Overflow (CSO) by the Cornell Dubilier plant and a third area was found surrounding the City of New Bedford's treatment plant outfall.

The 1998 OU1 ROD included an interim remedy to address the two localized areas in the Outer Harbor near the CDE facility where PCB-contaminated sediment had concentrations above 50 ppm. The two areas near the CDE facility were capped as part of a pilot study in 2005. The cap material was generated from the construction of the first SER CAD Cell. The third area of heightened PCB concentrations in sediment in the Outer Harbor identified was the area of PCB contamination near the City's outfall pipe, which has since been addressed through wastewater treatment facility upgrades and the reduction of PCB disposal in the City's wastewater system. An area adjacent to the 2005 Pilot Cap and the shoreline which had sediment PCB concentration less than 50 ppm was also later capped in 2015 as part of a mitigation project required under the State Enhanced Remedy. See Figure 2 below, also Figure 2.3.1 of the 2017 RI. Finally, the 1998 ROD also called for further investigation to determine if any additional remedial action was required for the remainder of the Outer Harbor.

Figure 2. 2005 and 2015 Cap Footprint Areas



III. BASIS FOR THE DOCUMENT

EPA is proposing through this ESD6 to expand the OU1 remedy to include the OU3 area based on the key findings of the 2017 Remedial Investigation of the Outer Harbor, including the long-term monitoring results.

Based on the 2017 Remedial Investigation, EPA has determined that:

1. PCB concentrations in OU 3 Outer Harbor sediment are generally low, ranging from 0.0003 ppm to a high of 19.5 ppm; approximately 80% of the OU3 sample results were below a concentration level of 1 ppm. The median and mean sediment concentrations found were 0.166 ppm and 1.33 ppm respectively. Sediment concentrations have been decreasing over time;
2. PCBs from OU1 contribute a measureable amount of PCBs to OU3 by tidally driven surface water flux and;
3. There is an unacceptable risk to human health due to potential consumption of PCB contaminated seafood in OU3; however, the PCBs in the seafood are due to exposure to PCBs originating in surface water flowing from OU1. There is also an unacceptable risk to ecological receptors to PCBs through the diet or direct contact with PCB-contaminated media.

EPA believes that the implementation of the OU1 Remedy will reduce the overall PCB concentrations at the Site, thereby reducing the PCB flux that is the ongoing primary source of the contamination in OU3. As described above, based on modeling performed in 2017, EPA estimates that PCB flux in surface water from the Upper and Lower Harbors to the Outer Harbor will be reduced significantly after the OU1 Remedy is complete (Hayter, 2017).

Based on the long-term monitoring data, the OU1 Remedy has been effective, and its continued performance has resulted in reductions in levels of PCBs in fish tissue causing unacceptable risks in the Outer Harbor (although risks still remain from consuming Outer Harbor seafood). For these reasons, through this proposed sixth ESD to the OU1 ROD, EPA is proposing to modify the OU1 Remedy to expand the OU1 area to include the OU3 area and eliminate the designation of "OU3". This ESD is not changing any of the remedial components of the OU1 Remedy. EPA will continue to perform the OU1 Remedy, which includes implementing institutional controls on seafood consumption (seafood advisories, signage, and educational campaigns) and the performance of long-term seafood monitoring. EPA will continue to monitor the effect of the completion of the OU1 Remedy on the entire Site, including the Outer Harbor.

A discussion of key findings from the 2017 Remedial Investigation for the Outer Harbor, including the long-term monitoring efforts, is provided below.

1. Sediment PCB Concentrations in the Outer Harbor are Low and Continue to Decrease

As presented in the 2017 RI report, sediment PCB concentrations in OU3 were characterized with data from three sources: (i) EPA's Long Term Monitoring (LTM) sampling program, which included sampling for PCBs in surface sediments throughout the Site and was carried out in 1993, 1995, 1999, 2004, 2009 and 2014; (ii) the Pilot Cap area sampling conducted since 2005; and (iii) supplemental sampling completed in 2009 as part of the remedial investigation.

EPA LTM sampling included collecting data from 79 stations in the Upper Harbor, Lower Harbor, and Outer Harbor to assess spatial and temporal trends in the data and the effects and/or effectiveness of the remedial activities. Sediment grabs from the top 2 cm were collected for chemical and physical testing; benthic community analysis was conducted to assess sediment conditions as well.

Pilot Cap area sediment sampling data has been collected since 2005 and includes seven sampling events (over several years) to determine cap thickness using bathymetric surveys and to determine PCB levels in surface sediment from grab samples collected in the top 3 inches.

The 2009 RI sampling included sampling from four habitat types in OU3 (salt marshes, nearshore environments, cap and hurricane barrier stations, and offshore areas) and in corresponding habitats in the reference areas. The 2009 sampling included a total of 42 sediment samples for chemical analysis. Biological tissue samples for chemical analysis were also collected along with sediment samples for toxicity testing and benthic community analysis. Surface water samples were also collected for the RI; analytical results are presented in the following section.

In general, the conclusions presented in the 2017 RI report are:

- Sediment PCB concentrations are decreasing over time in OU3, based on LTM sampling.
- There are areas where PCB concentrations in sediment exceed the biological effect screening levels (NOAA Effects Range Low (ER-L, 23 ppb or 0.023 ppm) and the Effects Range Median (ER-M, 180 ppb or 0.18 ppm), but the extent of the Outer Harbor that is below the ER-L and ER-M is increasing with time.
- Sediment PCB concentrations in OU3 are elevated relative to the reference area³, but lower than the Upper and Lower Harbor.
- In 2009, there were elevated concentrations of PCBs (but not exceeding 50 ppm) inshore of the 2005 Pilot Cap near the CDE facility, but those areas were capped in 2015 as part of a mitigation project required under the State Enhanced Remedy.

More specifically, EPA's LTM program indicates that sediment concentrations in OU3 have decreased since 1993. A comparison of LTM data from the two most recent sampling events (2009 and 2014) shows the mean sediment PCB concentration in OU3 surficial sediments dropped from 0.24 to 0.17 mg/kg (ppm) over this period, and samples from 20 of the 23 stations showed a decrease in concentration (EPA, 2015).

Although the 2009 RI sampling data shows elevated PCB concentrations in sediment in certain areas of OU3 when compared to the ER-L and ER-M, EPA's LTM data shows that the areas where concentrations are below the ER-L and ER-M have expanded since 1993 (Figure 5.1-1 of the 2017 RI). Despite the fact that PCB sediment concentrations in OU3 continue to exceed levels in reference areas, benthic community analysis shows that the benthic community in OU3 is relatively healthy. Nevertheless, tissue concentrations of PCBs in all biota measured in OU3 are generally an order of magnitude, or more, higher than those in biota from the reference area.

³ Reference area is where habitats of interest, similar to the Site, may be found and are used for comparisons to ascertain conditions at the site relative to the general region. The reference area for the RI was Sippican Harbor located in Marion, MA.

Overall, the sediment PCB concentrations in OU3 are lower than concentrations in OU1. The sediment PCB concentrations in Upper and Lower Harbor sediments range from 10-1000 mg/kg, while surface sediment PCB concentrations in OU3 (not capped with clean material) are generally less than 1 mg/kg at most locations. OU3 Outer Harbor PCB concentrations in sediment range from 0.0003 ppm to a high of 19.5 ppm; approximately 80% of the OU3 sample results were below a concentration level of 1 ppm. The median and mean sediment concentrations found were 0.166 ppm and 1.33 ppm respectively.

A 2014 study, conducted as part of the RI, concluded that there has been a general decrease in the total mass of PCBs in surface sediments (top 2 centimeters) within OU3. Samples collected in 2016, which included samples taken both within and outside of the capped areas in the Outer Harbor, range from 0.0347 to 1.19 mg/kg with an average of 0.4 mg/kg. The most recent Pilot Cap monitoring report, (Jacobs, 2017) indicates that the surface of the capped areas found near CDE contains PCB concentration levels below 4 mg/kg.

2. PCBs from OU1 Contribute PCBs to OU3 by Surface Water Flux

Surface water sampling was done in 2010 as part of a flux study at the hurricane barrier to characterize the net flow of PCBs to OU3 from the Upper and Lower Harbor areas. The flux study also used data from the 2009 RI Investigation collected near two combined sewer outfalls in OU3. Finally, in 2015 surface water PCBs were measured using Passive Samplers in key areas: just outside the hurricane barrier, in the marsh areas throughout OU3 that were previously sampled for biological tissue and sediment, and at the reference area.

In summary, the conclusions from the 2017 RI report indicate:

- Surface water PCBs are elevated in OU3 relative to the reference area, both in the freely dissolved fraction and whole water (particulate plus dissolved) fractions;
- Surface water PCB concentrations are elevated at the hurricane barrier, relative to both the reference area, and the other stations within OU3;
- Waterborne concentrations of PCBs at the hurricane barrier exceed the National Recommended Water Quality Criteria (NRWQC) criterion for protection of aquatic life;
- A measurable PCB flux from inside the hurricane barrier to OU3 constitutes a continuing source of PCBs from the Upper and Lower Harbor areas to the Outer Harbor.

More specifically, the 2010 PCB flux study data showed PCB concentrations at the hurricane barrier ranging from 0.88 to 11.9 ng/l in the dissolved phase, and 8 to 42 ng/l in the whole water (dissolved plus particulate) portion (Appendix F of the 2017 RI). Flood tide values, which represent the PCB concentration in the water mass moving into the harbor from OU3 and Buzzard's Bay, were always lower than ebb tide values which reflect the water mass moving from the harbor to OU3. Flood tide PCB concentrations were generally about half the values of ebb tides. In addition, 5 of the 6 measured ebb tide PCB concentrations for dissolved plus particulate PCBs exceeded the National Recommended Water Quality Criterion, CCC (Criterion Chronic Concentration) for total PCBs in marine water of 30 ng/l, while the average flood tide values never did. All PCB concentrations in these samples exceeded the National Recommended Water Quality Criterion for protection of humans (0.064 ng/L based on a carcinogenic risk of 10E-6 or 6.4 ng/L based on a carcinogenic risk of 10E-4). EPA notes that consistent with the findings in the OU1 ROD, swimming has not been found to result in a significant human health risk at the Site.

The flux study measured the mass of PCBs flowing into the harbor, and out to OU3 on each measured tide, and provided an estimate of annual net flux of PCBs from the harbor to OU3. Mass flux was calculated from the measured PCB concentration in flow-proportioned composite samples, and the measured flow volume for the particular tide. The net PCB mass flux to OU3 from the Lower Harbor ranged from 24.7 g (0.05 lb) per tidal cycle (neap tide on April 21, 2010) to 82.8 g (0.18 lb) per tidal cycle (weather event on April 28, 2010 coinciding with spring tide). The mean net PCB mass flux from the Lower Harbor to OU3 for the six sampling events was 61 g (0.13 lb) per tidal cycle, which, if scaled to daily and yearly flux is approximately 118 g (0.26 lb) per day and 43 kg (95 lb) per year.

Sampling results from the 2015 passive sampling study show that freely dissolved PCBs ranged from 1.5 to 60 ng/L in surface water, and 2 to 23 ng/l in pore water. The freely dissolved PCB concentration in water represents the bioavailable fraction, and is of interest in determining biological exposure to PCBs. Concentrations were higher near the hurricane barrier (average 48.6 ng/L in surface water and 20.8 ng/L in pore water) than in the other stations throughout OU3 (average 3.7 ng/L in surface water, 4.1 ng/L in pore water). In the reference area sample, the surface water concentration was less than 1 ng/L (0.36 ng/L). The measurement of PCBs in surface water supports the importance of surface water as the exposure medium in the food chains for the Site, relative to sediment.

The surface water PCBs concentrations from OU1 contribute PCBs to receptors in the Outer Harbor through surface water, food web, and sediment exposures, and represents an uncontrolled source of PCBs to OU3. However, full scale remediation of the OU1 area is intended to reduce the flux of waterborne PCBs from the Upper and Lower Harbor areas, along with removing (or containing) contaminated sediment from the Harbor. As remediation of sediment within OU1 moves towards completion, surface water PCB concentrations are expected to decrease. As described in the OU1 ROD at page 34: "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."⁴ Monitoring will continue to measure progress towards this goal as the OU1 Remedy is performed.

In addition to the previous lines of evidence cited, modeling was performed to estimate PCB flux in surface water from the Upper and Lower Harbors to the Outer Harbor. Based on this modeling, EPA estimates that the PCB flux will be reduced significantly after the OU1 Remedy is complete (Hayter, 2017). Although the model was based on limited data sets, collection of additional data going forward can be used to lower the uncertainty of the forecast results. The average annual flux of PCBs from the OU1 area to OU3 measured in the 2010 flux study was approximately 43 kg/year, while the model predicted pre-remediation flux rates with a median and average value of about 30 kg/year. According to the model, once the remedial dredging is completed at OU1, the post-remediation flux rate is forecast to decrease by about an order of magnitude (to about 4.5 kg/year) from the pre-remedial range, followed by a slow decrease of another order of magnitude over a 30-year period down to approximately 0.4 kg/year. Therefore, according to the model, 30 years after the OU1 Remedy is completed the average annual flux of PCBs through the hurricane barrier is estimated to be approximately two orders of magnitude less than before remediation.

3. Remaining Risk in OU3 is Due to Consumption of Seafood Exposed to PCBs in Surface Water

4. OU1 ROD at 34.

Human health risks associated with consumption of edible seafood from OU3, and risks to ecological receptors exposed to PCBs through the diet or direct ingestion of contaminated media constitute unacceptable CERCLA risks that remain in the Outer Harbor. Therefore, the OU1 remedy must continue to be performed to reduce PCBs in surface water at the Site. Below is a brief summary of the general findings of the Ecological and Human Health Risk assessment documented in the 2017 RI report for OU3:

- The Ecological Risk Assessment evaluated the potential ecological risks of PCBs in the near shore marine environment for various exposure routes including direct exposure to PCBs in water and sediment, or consumption of contaminated prey (killifish, scup, quahog, mussel, oyster, lobster and soft-bodied worms). For example, the risks of measured tissue PCB concentrations were evaluated by comparing the tissue concentration in OU3 organisms with the tissue concentrations known from the scientific literature studies to be toxic or non-toxic (i.e. residue effects levels). If the tissue concentrations in OU3 organisms were less than the no-effect residue effect level, then it was concluded that there was no significant risk. The risks to wildlife species (heron, cormorant, tern, osprey, mink) due to ingestion of PCB-contaminated prey was evaluated using modeled ingestion rates along with PCB concentrations in prey (e.g. eel, killifish, scup, lobster). The risk was characterized by comparing the modeled ingested dose by the no-effect dose obtained from literature studies. The risk was expressed as a hazard quotient (HQ), calculated by dividing the modeled dose in OU3 wildlife by the no-effect dose. In general, all wildlife receptors considered had an HQ greater than one, which indicates a potentially adverse ecological effect from PCBs (Table 6.3-13 of the 2017 RI). The highest HQ of 40 was calculated for Osprey feeding on scup and eel throughout the Site.
- The Baseline Human Health Risk Assessment (BHHRA) evaluated human health risks for a potential recreational angler and family members (child, older child, and adult) who consume seafood contaminated with PCBs (lobster meat, lobster meat and tomalley, quahogs, scup, and black sea bass) caught from OU3. The exposures and risks for seafood consumption were evaluated separately for Closure Area II (in OU3)⁵, Closure Area III (in OU3) and the Reference Area at Sippican Harbor (see Figure 2). The BHHRA concluded that the seafood consumption risks are higher than CERCLA limits (i.e. cancer risk greater than 1E-04, or HQ greater than 1) in Closure Area II and III, as well as in the Reference Area. Closure Area II risks are higher than those associated with Closure Area III, and risks for both closure areas are at least double the risks for the Reference Area. Additional details of the BHHRA are provided in Chapter 7 of the 2017 RI report.

As described above, the evaluation of exposure pathways suggests that surface water, rather than sediment, is the more important source of PCBs to ecological and human receptors in the Outer Harbor. In Chapter 8 of the 2017 RI, the analysis of modeled food chain exposures in fish and shellfish for ecological and human receptors shows an unacceptable ecological risk and human health risk from seafood consumption and that risk originates largely through exposure of the consumed organisms to total PCBs or dioxin-like PCB congeners in the surface water, rather than the sediment. Table 8.3-2 and

⁵ The closure areas were established in 1979 by MassDEP and MassDPH when PCB contamination was initially identified in edible seafood (MassDPH, 1979).

Table 8.3-3 from the 2017 RI provide a summary of the exposure pathways for ecological and human receptors that have an unacceptable risk, respectively.

Surface water is a significant exposure medium in the food chains for the Site because (1) PCB congeners occur in OU3 surface water in concentrations that often exceed NRWQC for protection of marine organisms and humans; (2) the concentrations of the freely dissolved PCB congeners in surface water, which are generally accepted as the bioavailable fraction, are elevated above reference area concentrations; and (3) the areas of elevated concentrations of freely dissolved PCB congeners correspond to areas where elevated concentrations of PCBs were measured in biological tissue.

IV. DESCRIPTION OF SIGNIFICANT DIFFERENCES

Although levels of PCBs in contaminated sediment in OU3 are generally below 1 ppm at most locations, the consumption of PCB-contaminated seafood caught in OU3 continues to present a human health risk above the acceptable CERCLA risk range. In addition, consumption of PCB-contaminated prey by several wildlife species currently presents an unacceptable ecological risk. An evaluation of exposure pathways suggests surface water, rather than sediment, is the primary source of PCBs to receptors in OU3. PCB flux in surface water from OU1 therefore represents an uncontrolled source of PCB contamination in OU3.

The implementation of the OU1 Remedy is expected to continue to reduce the overall PCB sediment concentrations at the Site, which is expected to address the PCB flux that is the cause of the contamination in OU3. Through this proposed sixth ESD to the OU1 ROD, EPA is proposing to modify the OU1 area to include the OU3 area and eliminate the designation of "OU3". This ESD is not changing any of the remedial components of the OU1 Remedy. EPA will continue to monitor the effectiveness and protectiveness of the OU1 Remedy, including the Outer Harbor as part of Five Year Review process. The need for any additional remedial measures in the Outer Harbor area (of the enlarged OU1) will be addressed in a future decision document, after the OU1 dredging within the Upper and Lower Harbors has been completed and its impact on the Outer Harbor is evaluated.

EPA will continue to perform the OU1 Remedy, implement institutional controls on seafood consumption (seafood advisories, signage, and educational campaigns), and EPA will continue to perform long-term seafood monitoring already being conducted under the OU1 Remedy. The goal of these fish consumption institutional controls is to minimize ingestion of locally-caught PCB-contaminated seafood until PCBs in seafood reach safe levels. State fishing restrictions are also in effect. As described above, the 1998 OU1 Remedy included an interim action addressing areas in the Outer Harbor where sediment contaminated with PCB concentrations were over 50 ppm. This area was capped in 2005 by the Pilot Cap; evaluation of this Pilot Cap is ongoing. As part of a mitigation project under the SER, an additional area of elevated sediment contamination adjacent to the Pilot Cap was also capped in 2015. The combination of capping these two areas reduced the availability of PCBs to the marine food chain and significantly reduced the source of PCBs to surface water in the Outer Harbor.

In addition, as part of the OU1 Remedy, institutional controls have been put in place to prevent any damage to the Pilot Cap in the Outer Harbor. In July 2011, the U.S. Coast Guard designated the Pilot Cap area as a Regulated Navigation Area (RNA) at EPA's request after a formal rulemaking process. This RNA is an institutional control that restricts persons and vessels from disturbing the seabed, which includes

but is not limited to anchoring, dragging, trawling and spudding within this area. EPA will continue to monitor the physical, chemical and biological quality of the cap to ensure that it is functioning as intended.

EPA will continue the seafood monitoring program (being carried out by MassDEP) within the Site, including the Outer Harbor, to evaluate whether the cleanup work is having an impact on PCB concentration levels in locally caught fish and shellfish. This monitoring continues under the OU1 Remedy. EPA will also continue to perform long term monitoring of sediment and biota, and will continue to conduct Five-Year Reviews for the Site, including the expanded area of OU1 that encompasses the Outer Harbor. EPA will continue to monitor the effect of the completion of the OU1 Remedy on the entire Site, including the Outer Harbor.

V. SUPPORTING AGENCY COMMENTS

EPA will accept comments from the Commonwealth of Massachusetts on the draft ESD during the public comment period. State comments or other information received from the State may result in the modification to the ESD.

VI. STATUTORY DETERMINATIONS

The proposed modification of the OU1 area to include the OU3 area and eliminate the designation of "OU3" does not require the addition and/or modification of Applicable or Relevant and Appropriate Requirements (ARARs) that have been identified in the 1998 ROD and the subsequent five ESDs that have modified it.

The remedy as modified herein remains protective of human health and the environment, complies with all federal and state requirements that are applicable or relevant and appropriate to the remedy, and is cost-effective. In addition, the remedy as modified utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable for this Site.

VII. PUBLIC PARTICIPATION COMPLIANCE

EPA maintains significant public outreach regarding the Site, including an extensive website, emailed community updates, and the holding of public meetings with site stakeholders to keep them up to date on the Site's cleanup status. A public informational meeting will be held on this Draft ESD on Tuesday, June 27, 2017.

Also to ensure that all interested parties have an opportunity to provide input to EPA before its final decision on this modification to the remedy, a public comment period will be held from June 28, 2017 through July 27, 2017. In the Final ESD, **Attachment D** will include EPA's responses to comments received on this Draft ESD. Any revisions in the Final ESD, as referenced in the EPA responses, will be incorporated into the document, as appropriate.

VIII. DECLARATION

For the foregoing reasons, by my signature below, I approve the issuance of this sixth Explanation of Significant Differences for the New Bedford Harbor Superfund Site located in New Bedford, Acushnet, Fairhaven and Dartmouth, Massachusetts and the changes and conclusions stated therein.

Bryan Olson, Director
Office of Site Remediation and Restoration
EPA Region 1

Date