New Bedford Harbor Superfund Site

U.S. Army Corps of Engineers New England District

Final Pierce Mill Cove After Action Report

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Project Manager:	Steve Fox
Author:	Patrick Lawler

Jacobs Engineering

6 Otis Park Drive
Bourne, Massachusetts 02532-3870
United States
T +1.508.743.0214
F +1.508.743.9177
www.jacobs.com

Table of Contents

Acronyms and Abbreviations iii
1. Introduction 1
2. Remedial Activities 1
   2.1 Site Preparation 1
   2.2 Removal of Contaminated Sediments 2
   2.3 Environmental Sampling 2
   2.4 Site Restoration 3
3. Waste Management 3
4. References 4

Figures

Figure 1-1 Pierce Mill Cove Site Location and Pre-Excavation Features
Figure 2-1 Pierce Mill Cove Pre-Excavation Contaminant Boundaries
Figure 2-2 Pierce Mill Cove Pre-Excavation Wetland Cover and Topography
Figure 2-3 Pierce Mill Cove Limits of Excavation
Figure 2-4 Intertidal Verificaton and Confirmation Sample Locations, South
Figure 2-5 Intertidal Verificaton and Confirmation Sample Locations, West
Figure 2-6 Intertidal Verificaton and Confirmation Sample Locations, North
Figure 2-7 Pierce Mill Cove Post-Excavation Restoration

Tables

Table 2-1 Pre-Remediation PCB Data Points
Table 2-2 Post-Excavation PCB Congener Sample Data
Table 2-3 Site Restoration Summary

Attachment

Attachment 1 95% Upper Confidence Limit Calculation

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Acronyms and Abbreviations

CDA	Compliance Demonstration Area
cy	cubic yards
DDA	Debris Disposal Area
EPA	Environmental Protection Agency
FSP	Field Sampling Plan
ft.	feet
GPS	global positioning system
ID	identification
Jacobs	Jacobs Engineering Group
Mg/kg	milligrams per kilogram
MHHW	mean higher-high water
MLLW	mean lower-low water
NAE	New England District
PCB	polychlorinated biphenyl
PMC	Pierce Mill Cove
QAPP	Quality Assurance Project Plan
QC	quality control
QUAL	qualifier
RBG	Risk-Based Goals
REP	field replicate
RTK	real-time kinematic
SA	field sample
Sevenson	Sevenson Environmental Services, Inc.
TCL	target cleanup level
TSCA	Toxic Substances Control Act
U	not detected
UCL	upper confidence limit
UFP	Uniform Federal Policy

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1. Introduction

Remediation and restoration of the Pierce Mill Cove (PMC) intertidal zone were conducted by Jacobs Engineering Group (Jacobs) under U.S. Army Corps of Engineers – New England District (NAE) Interim Remediation Action Contract No. W912WJ-14-D-0002 between October 24, 2016 and December 19, 2017. The primary objective of remedial action at PMC was to remove soil and sediment with polychlorinated biphenyl (PCB) levels 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 PMC Site are 10 milligrams per kilogram (mg/kg) for mudflats/subtidal areas (regardless of depth), 25 mg/kg for soil and sediment one foot (ft.) deep or less in vegetated marsh areas for recreational users, and 50 mg/kg for soil and sediment deeper than 1 ft. in vegetated marsh areas. A 95% upper confidence level (UCL) compliance calculation was performed on the final remediated and restored condition of the top foot of the entire PMC intertidal zone to ensure PCB concentrations were below the recreational TCL of 25 mg/kg. PMC is located on the western side of New Bedford Harbor extending from the northern end of the EPA/USACE Sawyer Street facility to the southeastern corner of the Star Plating property (Figure 1-1).

The purpose of this After Action Report is to document the remediation activity and final disposition of the restored PMC area. Remediation and restoration activities were conducted in accordance with the Work Plan. Contaminated sediments were removed and the PMC area was restored according to the *Draft Final Pierce Mill Cove Intertidal Remediation Plan Restoration Addendum* (Work Plan Addendum) [Jacobs 2016c].

2. Remedial Activities

The methods used to complete the remedial activities at the site are presented below. All site activities were conducted in accordance with the Work Plan.

2.1 Site Preparation

Sampling of sediment and soil from the subtidal, intertidal, and vegetated areas around PMC was conducted between 1999 and 2008, which provided the horizontal and vertical boundaries for PCB-contaminated sediment excavation. Figure 2-1 and Table 2-1 presents the pre-excavation sampling locations and PCB concentrations in sediments for the PMC intertidal zone.

Pre-existing conditions at PMC 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 of the intertidal area (Figure 2-2). Pre-existing vegetative characteristics including the type and extent of vegetative cover were outlined in the *Draft Final Restoration Basis of Design / Design Analysis Report* (FW 2002) [Restoration BOD], the *Final Wetland Delineation and Function and Values Update Memorandum* (AECOM 2015) [Wetland Delineation], and the *Existing Tree Inventory Memorandum* (Jacobs 2016b). Other pre-excavation preparation activities included the installation of security fencing, site clearing, construction of an access road, and mobilization of equipment.

2.2 Removal of Contaminated Sediments

Excavation was conducted by Sevenson Environmental Services, Inc. (Sevenson) with a track-mounted excavator operated in the intertidal zone and guided by real time kinematic global positioning system (RTK GPS) (Figure 2-3). Excavated material was temporarily piled and staged in the intertidal zone near the mean higher-high water (MHHW) mark to allow for water to drain from the sediment prior to loading into trucks.

PCB-impacted subsoil unrelated to harbor contamination was identified in the southwest corner of the project site near location JE-01 (Figure 2-4). Removal of stained subsurface soil above and beyond the amount called for in the work plan was performed in this area, and unexcavated potentially-impacted subsoil was covered with geotextile fabric prior to backfill to demarcate this area and prevent mixing with the clean backfill. This subsurface area of impacted soil existed at depth covered by an abandoned subsurface concrete slab, and therefore does not present an exposure risk to the public. Characterization data suggests potential subsurface contamination extends southwest of JE-01, but that this material is from a different source unrelated to PCB-contamination from the harbor.

An estimated total of 13,488 cubic yards (cy) of contaminated sediments was removed from the PMC intertidal zone during field activities based on estimates derived from the pre-excavation and post-excavation survey data. The limits of excavation are presented on Figure 2-3.

2.3 Environmental Sampling

Post-excavation verification sampling was conducted by an independent party in accordance with the Field Sampling Plan Addendum #1 to the *Revised Draft Final Confirmatory Sampling Field Sampling Plan, Lower Harbor Winter 2016 Dredge Areas and Parcel 265* (Battelle 2016a) [Confirmatory Sampling FSP] as well as the *Uniform Federal Policy- Quality Assurance Project Plan* (*QAPP) Addendum* (Battelle 2016b). Verification samples were collected on a 50-ft. grid from a pre-defined mudflat/subtidal compliance demonstration area (CDA) and a saltmarsh CDA. Jacobs screened the verification samples using immunoassay analysis to evaluate whether any further removal of contaminated sediment was required (Figure 2-4, Figure 2-5 and Figure 2-6).

A spatially-representative subset of the verification samples pre-designated as confirmatory samples in the Confirmatory Sampling FSP was submitted for PCB congeners following excavation to ensure compliance with the applicable target cleanup level. PCB analysis for 139 PCB congeners was performed by an independent party according to the methods outlined in the *QAPP Addendum* (Battelle 2016b). Post-excavation average concentrations were calculated for the PMC low marsh (6.4 mg/kg, prior to placement of clean backfill) and mudflat/subtidal areas (4.7 mg/kg), as summarized in Table 2-2.

To assess recreational dermal exposure to intertidal soils and sediments, a 95% upper confidence level (UCL) calculation was performed on the final remediated and restored condition of the top foot of the entire PMC intertidal zone (i.e., remediated areas as well as areas not requiring remediation). This 95% UCL was calculated to be 2.51 mg/kg, as detailed further in Attachment 1. All compliance calculations are below applicable TCLs. Verification and confirmation sample data are presented in the *Draft 2017 Intertidal Verification and Confirmatory Report* (Battelle 2018).

Ambient air and particulate monitoring was conducted by an independent party at fixed monitoring locations during PMC remedial activities in accordance with the *Draft Final Ambient Air Monitoring Plan for Remediation Activities* (Jacobs 2015), plus one additional location set up in PMC to monitor local concentrations during the field work only. No exceedances to Risk-Based Goals (RBGs) were identified (USEPA 2017).

2.4 Site Restoration

Site restoration activities were completed following the removal of contaminated sediments according to the methods defined in the Work Plan Addendum. Restoration activities included backfill, revegetation, and removal of security fencing and access road. Backfill of excavated areas was performed by Sevenson using fill material from an uncontaminated virgin source as specified in the Work Plan Addendum. A post-excavation drone survey was conducted by Nearview, LLC to document post-restoration topography and vegetative cover (Nearview 2018).

The plant community composition at the Site was restored on an approximate 1:1 basis, as compared to the *Wetland Delineation* (AECOM 2015). The exception to this restoration ratio is mudflat, where the pre-excavation survey (5.52 acres in 2002) and the post-excavation survey (2.2 acres in 2018) differ. The difference is the excavated mudflat areas were not restored, except to establish a stable slope near the low marsh border. Also the growth of vegetation into the mudflats from 2002 to 2017 reduced the final mudflat footprint. A post-excavation wetlands cover map is presented in Figure 2-7.

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 protocols are described in the Work Plan Addendum. Upland areas impacted by construction were restored in accordance with the upland tree and shrub planting plan (Jacobs 2016c) to ensure that impacted trees and shrubs were replaced with suitable native species. The west shore PMC access road was left in place to serve as a barrier for *Phragmites* growth, then covered with topsoil and seeded. Some trees and shrubs were offset from their proposed locations to accommodate this control. Additional site restoration details are provided in Table 2-3.

3. Waste Management

Sediment generated from the PMC Intertidal Remediation was disposed in accordance with the Toxic Substances Control Act (TSCA). A total of 8,785.45 tons of stabilized sediment generated during the PMC Intertidal Remediation was transported via truck to Worcester, Massachusetts where it was transloaded to rail to Wayne Disposal, Inc. Site #2 Landfill, operated by US Ecology, Inc. in Belleville, MI.

4. References

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Nearview. 2018. *New Bedford Harbor Superfund Site Wetland Mapping Memorandum – Final*. New Bedford Harbor Superfund Site. January 10, 2018.

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U.S. Environmental Protection Agency (EPA). 1998. Record of Decision for the Upper and Lower Harbor Operable Unit, New Bedford Harbor Superfund Site. September 1998. USEPA Region 1 – New England.

——— 2017. Air Monitoring Data Status as of September 2017. Table E-1, Ambient Air Monitoring Program—Total Detectable PCB Homologues. http://www2.epa.gov/new- bedfordharbor/new-bedford-harbor-cleanup-plans-technical-documents-and-environmental-data

Figures

Star Plating

Belleville Ave

Riverside Park

Pierce Mill Cove

Area C North Dock

Wooded Area

DDA

USGS, MassGIS

Legend

- Rip Rap Berm
- Concrete Retaining Wall
- MLLW
- MHHW

DDA = Area C Debris Disposal Area

Aerial Photography MASSGIS 2014

0 150 Feet

1:1,800

JACOBS

Pierce Mill Cove Site Location and Pre-Excavation Features

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 1-1

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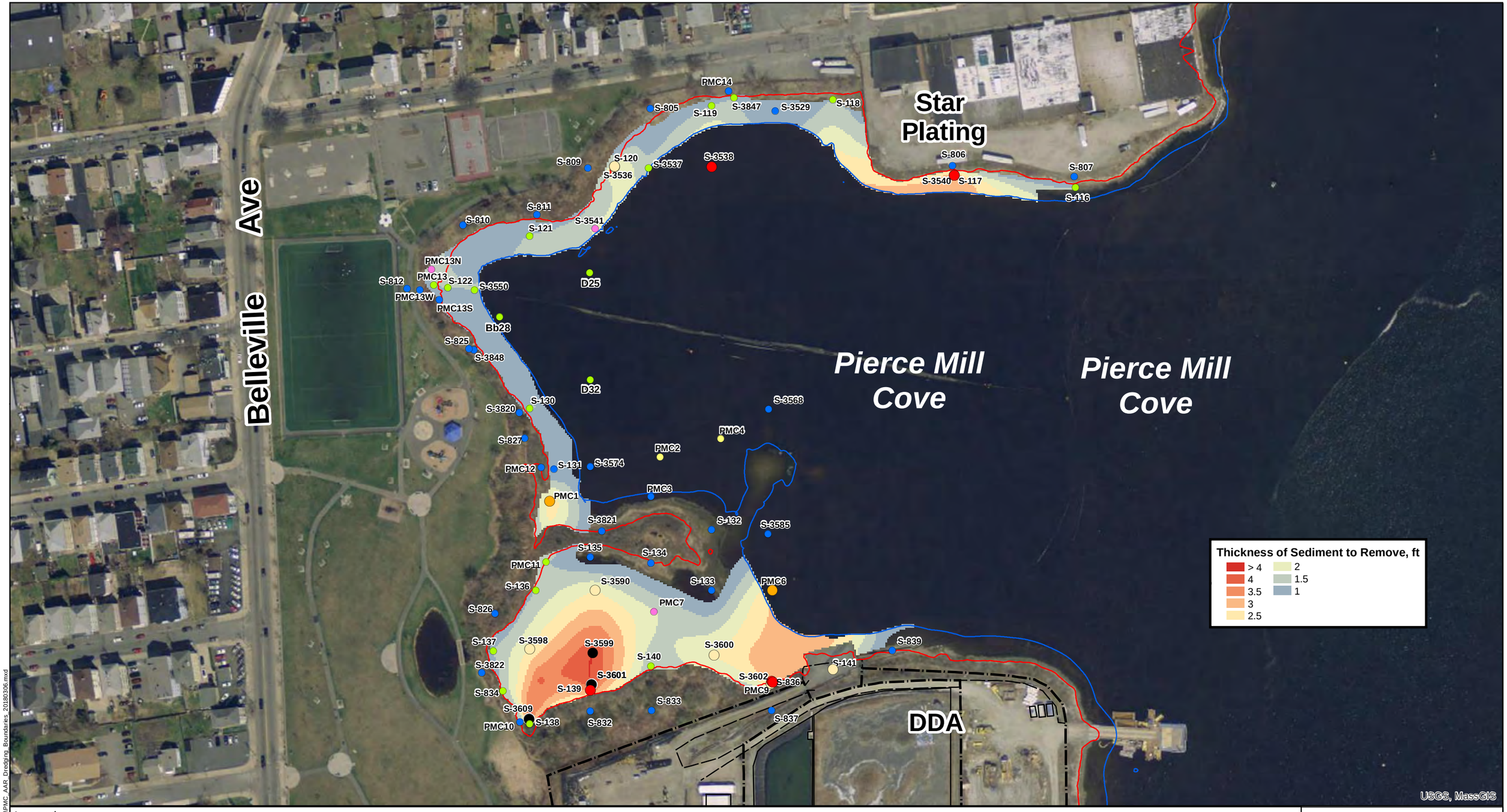


Legend

Sediment Thickness (ft) Where Total PCB > Target Cleanup Level

0
0.5
1
1.5
2
2.5
3
> 3

Total PCB Target Cleanup Levels

0-1 foot: 25 ppm mudflats: 10 ppm
> 1 foot: 50 ppm

MLLW
MHHW

DDA = Area C Debris Disposal Area

Aerial Photography MASSGIS 2014

0 150 Feet

1:1,800

JACOBS

Pierce Mill Cove Pre-Excavation Contaminant Boundaries

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-1

Path: Y:\NBH\Projects\35BG1001\20180306\ArcGIS\PMC_AAR_Dredging_Boundaries_20180306.mxd

Belleville Ave

Pierce Mill Cove

Pre-Excavation Wetland Cover Types

- Low Marsh
- High Marsh
- Scrub-Shrub Marsh
- Phragmites Marsh
- Mudflat
- Beach
- Open Water

USGS, MassGIS

Legend

- Pre-Excavation Topography (1ft Contour)
- MLLW (-1.97)
- MHHW (1.99)

Aerial Photography MASSGIS 2014

N

0 150 Feet

1:1,800

JACOBS

Pierce Mill Cove Pre-Excavation Wetland Cover and Topography

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-2

Path: Y:\NBHProjects\35BG10012018036\ArcGIS\PMC_AAR_Wetland_Cover_20180306.mxd

Star Plating

Belleville Ave

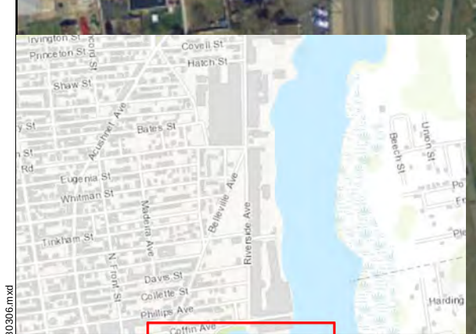
Riverside Park

Pierce Mill Cove

Area C North Dock

Wooded Area

DDA



USGS, MassGIS

Legend

- Proposed River Walk
- Rip Rap Bank
- Concrete Retaining Wall
- MLLW
- MHHW
- Limits of Excavation

DDA = Area C Debris Disposal Area

Aerial Photography MASSGIS 2014

N

0 150

Feet

1:1,800

JACOBS

Pierce Mill Cove Limits of Excavation

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-3

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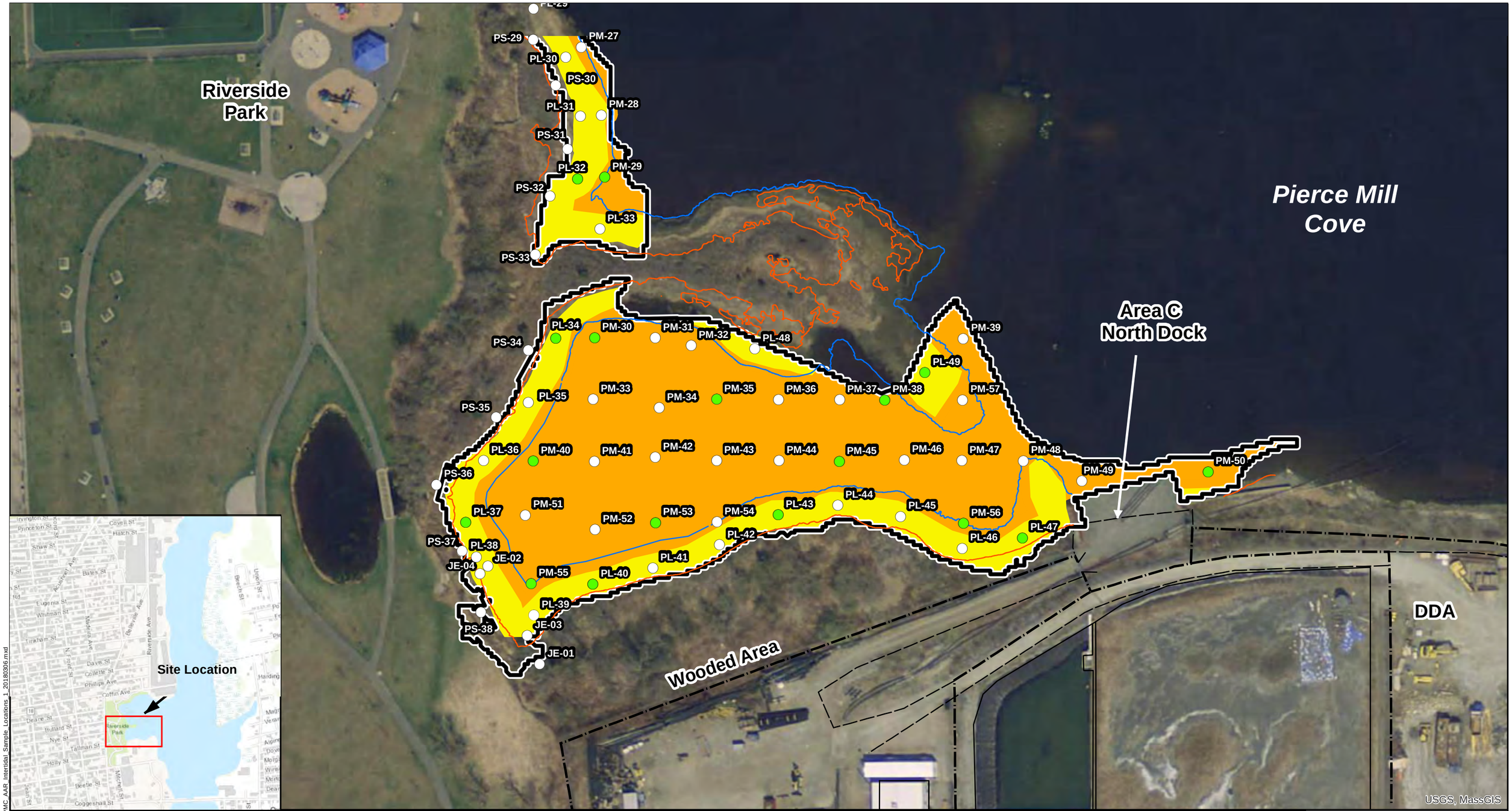

Legend

Saltmarsh CDA

Mudflat CDA

MLLW (Post-Excavation)

MHHW (Post-Excavation)

Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap

Verification (screening) Sample Location

Confirmation Sample

Post-Excavation Limits

DDA = Area C Debris Disposal Area

Aerial Photography MASSGIS 2014

N

0 75 Feet

1:900

JACOBS

Intertidal Verification and Confirmation Sample Locations, South

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-4

Path: Y:\NB\#Projects\35BG1001\20180306\ArcGIS\PMC_AAR_Intertidal_Sample_Locations_1_20180306.mxd

Belleville Ave

Riverside Park

Pierce Mill Cove

PM-15 PS-18 PL-18 PM-16 PS-19 PS-20 PS-21 PL-19 PS-22 PL-22 PL-21 PL-20 PM-17 PM-19 PL-23 PS-23 PM-20 PM-18 PM-21 PL-24 PS-24 PM-22 PL-25 PM-23 PS-25A PL-26 PS-26 PM-24 PL-27 PM-25A PL-28 PS-27 PS-28A PM-26 PL-29 PS-29 PM-27 PL-30 PS-30 PL-31 PM-28 PS-31 PL-32 PM-29 PS-32 PL-33 PS-33 PL-34 PM-30 PM-31 PM-39

PM-06 PM-05 PL-05 PL-06

Legend

- Saltmarsh CDA
- Mudflat CDA
- MLLW (Post-Excavation)
- MHHW (Post-Excavation)
- Verification (screening) Sample Location
- Confirmation Sample
- Post-Excavation Limits

Aerial Photography MASSGIS 2014

USGS, MassGIS

0 75 Feet

1:900

JACOBS

Intertidal Verification and Confirmation Sample Locations, West

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-5

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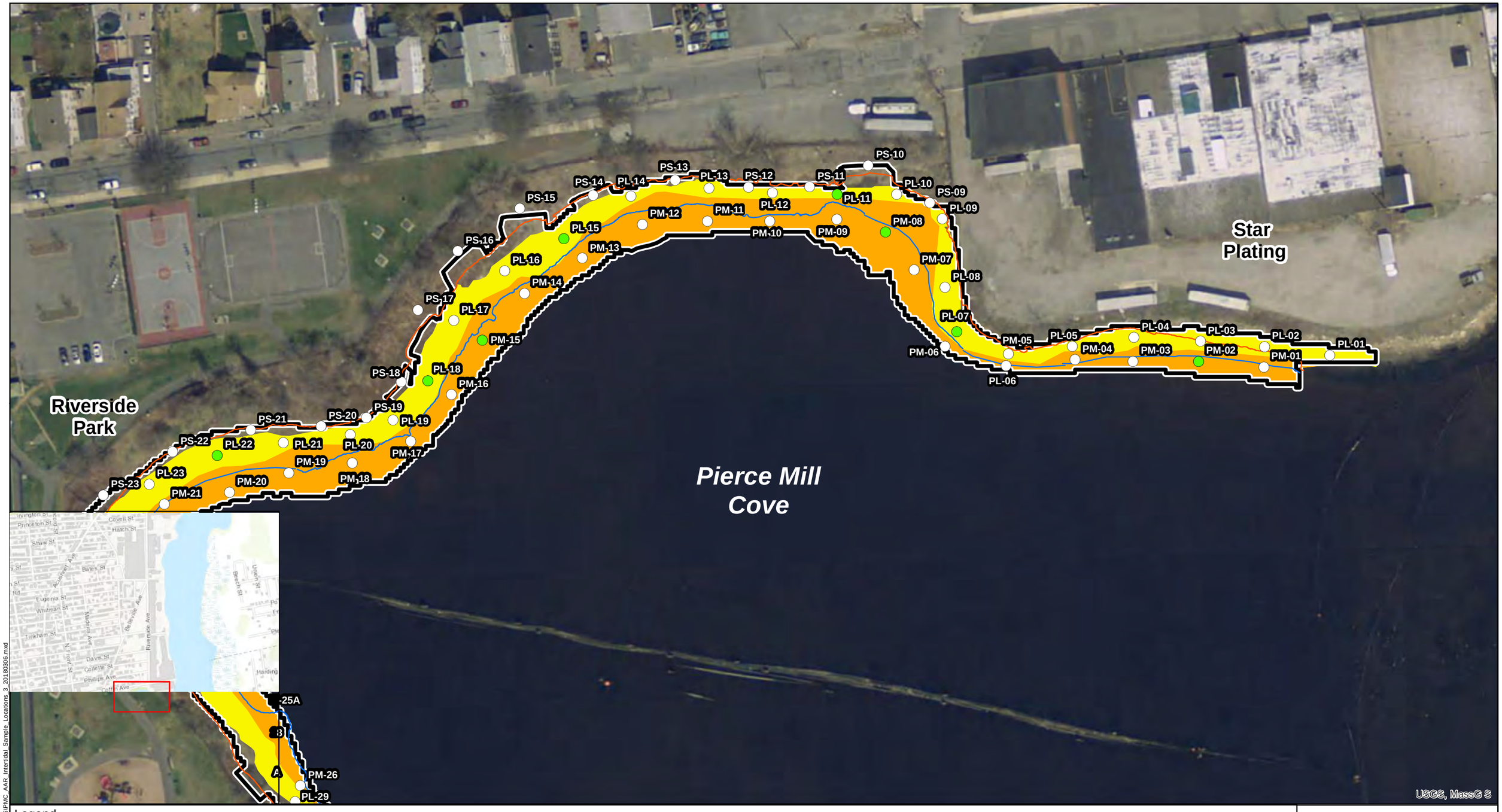


Legend

- Saltmarsh CDA
- Mudflat CDA
- MLLW (Post-Excavation)
- MHHW (Post-Excavation)
- Verification (screening) Sample Location
- Confirmation Sample
- Post-Excavation Limits

Aerial Photography MASSGIS 2014

0 75 Feet

1:900

JACOBS

Intertidal Verification and Confirmation Sample Locations, North

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 3/27/2018

Figure 2-6

Path: Y:\NBH\Projects\35BG10012018306\ArcGIS\PMC_AAR_Intertidal_Sample_Locations_3_20180306.mxd

Belleville Ave

Pierce Mill Cove

Access Road Left in Place for Future River Walk

Post-Excavation Wetland Cover Types

- Low Marsh
- High Marsh
- Scrub-Shrub Marsh
- Mudflat
- Beach
- Open Water

Note: The 2015 pre-excavation vegetation and topographic survey was conducted using land-based survey methods, and included data outside of the boundaries of the excavation. The 2017 post-excavation vegetation and topographic survey was conducted using an aerial drone and did not include a comprehensive survey beyond the excavation boundaries. Minor discrepancies between pre- and post-survey data are evident outside of the boundaries of excavation due to the differences in survey methodology, most notably on the peninsula extending into Pierce Mill Cove.

USGS, MassGIS

Legend

- Tree/Shrub
- Tree
- Two-Man-Stones
- Post-Excavation Topography (1ft Contour)
- MLLW (Post-Excavation) (-1.97)
- MHHW (Post-Excavation) (1.99)
- Conservation Seed Mix Areas
- Swale Drainage Areas
- Unvegetated Areas (Stone and Sand)

Aerial Photography MASSGIS 2014

N

0 150 Feet

1:1,800

JACOBS

Pierce Mill Cove Post-Excavation Restoration

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 4/13/2018

Figure 2-7

Path: Y:\NBH\Projects\35BG1\001\20180306\ArcGIS\PMC_AAR_Post_Dredge_Restoration_20180306.mxd

Tables

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
PMC1	0-0.42	12/2/2004	Beachcombing	**179**	
PMC1	0.42-0.75	12/2/2004	Beachcombing	**59.8**	
PMC1	0.75-1.33	12/13/2004	Beachcombing	**255**	b
PMC2	0-0.5	11/22/2004	Mudflat	**44.2**	
PMC2	1-1.5	11/22/2004	Mudflat	0.101	
PMC2	2-2.5	11/22/2004	Mudflat	0.0117	
PMC3	0-0.5	12/2/2004	Mudflat	0.416	
PMC3	0.5-1	12/2/2004	Mudflat	0.0936	
PMC4	0-0.5	12/2/2004	Mudflat	**49.4**	
PMC4	0.83-1.33	12/2/2004	Mudflat	0.122	
PMC4	1.83-2.35	12/2/2004	Mudflat	0.0442	
PMC6	0-0.5	11/22/2004	Mudflat	**25**	
PMC6	0.5-1	11/22/2004	Mudflat	**39**	
PMC6	1-1.5	11/22/2004	Mudflat	**416**	b
PMC7	0-0.5	11/22/2004	Mudflat	6.76	
PMC7	0.67-1.17	11/22/2004	Mudflat	**28.6**	
PMC7	1.5-2	11/22/2004	Mudflat	0.0546	
PMC9	0.83-1.33	12/6/2004	Beachcombing	1.14	
PMC9	1.33-1.83	12/6/2004	Beachcombing	41.6	
PMC9	1.83-2.34	12/6/2004	Beachcombing	1.64	
PMC9	2.34-2.84	12/6/2004	Beachcombing	0.624	
PMC10	0-0.5	12/6/2004	Beachcombing	0.0988	
PMC10	0.5-1	12/6/2004	Beachcombing	0.125	
PMC10	1-1.5	12/6/2004	Beachcombing	0.107	
PMC11	0-0.5	12/2/2004	Beachcombing	**93.6**	
PMC11	0.5-1	12/2/2004	Beachcombing	**239**	
PMC11	1-1.5	12/2/2004	Beachcombing	39	
PMC11	1.83-2.34	12/13/2004	Beachcombing	1.3	
PMC11	2.34-2.84	12/13/2004	Beachcombing	0.208	
PMC12	0-0.5	12/2/2004	Upland Soil	2.6	

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
PMC12	0.67-1.17	12/2/2004	Upland Soil	0.205	
PMC13	0-0.67	12/6/2004	Upland Soil	14.6	
PMC13	0.67-1	12/6/2004	Upland Soil	**93.6**	
PMC13	1.17-1.5	12/6/2004	Upland Soil	25	
PMC13N	0-0.5	1/13/2005	Upland Soil	0.728	
PMC13N	0.5-1	1/13/2005	Upland Soil	17.7	
PMC13N	1-1.5	1/13/2005	Upland Soil	**52**	
PMC13N	1.5-2	1/13/2005	Upland Soil	15.6	
PMC13N	2.5-3	1/13/2005	Upland Soil	5.2	
PMC13S	0-0.5	1/13/2005	Beachcombing	0.546	
PMC13S	0.5-0.92	1/13/2005	Beachcombing	16.1	
PMC13S	0.92-1.67	1/13/2005	Beachcombing	8.84	
PMC13S	1.67-1.83	1/13/2005	Beachcombing	7.28	
PMC13W	0-0.5	1/13/2005	Upland Soil	6.5	
PMC13W	1-1.5	1/13/2005	Upland Soil	1.98	
PMC13W	1.5-2	1/13/2005	Upland Soil	0.702	
PMC14	0-0.5	12/6/2004	Upland Soil	0.78	
PMC14	0.5-1	12/6/2004	Upland Soil	0.806	
PMC14	1-1.5	12/6/2004	Upland Soil	0.78	
S-3529	1.5-2	11/2/2001	Mudflat	8.58	
S-3536	1-2	9/24/2001	Beachcombing	0.52	
S-3536	2-3	9/24/2001	Beachcombing	1.87	
S-3537	0.4-0.9	8/30/2001	Mudflat	**14**	
S-3537	0.9-1.4	8/30/2001	Mudflat	1.37	a
S-3538	1.7-2.2	8/30/2001	Mudflat	**67.6**	
S-3540	0.5-1	10/19/2001	Mudflat	**702**	b
S-3541	1.3-1.8	9/14/2001	Mudflat	0.884	a
S-3550	2.1-2.6	9/17/2001	Mudflat	0.39	
S-3568	1.1-1.6	8/31/2001	Mudflat	1.25	
S-3568	1.6-2.1	8/31/2001	Mudflat	1.46	

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
S-3574	0.5-1	8/31/2001	Mudflat	3.64	
S-3574	1-1.5	8/31/2001	Mudflat	1.94	a
S-3585	0.7-1.2	9/26/2001	Mudflat	0.624	a
S-3590	1.3-1.8	9/5/2001	Mudflat	**252**	
S-3590	2.3-2.8	9/5/2001	Mudflat	3.9	
S-3590	2.8-3.3	9/5/2001	Mudflat	0.91	
S-3598	1.5-2	9/5/2001	Mudflat	**52**	
S-3598	2-2.5	9/5/2001	Mudflat	0.65	
S-3598	2.5-3	9/5/2001	Mudflat	0.148	
S-3599	2.4-2.9	9/5/2001	Mudflat	**200**	b
S-3600	1.4-1.9	9/5/2001	Mudflat	**28.6**	
S-3600	1.9-2.4	9/5/2001	Mudflat	7.8	
S-3600	2.9-3.4	9/5/2001	Mudflat	2.86	
S-3601	2.8-3.3	9/5/2001	Mudflat	**44.2**	
S-3601	3.3-3.8	9/5/2001	Mudflat	0.91	
S-3602	1-2	9/24/2001	Beachcombing	**65**	
S-3602	2-3	9/24/2001	Beachcombing	**85.8**	
S-3602	3-4	9/24/2001	Beachcombing	0.177	
S-3609	3-3.5	9/5/2001	Beachcombing	**54.6**	
S-3609	3.5-4	9/5/2001	Beachcombing	7.02	
S-3609	4-4.5	9/5/2001	Beachcombing	0.676	
S-3820	0-1	10/17/2001	Upland Soil	0.234	
S-3820	2.5-3	10/17/2001	Upland Soil	6.5	
S-3821	0-0.5	10/17/2001	Beachcombing	2.08	
S-3822	0-1	10/17/2001	Upland Soil	0.0728	
S-3847	0-0.5	10/17/2001	Beachcombing	**117**	
S-3847	2.8-3	10/17/2001	Beachcombing	4.68	
S-3847	3-4	10/17/2001	Beachcombing	0.78	
S-3848	1-1.5	10/17/2001	Upland Soil	1.82	
S-116	0-1	9/23/1999	Mudflat	**203**	

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
S-116	1-2	9/23/1999	Mudflat	7.8	
S-117	0-1	9/23/1999	Mudflat	**177**	
S-117	1-2	9/23/1999	Mudflat	**229**	a, b
S-118	0-1	9/23/1999	Beachcombing	**190**	
S-118	1-2	9/23/1999	Beachcombing	2	
S-119	0-1	9/20/1999	Beachcombing	**80.6**	
S-119	1-2	9/20/1999	Beachcombing	2.34	
S-119	2-3	9/20/1999	Beachcombing	1.07	
S-120	0-1	9/20/1999	Beachcombing	2.6	
S-120	1-2	9/20/1999	Beachcombing	**164**	d
S-121	0-1	9/20/1999	Beachcombing	**218**	
S-121	1-2	9/20/1999	Beachcombing	3.64	
S-121	2-3	9/20/1999	Beachcombing	0.39	
S-122	0-1	9/21/1999	Beachcombing	**218**	
S-122	1-2	9/20/1999	Beachcombing	6.5	
S-130	0-1	9/20/1999	Beachcombing	**88.4**	
S-130	1-2	9/20/1999	Beachcombing	0.468	
S-131	0-1	9/20/1999	Beachcombing	0.546	
S-131	1-2	9/20/1999	Beachcombing	0	U
S-132	0-1	9/20/1999	Beachcombing	0.702	
S-132	1-2	9/20/1999	Beachcombing	0.0364	
S-132	2-3	9/20/1999	Beachcombing	0	U
S-133	0-1	9/17/1999	Beachcombing	9.1	
S-133	1-2	9/17/1999	Beachcombing	4.94	
S-133	2-3	9/17/1999	Beachcombing	5.98	
S-134	0-1	9/20/1999	Beachcombing	0.702	
S-134	1-2	9/20/1999	Beachcombing	0.0416	
S-135	0-1	9/17/1999	Beachcombing	12.2	
S-135	1-2	9/17/1999	Beachcombing	4.16	
S-135	2-3	9/17/1999	Beachcombing	0.416	

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
S-136	0-1	9/17/1999	Beachcombing	**62.4**	
S-136	1-2	9/17/1999	Beachcombing	0.468	
S-137	0-1	9/17/1999	Beachcombing	**28.6**	
S-137	1-2	9/17/1999	Beachcombing	0.676	
S-138	0-1	9/17/1999	Beachcombing	**62.4**	b
S-139	0-1	9/17/1999	Mudflat	**107**	
S-139	1-2	9/17/1999	Mudflat	**125**	
S-139	2-3	9/17/1999	Mudflat	**44.2**	
S-140	0-1	9/17/1999	Beachcombing	**44.2**	
S-140	1-2	9/17/1999	Beachcombing	2.86	
S-141	0-1	9/17/1999	Beachcombing	**46.8**	
S-141	1-2	9/17/1999	Beachcombing	**52**	b
S-805	0-1	10/25/2000	Upland Soil	0.572	
S-805	1-2	10/25/2000	Upland Soil	0.988	
S-806	0-1	10/18/2000	Upland Soil	0.0494	
S-806	1-2	10/18/2000	Upland Soil	0.039	
S-807	0-1	10/18/2000	Upland Soil	0.598	
S-807	1-2	10/18/2000	Upland Soil	0.187	
S-809	0-1	10/25/2000	Upland Soil	0.936	
S-809	1-2	10/25/2000	Upland Soil	0.702	
S-810	0-1	10/18/2000	Upland Soil	0.39	
S-810	1-2	10/18/2000	Upland Soil	3.38	
S-811	0-1	10/25/2000	Upland Soil	2.86	
S-811	1-2	10/25/2000	Upland Soil	0.442	
S-812	0-1	10/18/2000	Upland Soil	0.052	
S-812	1-2	10/18/2000	Upland Soil	0	U
S-825	0-1	10/23/2000	Upland Soil	1.74	
S-825	1-2	10/23/2000	Upland Soil	2.6	
S-826	0-1	10/24/2000	Upland Soil	0.468	
S-826	1-2	10/24/2000	Upland Soil	0.213	

Table 2-1
Pre-Excavation PCB Data Points

Location	Depth Interval (feet)	Collection Date	Area-Specific Shoreline Cleanup Levels[1]	Total PCB [2,3] (mg/kg)	Qual
S-827	1-2	10/24/2000	Upland Soil	0.936	
S-832	0-1	9/28/2000	Upland Soil	0.286	
S-832	1-2	9/28/2000	Upland Soil	0	U
S-833	0-1	9/28/2000	Upland Soil	0.112	
S-833	1-2	9/28/2000	Upland Soil	0.148	
S-834	0-1	10/24/2000	Beachcombing	**33.8**	
S-834	1-2	10/24/2000	Beachcombing	17.4	
S-836	0-1	9/28/2000	Beachcombing	4.68	
S-836	1-2	9/28/2000	Beachcombing	**286**	b
S-837	0-1	9/28/2000	Upland Soil	0.572	
S-837	1-2	9/28/2000	Upland Soil	12.5	
S-839	0-1	9/28/2000	Upland Soil	0.17	a
S-839	0-2	9/28/2000	Upland Soil	0.52	
D25	0-0.7	12/5/2008	Mudflat	9.3	c
D32	0-0.5	12/5/2008	Mudflat	7.5	c
bb28	0-1	12/5/2008	Mudflat	3.9	c

Notes:

[1] TCLs: Mudflats: 10 ppm, and Beachcombing/Upland : 25 ppm for 0-1 foot interval, and 50 ppm > 1 foot

[2] Total PCB method for all samples: sum of NOAA 18 congeners X 2.6

[3] Bold font - Location included in remediation footprint

a- average of field duplicates/lab replicates

b - vertical extent of contamination not delineated

c - 2008 post dredge samples

d - vertical extent is defined by adjacent sample point

U- not detected at the method reporting limit

Table 2-2
Post-Excavation PCB Congener Sample Data

Station ID	Sample ID	Field QC Code	Sample Date	Sum 139 PCB Congeners[1] (mg/kg)	Qual	Sum 139 PCB Congener Average[2] (mg/kg)
Low Marsh: target cleanup level = 25 mg/kg in top 1 ft						
PL-07	S-17M-PL-07-00-10	SA	3/9/2017	0	U	
PL-11	S-17A-PL-11-00-10	SA	4/27/2017	66		
PL-15	S-17A-PL-15-00-10	SA	4/27/2017	0.63		
PL-18	S-17A-PL-18-00-10	SA	4/27/2017	0.059		
PL-22	S-17M-PL-22-00-10	SA	3/9/2017	0.4		
PL-25	S-16D-PL-25-00-10	SA	12/14/2016	5.6		
PL-28	S-16D-PL-28-00-10	SA	12/14/2016	0.42		
PL-32	S-16D-PL-32-00-10	SA	12/14/2016	0.29		6.4
PL-32	S-16D-PL-32-00-10-REP	REP	12/14/2016	0.18		
PL-34	S-17A-PL-34-00-10	SA	4/11/2017	7.5		
PL-37	S-17A-PL-37-00-10	SA	4/11/2017	0.052		
PL-40	S-17A-PL-40-00-10	SA	4/11/2017	7.5		
PL-43	S-17Y-PL-43-00-10-B	SA	5/11/2017	0.17		
PL-47	S-17Y-PL-47-00-10-A	SA	5/9/2017	0.9		
PL-49	S-17A-PL-49-00-10	SA	4/11/2017	0.53		
Mudflat/Subtidal: target cleanup level = 10 mg/kg						
PM-02	S-17Y-PM-02-00-05	SA	5/1/2017	0.13		
PM-08	S-17A-PM-08-00-05	SA	4/27/2017	0.36		
PM-15	S-17A-PM-15-00-05	SA	4/27/2017	0.3		
PM-22	S-16D-PM-22-00-05	SA	12/20/2016	11		
PM-29	S-16D-PM-29-00-05	SA	12/14/2016	6.2		
PM-29	S-16D-PM-29-00-05-REP	REP	12/14/2016	1.9		
PM-30	S-17Y-PM-30-00-05	SA	5/4/2017	0.35		
PM-35	S-17A-PM-35-00-05	SA	4/11/2017	0.23		4.7
PM-38	S-17Y-PM-38-00-05	SA	5/4/2017	8.9		
PM-40	S-17A-PM-40-00-05	SA	4/11/2017	3		
PM-45	S-17Y-PM-45-00-05	SA	5/4/2017	0.041		
PM-50	S-17A-PM-50-00-05	SA	4/14/2017	3.8		
PM-53	S-17A-PM-53-00-05	SA	4/11/2017	0.35		
PM-55	S-17A-PM-55-00-05	SA	4/11/2017	13		
PM-56	S-17A-PM-56-00-05	SA	4/11/2017	20		

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.

U - not detected

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

SA - field sample; REP - field duplicate

Note: Samples indicated with the prefix "PL-" were covered with clean backfill as part of site restoration.

Table 2-3
Site Restoration Summary

PLANTING DATES (Completed)	
11/16/2017	Hydro seeding completed. (New England Conservation/Wildlife Mix with winter rye at 25 lbs per acre)
11/17/2017	Tree and shrub planting completed. (20 trees, 85 trees/shrubs)
7/21/2017	Saltmarsh plugs completed. (32,130 Spartina alterniflora 2" plugs,1,400 Spartina patens 2" plugs)
PHRAGMITES CONTROL	
8/22/2017	Round 1 – Treatment in phragmites marsh (Figure 2-2) with Foliar herbicide applications was conducted to all existing phragmites using a solution of 1.25% or 1.6 oz. Rodeo (Glyphosate) and a 1% or 1.3 oz. non-ionic surfactant. Pre-treatment cutting not required.
9/18/2017	Round 2 – Same treatment method and locations.
LOW MARSH AND HIGH MARSH ELEVATIONS (Bottom to Top)	
Low Marsh	From coir log (approximately 0.18') to 1.68'
High Marsh	1.68' to 2.68'
Conservation Seed Mix	Above 2.68' (New England Conservation/Wildlife Mix mixed with winter rye)
IMPORTED TOPSOIL	
Grain Size	0.074 mm (No. 200 sieve) to 9.51 mm (3/8-inch), with 45% measured at 0.420 mm (No. 40 sieve).
Organic Content	8.20%
Quantity	1,012 cubic yards of wetland soil and 4,086 cubic yards of topsoil (screened loam)
SHORELINE PROTECTION	
Coir log/two-man stone	2,016 linear feet

Attachment 1

95% Upper Confidence Limit Calculation

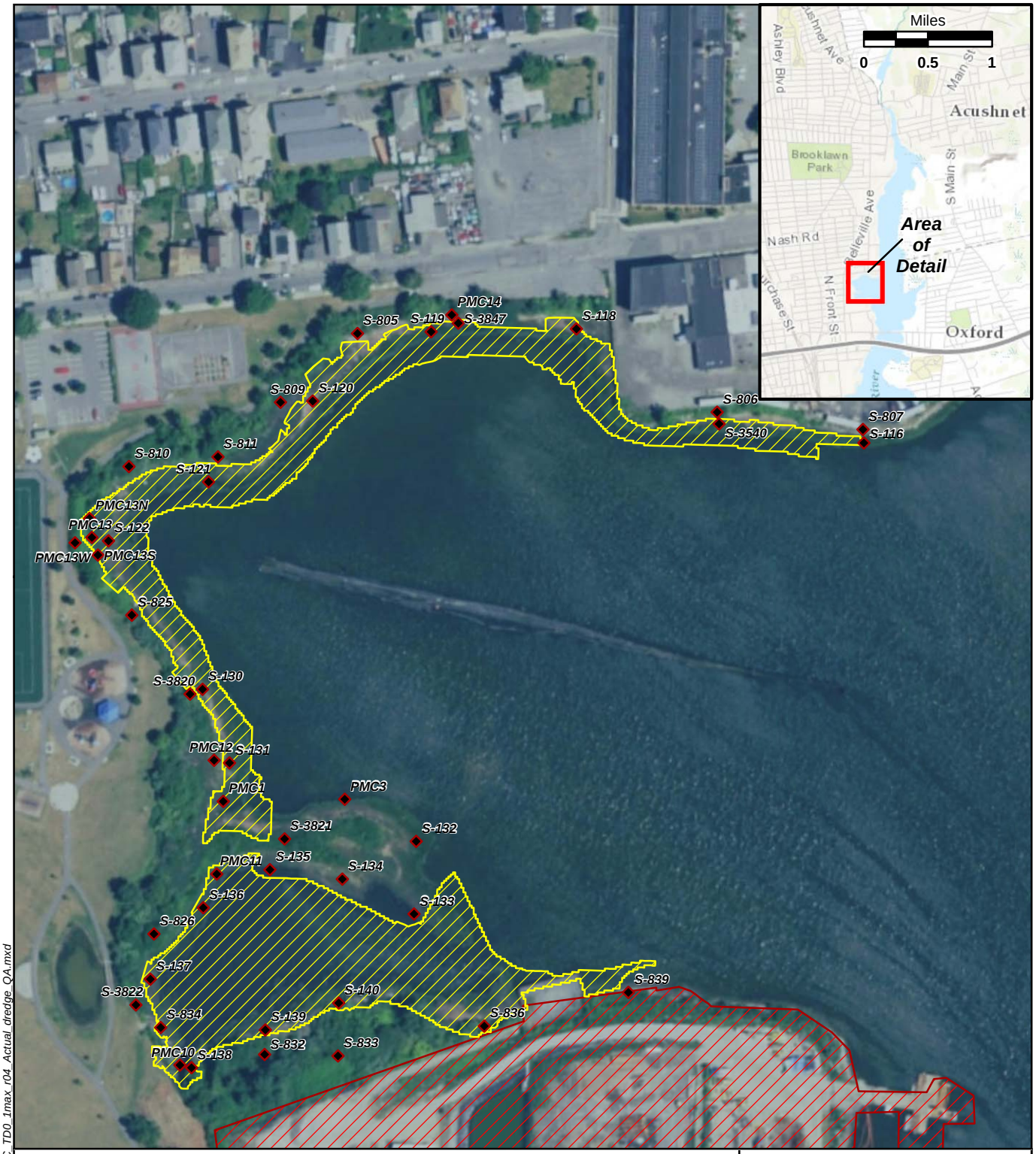
95% Upper Confidence Limit (UCL) Calculation for the Pierce Mill Cove Intertidal Remediation Area
New Bedford Harbor Superfund Site
March 6, 2018

Study ID	Station ID	Sample Date	Northing	Easting	Depth-Weighted Average PCB Concentration 0-1 foot interval [1] (mg/kg)	Comment
NBHMON2004	PMC1	12/2/2004	2701947	814033	0.01	Excavated and backfilled
NBHMON2004	PMC3	12/2/2004	2701955	814200	0.255	
NBHMON2004	PMC10	12/6/2004	2701583	813984	0.01	Excavated and backfilled
NBHMON2004	PMC11	12/2/2004	2701847	814027	0.01	Excavated and backfilled
NBHMON2004	PMC12	12/2/2004	2702003	814019	1.40	
NBHMON2004	PMC13	12/6/2004	2702304	813842	0.01	Excavated and backfilled
NBHMON2005	PMC13N	1/13/2005	2702330	813838	0.01	Excavated and backfilled
NBHMON2005	PMC13S	1/13/2005	2702280	813851	0.01	Excavated and backfilled
NBHMON2005	PMC13W	1/13/2005	2702296	813819	6.50	
NBHMON2004	PMC14	12/6/2004	2702624	814328	0.793	
PHASEI	S-116	9/23/1999	2702465	814900	0.01	Excavated and backfilled
PHASEI	S-118	9/23/1999	2702610	814500	0.01	Excavated and backfilled
PHASEI	S-119	9/20/1999	2702600	814300	0.01	Excavated and backfilled
PHASEI	S-120	9/20/1999	2702500	814140	0.01	Excavated and backfilled
PHASEI	S-121	9/20/1999	2702385	814000	0.01	Excavated and backfilled
PHASEI	S-122	9/21/1999	2702300	813865	0.01	Excavated and backfilled
PHASEI	S-130	9/20/1999	2702100	814000	0.01	Excavated and backfilled
PHASEI	S-131	9/20/1999	2702000	814040	0.01	Excavated and backfilled
PHASEI	S-132	9/20/1999	2701900	814300	0.702	
PHASEI	S-133	9/17/1999	2701800	814300	9.10	
PHASEI	S-134	9/20/1999	2701845	814200	0.702	
PHASEI	S-135	9/17/1999	2701855	814100	12.2	
PHASEI	S-136	9/17/1999	2701800	814010	0.01	Excavated and backfilled
PHASEI	S-137	9/17/1999	2701700	813940	0.01	Excavated and backfilled
PHASEI	S-138	9/17/1999	2701580	814000	0.01	Excavated and backfilled
PHASEI	S-139	9/17/1999	2701635	814100	0.01	Excavated and backfilled
PHASEI	S-140	9/17/1999	2701675	814200	0.01	Excavated and backfilled
PHASEII	S-805	10/25/2000	2702595	814199	0.572	
PHASEII	S-806	10/18/2000	2702501	814697	0.0494	
PHASEII	S-807	10/18/2000	2702483	814898	0.598	
PHASEII	S-809	10/25/2000	2702497	814096	0.936	
PHASEII	S-810	10/18/2000	2702403	813890	0.390	
PHASEII	S-811	10/25/2000	2702420	814012	2.86	
PHASEII	S-825	10/23/2000	2702199	813900	1.74	
PHASEII	S-826	10/24/2000	2701762	813943	0.468	
PHASEII	S-832	9/28/2000	2701601	814100	0.286	
PHASEII	S-833	9/28/2000	2701602	814201	0.112	
PHASEII	S-834	10/24/2000	2701634	813956	0.01	Excavated and backfilled
PHASEII	S-836	9/28/2000	2701649	814401	0.01	Excavated and backfilled
PHASEII	S-839	9/28/2000	2701701	814598	0.170	
PHASE3B	S-3540	10/19/2001	2702485	814700	0.01	Excavated and backfilled
PHASE3D	S-3820	10/17/2001	2702093	813983	0.234	
PHASE3D	S-3821	10/17/2001	2701898	814119	2.08	
PHASE3D	S-3822	10/17/2001	2701664	813921	0.0728	
PHASE3D	S-3847	10/17/2001	2702613	814337	0.01	Excavated and backfilled
Maximum					**12.2**	
Mean					**0.944**	
95% UCL [2]					**2.51**	

Notes:

[1] Total PCB is the sum of detected NOAA 18 congeners X 2.6 correction factor; a concentration of 0.01 mg/kg was assumed for backfilled areas. A depth-weighted average concentration was calculated if more than one sample was collected in the top 1 foot interval.

[2] Non-parametric, distribution-free UCL: 95% Chebyshev (Mean, Sd) UCL, calculated in ProUCL Version 5.0.00.



Legend

- Final Excavation Areas
- Sawyer Street Facility
- Sampling Location

Feet

0 100 200

BATTELLE

Pierce Mill Cove
Intertidal Sampling Locations

New Bedford Harbor
Superfund Site

DATE: 11/22/2017	ANALYST: HICKSJ
REV. 0	APPROVED: WHITE

FILE: C:\GIS\New_Bedford_Harbor\Maps\Base_PMC_TD0_1max_r04_Actual_dredge_QA.mxd

Attachment: ProUCL Output for Pierce Mill Cove Post-Excavation Data

r Uncensored Full Data Sets

User Selected Options

Date/Time of Computation	3/6/2018 17:38
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

PCB (ppm)

General Statistics

Total Number of Observations	45	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	0.01	Mean	0.943
Maximum	12.2	Median	0.01
SD	2.408	Std. Error of Mean	0.359
Coefficient of Variation	2.553	Skewness	3.623

Normal GOF Test

Shapiro Wilk Test Statistic	0.447	Shapiro Wilk GOF Test	
5% Shapiro Wilk Critical Value	0.945	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.349	Lilliefors GOF Test	
5% Lilliefors Critical Value	0.132	Data Not Normal at 5% Significance Level	
Data Not Normal at 5% Significance Level			

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	1.546	95% Adjusted-CLT UCL (Chen-1995)	1.741
		95% Modified-t UCL (Johnson-1978)	1.579

Gamma GOF Test

A-D Test Statistic	4.165	Anderson-Darling Gamma GOF Test	
5% A-D Critical Value	0.871	Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.295	Kolmogrov-Smirnoff Gamma GOF Test	
5% K-S Critical Value	0.144	Data Not Gamma Distributed at 5% Significance Level	
Data Not Gamma Distributed at 5% Significance Level			

Gamma Statistics

k hat (MLE)	0.281	k star (bias corrected MLE)	0.277
Theta hat (MLE)	3.354	Theta star (bias corrected MLE)	3.401
nu hat (MLE)	25.32	nu star (bias corrected)	24.96
MLE Mean (bias corrected)	0.943	MLE Sd (bias corrected)	1.791
		Approximate Chi Square Value (0.05)	14.58
Adjusted Level of Significance	0.0447	Adjusted Chi Square Value	14.32

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	1.615	95% Adjusted Gamma UCL (use when n<50)	1.645

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.789	Shapiro Wilk Lognormal GOF Test	
5% Shapiro Wilk Critical Value	0.945	Data Not Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.32	Lilliefors Lognormal GOF Test	
5% Lilliefors Critical Value	0.132	Data Not Lognormal at 5% Significance Level	
Data Not Lognormal at 5% Significance Level			

Lognormal Statistics

Minimum of Logged Data	-4.605	Mean of logged Data	-2.536
Maximum of Logged Data	2.501	SD of logged Data	2.369

Assuming Lognormal Distribution

95% H-UCL	5.931	90% Chebyshev (MVUE) UCL	2.763
95% Chebyshev (MVUE) UCL	3.531	97.5% Chebyshev (MVUE) UCL	4.597
99% Chebyshev (MVUE) UCL	6.692		

Nonparametric Distribution Free UCL Statistics

Data do not follow a Discernible Distribution (0.05)

Nonparametric Distribution Free UCLs

95% CLT UCL	1.534	95% Jackknife UCL	1.546
95% Standard Bootstrap UCL	1.521	95% Bootstrap-t UCL	2.15
95% Hall s Bootstrap UCL	1.875	95% Percentile Bootstrap UCL	1.588
95% BCA Bootstrap UCL	1.831		
90% Chebyshev(Mean, Sd) UCL	2.02	95% Chebyshev(Mean, Sd) UCL	2.51
97.5% Chebyshev(Mean, Sd) UCL	3.185	99% Chebyshev(Mean, Sd) UCL	4.515

Suggested UCL to Use

97.5% Chebyshev (Mean, Sd) UCL	3.185

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
These recommendations are based upon the results of the simulation studies summarized in Singh, Singh, and Iaci (2002)
and Singh and Singh (2003). However, simulations results will not cover all Real World data sets.
For additional insight the user may want to consult a statistician.