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FINAL
TECHNICAL MEMORANDUM
SUMMARY OF FINDINGS

New Bedford Harbor Superfund Site
2012 Near-Shore Boring Program Adjacent to the Former Aerovox Property
740 Belleville Avenue
New Bedford, MA

April 2013

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ACRONYMS AND ABBREVIATIONS

1,1-DCE	1,1-dichloroethene
1,2-DCB	1,2-dichlorobenzene
1,3-DCB	1,3-dichlorobenzene
1,4-DCB	1,4-dichlorobenzene
1,2,3-TCB	1,2,3-trichlorobenzene
1,2,4-TCB	1,2,4-trichlorobenzene
ACO	Administrative Consent Order
Aerovox Site	former Aerovox Corporation property
AVX	AVX Corporation
BBL	Blasland, Bouck & Lee, Inc.
CDF	Confined Disposal Facility
CERCLIS	Comprehensive Environmental Response, Compensation, and Liability Information System
cis-1,2-DCE	cis-1,2-dichloroethene
cy	cubic yards
DNAPL	dense non-aqueous phase liquid
EE/CA	engineering evaluation/cost analysis
EPA	United States Environmental Protection Agency
ESD	Explanation of Significant Difference
GHR	GHR Engineering Corporation
HAC	hydraulic asphalt concrete
Harbor Site	New Bedford Harbor Superfund Site
Jacobs	Jacobs Engineering Group, Inc.
MassDEP	Massachusetts Department of Environmental Protection

ACRONYMS AND ABBREVIATIONS

MCP	Massachusetts Contingency Plan
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
NGVD 29	national geodetic vertical datum 1929
NPL	National Priorities List
NTCRA	non-time critical removal action
OL	organic silt
OU	operable unit
PCB	polychlorinated biphenyl
PCE	tetrachloroethene
ppm	parts per million
RCRA	Resource Conservation and Recovery Act
ROD	Record of Decision
SEE/CA	Supplemental Engineering Evaluation/Cost Analysis
TCE	trichloroethene
TCLP	Toxicity Characteristic Leaching Procedure
tr-1,2-DCE	trans-1,2-dichloroethene
TSCA	Toxic Substances Control Act
USACE	Unites States Army Corps of Engineers
VC	vinyl chloride
VOC	volatile organic compound
WHG	Woods Hole Group

ABSTRACT

The former Aerovox capacitor manufacturing plant at 740 Bellevue Avenue was the primary source of polychlorinated biphenyl (PCB) discharges to the Acushnet River and New Bedford Harbor. As part of the remediation of PCB-contaminated sediment conducted pursuant to a 1998 Record of Decision (ROD), as modified, for the New Bedford Harbor Superfund Site, in 2008 approximately 6,900 cubic yards (cy) of highly contaminated sediment abutting the Aerovox shoreline was removed using land-based mechanical excavation. In July 2012, twelve sediment/soil borings were advanced to bedrock in the near-shore Aerovox area to obtain a vertical profile of remaining PCBs and select solvents in and under the marine sediments. This report discusses the results of the 2012 boring program and incorporates historic data gathered from the Aerovox Site.

Although three of the twelve borings revealed high levels of remaining PCBs at the surface and at depth (up to approximately 8,400 parts per million [ppm]), the other nine borings had much lower PCB levels. Seven of these borings at all depths were below the 10 ppm target cleanup level specified in the 1998 ROD, while two borings had slightly higher but relatively low PCB levels given the proximity to the Aerovox Site, in the top foot of sediment only (59 and 163 ppm). The three borings with high levels of PCBs were just offshore of the former plant's two drainage trenches (originally unlined), indicating that historic direct PCB discharges via these trenches and then "sinking" within the marine sediments and underlying soils could be a primary contaminant transport pathway.

High levels of select solvents were also detected in several borings, the highest being approximately 28,000 ppm of trichloroethene just offshore of the southern drainage trench. Additional investigation in the study area would further help to identify contaminant pathways and trends, including any exacerbated PCB migration due to co-located solvents.

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1.0 INTRODUCTION

This Technical Memorandum provides an updated description of the near-shore sediment contamination abutting the former Aerovox Corporation property (Aerovox Site), located at 740 Belleville Avenue in New Bedford, Massachusetts (Comprehensive Environmental Response, Compensation, and Liability Information System [CERCLIS] ID MAN000103307). As part of the 2012 near-shore boring program, samples were taken from sediment located within the New Bedford Harbor Superfund Site (Harbor Site), immediately east of the Aerovox Site. The Technical Memorandum was prepared for the U.S. Environmental Protection Agency (EPA) and the U.S. Army Corps of Engineers (USACE) by Jacobs Engineering Group, Inc. (Jacobs). This report discusses the results of a near-shore boring program that was conducted adjacent to the Aerovox Site in 2012 (Woods Hole Group [WHG], 2013), and combines those results with historic soil sampling activities in and around the former Aerovox facility (GHR Engineering Corporation [GHR], 1983; Gushue and Cummings, 1984; and Blasland, Bouck & Lee, Inc. [BBL], 1998).

This Technical Memorandum was prepared as a concise summary and interpretation of the 2012 Aerovox shoreline boring program (WHG, 2013) to be used in the design and scheduling of further dredging along the shoreline as part of the overall remediation of the Harbor Site. In addition, the combined geologic and contaminant data collected through this boring program may be useful in the planned 21E action for the Aerovox Site.

1.1 BACKGROUND ON THE NEW BEDFORD HARBOR SUPERFUND SITE

The Harbor Site is located in Bristol County, Massachusetts, and extends from the shallow northern reaches of the Acushnet River estuary south through the commercial harbor of New Bedford and into 17,000 adjacent acres of Buzzards Bay. Industrial and urban development surrounding the harbor has resulted in sediment becoming contaminated with high concentrations of many pollutants, notably polychlorinated biphenyls (PCBs) and heavy metals, with contaminant gradients decreasing from north to south. The Harbor Site is divided into three areas, the Upper, Lower and Outer Harbors - consistent with geographical features of the area and gradients of contamination. The Harbor Site is also defined by three state-sanctioned fishing closure areas extending approximately 6.8 miles north to south and encompassing approximately 18,000 acres in total.

There are three operable units (OUs) at the Harbor Site: OU1 - the Upper and Lower Harbor; OU2 - the hot spot operable unit, consisting of some of the Harbor Site's most highly PCB-contaminated sediment (concentrations greater than 4,000 parts per million [ppm]) located adjacent to the Aerovox Site; and OU3 - the Outer Harbor.

The Upper Harbor comprises approximately 187 acres. The boundary between the Upper and Lower Harbor is the Coggeshall Street Bridge. The Lower Harbor comprises approximately 750 acres. The boundary between the Lower and Outer Harbor is the New Bedford hurricane barrier, constructed from 1962 to 1966. The Outer Harbor is comprised of approximately 17,000 acres with its southern extent (and the Harbor Site's boundary) formed by an imaginary line drawn from Rock Point (the southern tip of West Island in Fairhaven) southwesterly to navigational Buoy C3 and then southwesterly to Mishaum Point in Dartmouth (Figure 1-1).

Identification of PCB contaminated sediment and seafood in and around New Bedford Harbor was first made in the mid-1970s as a result of EPA region-wide sampling programs. The manufacture and sale of PCBs was banned by the Toxic Substances Control Act (TSCA) in 1979. The Massachusetts Department of Public Health promulgated regulations in 1979 prohibiting fishing, shellfishing and lobstering within areas of the Harbor Site due to elevated PCB levels in area seafood. Designated by the Commonwealth of Massachusetts, pursuant to 40 C.F.R. § 300.425(c)(2) of the National Contingency Plan, as its highest priority site, the New Bedford Site was proposed for inclusion on the Superfund National Priorities List (NPL) in 1982, and finalized on the NPL in September 1983.

EPA's Harbor Site-specific investigations began in 1983 and 1984 (Metcalf & Eddy Engineers, 1983; NUS Corporation 1984a, 1984b). Harbor Site investigations continued throughout the rest of the 1980s and early 1990s, including a pilot dredging and disposal study in 1988 and 1989 (Otis et al., 1990), a baseline public health risk assessment in 1989 (Ebasco Services Incorporated, 1990), computer modeling of site cleanup options, and an updated feasibility study for the Harbor Site completed in 1990 (Battelle Memorial Institute, 1990; Ebasco Services Incorporated, 1990). These investigations found that hazardous substances, particularly PCBs, were released, deposited, disposed of, or placed at the Aerovox facility which manufactured PCB-impregnated electrical capacitors from at least 1947 through 1973. Various solvents were also used in manufacturing operations (Versar, 1981). The Aerovox Site was found to be the primary source of PCBs released at and to the Harbor Site through operations and disposal practices that occurred at the Aerovox Site. PCBs were released, deposited, disposed, placed, or came to be located at the Harbor Site, or migrated, and may still be migrating, to the Harbor Site from the Aerovox Site by several pathways including, direct and indirect disposal at and from the Aerovox facility; discharges of PCB wastes from the Aerovox facility through unlined and later lined trenches and discharge pipes directly to the Upper Harbor; the drainage and release of PCBs into the Upper Harbor as a result of PCBs leaked and spilled onto the floor of the Aerovox facility building and the grounds outside the building; indirect disposal of PCBs to the Harbor via storm drains and combined sewer overflows; leaking of PCBs from the Aerovox facility to the groundwater underlying the facility and discharges of that groundwater to the Harbor; and leaking of PCBs from PCB-impregnated capacitors discarded on tidal flats within the Harbor adjacent to the Aerovox facility. PCBs were also released to the Harbor Site from the Comell-Dubilier Electronics, Inc. facility just south of the hurricane barrier in New Bedford. Studies performed on sediment in the harbor, surface water, shoreline, and biota at the Harbor Site demonstrate decreasing north to south gradients of PCB levels as the distance from the Aerovox Site increases, with the highest concentrations of PCBs detected in the northern portion of the Harbor Site. Sediment within the Harbor Site also contains high levels of other hazardous substances, including heavy metals (e.g., cadmium, chromium, copper, and lead) (Summerhayes, et al. 1977; Pruell et al. 1988; Schwartz, 1988; Lake et al., 1990).

In April 1990, EPA issued a Record of Decision (ROD) for OU2 at the Harbor Site ("1990 OU2 ROD" or "Hot Spot ROD") (EPA, 1990). The 1990 OU2 ROD called for dredging and on-site incineration of sediment above 4,000 ppm PCBs in the vicinity of the Aerovox facility. Dredging and temporary disposal of this sediment – about 14,000 cubic yards (cy) in volume and 5 acres in area - began in April 1994 and was completed in September 1995. Pursuant to an April 1999 amendment to the 1990 OU2 ROD, the sediment was dewatered and transported to an offsite landfill for permanent disposal. This final offsite disposal phase of the hot spot remedy was completed in May 2000.

The Record of Decision for Upper and Lower Harbor OU1 ROD (1998 OU1 ROD) was issued on September 25, 1998 (EPA, 1998). The 1998 OU1 ROD called for approximately 450,000 cy of PCB-contaminated in-situ sediment to be dredged from the harbor bottom and surrounding wetlands, and to be disposed in perpetuity in four shoreline confined disposal facilities (CDFs), long-term monitoring, and institutional controls.[1]

Since the issuance of the 1998 OU1 ROD (EPA, 1998), EPA has gathered additional site information and refined the cleanup approach for the Upper and Lower Harbor areas through four Explanations of Significant Difference (ESDs) (EPA, September 2001; August 2002; March 2010; and March 2011). The ESDs explained that the total *in situ* sediment volume above the OU1 ROD cleanup standards was estimated to be approximately 900,000 cy.

Since the issuance of the 1998 OU1 ROD, various remedial activities have been executed at the Harbor Site. Primarily utilizing hydraulic dredging with some limited mechanical excavation, approximately 250,000 cy of contaminated material have been addressed

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1 An additional 126,000 cubic yards of contaminated sediment would be contained within the footprints of the CDFs.

through 2012. Due to tidal effects, contaminant concentrations, material type, and material thickness, a two phase dredging approach has been implemented. This process consists of a mass removal phase (Phase 1) wherein the most contaminated sediment is dredged first, followed by a clean-up dredging phase (Phase 2). During Phase 1, dredge area sequencing is prioritized by contaminant mass, with the most contaminated areas being dredged first (as feasible), until nearly all sediment has been dredged to the target elevation. Following Phase 1, progress sediment sampling will identify target areas and depths for Phase 2 dredging. Phase 2 dredging is intended to remove any remaining sediment containing PCB concentrations greater than the target clean-up levels. As of 2012, Phase 1 dredging is on-going with no Phase 2 dredging or confirmatory sampling conducted in the Upper Harbor, with the exception of the area north of Wood Street, where sediment was removed “in the dry” to clean-up levels using a confirmatory sampling program with total shoreline restoration achieved (Tetra Tech, 2005).

During the 2006 dredging season for the Harbor Site, high concentrations of volatile organic compounds (VOCs) were found in addition to elevated PCB concentrations in sediment immediately adjacent to the Aerovox Site. In 2008, EPA mechanically excavated approximately 6,900 cy of this contaminated sediment along the shoreline of the Aerovox Site and further characterized the presence of very high levels of PCBs and VOCs, particularly trichloroethene (TCE) and this compound’s breakdown products at the Harbor Site. The Toxicity Characteristic Leaching Procedure (TCLP) testing on this material showed that this sediment exceeds the Resource Conservation and Recovery Act (RCRA) characteristic hazardous waste standards for toxicity due to the presence of TCE with concentrations ranging from 0.130 milligrams per liter (mg/L) to 43.0 mg/L. The regulatory TCLP limit for TCE to be a RCRA characteristic hazardous waste is 0.5 mg/L. This contaminated sediment is currently being stored in a lined and capped cell located at EPA’s Sawyer Street facility (Jacobs, 2007). Groundwater and air monitoring is routinely conducted around and near the cell.

EPA initiated an investigative boring program in 2012 in an effort to characterize the geology and extent of chemical contamination from the sediment surface to bedrock. Twelve borings were advanced by WHG with support from Jacobs (WHG, 2013).

1.2 BACKGROUND ON THE AEROVOX FACILITY

The Aerovox Site facility is located on an approximately 10.3 acre, industrially zoned parcel at 740 Belleville Avenue in New Bedford, Massachusetts (Figure 1-1). The facility (Figure 1-2), which directly abuts the Harbor, consisted of a former three story textile mill, purchased in 1938 by Aerovox Corporation and subsequently converted for capacitor manufacturing operations. Aerovox Corp., and a subsequent owner/operator, Aerovox Incorporated, used dielectric fluid containing PCBs in many of their products (capacitors) from the 1940s until a ban was placed on their use in the late 1970s. Aerovox Corp. and Aerovox Inc. also utilized TCE in the manufacturing process as a degreasing solvent (Versar, 1981).

Inspections and sampling conducted at the Aerovox facility in the late 1970s and early 1980s led to a 1982 administrative order with EPA and a consent agreement with Massachusetts Department of Environmental Quality Engineering (now named the Massachusetts Department of Environmental Protection [MassDEP]) that required Aerovox Inc.'s performance of protective measures to prevent the spread of existing PCB contamination from the facility. These measures included installation of a hydraulic asphalt concrete (HAC) cap over soils on the northeast and eastern sides of the property and the installation of a steel sheetpile wall along the shoreline to isolate PCB-contaminated soils and a shallow perched aquifer beneath the Aerovox facility from the harbor. These remedial actions were implemented in 1983-1984 (Gushue and Cummings, 1984). A subsequent agreement between the parties in 1984 required Aerovox Inc. to commence and carry out a long-term monitoring and maintenance program, including compliance with the reporting requirements outlined in the program, and to take maintenance measures as necessary to maintain on-site containment and prevent the release of PCBs.

A site inspection by EPA in 1997 (and an EPA Approval Memorandum in 1998) lead to an Engineering Evaluation/Cost Analysis (EE/CA) conducted by Aerovox Inc. at the Aerovox Site which revealed extensive PCB contamination. The EE/CA recommended building demolition with onsite and offsite disposal of PCB-contaminated building debris, followed by capping (BBL, 1998).

An administrative order entered into between EPA and Aerovox Inc. in 1999 to conduct the building demolition and capping was not completed when Aerovox Inc. vacated the building and soon after filed for bankruptcy in 2001. A bankruptcy settlement in 2003 with Aerovox Inc. provided limited funds to address the Aerovox Site contamination. A Time Critical Removal Action was conducted by EPA in 2004 to remove barrels containing hazardous waste and to seal cracks in the existing cap. In April 2006, EPA issued a supplement to the 1998 EE/CA (SEE/CA).

In March 2006, EPA prepared a Conceptual Site Model which provided a summary of available information regarding PCB contamination present at the Aerovox Site (ENSR, 2006). Existing site data were reviewed, and a limited investigation was performed to provide additional information on storm water runoff from the Aerovox Site and groundwater beneath the Aerovox Site. The existing site data indicated that a significant mass of PCBs likely remained in the unsaturated and saturated soils beneath the building and immediate surrounding area both in the aqueous phase and as a separate dense non-aqueous phase liquid (DNAPL). However, the combined data provided a screening-level assessment of PCB transport in surface water runoff and groundwater discharge from the Aerovox Site to the adjacent waters of the Harbor Site that showed a very low potential for significant transport (ENSR, 2006). The assessment noted that deterioration of the building shell could increase the potential for mobilization and transport of PCBs.

On January 27, 2010 EPA issued an action memorandum for a Non-Time Critical Removal Action (NTCRA) to achieve a controlled demolition of the Aerovox Site facility, offsite disposal of waste material, capping and implementation of post-removal site control measures. On June 3, 2010, an Administrative Settlement Agreement and Order on Consent was entered into between EPA and AVX Corporation (AVX), which is the successor of Aerovox Corporation, for the Aerovox Site. Pursuant to the Settlement Agreement, AVX demolished the building and capped the Site. Demolition was completed in December 2011. The majority of the building debris was trucked off-site for TSCA disposal by the City of New Bedford through a Cooperative Agreement with EPA. The building's foundation was filled with compacted material and capped with asphalt. Except for a small strip on the western edge along Belleville Avenue, the existing asphalt cap was covered with new asphalt. The HAC cap covering the eastern portion of the Aerovox facility site was partially covered with asphalt and some cracks were sealed (Jacobs, 2012).

Also on June 3, 2010, an administrative settlement entered into, by, and between the Commonwealth of Massachusetts and AVX entitled Administrative Consent Order and Notice of Responsibility (ACO), involving the assessment and cleanup of the Aerovox Site pursuant to M.G.L. c. 21E and the regulations promulgated there under the Massachusetts Contingency Plan, 310 CMR 40.0000 (MCP). Through this ACO, the extent of contaminated soil and groundwater will be assessed, additional site cleanup and/or capping needs will be evaluated and conducted pursuant to the state cleanup program and long-term groundwater monitoring and cap maintenance will be performed to address source control and groundwater contamination. This work is scheduled to begin once EPA issues a Notice of Completion of Work for the NTCRA. In addition, there will be future groundwater monitoring requirements under TSCA.

1.3 TECHNICAL SOURCES OF INFORMATION USED IN THIS REPORT

The figures and interpretation contained in this technical memorandum were developed with data spanning multiple years and sources. The table below lists the sources and types of information each document served in the development of the figures for this report.

Document	Reference	Information	Relevant Figures in this Tech Memo
Alternative Remedial Responses	GHR 1983	Monitoring well and soil boring information	2-1, 2-4, 2-5, 2-6, 3-5, 3-6, 3-7
On-Site Containment	Gushue & Cummings 1984	Monitoring well and soil boring information	2-1, 2-4, 2-5, 2-6, 3-2, 3-5, 3-6, 3-7
1998 EE/CA	BBL 1998	Subsurface geology, soil logs and cross sections	2-1, 2-4, 2-5, 2-6, 3-5, 3-6, 3-7
Hot Spot Operable Unit Dredging Plan	USACE 1991	Pre-dredge sediment surface.	2-2, 2-3
Conceptual Site Model	ENSR 2006	Summary of previous actions	2-1
2006 Data Summary Report	Jacobs 2007	2006 Cross Sections and limits of dredging adjacent to the Aerovox shoreline	2-2, 2-3
Former Aerovox Property Photographic Record	Jacobs 2012	Sheet pile locations	2-2, 3-2
2012 Sediment Boring Report	WHG 2013	Subsurface geology, boring logs, analytical results	2-2, 2-3, 2-4, 2-5, 2-6, 2-7, 3-1, 3-2, 3-3, 3-4, 3-5, 3-6, 3-7, 3-8, 3-9

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2.0 SITE GEOLOGY

The Aerovox Site and the shoreline are located in southeastern Massachusetts, near the northern extremity of the Acushnet River estuary, upstream of Buzzards Bay, which opens into the Rhode Island Sound and the Atlantic Ocean. The regional geology is characterized by crystalline bedrock, eroded and contoured by Pleistocene glaciation into a series of low amplitude valleys and ridges. Glaciation is also responsible for the majority of the unconsolidated sediments overlying bedrock. These glacial deposits range from dense till to highly permeable outwash sand and gravel.

Geologic cross sections were devised from the existing boring information and are represented on Figure 2-1. Two north to south cross-sections (A-A' and B-B') representing the 2012 Aerovox shoreline investigation (WHG, 2013) are presented in Figures 2-2 and 2-3. Geologic boring logs from this investigation are presented in Appendix A. In addition, four east to west cross sections (C-C', D-D', E-E', and F-F') were developed by combining historic information (GHR 1983, Gushue and Cummings 1984, and BBL 1998) with the 2012 borings and are presented in Figures 2-4, 2-5, and 2-6.

Cross-sections A-A' and B-B' were developed from the shoreline boring activities completed in 2012 (WHG, 2013). However, additional information from two previous investigations was also added to the cross-sections. A blue line labeled "1991 Sediment Elevation" demarcates the sediment surface as it was mapped in 1991 (USACE, 1991). There is also a graphic that shows a black organic silt layer (OL) and an inorganic silty layer below to show the material to be dredged as mapped in 2006 (Jacobs, 2007). The results of the two previous investigations were included to illustrate how much sediment had been removed along cross-sections A-A' and B-B' from 1991 to the present.

In addition, cross-section A-A' also includes a representation of the current sheetpile wall configuration. Each vertical line represents every fifth sheetpile as they were surveyed along the Aerovox Site shoreline (Jacobs, 2012). The depth of each sheetpile is represented by a hatch mark at 9 feet below ground surface (bgs) and at 13 feet bgs to represent the estimated minimum and maximum depths these sheetpiles have been placed (Gushue and Cummings, 1984). A 9 or 13 feet bgs depth is assumed based on the reported lengths of the sheetpiles. The sheetpiles on Figure 2-2 are to provide a comparison between the inferred depths of the sheetpiles and the geologic unit in which they were placed.

The general geologic sequence in the Aerovox shoreline investigation begins with crystalline bedrock ranging from mafic gabbro to schist. Bedrock is clearly defined in all cross sections and generally ranges in elevation from approximately 7 ft to -35 feet national geodetic vertical datum 1929 (NGVD 29). The bedrock surface generally slopes from west to east with the higher elevations occurring near the Aerovox footprint and the lower elevations within the Harbor Site (Figures 2-4 through 2-6). Directly above bedrock lays either glacial till or glacial outwash. The glacial till is generally dense and gravelly with high contents of silt and clay with angular to subangular gravels. The till was formed by the movement of the glaciers along the Acushnet Valley where glacial flour and poorly sorted sediments were carried with the glacier's movement down the valley. The angular gravels were formed from the cryoplanation of the glacier bottom across the bare bedrock surface, "plucking" and incorporating the gravel into the matrix. The glacial till is observed primarily in the sediments of the harbor (Figures 2-2 and 2-3) and thins considerably to the west (Figures 2-4, 2-5, and 2-6). There is little evidence of the glacial till under the Aerovox Site, although this may be due to most borings not being advanced to bedrock.

Overlying the till and/or the bedrock is a relatively thick layer of glacial outwash. This feature consists of poorly sorted sands and rounded gravels with intermittent lenses of silts and clays. This unit was formed by the fluvial influence of retreating and melting glaciers. The volume of water moving down the valleys created a series of braided streams with intermittent glaciolacustrine deposits in proglacial lakes at the ice margins. These landforms may have been stable enough to support terrestrial vegetation for a period of time and, as a result, exhibits some characteristics of paleosol development including the presence of oxidized horizons from a former terrestrial regime. This outwash is present in all cross-sections and ranges in thickness from 10 to 25 feet with the thicker deposits found in the harbor (Figures 2-2 and 2-3) gradually thinning to the west (Figures 2-4, 2-5, and 2-6).

Above the glacial outwash is an intermittent deposit of peat. This deposit consists of plant fibers, preserved in the sediment due to reducing conditions and represents the transition from a terrestrial to an aquatic environment. This occurred after the glacial retreat and the subsequent sea level rise from the Pleistocene through the Holocene. The presence of the peat layer is intermittent in the harbor (Figures 2-2, 2-3, and 2-7) and thickens to the west (Figures 2-4, 2-5, and 2-6). The peat thickness on the Aerovox Site is intermittent ranging from 0 feet in the west to 5 feet farther east.

The overlying post-glacial marine deposits are found in the upper sections of the landscape, particularly in the Harbor Site. The thickness of this unit ranges from 30 feet in the harbor (A-A' in Figure 2-2) and thins to the west to about 2 feet. The unit is continuous in the east and discontinuous in the west (Figures 2-4 and 2-5). These deposits are characterized by silts, sands, and clays that were placed as a result of an inundated marine environment. The sediments are better sorted than the glacial outwash and generally exhibit morphology conducive to deposition in a reducing environment (gray colors, sulfide odors). There are two main components of the marine deposits that have been characterized in the harbor. The upper organic silt unit is generally black in color, loose in consistency (sometimes described as "black mayonnaise"), with petroleum odor. Studies have shown that most of the PCB contamination in the harbor is restricted to this upper sediment subunit (Morris et al., 2011). Below the organic silt is a dark gray silty clay to silty sand that is firmer in consistence and has a sulfur odor. The concentration of PCBs generally decline precipitously from the upper organic silt to the lower silty clay and silty sand. This unit overlies the peat or the glacial outwash where the peat is discontinuous.

There is a unit identified as fill found primarily in the vicinity of the Aerovox Site with thin, discontinuous deposits found in the Harbor Site. This fill consists of poorly sorted gravels, sands, silts, and clays. The fill material generally contains pieces of building materials such as broken bricks and tiles. It also commonly has darkened matrices due to coal tar or petroleum. It is distinguished from the underlying marine and outwash deposits due to its poor sorting as well as the presence of man-made materials.

The geology of the Harbor Site represents a dynamic landscape progression due to the glacial and subsequent interglacial processes. The advance and retreat of the glaciers in the area of New Bedford Harbor scoured the valleys and deposited poorly sorted till above the scoured bedrock surface. As the glaciers retreated, meltwater from the glaciers moved through the valley depositing thick lenses of poorly sorted sands and gravels with some glaciolacustrine deposits in the proglacial portions of the ice margin. As water levels began to rise, this terrestrial environment converted to a subaquatic regime with invasion by aquatic near-shore vegetation producing peat. As the water levels continued to rise, the peat was buried by marine deposits in the harbor. The extent of these marine deposits was determined by the eventual level of seawater in the harbor reflecting current landscape conditions. Some of the deposits have been historically modified by placement of buildings and structures around the Aerovox Site as well as the removal of sediments by active dredging in the Harbor Site.

3.0 DISTRIBUTION OF CONTAMINANTS

The extent of the contaminants on the Aerovox Site and in the Harbor Site is presented in the following sections. Cross-sections incorporating both the 2012 shoreline investigation and historic soils data from previous Aerovox investigations were used to develop an understanding of the nature and extent of the contamination in this area based on this data. Further investigation on the Aerovox Site may be necessary for a fuller characterization of that Site and its potential impact, if any, on the Harbor Site. This section is divided into separate presentations of PCBs and VOCs. Details on the sampling and analytical methodologies can be found in the investigation report (WHG, 2013).

Samples were collected differently between those from the Aerovox Site (GHR, 1983; BBL, 1998) versus those collected from the Harbor Site (WHG, 2013). Aerovox Site data were collected from monitoring wells, test borings, and soil borings executed using a hollow stem auger and sampled and/or described using a split spoon (GHR, 1983; BBL, 1998). Sediment cores from the Harbor Site during 2012 were collected using a barge-mounted mini-sonic rig and samples collected with Lexan liners (WHG, 2013). All Harbor Site borings were completed to bedrock, whereas the Aerovox Site borings were infrequently drilled to bedrock and generally were terminated within the fill material.

3.1 PCBs

PCB concentrations from the 2012 borings are presented as totals detected in samples from the borings based on a sum of the following Aroclors:

Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260

Aroclor 1262

Aroclor 1268

The highest concentrations of PCBs are found along the A-A' transect from the 2012 Aerovox shoreline investigation (WHG 2013). This cross-section is oriented north to south and parallels the shoreline with all borings located within 40 feet of the defined shoreline (Figure 2-1). Parts of this area have been previously dredged for mass removal as recently as 2008, with the exception of the southern portion (ASB-7) which was dredged in 2011. Based on comparison to 1991 elevations, up to 6 feet of material has been removed in some areas since active dredging began (Figure 2-2). The orientation of cross-section A-A' reflects a groundwater flow path that generally runs perpendicular to and into the page indicating a flow from west to east. The highest PCB concentrations are found in borings ASB-1 and ASB-3 (Figures 3-1 and 3-2). The location of the two main concentration centers (borings ASB-1 and ASB-3) align with the two drainage swales or trenches that paralleled the north and south sides of the former Aerovox building east to the harbor (Figure 2-1).

Another area of elevated PCBs is found in boring ASB-5 and is aligned with a storm water outfall from the parking area to the harbor. Boring ASB-1 has the highest concentration of PCBs (8,350 milligrams per kilogram [mg/kg]) on the A-A' cross-section. This contamination was found 4.0 feet below the sediment surface in the outwash deposits and below the organic silts (Figure 3-2). In boring ASB-1, contamination greater than 1 mg/kg is found as deep as 16.7 feet below the surface (4.85 mg/kg), also in the glacial outwash. Concentrations fall below 1 mg/kg in the underlying glacial till.

The highest concentrations of PCBs in boring ASB-3 are found primarily in the organic silt layer (2,030 and 3,580 mg/kg), but elevated concentrations also extend below the organic layer into the lower marine and outwash deposits (Figure 3-2). Concentrations greater than 1 mg/kg are found as deep as 9.0 feet below the sediment surface and are located well below the estimated bottom of the sheetpile wall (Figure 3-2). In contrast, the elevated concentrations (163 mg/kg) in boring ASB-5 are restricted to the organic silt and are well below 1 mg/kg with depth. In the remaining A-A' sediment borings, all of the concentrations are less than 10 mg/kg, but concentrations greater than 1 mg/kg are generally confined to the organic silt (Figures 3-1 and 3-2). One notable exception is a concentration of 7.85 mg/kg in the peat layer in boring ASB-7.

Cross-section B-B' is located approximately 50 to 100 feet east of cross-section A-A' (Figure 2-1). As in A-A', the general groundwater flow in B-B' is believed to be perpendicular to the page, with some influence on hydrology from the southward trending Acushnet River valley. The sediments along B-B' have been dredged previously, and up to 6 feet of sediment has been removed since 1991 (Figure 2-3). The sediment samples analyzed from boring ASB-8 had considerably elevated concentrations of PCBs. Boring ASB-8 is on a similar flow path as boring ASB-1 in cross-section A-A'. Concentrations of PCBs in boring ASB-8 are as high as 3,280 mg/kg, and concentrations greater than 100 mg/kg were found as deep as 17 feet below the harbor bottom sediment surface at the time of drilling (Figure 3-3). No organic silt deposit was found in boring ASB-8, and the contamination is found in the lower marine and glacial outwash deposits (Figure 3-4). There is no case where PCB concentrations exceed 1 mg/kg in the glacial till or sediment overlying bedrock (Figure 3-3). For the remaining sediment borings in cross-section B-B', the PCB concentrations are much lower than in boring ASB-8. Boring ASB-11 has no concentrations above 1 mg/kg, and boring ASB-9 has one concentration of 1.05 mg/kg in the organic silt layer (Figure 3-4). Boring ASB-10 has a concentration of 59 mg/kg in the black organic silt layer and a concentration of 2.25 mg/kg in the marine deposits below (Figure 3-4). All remaining PCB concentrations in this cross-section are below 1 mg/kg. Results for seven of the twelve 2012 nearshore borings along the Aerovox Site show that PCB concentrations in sediment down to bedrock are below the OU1 ROD subtidal cleanup level of 10 ppm for Upper Harbor mudflats and subtidal areas (Figures 3-3 and 3-4).

Cross-section C-C' is a west-east cross-section south of the former Aerovox building that represents a contaminant transport pathway along the drainage swale from the south side of the location of the former Aerovox building into the harbor (Figure 1-2). Historically the drainage swale was described as unlined (Versar, 1981). The cross-section begins at monitoring well MW-4B and includes several soil borings from 1998 and two test borings from 1983. It extends through boring ASB-3 and boring ASB-9 in the harbor. The PCBs on the Aerovox Site show two major areas of soil contamination (Figure 3-5). The concentrations found farthest west are from borings SB-4 and SB-5, located on each side of the loading bay of the former Aerovox building (Figure 1-2). Both of these samples were found in the fill material near the building with a maximum concentration of 178 mg/kg (Figures 2-4 and 3-5). A second major area of contamination is found in boring SB-7 with a maximum concentration of 2,900 mg/kg, and is found within the peat below the fill. Three samples collected in the fill material range from 120 to 790 mg/kg in borings SB-7 and MW-3. All remaining samples in the peat and fill are less than 1 mg/kg.

Cross-section D-D' characterizes the southern portion of the Aerovox Site (Figure 2-1). The cross-section begins at MW-4B and includes several soil borings from 1998 and one test boring from 1983. It extends through boring ASB-5 and boring ASB-10 in the harbor (Figure 2-1). All of the Aerovox Site soil sample locations are found within the fill material, and all but one sample exceed 1 mg/kg (Figure 3-6). The maximum concentration along this transect line is 310 mg/kg in boring SB-14 with a concentration of 100 mg/kg located upslope in boring SB-13. It is noted that a storm sewer outfall is located on the shoreline in proximity to boring ASB-5.

Cross Section E-E' traverses west to east along the northern side of the former Aerovox building, parallel to the former plant's northern drainage trench (Figure 2-1). The cross section begins at MW-6 and runs through three test borings and one monitoring well from 1983. The cross section continues into the harbor through ASB-1 and ASB-8 (Figure 3-7). On the Aerovox Site, the highest historical concentration of PCBs along this transect was found during the installation of monitoring well MW-4 with 72 mg/kg in the fill. An additional sample containing 23 mg/kg was found in the fill during the installation of monitoring well MW-6 to a depth of 4 feet and extends to the outwash at MW-4 with a similar concentration of 23 mg/kg. Higher concentrations of PCBs were found in the harbor borings with 8,350 mg/kg in boring ASB-1 and 3,790 mg/kg in boring ASB-8.

Cross-section F-F' traverses west to east between cross-sections C-C' and E-E' (Figure 2-1). The cross-section runs from sheetpile location 25 through boring ASB-2 and boring ASB-11, described in previous cross-sections (Figures 3-1 and 3-3). Cross-section F-F' shows a typical marine over glacial outwash over glacial till over bedrock sequence typically found in the dredged areas of the harbor. PCBs in the cross-section are restricted to one sample in boring ASB-2 with a concentration of 2.74 mg/kg in the black organic silt (Figure 3-2). No other sample in this cross-section exceeded a 1 mg/kg concentration.

3.2 VOCs

Total chlorinated VOCs were determined using a sum of volatile organic compounds detected in samples from the borings. Those compounds included:

Chlorobenzene
1,1-Dichloroethene (1,1-DCE)
trans-1,2-Dichloroethene (tr-1,2-DCE)
cis-1,2-Dichloroethene (cis-1,2-DCE)
1,4-Dichlorobenzene (1,4-DCB)
1,3-Dichlorobenzene (1,3-DCB)
1,2-Dichlorobenzene (1,2-DCB)
1,2,4-Trichlorobenzene (1,2,4-TCB)
1,2,3-Trichlorobenzene (1,2,3-TCB)
Trichloroethene (TCE)
Tetrachloroethene (PCE)
Vinyl chloride (VC)

Given that the majority of the historical VOC data for upland locations on the Aerovox Site were obtained from samples collected from unsaturated soils, they were not considered comparable with the saturated sediment samples; therefore, only the 2012 boring cross-sections A-A' and B-B' incorporate VOC data. The soil samples from the Aerovox Site represent the vadose zone above the groundwater table that is exposed to the atmosphere and where VOCs can more easily volatilize into the atmosphere. VOCs in the harbor sediments have a more difficult pathway to the atmosphere and tend to be more recalcitrant in saturated sediment as the exposure to the atmosphere is limited. Also, no known samples were collected on shore at a depth greater than 10 feet below the surface, so deeper contamination remains uncharacterized.

Cross-section A-A' contains borings with the highest concentrations of VOCs of all of the cross-sections from the 2012 near-shore boring program (Figure 2-1). Boring ASB-3 has the highest concentrations of any boring with a maximum total concentration of 27,700 mg/kg (Figure 3-8). All of the concentrations greater than 1,000 mg/kg were located in the black organic silt of boring ASB-2 and boring ASB-3 (Figures 3-2 and Figure 3-8). Concentrations greater than 10 mg/kg are found in borings ASB-1, ASB-2, ASB-12, ASB-3, ASB-4, and ASB-6 with the deepest located approximately at 9 feet below the sediment surface in ASB-3 (Figure 3-8). The elevated VOC concentrations in boring ASB-3 are coincident with the highest PCB concentrations in cross-section A-A' (Figure 3-1). However, the overall distribution of VOC concentrations varied from that of the PCBs along A-A', with elevated VOCs found in the upper portions of boring ASB-2 and ASB-12. In addition, lower concentrations of VOCs (consisting almost entirely of TCE) were also found in the deeper glacial outwash and till samples of several borings (Figure 3-8).

Similar to cross-section A-A', the highest VOC concentrations along cross-section B-B' were coincident with the highest PCB concentrations with a maximum VOC concentration of 1,550 mg/kg found in boring ASB-8 at a depth of 7.5 feet below the sediment surface (Figure 3-9). Also similar to cross-section A-A', the overall distribution of VOC concentrations varied somewhat from that of PCBs along B-B' (Figure 3-9). VOC were still detected in the deeper portions of the borings along B-B', but total concentrations were below 1 mg/kg.

4.0 SUMMARY

The percentage level VOC concentrations and near percentage level PCB concentrations detected in some of the nearshore borings indicate residual contamination likely exists as a separate DNAPL phase within the shallow river system. This level of contamination was not unexpected given the operational history of the Aerovox Site and previous sampling EPA performed during and after dredging in this area of the Harbor Site. Potential transport mechanisms that could have resulted in this contaminant distribution beyond the Aerovox Site boundary include: (1) direct release of separate phase product from the plant's two drainage trenches to the shoreline during the operation of the Aerovox Site; (2) release/transport of separate phase product into the subsurface stormwater drainage system with release to underlying soils and subsequent discharge to the harbor; (3) migration of separate phase product from the Aerovox Site prior to the installation of the sheetpile containment wall; and (4) migration of separate phase product that occurred after installation of the sheetpile wall, with transport beneath the wall or through gaps within the wall. In some instances, the PCBs and VOCs are expected to be co-located as it has been reported that TCE was used as a degreaser in the manufacturing process at the Aerovox Site (Versar, 1981).

As part of the Massachusetts c. 21E assessment and response action at the Aerovox Site, which will be undertaken by AVX through an Administrative Consent Order (ACO) with the Massachusetts Department of Environmental Protection (MassDEP), the nature and extent of contamination at the Aerovox Site will be investigated and addressed, including any offsite migration of contaminants that may be occurring.

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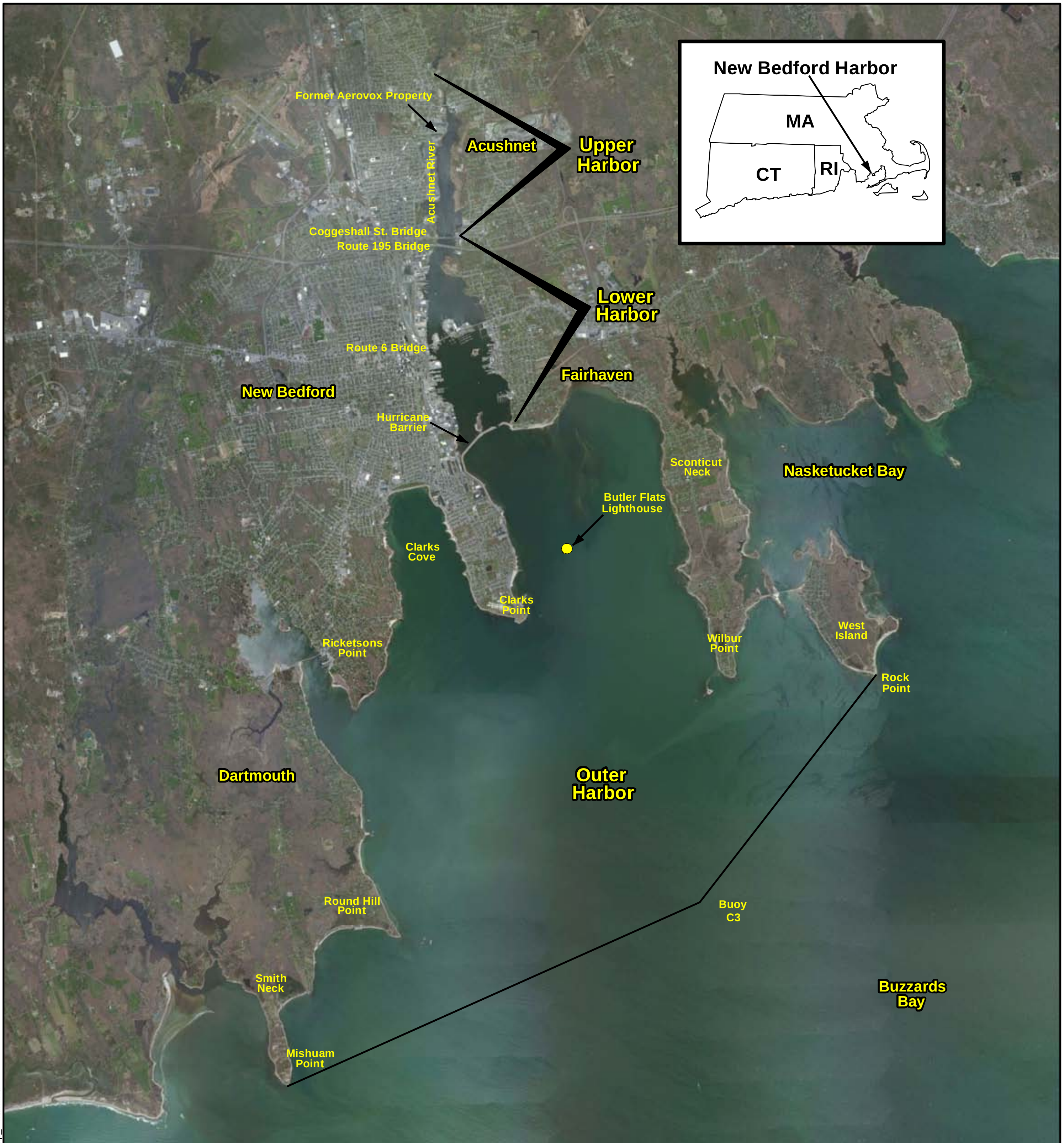
FIGURES



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Basemap Reference: © 2009 Bing Maps Aerial

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Site Location Map

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 2/26/2013

Figure 1-1

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Aerial Photography MASSGIS 2009

JACOBS

Upper Harbor Showing Former Aerovox Property Location

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 2/26/2013

Figure 1-2

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Legend

△	Aerovox Sheetpile Location
⊕	1982 Monitoring Well
⊙	2012 Boring Location
⊙	1998 Boring Location
⊙	1983 Test Boring Location
A ↔ A'	North/South Cross Section Location
D ↔ D'	West/East Cross Section Location
	Areas Dredged Through 2012

Aerial Photography MASSGIS 2009

Note: Transparent cross sections shown are from the 2006 Dredge Season Data Submittal.

N

0 30 60 Feet

1:720

JACOBS

Lines of Cross-Section

New Bedford Harbor Superfund Site

NAME: jpiccuito Date: 2/26/2013

Figure 2-1

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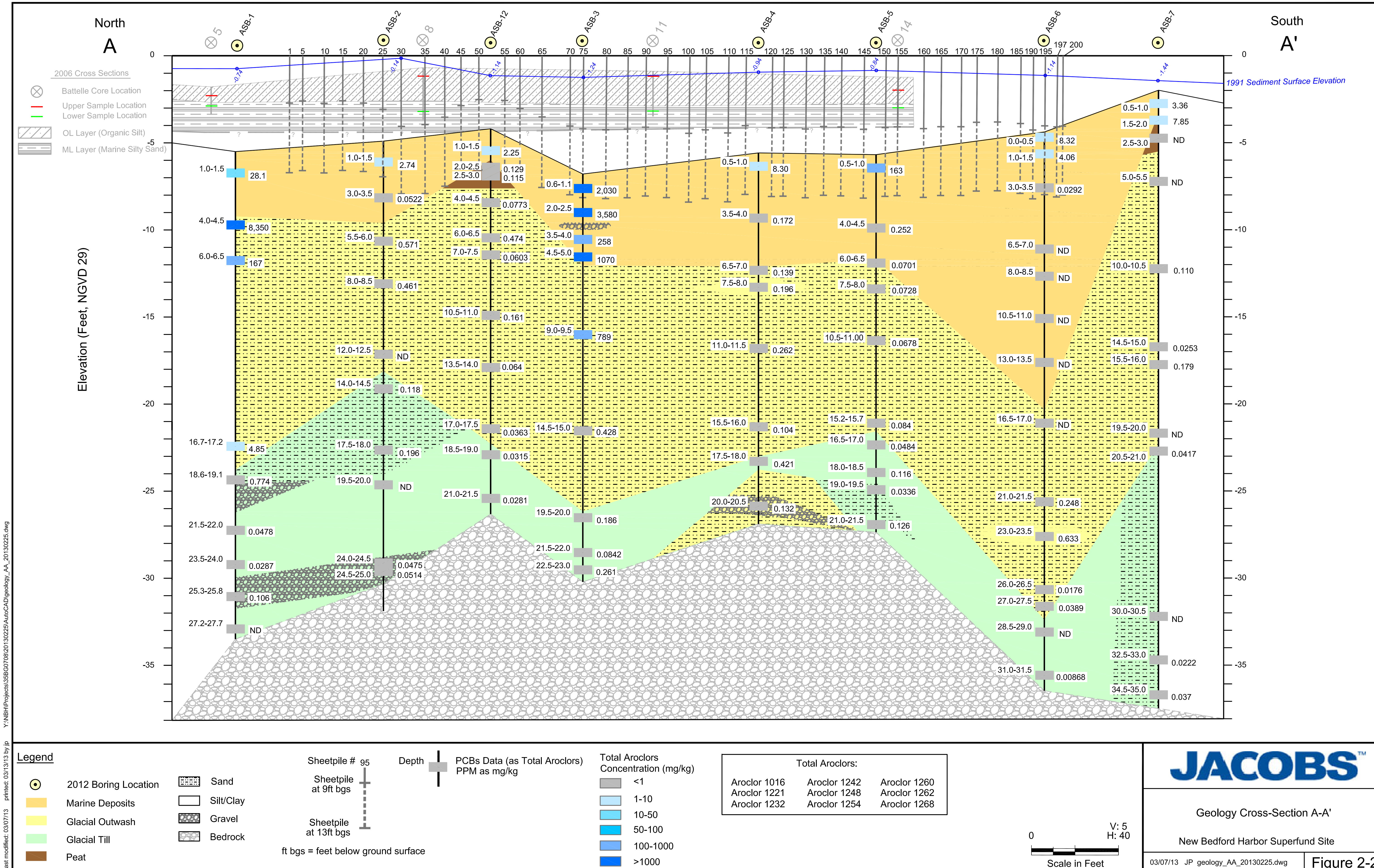

North
A
South
A'
ASB-1
ASB-2
ASB-12
ASB-3
ASB-4
ASB-5
ASB-6
ASB-7
1991 Sediment Surface Elevation
2006 Cross Sections
Battelle Core Location
Upper Sample Location
Lower Sample Location
OL Layer (Organic Silt)
ML Layer (Marine Silty Sand)
Elevation (Feet, NGVD 29)
Legend
2012 Boring Location
Marine Deposits
Glacial Outwash
Glacial Till
Peat
Sand
Silt/Clay
Gravel
Bedrock
Sheetpile # 95
Sheetpile at 9ft bgs
Sheetpile at 13ft bgs
ft bgs = feet below ground surface
Depth
PCBs Data (as Total Aroclors) PPM as mg/kg
Total Aroclors Concentration (mg/kg)
<1
1-10
10-50
50-100
100-1000
>1000
Total Aroclors:
Aroclor 1016
Aroclor 1221
Aroclor 1232
Aroclor 1242
Aroclor 1248
Aroclor 1254
Aroclor 1260
Aroclor 1262
Aroclor 1268
V: 5
H: 40
Scale in Feet
JACOBS
Geology Cross-Section A-A'
New Bedford Harbor Superfund Site
03/07/13 JP geology_AA_20130225.dwg
Figure 2-2
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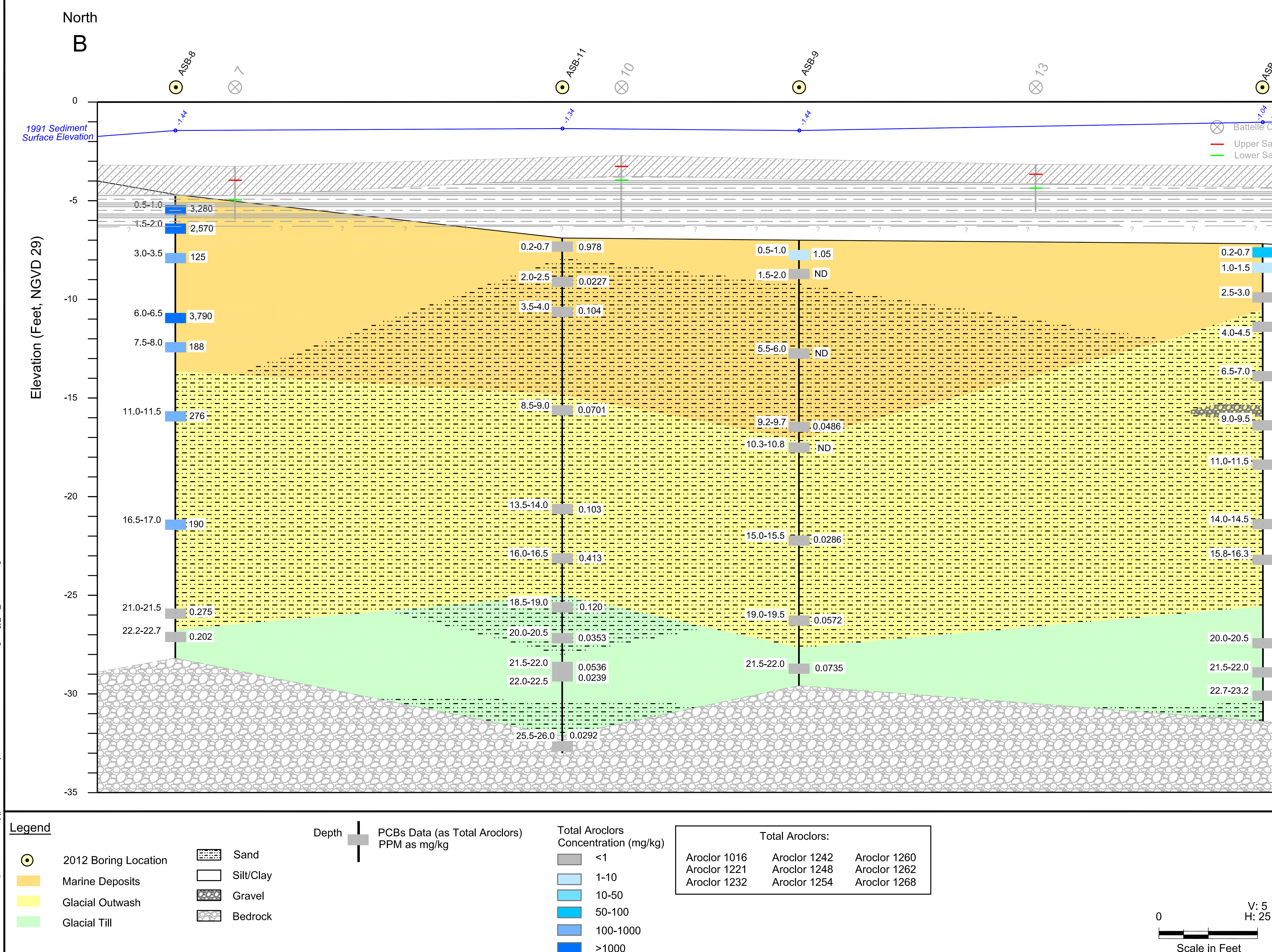

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Geology Cross-Section B-B'

New Bedford Harbor Superfund Site

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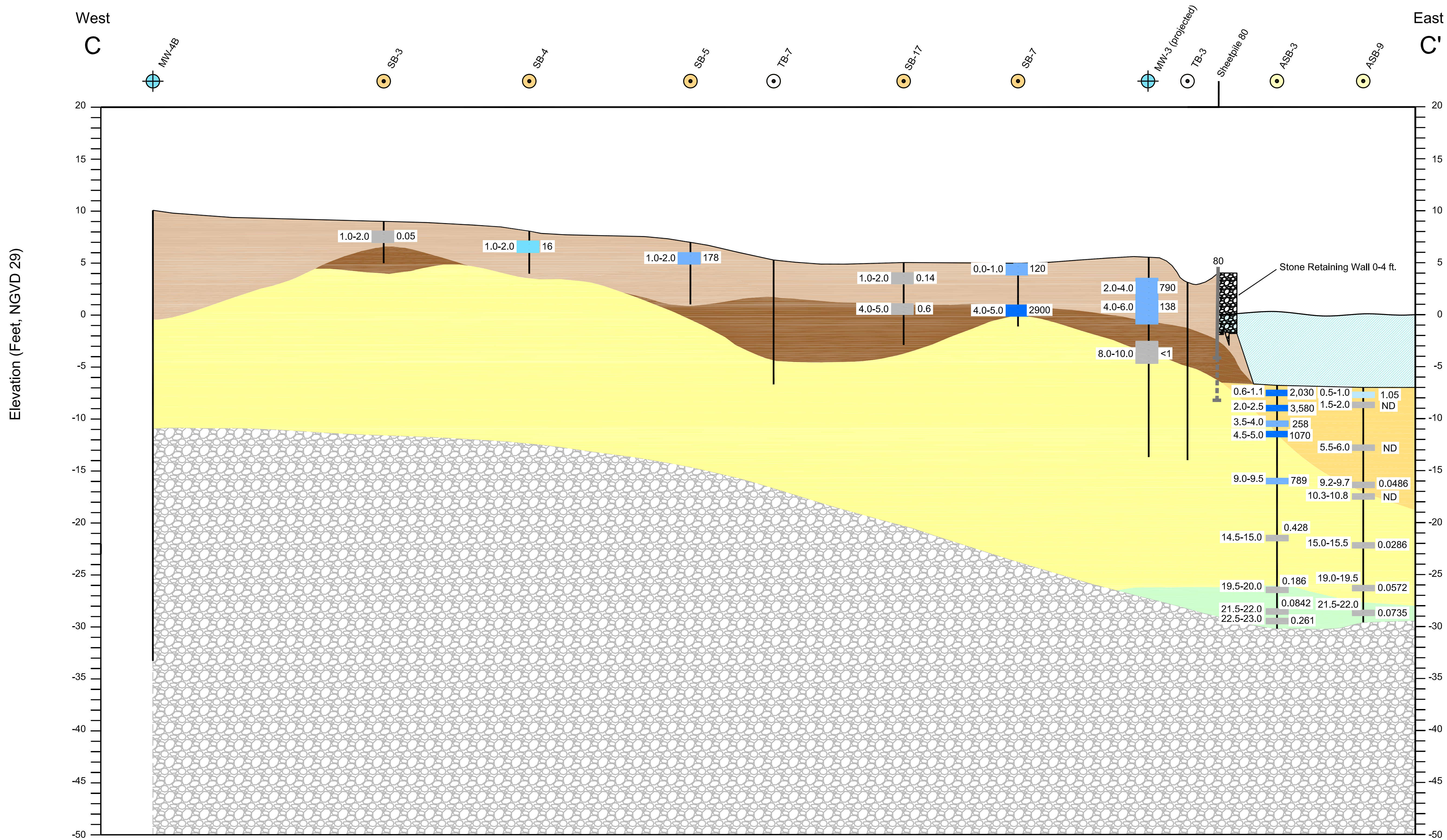
Figure 2-3



Legend

1982 Monitoring Well	Harbor Water
2012 Boring Location	Marine Deposits
1998 Boring Location	Glacial Outwash
1983 Test Boring Location	Glacial Till
	Peat
	Fill
	Bedrock

Sheetpile # 95

Sheetpile at 9ft bgs

Sheetpile at 13ft bgs

ft bgs = feet below ground surface

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- <1
- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*Geology on the Aerovox Site is inferred from historic soil borings.

0 — V: 10 H: 80

Scale in Feet

JACOBS™

Geology Cross-Section C-C'*

New Bedford Harbor Superfund Site

03/11/13 JP geology_CC_20130225.dwg

Figure 2-4

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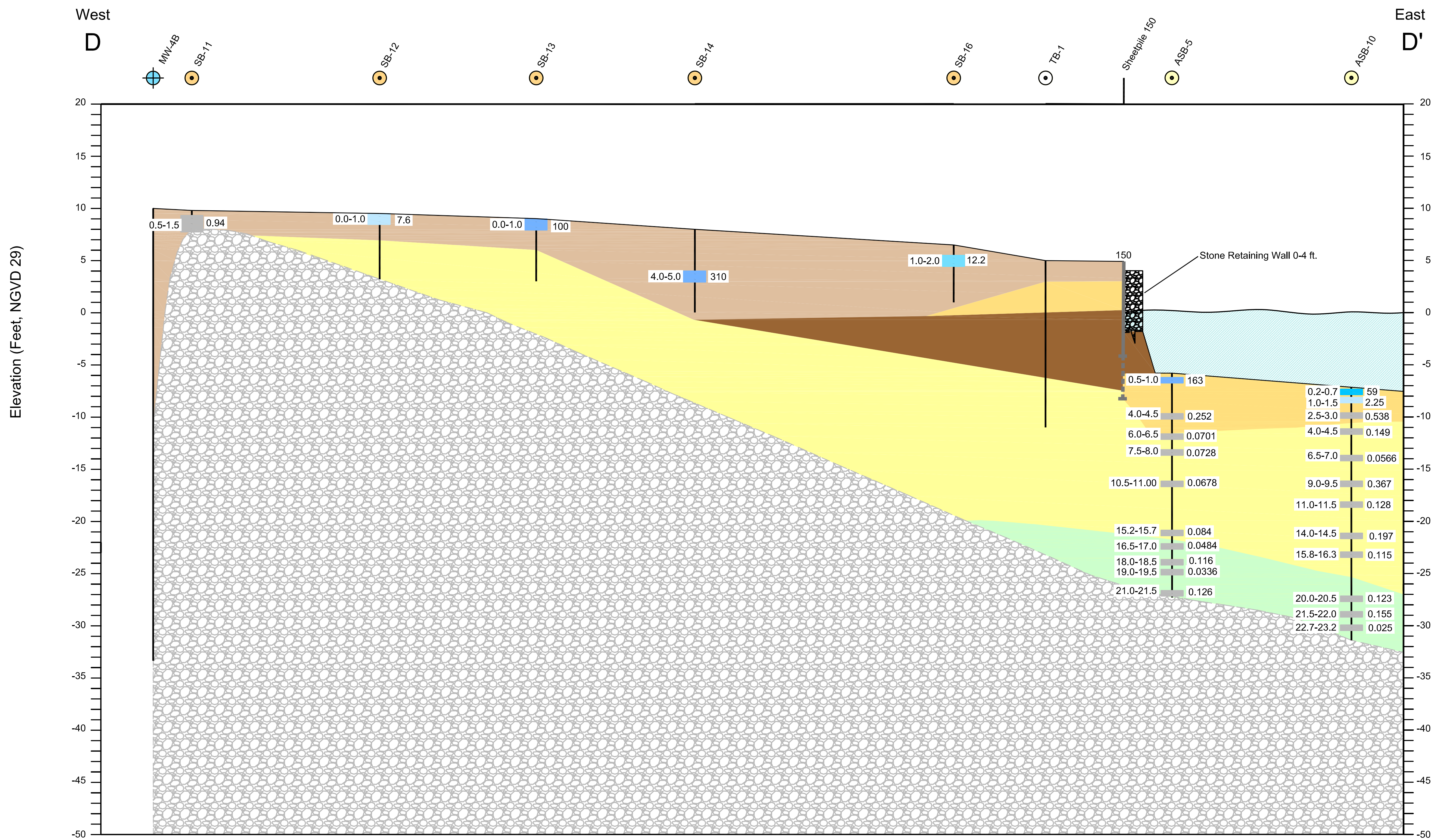

Legend

- 1982 Monitoring Well
- 2012 Boring Location
- 1998 Boring Location
- 1983 Test Boring Location

- Harbor Water
- Marine Deposits
- Glacial Outwash
- Glacial Till
- Peat
- Fill
- Bedrock

Sheetpile # 95
Sheetpile at 9ft bgs
Sheetpile at 13ft bgs
ft bgs = feet below ground surface

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)
- <1
- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*Geology on the Aerovox Site is inferred from historic soil borings.

0 — Scale in Feet — V: 10 H: 80

JACOBS™

Geology Cross-Section D-D'*

New Bedford Harbor Superfund Site

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Figure 2-5

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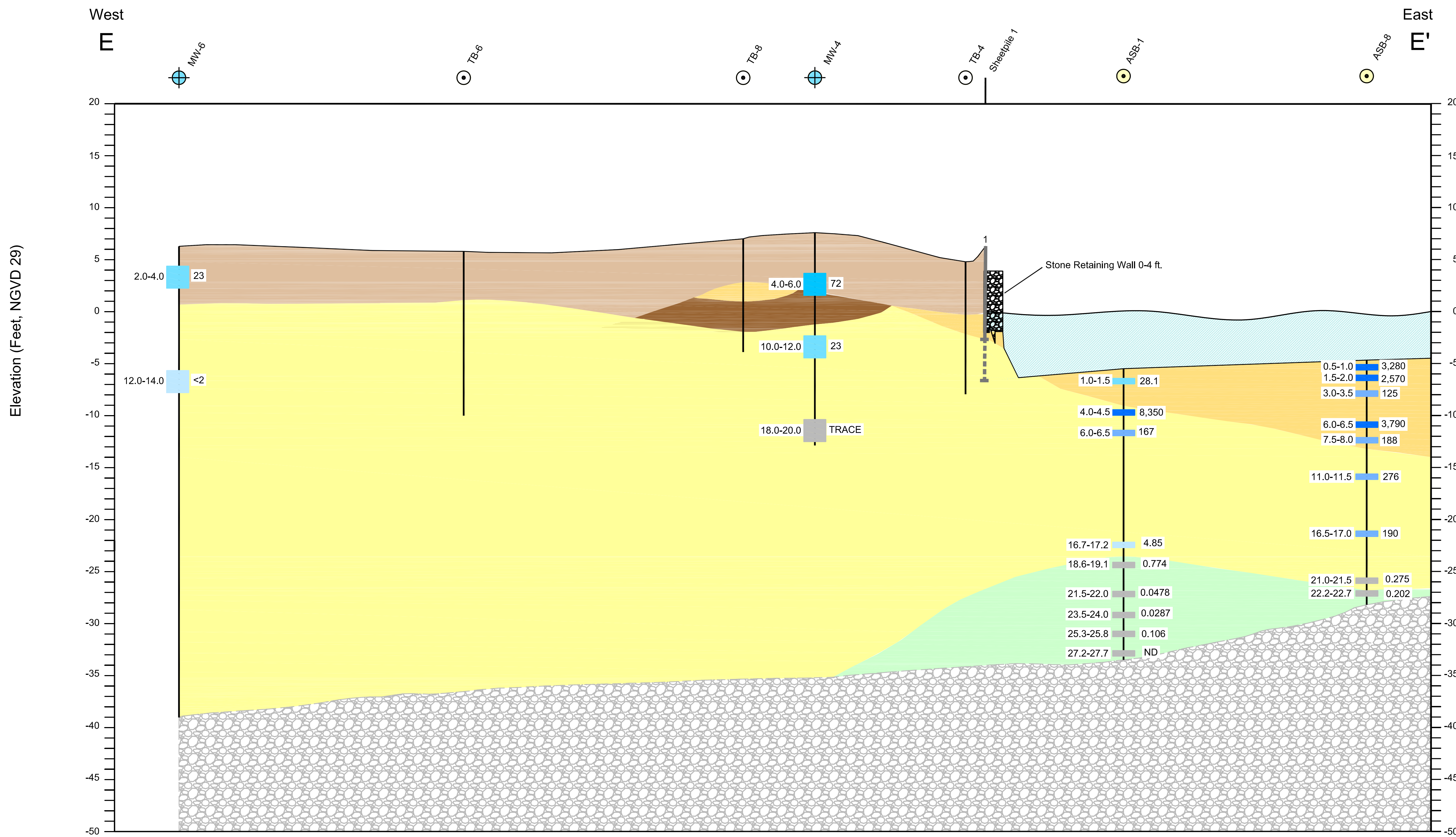

Legend

- 1982 Monitoring Well
- 2012 Boring Location
- 1983 Test Boring Location

- Harbor Water
- Marine Deposits
- Glacial Outwash
- Glacial Till
- Peat
- Fill
- Bedrock

Sheetpile # 95

Sheetpile at 9ft bgs

Sheetpile at 13ft bgs

ft bgs = feet below ground surface

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- <1
- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*Geology on the Aerovox Site is inferred from historic soil borings.

0 — Scale in Feet — V: 10 H: 40

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Geology Cross-Section E-E'*

New Bedford Harbor Superfund Site

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Figure 2-6

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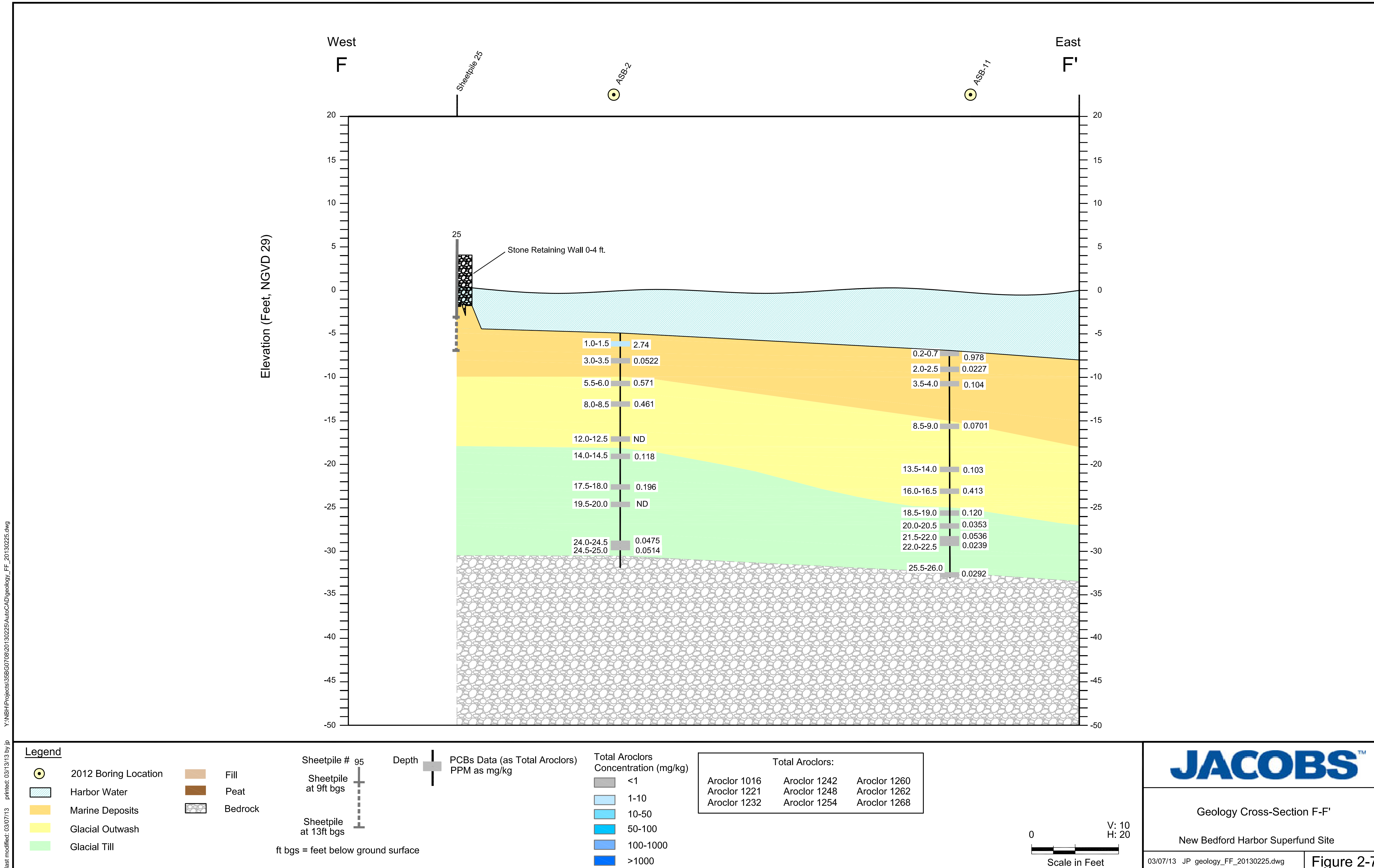
West
F
East
F'
Sheetpile 25
ASB-2
ASB-11
Elevation (Feet, NGVD 29)
Stone Retaining Wall 0-4 ft.
25
1.0-1.5 2.74
3.0-3.5 0.0522
5.5-6.0 0.571
8.0-8.5 0.461
12.0-12.5 ND
14.0-14.5 0.118
17.5-18.0 0.196
19.5-20.0 ND
24.0-24.5 0.0475
24.5-25.0 0.0514
0.2-0.7 0.978
2.0-2.5 0.0227
3.5-4.0 0.104
8.5-9.0 0.0701
13.5-14.0 0.103
16.0-16.5 0.413
18.5-19.0 0.120
20.0-20.5 0.0353
21.5-22.0 0.0536
22.0-22.5 0.0239
25.5-26.0 0.0292
Legend
2012 Boring Location
Harbor Water
Marine Deposits
Glacial Outwash
Glacial Till
Fill
Peat
Bedrock
Sheetpile # 95
Sheetpile at 9ft bgs
Sheetpile at 13ft bgs
ft bgs = feet below ground surface
Depth
PCBs Data (as Total Aroclors) PPM as mg/kg
Total Aroclors Concentration (mg/kg)
<1
1-10
10-50
50-100
100-1000
>1000
Total Aroclors:
Aroclor 1016 Aroclor 1242 Aroclor 1260
Aroclor 1221 Aroclor 1248 Aroclor 1262
Aroclor 1232 Aroclor 1254 Aroclor 1268
V: 10
H: 20
0
Scale in Feet
JACOBS
Geology Cross-Section F-F'
New Bedford Harbor Superfund Site
03/07/13 JP geology_FF_20130225.dwg
Figure 2-7
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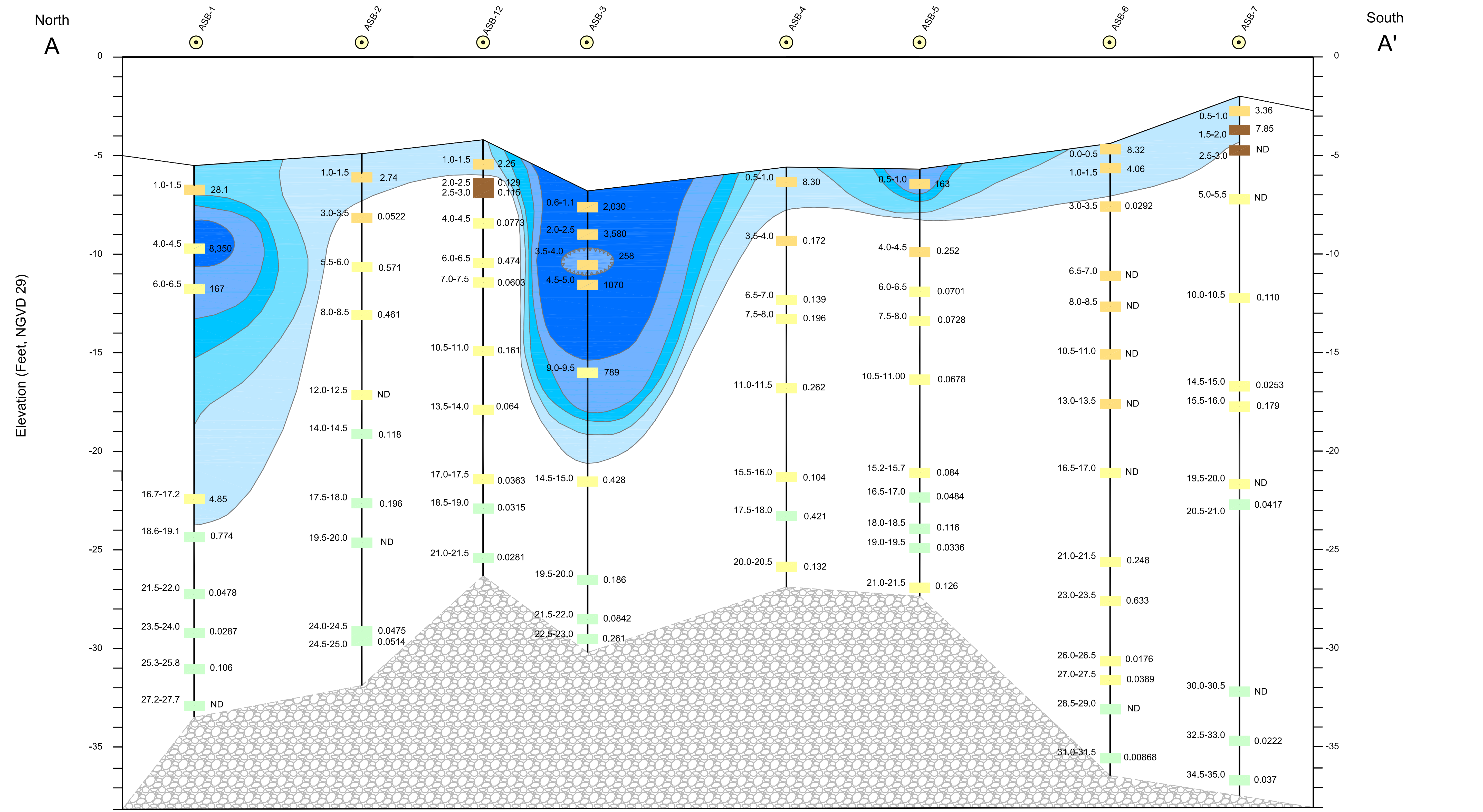


Legend

- 2012 Boring Location
- Marine Sample Location
- Peat Sample Location
- Glacial Outwash Sample Location
- Glacial Till Sample Location
- Bedrock

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

0 — Scale in Feet — V: 5 H: 40

JACOBS™

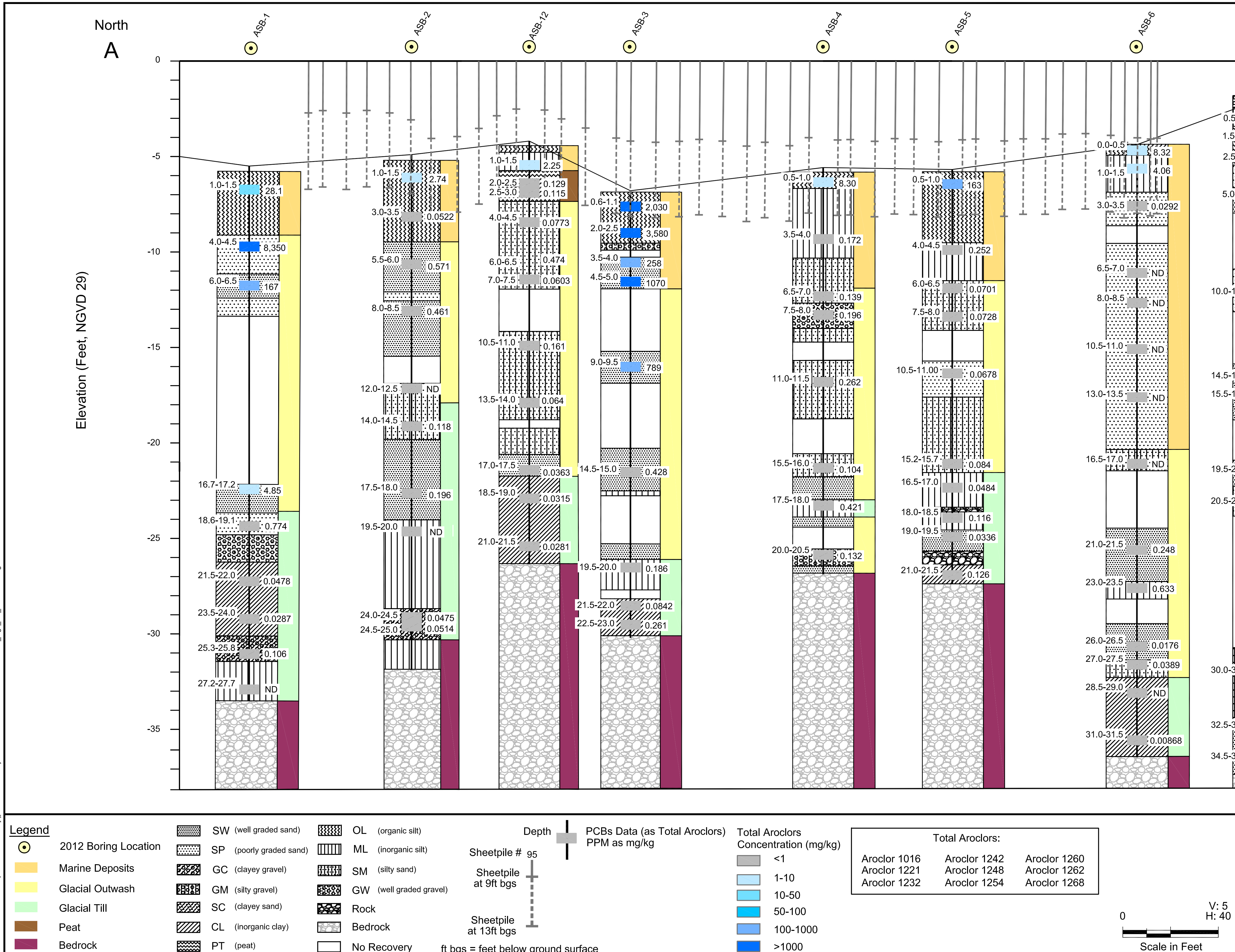
Cross-Section A-A' PCBs

New Bedford Harbor Superfund Site

03/07/13 JP PCBs_AA_20130225.dwg

Figure 3-1

Y:\NBH\Projects\35BG0708\20130225\AutoCAD\PCBs_AA_20130225.dwg
last modified: 03/07/13 printed: 03/13/13 by jp



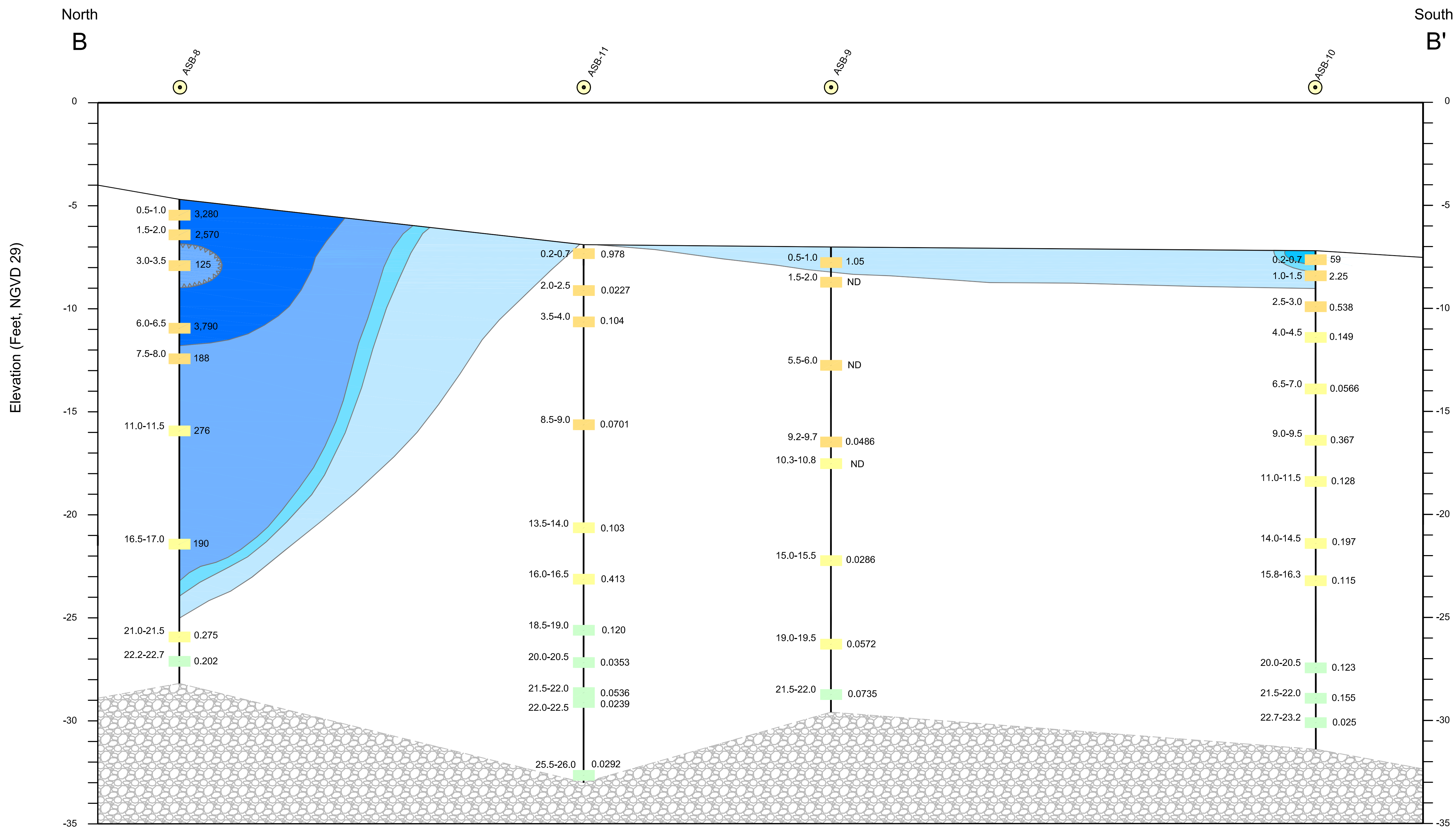
JACOBS™

Cross-Section A-A' Core Logs

New Bedford Harbor Superfund Site

03/07/13 JP core_logs_AA_20130225.dwg

Figure 3-2



Legend

- 2012 Boring Location
- Marine Sample Location
- Glacial Outwash Sample Location
- Glacial Till Sample Location
- Bedrock

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

0 V: 5 H: 25
Scale in Feet

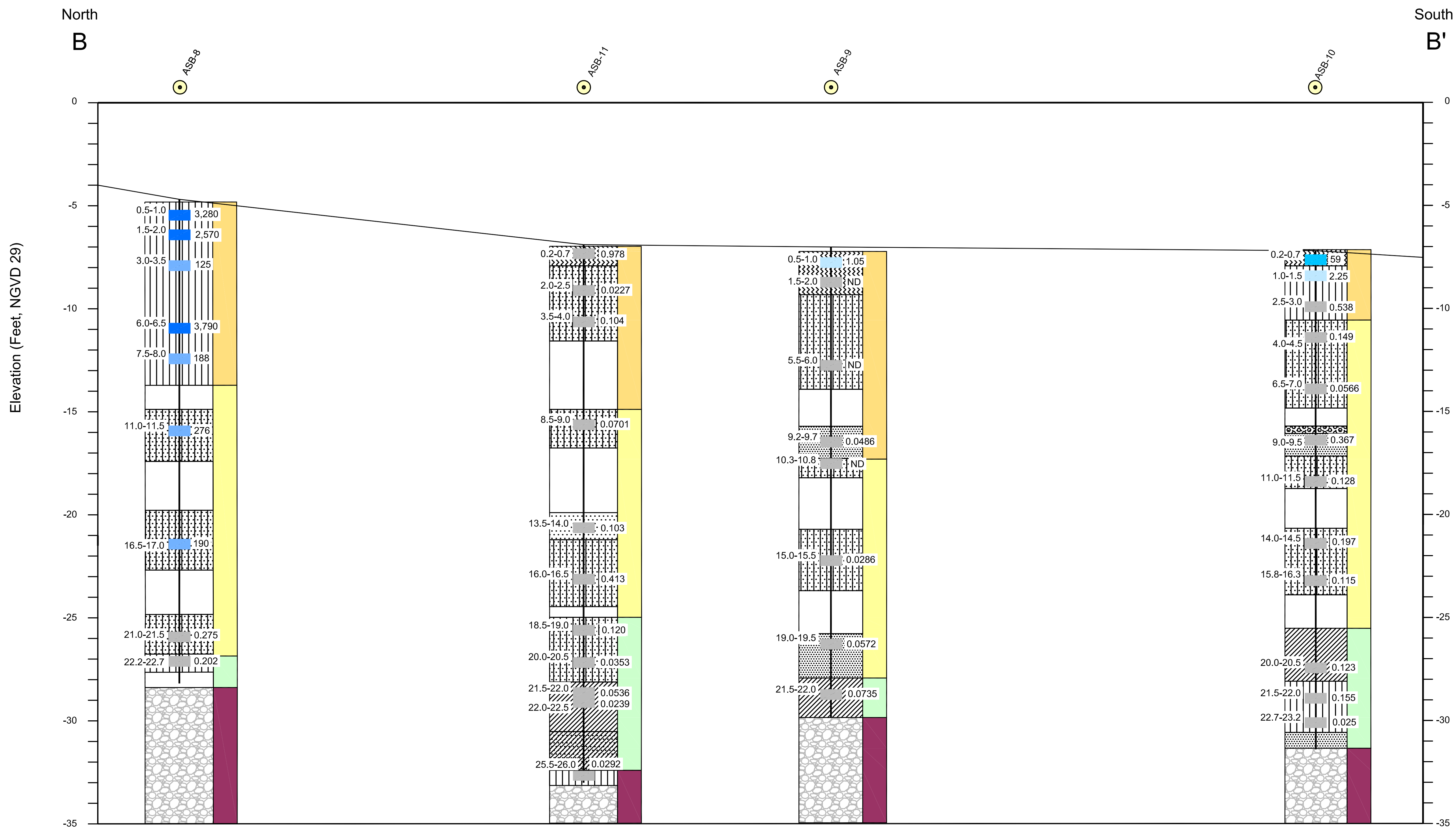
JACOBS™

Cross-Section B-B' PCBs

New Bedford Harbor Superfund Site

03/07/13 JP PCBs_BB_20130225.dwg

Figure 3-3



Y:\NBH\Projects\35BG0708\20130225\AutoCAD\core_logs_BB_20130225.dwg

last modified: 03/07/13 printed: 03/13/13 by jp

Legend

- 2012 Boring Location
- Marine Deposits
- Glacial Outwash
- Glacial Till
- Peat
- Bedrock

SW	(well graded sand)	OL	(organic silt)
SP	(poorly graded sand)	ML	(inorganic silt)
GC	(clayey gravel)	SM	(silty sand)
GM	(silty gravel)	GW	(well graded gravel)
SC	(clayey sand)	Rock	
CL	(inorganic clay)	Bedrock	
PT	(peat)	No Recovery	

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- <1
- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

0 V: 5 H: 25

Scale in Feet

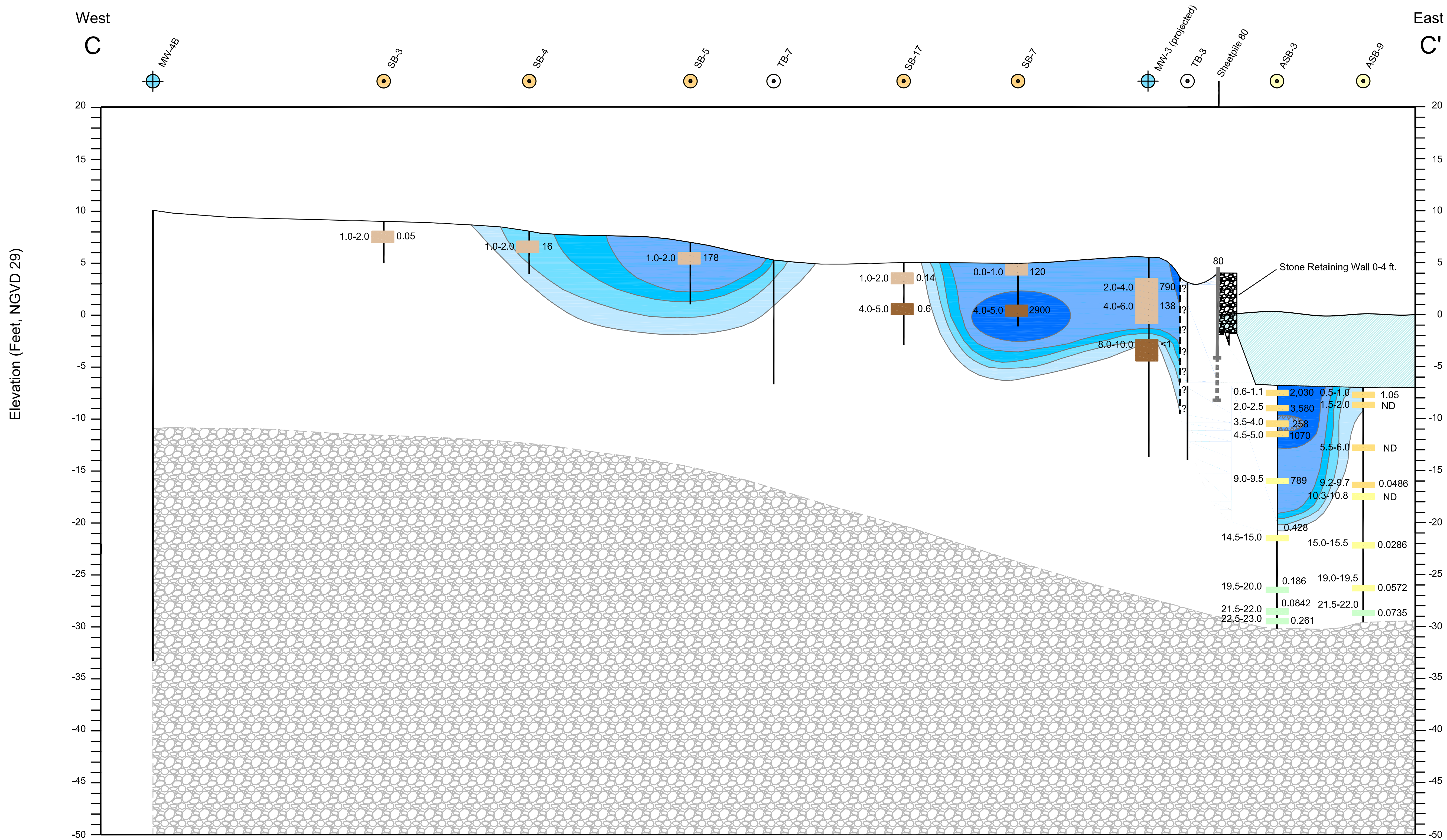
JACOBS™

Cross-Section B-B' Core Logs

New Bedford Harbor Superfund Site

03/07/13 JP core_logs_BB_20130225.dwg

Figure 3-4



Legend

1982 Monitoring Well	Harbor Water
2012 Boring Location	Marine Sample Location
1998 Boring Location	Glacial Outwash Sample Location
1983 Test Boring Location	Glacial Till Sample Location
	Peat Sample Location
	Fill Sample Location
	Bedrock

Sheetpile # 95
Sheetpile at 9ft bgs
Sheetpile at 13ft bgs
Depth
PCBs Data (as Total Aroclors) PPM as mg/kg
ft bgs = feet below ground surface

Total Aroclors Concentration (mg/kg)
- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*PCB contours on the Aerovox Site are inferred from historic soil data points.

0 — 80 Scale in Feet
V: 10
H: 80

JACOBS™

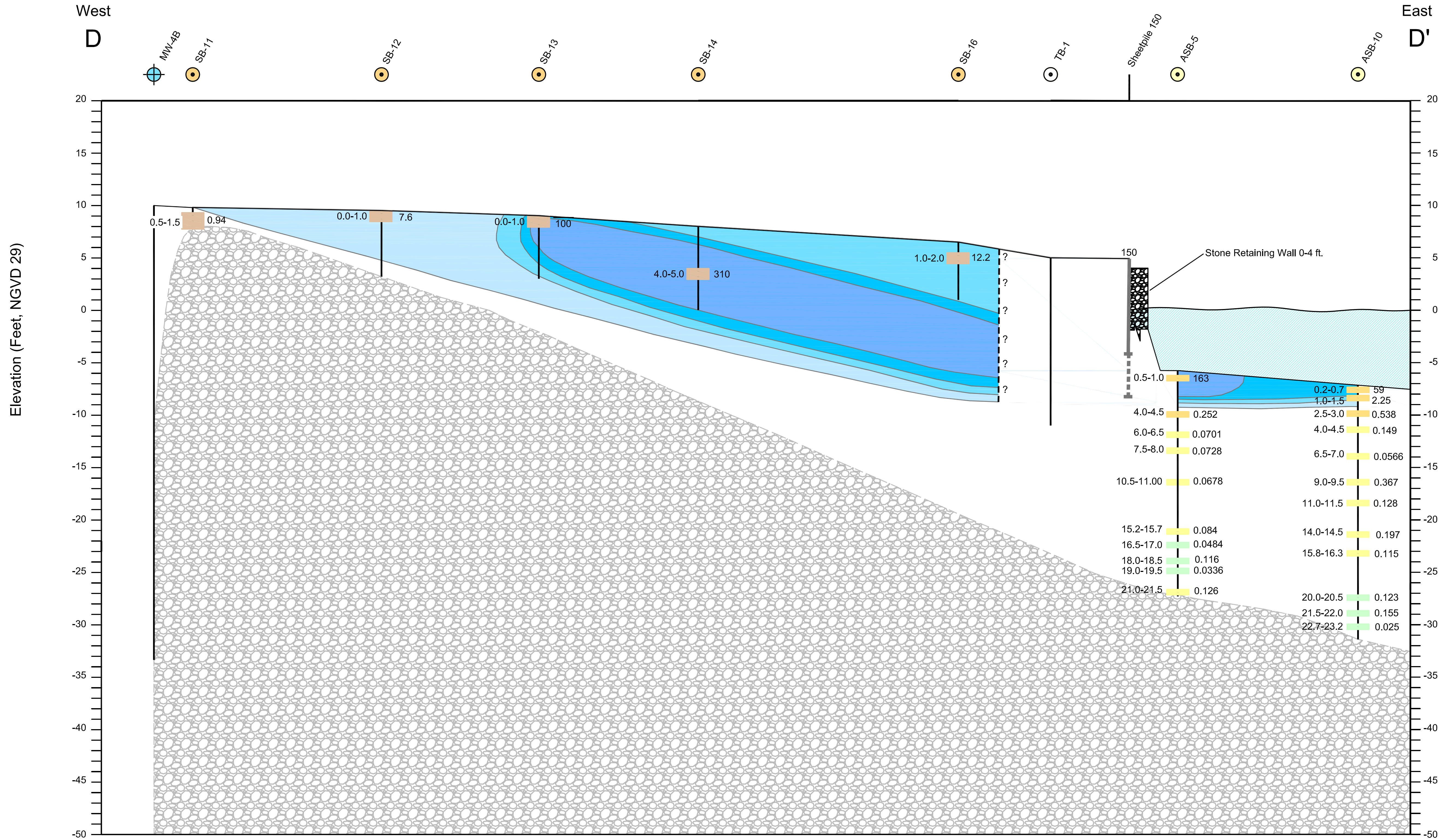
Cross-Section C-C' PCBs*

New Bedford Harbor Superfund Site

03/11/13 JP PCBs_CC_20130225.dwg

Figure 3-5

last modified: 03/11/13 printed: 03/13/13 by jp
Y:\NBH\Projects\35BG0708\20130225\AutoCAD\PCBs_CC_20130225.dwg



Legend

1982 Monitoring Well	Harbor Water
2012 Boring Location	Marine Sample Location
1998 Boring Location	Glacial Outwash Sample Location
1983 Test Boring Location	Glacial Till Sample Location
	Peat Sample Location
	Fill Sample Location
	Bedrock

Sheetpile # 95

Sheetpile at 9ft bgs

Sheetpile at 13ft bgs

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

ft bgs = feet below ground surface

Total Aroclors Concentration (mg/kg)

- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*PCB contours on the Aerovox Site are inferred from historic soil data points.

0 — V: 10 H: 80

Scale in Feet

JACOBS™

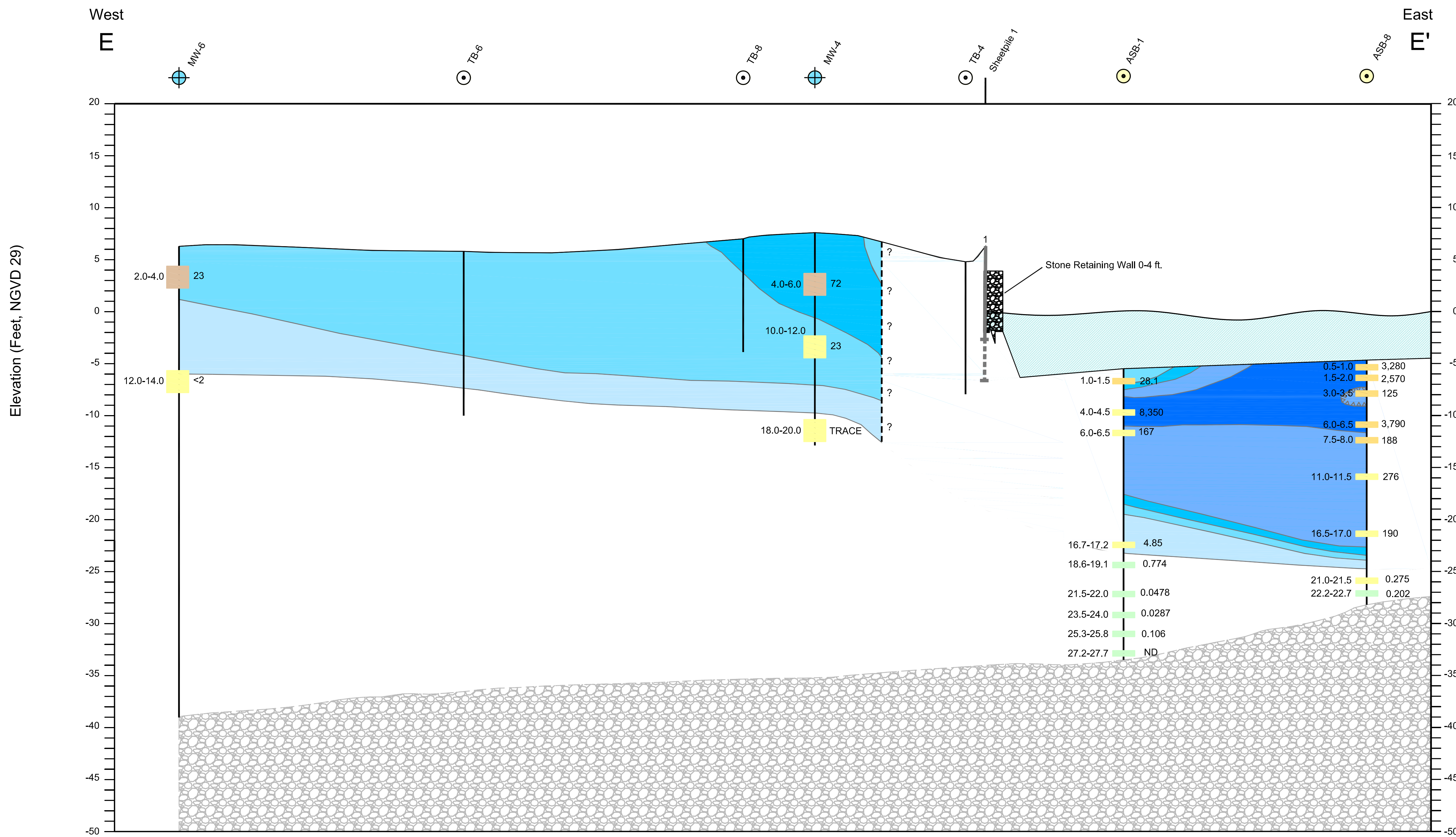
Cross-Section D-D' PCBs*

New Bedford Harbor Superfund Site

03/11/13 JP PCBs_DD_20130225.dwg

Figure 3-6

last modified: 03/11/13 printed: 03/13/13 by jp Y:\NBH\Projects\35BG0708\20130225\AutoCAD\PCBs_DD_20130225.dwg



Y:\NBH\Projects\35BG0708\20130225\AutoCAD\PCBs_EE_20130225.dwg

last modified: 03/11/13 printed: 03/13/13 by jp

Legend

- 1982 Monitoring Well
- 2012 Boring Location
- 1983 Test Boring Location
- Harbor Water
- Marine Sample Location
- Glacial Outwash Sample Location
- Glacial Till Sample Location
- Peat Sample Location
- Fill Sample Location
- Bedrock

Sheetpile # 95

Sheetpile at 9ft bgs

Sheetpile at 13ft bgs

ft bgs = feet below ground surface

Depth — PCBs Data (as Total Aroclors) PPM as mg/kg

Total Aroclors Concentration (mg/kg)

- 1-10
- 10-50
- 50-100
- 100-1000
- >1000

Total Aroclors:

Aroclor 1016	Aroclor 1242	Aroclor 1260
Aroclor 1221	Aroclor 1248	Aroclor 1262
Aroclor 1232	Aroclor 1254	Aroclor 1268

*PCB contours on the Aerovox Site are inferred from historic soil data points.

0 — V: 10 H: 40 — Scale in Feet

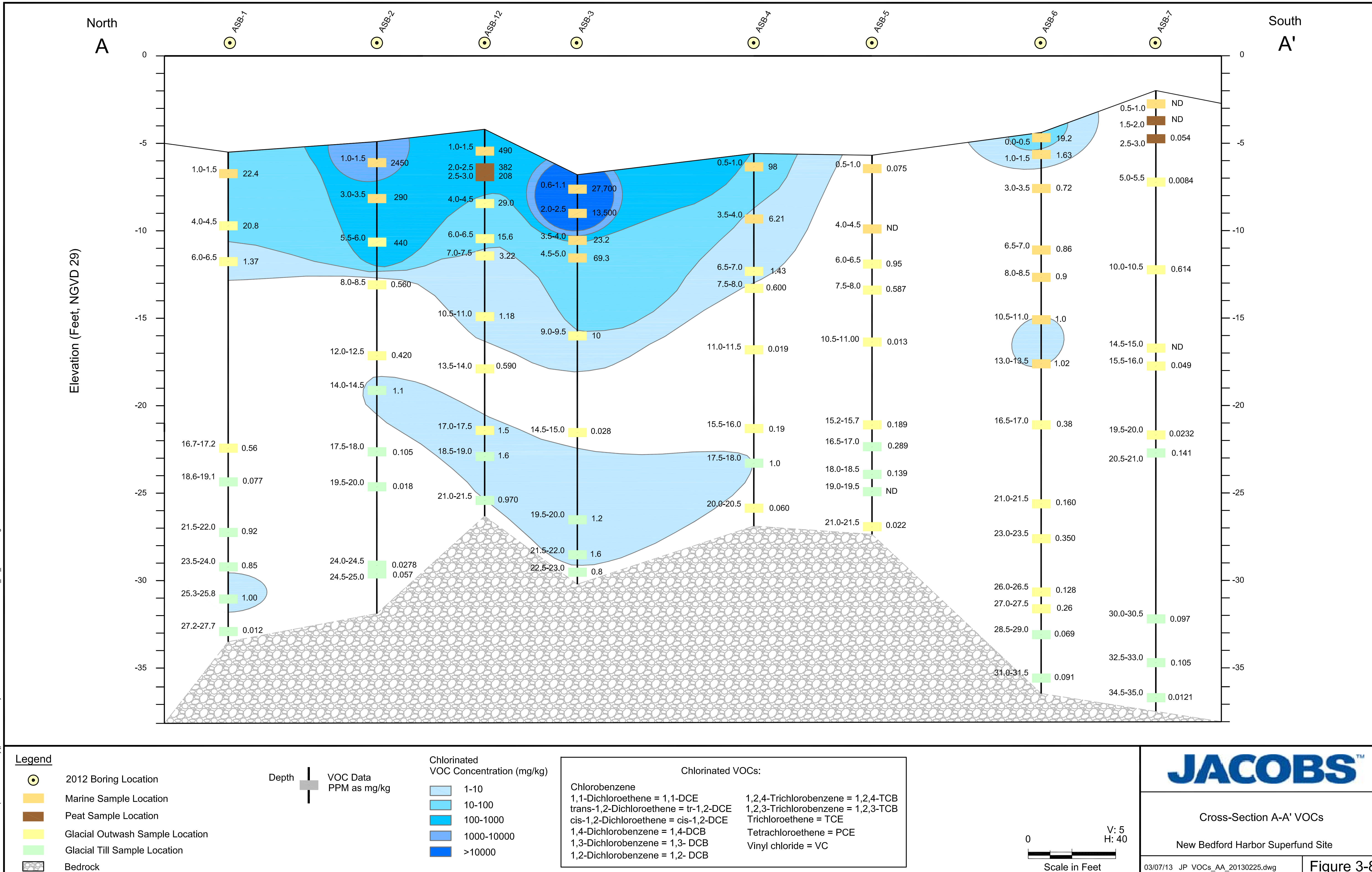
JACOBS™

Cross-Section E-E' PCBs*

New Bedford Harbor Superfund Site

03/11/13 JP PCBs_EE_20130225.dwg

Figure 3-7



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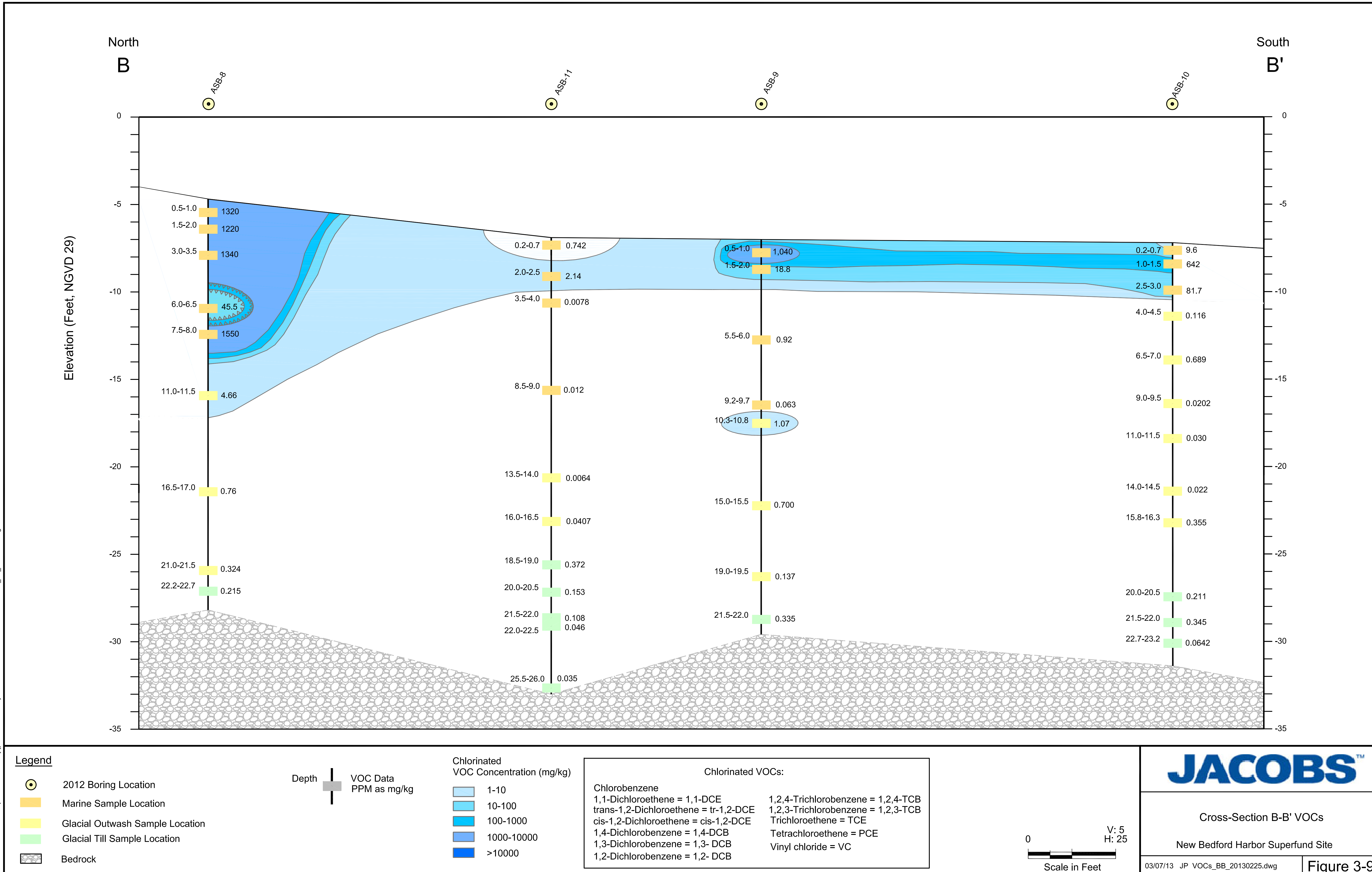
last modified: 03/07/13 printed: 03/13/13 by jp



last modified: 03/07/13 printed: 03/13/13 by jp Y:\NBH\Projects\35BG0708\20130225\AutoCAD\VOCs_BB_20130225.dwg

APPENDIX A

BORING LOGS

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring		Boring ID No: ASB-1	Sheet: 1 Of: 1
Project Number: W91WJ-09-D-0001, TO 0010		Date/Time Started: 7/12/12 1215	Date/Time Compl: 7/12/12 1525
Location: New Bedford, Massachusetts		Borehole Dia: 5.5"	
		Drill Type: Mini-Sonic	
		Drill Rig and Model: 200C No. 01636	
Coordinates: N: 2707037.53	E: 815657.42	Sampling Tool: 4.5" Core Barrel	
Ground Elevation: -5.5 ft NGVD		Drilling Company: Boart Longyear	
Depth to Sediment Interface: 6.1 ft		Name of Driller: Kevin Smith	
Tideboard Reading: 0.60 ft NGVD		Geologist: Don Melcher, Mike Morris	
Total Depth of Boring: 28.0 ft		Hammer Weight/Drop: N/A	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
3.5	Marine		S-12L-B001-1.0-1.5	1245		OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, trace fine sand, little clay, soft to very soft, wet	petroleum odor, slight sheen 0-1.5 ft
4.6	Glacial Outwash		S-12L-B001-4.0-4.5	1245		SP	SAND WITH GRAVEL	POORLY GRADED SAND WITH GRAVEL: 2.5Y 5/2 grayish brown, medium sand, some fine sand, few rounded to subrounded gravels, trace silt	gravels are rounded to subrounded, no odor, oily film noted on sampling spoon
5.7						SP	SAND	POORLY GRADED SAND: 2.5Y6/1 gray, medium sand, some fine sand, trace silt	matrix shows low chroma, evidence of gleying, no odor, no gravel
6.8			S-12L-B001-6.0-6.5	1315		SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 2.5Y 5/2 grayish brown, medium sand, some fine sand, some coarse sand, little rounded gravels, trace silt, trace clay, medium dense	bright mottles (7.5YR 5/6 strong brown) veining through matrix, evidence of oxidation, no odor
7.7						SP	SAND With GRAVEL	POORLY GRADED SAND WITH GRAVEL: 2.5Y 6/1 gray, fine sand, little rounded gravel, little medium sand, trace silt, trace clay, loose.	
16.7								NO RECOVERY	
18.1			S-12L-B001-16.7-17.2	1425		SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 2.5Y 5/3 light olive brown, coarse sand, some medium sand, little fine sand, trace silt, trace clay, little round to subrounded gravels, some rounded cobbles, medium dense	large cobble marks bottom of unit
19.3	Glacial Till		S-12L-B001-18.6-19.1	1425		SP	SAND WITH GRAVEL	POORLY GRADED SAND WITH GRAVEL: 2.5Y 6/2 light brownish gray, fine sand, little silt, trace clay, little subangular to angular gravels.	Change in lithology at 18.1 ft. Go from water lain deposits to gracial till. Looks like alluvium over glacial till
20.6						GW	GRAVEL WITH SAND	WELL GRADED GRAVEL WITH SAND: 2.5Y 5/2 grayish brown, angular to subangular gravels, some coarse sand, trace silt, trace clay, medium dense, wet	Presence of free water may indicate flow zone.
20.9						CL	CLAY WITH GRAVEL	LEAN CLAY WITH GRAVEL: 10GY 5/1 greenish gray, clay, some silt, trace fine sand, little angular to subangular gravels, stiff, moist.	Shows signs of oxidation.
24.4			S-12L-B001-21.5-22.0 S-12L-B001-23.5-24.0	1500 1500		CL	CLAY WITH GRAVEL	LEAN CLAY WITH GRAVEL: 10GY 5/1 greenish gray, clay, some silt, trace medium sand, little gravel, stiff, moist, medium plasticity.	Evidence of reduced conditions, no odor, no sign of stratification but feels like lacustrine-type deposit
26.0			S-12L-B001-25.3-25.8	1525		GW-GC	GRAVEL WITH CLAY	WELL GRADED GRAVEL WITH CLAY: 5GY 6/1 greenish gray, clay, some silt, little fine sand, some medium sand, some angular to subangular gravels, medium dense, moist, medium plasticity.	No odor
28.0			S-12L-B001-27.2-27.7	1525		ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 10GY 5/1 greenish gray, silt, some angular gravels, little clay, trace fine sand, stiff, dry.	Common distinct mottles (10GY 8/1 light greenish gray), suggest characteristics of a fragipan. Lamellae seem stripped of weatherable minerals along flow path. Bedrock in bottom of unit.
28.0+	Bedrock							BEDROCK	

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-2
Project Number: W91WJ-09-D-0001, TO 0010	Sheet: 1 Of: 1
Location: New Bedford, Massachusetts	Date/Time Started: 7/13/12 0700
Coordinates: N: 2706970.69 E: 815653.32	Date/Time Compl: 7/13/12 1215
Ground Elevation: -4.9 ft NGVD	Borehole Dia: 5.5"
Depth to Sediment Interface: 4.1 ft	Drill Type: Mini-Sonic
Tideboard Reading: -0.8 ft NGVD	Drill Rig and Model: 200C No. 01636
Total Depth of Boring: 27.0 ft	Sampling Tool: 4.5" Core Barrel
	Drilling Company: Boart Longyear
	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A
	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
4.5	Marine		S-12L-B002-1.0-1.5 S-12L-B002-3.0-3.5	0755 0755		OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, little fine sand, little clay, trace medium sand, few peat fibers, very soft, moist to wet.	Petroleum odor
7.1	Glacial Outwash		S-12L-B002-5.5-6.0	0825		SW	SAND	WELL GRADED SAND: 10YR 3/3 dark brown, medium sand, some fine sand, some coarse sand, little silt, trace clay, trace rounded quartz gravels, medium dense, moist.	No odor
7.5					0.3	SP	SAND	POORLY GRADED SAND: 2.5Y 4/1 dark gray, fine sand, little silt, trace clay, medium dense, moist	No odor.
9.7			S-12L-B002-8.0-8.5	0845	0.0	SW	SAND	WELL GRADED SAND: 2.5Y 5/1 gray, medium sand, some fine sand, some coarse sand, little silt, trace clay, trace rounded gravels, loose, moist.	No odor
10.5					0.0	SW	SAND	WELL GRADED SAND: 5Y 4/1 dark gray, coarse sand, little fine sand, little medium sand, trace silt, trace clay, trace rounded gravels, loose, moist.	No odor
12.0								NO RECOVERY	
13.1			S-12L-B002-12.0-12.5	0930	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 2.5Y 5/2 grayish brown, coarse sand, some fine sand, some medium sand, little silt, trace clay, few rounded gravels, dense, moist	
14.85	Glacial Till		S-12L-B002-14.0-14.5	0930	0.0	SP-SM	SAND WITH SILT	POORLY GRADED SAND WITH SILT: 5Y 5/1 gray, fine sand, little medium sand, little silt, trace clay, few angular to subangular gravels, loose, moist	Lithologic discontinuity, probably glacial
19.1			S-12L-B002-17.5-18.0	1000	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 10YR 4/4 dark yellowish brown, medium sand, some coarse sand, some fine sand, little silt, trace clay, little angular to subangular gravels, dense, moist to wet.	Looks partially oxidized, no odor, large cobble marking base of unit
23.8			S-12L-B002-19.5-20.0	1000	0.0	ML	SILT	SILT: 5Y 5/3 olive, silt, some clay, little fine sand, trace medium sand, few angular gravels, stiff, moist.	No odor
25.4			S-12L-B002-24.0-24.5 S-12L-B002-24.5-25.0	1050	0.0	GW-GC	GRAVEL WITH CLAY	WELL GRADED GRAVEL WITH CLAY: 5/Y 4/1 dark gray, angular to subangular gravel, some clay, little silt, trace fine sand, dense, moist to wet, medium plasticity	
27.0	Bedrock				0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 8/1 white, silt, some angular gravel, very stiff, dry.	Common prominent mottles of 5Y 5/1 (gray). Looks like saprolite or weathered bedrock

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-3
Project Number: W91WJ-09-D-0001, TO 0010	Sheet: 1 Of: 1
Location: New Bedford, Massachusetts	Date/Time Started: 7/13/12 1200
Coordinates: N: 2706879.60 E: 815653.94	Date/Time Compl: 7/13/12 1530
Ground Elevation: -6.8 ft NGVD	Borehole Dia: 5.5"
Depth to Sediment Interface: 6.8 ft	Drill Type: Mini-Sonic
Tideboard Reading: 0.0 ft NGVD	Drill Rig and Model: 200C No. 01636
Total Depth of Boring: 24.0 ft	Sampling Tool: 4.5" Core Barrel
	Drilling Company: Boart Longyear
	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A
	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
2.9	Marine		S-12L-B003-0.6-1.1 S-12L-B003-2.0-2.5	1200 1200	111	OL	ORGANIC SILT	ORGANIC SILT WITH PEAT: 2.5Y 2.5/1 black, silt, some clay, trace fine sand, trace medium sand, little peat fibers, very soft, moist to wet	Strange odor, different than usual petroleum odor. PID written on core barrel = 94 ppm VOCs
3.2	Marine				2.4	GW-GM	GRAVEL WITH SILT	WELL GRADED GRAVEL WITH SILT: 2.5Y 3/1 very dark gray, rounded to subrounded gravels, some silt, little fine sand, little medium sand, trace clay, loose, moist to wet	Oil sheen on surface, petroleum odor + a sweet smell, rubber mat material found at top of interval, some OL organic material mixed with gravel
3.5	Marine							NO RECOVERY	
4.2	Marine		S-12L-B003-3.5-4.0	1215	0.7	SW	SAND	WELL GRADED SAND: 2.5Y 5/1 gray, medium sand, some fine sand, some coarse sand, trace silt, trace clay, trace rounded gravels, loose, moist	Strange, sweet detergent odor
5.2	Marine		S-12L-B003-4.5-5.0	1215	0.7	SW	SAND	WELL GRADED SAND: 5Y 4/1 dark gray, coarse sand, some fine sand, some medium sand, little rounded gravels, trace silt, loose, moist to wet	Strange detergent odor
8.5	Glacial Outwash							NO RECOVERY	
10.0	Glacial Outwash		S-12L-B003-9.0-9.5	1330	0.0	SW	SAND	WELL GRADED SAND: 7.5YR 4/6 strong brown, coarse sand, some medium sand, little fine sand, trace silt, little rounded gravel, loose, moist	Thin iron coatings on sand grains, strange, sweet smell, looks more oxidized than the unit described above
13.5	Glacial Outwash							NO RECOVERY	
15.7	Glacial Outwash		S-12L-B003-14.5-15.0	1400	0.0	SW	SAND	WELL GRADED SAND: 2.5Y 4/2 dark grayish brown, coarse sand, some medium sand, little fine sand, little rounded gravels, loose, moist	No odor
15.8	Glacial Outwash				0.0	ML	SILT	SILT: 7.5YR 5/6 strong brown, silt, little clay, trace fine sand, stiff	Common prominent mottles of 2.5Y 6/3 light yellowish brown, definite redoxymorphic features with veins of reddish and gray colors + coarse manganese nodules. Moderate medium subangular blocky structure, no odor.
18.5	Glacial Outwash							NO RECOVERY	
19.4	Glacial Outwash				0.0	SW	SAND	WELL GRADED SAND: 2.5Y 5/2 grayish brown, coarse sand, some medium sand, little fine sand, trace silt, little rounded gravels, moist	
21.0	Glacial Till		S-12L-B003-19.5-20.0	1435	0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 6/1 gray, silt, some angular to subangular gravel, little fine sand, trace medium sand, little clay, soft, moist to wet, medium plasticity	Represents a lithologic discontinuity from alluvium above
21.5	Glacial Till							NO RECOVERY	
22.2	Glacial Till		S-12L-B003-21.5-22.0	1515	0.0	CL-ML	SILTY CLAY	SILTY CLAY: 5G 5/1 greenish gray, clay, some silt, trace fine sand, stiff, dry, medium plasticity	Common prominent mottles of 10YR 4/6 dark yellowish brown and 5GY 7/1 light greenish gray, moderate medium subangular blocky structure with remnants of lamellae present, low chroma mottles found along flow path, redoxymorhpic features, common manganese stains on ped faces,
23.4	Glacial Till		S-12L-B003-22.5-23.0	1515	0.0	CL-ML	SILTY CLAY	SILTY CLAY: 5Y 6/1 gray, clay, some silt, little fine sand, trace medium sand, trace angular gravels, soft, moist to wet, medium plasticity	Shows reducing conditions
23.4+	Bedrock							BEDROCK: Gabbro?	

NBH BORING LOG

JACOBS	Boring ID No: ASB-4	Sheet: 1 Of: 1
	Date/Time Started: 7/14/12 0735	Date/Time Compl: 7/14/12 1010
Project Name: New Bedford Aerovox Boring	Borehole Dia: 5.5"	
Project Number: W91WJ-09-D-0001, TO 0010	Drill Type: Mini-Sonic	
Location: New Bedford, Massachusetts	Drill Rig and Model: 200C No. 01636	
Coordinates: N: 2706806.47 E: 815618.01	Sampling Tool: 4.5" Core Barrel	
Ground Elevation: -5.6 NGVD	Drilling Company: Boart Longyear	
Depth to Sediment Interface: 6.1 ft	Name of Driller: Kevin Smith	
Tideboard Reading: 0.5 ft NGVD	Geologist: Don Melcher, Mike Morris	
Total Depth of Boring: 21.25 ft	Hammer Weight/Drop: N/A	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
1.1	Marine		S-12L-B004-0.5-1.0	0740	0.0	OL	ORGANIC SILT WITH SAND AND GRAVEL	SANDY ORGANIC SILT WITH GRAVEL: 2.5Y 2.5/1 black, silt, some medium sand, some fine sand, little clay, little rounded gravels, very soft, wet	Petroleum odor, piece of bark found in the sample
4.8	Marine		S-12L-B004-3.5-4.0	0740	0.0	ML	SANDY SILT	SANDY SILT, 5Y 4/1 dark gray, silt, some fine sand, some clay, stiff, moist	Slight petroleum odor, evidence of reducing conditions
6.5	Marine				0.0	SP-SM	SAND WITH SILT	POORLY GRADED SAND WITH SILT: 5Y 5/1 gray, fine sand, some silt, little clay, stiff, moist	No odor, consistence is almost brittle
7.1	Glacial Outwash		S-12L-B004-6.5-7.0	0835	0.0	SP-SM	SAND WITH SILT	POORLY GRADED SAND WITH SILT: 10YR 4/6 dark yellowish brown and 5Y 4/1 dark gray, fine sand, some silt, little clay, medium dense, wet	Presence of free water, peds are gleyed on the inside, oxidized on the outside, neither color is dominant, no odor. Note, this core and all following were collected from ASB-4A, an offset of ASB -4. ASB-4 (0-5 ft) was collected because of good recovery. Remaining cores are from ASB-4A offset
8.3	Glacial Outwash		S-12L-B004-7.5-8.0	0835	0.0	GW	GRAVEL WITH SAND	WELL GRADED GRAVEL WITH SAND: 10YR4/6 dark yellowish brown, rounded and subrounded gravel, some coarse sand, some medium sand, some fine sand, some silt, trace clay, loose, wet	Color due to oxidzed iron, no odor
9.0	Glacial Outwash				0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 10YR 4/6 dark yellowish brown, coarse sand, some medium sand, some fine sand, some silt, little rounded and subrounded gravel, soft, wet	No odor
10.0	Glacial Outwash							NO RECOVERY	
13.0	Glacial Outwash		S-12L-B004-11.0-11.5	0850	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH GRAVEL: 2.5Y 4/2 dark grayish brown, coarse sand, some medium sand, little fine sand, some rounded and subrounded gravels, loose, moist to wet	No odor
15.0	Glacial Outwash							NO RECOVERY	
16.1	Glacial Outwash		S-12L-B004-15.5-16.0	0925	0.1	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 5/1 gray, coarse sand, some silt, some medium sand, some fine sand, some rounded and subrounded gravel, loose, moist to wet	No odor
17.4	Glacial Outwash				0.1	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 6/1 gray, coarse sand, some medium sand, little fine sand, trace silt, some rounded to subrounded gravel, loose, moist to wet.	No odor
18.3	Till?		S-12L-B004-17.5-18.0	0925	0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 6/1 gray, silt, some medium sand, some fine sand, little clay, little angular gravel, soft, moist to wet	No odor, reduced, lower boundary marked by rock (gabbro?)
18.9	Glacial Outwash				0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 6/1 gray, coarse sand, some medium sand, little fine sand, trace silt, some rounded to subrounded gravels, soft, moist	No odor
20.0	Glacial Outwash							NO RECOVERY	
20.9	Glacial Outwash		S-12L-B004-20.0-20.5	0950	0.0	GW-GM	GRAVEL WITH SILT	WELL GRADED GRAVEL WITH SILT: 5Y 7/1 light gray, rounded gravels, some silt, some medium sand, some fine sand, trace clay, medium dense, moist to wet	No odor
21.3	Glacial Outwash				0.0	SW	SAND with GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 6/1 gray, coarse sand, some medium sand, little fine sand, trace silt, little rounded and subrounded gravel, loose, moist to wet	No odor
21.3+	Bedrock?							BEDROCK?	Top of bedrock determined through observation during drilling

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-5
Project Number: W91WJ-09-D-0001, TO 0010	Sheet: 1 Of: 1
Location: New Bedford, Massachusetts	Date/Time Started: 7/14/12 1030
Coordinates: N: 2706757.73 E: 815595.58	Date/Time Compl: 7/14/12 1340
Ground Elevation: -5.7 ft NGVD	Borehole Dia: 5.5"
Depth to Sediment Interface: 4.7 ft	Drill Type: Mini-Sonic
Tideboard Reading: -1.0 ft NGVD	Drill Rig and Model: 200C No. 01636
Total Depth of Boring: 21.7 ft	Sampling Tool: 4.5" Core Barrel
	Drilling Company: Boart Longyear
	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A
	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
3.9	Marine		S-12L-B005-0.5-1.0	1045	1.5	OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, some fine sand, little medium sand, some clay, soft to very soft, moist to wet	Petroleum odor, slight sheen @ 0.10 ft
5.9	Marine		S-12L-B005-4.0-4.5	1045	0.0	ML	SILT	SILT: 5Y 5/1 gray, silt, some fine sand, some clay, stiff, dry to moist	Some of the structure is almost platy, H_2S odor
8.4	Glacial Outwash		S-12L-B005-6.0-6.5 S-12L-B005-7.5-8.0	1100 1100	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 5/1 gray, coarse sand, some medium sand, little rounded gravels, little fine sand, little silt, loose, wet	No odor
10.0	Glacial Outwash							NO RECOVERY	
12.0	Glacial Outwash		S-12L-B005-10.5-11.0	1210	0.0	SP	SAND	POORLY GRADED SAND: 5Y 5/1 gray, medium sand, little coarse sand, some fine sand, trace silt, trace rounded gravels, loose, moist	No odor
15.9	Glacial Outwash		S-12L-B005-15.2-15.7	1240	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 4/1 dark gray, coarse sand, some medium sand, little fine sand, little silt, some rounded gravels, loose, moist to wet	Gravels look polished. No odor
17.6	Glacial Till		S-12L-B005-16.5-17.0	1240	0.0	ML	SILT WITH SAND	SILT WITH SAND: 5Y 5/1 gray, silt, little medium sand, little fine sand, trace clay, soft, moist	No odor, represent lithologic discontinuity
18.0	Glacial Till							ROCK	Core drilled through a rock.
18.9	Glacial Till		S-12L-B005-18.0-18.5	1240	0.0	ML	SILT WITH SAND	SILT WITH SAND: 10Y 6/1 greenish gray, fine sand, little medium sand, trace clay, trace angular gravels, loose, moist to wet	Many fine pores (almost "fluffy"), no odor, reducing conditions
20.0	Glacial Till		S-12L-B005-19.0-19.5	1240	0.0	SW	SAND	WELL GRADED SAND; 5Y 6/1 greenish gray, coarse sand, some medium sand, little fine sand, trace silt, loose, moist	No odor
20.7	Glacial Till							ROCK	Rig drilled through two large cobbles
21.7	Glacial Till		S-12L-B005-21.0-21.5	1320	0.0	CL-ML	SILTY CLAY	SILTY CLAY: N 6/1 gray, clay, some silt, trace angular gravels, stiff, moist to wet	Common medium pores (almost "fluffy")
21.7+	Bedrock?							BEDROCK?	Top of bedrock inferred in field based on drilling

NBH BORING LOG

JACOBS

Boring ID No: ASB-6	Sheet: 1 Of: 1
Date/Time Started: 7/16/12 0745	Date/Time Compl: 7/16/12 1010
Project Name: New Bedford Aerovox Boring	Borehole Dia: 5.5"
Project Number: W91WJ-09-D-0001, TO 0010	Drill Type: Mini-Sonic
Location: New Bedford, Massachusetts	Drill Rig and Model: 200C No. 01636
Coordinates: N: 2706684.66 E: 815568.76	Sampling Tool: 4.5" Core Barrel
Ground Elevation: -4.4 ft NGVD	Drilling Company: Boart Longyear
Depth to Sediment Interface: 6.6 ft	Name of Driller: Kevin Smith
Tideboard Reading: 2.2 ft NGVD	Geologist: Don Melcher, Mike Morris
Total Depth of Boring: 32.5 ft	Hammer Weight/Drop: N/A; PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
0.5	Marine		S-12L-B006-0-0.5	0810	0.0	OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, little clay, few fine sand, trace medium sand, trace angular granules, very soft, wet	Petroleum odor, trace pieces of asphalt in matrix
2.4			S-12L-B006-1.0-1.5	0810	0.0	ML	SILT	SILT WITH GRAVEL: 2.5Y 3/1 very dark gray, silt, trace clay, little fine sand, little angular gravels and granules, soft, moist	Petroleum odor, found remnants of firecracker plastic from 1.2-1.6 ft below surface
4.2			S-12L-B006-3.0-3.5	0810	0.0	SP	SAND	POORLY GRADED SAND: 5/Y 5/2 olive gray, fine sand, trace medium sand, little silt, trace clay, medium dense, moist	H_2S odor, could be some lamination, but more likely result of pushing by rig.
5.0								NO RECOVERY	
8.9			S-12L-B006-6.5-7.0	0825	0.0	SP	SAND	POORLY GRADED SAND: 5Y 4/1 dark gray, fine sand, few silt, trace clay, medium dense, moist	Slight H_2S odor, few thin silt inclusions between ped faces
12.7			S-12L-B006-8.0-8.5 S-12L-B006-10.5-11.0	0825 0840	0.0	SP	SAND	POORLY GRADED SAND, 5Y 5/1 gray, fine sand, trace medium sand, some silt, trace clay, medium dense, moist	No odor, wet between some of the pore spaces
15.9			S-12L-B006-13.0-13.5	0840	0.0	SP	SAND WITH GRAVEL	POORLY GRADED SAND WITH GRAVEL: 5Y 5/1 gray, medium sand, trace coarse sand, some fine sand, few silt, trace clay, little rounded and subrounded gravel, medium dense, moist	No odor
17.0	Glacial Outwash		S-12L-B006-16.5-17.0	0850	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT: 5Y 5/1 gray and 7.5YR 4/6 strong brown, medium sand, some fine sand, some silt, trace clay, little rounded gravels, medium dense, moist	No odor, reddish material (7.5YR 4/6 strong brown) forms vertical veins through low chroma material (5Y 5/1 gray), neither color is dominant over the other, evidence of redox conditions in this unit, obvious signs of weathering
20.0								NO RECOVERY	
22.8			S-12L-B006-21.0-21.5	0910	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 10YR 4/2 dark grayish brown, coarse sand, some medium sand, few fine sand, trace silt, little rounded and subrounded gravels, loose, moist	No odor
23.7			S-12L-B006-23.0-23.5	0910	0.0	ML	SANDY SILT WITH GRAVEL	SANDY SILT WITH GRAVEL: 10YR 4/3 brown, silt, some medium sand, little rounded and subrounded gravels and cobbles, soft, moist	No odor
25.0								NO RECOVERY	
27.0			S-12L-B006-26.0-26.5	0950	0.0	SW	SAND	WELL GRADED SAND: 10YR 4/3 brown, medium sand, little fine sand, little coarse sand, trace silt, loose, moist	No odor, note on core barrel says "packed by hand," core looks jumbled and homogeneous
27.9			S-12L-B006-27.0-27.5	0950	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL; 2.5Y 4/2 dark grayish brown, medium sand, little fine sand, some silt, trace clay, trace coarse sand, little rounded and subrounded gravel, medium dense, moist	No odor
32.0	Glacial Till		S-12L-B006-28.5-29.0 S-12L-B006-31.0-31.5	0950 1010	0.0	CL-ML	SILTY CLAY WITH GRAVEL	SILTY CLAY WITH GRAVEL: 5Y 4/2 olive gray, clay, some silt, little angular gravels, trace fine sand, stiff, moist	No odor, probably glacial
32.0+	Bedrock?							BEDROCK?	Top of bedrock determined based on drilling

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-7 / Sheet: 1 Of: 1
Project Number: W91WJ-09-D-0001, TO 0010	Date/Time Started: 7/12/12 1355 / Date/Time Compl: 7/14/12 1640
Location: New Bedford, Massachusetts	Borehole Dia: 5.5"
Coordinates: N: 2706641.93 E: 815537.18	Drill Type: Mini-Sonic
Ground Elevation: -2.0 ft NGVD	Drill Rig and Model: 200C No. 01636
Depth to Sediment Interface: 2.6 ft	Sampling Tool: 4.5" Core Barrel
Tideboard Reading: 0.6 ft NGVD	Drilling Company: Boart Longyear
Total Depth of Boring: 36.2 ft	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A / PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
0.5	Fill				0.0	GW	GRAVEL WITH SAND	WELL GRADED GRAVEL WITH SAND: 5Y 3/1 very dark gray, rounded and angular gravel, little coarse sand, little medium sand, few fine sand, trace silt, very loose, moist	Heavy tar odor
1.5	Marine		S-12L-B007-0.5-1.0	1410	0.0	ML	SILT	SILT: 2.5Y 3/1 very dark gray, silt, few fine sand, little clay, soft, moist	Slight petroleum odor, weak coarse subangular blocky structure with liquid channels
3.6	Peat		S-12L-B007-1.5-2.0 S-12L-B007-2.5-3.0	1410	0.0	Pt	PEAT	PEAT: 10YR 3/3 dark brown, peat fibers, wet	Decay odor
4.8	Glacial Outwash				0.0	SM	SILTY SAND WITH GRAVEL	SILTY SAND WITH GRAVEL: 5Y 3/2 dark olive gray, fine sand, some silt, trace clay, little rounded gravel, soft, moist	Slight petroleum odor
6.1			S-12L-B007-5.0-5.5	1430	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 2.5Y 3/1 very dark gray, medium sand, little coarse sand, little fine sand, few silt, little rounded gravels, loose, moist	Gravels are polished to a sheen, no odor
9.0								NO RECOVERY	
11.2			S-12L-B007-10.0-10.5	1445	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, few silt, trace rounded to subrounded gravels, medium dense, moist	No odor
14.0								NO RECOVERY	
15.3			S-12L-B007-14.5-15.0	1500	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 5/1 gray, fine sand, trace medium sand, little rounded gravels, loose, moist	No odor
16.7			S-12L-B007-15.5-16.0	1500	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 10YR 4/3 brown, medium sand, little coarse sand, little fine sand, few silt, trace clay, moist	Pockets of finer material (silt loam) in unit. Mottles of 7.5YR 5/6 strong brown (oxidized) and 5Y 3/1 very dark gray (reduced) on the outside of the red peds, no odor, pocket of manganese nodules in bottom of core
19.0								NO RECOVERY	
20.4			S-12L-B007-19.5-20.0	1520	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 5/2 olive gray, coarse sand, little medium sand, few fine sand, trace silt, little rounded gravels, loose, moist	No odor
21.9	Glacial Till		S-12L-B007-20.5-21.0	1520	0.0	SP-SM	SAND WITH SILT AND GRAVEL	POORLY GRADED SAND WITH SILT AND GRAVEL: 5Y 4/2 olive gray, fine sand, little silt, trace clay, little angular and subangular gravels, medium dense, moist	No odor, glacial, many rounded gravels look cracked (no sign of heating)
29.0								NO RECOVERY	
31.3			S-12L-B007-30.0-30.5	1605	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 5/1 gray, medium sand, little coarse sand, little fine sand, few silt, little rounded gravel, loose, moist	No odor
32.6					0.0	SM	SILTY SAND	SILTY SAND: 5Y 5/1 gray, fine sand, little medium sand, little angular and subangular gravels, trace clay, firm, moist	No odor, mottles of 5Y 4/4 olive, glacial?
35.4			S-12L-B007-32.5-33.0 S-12L-B007-34.5-35.0	1605	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL, medium sand, little coarse sand, little fine sand, few silt, little subrounded and subangular gravels, moist	No odor
36.2+	Bedrock							BEDROCK	Mafic gabbro

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-8
Project Number: W91WJ-09-D-0001, TO 0010	Sheet: 1 Of: 1
Location: New Bedford, Massachusetts	Date/Time Started: 7/17/12 0815
Coordinates: N: 2707062.44 E: 815748.31	Date/Time Compl: 7/17/12 0955
Ground Elevation: -4.7 ft NGVD	Borehole Dia: 5.5"
Depth to Sediment Interface: 7.0 ft	Drill Type: Mini-Sonic
Tideboard Reading: 2.3 ft NGVD	Drill Rig and Model: 200C No. 01636
Total Depth of Boring: 23.5 ft	Sampling Tool: 4.5" Core Barrel
	Drilling Company: Boart Longyear
	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A
	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
1.3	Marine		S-12L-B008-0.5-1.0	0815	58.7	ML	SILT	SILT: 2.5Y 3/1 very dark gray, silt, some clay, trace fine sand, soft, moist	Burnt rubber odor
8.8	Marine		S-12L-B008-1.5-2.0 S-12L-B008-3.0-3.5 S-12L-B008-6.0-6.5 S-12L-B008-7.5-8.0	0815 0815 0830 0830	58.7 94.6 350 163	ML	SILT WITH CLAY	SILT: 2.5Y 3/2 very dark grayish brown, silt, some clay, trace fine sand, soft, moist	Burnt rubber odor, break core open and see macropores or channels coming from top strata, channels had elevated PID readings, maybe contaminants in the surface are working their way down into the subsurface, a shiny opalescent liquid is flowing through the strata, coarse sand in bottom of unit may indicate lithologic discontinuity
10.0	Glacial Outwash							NO RECOVERY	
12.5	Glacial Outwash		S-12L-B008-11.0-11.5	0855	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 5/1 gray, medium sand, some coarse sand, little fine sand, little silt, trace rounded gravels, loose, moist	Sickening sweet odor
15.0	Glacial Outwash							NO RECOVERY	
16.6	Glacial Outwash				0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 5/1 gray, medium sand, some coarse sand, little fine sand, little silt, trace rounded gravels, loose, moist	
17.7	Glacial Outwash		S-12L-B008-16.5-17.0	0925	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 10YR 4/4 dark yellowish brown, coarse sand, some medium sand, little fine sand, little silt, little rounded gravels, firm, moist	Little odor, weak iron coatings on grains of sand and gravel
20.0	Glacial Outwash							NO RECOVERY	
22.1	Glacial Outwash		S-12L-B008-21.0-21.5	0955	0.0	SP-SM	SAND WITH SILT	POORLY GRADED SAND WITH SILT: 2.5Y 5/2 grayish brown, fine sand, little silt, trace medium sand, medium dense, moist	No odor
22.8	Glacial Till		S-12L-B008-22.2-22.7	0955	0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 4/2 olive gray, silt, little clay, trace fine sand, little angular gravels, firm, moist	No odor, glacial
23.5	Glacial Till							NO RECOVERY	
23.5+	Bedrock							BEDROCK	Top of bedrock inferred through drilling observations

NBH BORING LOG

JACOBS

Boring ID No: ASB-9	Sheet: 1 Of: 1
Date/Time Started: 7/16/12 1650	Date/Time Compl: 7/16/12 1830
Project Name: New Bedford Aerovox Boring	Borehole Dia: 5.5"
Project Number: W91WJ-09-D-0001, TO 0010	Drill Type: Mini-Sonic
Location: New Bedford, Massachusetts	Drill Rig and Model: 200C No. 01636
Coordinates: N: 2706910.37 E: 815712.93	Sampling Tool: 4.5" Core Barrel
Ground Elevation: -7.0 ft NGVD	Drilling Company: Boart Longyear
Depth to Sediment Interface: 8.8 ft	Name of Driller: Kevin Smith
Tideboard Reading: 1.8 ft NGVD	Geologist: Don Melcher, Mike Morris
Total Depth of Boring: 22.9 ft	Hammer Weight/Drop: N/A — PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
2.1	Marine		S-12L-B009-0.5-1.0 S-12L-B009-1.5-2.0	1650 1650	0.0	OL	ORGANIC SILT WITH PEAT	ORGANIC SILT WITH PEAT: 2.5Y 2.5/1 black, silt, little clay, trace fine sand, little peat, very soft, moist to wet	Petroleum odor
5.1	Marine				0.0	SP-SM	SAND WITH SILT	POORLY GRADED SAND WITH SILT: 2.5Y 3/1 very dark gray, fine sand, some silt, trace clay, trace medium sand, loose, moist	Petroleum odor
6.7	Marine		S-12L-B009-5.5-6.0	1710	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 2.5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, little silt, trace rounded gravels, medium dense, moist	No odor
8.5	Marine							NO RECOVERY	
10.1	Marine		S-12L-B009-9.2-9.7	1730	0.0	SW	SAND	WELL GRADED SAND: 5Y 4/1 dark gray, medium sand, little fine sand, little coarse sand, trace silt, medium dense, moist	Slight H_2S odor
11.0	Glacial Outwash		S-12L-B009-10.3-10.8	1730	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 3/1 very dark gray, fine sand, some silt, trace medium sand, little rounded gravels, medium dense, moist	Slight H_2S odor, common faint mottles of 5Y 4/1 dark gray fingers down into section, looks reduced
13.5	Glacial Outwash							NO RECOVERY	
16.5	Glacial Outwash		S-12L-B009-15.0-15.5	1745	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/2 olive gray, coarse sand, some medium sand, little fine sand, little silt, trace rounded gravels, medium dense, moist	No odor
18.5	Glacial Outwash							NO RECOVERY	
20.7	Glacial Outwash		S-12L-B009-19.0-19.5	1810	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 4/2 olive gray, medium sand, some coarse sand, some fine sand, trace silt, little rounded gravels, medium dense, moist	No odor
22.6	Glacial Till		S-12L-B009-21.5-22.0	1810	0.0	CL	SANDY CLAY WITH GRAVEL	SANDY LEAN CLAY WITH GRAVEL: 5Y 5/3 olive, clay, little fine sand, little silt, trace medium sand, trace angular gravels and granules, stiff, moist	No odor, glacial
22.9+	Bedrock							BEDROCK	Gabbro?

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-10
Project Number: W91WJ-09-D-0001, TO 0010	Sheet: 1 Of: 1
Location: New Bedford, Massachusetts	Date/Time Started: 7/17/12 1045
Coordinates: N: 2706795.1 E: 815731.93	Date/Time Compl: 7/17/12 1400
Ground Elevation: -7.2 ft NGVD	Borehole Dia: 5.5"
Depth to Sediment Interface: 7.8 ft	Drill Type: Mini-Sonic
Tideboard Reading: 0.6 ft NGVD	Drill Rig and Model: 200C No. 01636
Total Depth of Boring: 25.5 ft	Sampling Tool: 4.5" Core Barrel
	Drilling Company: Boart Longyear
	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A
	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
0.7	Marine		S-12L-B010-0.2-0.7	1050	0.0	OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, trace fine sand, trace medium sand, little clay, very soft, moist to wet	Petroleum odor, soupy
3.2	Marine		S-12L-B010-1.0-1.5 S-12L-B010-2.5-3.0	1050 1050	0.0	ML	PEATY SILT	PEATY SILT: 2.5Y 3/2 very dark grayish brown, silt, trace fine sand, little clay, some peat fibers, soft, moist	Burnt rubber odor
3.5	Marine				0.0	ML	GRAVELLY SILT WITH SAND	GRAVELLY SILT WITH SAND: 2.5Y 3/2 very dark grayish brown, silt, little coarse sand, little medium sand, little clay, little rounded gravels, soft, moist	Slight burnt rubber odor
7.7	Glacial Outwash		S-12L-B010-4.0-4.5 S-12L-B010-6.5-7.0	1120 1120	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, little silt, loose, moist	Slightly sweet odor
8.5	Glacial Outwash							NO RECOVERY	
8.8	Glacial Outwash				0.0	GW	GRAVEL	WELL GRADED GRAVEL: 5Y 4/1 dark gray, rounded to subrounded gravel, little fine sand, few silt, trace clay, moist	No odor
10.0	Glacial Outwash		S-12L-B010-9.0-9.5	1135	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 5Y 4/1 dark gray, coarse sand, some rounded gravels, little medium sand, little fine sand, few silt, medium dense, moist	No odor
11.6	Glacial Outwash		S-12L-B010-11.0-11.5	1135	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, few silt, loose, moist to wet	No odor
13.5	Glacial Outwash							NO RECOVERY	
15.1	Glacial Outwash		S-12L-B010-14.0-14.5	1220	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, few silt, loose, moist to wet	No odor
16.8	Glacial Outwash		S-12L-B010-15.8-16.3	1220	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/1 dark gray, medium sand, little coarse sand, little fine sand, few silt, little rounded and subrounded gravels, loose, moist to wet	No odor, gravels are highly polished
18.5	Glacial Outwash							NO RECOVERY	
19.7	Glacial Till				0.0	CL	SANDY CLAY	SANDY LEAN CLAY: 5Y 5/1 gray, clay, little coarse sand, few medium sand, little fine sand, little silt, few angular gravels, stiff, moist	No odor, two rounded cobbles in matrix
21.0	Glacial Till		S-12L-B010-20.0-20.5	1300	0.0	CL-ML	SILTY CLAY	SILTY CLAY: 5Y 5/1 gray and 2.5Y 6/3 light yellowish brown, clay, some silt, little fine sand, few angular gravels, stiff, moist	5Y 5/1 material is silty and 2.5Y 6/3 material is clayey, thinly bedded, laminated, possible varves?
22.6	Glacial Till		S-12L-B010-21.5-22.0	1300	0.0	ML	SILT WITH SAND	GRAVELLY SILT WITH SAND: 2.5Y 5/2 grayish brown, silt, little coarse sand, little clay, little angular gravel, stiff, moist	No odor, glacial
23.5	Glacial Till		S-12L-B010-22.7-23.2	1300	0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 6/1 gray, 5Y 8/1 white (low chroma mottles), 2.5Y 6/6 olive yellow (oxidized mottles), silt, some angular gravel, very stiff, dry	Torn between a rotten bedrock saprolite and a silt pan (fragipan), seems to have characteristic of both, no odor, bedrock is relatively close, low chroma/high chroma mottles indicate water movement through unit, very dense
24.2	Glacial Till				0.0	SW	SAND	WELL GRADED SAND: 2.5Y 5/1 gray, medium sand, little coarse sand, little fine sand, trace silt, loose, moist	No odor
24.9+	Bedrock							BEDROCK	Highly fractured bedrock, manganese coatings on fracture faces, wet

NBH BORING LOG

JACOBS

Project Name: New Bedford Aerovox Boring	Boring ID No: ASB-11 / Sheet: 1 Of: 1
Project Number: W91WJ-09-D-0001, TO 0010	Date/Time Started: 7/17/12 1530 / Date/Time Compl: 7/17/12 1715
Location: New Bedford, Massachusetts	Borehole Dia: 5.5"
Coordinates: N: 2706965.18 E: 815735.32	Drill Type: Mini-Sonic
Ground Elevation: -6.9 ft NGVD	Drill Rig and Model: 200C No. 01636
Depth to Sediment Interface: 7.7 ft	Sampling Tool: 4.5" Core Barrel
Tideboard Reading: 0.8 ft NGVD	Drilling Company: Boart Longyear
Total Depth of Boring: 26.5 ft	Name of Driller: Kevin Smith
	Geologist: Don Melcher, Mike Morris
	Hammer Weight/Drop: N/A / PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
0.9	Marine		S-12L-B011-0.2-0.7	1530	0.2	OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, little fine sand, trace clay, very soft, wet	Petroleum odor, soupy
1.5	Marine				0.2	SM	SILTY SAND	SILTY SAND: 2.5Y 3/1 very dark gray, fine sand, little medium sand, trace rounded gravels, little silt, trace clay, soft, moist	Petroleum odor
3.0	Marine		S-12L-B011-2.0-2.5	1530	0.0	SM	SILTY SAND	SILTY SAND: 2.5Y 3/2 very dark grayish brown, fine sand, little medium sand, trace rounded gravels, little silt, trace clay, medium dense, moist to wet	Slight petroleum odor
4.7	Marine		S-12L-B011-3.5-4.0	1545	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 2.5Y 4/1 dark gray, medium sand, little fine sand, little coarse sand, few silt, loose, moist	Slight sweet odor
8.0	Marine							NO RECOVERY	
9.8	Glacial Outwash		S-12L-B011-8.5-9.0	1600	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 5Y 4/1 dark gray, medium sand, little fine sand, little coarse sand, trace rounded granules, little silt, loose, moist	No odor
13.0	Glacial Outwash							NO RECOVERY	
14.2	Glacial Outwash		S-12L-B011-13.5-14.0	1630	0.0	SP	SAND	POORLY GRADED SAND: 10YR 5/4 yellowish brown, fine sand, trace medium sand, trace silt, medium dense, moist	No odor, well sorted, looks partially oxidized
17.5	Glacial Outwash		S-12L-B011-16.0-16.5	1630	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 2.5Y 5/3 light olive brown, coarse sand, little fine sand, little medium sand, little silt, medium dense, moist	No odor, very few flecks of MnO_2 nodules
18.0	Glacial Outwash							NO RECOVERY	
19.9	Glacial Till		S-12L-B011-18.5-19.0	1700	0.0	SM	SILTY SAND WITH GRAVEL	SILTY SAND WITH GRAVEL: 5Y 5/2 olive gray, medium sand, little coarse sand, little fine sand, little angular to subangular gravels and cobbes, little silt, trace clay, loose, moist	Common medium pores (fluffy), no odor
21.3	Glacial Till		S-12L-B011-20.0-20.5	1700	0.0	SM	SILTY SAND	SILTY SAND: 10YR 4/3 brown with common mottles of 7.5YR 4/3 brown, medium sand, little silt, little clay, little angular gravels, medium dense, moist	No odor, looks like a buried A horizon
23.6	Glacial Till		S-12L-B011-21.5-22.0 S-12L-B011-22.0-22.5	1700 1715	0.0	CL	GRAVELLY CLAY	GRAVELLY LEAN CLAY: 2.5Y 5/1 gray with common mottles of 10YR 5/6 yellowish brown, clay, little silt, little angular gravels, very stiff, moist to dry	No odor, 10YR 5/6 yellowish brown mottles from weathered gravels
25.4	Glacial Till				0.0	SC	CLAYEY SAND WITH GRAVEL	CLAYEY SAND WITH GRAVEL: 5Y 4/2 olive gray, coarse sand, little medium sand, little fine sand, little silt, little clay, little angular gravels, firm, moist to wet	No odor, 5G 5/1 greenish gray mottles
26.1	Bedrock		S-12L-B011-25.5-26.0	1715	0.0	ML	SILT WITH GRAVEL	SILT WITH GRAVEL: 5Y 5/1 gray, silt, trace clay, some angular gravel, stiff, dry	No odor, potentially saprolite
26.5	Bedrock							BEDROCK	Bedrock inferred from drilling observations

NBH BORING LOG

JACOBS	NBH BORING LOG	Boring ID No: ASB-12	Sheet: 1 Of: 1
		Date/Time Started: 7/18/12 0745	Date/Time Compl: 7/18/12 0930
	Project Name: New Bedford Aerovox Boring	Borehole Dia: 5.5"	
	Project Number: W91WJ-09-D-0001, TO 0010	Drill Type: Mini-Sonic	
	Location: New Bedford, Massachusetts	Drill Rig and Model: 200C No. 01636	
Coordinates: N: 2706922.14	E: 815658.20	Sampling Tool: 4.5" Core Barrel	
Ground Elevation: -4.2 ft NGVD		Drilling Company: Boart Longyear	
Depth to Sediment Interface: 7.0 ft		Name of Driller: Kevin Smith	
Tideboard Reading: 2.8 ft NGVD		Geologist: Don Melcher, Mike Morris	
Total Depth of Boring: 22.5 ft		Hammer Weight/Drop: N/A	PID: Multi Rae 1114679

LOWER DEPTH (ft)	STRATIGRAPHY	UNIT	SAMPLE ID OR CONTROL NO.	SAMPLE COLL TIME (24 hr)	PID (ppm)	USCS CLASS.	LITHOLOGY	DESCRIPTION OF MATERIALS (MAJOR LITHOLOGY Secondary Components, color, grain size, sorting, grain shape, other lithologic components, sedimentary structures/bedding, consistency or relative density and moisture)	REMARKS
0.3	Marine				2.7	OL	ORGANIC SILT	ORGANIC SILT: 2.5Y 2.5/1 black, silt, little fine sand, trace clay, very soft, wet	Petroleum odor, soupy consistence
1.5	Marine		S-12L-B012-1.0-1.5	0755	2.7	ML	SILT	SILT: 2.5Y 3/1 very dark gray, silt, little fine sand, little clay, soft, moist	Petroleum odor, shell hash at 0.9-1.1 ft
3.2	Peat		S-12L-B012-2.0-2.5 S-12L-B012-2.5-3.0	0755 0755	2.7	Pt	PEAT	PEAT: 2.5Y 3/2 very dark grayish brown, peat fibers, wet	Petroleum and rot odor
5.9	Glacial Outwash		S-12L-B0012-4.0-4.5	0755	0.0	SM	SILTY SAND	SILTY SAND: 2.5Y 3/2 very dark brown grayish brown, fine sand, trace medium sand, trace rounded gravels, some silt, trace clay, loose, wet	Slight petroleum odor
7.0	Glacial Outwash		S-12L-B012-6.0-6.5	0810	0.0	SM	SILTY SAND	SILTY SAND: 2.5Y 3/3 dark olive brown, medium sand, little fine sand, some silt, trace clay, medium dense, moist to wet	No odor
7.7	Glacial Outwash		S-12L-B012-7.0-7.5	0810	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 2.5Y 4/2 dark grayish brown, medium sand, little fine sand, little rounded gravel, little silt, trace clay, loose, moist	No odor
10.0	Glacial Outwash							NO RECOVERY	
11.6	Glacial Outwash		S-12L-B012-10.5-11.0	0825	0.0	SW-SM	SAND WITH SILT	WELL GRADED SAND WITH SILT: 2.5Y4/1 dark gray, medium sand, little fine sand, few coarse sand, little silt, trace rounded gravel, loose, moist	No odor
12.8	Glacial Outwash				0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 4/1 dark gray, coarse sand, little medium sand, little fine sand, little silt, little rounded gravel, loose, moist	No odor, pocket of brownish fine sand at interface at 11.6 ft
14.6	Glacial Outwash		S-12L-B012-13.5-14.0	0825	0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 3/1 very dark gray with mottles of 5Y 5/4 olive, coarse sand, little medium sand, little fine sand, few silt, little rounded gravels, medium dense, moist	No odor, sandy mottle of 5Y 5/4 in middle of unit
15.0	Glacial Outwash							NO RECOVERY	
16.7	Glacial Outwash				0.0	SW-SM	SAND WITH SILT AND GRAVEL	WELL GRADED SAND WITH SILT AND GRAVEL: 5Y 3/1 very dark gray with mottles of 5Y 5/4 olive, coarse sand, little medium sand, little fine sand, few silt, little rounded gravels, medium dense, moist	No odor
17.5	Glacial Outwash		S-12L-B012-17.0-17.5	0850	0.0	SW	SAND WITH GRAVEL	WELL GRADED SAND WITH GRAVEL: 10YR 4/6 dark yellowish brown, coarse sand, little medium sand, little fine sand, few silt, little rounded gravels, medium dense, moist	No odor, iron oxide coatings on sand grains, evidence of oxidizing conditions
22.1	Glacial Till		S-12L-B012-18.5-19.0 S-12L-B012-21.0-21.5	0850 0930	0.0	CL	CLAY WITH GRAVEL	LEAN CLAY WITH GRAVEL: 5Y 5/3 olive and 5G 5/1 greenish gray, clay, few silt, few fine sand, little angular gravels, stiff, moist to wet	Some indication of lamellae (banding) in unit, no odor, more reduction in bottom of unit than in top
22.5+	Bedrock							BEDROCK	