



New Bedford Harbor Superfund Site
U.S. Army Corps of Engineers New England District
Final North Street Saltmarsh After Action Report
ACE-J23-35BG2000-M17-0043
November 2018



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Acronyms and Abbreviations

bgs	below ground surface
cy	cubic yards
EPA	U.S. Environmental Protection Agency
ft.	feet
GPS	global positioning system
Jacobs	Jacobs Engineering Group
mg/kg	milligrams per kilogram
MHHW	mean higher-high water
NAE	U.S. Army Corps of Engineers - New England District
NSSM	North Street Salt Marsh
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

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1. Introduction

Remediation and restoration of the North Street Saltmarsh (NSSM) 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 May 7, 2018 and July 25, 2018. The primary objective of remedial action at NSSM 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 (ROD) for the New Bedford Harbor Superfund Site* (U.S. Environmental Protection Agency [EPA] 1998), and to restore the site to baseline or comparable conditions. Although the North Street Saltmarsh is unlikely to be developed as a residential property due to the various wetland protection statutes and regulations, it is also directly adjacent to over a dozen existing residential homes in close proximity. In light of that setting, EPA determined that the TCL for the cleanup would be that for residential areas in the 1998 Record of Decision. The TCL used for the NSSM site was the 1 milligram per kilogram (mg/kg) level for intertidal sediment and soil in residential areas, including fringe saltmarshes bordering homes, for the 0 to 1-foot (ft.) depth interval below ground surface (bgs). Compliance was reached based on the 95% upper confidence limit (UCL) of the mean as described in the ROD for dermal exposure. Details are included in Section 2.3. NSSM is located on the eastern side of New Bedford Harbor extending from residential areas and Hedge Street to the north, residential property to the south, residential properties and Cherry Street to the east, and the Harbor to the west ([Figure 1-1](#)).

The purpose of this After Action Report is to document the remediation activity and final disposition of the restored NSSM area. Remediation and restoration activities were conducted in accordance with the *Draft Final North Street Saltmarsh Intertidal Work Plan* (Jacobs 2018).

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 NSSM 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](#) present the pre-excavation sampling locations and PCB concentrations in sediments for the NSSM intertidal zone. Additional grid-based sediment and soil sampling was performed in 2017, as discussed below in Section 2.3.

Pre-existing conditions at NSSM 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). Other pre-excavation preparation activities included site clearing, construction of an access road, and mobilization of equipment.

2.2 Removal of Contaminated Sediments

Excavation was conducted by Severson Environmental Services, Inc. (Severson) with a track-mounted excavator operated in the intertidal zone and guided by real time kinematic global positioning system (RTK GPS). 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.

An estimated total of 1,987.4 cubic yards (cy) of contaminated sediments was removed from the NSSM 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

To assess residential dermal exposure to intertidal soils and sediments, a 95% UCL of the mean was calculated for the final remediated and restored condition of the top foot of the entire NSSM intertidal zone (i.e., remediated areas as well as areas not requiring remediation) ([Figure 2-4](#)). For this evaluation, the previous PCB data collected from the 0 to 1-ft. depth interval was used for grid locations outside the excavation zone. Samples located within the excavation zone, which were 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](#)). Per the ROD, a 95% UCL compliance calculation was performed on the proposed final remediated and restored condition of the top foot of the entire NSSM intertidal zone to ensure PCB concentrations were below the residential TCL of 1.0 mg/kg. Because the material within the excavation footprint was replaced with clean backfill, a value slightly above zero (0.01 mg/kg) was used in the calculations to represent PCB concentration in the excavated area. This 95% UCL is calculated to be 1.0 mg/kg, as detailed further in [Attachment 1](#).

An additional measure was performed to confirm that all of the contaminated sediment identified in the Work Plan was removed. A total of fourteen locations were identified to document the vertical extents of excavation. These fourteen locations had a target elevation that was determined to be one foot deeper than the sediment surface. After excavation, an additional elevation was determined from each location as identified in [Table 2-3](#). The difference between the final elevation and the target elevation was calculated for each location. All locations showed a difference of ≤ 0.0 and were therefore at least one foot or deeper at each location ([Table 2-3](#)). Therefore, all sediment proposed for removal was excavated and transported from NSSM.

Ambient air and particulate monitoring was conducted by an independent party at fixed monitoring locations during NSSM remedial activities in accordance with the *Draft Final Ambient Air Monitoring Plan for Remediation Activities* (Jacobs 2015). One additional location was established in NSSM 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 2018). Restoration activities included backfill, revegetation, and removal of access road. Backfill of excavated areas was performed by Severson using fill material from an uncontaminated virgin source as specified in the Work Plan. A post-excavation drone survey was conducted by

Nearview, LLC to document post-restoration topography and vegetative cover (Meridian 2018). Restoration activities were completed in September 2018.

The plant community composition at the Site was restored on an approximate 1:1 basis, as compared to a pre-excavation survey (Work Plan Figure 6-1). A post-excavation wetlands cover map is presented in [Figure 2-5](#).

Site monitoring and maintenance will continue through the first five full growing seasons following restoration (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. Additional site restoration details are provided in [Table 2-4](#).

3. Waste Management

Sediment generated from the NSSM Intertidal remediation was disposed in accordance with the Toxic Substances Control Act (TSCA). A total of 1,883.5 tons of stabilized sediment generated during the NSSM 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

- Foster Wheeler (FW). 2002. *Draft Final Restoration Basis of Design/Design Analysis Report*. New Bedford Harbor Superfund Site, New Bedford, MA.
- Jacobs Engineering Group Inc. (Jacobs). 2018. *Draft Final North Street Saltmarsh Intertidal Work Plan*, New Bedford Harbor Superfund Site. ACE-J23-35BG2000-M1-0021. May.
- . 2015. *Draft Final Ambient Air Monitoring Plan for Remediation Activities*. ACE-J23-35BG1001-M17-0009. New Bedford Harbor Superfund Site. July.
- Meridian. 2018. *North Street Salt Marsh UAS Survey Final Report*. New Bedford Harbor Superfund Site. August 24, 2018.
- 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

Marsh Island

Riverside Cemetery

Radio Transmission Tower

Radio Transmission Tower

Taber St.

Hedge St.

Limits of Excavation

Lower Harbor (Acushnet River)

Cherry St.

North St.

Main St.

Oxford St.

Lafayette St.



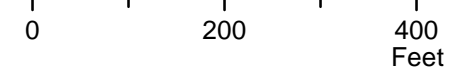
Path: Y:\NBH\Projects\9565G\001\20180827_ArcGIS\Fig1_1_AAR_North_St_Saltmarsh_Site_Location_20180827.mxd

USGS, MassGIS

Legend

Limits of 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



Basemap Data Source: MassGIS, ESRI

September 2018

Elevation Data NAVD88 ft

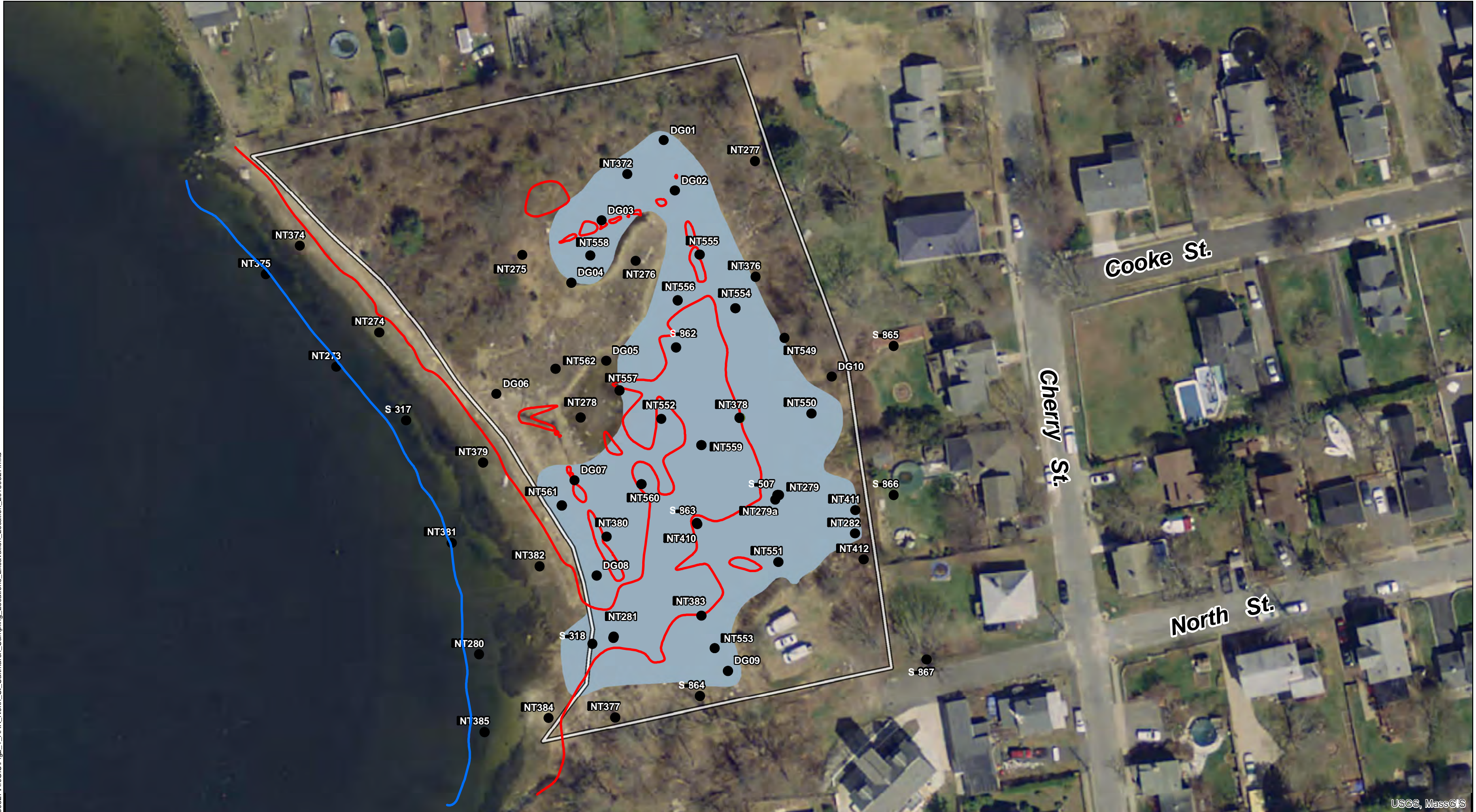
North Street Saltmarsh
Site Location and Pre-Excavation Features

New Bedford Harbor Superfund Site



Figure 1-1

Path: Y:\NH\Projects\356BG\1001\20180827\ArcGIS\Fig_1_AAR_North_St_Saltmarsh_Sampling_Locations_Excavation_Location_20180827.mxd



USGS, MassGIS

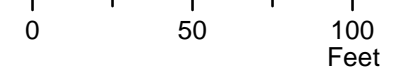
- Legend**
- MLLW (-1.97 ft)
 - MHHW (1.99 ft)
 - Property/Parcel Line

● Sample Location

— Excavation Footprint

Note:
Location of S-867 is approximate.

Elevation Data NAVD88 ft



Basemap Data Source:
MassGIS, ESRI

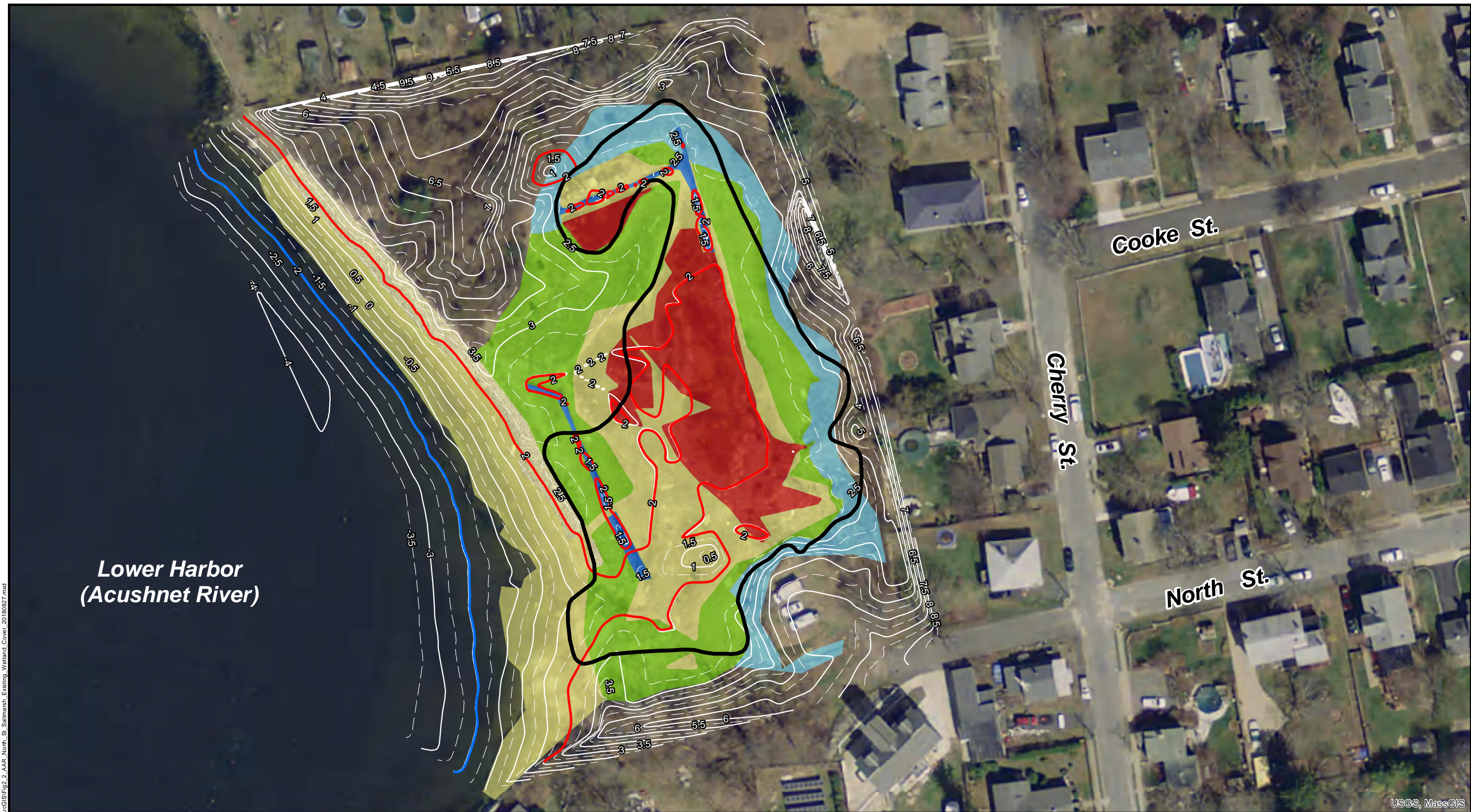
September 2018

North Street Saltmarsh Pre-Excavation Contaminant Boundary

New Bedford Harbor Superfund Site



Figure 2-1



USGS, MassGIS

Legend

- MHHW (1.99 ft)
- MLLW (-1.97 ft)
- 1 ft Contour
- 0.5 ft Contour

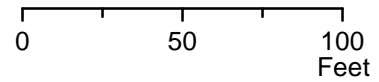
Limits of Excavation

Note:
Pre-Excavation Survey Meridian/Jacobs Jan/Feb 2018

Wetland Cover Types

- Creek
- Panne
- Beach
- High Marsh
- Low Marsh
- Phragmites

Elevation Data NAVD88 ft



Basemap Data Source:
MassGIS, ESRI

November 2018

**North Street Saltmarsh
Pre-Excavation Wetland Cover
and Topography**

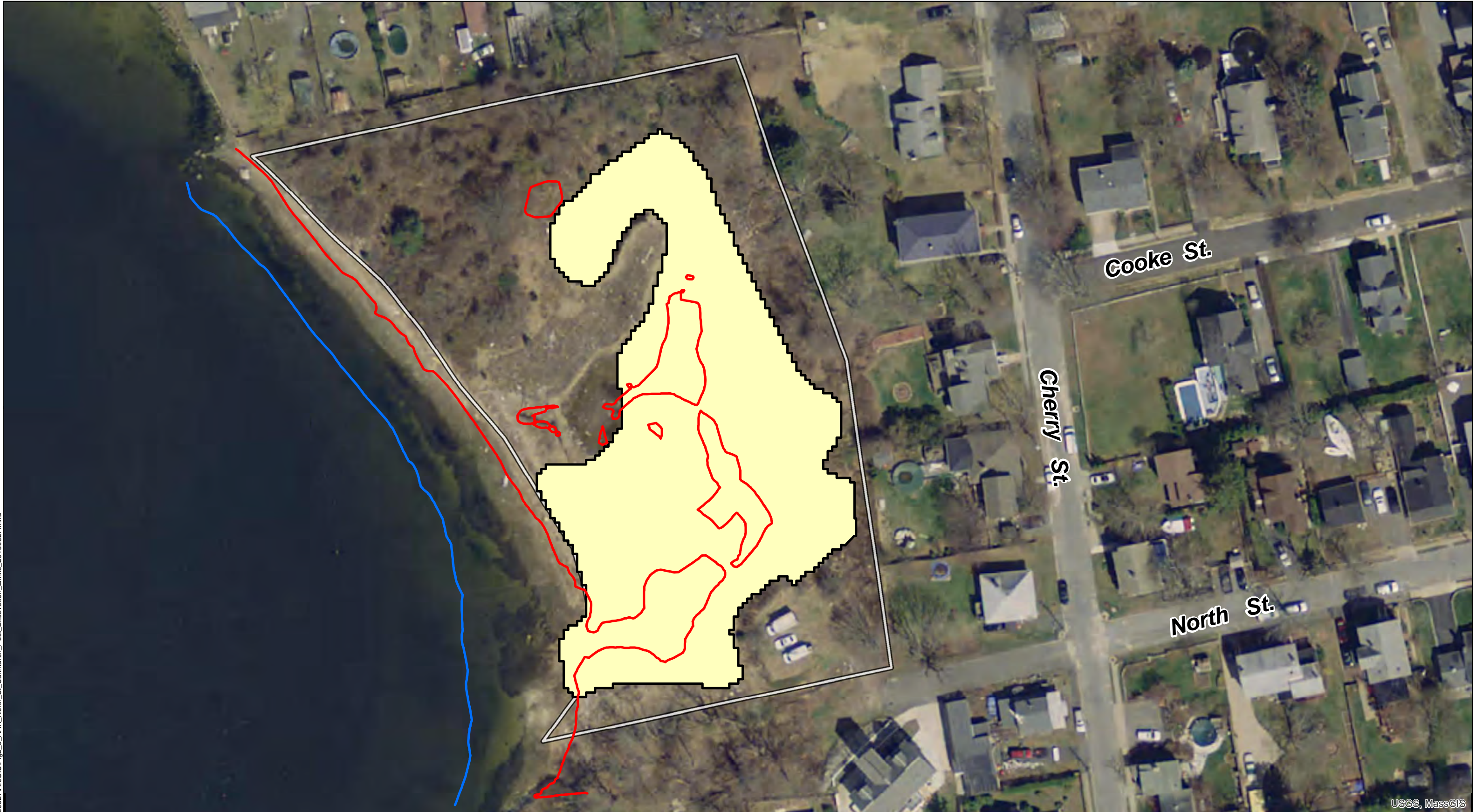
New Bedford Harbor Superfund Site

JACOBS

Figure 2-2

Path: Y:\NBH\Projects\5656\1010180827\ArcGIS\Fig2_2_AAR_North_St_Saltmarsh_Existing_Wetland_Cover_20180827.mxd

Path: Y:\NH\Projects\356BG\1001\20180827\ArcGIS\Fig2_3_AAR_North_St_Saltmarsh_Post_Excavation_Limits_20180827.mxd



USGS, MassGIS

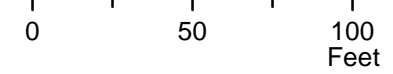
Legend

— MLLW (-1.97 ft)

— MHHW (1.99 ft - Post-Excavation)

□ Property/Parcel Line

■ Limits of Excavation



Basemap Data Source:
MassGIS, ESRI

September 2018

**North Street Saltmarsh
Post-Excavation Limits**

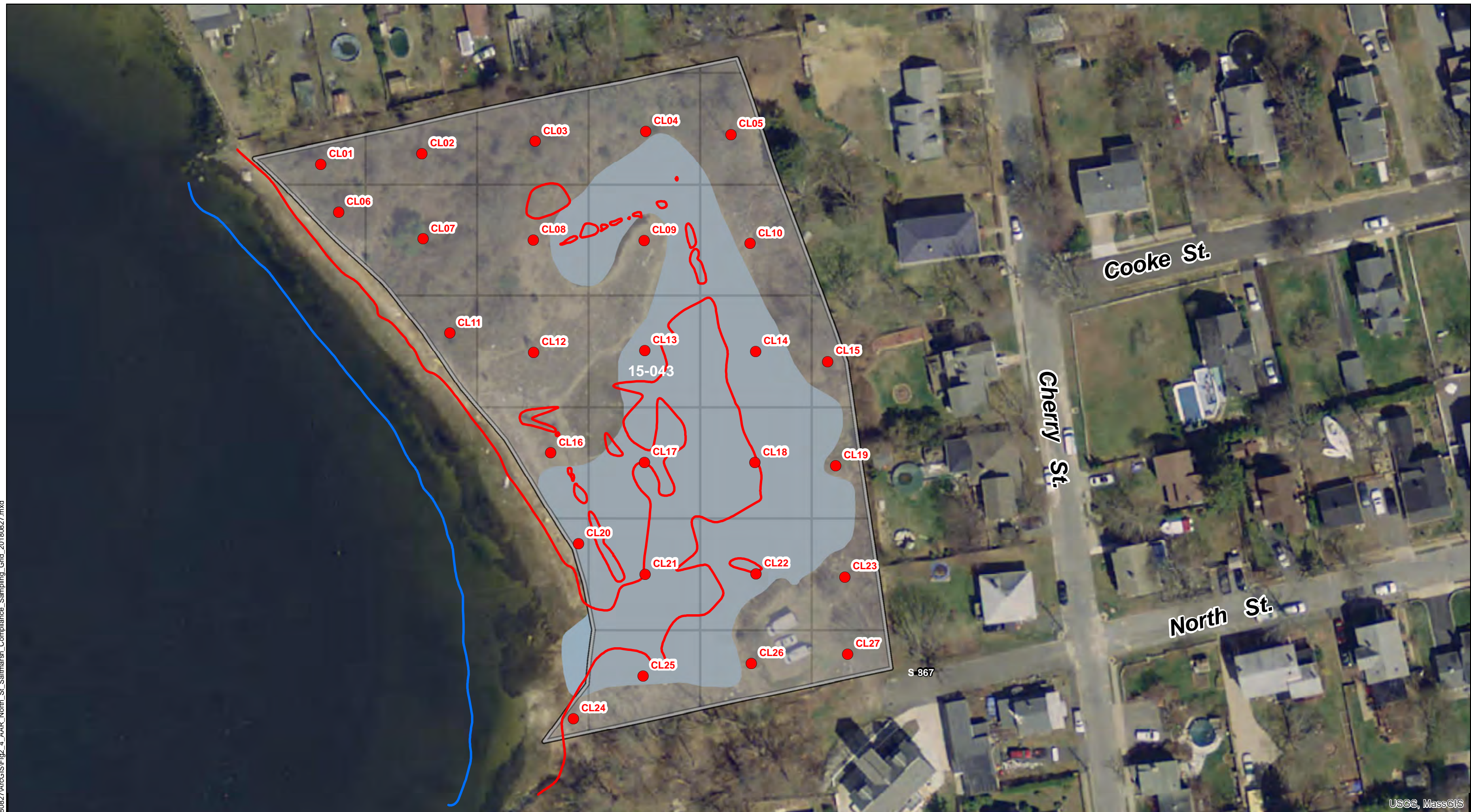
New Bedford Harbor Superfund Site

JACOBS

Figure 2-3

Elevation Data NAVD88 ft

Path: Y:\NH\Projects\356BG\1001\20180827\ArcGIS\Fig2_4_AAR_North_St_Saltmarsh_Compliance_Sampling_Grid_20180827.mxd

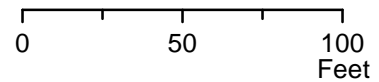


USGS, MassGIS

Legend

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

Elevation Data NAVD88 ft



Basemap Data Source:
MassGIS, ESRI

September 2018

**North Street Saltmarsh Compliance
Sampling Grid for 95% UCL Calculations**

New Bedford Harbor Superfund Site





JACOBS

Figure 2-4







Path: Y:\NBH\Projects\3656G\1001\20180827\ArcGIS\Fig_5_AAR_North_St_Saltmarsh_Post_Restoration_20180827.mxd

Legend

-  Shrub
-  Ground Shot
-  Two-Man-Stones
-  Riprap

Post-Excavation Contours

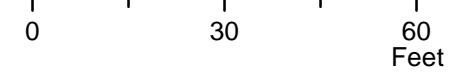
-  1 ft contours
-  5 ft contours
-  MHHW (1.99 ft - Post-Excavation)
-  2018 PCB Remediation Area

Wetland Cover Types

-  Creek
-  Panne
-  High Marsh
-  Low Marsh
-  Phragmites

Note:
Post-Restoration Survey Meridian August 23, 2018

Elevation Data NAVD88 ft



Basemap Data Source:
MassGIS, ESRI

November 2018

**North Street Saltmarsh
Post-Excavation Restoration**

New Bedford Harbor Superfund Site



Figure 2-5

Tables

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
INT273	0-1	10/21/2015	Mudflat	0.5 ^b
INT274	0-1	10/21/2015	Beach	ND ^b
INT275	0-1	10/21/2015	High Marsh	0.5 ^b
INT276	0-1	10/21/2015	High Marsh	1.37 ^a
INT276	1-2	10/21/2015	High Marsh	ND ^b
INT277	0-1	10/21/2015	High Marsh	0.0452 ^a
INT277	1-2	10/21/2015	High Marsh	ND ^b
INT278	0-1	10/21/2015	High Marsh	3.5 ^a
INT278	1-2	10/21/2015	High Marsh	ND ^b
INT279	0-1	10/21/2015	Low Marsh	25.1^a
INT279	1-2	10/21/2015	Low Marsh	6.91 ^a
INT279a	0-1	6/6/2016	Low Marsh	83.2^b
INT279a	1-2	6/6/2016	Low Marsh	0.7 ^b
INT279a	2-2.9	6/6/2016	Low Marsh	0.0438 ^a
INT280	0-1	10/21/2015	Mudflat	2.44 ^a
INT280	1-2	10/21/2015	Mudflat	ND ^b
INT281	0-1	10/21/2015	High Marsh	11.9^a
INT281	1-2	10/21/2015	High Marsh	7.48 ^a
INT282	0-1	10/21/2015	High Marsh	12.5^a
INT282	1-2	10/21/2015	High Marsh	0.208 ^a
INT372	0-1	5/26/2016	High Marsh	3.64^a
INT372	1-2	5/26/2016	High Marsh	0.0329 ^a
INT374	0-1	5/26/2016	Beach	1.5 ^a
INT374	1-2	5/26/2016	Beach	0.134 ^a
INT375	0-1	7/20/2016	Mudflat	0.28 ^a
INT376	0-1	5/26/2016	High Marsh	2.03^a
INT376	1-2	5/26/2016	High Marsh	0.139 ^a
INT377	0-1	5/26/2016	High Marsh	1.54 ^a
INT377	1-2	5/26/2016	High Marsh	0.085 ^a
INT378	0-1	6/6/2016	Low Marsh	28^a
INT378	1-2	6/6/2016	Low Marsh	0.0692 ^a
INT379	0-1	5/26/2016	Beach	0.223 ^a
INT380	0-1	5/26/2016	High Marsh	9.82^a
INT380	1-2	5/26/2016	High Marsh	0.0111 ^a
INT381	0-1	7/6/2016	Mudflat	0.348 ^a
INT382	0-1	5/26/2016	Beach	3.3 ^a
INT382	1-2	5/26/2016	Beach	0.175 ^a
INT383	0-1	6/6/2016	Mudflat	4.99^a
INT383	1-2	6/6/2016	Mudflat	0.0989 ^a
INT384	0-1	5/26/2016	Beach	0.335 ^a

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
INT385	0-1	7/6/2016	Mudflat	0.769 ^a
INT410	0-1	5/26/2016	Low Marsh	4.6^b
INT410	1-2	5/26/2016	Low Marsh	0.24J ^b
INT410	2-3	5/26/2016	Low Marsh	0.296 ^a
INT411	0-1	5/26/2016	High Marsh	2.57^a
INT411	1-2	5/26/2016	High Marsh	0.4 ^a
INT412	0-1	5/26/2016	High Marsh	0.607 ^a
INT549	0-1	5/12/2017	High Marsh	1.7 ^b
INT549	1-2	5/12/2017	High Marsh	1 ^b
INT550	0-1	5/12/2017	High Marsh	9^b
INT550	1-2	5/12/2017	High Marsh	0.5 ^b
INT551	0-1	5/12/2017	Low Marsh	1.5^b
INT551	1-2	5/12/2017	Low Marsh	0.4 ^b
INT552	0-1	5/12/2017	Low Marsh	1.6^b
INT552	1-2	5/12/2017	Low Marsh	1.7 ^b
INT553	0-0.5	8/16/2017	High Marsh	4.9^b
INT553	0.5-1	8/16/2017	High Marsh	4.9^b
INT554	0-0.5	8/16/2017	High Marsh	4.6^b
INT554	0.5-1	8/16/2017	High Marsh	6.1^b
INT554	1-1.5	8/16/2017	High Marsh	3.2 ^b
INT555	0-0.5	8/16/2017	Low Marsh	8.1^b
INT555	0.5-1	8/16/2017	Low Marsh	6^b
INT555	1-1.5	8/16/2017	Low Marsh	1.1 ^b
INT556	0-0.5	8/16/2017	Low Marsh	4.4^b
INT556	0.5-1	8/16/2017	Low Marsh	0.7^b
INT557	0-0.5	8/16/2017	Low Marsh	3.9^b
INT557	0.5-1	8/16/2017	Low Marsh	ND^b
INT558	0-0.5	8/16/2017	Low Marsh	7.2^b
INT558	0.5-1	8/16/2017	Low Marsh	0.6b
INT559	0-0.5	8/16/2017	Low Marsh	9.2^b
INT559	0.5-1	8/16/2017	Low Marsh	0.6^b
INT560	0-0.5	8/16/2017	Low Marsh	1.8^b
INT560	0.5-1	8/16/2017	Low Marsh	3.9^b
INT561	0-0.5	8/16/2017	High Marsh	5.5^b
INT561	0.5-1	8/16/2017	High Marsh	4.8^b
INT562	0-0.5	8/19/2017	High Marsh	ND ^b
S-317	0-1	10/4/1999	Mudflat	0.988
S-317	1-2	10/4/1999	Mudflat	ND
S-318	0-1	10/4/1999	High Marsh	16.12
S-318	1-2	10/4/1999	High Marsh	0.286

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
S-507	0-1	10/4/1999	Low Marsh	28.6
S-507	1-2	10/4/1999	Low Marsh	0.754
S-862	0-1	10/31/2000	Low Marsh	12.22
S-862	1-2	10/31/2000	Low Marsh	0.728
S-863	0-1	10/31/2000	Low Marsh	17.68
S-863	1-2	10/31/2000	Low Marsh	2.574
S-864	0-1	10/31/2000	High Marsh	0.0858
S-864DUP	0-1	10/31/2000	High Marsh	0.312
S-864	1-2	10/31/2000	High Marsh	ND
S-865	0-1	10/30/2000	Upland	0.364
S-865	1-2	10/30/2000	Upland	0.0468
S-866	0-1	10/30/2000	Upland	ND
S-866	1-2	10/30/2000	Upland	ND
S-867	0-1	10/30/2000	Upland	ND
S-867	1-2	10/30/2000	Upland	ND
S-CL01 A	0-1	11/1/2017	Upland	0.0233 ^a
S-CL01 B	1-2	11/1/2017	Upland	0.0638 ^b
S-CL01 C	2-3	11/1/2017	Upland	0.3241 ^b
S-CL02 A	0-1	11/3/2017	Upland	0.00327 ^a
S-CL02 B	1-2	11/3/2017	Upland	0 ^b
S-CL02 C	2-3	11/3/2017	Upland	0 ^b
S-CL03 A	0-1	11/6/2017	Upland	0 ^c
S-CL03 B	1-2	11/6/2017	Upland	0.0071 ^c
S-CL03 C	2-3	11/6/2017	Upland	0.0583 ^b
S-CL04 A	0-1	11/6/2017	Upland	0.0694 ^a
S-CL04 B	1-2	11/6/2017	Upland	0 ^b
S-CL05 A	0-1	11/6/2017	Upland	0.133 ^a
S-CL05 B	1-2	11/6/2017	Upland	0.0753 ^b
S-CL05 C	2-3	11/6/2017	Upland	0.0584 ^b
S-CL06 A	0-1	11/3/2017	Upland	0.0085 ^a
S-CL06 A Rep	0-1	11/3/2017	Upland	0.0165 ^a
S-CL06 B	1-2	11/3/2017	Upland	0 ^b
S-CL07 A	0-1	11/2/2017	Upland	0.00755 ^a
S-CL07 A Rep	0-1	11/2/2017	Upland	0.0059 ^a
S-CL08 A	0-1	11/3/2017	Upland	0.111 ^a
S-CL08 A Rep	0-1	11/3/2017	Upland	0.102 ^a
S-CL09 A	0-1	11/3/2017	Upland	0.0737 ^a
S-CL09 B	1-2	11/3/2017	Upland	0 ^b
S-CL09 C	2-3	11/3/2017	Upland	0 ^b
S-CL10 A	0-1	11/3/2017	Upland	0.553 ^a

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
S-CL10 B	1-2	11/3/2017	Upland	0 ^c
S-CL10 C	0-1	11/3/2017	Upland	0 ^b
S-CL11 A	0-1	11/6/2017	Upland	0.00571 ^a
S-CL11 A Rep	0-1	11/6/2017	Upland	0.00723 ^a
S-CL11 B	1-2	11/6/2017	Upland	0.0319 ^b
S-CL11 C	2-3	11/6/2017	Upland	0.0081 ^b
S-CL12 A	0-1	11/3/2017	High Marsh	0.159 ^a
S-CL12 B	1-2	11/3/2017	High Marsh	0 ^b
S-CL12 C	2-3	11/3/2017	High Marsh	0 ^b
S-CL13 A	0-1	11/2/2017	Low Marsh	3.16^a
S-CL13 B	1-2	11/2/2017	Low Marsh	0.5 ^c
S-CL13 C	2-3	11/2/2017	Low Marsh	0.4597 ^b
S-CL14 A	0-1	11/2/2017	High Marsh	29.9^a
S-CL14 B	1-2	11/2/2017	High Marsh	0.18 ^c
S-CL14 C	2-3	11/2/2017	High Marsh	0.0044 ^b
S-CL15 A	0-1	11/2/2017	Upland	0.455 ^a
S-CL15 B	1-2	11/2/2017	Upland	0 ^c
S-CL15 C	2-3	11/2/2017	Upland	0.2599 ^b
S-CL16 A	0-1	11/2/2017	High Marsh	4.86 ^a
S-CL16 B	1-2	11/2/2017	High Marsh	0.0113 ^a
S-CL16 C	2-3	11/2/2017	High Marsh	0.0945 ^b
S-CL17 A	0-1	11/2/2017	Low Marsh	5.15^a
S-CL17 B	1-2	11/2/2017	Low Marsh	1.5939 ^b
S-CL17 C	2-3	11/2/2017	Low Marsh	0.7783 ^b
S-CL18 A	0-1	11/2/2017	Low Marsh	17.3^a
S-CL18 B	1-2	11/2/2017	Low Marsh	6.2 ^c
S-CL18 C	2-3	11/2/2017	Low Marsh	0.4736 ^b
S-CL19 A	0-1	11/2/2017	Upland	0.601 ^a
S-CL19 B	1-2	11/2/2017	Upland	0.63 ^c
S-CL19 B Rep	1-2	11/2/2017	Upland	0.801 ^b
S-CL19 C	2-3	11/2/2017	Upland	0.5644 ^b
S-CL20 A	0-1	11/1/2017	High Marsh	9.15^a
S-CL20 B	1-2	11/1/2017	High Marsh	0.84 ^c
S-CL20 C	2-3	11/1/2017	High Marsh	0.7805 ^b
S-CL21 A	0-1	11/2/2017	Low Marsh	15.2^a
S-CL21 B	1-2	11/2/2017	Low Marsh	1.2 ^c
S-CL21 C	2-3	11/2/2017	Low Marsh	0.2795 ^b
S-CL22 A	0-1	11/2/2017	Low Marsh	12.8^a
S-CL22 B	1-2	11/2/2017	Low Marsh	1.43 ^c
S-CL22 C	2-3	11/2/2017	Low Marsh	5.8414 ^b

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
S-CL22 C Rep	2-3	11/2/2017	Low Marsh	5.7475 ^b
S-CL23 C	2-3	11/2/2017	High Marsh	0 ^b
S-CL23 A	0-1	11/2/2017	High Marsh	3.04 ^a
S-CL23 B	1-2	11/2/2017	High Marsh	1.8387 ^b
S-CL24 A	0-1	11/1/2017	Beach	0.0104 ^a
S-CL24 B	1-2	11/1/2017	Beach	0.0418 ^b
S-CL24 C	2-3	11/1/2017	Beach	0.2116 ^b
S-CL25 A	0-1	11/1/2017	High Marsh	3.59^a
S-CL25 B	1-2	11/1/2017	High Marsh	5.4802 ^b
S-CL25 C	2-3	11/1/2017	High Marsh	5.2004 ^b
S-CL26 A	0-1	11/1/2017	Upland	2.75 ^a
S-CL26 B	1-2	11/1/2017	Upland	2.5791 ^b
S-CL26 C	2-3	11/1/2017	Upland	4.3166 ^b
S-CL27 A	0-1	11/1/2017	Upland	0.168 ^a
S-DG01 A	0-1	11/6/2017	High Marsh	5.65^a
S-DG02 A	0-1	11/3/2017	High Marsh	11.4^a
S-DG02 B	1-2	11/3/2017	High Marsh	1.11 ^a
S-DG02 C	2-3	11/3/2017	High Marsh	0.158 ^a
S-DG03 A	0-1	11/3/2017	Low Marsh	11.9^a
S-DG03 B	1-2	11/3/2017	Low Marsh	3.41 ^a
S-DG03 C	2-3	11/3/2017	Low Marsh	0.47 ^a
S-DG03 C Rep	2-3	11/3/2017	Low Marsh	0.438 ^a
S-DG04 A	0-1	11/3/2017	Low Marsh	1.09^a
S-DG04 B	1-2	11/3/2017	Low Marsh	0.0257 ^a
S-DG04 C	2-3	11/3/2017	Low Marsh	0.00275 ^a
S-DG05 A	0-1	11/2/2017	High Marsh	0.309 ^a
S-DG05 B	1-2	11/2/2017	High Marsh	0.0114 ^a
S-DG05 C	2-3	11/2/2017	High Marsh	0.000839 ^a
S-DG06 A	0-1	11/3/2017	High Marsh	0.204 ^a
S-DG06 B	1-2	11/3/2017	High Marsh	0.0763 ^a
S-DG06 C	2-3	11/3/2017	High Marsh	0.0241 ^a
S-DG07 A	0-1	11/2/2017	High Marsh	8.07^a
S-DG07 B	1-2	11/2/2017	High Marsh	0.31 ^c
S-DG07 C	2-3	11/2/2017	High Marsh	0.139 ^a
S-DG08 A	0-1	11/1/2017	High Marsh	10.8^a
S-DG08 B	1-2	11/1/2017	High Marsh	2.85 ^c
S-DG08 C	2-3	11/1/2017	High Marsh	1.9 ^c
S-DG08 B	1-2	11/3/2017	High Marsh	0.2347 ^b
S-DG08 C	2-3	11/3/2017	High Marsh	0.1796 ^b
S-DG09 A	0-1	11/1/2017	High Marsh	12.7^a

**Table 2-1
Pre-Remediation PCB Data Points**

Location	Depth Interval (ft)	Collection Date	Location	Total PCB ¹ (ppm)
S-DG09 B	1-2	11/1/2017	High Marsh	2.3 ^c
S-DG09 C	2-3	11/1/2017	High Marsh	0.79 ^c
S-DG10 A	0-1	11/2/2017	High Marsh	1.37 ^a
S-DG10 B	1-2	11/2/2017	High Marsh	0.0411 ^a
S-DG10 C	2-3	11/2/2017	High Marsh	0.0129 ^a

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
TCL: 1.0 ppm for residential saltmarsh (95% UCL of the mean).

**Table 2-2
Compliance 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)
<i>Residential Marsh: target cleanup level = 1.0 mg/kg in top 1 ft</i>						
CL01	S-CL01-17ADD3-A	SA	11/1/2017	0.02		0.63
CL02	S-CL02-17ADD3-A	SA	11/3/2017	0.00		
CL03	S-CL03-17ADD3-A	SA	11/6/2017	0.01		
CL04	S-CL04-17ADD3-A	SA	11/6/2017	0.07		
CL05	S-CL05-17ADD3-A	SA	11/6/2017	0.13		
CL06	S-CL06-17ADD3-A	SA	11/3/2017	0.02		
CL-06	S-CL06-17ADD3-A-REP ²	REP	11/3/2017	0.02		
CL07	S-CL07-17ADD3-A	SA	11/2/2017	0.01		
CL07	S-CL07-17ADD3-A-REP ²	REP	11/2/2017	0.10		
CL08	S-CL08-17ADD3-A	SA	11/3/2017	0.11		
CL08	S-CL08-17ADD3-A-REP ²	REP	11/3/2017	0.10		
CL09	S-CL09-17ADD3-A	SA	11/3/2017	0.07		
CL10	S-CL10-17ADD3-A	SA	11/3/2017	0.55		
CL11	S-CL11-17ADD3-A	SA	11/6/2017	0.01		
CL11	S-CL11-17ADD3-A-REP ²	REP	11/6/2017	0.01		
CL12	S-CL12-17ADD3-A	SA	11/3/2017	0.16		
CL13	S-CL13-17ADD3-A	SA	11/2/2017	0.01 ³		
CL14	S-CL14-17ADD3-A	SA	11/2/2017	0.01 ³		
CL15	S-CL15-17ADD3-A	SA	11/2/2017	0.46		
CL16	S-CL16-17ADD3-A	SA	11/2/2017	4.86		
CL17	S-CL17-17ADD3-A	SA	11/2/2017	0.01 ³		
CL18	S-CL18-17ADD3-A	SA	11/2/2017	0.01 ³		
CL19	S-CL19-17ADD3-A	SA	11/2/2017	0.004		
CL20	S-CL20-17ADD3-A	SA	11/1/2017	0.01 ³		
CL21	S-CL21-17ADD3-A	SA	11/2/2017	0.01 ³		
CL22	S-CL22-17ADD3-A	SA	11/2/2017	0.01 ³		
CL23	S-CL23-17ADD3-A	SA	11/2/2017	3.04		
CL24	S-CL24-17ADD3-A	SA	11/1/2017	0.01		
CL25	S-CL25-17ADD3-A	SA	11/1/2017	0.01 ³		
CL26	S-CL26-17ADD3-A	SA	11/1/2017	2.75		
CL27	S-CL27-17ADD3-A	SA	11/1/2017	0.17		
INT374	S-17G-INT374-00-10	SA	5/26/2016	1.5		
INT375	S-17G-INT375-00-10	SA	7/20/2016	0.28		
S-317	S-317	SA	10/4/1999	0.99		
INT379	S-17G-INT379-00-10	SA	5/26/2016	0.23		
INT381	S-17G-INT381-00-10	SA	7/6/2016	0.35		
INT382	S-17G-INT382-00-10	SA	5/26/2016	3.3		
INT280	S-17G-INT280-00-10	SA	10/21/2015	2.44		
INT385	S-17G-INT385-00-10	SA	7/6/2016	0.77		
INT384	S-17G-INT384-00-10	SA	5/26/2016	0.34		

Notes:

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

² Field duplicate results are averaged in the calculation.

³ Locations where clean backfill was added. Backfill assumed to have PCB concentration less than 0.01 mg/kg.

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

SA - field sample; REP - field duplicate

**Table 2-3
Pre- and Post-Excavation Elevation Comparison**

Location	Northing	Easting	Design Elevation (NAVD88)	Final Elevation (NAVD88)	Δ
	ft				
INT279	2697500	816924.2	1.32	1.17	-0.15
INT281	2697404	816814.1	1.04	0.94	-0.1
INT372	2697715	816823.3	1.42	1.31	-0.11
INT378	2697552	816898.6	0.99	0.92	-0.07
INT380	2697472	816809.4	1.32	1.07	-0.25
INT383	2697419	816873.0	1.2	1.08	-0.12
S-CL13B	2697598	816834.5	1.29	1.22	-0.07
S-CL14B	2697597	816909.1	1.46	1.14	-0.32
S-CL17B	2697523	816834.4	0.99	0.45	-0.54
S-CL18B	2697522	816908.6	0.94	0.41	-0.53
S-CL20B	2697468	816789.9	1.5	1.39	-0.11
S-CL21B	2697447	816834.7	0.95	0.82	-0.13
S-CL22B	2697448	816909.5	1.00	1.00	0.00
S-CL25B	2697379	816833.3	1.28	1.2	-0.08

Δ = difference between final excavation elevation and design elevation

bold = difference is ≤ 0.0, and therefore compliant with design

NAVD88 = North American Vertical Datum 1988

ft = feet

**Table 2-4
Site Restoration Summary**

PLANTING DATES (Completed)	
7/12/2018	Shrub planting completed. 75 High-Tide bush (<i>Iva frutescens</i>), 1-gallon containers
7/12/2018	Saltmarsh plugs completed. 3,600 Low Marsh (<i>Spartina alterniflora</i>) 2" plugs
7/17/2018	Staging area seeding completed. Seeding with New England Conservation/Wildlife Mix to begin in the Fall 2018.
7/26/2018	High marsh plugs completed. 18,750 High Marsh (<i>Spartina patens</i>) 2" plugs
9/21/2018	Plantings from Between the Bridges leftovers 1,350 Spicata 1,350 High Marsh (<i>Spartina patens</i>) 2" plugs 15-20 High-Tide bush (<i>Iva frutescens</i>), 1-gallon containers
LOW MARSH AND HIGH MARSH ELEVATIONS (Bottom to Top)	
Low Marsh	Approximately 1.9 ft. to 2.3 ft. (NAVD88)
High Marsh	2.3 ft. to 3.0 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 Content	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	
Two-Man-Stone	225 linear feet

Attachment 1

95% Upper Confidence Limit Calculation

