New Bedford Harbor Superfund Site

U.S. Army Corps of Engineers New England District

Final Between the Bridges After Action Report

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Acronyms and Abbreviations

BtB	Between the Bridges
cy	cubic yards
EPA	U.S. Environmental Protection Agency
ft.	feet
GPS	global positioning system
Jacobs	Jacobs Engineering Group, Inc.
mg/kg	milligrams per kilogram
NAE	U.S. Army Corps of Engineers – New England District
PCB	polychlorinated biphenyl
RBG	risk-based goals
ROD	Record of Decision
RTK	real-time kinematic
Sevenson	Sevenson Environmental Services, Inc.
TCL	target cleanup level
TSCA	Toxic Substances Control Act
UCL	upper confidence limit
Work Plan	*Draft Final Intertidal Remediation Work Plan for Between the Bridges*

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1. Introduction

Remediation and restoration of the Between the Bridges (BtB) intertidal zone and adjacent parcels were conducted by Jacobs Engineering Group, Inc. (Jacobs) under U.S. Army Corps of Engineers – New England District (NAE) Interim Remediation Action Contract No. W912WJ-14-D-0002 between July 2018 and August 2018. The primary objective of remedial action at BtB was to remove soil and sediment with polychlorinated biphenyl (PCB) concentrations greater than the site-specific target cleanup levels (TCLs) as established in the *1998 Record of Decision for the New Bedford Harbor Superfund Site* (EPA 1998), and to restore the site to baseline or comparable conditions. TCLs established for the BtB site are 1 milligram per kilogram (mg/kg) for residential properties and 25 mg/kg for non-residential shoreline areas where beachcombing is expected. These TCLs apply to the top 1 foot (ft.) of sediment. A TCL of 50 mg/kg applies to shoreline areas where contact with intertidal sediment is not expected due to physical barriers such as rip rap or commercial/industrial land use. U.S. Environmental Protection Agency (EPA) has established TCLs for intertidal sediment/soil below a depth of 1 ft. as follows: 50 mg/kg for recreational and commercial/industrial/remote wetland properties; 1 mg/kg average for easy-to-access areas on residential properties (e.g., areas landward of saltmarsh or retaining walls, backyards) and 25 mg/kg average for hard-to-access areas on residential properties (e.g., saltmarsh, mudflats, areas seaward of retaining walls). Collectively, the BtB area includes contaminated parcels of land that fall into all of these categories (Table 1-1). The BtB area includes six sub-areas delineated by property boundaries. The excavation areas comprise approximately 7,600 square feet (less than 0.2 acres) (Figure 1-1).

The purpose of this After Action Report is to document the remediation activity and final disposition of the restored BtB area. Contaminated sediments were removed and the BtB area was restored in accordance with the Draft Final Intertidal Remediation Work Plan for Between the Bridges (Work Plan) (Jacobs 2018a). The designed excavation areas are presented on Figure 1-1.

2. Remedial Activities

The methods used to complete the remedial activities at the Site are presented below.

2.1 Site Preparation

Sampling of sediment and soil from the subtidal, intertidal, and upland areas around BtB was conducted in 1999, 2000, and 2001 which provided the horizontal and vertical boundaries of the excavation operation for PCB soil and sediment. At the direction of EPA, additional data gap sampling was conducted in 2015, 2016, and 2017 to further refine excavation boundaries. Figure 2-1 and Table 2-1 present the pre-excavation sampling locations and PCB concentrations in sediments for the BtB intertidal zone.

Pre-existing conditions at BtB were documented prior to the initiation of remedial activities to establish baseline conditions for backfill, contouring, and re-establishment of native vegetation. This included a pre-excavation elevation survey and mapping of wetland cover type within the intertidal area (Figure 2-2). Other pre-excavation preparation activities included the installation of a construction fence along Beach Street, site clearing, clearing and construction of the access road, and mobilization of equipment.

2.2 Removal of Contaminated Sediments

Excavation was conducted by Sevenson Environmental Services, Inc. (Sevenson) with track-mounted excavators operated in the intertidal zone and guided by real-time kinematic global positioning system (RTK GPS) (Figure 2-3). Excavated material was loaded onto scows and transported to the Area C dock where the material was loaded into trucks. The material was then transported by truck to the Debris Disposal Area (DDA) in Area C for further stabilization and load out. See Section 3 below for additional disposal details.

A total of 655.9 cubic yards (cy) of contaminated sediment was removed from the BtB intertidal zone. This value is based on estimates derived from the pre-excavation and post-excavation survey data. The as-built limits of excavation are presented on Figure 2-3. Excavation was halted at the southern border of Parcel 17-010 and did not impact the I-195 right of way.

2.3 Environmental Sampling

Consistent with the Record of Decision (ROD) (EPA 1998), to assess residential and recreational dermal exposure to intertidal soils and sediments, 95% upper confidence limit (UCL) calculations were performed on the top foot of the final remediated and restored condition of the top foot of the entire BtB intertidal zone (i.e., remediated areas as well as areas not requiring remediation) (Figure 2-4; Table 1-1; Attachment 1). For this evaluation, the previous data collected from the 0 to 1-ft. depth interval were used for grid locations outside the excavation zone. Samples located within the excavation zone, which was backfilled with clean material, were assigned a PCB concentration of 0.01 mg/kg because the clean fill would occupy the top 1.0 ft. of the soil column within the excavation zone (Table 2-2). Because the material within the excavation footprint was replaced with clean backfill, a value slightly above zero (0.01 mg/kg) was used to calculate the 95%UCL in the excavated area. This 95% UCL is calculated to be below each TCL for the different properties, as detailed further in Attachment 1. The calculated compliance of total PCB concentrations is below the applicable TCL (Table 2-2) with the exception of part of Parcel 17-04 where refusal encountered in the field prevented excavation greater than two-feet deep (Attachment 1). These values were calculated prior to excavation, and following the excavation, these values were used to represent the post-excavation conditions at BtB.

Ambient air monitoring was conducted by an independent party at fixed monitoring locations during BtB remedial activities in accordance with the *Draft Final Ambient Air Monitoring Plan for Remediation Activities* (Jacobs 2018b), plus one additional location set up in BtB to monitor local concentrations during the field work only. No exceedances to Risk-Based Goals (RBGs) were identified (EPA 2018).

2.4 Site Restoration

Site restoration activities were completed following the removal of contaminated sediments according to the methods defined in the Work Plan (Jacobs 2018a). Restoration activities included backfill, planting of native shrubs and saltmarsh grasses, and hydroseeding a conservation seed mix. Backfill of excavated areas was performed by Sevenson using fill material from an uncontaminated virgin source as specified in the Work Plan. A post-excavation drone survey was conducted by Meridian to document post-restoration topography and vegetative cover (Meridian 2019).

The plant community composition at BtB was restored on an approximate 1:1 basis, as compared between the pre-excavation (Figure 2-2) and post-excavation (Figure 2-5) wetland distribution. The exception to this restoration ratio is mudflat; excavated mudflat areas were not backfilled and restored, except to establish a stable slope near the low marsh border. A park area was created on town-owned property that was used as the main staging area, using a design plan developed in collaboration with the Town of Fairhaven (Figure 2-5).

Site monitoring and maintenance will continue through the first five full growing seasons (Fall 2023) to document the extent to which the wetland restoration and, where applicable, upland restoration goals of the project are being met. The monitoring and maintenance protocols are described in the Work Plan. Additional site restoration details are provided in Table 2-3.

3. Waste Management

Sediment generated from the BtB Intertidal Remediation was disposed in accordance with the Toxic Substances Control Act (TSCA). Approximately 1,000 tons of stabilized sediment generated during the BtB Intertidal Remediation were transported via truck from the Sawyer Street facility to Worcester, Massachusetts where it was transloaded to rail cars for ultimate disposal at the Wayne Disposal, Inc. Site #2 Landfill, operated by US Ecology, Inc. in Belleville, MI.

4. References

Jacobs Engineering Group Inc. (Jacobs). 2018a. *Draft Final Intertidal Work Plan for Between the Bridges,* New Bedford Harbor Superfund Site. ACE-J23-35BG2000-M1-0030. July.

——— 2018b. *Draft Final Ambient Air Monitoring Plan for Remediation Activities.Rev2*. ACE-J23-35BG2000-M17-0016. New Bedford Harbor Superfund Site. April.

Meridian. 2019. *Between the Bridges Survey Final Report.* New Bedford Harbor Superfund Site. January 17, 2019.

U.S. Environmental Protection Agency (EPA). 2018. Air Monitoring Data Status as of August 2018. Table E-1, Ambient Air Monitoring Program—Total Detectable PCB Homologues. https://www.epa.gov/new-bedford-harbor/new-bedford-harbor-cleanup-plans-technical-documents-and-environmental-data

———. 1998. Record of Decision for the Upper and Lower Harbor Operable Unit, New Bedford Harbor Superfund Site. September 1998. USEPA Region 1 – New England.

Figures

Legend

- MLLW
- MHW
- Limits of Excavation

0 200 400 Feet

Basemap Data Source:
MassGIS, ESRI

January 2019

Between the Bridges
Pre-Excavation
Site Location and Features

New Bedford Harbor Superfund Site

JACOBS

Figure 1-1

Path: Y:\NBH\Projects\35BG\100\120190128\ArcGIS\BB_AAR_Site_Location_20190128.mxd

Legend

- MLLW (-1.97 ft)
- MHHW (1.99 ft)
- Property/Parcel Line
- Sample Location

Thickness of Sediment to Remove, ft

- 1
- 2

0 50 100 Feet

Basemap Data Source: MassGIS, ESRI

January 2019

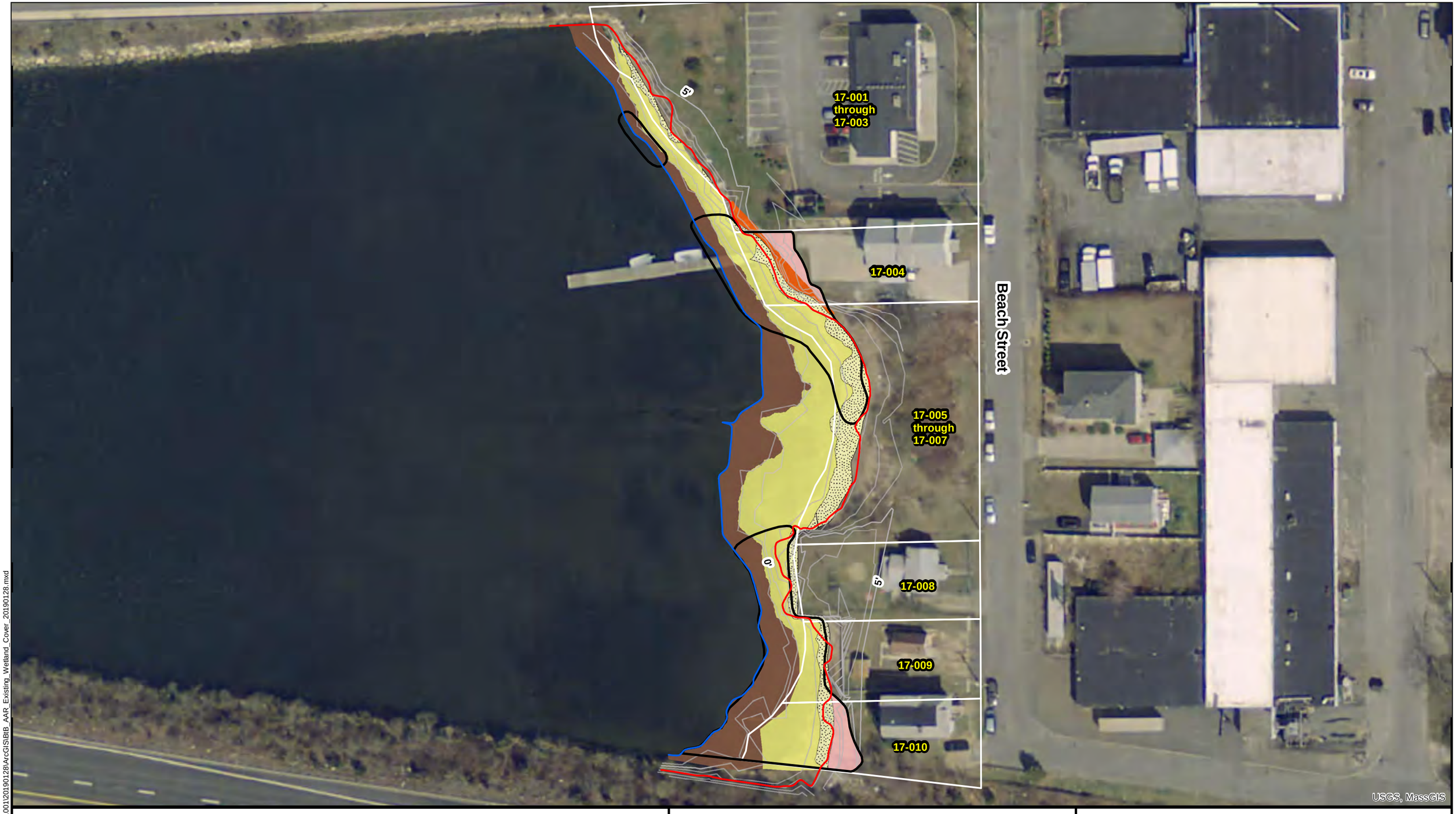
Between the Bridges
Pre-Excavation Contaminant Boundaries

New Bedford Harbor Superfund Site

JACOBS

Figure 2-1

Path: Y:\NBH\Projects\35BG1001\20190128\ArcGIS\BtB_AAR_Dredging_Boundaries_20190128.mxd



Legend

- Excavation Footprint
- Mean Lower Low Water
- Mean Higher High Water
- 1-foot Contour
- Upland
- Low Marsh
- Rip Rap
- Beach
- Mudflat
- Property/Parcel Line

0 50 100 Feet

Basemap Data Source: MassGIS, ESRI

Elevation Data NAVD88 ft

January 2019

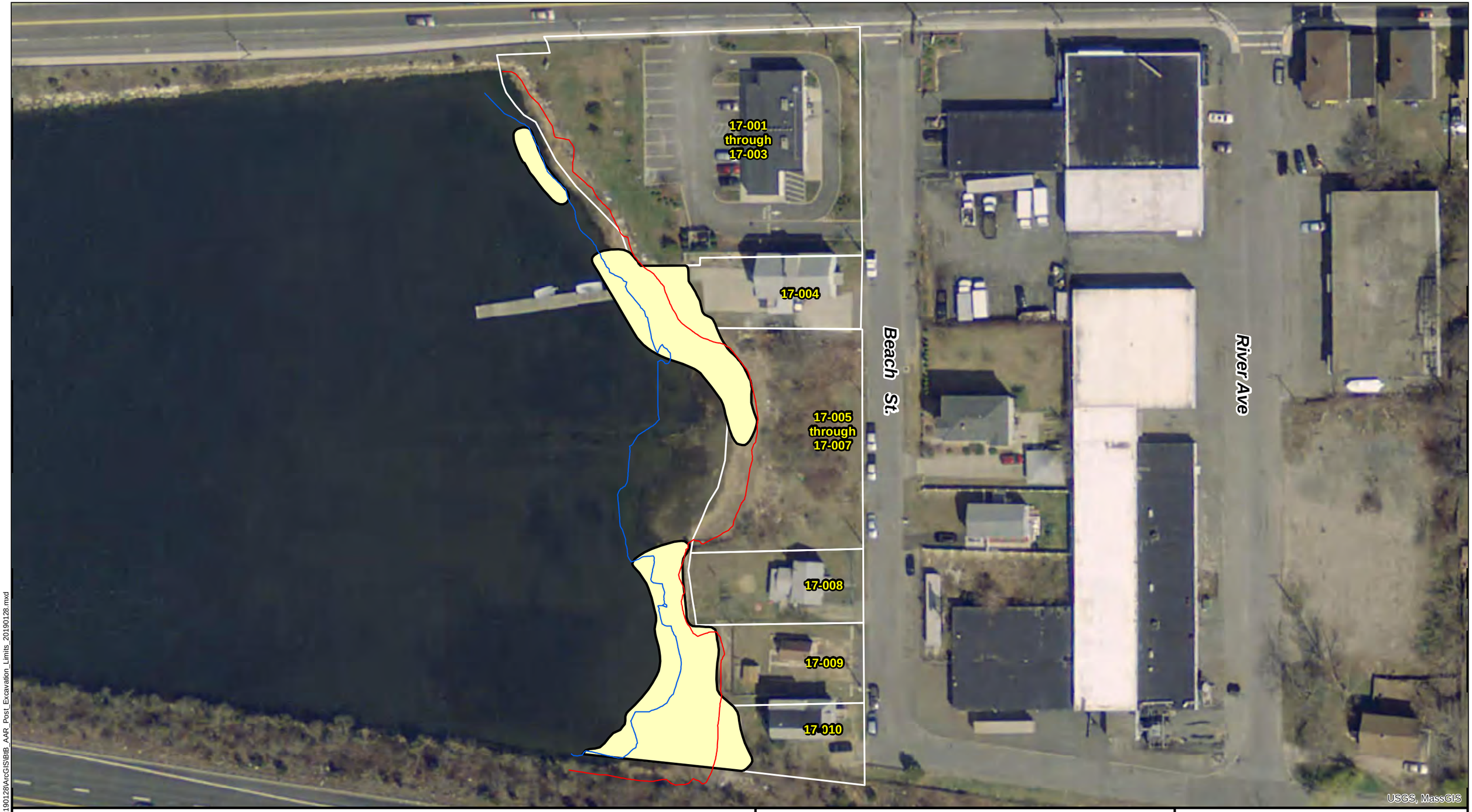
Between the Bridges
Pre-Excavation Wetland Cover and Topography

New Bedford Harbor Superfund Site

JACOBS

Figure 2 - 2

Path: Y:\NBH\Projects\35BG100112019012801\ArcGIS\StBB_AAR_Existing_Wetland_Cover_20190128.mxd



Legend

- MLLW (Post-Excavation)
- MHHW (Post-Excavation)
- Property/Parcel Line
- Limits of Excavation

Elevation Data NAVD88 ft

0 50 100 Feet

Basemap Data Source:
MassGIS, ESRI

January 2019

Between the Bridges
Post-Excavation Limits

New Bedford Harbor Superfund Site

JACOBS

Figure 2-3

Path: Y:\NBH\Projects\35BG1001\20190128\ArcGIS\BtB_AAR_Post_Excavation_Limits_20190128.mxd

Legend

- MLLW (-1.97 ft)
- MHHW (1.99 ft)
- Property/Parcel Line
- Compliance Sample Location
- Excavation Footprint

Note: Total PCB determined using congener analytical method at compliance sample locations.

0 50 100 Feet

Basemap Data Source: MassGIS, ESRI

January 2019

Between the Bridges Compliance Sampling Locations

New Bedford Harbor Superfund Site

JACOBS

Figure 2-4

Path: Y:\NBH\Projects\35BG1001\20190128\ArcGIS\BtB_AAR_Compliance_Sampling_Locations_20190128.mxd

Legend

- Shrub
- Tree
- Two-Man-Stones
- Stone Retaining Wall
- MLLW (Post-Excavation)
- MHHW (Post-Excavation)
- Property/Parcel Line
- Chain Link Fence
- 2018 PCB Remediation Area
- **Post-Excavation Contours**
  - 1 ft contours
  - 5 ft contours
- Boulder
- Gravel
- Conservation Seed Mix Area

Elevation Data NAVD88 ft

Note:
Post-Restoration Survey Meridian January 17, 2019

0 50 100 Feet

Basemap Data Source:
MassGIS, ESRI

January 2019

Between the Bridges
Post-Excavation and Restoration
Record Drawing

New Bedford Harbor Superfund Site

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Figure 2-5

Path: Y:\NBH\Projects\35BG1001\20190128ArcGIS\BtB_AAR_Post_Restoration_20190128.mxd

Tables

Table 1-1
Between the Bridges Parcel ID and Target Cleanup Level

Parcel ID	PCB Target Cleanup Level	Description
17-001 through 17-003	50 mg/kg at all depths (not to exceed)	Commercial property with little to no public access to shoreline
17-004	1 mg/kg to a depth ≤1.0 ft. (95UCL) Average of 1 mg/kg at depths >1.0 ft. in easy-to-access areas (landward of saltmarsh; backyard) Average of 25 mg/kg at depths >1.0 ft. in hard-to-access areas (saltmarsh, seaward of saltmarsh)	Residential property
17-005 through 17-007	25 mg/kg to a depth of ≤1 ft. (95UCL) 50 mg/kg at depths >1 ft. (not to exceed)	Town-owned property with access to shoreline and beachcombing activities
17-008 through 17-10	1 mg/kg to a depth ≤1.0 ft. (95UCL) Average of 1 mg/kg at depths >1.0 ft. in easy-to-access areas (backyards) Average of 25 mg/kg at depths ≥1.0 ft. in hard-to-access areas (seaward of retaining walls and saltmarsh)	Residential properties

Notes:

95UCL = 95 percent upper confidence limit

mg/kg = milligrams per kilogram

ft. = feet

Table 2-1
Pre-Remediation PCB Data Points

Location	Depth Interval (ft)	Collection Date	Location	Total PCB [1] (ppm)
BB001	0-1	2/21/2018	Mudflat	32.8[a]
BB002	0-1	2/28/2018	Mudflat	**64[a]**
BB002	1-2	2/28/2018	Mudflat	14.2[a]
BB003	0-1	2/28/2018	Low Marsh	3.23[a]
BB004	0-1	2/28/2018	Upland	0.67[a]
BB005	0-1	2/28/2018	Mudflat	25.9[a]
BB006	0-1	2/28/2018	Low Marsh	9.85[a]
BB007	0-1	2/28/2018	Upland	0.239[a]
BB008	0-1	3/20/2018	Mudflat	15.6[a]
BB008	0-1	3/20/2018	Mudflat	3.68[a]
BB008	2-3	3/20/2018	Mudflat	1.27[a]
BB008R	0-1	3/20/2018	Mudflat	12.6[a]
BB008R	1-2	3/20/2018	Mudflat	5.48[a]
BB008R	2-3	3/20/2018	Mudflat	0.616[a]
BB009	0-1	3/1/2018	High Marsh	**10.7[a]**
BB009	1-2	3/1/2018	High Marsh	**8.84[a]**
BB009	2-3	3/1/2018	High Marsh	3.95[a]
BB010	0-1	3/1/2018	Upland	**0.647[a]**
BB010	1-2	3/1/2018	Upland	**7.13[a]**
BB011	0-1	3/1/2018	Mudflat	**15.9[a]**
BB011	1-2	3/1/2018	Mudflat	0.521[a]
BB011	2-3	3/1/2018	Mudflat	0.271[a]
BB012	0-1	3/1/2018	High Marsh	**9.43[a]**
BB012	1-2	3/1/2018	High Marsh	**13.7[a]**
BB012	2-3	3/1/2018	High Marsh	7.29[a]
BB013	0-1	3/5/2018	Upland	0.226[a]
BB013	1-2	3/5/2018	Upland	**2.8[a]**
BB014	0-1	3/5/2018	Mudflat	9.5[a]
BB015	0-1	3/5/2018	Mudflat	30.2[a]
BB015	1-2	3/5/2018	Mudflat	8.07[a]
BB016	0-1	3/1/2018	Mudflat	15.2a
BB016	1-2	3/1/2018	Mudflat	2.6818[b]
BB017	0-1	2/28/2018	Beach	7.71[a]
BB018	0-1	3/1/2018	Low Marsh	**37.3[a]**
BB018	1-2	3/1/2018	Low Marsh	30.29[b]
BB019	0-1	3/5/2018	Low Marsh	**18.5[a]**
BB019	1-2	3/5/2018	Low Marsh	15.9[a]
BB020	0-1	3/5/2018	Mudflat	**23.4[a]**
BB020	1-2	3/5/2018	Mudflat	6.69[a]
BB021	0-1	3/5/2018	Upland	**19.5[a]**
BB021	1-2	3/5/2018	Upland	7.52[a]

Table 2-1
Pre-Remediation PCB Data Points

Location	Depth Interval (ft)	Collection Date	Location	Total PCB [1] (ppm)
BB022	0-1	3/5/2018	Mudflat	**2.72[a]**
BB022	1-2	3/5/2018	Mudflat	0.0793[a]
BB023	0-1	3/5/2018	Mudflat	**4.39[a]**
BB023	1-2	3/5/2018	Mudflat	0.313[a]
BB024	0-1	3/5/2018	High Marsh	**5.75[a]**
BB024	1-2	3/5/2018	High Marsh	0.475[a]
BB025	0-1	3/5/2018	Mudflat	**3.76[a]**
BB025	1-2	3/5/2018	Mudflat	6.09[a]
BB025	2-3	3/5/2018	Mudflat	0.689[a]
BB026	0-1	3/5/2018	Mudflat	**5.68[a]**
BB026	1-2	3/5/2018	Mudflat	2.34[a]
BB026	2-3	3/5/2018	Mudflat	1.03[a]
BB027	0-1	5/4/2018	Low Marsh	7.55[a]
BB027	1-2	5/4/2018	Low Marsh	0.963[a]
BB027R	0-1	5/4/2018	Low Marsh	5.28[a]
BB027R	1-2	5/4/2018	Low Marsh	0.463[a]
BB028	1-2	5/4/2018	High Marsh	45[a]
BB029	0-1	5/4/2018	Upland	0.134[a]
BB030	0-1	5/4/2018	Upland	0.107[a]
BB031	0-1	5/4/2018	Upland	0.275[a]
BB032	0-1	5/4/2018	Upland	0.118[a]
INT149	0-1	5/13/2015	Low Marsh	30[a]
INT149	1-2	5/13/2015	Low Marsh	2.4[b]
INT150	0-1	5/5/2015	Upland	ND[b]
INT150	1-2	5/5/2015	Upland	NDb
INT151	0-1	5/13/2015	Mudflat	**63.8[b]**
INT151	1-2	5/13/2015	Mudflat	4[b]
INT152	0-1	5/5/2015	Upland	1.2[b]
INT152	1-2	5/5/2015	Upland	1.8[b]
INT153	0-1	5/6/2015	Mudflat	**35.7[b]**
INT153	1-2	5/6/2015	Mudflat	1.3[b]
INT153-REP	0-1	5/6/2015	Mudflat	**19.3[b]**
INT153-REP	1-2	5/6/2015	Mudflat	1.7[b]
INT154	0-1	5/5/2015	High Marsh	**3.9[a]**
INT154	1-2	5/5/2015	High Marsh	**9.2[a]**
INT155	0.4-1.3	5/5/2015	Upland	0.8[b]
INT156	0-1	5/5/2015	Mudflat	15[a]
INT156	0-1	5/5/2015	Mudflat	15a
INT156	1-2	5/5/2015	Mudflat	7.2[a]
INT157	0-1	5/5/2015	Beach	10.6[b]
INT157	1-2	5/5/2015	Beach	ND[b]

Table 2-1
Pre-Remediation PCB Data Points

Location	Depth Interval (ft)	Collection Date	Location	Total PCB [1] (ppm)
INT158	0-1	5/5/2015	Upland	0.9[b]
INT158	1-2	5/5/2015	Upland	ND[b]
INT158-REP	0-1	5/5/2015	Upland	0.7[b]
INT158-REP	1-2	5/5/2015	Upland	ND[b]
INT159	0-1	5/5/2015	Low Marsh	2.6[b]
INT159	1-2	5/5/2015	Low Marsh	ND[b]
INT160	0-1	5/5/2015	Upland	0.8[b]
INT160	1-2	5/5/2015	Upland	1.4[a]
INT162	0-1	5/5/2015	Upland	ND[b]
INT162	1-2	5/5/2015	Upland	ND[b]
INT163	0-1	5/5/2015	Upland	ND[b]
INT163	1-2	5/5/2015	Upland	0.5[b]
INT164	0-1	5/5/2015	Upland	0.6[b]
INT164	1-2	5/5/2015	Upland	0.6[b]
INT165	0-1	5/5/2015	Upland	0.6[b]
INT165	1-2	5/5/2015	Upland	0.5[b]
INT166	0-1	5/6/2015	Mudflat	**2.8[a]**
INT166	1-2	5/6/2015	Mudflat	ND[b]
INT167	0-1	5/5/2015	Upland	0.5[b]
INT167	1-2	5/5/2015	Upland	ND[b]
INT168	0-1	5/7/2015	Upland	0.55[a]
INT168	1-2	5/7/2015	Upland	0.7[b]
INT169	0-1	5/5/2015	Upland	0.99[a]
INT169	1-2	5/5/2015	Upland	ND[b]
INT170	0-1	5/6/2015	Mudflat	6.4[b]
INT170	1-2	5/6/2015	Mudflat	**4.7[a]**
INT171	0-1	5/5/2015	Upland	63[a]
INT171	1-2	5/5/2015	Upland	ND[b]
INT172	0-1	5/5/2015	Upland	**66.7[b]**
INT172	1-2	5/5/2015	Upland	0.51[a]
INT358	0-1	5/23/2016	Low Marsh	**44[b]**
INT358	1-2	5/23/2016	Low Marsh	50[b]
INT358	2-2.1	5/23/2016	Low Marsh	22[b]
INT359	0-1	5/23/2016	High Marsh	**92[b]**
INT359	1-2	5/23/2016	High Marsh	2.5[b]
INT360	0-1	5/23/2016	Beach	**95[b]**
INT360	1-2	5/23/2016	Beach	24[b]
INT361	0-1	5/23/2016	Beach	**6[a]**
INT361	1-2	5/23/2016	Beach	0.1[a]
INT362	0-1	5/23/2016	Upland	0.065[a]
INT363	0-1	5/23/2016	Upland	0.23[a]

Table 2-1
Pre-Remediation PCB Data Points

Location	Depth Interval (ft)	Collection Date	Location	Total PCB [1] (ppm)
INT407	0-1	5/25/2016	Mudflat	0.46[a]
INT407	1-1.3	5/25/2016	Mudflat	2.9[a]
INT408	0-1	5/25/2016	Mudflat	**10.4[a]**
S-300	0-1	10/1/1999	Mudflat	39
S-300	0-1	10/1/1999	Mudflat	39
S-301	0-1	10/1/1999	Beach	44
S-301	1-2	10/1/1999	Beach	0.01
S-302	0-1	10/1/1999	Mudflat	**7.0**
S-302	1-2	10/1/1999	Mudflat	ND
S-3171	0-1	7/11/2001	Beach	**4.4**
S-3171	1-2	7/11/2001	Beach	0.70
S-3172	0-1	7/11/2001	Beach	**3.4**
S-3172	1-2	7/11/2001	Beach	0.31
S-3176	0-1	7/11/2001	Beach	6.0
S-3176	1-2	7/11/2001	Beach	0.36
S-3177	0-1	7/11/2001	Upland	6.5
S-3177	0-1	7/11/2001	Upland	7.5
S-3177	1-2	7/11/2001	Upland	1.0
S-3180	0-1	7/11/2001	High Marsh	24
S-3180	1-2	7/11/2001	High Marsh	0.24
S-615	1-2	5/4/2000	Low Marsh	14.8
S-616	0-1	5/4/2000	High Marsh	47
S-851	0-1	10/24/2000	Upland	0.36
S-851	1-2	10/24/2000	Upland	0.065
S-851	1-2	10/24/2000	Upland	0.083
S-852	0-1	10/24/2000	Upland	0.12
S-852	1-2	10/24/2000	Upland	2.1
S-853	0-1	10/24/2000	Upland	0.86
S-853	1-2	10/24/2000	Upland	ND

[1] - Total PCB method for all samples: sum of NOAA 18 congeners X 2.6 with the exception of:

[a] - Total congeners

[b] - Immunoassay

[c] - Total Aroclors

Bold font - Location included in remediation footprint

Table 2-2
Compliance PCB Congener Sample Data

Station ID	Sample ID	Field QC Code	Sample Date	Sum 139 PCB Congeners[1,3] (mg/kg)	Qual	Sum 139 PCB Compliance Calc[2] (mg/kg)
Parcel 17-04: target cleanup level = 1.0 mg/kg 95UCL in top 1 ft						
BB009	S-BB009-18FSP5-00-10	SA	3/1/2018	0.01		0.155
BB010	S-BB010-18FSP5-00-10	SA	3/1/2018	0.01		
BB011	S-BB011-18FSP5-00-10	SA	3/1/2018	0.01		
BB012	S-BB012-18FSP5-00-10	SA	3/1/2018	0.01		
BB013	S-BB013-18FSP5-00-10	SA	3/5/2018	0.226		
INT153	S-15Y-INT153-00-10	SA	5/6/2015	0.01		
INT154	S-15Y-INT154-00-10	SA	5/5/2015	0.01		
INT358	S-16Y-INT358-00-10	SA	5/23/2016	0.01		
Parcel 17-04: target cleanup level = 1.0 mg/kg average at depths >1.0 ft in easy-to-access areas (landward of saltmarsh; backyard)[4]						
BB009	S-BB009-18FSP5-10-20	SA	3/1/2018	0.01		2.74
BB010	S-BB010-18FSP5-10-20	SA	3/1/2018	0.01		
BB012	S-BB012-18FSP5-10-20	SA	3/1/2018	0.01		
BB013	S-BB013-18FSP5-10-20	SA	3/5/2018	0.01		
BB013	S-BB013-18FSP5-20-23	SA	5/4/2018	10.60		
INT154	S-15Y-INT154-10-20	SA	5/5/2015	0.01		
BB009	S-BB009-18FSP5-20-30	SA	3/1/2018	3.95		
BB012	S-BB012-18FSP5-20-30	SA	3/1/2018	7.29		
Parcel 17-04: target cleanup level = 25 mg/kg average at depths >1.0 ft in hard-to-access areas (saltmarsh, seaward of saltmarsh)						
BB011	S-BB011-18FSP5-10-20	SA	3/1/2018	0.521		20.1
BB028	S-BB028-18FSP5-10-20	SA	5/4/2018	45		
S-615	S-0615-2	SA	5/4/2000	14.82		
Parcels 17-05 - 17-07: target cleanup level = 25.0 mg/kg 95UCL in top 1.0 ft						
BB014	S-BB014-18FSP5-00-10	SA	3/5/2018	9.5		14.1
BB015	S-BB015-18FSP5-00-10	SA	3/5/2018	30.2		
BB016	S-BB016-18FSP5-00-10	SA	3/1/2018	15.2		
BB017	S-BB017-18FSP5-00-10	SA	2/28/2018	7.71		
INT156	S-15Y-INT156-00-10	SA	5/5/2015	15		
INT359	S-16Y-INT359-00-10	SA	5/23/2016	0.01		
INT360	S-16Y-INT360-00-10	SA	5/23/2016	0.01		
INT407	S-16Y-INT407-00-10	SA	5/25/2016	0.46		
S-3176	S-3176-0.0-1.0	SA	7/11/2001	6.0		
S-3177	S-3177-0.0-1.0	SA	7/11/2001	6.5		
S-3177	S-3177-0.0-1.0REP	REP	7/11/2001	7.5		
S-3180	S-3180-0.0-1.0	SA	7/11/2001	24		
S-852	S-0852-1	SA	10/24/2000	0.12		
BB027	S-BB027-18FSP5-00-10	SA	5/4/2018	7.55		
BB027R	S-BB027R-18FSP5-00-10-REP	REP	5/4/2018	5.28		
Parcels 17-8 - 17-10: target cleanup level = 1.0 mg/kg 95UCL in top 1.0 ft						
BB018	S-BB018-18FSP5-00-10	SA	3/1/2018	0.01		
BB019	S-BB019-18FSP5-00-10	SA	3/5/2018	0.01		
BB020	S-BB020-18FSP5-00-10	SA	3/5/2018	0.01		
BB021	S-BB021-18FSP5-00-10	SA	3/5/2018	0.01		
BB022	S-BB022-18FSP5-00-10	SA	3/5/2018	0.01		
BB023	S-BB023-18FSP5-00-10	SA	3/5/2018	0.01		

Table 2-2
Compliance PCB Congener Sample Data

Station ID	Sample ID	Field QC Code	Sample Date	Sum 139 PCB Congeners[1,3] (mg/kg)	Qual	Sum 139 PCB Compliance Calc[2] (mg/kg)
BB024	S-BB024-18FSP5-00-10	SA	3/5/2018	0.01		
BB025	S-BB025-18FSP5-00-10	SA	3/5/2018	0.01		
BB026	S-BB026-18FSP5-00-10	SA	3/5/2018	0.01		
BB029	S-BB029-18FSP5-00-10	SA	5/4/2018	0.134		
BB030	S-BB030-18FSP5-00-10	SA	5/4/2018	0.107		
BB031	S-BB031-18FSP5-00-10	SA	5/4/2018	0.275		
BB032	S-BB032-18FSP5-00-10	SA	5/4/2018	0.118		
INT166	S-15Y-INT166-00-10	SA	5/6/2015	0.01		0.35
INT168	S-15Y-INT168-00-10	SA	5/7/2015	0.55		
INT169	S-15Y-INT169-00-10	SA	5/5/2015	0.99		
INT170	S-15Y-INT170-00-10	SA	5/6/2015	0.01		
INT171	S-15Y-INT171-00-10	SA	5/5/2015	0.01		
INT172	S-15Y-INT172-00-10	SA	5/5/2015	0.01		
INT361	S-16Y-INT361-00-10	SA	5/23/2016	0.01		
INT362	S-16Y-INT362-00-10	SA	5/23/2016	0.065		
INT363	S-16Y-INT363-00-10	SA	5/23/2016	0.23		
INT408	S-16Y-INT408-00-10	SA	5/25/2016	0.01		
S-302	S-0302-1	SA	10/1/1999	0.01		
S-3171	S-3171-0.0-1.0	SA	7/11/2001	0.01		
S-3172	S-3172-0.0-1.0	SA	7/11/2001	0.01		
S-853	S-0853-1	SA	10/24/2000	0.86		
Parcels 17-8 - 17-10: target cleanup level = 1.0 mg/kg average > 1.0 ft in easy access areas						
INT172	S-15Y-INT172-10-20	SA	5/5/2015	0.51		0.41
S-3172	S-3172-1.0-2.0	SA	7/11/2001	0.31		
Parcels 17-8 - 17-10: target cleanup level = 25.0 mg/kg average > 1.0 ft in hard to access areas						
BB019	S-BB019-18FSP5-10-20	SA	3/5/2018	15.9		
BB020	S-BB020-18FSP5-10-20	SA	3/5/2018	6.69		
BB021	S-BB021-18FSP5-10-20	SA	3/5/2018	7.52		
BB022	S-BB022-18FSP5-10-20	SA	3/5/2018	0.0793		
BB023	S-BB023-18FSP5-10-20	SA	3/5/2018	0.313		
BB024	S-BB024-18FSP5-10-20	SA	3/5/2018	0.475		3.70
BB025	S-BB025-18FSP5-10-20	SA	3/5/2018	6.09		
BB026	S-BB026-18FSP5-10-20	SA	3/5/2018	2.34		
INT170	S-15Y-INT170-10-20	SA	5/6/2015	4.7		
INT361	S-16Y-INT361-10-20	SA	5/23/2016	0.1		
S-302	S-0302-2	SA	10/1/1999	0.00		
S-3171	S-3171-1.0-2.0	SA	7/11/2001	0.70		

Notes:

[1] Sum of 139 PCB congeners; non-detects are set to zero in the sums.

[2] Field duplicate results are averaged in the compliance calculation.

[3]Locations where clean backfill was added are shown in orage shading. Backfill assumed to have PCB concentration less than 0.01 mg/kg.

[4]Refusal encountered in the field prevented excavaion greater than 2 ft deep.

ID - identification; QC - quality control; PCB - polychlorinated biphenyl; Qual - qualifier

SA - field sample; REP - field duplicate

Table 2-3
Site Restoration Summary

PLANTING DATES (Completed)	
9/21/2018	Shrub planting completed. 50 High-Tide bush (*Iva frutescens*), 1-gallon containers
9/21/2018	Saltmarsh plugs completed. 4,845 Low Marsh (*Spartina alterniflora*) 2" plugs
9/21/2018	Seeding completed for two yards. Seeding with New England Conservation/Wildlife Mix.
12/6/2018	Tree plantings completed in town park. 1 *Quercus rubra* *2 Amelanchier canadensis* 1 *Cercis canadensis*
12/6/2018	Shrub Plantings in town park 6 *Viburnum opulus* or *Viburnum trilobum* 2 *Clethra alnifolia* 4 *Myrica pensylvanica*
12/6/2018	Seeding completed for town park. Seeding with New England Conservation/Wildlife Mix.
LOW MARSH AND CONSERVATION SEED MIX ELEVATIONS (Bottom to Top)	
Low Marsh	Approximately -0.68 ft. to 0.72 ft. (NAVD88)
Conservation Seed Mix	Above 3.0 ft. (NAVD88) (New England Conservation/Wildlife Mix mixed with winter rye)
IMPORTED TOPSOIL	
Grain Size	0.044 mm (No. 325 sieve) to 12.7 mm (1/2-inch), with 58% measured at 0.420 mm (No. 40 sieve).
Organic Content	5.00%
Moisture Contennt	18.40%
pH	6.9
Electrical Conductivity	0.00977 S/m
Nitrogen	Low (0-30 lbs/acre)
Phosphorus	Low (0-50 lbs/acre)
Potassium	Low (0-120 lbs/acre)
Quantity	1,425 cubic yards of topsoil (screened loam)
SHORELINE PROTECTION	
Retaining Wall	101.7 linear feet
Two-Man-Stone	473.8 linear feet

Attachment 1

95% Upper Confidence Limit Calculation

Attachment 1
95% Upper Confidence Limit Calculation

Compliance Calculations for Between the Bridges (BtB) East Shoreline Intertidal Area
Based on April 20, 2018 meeting discussion; updated 6/13/18
Green shading - to be backfilled (assumed PCB concentration = 0.01 mg/kg)

Parcel	TCL	Station ID	Sample ID	Sample Date	Field QC Code	Depth Top (feet)	Depth Bottom (feet)	Total PCB (mg/kg)	Final Qual	PCB Analytical Method	Comment	Compliance Calculation
17-04	1	BB009	S-BB009-18FSP5-00-10	3/1/2018	N	0	1	0.01				95UCL (1) 0.155 mg/kg
17-04	1	BB010	S-BB010-18FSP5-00-10	3/1/2018	N	0	1	0.01				
17-04	1	BB011	S-BB011-18FSP5-00-10	3/1/2018	N	0	1	0.01				
17-04	1	BB012	S-BB012-18FSP5-00-10	3/1/2018	N	0	1	0.01				
17-04	1	BB013	S-BB013-18FSP5-00-10	3/5/2018	N	0	1	0.226		Sum 209 congeners		
17-04	1	INT153	S-15Y-INT153-00-10	5/6/2015	N	0	1	0.01				
17-04	1	INT154	S-15Y-INT154-00-10	5/5/2015	N	0	1	0.01				
17-04	1	INT358	S-16Y-INT358-00-10	5/23/2016	N	0	1	0.01				
17-04	1 avg	BB009	S-BB009-18FSP5-10-20	3/1/2018	N	1	2	0.01				Average 2.74 mg/kg EPA risk management decision: excavate to 2 feet and backfill
17-04	1 avg	BB010	S-BB010-18FSP5-10-20	3/1/2018	N	1	2	0.01			Refusal at 2.0 ft; EPA decision to not sample deeper	
17-04	1 avg	BB012	S-BB012-18FSP5-10-20	3/1/2018	N	1	2	0.01				
17-04	1 avg	BB013	S-BB013-18FSP5-10-20	3/5/2018	N	1	2	0.01				
17-04	1 avg	BB013	S-BB013-18FSP5-20-23	5/4/2018	N	2	2.3	10.60		Sum 209 congeners	Refusal at 2.3 ft; EPA decision to not sample deeper	
17-04	1 avg	INT154	S-15Y-INT154-10-20	5/5/2015	N	1	2	0.01				
17-04	1 avg	BB009	S-BB009-18FSP5-20-30	3/1/2018	N	2	3	3.95		Sum 209 congeners		
17-04	1 avg	BB012	S-BB012-18FSP5-20-30	3/1/2018	N	2	3	7.29		Sum 209 congeners		
17-04	25 avg	BB011	S-BB011-18FSP5-10-20	3/1/2018	N	1	2	0.521		Sum 209 congeners		Average 20.1 mg/kg
17-04	25 avg	BB028	S-BB028-18FSP5-10-20	5/4/2018	N	1	2	45		Sum 209 congeners		
17-04	25 avg	S-615	S-0615-2	5/4/2000	N	1	2	14.82		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	BB014	S-BB014-18FSP5-00-10	3/5/2018	N	0	1	9.5		Sum 209 congeners		95UCL (2) 14.1 mg/kg
17-05 - 17-07	25	BB015	S-BB015-18FSP5-00-10	3/5/2018	N	0	1	30.2		Sum 209 congeners		
17-05 - 17-07	25	BB016	S-BB016-18FSP5-00-10	3/1/2018	N	0	1	15.2		Sum 209 congeners		
17-05 - 17-07	25	BB017	S-BB017-18FSP5-00-10	2/28/2018	N	0	1	7.71		Sum 209 congeners		
17-05 - 17-07	25	INT156	S-15Y-INT156-00-10	5/5/2015	N	0	1	15		Sum 139 congeners		
17-05 - 17-07	25	INT359	S-16Y-INT359-00-10	5/23/2016	N	0	1	0.01				
17-05 - 17-07	25	INT360	S-16Y-INT360-00-10	5/23/2016	N	0	1	0.01				
17-05 - 17-07	25	INT407	S-16Y-INT407-00-10	5/25/2016	N	0	1	0.46		Sum 139 congeners		
17-05 - 17-07	25	S-3176	S-3176-0.0-1.0	7/11/2001	N	0	1	6.0		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	S-3177	S-3177-0.0-1.0	7/11/2001	N	0	1	6.5		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	S-3177	S-3177-0.0-1.0REP	7/11/2001	FD	0	1	7.5		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	S-3180	S-3180-0.0-1.0	7/11/2001	N	0	1	24		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	S-852	S-0852-1	10/24/2000	N	0	1	0.12		Sum NOAA18 congeners X 2.6		
17-05 - 17-07	25	BB027	S-BB027-18FSP5-00-10	5/4/2018	N	0	1	7.55		Sum 209 congeners		
17-05 - 17-07	25	BB027R	S-BB027R-18FSP5-00-10-REP	5/4/2018	FD	0	1	5.28		Sum 209 congeners		
17-08 - 17-10	1	BB018	S-BB018-18FSP5-00-10	3/1/2018	N	0	1	0.01				
17-08 - 17-10	1	BB019	S-BB019-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB020	S-BB020-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB021	S-BB021-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB022	S-BB022-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB023	S-BB023-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB024	S-BB024-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB025	S-BB025-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB026	S-BB026-18FSP5-00-10	3/5/2018	N	0	1	0.01				
17-08 - 17-10	1	BB029	S-BB029-18FSP5-00-10	5/4/2018	N	0	1	0.134		Sum 139 congeners		

Attachment 1
95% Upper Confidence Limit Calculation

Parcel	TCL	Station ID	Sample ID	Sample Date	Field QC Code	Depth Top (feet)	Depth Bottom (feet)	Total PCB (mg/kg)	Final Qual	PCB Analytical Method	Comment	Compliance Calculation
17-08 - 17-10	1	BB030	S-BB030-18FSP5-00-10	5/4/2018	N	0	1	0.107		Sum 139 congeners		95UCL (1) 0.35 mg/kg
17-08 - 17-10	1	BB031	S-BB031-18FSP5-00-10	5/4/2018	N	0	1	0.275		Sum 139 congeners		
17-08 - 17-10	1	BB032	S-BB032-18FSP5-00-10	5/4/2018	N	0	1	0.118		Sum 139 congeners		
17-08 - 17-10	1	INT166	S-15Y-INT166-00-10	5/6/2015	N	0	1	0.01				
17-08 - 17-10	1	INT168	S-15Y-INT168-00-10	5/7/2015	N	0	1	0.55		Sum 139 congeners		
17-08 - 17-10	1	INT169	S-15Y-INT169-00-10	5/5/2015	N	0	1	0.99		Sum 139 congeners		
17-08 - 17-10	1	INT170	S-15Y-INT170-00-10	5/6/2015	N	0	1	0.01				
17-08 - 17-10	1	INT171	S-15Y-INT171-00-10	5/5/2015	N	0	1	0.01				
17-08 - 17-10	1	INT172	S-15Y-INT172-00-10	5/5/2015	N	0	1	0.01				
17-08 - 17-10	1	INT361	S-16Y-INT361-00-10	5/23/2016	N	0	1	0.01				
17-08 - 17-10	1	INT362	S-16Y-INT362-00-10	5/23/2016	N	0	1	0.065		Sum 139 congeners	Sidewall location for Parcel 17-10	
17-08 - 17-10	1	INT363	S-16Y-INT363-00-10	5/23/2016	N	0	1	0.23		Sum 139 congeners		
17-08 - 17-10	1	INT408	S-16Y-INT408-00-10	5/25/2016	N	0	1	0.01				
17-08 - 17-10	1	S-302	S-0302-1	10/1/1999	N	0	1	0.01				
17-08 - 17-10	1	S-3171	S-3171-0.0-1.0	7/11/2001	N	0	1	0.01				
17-08 - 17-10	1	S-3172	S-3172-0.0-1.0	7/11/2001	N	0	1	0.01				
17-08 - 17-10	1	S-853	S-0853-1	10/24/2000	N	0	1	0.86		Sum NOAA18 congeners X 2.6	Sidewall location for Parcel 17-10	
17-08 - 17-10	1 avg	INT172	S-15Y-INT172-10-20	5/5/2015	N	1	2	0.51		Sum 139 congeners		Average 0.41 mg/kg
17-08 - 17-10	1 avg	S-3172	S-3172-1.0-2.0	7/11/2001	N	1	2	0.31		Sum NOAA18 congeners X 2.6		
17-08 - 17-10	25 avg	BB019	S-BB019-18FSP5-10-20	3/5/2018	N	1	2	15.9		Sum 209 congeners		Average 3.7 mg/kg
17-08 - 17-10	25 avg	BB020	S-BB020-18FSP5-10-20	3/5/2018	N	1	2	6.69		Sum 209 congeners		
17-08 - 17-10	25 avg	BB021	S-BB021-18FSP5-10-20	3/5/2018	N	1	2	7.52		Sum 209 congeners		
17-08 - 17-10	25 avg	BB022	S-BB022-18FSP5-10-20	3/5/2018	N	1	2	0.0793		Sum 209 congeners		
17-08 - 17-10	25 avg	BB023	S-BB023-18FSP5-10-20	3/5/2018	N	1	2	0.313		Sum 209 congeners		
17-08 - 17-10	25 avg	BB024	S-BB024-18FSP5-10-20	3/5/2018	N	1	2	0.475		Sum 209 congeners		
17-08 - 17-10	25 avg	BB025	S-BB025-18FSP5-10-20	3/5/2018	N	1	2	6.09		Sum 209 congeners		
17-08 - 17-10	25 avg	BB026	S-BB026-18FSP5-10-20	3/5/2018	N	1	2	2.34		Sum 209 congeners		
17-08 - 17-10	25 avg	INT170	S-15Y-INT170-10-20	5/6/2015	N	1	2	4.7		Sum 139 congeners		
17-08 - 17-10	25 avg	INT361	S-16Y-INT361-10-20	5/23/2016	N	1	2	0.1		Sum 139 congeners		
17-08 - 17-10	25 avg	S-302	S-0302-2	10/1/1999	N	1	2	0.00		Sum NOAA18 congeners X 2.6		
17-08 - 17-10	25 avg	S-3171	S-3171-1.0-2.0	7/11/2001	N	1	2	0.70		Sum NOAA18 congeners X 2.6		

Notes:
95% UCLs calculated using ProUCL version 5.1
(1) 95% Chebyshev (Mean, Sd) UCL
(2) 95% Student's t UCL