

Sediment Sampling Work Plan

BASF (Former Ciba-Geigy Facility)
180 Mill Street, Cranston, Rhode Island

RCRA Corrective Action Program
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BASF Corporation

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1. Introduction

AECOM Technical Services, Inc. (AECOM) has prepared this Sediment Sampling Plan on behalf of BASF Corporation (BASF) to provide sediment quality data in a reach of the Pawtuxet River adjacent to the former Ciba-Geigy Facility located at 180 Mill Street in Cranston, Rhode Island (Facility or Site).

1.1 Site Description and Environmental History

The former Ciba-Geigy Facility was a chemical manufacturing facility operated by Alrose Chemical Company beginning in 1930 and continuing operation until May 1986. The Site is bounded to the south by the Pawtuxet River, to the north and east by residential properties on Mill Street and Robert Circle, respectively, and to the west by industrial properties and undeveloped land (Figure 1). In 2009, BASF acquired Ciba Specialty Chemicals, and BASF retains regulatory responsibility for the Site. Investigation and remediation activities at the Site have been conducted by Ciba (now BASF) under regulatory oversight of the United States Environmental Protection Agency (USEPA) since 1989 as part of the USEPA Resource Conservation and Recovery Act (RCRA) Corrective Action program.

Following closure, the facility was decommissioned, and former production area buildings were demolished to grade. Remedial investigation activities were performed between 1990 and 2014, and several remedial measures were completed both during the investigation and subsequent to the May 2016 Statement of Basis in which the USEPA issued the Remedy Determination for the Facility.

The RCRA Facility Investigation (RFI) (Ciba-Geigy, 1993), Supplemental RFI (AECOM, 2016) and Statement of Basis (USEPA, 2016) identified polychlorinated biphenyls (PCBs) and volatile organic compounds (VOCs) as constituents requiring remediation in the former production area. VOCs identified as constituents of concern (COC) included chlorobenzene, 1,2-dichlorobenzene, 2-chlorotoluene, toluene, and xylenes. Sources of releases included documented chemical spills, a failure of the Boiler Plant Jet Sump, the Hot Sump, and the Building #21 Tank Farm.

Most documented sources of COCs were in upland areas. However, the Boiler Plant Jet Sump was formerly located in the southeastern corner of the property, approximately 20 feet from the river, and the Hot Sump was located in the northeastern corner of the former production area, adjacent to the river. The Boiler Plant Jet Sump failed in the mid-1970s, and solvents were observed in the structure at the time prior to filling the sump in approximately 1978. High concentrations of VOCs were identified in this area during the Supplemental RCRA Field Investigation (RFI). The Hot Sump was connected via an outfall to a cofferdam treatment area in the river. The cofferdam treatment area received facility wastewater from this outfall. This cofferdam was approximately 8 feet wide adjacent to the Facility along a 50-foot length of river.

In 1995 and 1996, an area of visually impacted sediment in the vicinity of the former cofferdam treatment area was excavated and a non-woven geotextile fabric and a 12-inch clean sand cap was placed in the footprint of the excavation as a cap. Long-term periodic monitoring of the cap is required by USEPA in the 2016 Statement of Basis; however, the first monitoring event occurred prior to the issuance of this document, in 2010, following a storm event. Sediment cores from the cap were collected from 12 locations to ensure the cap remained intact and that PCB concentrations in the cap material were not indicative of disturbance of the cap. Based on the results of the 2010 inspection, which demonstrated the cap remained approximately one foot thick and that concentrations of PCBs in the cap material were less than 1 milligram per kilogram (mg/kg), the cap was determined to be functioning as intended.

In 2010, a near-shore sediment sampling program was performed in conjunction with and following the sand cap inspection. Based on the results of that sampling program, in 2011 limited quantities of sediment were removed from three sediment hot spots containing PCBs at concentrations greater than 50 mg/kg. These three areas, known as the SD2R, SD-34, and SD-42 areas, are depicted in Figure 2. More recently, in 2022, additional sediment samples were collected from locations near the Jet Sump area.

The following remedial activities have been completed at the Site under the RCRA program:

1995-1996	Shallow soil excavation and capping to address PCBs Soil vapor extraction (SVE) system installation to address a toluene spill Groundwater extraction and treatment system installation to address constituents of concern discharging to the Pawtuxet River
1995-1997	Sediment excavation and capping to address PCBs in the vicinity of the of the cofferdam treatment area
1997-2005	SVE system operation
1996-2006	Groundwater extraction and treatment system operation
2011	Focused sediment excavation and capping to address PCBs identified during a 2010-2011 sampling program.
2018-2019	Soil excavation and capping to address PCB impacted soil
2018	Introduction of sodium persulfate to address residual VOC impacts in the toluene spill area
2019-2023	Installation and operation of permeable reactive barrier, utilizing alkaline activated persulfate, in the jet sump area

Potential sources of impacts to sediment include the former Facility outfalls, including the outfall at the Hot Sump area, and an abandoned pipe in the Jet Sump area. All outfalls from the upland portions of the Site were capped during facility decommissioning (1986 through 1987). VOCs in groundwater discharging to the river also represent a potential source of impacts to sediment. However, the groundwater plume only extends to the river in the Jet Sump area and discharge is limited by a sheet pile wall extending approximately 20 feet below ground surface.

The Statement of Basis requires periodic monitoring of the sediment cap to ensure that it is operating as intended. Existing Conditions

1.2 Pawtuxet River Sediment Sampling

Under the RCRA program, sediment sampling has occurred at in the Pawtuxet River since the early 1990's. A review of data collected from multiple rounds of sampling indicate that:

- PCBs are present in the sediments adjacent to the Facility; and
- VOCs such as chlorinated benzenes have been detected at high concentrations adjacent to the bulkhead in the upstream portion of the Site, near the former tank storage area.

1.2.1 Historical PCB Sampling and Analysis

Figure 2 depicts the results of PCB sediment sampling conducted between 1990 to 2022. Concentrations of PCBs (analyzed as Aroclors) above 0.4 milligram per kilogram (mg/kg or parts per million) were found in nearshore environments, in the vicinity of the three historic sediment removal areas (SD2R, SD-34, and SD-42) and adjacent to the bulkhead separating the river from upland portions of the Site.

The highest concentrations of PCBs were detected at sampling location PZ-01D2, adjacent to the bulkhead, in August 2022. Concentrations ranged from 840 to 1,200 mg/kg in the upper 5.5 feet of the sediment profile, and concentrations rapidly decreased with depth of the sediment column. Concentrations were less than 1 mg/kg or not detected from 9 feet to the bottom of the core (23.3 feet). PCB concentrations up to 32 mg/kg were detected in the top 2 feet of sediment in samples collected in 2022 near the SD2R and SD-34 removal areas, just downstream of the PZ-01D2 location. Near the SD-42 excavation area and the downstream Facility Railroad Bridge, PCBs were largely found at concentrations less than 0.4 mg/kg. However, in 1994, at two locations in the vicinity of the railroad bridge (SD-TUF2C and SD-TUF2B), PCBs were detected at 2.1 and 75 mg/kg in the 1 to 2 ft sampling horizon.

In the immediate vicinity of the Site, PCB impacts to the Pawtuxet River have largely been bounded by historic sampling activities (Figure 2).

- **Upstream Extent:** Approximately 100 feet upstream of sampling location PZ-01D2, in the transect of samples labeled SD-TUF10A through C, PCB concentrations ranged from ND to 0.021 mg/kg, indicating that the upstream extent of PCB impacts to the river has been defined.
- **Cross-River Extent.** Multiple sediment samples were collected from across the river from the Site. PCB concentrations in these samples ranged ND to 0.3 mg/kg, indicating that PCB impacts do not extend laterally to the southeasterly far-shore side of the river.
- **Downstream Extent:** Approximately 50 feet downstream of the Facility Railroad Bridge, PCB concentrations in a cross-river transect (SD-TUFA through C) ranged from 0.038 to 0.176 mg/kg, indicating that the downstream end of near-Site PCB impacts is well delineated.

A second smaller area of PCB-impacted sediment is located approximately 200 feet downstream of the Facility Railroad Bridge. This area was sampled in 1992, 1994, 1995, and 2002. PCBs were detected in two sample locations (SD-TLF-12B and SD-04R) abutting the northern side of the river at concentrations ranging from ND to 17.5 mg/kg. It is not known if the PCBs in sediment in this other area are related to operations at the Facility.

1.2.2 Historical VOC Sampling and Analysis

Figure 3 depicts the results of sediment sampling for nine selected VOCs¹ conducted between 1992 to 2022. Historic sampling locations are situated adjacent to the bulkhead in an area of presumed former discharges of groundwater to the river and near the old tank storage area. VOCs were not sampled in the middle of or on the far shore of the river.

The highest concentrations of VOCs were detected at sampling location PZ-01D2 in August 2022. This station was sampled in the mudflat adjacent to the open water using mechanical drilling equipment (e.g., an auger or casing rig); as such, deeper samples were obtained than would be with a sediment coring device. Except for 1,2-dichlorobenzene; concentrations of the selected VOCs were highest in the upper 5.5 feet of sediment. Concentrations decreased with depth.

VOC concentrations in the three samples adjacent to the bulkhead ranged from:

- Non detect (ND) to 410 mg/kg for chlorobenzene (maximum in 0.25 to 0.75 ft horizon at PZ-01D2),
- ND to 3,200 mg/kg for trichloroethylene (maximum in 0.25 to 0.75 ft horizon at PZ-01D2),
- ND to 20,000 mg/kg for tetrachloroethylene (maximum in 4 to 5.5 ft horizon at PZ-01D2),
- ND to 3,400 mg/kg for cis-1,2-dichloroethene (maximum in 4 to 5.5 ft horizon at PZ-01D2),
- ND to 130 mg/kg for 1,2-dichlorobenzene (maximum in 9 to 10.4 ft horizon at PZ-01D2),
- ND to 300 mg/kg for 1,2,4-trimethylbenzene (maximum in 4 to 5.5 ft horizon at PZ-01D2),
- ND to 200 mg/kg for 1,3,5-trimethylbenzene (maximum in 4 to 5.5 ft horizon at PZ-01D2),
- ND to 95 mg/kg for toluene (maximum in 4 to 5.5 ft horizon at PZ-01D2),
- ND to 233 mg/kg for xylene (maximum in 4 to 5.5 ft horizon at PZ-01D2),

Available data suggests that sediments impacted with VOCs are limited to the north-westerly side of the river, immediately adjacent to the Facility bulkhead. While no upstream samples were collected, sediment collected from across the river at sampling location SD-02L contained ND to very low (0.063 mg/kg for chlorobenzene and 0.076 mg/kg for toluene) concentrations of VOCs. A 2nd across river sample (SD-03L) is located upstream of the railroad bridge; VOC concentrations at this location were also very low (0.078 mg/kg for chlorobenzene and ND to 0.1 mg/kg for toluene). Approximately 200 linear feet downstream of the Facility Railroad Bridge, at sampling location SD-04R, concentrations of chlorobenzene and toluene were detected at concentrations ranging from 0.17 to 0.66 and ND to 0.58 mg/kg, respectively.

¹ Chlorobenzene, trichloroethylene, tetrachloroethylene, cis-1,2-dichlorobenzene, 1,2-dichlorobenzene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, toluene and xylene were selected to present on Figure 3 as indicative VOCs detected in sediment.

2. Scope of Work

PCBs and VOCs are present in Pawtuxet River sediments at elevated concentrations, particularly near the bulkhead and adjacent to the Facility. Although the upstream and downstream sediment impacts are well delineated, given the age and limitations of the existing data set, developing a better understanding of the distribution of these constituents in the river adjacent to the Facility is necessary.

For the purposes of this Work Plan, three distinct areas of the river requiring additional investigation have been operationally defined:

- **Study Area 1:** The reach of the Pawtuxet River adjacent to the Facility
- **Study Area 2:** The portion of the river approximately 200 ft downstream of the Facility Railroad Bridge where PCBs were detected in some samples.
- **Background:** Clean boundary transects have been identified approximately 50 ft upstream and immediately downstream of the Former Railroad Bridge, bracketing Study Area 1. Additional background/reference samples have been located upstream of the boundary.

The sediment sampling procedures are provided in Appendix A.

2.1 Study Area 1

The Study Area 1 sediment sampling program has been designed using gridded nodes on 50-foot centers in the river (Figure 4 and Figure 5). The longitudinal spacing is 50-ft for all samples; the latitudinal spacing varies from 34-ft to 50-ft to maximize coverage in the river. Samples will be collected along four transects (Transects A, B, C, and D) running longitudinally or parallel to the river flow. Transect A is the transect on the side of the river adjacent to the Facility. The 50-foot on center sampling frequency will provide the level of characterization needed to evaluate the current conditions of PCB and VOC concentrations in the sediment and provide a delineation longitudinally (upstream and downstream), latitudinally (across the river), and horizontally (depth). The information presented in Section 1 has been used to inform the sampling program presented below.

At each sampling location, sediment cores will be advanced via vibracore to 6 feet below sediment surface or refusal (or indication of native materials [i.e., silt with clay]) and sub-divided into discrete sampling horizons. As described below, some sediment samples will be analyzed immediately, and other samples will be archived (stored at the laboratory) for potential future analysis, pending review of results of the initial analyses.

Sediment samples collected from Study Area 1 will be evaluated for the following parameters:

- VOCs (Method SW-846 82620B);
- PCB congeners (Method EPA method 1628);
- Total Organic Carbon (TOC) (Lloyd Kahn method); and
- Grain size (Method ASTM D422).

Details of the analyses are provided in the Quality Assurance Project Plan (QAPP) Addendum (Appendix B). This sampling and analysis program has been designed to maximize efficiency with sampling (collection of cores in one vessel mobilization) and provide flexibility in the analytical approach. Sampling depths have been selected based on evidence (i.e., PCB and VOC concentrations) from previous investigations; therefore, not all cores will have samples from all horizons analyzed immediately.

As depicted in Figures 4 and 5, and based on the historical information presented in Section 3, the following sampling and analysis approach will be used in Study Area 1, which includes the Study Area 1 Transects the Upstream and Downstream Boundary Transects:

1. Sediment cores will be advanced to six feet below sediment surface or refusal at all sampling locations (n = 38), and sub-divided into the following distinct sediment horizons based on core recovery:

- 0.0 to 0.5 feet below sediment surface;
 - 0.5 to 2.0 feet below sediment surface;
 - 2.0 to 3.0 feet below sediment surface;
 - 3.0 to 4.0 feet below sediment surface;
 - 4.0 to 5.0 feet below sediment surface; and
 - 5.0 to 6.0 feet below sediment surface
2. All sediment samples collected will be collected in the field in appropriate containers using preservation per the QAPP in Appendix B (whether analyzed immediately or archived).
 3. Based on the results of the historical sampling efforts described above, the following sampling and analysis program will be performed in Study Area 1:
 - **Transect A and Transect B:** all sediment samples, at all depths will be analyzed for PCBs, TOC, VOC, and grain size.
 - **Transect C:** The top 2 feet of sediment (0 to 0.5, and 0.5 to 2 foot horizons) will be initially analyzed for PCBs, TOC, and grain size. The samples from the remaining horizons will be archived at the laboratory. VOCs have not been detected historically in this portion of the river. Samples will be collected for VOCs from five locations in Transect C and archived at the laboratory.
 - **Transect D:** The top 2 feet of sediment (0 to 0.5, and 0.5 to 2 foot horizons) will be initially analyzed for PCBs, TOC, and grain size. Samples from horizons below 2 ft in Transect D will be archived and analyzed as needed, pending the results of the analyses in the top 2 ft. VOCs have not been detected historically in this portion of the river and will not be collected from Transect D.

Samples that have been archived at the laboratory will be analyzed following a review of sample results from the adjacent transects and, if applicable, the surficial horizons from that core.

- **PCBs:** If PCBs are detected in adjacent samples (latitudinally or longitudinally) above 1 mg/kg (total congeners), BASF will analyze archived samples.
- **VOCs:** Due to the shorter holding time for VOCs (i.e., 28 days), VOCs will be analyzed if concentrations exceed risk-based screening values² for benthic organisms.

Table 1 Proposed Samples and Analyses – Study Area 1 Grid Sampling Sediment Chemistry Program (PCB Congeners, VOCs, TOC, and Grain Size)

Sampling Horizon (ft)	Number of Samples Analyzed for PCBs, TOC, and Grain size	Number of Samples Placed On Hold for PCBs, TOC, and Grain size	Number of Samples Analyzed for VOCs	Number of Samples Placed On Hold for VOCs
0 to 0.5	38	0	17	10
0.5 to 2	38	0	17	10
2 to 3	17	21	7	20
3 to 4	17	21	7	20
4 to 5	17	21	7	20
5 to 6	17	21	7	20
Total	144	84	62	100

Notes:

1. Sampling to 6 feet dependent on field conditions. Cores will be collected to a maximum of 6 feet or to refusal.

² The benthic screening values will include NYSDEC and USEPA Region 4 screening values, adjusted to site-specific organic carbon content.

2.2 Study Area 2

Sampling and analysis in Study Area 2, located approximately 200 linear feet downstream of Study Area 1, will focus on the nearshore environment. Based on the historical information presented in Section 1, while there is no indication of VOC impacts in this portion of the Site, it is possible that elevated PCBs occur in the sediment. Therefore, a sediment coring and PCB sampling and analysis program will be conducted to in this area to better delineate current day conditions.

Figure 4 presents the Study Area 2 sampling grid. Sediment cores will be advanced to 6 feet or refusal, and sediment samples will be collected as follows:

- 0.0 to 0.5 feet below sediment surface;
- 0.5 to 2.0 feet below sediment surface;
- 2.0 to 3.0 feet below sediment surface;
- 3.0 to 4.0 feet below sediment surface;
- 4.0 to 5.0 feet below sediment surface; and
- 5.0 to 6.0 feet below sediment surface

Sediment samples collected from Study Area 2 will be evaluated for the following parameters:

- PCB congeners (Method 1628);
 - TOC (Lloyd Kahn); and
 - Grain size (Method D422).
1. Based on the results of the historical sampling efforts described above, the following sampling and analysis program will be performed in Study Area 2:
 - **Transect A and Transect B:** all sediment samples, at all depths will be analyzed for PCBs, TOC, and grain size.
 - **Transect C:** The top 2 feet of sediment (0 to 0.5, and 0.5 to 2 foot horizons) will be initially analyzed for PCBs, TOC, and grain size. The remaining horizons will be archived at the laboratory.
 2. Samples that have been archived at the laboratory will be analyzed following a review of sample results from the adjacent transects and, if applicable, the surficial horizons from that core.
 - **PCBs:** If PCBs are detected in adjacent samples (latitudinally or longitudinally) above 1 mg/kg (total congeners), BASF will analyze archived samples.

Table 2 Proposed Samples and Analyses – Study Area 2 Grid Sampling Sediment Chemistry Program (PCB Congeners, TOC, and Grain Size)

Sampling Horizon (ft)	Number of Samples Analyzed for PCBs, TOC and Grain size	Number of Samples Placed On Hold for PCBs, TOC, and Grain size
0 to 0.5	9	0
0.5 to 2	9	0
3 to 3	6	3
3 to 4	6	3
4 to 5	6	3
5 to 6	6	3
Total	42	12

Notes:

1. Sampling to 6 feet dependent on field conditions. Cores will be collected to a maximum of 6 feet or to refusal.

2.3 Background

Given the urban and historic industrialized nature of the Pawtuxet River, an understanding of potential continuing sources to the sediments in the vicinity of the Site is an important element to future planning at the Site.

A grid of four (4) samples have been placed on Figures 4 and 5 for background sampling. These samples are located approximately 500 ft upstream of the Study Area 1 boundary.

A literature review of historic or current sources of contamination upstream is currently being conducted. Should any potential sources be identified, additional background locations may be collected, and an addendum to the Sampling Plan depicting sampling locations will be provided to USEPA prior to the initiation of field work.

3. Sediment cores will be advanced to six feet below sediment surface or refusal at all background sampling locations (n = 4), and sub-divided into the following distinct sediment horizons based on core recovery:
 - 0.0 to 0.5 feet below sediment surface;
 - 0.5 to 2.0 feet below sediment surface;
 - 2.0 to 3.0 feet below sediment surface;
 - 3.0 to 4.0 feet below sediment surface;
 - 4.0 to 5.0 feet below sediment surface; and
 - 5.0 to 6.0 feet below sediment surface
4. All sediment samples collected will be collected in the field in appropriate containers using preservation per the QAPP in Appendix B (whether analyzed immediately or archived).
5. The top 2 feet of sediment (0 to 0.5, and 0.5 to 2 foot horizons) will be initially analyzed for PCBs, TOC, VOCs, and grain size. The samples from the remaining horizons will be archived at the laboratory.

Table 3 Proposed Samples and Analyses – Background Grid Sampling Sediment Chemistry Program (PCB Congeners, VOCs, TOC, and Grain Size)

Sampling Horizon (ft)	Number of Samples Analyzed for PCBs, TOC, VOCs, and Grain size	Number of Samples Placed On Hold for PCBs, TOC, VOCs, and Grain size
0 to 0.5	4	0
0.5 to 2	4	0
3 to 3	0	4
3 to 4	0	4
4 to 5	0	4
5 to 6 ²	0	4
Total	8	16

Notes:

1. Additional samples may be added pending results of file review.
2. Sampling to 6 feet dependent on field conditions. Cores will be collected to a maximum of 6 feet or to refusal.

The 2012 QAPP (AECOM, 2012) includes additional detail regarding Quality Control (QC) samples and data validation. The QAPP Addendum (Appendix B) provides additional detail regarding sample containers, preservatives, holding times, and special QC samples.

3. References

AECOM, 2012. Quality Assurance Project Plan for Supplemental Remedial Investigation at BASF (Former Ciba-Geigy Facility), 180 Main Street, Cranston, Rhode Island. May 23, 2012.

Appendix A Field Sampling Procedures

This appendix describes the procedures that will be implemented for the field sampling activities in the Pawtuxet River adjacent to the Facility. The field program will include surficial and sub-surficial sediment sampling and analysis. Data generated through this field program will be used to further the evaluation of the nature and extent of potentially impacted sediments in the river adjacent to the Site.

The proposed sampling locations are shown on Figure 4 of the work plan. Station locations may be slightly modified from points presented in Figure 4 based on conditions encountered in the field. Locations may be moved up to 10 feet from the proposed location due to issues with the substrate, penetration, or recovery. Cores will be collected beginning with downstream stations and continue towards the upstream locations. Sediment sampling station locations will be documented using a portable differential global positioning system (GPS) unit with sub-meter accuracy and real-time radial beacon correction.

A.1 Mobilization and Demobilization

The USEPA and Rhode Island Department of Environmental Management (RIDEM) will be given a minimum of two weeks' notice prior to the initiation of the field activities identified in this Work Plan. Mobilization for the field effort will include a kick-off meeting for the field team (and USEPA and RIDEM, should they be interested), subcontracting all required laboratories, subcontractors, purchasing/renting field equipment, coordinating receipt of sample bottles from the laboratory and verifying mass and volume requirements, and obtaining site clearance for the field team (if required). It is anticipated that the vessel to be used for coring will need to be launched using a crane from the Site. Prior to conducting any work at the Site, a Health and Safety Plan (or addendum) will be prepared including Task Hazard Analysis (THA) forms for each step in the program. Subcontractors will be vetted within the AECOM system for safety.

Field data sheets will be prepared during project mobilization. Prior to the mobilization/demobilization, a field reconnaissance trip may be held to refine sampling location selection.

A.2 Sediment Sampling and Analysis

The sediment sampling program is expected to commence pending approval of this work plan by USEPA. Sediment samples will be analyzed for the parameters listed in Appendix B.

As described in the USEPA's (2001) Method for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual³, the sampling station locations were selected following a "Systematic Sampling Design". Sample locations were identified in a grid pattern.

Whenever boat access is feasible (i.e., when river water levels and conditions permit), sediment sampling will be conducted via a vibracore-equipped hydraulic sampling device or a piston-coring device mounted aboard a sampling vessel. In the case that a vibracore or piston core device cannot be utilized, a decontaminated Ted Young grab, Ekman Dredge, petite Ponar, or equivalent sampling device will be used to collect the surficial sediment samples, and a hand-held coring devices will be used to sample sub-surficial materials. The deployment and retrieval of the sampling device will be conducted in a controlled manner to avoid deficient samples. All samples will be visually inspected immediately upon retrieval. Sample acceptability will be based on the guidelines outlined in Section 3.3 of the USEPA(2001) Technical Manual whereas samples may be rejected based on lack of penetration, over penetration, loss of fine-grained particulates on sediment surface, etc.

Based on the earlier studies, it is anticipated that the core sample will demonstrate a layer of native materials at a depth of approximately 4 to 6 feet in the Pawtuxet River. Each core will be logged, photographed, and sub-sampled as per the specified analytes require. It is anticipated that collecting sub-surficial sediment samples from certain portions of the Site may be challenging due to geological constraints, and that therefore deeper sediment samples may not be obtainable form all target stations.

³ Available online: <https://www.epa.gov/sites/default/files/2015-09/documents/collectionmanual.pdf>

As described in Appendix B and Table 1 of the Work Plan, surficial and sub-surficial sediment samples will be evaluated for the following parameters:

- VOCs,
- PCB congeners,
- TOC, and
- Grain size.

Additional detail regarding sampling (including sample containers, preservatives, holding times, and QC samples) and validation is presented in Appendix B, which provides the QAPP Addendum for this program.

A.3 General sediment sampling procedures

Upon retrieval of the core and examination for acceptable recovery, the core will be laid on its side and the liner split from surface to bottom. The core will be screened using a photoionization detector (PID). Locations of PID detections will be documented and sampled immediately for VOCs, up to one sample per horizon as defined above. If the PID does not indicate the presence of volatile organics, the VOC samples will be collected from each horizon using small amounts of sediment composited from along the length of sampling horizon.

VOC samples will be collected per the QAPP and preserved in methanol and deionized water. The preservative will be added to the vials by the laboratory prior to sending bottleware the site.

Following collection of VOC samples, the core will be characterized and described. Each core will be visually examined for physical characteristics such as composition, layering, odor, and discoloration. This information will be recorded in electronic field forms.

The appropriate sediment horizon (surficial or sub-surficial) will be removed from the coring device using a stainless steel or dedicated disposable plastic spoon/scoop and placed in a decontaminated 1-gallon stainless steel or Pyrex glass mixing bowl. Samples will be homogenized in the mixing bowl and placed in appropriate sample containers. Sediment sampling equipment such as bowls, spoons, augers, and dredges will be decontaminated prior to and following sample collection as described below.

The sample containers will be pre-labeled by the sampling task manager at the beginning of each day. Electronic sample collection forms will be used to record pertinent data while sampling. The time of sampling will be recorded on each pre-labeled bottle. All samples will be stored on ice (at $4^{\circ}\text{C} \pm 2^{\circ}\text{C}$), packed in coolers, and shipped under chain of custody for laboratory analysis as described in the QAPP. All laboratories used for sediment analyses are listed in the QAPP.

Samples that will not be immediately analyzed by the laboratory will be archived for possible future analysis. Such samples will initially be stored at the analytical laboratory pending review of other analytical data. Samples analysis may be required of the archived samples to delineate concentrations at other sample locations/horizons. Archive samples will be clearly marked on the sample containers and the chain of custody. The laboratory and the AECOM chemist will keep a record of samples held as archive including the holding times.

A.4 Field Records

The Field Team Leader (FTL) will be responsible for maintaining a detailed digital log of field activities. The field log will contain a chronological description of sample collection activities. The log will include information such as names and times for which all project-related personnel (consultant, subcontractors, and client) who are on-site, health and safety information, work-area assignments and goals, general notation of time and weather conditions, description of work-related problems and their solutions, any specific scope of work deviations, among other information. The log will identify the project name and the date and location of each activity completed.

Other field records such as sampling logs will also be collected using a tablet. Logs will include entries in every blank, with appropriate use of the abbreviations NA (not available) and NR (not recorded). The electronic forms will be developed in coordination with the database manager to provide data in a format easily imported into a database. Core logs will be developed using these data. At the end of each day, all completed field records will be uploaded to

the AECOM servers. Shipping and other paper forms will be scanned and uploaded. Originals will be retained by the FTL.

Shipping forms will be recorded in black waterproof ink. Corrections will include a single line crossing out the incorrect data, such that the incorrect data remains legible, and initialed by the field staff member.

A.5 Decontamination

Non-disposable or non-dedicated sampling equipment (e.g., dredge or core barrel, stainless spoons, stainless bowls, etc.) will be decontaminated prior to sampling and between samples. Cleaning of equipment is performed to prevent cross-contamination between samples and to maintain a clean working environment for all personnel.

Decontamination will generally consist of a station river water rinse to remove gross contamination (if needed), followed by a non-phosphate detergent (e.g., Alconox) water rinse, a rinse with a solvent (e.g., methanol), and a final rinse with de-ionized water. If equipment is to be stored or transported, it will be wrapped in aluminum foil after air-drying.

A.6 Sample documentation

A.6.1 Photographic records

Photographs from the site investigations and from site visits will be included in the reporting process. Photographs will be numbered and documented sequentially. The numbering system will include date and location for each photograph taken.

A.6.2 Sample labels

The sample containers will be labeled with a pre-printed adhesive label, which includes the site name, the analysis to be performed, the preservative, and a unique sample identifier. Field personnel will use a permanent marker to mark the date and time of collection and the sampler's initials once the label is affixed to the sampling container.

A.6.3 Chain-of-custody records

Samples will be accompanied by a properly completed chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the FTL to another person, to the permanent laboratory, or to/from a secure storage location.

The minimum information that will be recorded on the chain-of-custody in addition to the signatures and dates of all custodians will be:

- Client/project name,
- Project location,
- Project number,
- Field logbook number,
- Chain-of-custody tape numbers,
- The person to whom results should be reported,
- Field sampling number/identification,
- Sampling date and time,
- Type of sample (grab or composite),
- Identification of sample collector and his/her affiliation,
- Sample container number, size, and material,
- Sample description (matrix),

- Sample preservative (if any), and
- Analyses to be performed.

The FTL will be personally responsible for the care and custody of the samples until the samples are transferred or dispatched properly. As few people as possible should handle the samples. The FTL will review field activities to determine whether proper custody procedures were followed during the field work and will decide if additional samples are required.

A.6.4 Sample packaging and shipping requirements

Samples will be packaged properly for shipment and dispatched to the laboratories for analysis. A separate signed custody record will be enclosed in each sample cooler. Shipping containers will be locked or secured with strapping tape and sealed with custody seals. The preferred procedure is to attach a custody seal to the front right and back left of the cooler. The cooler will be taped closed with fiberglass tape covering the chain-of-custody seals.

Samples will be shipped daily from the field to the laboratory using an overnight courier or onsite pickup by the laboratory. All shipments will be accompanied by the chain-of-custody record identifying the contents. The back copy of the chain-of-custody will be detached and kept as part of the field records. The original record and remaining copies will accompany the shipment.

A.7 Investigation derived wastes

Given the nature of the field sampling effort (e.g., sediment), it is anticipated that only very limited waste materials will be generated during the field investigation. These materials include:

- Decontamination fluid;
- Used Personnel Protective Equipment (PPE);
- Used sampling equipment.

These wastes will be handled in the following manner:

- River water as well as de-ionized water used for final rinsing sampling equipment will be released back to the water body in the immediate vicinity of its point of generation.
- Phosphate-free detergent wash water used for decontamination will be contained in 55-gallon drums or bulk containers.
- Solvents will be retained in a container designed to hold flammable materials.
- Used PPE, such as sampling gloves, paper towels, or other materials will be bagged and sealed prior to disposal as general refuse. If PPE becomes grossly contaminated, it will be segregated from other PPE, labeled and staged as "contaminated material". Contaminated material will be drummed and staged in the IDW area designated by BASF or AECOM personnel. The field team will arrange for off-site disposal of drums by a licensed waste hauler at an approved facility.
- Used disposable sampling equipment, which generally has minor contamination, will be disposed of with the PPE as general refuse. Contaminated disposable equipment will require segregation from other equipment and proper disposal.

Appendix B Quality Assurance Project Plan Addendum

B.1 Analytical information

Table B-1. Project Action Levels (PALs) and Laboratory Reporting Limits for VOCs in Sediment.

Parameter (Low-Level)	PAL (mg/kg)	Laboratory Reporting Limit (mg/kg)
1,1,1-Trichloroethane	1.6E+02	0.005
1,1,2,2-Tetrachloroethane	5.6E-01	0.005
1,1,2-Trichloro-1,2,2-trifluoroethane	4.3E+03	0.005
1,1,2-Trichloroethane	1.1E+00	0.005
1,1-Dichloroethane	3.3E+00	0.005
1,1-Dichloroethene	7.0E-01 ³	0.005
1,2,3-Trichlorobenzene	4.9E+00	0.005
1,2,4-Trichlorobenzene	2.2E+01	0.005
1,2-Dibromo-3-chloropropane	5.4E-03	0.005
1,2-Dibromoethane	3.4E-02	0.005
1,2-Dichlorobenzene	1.9E+02	0.005
1,2-Dichloroethane	4.3E-01	0.005
1,2-Dichloropropane	9.4E-01	0.005
1,3-Dichlorobenzene	2.4E+00	0.005
1,4-Dichlorobenzene	2.4E+00	0.005
1,4-Dioxane	4.9E+00	0.1
2-Butanone	2.8E+03	0.05
2-Hexanone	2.1E+01	0.05
4-Methyl-2-pentanone	5.3E+02	0.05
Acetone	6.1E+03	0.05
Benzene	1.1E+00	0.005
Bromochloromethane	1.6E+01	0.005
Bromodichloromethane	2.7E-01	0.005
Bromoform	6.2E+01	0.005
Bromomethane	7.3E-01	0.010
Carbon disulfide	8.2E+01	0.005
Carbon tetrachloride	6.1E-01	0.005
Chlorobenzene	2.9E+01	0.005
Chloroethane	1.5E+03	0.01
Chloroform	2.9E-01	0.005
Chloromethane	1.2E+01	0.01
cis-1,2-Dichloroethene	1.6E+01	0.005
cis-1,3-Dichloropropene	1.7E+00	0.005
Cyclohexane	7.0E+02	0.005
Dibromochloromethane	6.8E-01	0.005
Dichlorodifluoromethane	9.4E+00	0.01
Ethylbenzene	5.4E+00	0.005
Isopropylbenzene	2.1E+02	0.005
Methyl acetate	7.8E+03	0.01

Parameter (Low-Level)	PAL (mg/kg)	Laboratory Reporting Limit (mg/kg)
Methylcyclohexane	7.0E+02	0.005
Methylene chloride	1.1E+01	0.025
Methyl-tert-butyl ether	4.3E+01	0.005
o-Xylene	6.9E+01	0.005
p/m-Xylene	5.9E+01	0.01
Styrene	6.4E+01 ³	0.005
Tetrachloroethene	5.5E-01	0.005
Toluene	5.4E+01	0.005
trans-1,2-Dichloroethene	1.5E+01	0.005
trans-1,3-Dichloropropene	1.7E+00	0.005
Trichloroethene	9.1E-01	0.005
Trichlorofluoromethane	7.9E+01	0.005
Vinyl chloride	6.0E-02	0.01

Note: PALs listed are for human exposure to VOCs in soil and are provided for reference only. See AECOM, 2012 for details.

Table B-2. Project Action Levels (PALs) and Laboratory Reporting Limits for VOCs in Sediment.

PCB Congener	Laboratory Reporting Limit (mg/kg)	Laboratory Method Detection Limit (mg/kg)
PCB-1	0.2	0.095
PCB-2	0.2	0.059
PCB-3	0.2	0.069
PCB-4/10	0.4	0.163
PCB-7/9	0.4	0.110
PCB-6	0.2	0.043
PCB-8/5	0.4	0.096
PCB-14	0.2	0.039
PCB-11	0.2	0.069
PCB-12/13	0.4	0.172
PCB-15	0.2	0.070
PCB-19	0.2	0.078
PCB-30	0.2	0.060
PCB-18	0.2	0.069
PCB-17	0.2	0.053
PCB-24/27	0.4	0.085
PCB-16/32	0.4	0.143
PCB-34/23	0.4	0.101
PCB-29	0.2	0.056
PCB-26	0.2	0.069
PCB-25	0.2	0.076
PCB-31	0.2	0.099
PCB-28	0.2	0.088
PCB-33/20/21	0.6	0.230
PCB-22	0.2	0.097
PCB-36	0.2	0.128

PCB Congener	Laboratory Reporting Limit (mg/kg)	Laboratory Method Detection Limit (mg/kg)
PCB-39	0.2	0.116
PCB-38	0.2	0.108
PCB-35	0.2	0.171
PCB-37	0.2	0.080
PCB-54	0.2	0.074
PCB-50	0.2	0.038
PCB-53	0.2	0.050
PCB-51	0.2	0.047
PCB-45	0.2	0.061
PCB-46	0.2	0.054
PCB-52/73	0.4	0.183
PCB-49/43	0.4	0.175
PCB-47/48/75	0.6	0.281
PCB-44	0.2	0.100
PCB-42	0.2	0.104
PCB-40	0.2	0.190
PCB-69	0.2	0.063
PCB-65	0.2	0.055
PCB-62	0.2	0.055
PCB-59	0.2	0.062
PCB-72	0.2	0.069
PCB-71	0.2	0.079
PCB-41/64	0.4	0.088
PCB-68	0.2	0.061
PCB-57	0.2	0.065
PCB-67	0.2	0.070
PCB-58	0.2	0.066
PCB-63	0.2	0.058
PCB-74/61	0.4	0.164
PCB-70	0.2	0.076
PCB-76	0.2	0.082
PCB-66/80	0.4	0.191
PCB-55	0.2	0.080
PCB-56/60	0.4	0.162
PCB-79	0.2	0.109
PCB-78	0.2	0.103
PCB-81	0.2	0.073
PCB-77	0.2	0.062
PCB-104	0.2	0.076
PCB-96	0.2	0.097
PCB-103	0.2	0.058
PCB-100	0.2	0.061
PCB-94	0.2	0.044
PCB-98/102	0.4	0.132

PCB Congener	Laboratory Reporting Limit (mg/kg)	Laboratory Method Detection Limit (mg/kg)
PCB-95/93	0.4	0.110
PCB-88/121	0.4	0.152
PCB-91	0.2	0.063
PCB-92	0.2	0.065
PCB-84	0.2	0.048
PCB-90/101/89	0.6	0.191
PCB-99	0.2	0.090
PCB-83/109	0.4	0.150
PCB-97/86	0.4	0.110
PCB-87/115/116	0.6	0.235
PCB-82	0.2	0.052
PCB-113	0.2	0.051
PCB-119	0.2	0.052
PCB-112	0.2	0.061
PCB-125	0.2	0.046
PCB-111/117	0.4	0.123
PCB-110	0.2	0.073
PCB-124	0.2	0.068
PCB-107/108	0.4	0.128
PCB-123	0.2	0.055
PCB-118/106	0.4	0.142
PCB-114	0.2	0.058
PCB-122	0.2	0.048
PCB-105/127	0.4	0.190
PCB-85/120	0.4	0.221
PCB-126	0.2	0.094
PCB-155	0.2	0.074
PCB-150	0.2	0.049
PCB-152	0.2	0.056
PCB-145	0.2	0.050
PCB-148	0.2	0.069
PCB-136	0.2	0.046
PCB-154	0.2	0.071
PCB-151	0.2	0.053
PCB-144/135	0.4	0.115
PCB-147	0.2	0.065
PCB-149/139	0.4	0.118
PCB-140	0.2	0.061
PCB-143	0.2	0.055
PCB-134	0.2	0.035
PCB-133	0.2	0.049
PCB-131/142	0.4	0.078
PCB-165	0.2	0.054
PCB-146	0.2	0.051

PCB Congener	Laboratory Reporting Limit (mg/kg)	Laboratory Method Detection Limit (mg/kg)
PCB-161	0.2	0.077
PCB-153	0.2	0.071
PCB-132/168	0.4	0.161
PCB-141	0.2	0.080
PCB-137	0.2	0.072
PCB-130	0.2	0.112
PCB-158/160	0.4	0.180
PCB-129	0.2	0.071
PCB-166	0.2	0.102
PCB-159	0.2	0.117
PCB-162	0.2	0.108
PCB-128	0.2	0.069
PCB-167	0.2	0.089
PCB-156	0.2	0.089
PCB-157	0.2	0.114
PCB-138/163/164	0.6	0.275
PCB-169	0.2	0.077
PCB-188	0.2	0.083
PCB-184	0.2	0.091
PCB-179	0.2	0.083
PCB-176	0.2	0.090
PCB-186	0.2	0.096
PCB-178	0.2	0.088
PCB-175	0.2	0.060
PCB-187/182	0.4	0.150
PCB-183	0.2	0.069
PCB-185	0.2	0.069
PCB-174	0.2	0.082
PCB-181	0.2	0.059
PCB-177	0.2	0.063
PCB-171	0.2	0.077
PCB-173	0.2	0.056
PCB-172/192	0.4	0.148
PCB-180	0.2	0.081
PCB-170/190	0.4	0.112
PCB-193	0.2	0.082
PCB-191	0.2	0.085
PCB-189	0.2	0.068
PCB-202	0.2	0.074
PCB-201	0.2	0.066
PCB-204	0.2	0.072
PCB-197	0.2	0.085
PCB-200	0.2	0.059
PCB-198	0.2	0.084

PCB Congener	Laboratory Reporting Limit (mg/kg)	Laboratory Method Detection Limit (mg/kg)
PCB-199	0.2	0.083
PCB-196/203	0.4	0.181
PCB-195	0.2	0.067
PCB-194	0.2	0.062
PCB-205	0.2	0.069
PCB-208	0.2	0.071
PCB-207	0.2	0.061
PCB-206	0.2	0.088
PCB-209	0.2	0.075

Table B-3. Sample Containers, Preservation, and Holding Time Requirements

Parameter	Container	Preservation	Holding Time
VOCs	High level analysis: 1- 40 mL vial filled with 5 mL methanol (5 g soil to 5 mL methanol) Low level analysis: 2-40 mL vials with Teflon stir bar and filled with 5 mL deionized water (5 g soil to 5 mL deionized water) % solids: 1 - 60 mL plastic	Ice, 4°C, in field	48 hours to freezing for water preserved samples 28 days from collection to analysis for methanol and water preserved samples
PCB – Congeners	1-8 oz amber glass with Teflon-lined cap	Ice, 4°C. Lab storage at <-10°C.	365 days to extraction 40 days from extraction to analysis
Total Organic Carbon	1-4 oz amber glass with Teflon-lined cap	Ice, 4°C	14 days to analysis
Grain Size Analysis	1 gallon zip-lock PE bag or gallon plastic container	none	none

Table B-4. Analytical Methods

Parameter	Method
TCL VOCs	SW-846 8260B
PCB – Congeners	EPA Method 1628
Total Organic Carbon	Lloyd Kahn
Grain Size Analysis	ASTM D422

Table B-5. Laboratory Standard Operating Procedures

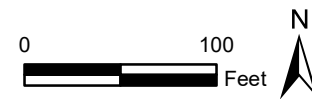
Reference Number	Laboratory Performing Analysis	Title	Reference Number
SOP No. 20_5035	ESS	Volatile Compounds by Gas Chromatography/ Mass Spectrometry (GC/MS): Capillary Column Technique (SW-846 Method 5035)	VOCs (soil)
LR PCB Congeners	SGS-Wilmington	Standard Operating Procedure for the Analysis of Polychlorinated Biphenyl Congeners by Low-Resolution GC/MS	PCB congeners

Figures



- Legend**
- Former Tank Farm
 - Former Building Footprint
 - Property Boundary
 - Bulkhead

Sources
 1. Aerial Photography from RIGIS (2022).
 2. RFI Report, Pawtuxet River, Woodward-Clyde, March 1996.



**FORMER CIBA-GEIGY
 SITE INVESTIGATION
 CRANSTON, RI**

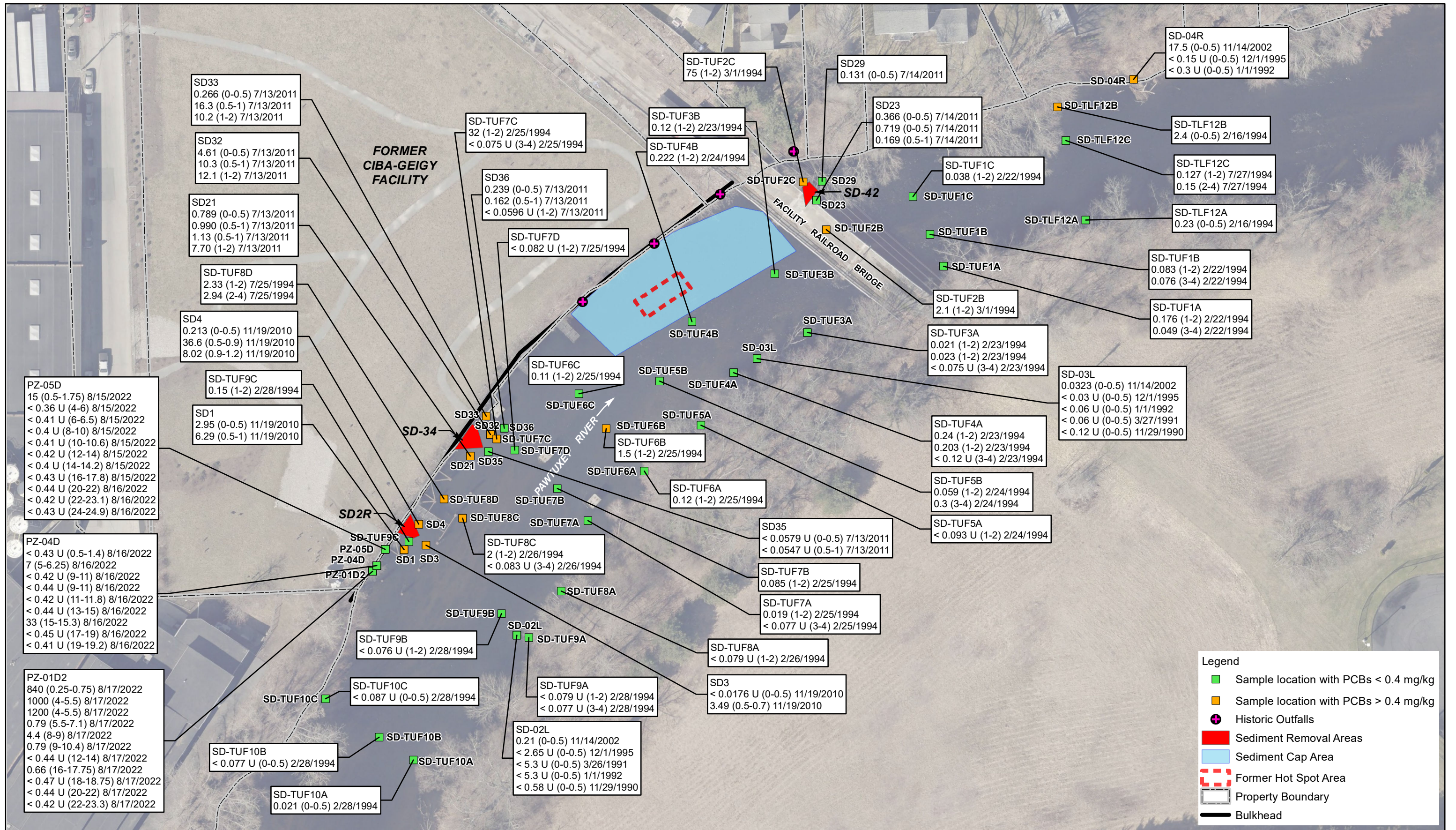
DATE: 6/19/2023

DRWN: JB

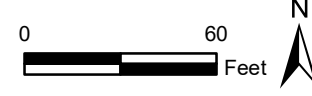
KEY MAP

**FIGURE 1
 SITE LOCATION MAP**





Sources
 1. Aerial Photography from RIGIS (2022).
 2. RFI Report, Pawtuxet River, Woodward-Clyde, March 1996.



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 SITE INVESTIGATION
 CRANSTON, RI
 DATE: 6/16/2023 DRWN: JB

FIGURE 2
 RESULTS OF HISTORIC SAMPLING
 IN SEDIMENT OF PAWTUXET RIVER
 TOTAL PCBs (MG/KG)



PZ-01D2
 Chlorobenzene 410 (0.25-0.75) 8/17/2022
 Chlorobenzene 360 (4-5.5) 8/17/2022
 Chlorobenzene 270 (4-5.5) 8/17/2022 (Dup)
 Chlorobenzene 4.9 (5.5-7.1) 8/17/2022
 Chlorobenzene 5.9 (8-9) 8/17/2022
 Chlorobenzene 6.3 (9-10.4) 8/17/2022
 Trichlorethylene 3200 (0.25-0.75) 8/17/2022
 Trichlorethylene 2900 (4-5.5) 8/17/2022
 Trichlorethylene 1800 (4-5.5) 8/17/2022 (Dup)
 Trichlorethylene 0.0053 (5.5-7.1) 8/17/2022
 Trichlorethylene 2.3 (8-9) 8/17/2022
 Trichlorethylene < 0.35 U (9-10.4) 8/17/2022
 Tetrachloroethylene 14000 (0.25-0.75) 8/17/2022
 Tetrachloroethylene 20000 (4-5.5) 8/17/2022
 Tetrachloroethylene 13000 (4-5.5) 8/17/2022 (Dup)
 Tetrachloroethylene 0.6 (5.5-7.1) 8/17/2022
 Tetrachloroethylene 18 (8-9) 8/17/2022
 Tetrachloroethylene 0.52 (9-10.4) 8/17/2022
 Cis-1,2,-Dichloroethene 3300 (0.25-0.75) 8/17/2022
 Cis-1,2,-Dichloroethene 3400 (4-5.5) 8/17/2022
 Cis-1,2,-Dichloroethene 1600 (4-5.5) 8/17/2022 (Dup)
 Cis-1,2,-Dichloroethene < 0.0053 U (5.5-7.1) 8/17/2022
 Cis-1,2,-Dichloroethene 2.7 (8-9) 8/17/2022
 Cis-1,2,-Dichloroethene 1.9 (9-10.4) 8/17/2022
 1,2-Diclorobenzene < 120 U (0.25-0.75) 8/17/2022
 1,2-Diclorobenzene < 11 U (4-5.5) 8/17/2022
 1,2-Diclorobenzene < 91 U (4-5.5) 8/17/2022 (Dup)
 1,2-Diclorobenzene 0.72 (5.5-7.1) 8/17/2022
 1,2-Diclorobenzene 9.1 (8-9) 8/17/2022
 1,2-Diclorobenzene 130 (9-10.4) 8/17/2022
 1,2,4-Trimethylbenzene 410 (0.25-0.75) 8/17/2022
 1,2,4-Trimethylbenzene 160 (4-5.5) 8/17/2022
 1,2,4-Trimethylbenzene 300 (4-5.5) 8/17/2022 (Dup)
 1,2,4-Trimethylbenzene 0.0076 (5.5-7.1) 8/17/2022
 1,2,4-Trimethylbenzene 1.8 (8-9) 8/17/2022
 1,2,4-Trimethylbenzene < 0.35 U (9-10.4) 8/17/2022
 1,3,5-Trimethylbenzene 190 (0.25-0.75) 8/17/2022
 1,3,5-Trimethylbenzene 200 (4-5.5) 8/17/2022
 1,3,5-Trimethylbenzene 150 (4-5.5) 8/17/2022 (Dup)
 1,3,5-Trimethylbenzene < 0.0053 U (5.5-7.1) 8/17/2022
 1,3,5-Trimethylbenzene 1 (8-9) 8/17/2022
 1,3,5-Trimethylbenzene < 0.35 U (9-10.4) 8/17/2022
 Toluene < 120 U (0.25-0.75) 8/17/2022
 Toluene 95 (4-5.5) 8/17/2022
 Toluene < 91 U (4-5.5) 8/17/2022 (Dup)
 Toluene < 0.0053 U (5.5-7.1) 8/17/2022
 Toluene < 0.41 U (8-9) 8/17/2022
 Toluene < 0.35 U (9-10.4) 8/17/2022
 Xylene 160 (0.25-0.75) 8/17/2022
 Xylene 233 (4-5.5) 8/17/2022
 Xylene 120 (4-5.5) 8/17/2022 (Dup)
 Xylene < 0.0053 U (5.5-7.1) 8/17/2022
 Xylene 0.53 (8-9) 8/17/2022
 Xylene < 0.35 U (9-10.4) 8/17/2022

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SD-04R

SD-04R
 Chlorobenzene 0.66 (0-0.5) 11/14/2002
 Chlorobenzene 0.17 (0-0.5) 12/1/1995
 Chlorobenzene 0.17 (0-0.5) 1/1/1992
 Toluene < 0 U (0-0.5) 11/14/2002
 Toluene 0.58 (0-0.5) 12/1/1995
 Toluene 0.58 (0-0.5) 1/1/1992

SD-42

SD-03L
 Chlorobenzene 0.008 (0-0.5) 11/14/2002
 Chlorobenzene 0.078 J (0-0.5) 12/1/1995
 Chlorobenzene 0.078 J (0-0.5) 1/1/1992
 Toluene < 0 U (0-0.5) 11/14/2002
 Toluene 0.1 J (0-0.5) 12/1/1995
 Toluene 0.1 J (0-0.5) 1/1/1992

SD-03L

SD-34

PZ-05D

PZ-05D
 Chlorobenzene 40 (0.5-1.75) 8/15/2022
 Chlorobenzene 0.41 (4-6) 8/15/2022
 Chlorobenzene 0.3 (6-6.5) 8/15/2022
 Chlorobenzene < 0.67 U (8-10) 8/15/2022
 Trichlorethylene < 0.99 U (0.5-1.75) 8/15/2022
 Trichlorethylene < 0.0051 U (4-6) 8/15/2022
 Trichlorethylene < 0.66 U (6-6.5) 8/15/2022
 Trichlorethylene < 0.67 U (8-10) 8/15/2022
 Tetrachloroethylene < 0.99 U (0.5-1.75) 8/15/2022
 Tetrachloroethylene < 0.0051 U (4-6) 8/15/2022
 Tetrachloroethylene 0.46 (6-6.5) 8/15/2022
 Tetrachloroethylene < 0.67 U (8-10) 8/15/2022
 Cis-1,2,-Dichloroethene < 0.99 U (0.5-1.75) 8/15/2022
 Cis-1,2,-Dichloroethene < 0.0051 U (4-6) 8/15/2022
 Cis-1,2,-Dichloroethene < 0.66 U (6-6.5) 8/15/2022
 Cis-1,2,-Dichloroethene < 0.67 U (8-10) 8/15/2022
 1,2-Diclorobenzene < 0.99 U (0.5-1.75) 8/15/2022
 1,2-Diclorobenzene 0.36 (4-6) 8/15/2022
 1,2-Diclorobenzene 43 (6-6.5) 8/15/2022
 1,2-Diclorobenzene 22 (8-10) 8/15/2022
 1,2,4-Trimethylbenzene 0.43 (0.5-1.75) 8/15/2022
 1,2,4-Trimethylbenzene < 0.0051 U (4-6) 8/15/2022
 1,2,4-Trimethylbenzene < 0.66 U (6-6.5) 8/15/2022
 1,2,4-Trimethylbenzene < 0.67 U (8-10) 8/15/2022
 1,3,5-Trimethylbenzene < 0.99 U (0.5-1.75) 8/15/2022
 1,3,5-Trimethylbenzene < 0.0051 U (4-6) 8/15/2022
 1,3,5-Trimethylbenzene < 0.66 U (6-6.5) 8/15/2022
 1,3,5-Trimethylbenzene < 0.67 U (8-10) 8/15/2022
 Toluene < 0.99 U (0.5-1.75) 8/15/2022
 Toluene < 0.0051 U (4-6) 8/15/2022
 Toluene < 0.66 U (6-6.5) 8/15/2022
 Toluene < 0.67 U (8-10) 8/15/2022
 Xylene < 0.99 U (0.5-1.75) 8/15/2022
 Xylene < 0.0051 U (4-6) 8/15/2022
 Xylene < 0.66 U (6-6.5) 8/15/2022
 Xylene < 0.67 U (8-10) 8/15/2022

SD2R

PZ-01D2

PZ-04D

SD-02L

SD-02L
 Chlorobenzene < 0 U (0-0.5) 11/14/2002
 Chlorobenzene 0.063 J (0-0.5) 12/1/1995
 Chlorobenzene 0.063 J (0-0.5) 1/1/1992
 Toluene < 0 U (0-0.5) 11/14/2002
 Toluene 0.076 J (0-0.5) 12/1/1995
 Toluene 0.076 J (0-0.5) 1/1/1992

PZ-04D

PZ-04D
 Chlorobenzene 13 (0.5-1.4) 8/16/2022
 Chlorobenzene 1.9 (5-6.25) 8/16/2022
 Trichlorethylene < 0.36 U (0.5-1.4) 8/16/2022
 Tetrachloroethylene < 0.36 U (0.5-1.4) 8/16/2022
 Tetrachloroethylene 11 (5-6.25) 8/16/2022
 Cis-1,2,-Dichloroethene < 0.36 U (0.5-1.4) 8/16/2022
 Cis-1,2,-Dichloroethene < 0.34 U (5-6.25) 8/16/2022
 1,2-Diclorobenzene < 0.36 U (0.5-1.4) 8/16/2022
 1,2-Diclorobenzene 110 (5-6.25) 8/16/2022
 1,2,4-Trimethylbenzene 1.1 (0.5-1.4) 8/16/2022
 1,2,4-Trimethylbenzene < 0.34 U (5-6.25) 8/16/2022
 1,3,5-Trimethylbenzene 0.65 (0.5-1.4) 8/16/2022
 1,3,5-Trimethylbenzene < 0.34 U (5-6.25) 8/16/2022
 Toluene < 0.36 U (0.5-1.4) 8/16/2022
 Toluene < 0.34 U (5-6.25) 8/16/2022
 Xylene 0.45 (0.5-1.4) 8/16/2022
 Xylene < 0.34 U (5-6.25) 8/16/2022

PAWTUXET RIVER

FACILITY RAILROAD BRIDGE

Legend

- Sediment Sample Location
- + Historic Outfalls
- Sediment Removal Areas
- Sediment Cap Area
- Former Hot Spot Area
- Property Boundary
- Bulkhead



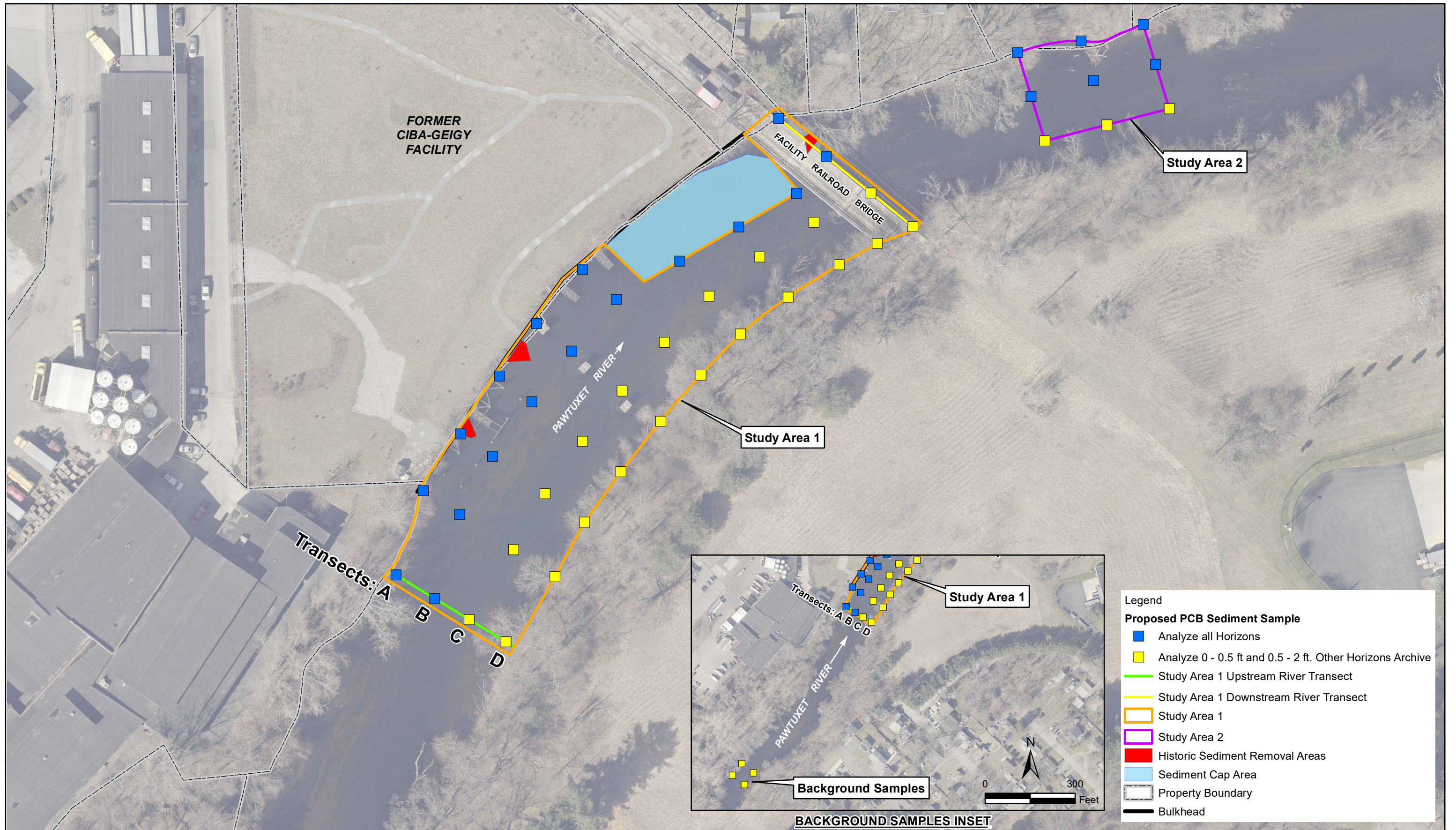
Sources
 1. Aerial Photography from RIGIS (2022).
 2. RFI Report, Pawtuxet River, Woodward-Clyde, March 1996.



FORMER CIBA-GEIGY
SITE INVESTIGATION
CRANSTON, RI

DATE: 6/15/2023 DRWN: JB

FIGURE 3
RESULTS OF HISTORIC SAMPLING
IN SEDIMENT OF PAWTUXET RIVER
SELECTED VOCs (MG/KG)



FORMER
CIBA-GEIGY
FACILITY

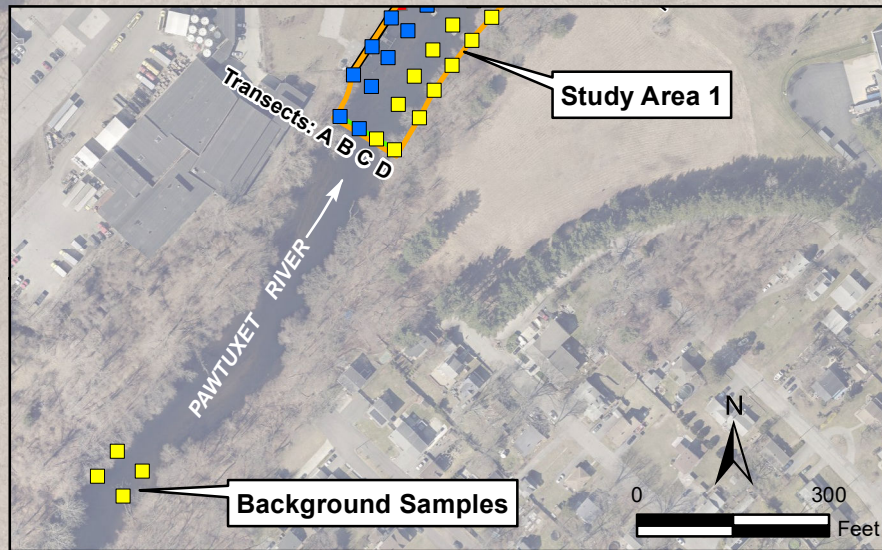
FACILITY RAILROAD BRIDGE

Study Area 2

PAWTUXET RIVER

Study Area 1

Transects: A
B
C
D

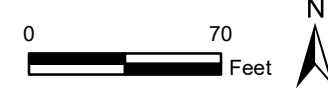


BACKGROUND SAMPLES INSET

- Legend
- Analyze all Horizons
 - Analyze 0 - 0.5 ft and 0.5 - 2 ft. Other Horizons Archive
 - Study Area 1 Upstream River Transect
 - Study Area 1 Downstream River Transect
 - Study Area 1
 - Study Area 2
 - ▲ Historic Sediment Removal Areas
 - Sediment Cap Area
 - Property Boundary
 - Bulkhead

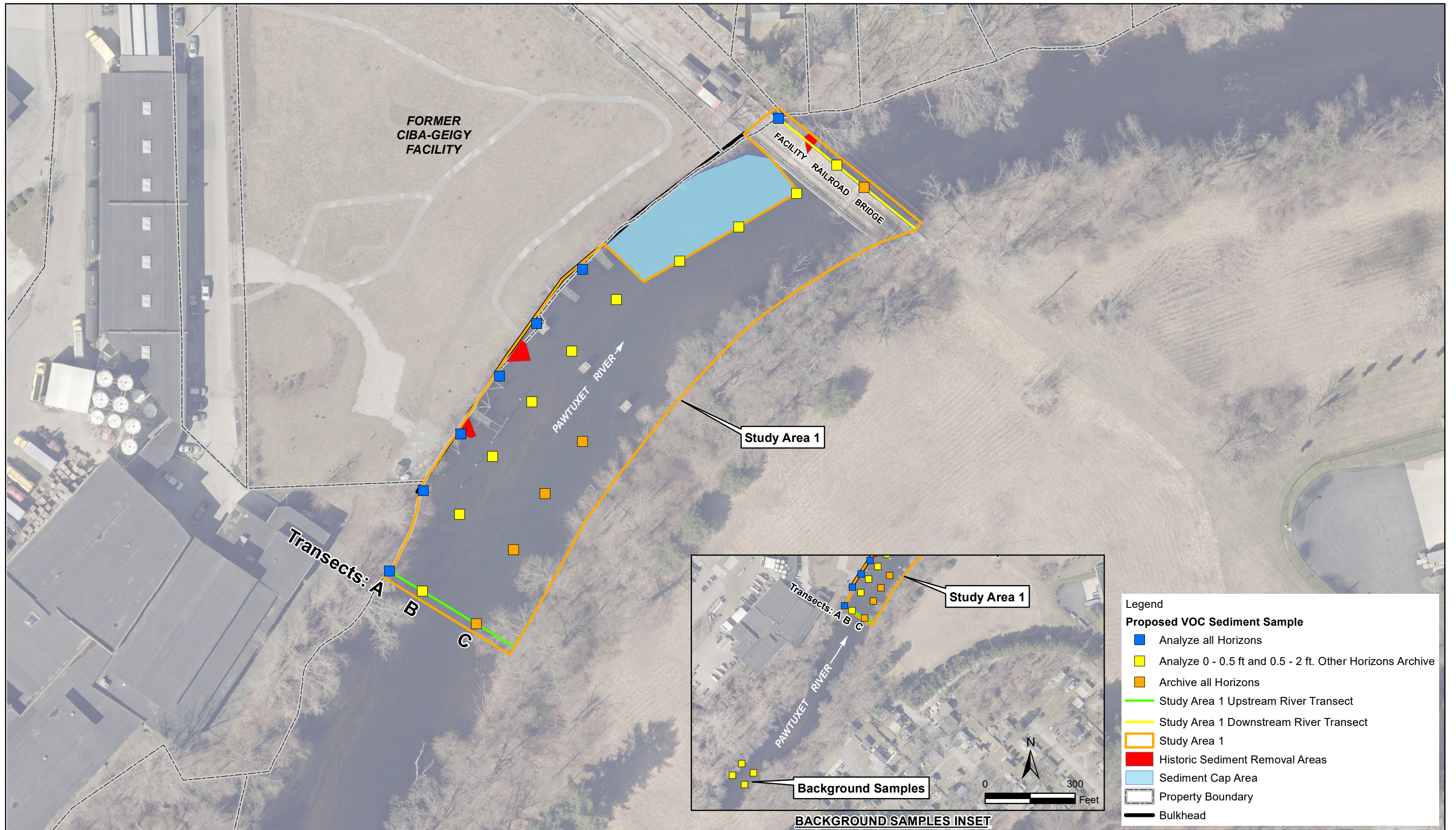


Sources
 1. Aerial Photography from RIGIS (2022).
 2. RFI Report, Pawtuxet River, Woodward-Clyde, March 1996.

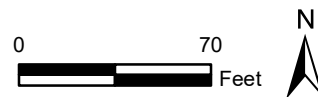


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FIGURE 4
 PROPOSED PCB SEDIMENT
 SAMPLING LOCATIONS



Sources
 1. Aerial Photography from RIGIS (2022).
 2. RFI Report, Pawtuxet River, Woodward-Clyde, March 1996.



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FIGURE 5
 PROPOSED VOC SEDIMENT
 SAMPLING LOCATIONS

