REMEDIAL INVESTIGATION AND FEASIBILITY STUDY WORK PLAN ADDENDUM # 3 – ADDITIONAL FIELD INVESTIGATION

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List of Acronyms

AECOM	AECOM Technical Services, Inc.
APAHs	Parent and Alkylated Polycyclic Aromatic Hydrocarbons
BAZ	Bioactive Zone
BERA	Baseline Ecological Risk Assessment
BHHRA	Baseline Human Health Risk Assessment
COC	Chain of Custody
COPCs	Contaminant of Potential Concern
CSIA	Compound Specific Isotope Analysis
CSM	Conceptual Site Model
DCRA	Department of Consumer and Regulatory Affairs
DNAPL	Dense Non-Aqueous Phase Liquid
DOC	Dissolved organic carbon
DOEE	District Department of Energy and Environment
DPT	Direct Push Technology
DQO	Data Quality Objective
FOIA	Freedom of Information Act
FSP	Field Sampling Plan
GBM	Geochemical Biomarkers
GC	Gas Chromatography
HASP	Health and Safety Plan
LNAPL	Light Non-Aqueous Phase Liquid
MBSS	Maryland Biological Stream Survey
MDE	Maryland Department of the Environment
MS/MS	Mass Spectrometry/Mass Spectrometry
MTBE	Methyl tert-butyl ether
NPS	National Park Service
PAH	Polycyclic Aromatic Hydrocarbons
PARCC	Precision, accuracy, representativeness, completeness, and comparability
PCBa	Polychlorinated biphenyls, Priority Pollutant Aroclors
PCBc	Polychlorinated biphenyls, 209 congeners
PCDD	Polychlorinated dibenzodioxins
PCDF	Polychlorinated dibenzofurans
PCE	Perchloroethylene
Pepco	Potomac Electric Power Company and Pepco Energy Services, Inc.
PID	Photoionization Detector
POC	Particulate organic carbon
PSL	Project Screening Level
QAPP	Quality Assurance Project Plan
QC	Quality Control
RI	Remedial Investigation
RI/FS	Remedial Investigation and Feasibility Study
RPD	Redox Potential Discontinuity
SAP	Sampling and Analysis Plan
SEM/AVS	Simultaneously Extracted Metals/Acid-Volatile Sulfide
SHC	Saturated Hydrocarbons

SPI	Sediment Profile Imaging
SVOC	Semi-Volatile Organic Compound
TOC	Total Organic Carbon
USACE	United States Army Corps of Engineers
USEPA	United States Environmental Protection Agency
VOC	Volatile Organic Compound

1 Introduction

AECOM Technical Services, Inc. (AECOM) has prepared this Addendum #3 to the Remedial Investigation and Feasibility Study (RI/FS) Work Plan on behalf of Potomac Electric Power Company and Pepco Energy Services, Inc. (collectively "Pepco") to describe the technical approach to address remaining data gaps and uncertainties regarding potential contamination at Pepco's Benning Road facility (the Site), located at 3400 Benning Road NE, Washington, D.C., and a segment of the Anacostia River adjacent to the Site. Together, the Site and the adjacent segment of the River are referred to herein as the "Study Area." The Study Area consists of a "Landside" component focused on the Site itself, and a "Waterside" component focused on the shoreline and sediments in the segment of the river adjacent to and immediately downstream of the Site.

The original RI/FS Work Plan for the Site was approved by the District Department of Energy and Environment (DOEE) in December 2012. The RI/FS Work Plan (2012 Work Plan) discussed the Phase I and II Landside and Waterside Investigations. Addendum #1 to the 2012 Work Plan, approved by DOEE in March 2014, detailed the Phase III Landside field activities, which included monitoring well installation and an investigation of perchloroethylene (PCE) in groundwater in the south-central portion of the Site. Addendum #2 to the 2012 Work Plan, approved by DOEE in July 2014, described soil sampling activities in the vicinity of the two cooling tower basins in the northwest of the Site.

The field work described in the 2012 Work Plan and its addenda took place between January 25, 2013 and December 31, 2014. The Draft Remedial Investigation (RI) Report (AECOM, 2016a) describing the field investigation and its findings was finalized on February 26, 2016. The Draft RI Report identified several data gaps with respect to the Site characterization, background data evaluation, and human health and ecological risk assessments. To expound the data gaps and formulate data needs, Pepco prepared three technical memoranda at the request of DOEE. The Technical Memorandum #1 – Conceptual Site Model (CSM) (Appendix C) provided a detailed description of the operational Site history, with a focus on the use, storage, disposal, release and cleanup of various chemicals and waste materials, and identified data gaps and uncertainties in the Site characterization conducted to date as part of the RI/FS. The Technical Memorandum #2 – Refined Background Evaluation Work Plan described the rationale and procedures for revising the background data evaluation originally presented in the Draft RI Report. The background characterization work plan (Appendix D) is based on Technical Memorandum

#2. The Technical Memorandum #3 – Baseline Human Health and Ecological Risk Assessment Work Plan (Appendix E) described the rationale and procedures for revising the preliminary baseline human health risk assessment (BHHRA) and preliminary baseline ecological risk assessment (BERA) originally presented in the Draft RI Report. Draft versions of these three technical memoranda were submitted to DOEE on August 5, 2016. This Addendum #3 to the 2012 Work Plan incorporates the rationale, procedures, and quality control requirements for the additional sampling described in the three technical memoranda.

1.1 Addendum Purpose and Scope

The purpose of Addendum #3 is to present a data collection program to address the identified data gaps, and document the planned additional field activities required to complete the RI/FS. All field activities described in this Addendum will be performed in accordance with the approved Health and Safety Plan (2012 HASP) and Sampling and Analysis Plan (2012 SAP) (including Field Sampling Plan [2012 FSP] and Quality Assurance Project Plan [2012 QAPP]) prepared in conjunction with the 2012 Work Plan. Where the procedures described in these supporting documents require updating or supplementation, these requirements are addressed in this document.

1.2 Addendum Organization

This addendum is organized into the following seven sections:

- Section 1 – Introduction
- Section 2 – Work Plan Rationale
- Section 3 – Addendum Tasks
- Section 4 – Field Sampling Plan
- Section 5 – Quality Assurance Project Plan
- Section 6 – Schedule and Reporting
- Section 7 – References

Figures, tables, and appendices are provided as stand-alone sections following **Section 7.**

2 Work Plan Rationale

This section summarizes the data gaps, rationale for additional data collection, and data quality objectives for completing the additional RI field activities. An updated Conceptual Site Model (CSM) is presented within the CSM Technical Memorandum (AECOM, 2016b) submitted under separate cover. The Draft RI Report and the CSM Technical Memorandum provide a detailed Site history and project background, and this information will not be reiterated herein. The CSM Technical Memorandum is included as Appendix C to this addendum.

2.1 Data Gaps

The data gaps are described in detail in the CSM Technical Memorandum (AECOM, 2016b), Background Evaluation Technical Memorandum (AECOM, 2016c), and the Risk Assessment Refinement Work Plan (AECOM, 2016d). The following is a summary of the data gaps, which form the rationale for the planned additional field investigation.

A table of additional Site characterization needs is provided as **Table 2-1**.

<u>Landside – Soil Characterization</u>

The data gaps identified consist primarily of potentially isolated detections of polychlorinated biphenyls (PCBs) and dioxins/furans in surface soils across the Site in excess of their screening levels. Vanadium in Target Area 1 (former sludge dewatering area and former coal pile area) was determined to be insufficiently characterized, and relatively high levels of polycyclic aromatic hydrocarbons (PAHs) detected in soils 10 ft bgs at DP19 in the southeast corner of the Site were not delineated.

<u>Landside – Groundwater Characterization</u>

Groundwater in two areas of the Site was found to be contaminated above Project Screening Levels (PSLs): perchloroethylene (PCE) and naphthalene down-gradient from the former power plant building in the southwest corner of the Site (newly created Target Area 19), and methyl tert-butyl ether (MTBE) in the center-east portion of the Site (downgradient of Target Area 18, former Kenilworth Fueling Island).

Uncertainty in Groundwater Data

The Draft RI noted that several hydrophobic organic compounds (e.g., PAHs, PCBs and dioxins/furans) detected in groundwater could be related to turbidity noted in groundwater samples. This data gap will be addressed in the additional field investigation by redeveloping and resampling select monitoring wells. Additionally, the Draft RI noted that several pesticide detections could be false positives. Additional sampling and analytical methods will be used in the additional field investigation to verify this finding.

Potential Impacts to National Park Service (NPS) Property

Groundwater discharges from the Site to the Anacostia River. In this process, any contaminants present in the groundwater discharging from the Site would migrate through the NPS property located between the Site and the River. The extent, if any, of groundwater impacts on the NPS property is a data gap. Additionally, records provided by the NPS during the public comment period indicate that Pepco had proposed to stage dredge spoils on the NPS property during an intake dredging project in 1967. The nature and extent of impacts resulting from the possible staging of dredge spoils on NPS property adjacent to the Site is a data gap, and a field investigation will be required in this area.

Expanded Forensic Investigation

The preliminary forensic analysis presented in the Draft RI Report indicated that several contaminants on the Site and in the River sediment are potentially attributable to a variety of off-site sources. Additional forensic sampling is needed to confirm these preliminary findings, define the exact forensic properties of these contaminants, and better differentiate onsite and offsite impacts resulting from site operations from the impacts attributable to urban background.

Selected sediment and soil samples will be tested for an expanded suite of analytes for forensic purposes. The locations of these soil and sediment samples will overlap with those collected for the BHHRA and BERA background evaluation and those reflecting upstream and runoff sources. The results of these analyses will be used to better understand the nature of the pyrogenic and petrogenic sources both upstream in the Anacostia sediments and from specific landside urban runoff sources such as stormwater outfalls not related to the Site.

Expanded Background Investigation

Non-site specific literature values were used in the background evaluation for comparison to the Landside soil and groundwater detections. Since DOEE required that Pepco revise the background study presented in the draft RI Report to include only data that is site-relevant and site-specific, this presents a data gap. Additional site-specific background sediment and forensic analyses were also required by DOEE to defensibly characterize urban background contributions of Site contaminant concentrations. Therefore, additional Landside and Waterside data collection is necessary to refine the preliminary background data evaluation and risk assessments. Background data collection will include sampling and analysis of background soil, sampling and analysis of background groundwater, sampling and analysis of background sediments, and interstitial pore water sampling, benthic macroinvertebrate surveys, and laboratory toxicity testing. The results of these analyses will be used in a background evaluation to assess how concentrations of constituents detected in environmental samples collected from multiple media in the Study Area compare to background concentrations of these same constituents in these same media.

Potential Risks to Benthic Organisms

The Draft RI concluded that there is limited potential for risk to the benthic macroinvertebrate community, especially in the vicinity of the cove to the northwest of the Site where Outfall 013 and three other outfalls discharge. The following sampling and analysis activities are proposed in order to refine this screening level risk finding. Pepco will conduct sediment profile imaging to confirm the thickness of bioactive zone (BAZ), benthic macroinvertebrate surveys, sediment pore water sampling, and toxicity studies within the cove and at upstream background locations. The results of these analyses will be used to help define the BAZ in surficial sediments in the Waterside Investigation Area, support the refined BERA, and, if necessary, for the development of ecological remedial goals.

2.2 Data Quality Objectives

The data quality objectives (DQOs) for this investigation are:

- To characterize environmental conditions within the Study Area and to address the uncertainties and data gaps identified in the CSM
- To update existing Landside and Waterside datasets so the nature and extent of impacts can be better defined and to support refinements of the human health and ecological risk assessment
- To better define the BAZ in the Anacostia River adjacent to the Site such that the shallow sediment sampling interval used in support of the risk assessments can be refined, if needed.
- To determine whether and to what extent past or current conditions at the Site have caused or contributed to contamination of the Anacostia River and support forensic evaluation of

contaminant sources in the Anacostia River and landside urban background contaminants, additional forensic data will be collected

- To identify potential Site-related, near-Site and far-Site sources of contaminants of potential concern (COPCs) in sediment, additional data will be collected within the Anacostia River
- To better understand sedimentation and sediment stability in the portion of the Anacostia River in Study Area, high resolution coring data will be collected
- To support the refinement of Human Health and Ecological Risk Assessments, site-specific and background bulk sediment, sediment pore water, sediment toxicity testing and macroinvertebrate community surveys, soil, and groundwater data will be collected
- To collect physical, chemical, and biological data to support development and evaluation of potential remedial alternatives

There are several analytical levels of data quality available to achieve the DQOs. These levels are typically designated as follows:

- Level I – Field screening or analysis using portable instruments, calibrated to non-compound specific standards;
- Level II – Field analysis using portable instruments, calibrated to specific compounds;
- Level III – USEPA recommended performance based methodologies such as those outlined in USEPA SW-846;
- Level IV – USEPA Contract Laboratory Program (CLP) Routine Analytical Services (RAS) methods; and
- Level V – Other internationally-recognized and/or non-standard analytical methods.

Field-screening data collected during the additional field investigation will be used in the Landside investigation to interpret lithologic units and aid in the identification of the presence or absence of a release in an area. Groundwater field data (e.g., pH, turbidity) will be used to identify stabilization of water quality prior to sampling. In addition, field screening data (e.g., turbidity) will be used in the Waterside investigation to monitor degradation of water quality due to sampling activities.

Landside and Waterside field screening activities will be conducted under Level I data quality protocol. Both Landside and Waterside field measurements (i.e., pH, temperature, turbidity, photoionization detector [PID] with 10.6 eV lamp) will be completed under Level II data quality protocol. Samples submitted for fixed laboratory analysis will be analyzed, at a minimum, under Level III data quality protocol. Level IV or V could be used for specialty methods such as high resolution PCB analysis or forensic analysis.

Additional information regarding the data quality indicators defined in terms of precision, accuracy, representativeness, completeness, and comparability (PARCC) parameters, is provided in Section 5 of this Addendum and in the 2012 QAPP.

3 Addendum Tasks

The additional RI/FS field investigation described in this Addendum includes Landside and Waterside components.

The Landside Investigation program will include the following three phases of work:

- Phase I: Additional On-Site Characterization
    - Task 1: Redevelop and resample onsite monitoring wells
    - Task 2: Surface and subsurface soil delineation sampling
    - Task 3: Surface and subsurface soil forensics sampling
    - Task 4: DPT groundwater sampling
- Phase II: Landside Offsite Background Sampling
    - Task 1: Background surface and subsurface soil sampling
    - Task 2: Background monitoring well sampling
    - Task 3: Background DPT groundwater sampling
- Phase III: NPS Property Sampling
    - Task 1: Surface soil sampling
    - Task 2: Subsurface soil and groundwater sampling
    - Task 3: Geotechnical boring

The Waterside Investigation program will consist of the following two phases of work:

- Phase I: Sediment Profile Imaging at Near-Site and Background Locations
- Phase II: Near-Site and Background Sediment Sampling
    - Task 1: Near-Site Surface Sediment Sampling at 15 locations for Chemistry
        - Combined pore water, lab toxicity, and benthic macroinvertebrate sampling at 10 of 15 locations
    - Task 2: Background Surface and Subsurface Sediment Sampling
        - Combined pore water, lab toxicity, and benthic macroinvertebrate sampling
        - Chemistry sampling of surface and subsurface sediment at background locations
        - Sediment sampling at one city storm drain
    - Task 3: High resolution coring

These tasks and other required activities for the proposed additional investigation are discussed in detail in the following sections.

3.1 Permitting

Appropriate permits and approvals will be obtained for access and drilling in the River and at Landside background locations. Landside background sampling also may require access agreements or authorization for drilling on public and private properties. It is anticipated that permits will be needed to collect sediment samples in the Anacostia River from U.S. Army Corps of Engineers (USACE), DOEE, Maryland Department of the Environment (MDE), and the National Park Service (NPS), and for drilling from District Department of Consumer and Regulatory Affairs (DCRA). In order to streamline the process and expedite the schedule, Pepco will explore the possibility of amending the permits previously obtained to conduct the RI field activities. A table of permits previously obtained for the first round of RI/FS field activities is provided as **Table 3-1**.

3.2 Utility Clearance

There are numerous overhead and underground utilities at the Site which will require extensive utility clearance before proposed drilling activities can proceed. Known utilities include a network of underground and overhead electric lines associated with the Site's three active substations, buildings, trailers, and other operations, as well as abandoned lines. Subsurface structures such as the river water intake/discharge tunnels to the west of the former power plant in the southwest area of the Site, and the active metro tunnel in the southeast area of the Site are also known to be present. Other utilities at the Site include active storm and sanitary sewer lines, water supply lines, and an elevated metro rail structure that runs along the southern Site property boundary. Given the facility's over 100-year operating history, it is also possible that there are abandoned and possibly undocumented subsurface utilities. Therefore, a multiple-phase utility clearance process will be conducted, and proposed sampling locations may be relocated or eliminated due to the presence of utilities if it is determined by the Field Team Leader and the Project Manager that sampling cannot be safely conducted at the proposed location. Any eliminations or material relocations of sampling points will be recorded in the field book and provided to DOEE for review following sampling.

Prior to the start of intrusive operations, a four-phase utility clearance process will be conducted at each proposed drilling location:

1) All available utility drawings, including as-built and design drawings, will be requested from Pepco and reviewed;

2) Each proposed drilling location will be visually inspected by the Field Team Leader and personnel from the Pepco Underground division to confirm there are no overhead utilities in the vicinity, that the proposed location does not lie on the same line as two manholes, that there is no disturbed earth or other evidence of construction work in the vicinity that might indicate a recently-installed utility, and the location is not near any utilities known to the Pepco Underground division;
3) A private utility locating contractor will be retained to identify and locate shallow subsurface utilities in the area of proposed drilling using electromagnetic scanning and geophysical survey methods; and,
4) The proposed drilling location will be hand cleared to 5 ft bgs using soft dig techniques (hand auger, air knife, and/or vacuum excavator) to clear for utilities.

3.3 Landside Investigation

3.3.1 Phase I, Task 1: Redevelop and Resample Onsite Monitoring Wells

The 30 wells installed during the initial RI/FS field investigation will be visually inspected for damage. At wells that have sustained damage, such as MW-08, which was damaged during the power plant demolition, the PVC risers will be reconstructed and the wells repaired as needed.

All 30 wells will be redeveloped using pump and surge methods to reduce turbidity to as low a level as possible, preferably <10 NTU. If a well runs dry during well development, municipal water supply may be added to the well to continue development. The field team will track the volume of such municipal water added and document that a volume equal to 110 percent of the municipal water volume is extracted following the addition of the municipal water. Well development may be suspended after four hours of pumping and surging after discussion with the Project Manager. Measurements of final turbidities will be recorded at the conclusion of well development. The redevelopment efforts at each monitoring well will be documented in the well development log and submitted to DOEE as part of the Revised RI Report.

A number of constituents were detected above their respective PSLs in groundwater samples collected from the 30 wells during the 2014 sampling event, including polychlorinated biphenyls PCBc, MTBE, PCE, and other hydrophobic compounds (i.e., pesticides and dioxins and furans). Some of the hydrophobic compound detections are suspected to have resulted from high turbidity in the groundwater samples, which were collected by HydraSleeve samplers. Twenty-three of the 30 onsite wells are proposed to be resampled to confirm previous analytical results. The wells will be sampled by low-flow methods (peristaltic pump or similar) using the Project Operating Procedures provided in Appendix A of the 2012 FSP. Groundwater samples for VOC analyses will be collected using an inertial pump or mini-bailer. The proposed wells and analytes for the monitoring well resampling are provided in **Table 3-2**, and the well locations are shown on **Figure 3-1**. In wells where PCE is known or suspected to be present (MW-1A/B, MW-5A and MW-9A/B), if PCE is detected above 2 µg/L, samples will also be analyzed by Compound Specific Isotope Analysis (CSIA) as a fingerprinting technique to determine if PCE detected in groundwater in MW-9 and MW-1 share a common source. Where pesticides are detected above PSLs, the detections will be verified by Gas Chromatography/Mass Spectrometry/Mass Spectrometry (GC/MS/MS) to confirm the detections are not false positives. At MW-2A, where groundwater exhibited relatively high levels of naphthalene, the proposed groundwater sample will also be analyzed for saturated hydrocarbons (SHC) and parent and alkylated polycyclic aromatic hydrocarbons (APAHs) for forensic purposes. Groundwater sampling at each monitoring well will be documented using the groundwater sample collection field form discussed in Section 5.2.

3.3.2 Phase I, Task 2: Onsite Surface and Subsurface Soil Delineation

<u>Surface Soil Delineation Areas</u>

During the RI/FS sampling activities, several contaminants (PCBa, PAHs, metals, and dioxins and furans) in surface and shallow subsurface soils were detected at levels exceeding their respective PSLs at locations across the Site. As presented in **Table 2-1**, ten of these locations (SUS05, SUS06, SUS08, SUS10, SUS12, SUS18, SUS/DP19, SUS20, SUS21 and DP44) require delineation sampling. As noted in Table 2-1, location SUS11 is within the proposed cooling tower excavation area, and confirmatory sampling performed during the cooling tower excavation will bound contamination at this location. Therefore, the detections at this location will not be delineated during the Addendum #3 supplemental investigation. Brief operational histories of each delineation location are provided in the footnotes to Table 2-1, and a more extensive Site history is provided in the CSM Technical Memorandum (**Appendix C**).

The following is a brief description of each of the ten locations where delineation surface soil sampling is proposed. The contaminant being delineated is given in parentheses:

- SUS05 (PCBa): located between the TA #3 (former 15,000 gal UST and 50,000 gal AST) and TA #5 (former cooling towers)
- SUS06 (PCBa): located south of TA #14 (former railroad switchyard)
- SUS08 (PCBa, PCDD/PCDFs, metals): located in TA #1 (former coal pile area and former sludge dewatering area)
- SUS10 (PCBa, PCDD/PCDFs): located in TA #10 (Red Tag Storage Area)
- SUS12 (PCBa): located in TA #4 (Salvage Yard)

- SUS18 (PCBa, PCDD/PCDFs): located adjacent to TA #9 (Green Tag Storage Area)
- SUS19 (PAHs): located in new TA #20 – this area was previously used as a railyard and laydown area before being converted into a parking lot in the mid-1980s
- SUS20 (PCBa): located in TA #7 (1988 PCB Cleanup Area)
- SUS21 (PCBa): located adjacent to TA #12 (waste oil containment Building 57)
- DP44 (PCBa): located adjacent to TA #11 (PCB Building)

The ten delineation areas are depicted in **Figure 3-1**. Two sampling rings have been drawn around each previous detection, the inner ring containing eight samples spaced 25 ft apart, and the outer ring containing 16 samples spaced 25 ft apart, as depicted on **Figures 3-2** through **3-10**. The eight samples in the inner ring, immediately adjacent to the previous detection, will be primary samples, to be collected and analyzed in a single mobilization. The samples in the outer ring will be secondary samples, a number of which may be collected in a second mobilization, pending the results of the primary samples and discussions with DOEE. If a secondary sample exceeds the PSL, an additional round of sampling will be required. The proposed sampling configurations may be moved or eliminated by the Field Team Leader as necessary due to field conditions (utilities, major structures, etc.). Any eliminations or material relocations of sampling points will be recorded in the field book and provided to DOEE for review following sampling. The specific analytes for each delineation area are provided in **Table 3-2**.

<u>Target Area 1 Grid Sampling</u>

Surface soil sampling point SUS08 is located within the former coal pile area and former sludge dewatering area. As described in the CSM Technical Memorandum, this area (Target Area 1) requires additional characterization for metals. The former sludge dewatering area appears to have been put in place following the removal of coal piles (late 1970s) to handle the sludge from the clarifiers associated with the cooling towers. The sludge dewatering area remained in place, adjacent and north of Building #65, gradually shrinking in size until 2010, when it is no longer visible in aerial photographs and appears to be replaced with a gravel-surfaced parking area. A 300 x 400 ft grid will be placed over the area centered on SUS08, with grid cells 50 x 50 ft, and samples will be collected as depicted on **Figure 3-4**. This grid encompasses the SUS08 delineation area, and covers the maximum historical footprint of the sludge dewatering area (based on 1981 aerial photograph). In addition to the points at regular 100 foot spacing, an additional four points are added to provide for a 50-foot spaced grid in the sub-portion of the larger area where sludge dewatering primarily occurred (approximately from 1988 – 2010). A surface sample will not be collected at grid location A5 due to its proximity to previous surface soil sample SUS07, and the two grid nodes to the north and south of SUS08 will already be sampled as part of the SUS08 delineation. Therefore, 21 surface soil samples will be collected from the grid to characterize the former coal pile area for metals impacts.

Former Timber Pole Storage Area and Former Transformer Shop Sampling

A review of historical aerial photos included in the CSM Tech Memo (Appendix C) revealed the former storage of timber poles in the central portion of the Site, as well as former transformer shop Buildings #38 and 39. The lack of samples collected in these two areas during the initial RI activities was identified in the CSM as a data gap. Three surface soil samples are proposed to be collected in the former timber pole storage area, and two surface soil samples are proposed to be collected from the former transformer shop area, as shown on **Figure 3-11**. These samples will be analyzed for the full suite of analytical parameters, as outlined in **Table 3-2**, specifically:

- PCBa
- Metals
- VOCs,
- SVOCs
- TPH-GRO/DRO/ORO
- Pesticides
- PCDD/PCDF

DP19 Subsurface Sampling

The general vicinity including the DP19 sampling location historically was a railyard from 1937 to at least 1963. This area was then converted to a laydown area for what appears to be electrical equipment from 1963 to approximately 1981 at which time the entire area appears to be vacant. Between 1981 and 1988, the DP19 vicinity was converted to a parking area which is its current use. Location DP19 exhibited high levels of PAHs in soils at depths of up to 10 ft bgs. The subsurface soils around DP19 to a depth of 15 ft bgs will be delineated for PAHs by Direct Push Technology (DPT) methods using the same 12-point delineation sampling scheme described above for surface soils, as shown on **Figure 3-8**.

The analytes for the soil sampling areas will be specific to each area, and depend on the initial RI/FS investigation exceedances being delineated. A summary of the soil sampling including analytes for each area is provided in **Table 3-2**.

3.3.3 Phase I, Task 3: Onsite Surface and Subsurface Soil Forensics Sampling

Twenty-two locations are proposed to be sampled for forensic purposes to help identify the source or sources of previously detected contamination. The locations and depths for the proposed forensic sampling were selected after review of the previous hydrocarbon and PCB sampling results. This forensic sampling will be conducted by DPT methods at various depths up to 20 ft bgs. The sampling includes collection of discrete samples at every 1-foot interval, plus three to four composite samples. Samples designated Tier 1 samples will be analyzed immediately for PCBa, PAHs, and SHC. Tier 2 samples will be collected and placed on hold pending the results of the Tier 1 samples. After consultation with DOEE, Tier 2 samples may then be analyzed for additional forensic analytes (PCBc, APAH, and GBM) and/or Priority Pollutants (VOCs, SVOCs, pesticides, PCDD/PCDF, PCBa, metals, and cyanide). Holding times will be extended to one year to accommodate extraction and analysis after the default EPA SW846 holding times defined in the QAPP Table 6 have been exceeded. Specific locations, depths, and analytes are provided in **Table 3-3**. All forensic sample locations are shown on **Figure 3-12**.

3.3.4 Phase I, Task 4: Onsite DPT Groundwater Investigation

An investigation will be conducted to delineate two areas of groundwater contamination identified by the initial RI/FS investigation: PCE and naphthalene contamination in the southwest corner of the Site (MW-1 and MW-2 location), and MTBE contamination in the east-center of the Site.

In the southwest corner of the site, PCE in groundwater was detected below screening levels in MW-1A and above screening levels in co-nested well MW-1B; naphthalene was detected above its screening level in MW-1A and -1B, and in adjacent well nest MW-2A and -2B. The PCE detections could potentially be related to former operations conducted in the power plant building. Both well nests are located adjacent to the southern portion of the former power plant building. In-person interviews revealed the use of degreasers SS25 and XL99, which are chlorinated solvents, in the southern portion of the power plant building. Their use was discontinued in the 1980s at which time the Site switched to non-chlorinated solvents. Naphthalene is a constituent present in the types of fuel oil used to power generating units at the plant since the early 1940s. To delineate these detections, the area will be gridded with an approximately 250 x 500 ft grid, with grid cells approximately100 x 100 ft as shown on **Figure 3-13**. Groundwater samples from the upper and lower water-bearing zones at each primary location (Figure 3-10) will be collected using direct push and intertial pump/bailer sampling techniques, for a total of 26 groundwater samples (13 in each aquifer). As depicted on **Figure 3-13**, the samples closest to MW-1 and MW-2 are designated primary samples and will be analyzed for PCE and naphthalene. If any of these samples are found to contain PCE and/or naphthalene above screening levels, a second mobilization will be required and the secondary sample adjacent to the detection and opposite the direction of MW-1 and MW-2 will be collected for analysis. If a secondary sample is found to contain PCE and/or naphthalene above screening levels, additional sampling is not planned because the existing groundwater data at MW-3, MW-5, MW-6, and MW-7 may then be sufficient to bound the observed contamination.

In the east-central portion of the Site, MTBE in groundwater was detected above its screening level at DPT locations DP32, DP33, and DP45, and in monitoring well MW-13B. The source of the MTBE plume in the lower water-bearing zone is believed to be the former Kenilworth Fueling Island (Target Area 18), a fueling facility operated at site continuously from 1979 to the present. In 1995, a leaking UST case at the fueling island was reported resulting from a leaking pressurized pipe associated with the UST. A remediation system was installed to recover free product and the case was closed by DDOE in September 1997. The tank was removed in August 2012. To further define the bounds of the plume, MTBE sampling of the upper and lower aquifers by direct push sampling methods is proposed at eleven primary locations as shown on **Figure 3-14**. Five of these locations are situated near to the main storm sewer line that traverses the Site from southeast to northwest to investigate a potential migration pathway associated with it. At least two secondary sampling locations have been identified to the north and west of the primary sample locations, which may be drilled and sampled during a second mobilization, pending the results of the primary samples and discussions with DOEE. This sampling distribution will serve to investigate TA 18 as the possible source of the plume, further define the limits of contamination adjacent to the highest detection at DP32, and evaluate potential offsite migration of MTBE to the north of the Site.

3.3.5 Phase II, Task 1: Background Surface and Subsurface Soil Sampling

To aid the refined background evaluation, twenty surface (0-1 ft bgs) and twenty subsurface (3-4 ft bgs) Site-specific background soil samples will be collected from locations in the vicinity of the Site. The selection and rationale for the background soils sample locations is discussed in Technical Memorandum #2 (Appendix D). Details of the proposed samples are summarized in **Table 3-2**, and their locations are presented in **Figure 3-15**. The samples will be analyzed for metals, VOCs, SVOCs, PCBa, PCDD/PCDF (polychlorinated dibenzodioxins/polychlorinated dibenzofurans, referred to as dioxins and furans), Total Petroleum Hydrocarbons-Diesel Range Organics (TPH-DRO) and Oil Range Organics (ORO), and pesticides. One subset of up to 12 samples will also be submitted for forensic analysis (SHC, APAHs, geochemical biomarkers [GBM]), and a second subset of up to 12 samples will be submitted for PCB congeners to develop a clearer understanding of site-specific urban background sources and determine the contributions of each source type.

3.3.6 Phase II, Task 2: Background Monitoring Well Sampling

The refined background evaluation will include sampling of four existing offsite monitoring wells located upgradient and across the River from the Site. The groundwater samples will be collected to improve the characterization of nature and extent of contaminants on Site, and to better understand contaminant contributions from background and off Site sources for forensic purposes. Three wells have been tentatively identified by their DCRA permit numbers. The locations of these wells are shown on **Figure 3-16.** Additional information regarding these wells including well construction data has been requested through a Freedom of Information Act (FOIA) request with DOEE, but this information was not available at the time of this document's production. If found to be unsuitable for sampling (due to problems with screen interval, structural integrity, or access), one or more of these wells may be substituted with a different background well upon review of the well construction data, or addressed by DPT groundwater sampling, as described in Phase II, Task 3, below. The background wells will be sampled by low-flow methods (peristaltic pump or similar) and analyzed for metals, VOCs, SVOCs, PCBs, PCDD/PCDF and pesticides.

3.3.7 Phase II, Task 3: Background DPT Groundwater Sampling

Groundwater samples will be collected by DPT low-flow sampling methods at nine locations upgradient and cross-gradient from the Site to supplement the background data collected from the existing off-site wells. These locations are depicted on **Figure 3-16**. Two samples will be collected from each location: one from the UWZ and one from the LWZ. The samples will be analyzed for metals, VOCs, PAHs, PCBs, PCDD/PCDF and pesticides.

3.3.8 Phase III, Task 1: NPS Property Surface Soil Sampling

As discussed in the CSM Technical Memorandum, Pepco is suspected to have staged potentially-contaminated sediments on a portion of the NPS property to the west of the Site during 1967 dredging of a cooling water intake pipe inlet immediately north of the Benning Road Bridge. The suspected dredge spoils area within the NPS property is depicted on **Figure 3-17**.

Pepco proposes to perform Multi-Incremental (MI) surface soil sampling in the suspected dredge spoils area of the NPS property. This probabilistic sampling method is proposed to determine an overall risk potential in the area, and is designed to provide an unbiased and statistically valid estimate of the mean concentration of potential contamination within each decision unit (DU) in the investigation area. This sampling method reduces data variability and produces a more representative result of potential contaminant concentrations.

MI surface soil samples will be collected from three DUs in the investigation area: two DUs along the riverbank and one further inland, as depicted on **Figure 3-18**. Each of the MI samples will be comprised of 30 increments to minimize grouping and segregation error and will be collected using a systematic random sampling pattern. Each increment will be collected as a cylindrical core through the entire one foot thickness of the DU to reduce increment delimitation error and sample bias. Furthermore, each increment will have a mass of approximately 30 grams to minimize fundamental error (ITRC, 2012).

In addition to the primary MI samples from each DU, one of the DUs will have three replicates collected so that the total sampling error can be estimated. This is key to understanding the quality of the data and whether it meets the project data quality objectives. These replicates will be collected in the same manner as the primary sample described above but from completely different sets of 30 increment locations in the DU. In addition to these field replicates, the laboratory will be instructed to collect 3 laboratory replicates from one of the field replicates so that the laboratory error can be quantified and potentially corrected. This will allow the project team to see whether the majority of the total sampling error is coming from the laboratory or the field. Since the entire one foot core cannot be included in the sample due to size limitations imposed by the laboratory, each core will be subsampled using either a wedge shaped slice from the length of the core or by collecting 6 Terra Core® subsamples evenly spaced along the one foot increment. Which increment subsampling method is used will be dictated by the soil properties since many soils are not amenable to the wedge slice method. Approximate increment locations are shown on **Figure 3-18**, but will not be surveyed since that information is not necessary owing to the fact that the increments are not analyzed individually but rather combined to form the MI sample which provides an estimate of the mean concentration across the entire DU volume. Each of the increments will be collected from 0-1 ft bgs, subsampled and combined in the field to form the MI samples that are sent to the laboratory. The increments will be placed in a plastic bag and kneaded by hand to homogenize. The mass of each MI sample received by the laboratory will be approximately 900 grams.

Upon receipt, the laboratory will log in each of the samples and spread them out on trays to air dry until a constant weight has been reached. The laboratory will then sieve the samples to 2 mm using a #10 mesh screen to eliminate those coarse materials that are not considered part of the soil fraction. Prior to sieving, the laboratory may disaggregate the material if clumps are present in the samples. Grinding of the samples is not being proposed at this time. Following the air drying and sieving steps, the laboratory will subsample the material for extraction. The laboratory will use either a sectorial splitter, two-dimensional slab cake method, or equivalent to collect a MI subsample as described in EPA/600/R-03/027 (EPA 2003). Laboratory error will be minimized by applying the same sampling principles to the laboratory subsampling as are used in the field. The samples will be analyzed for the following analytes:

- PCBa
- SVOCs
- Metals
- TPH-GRO/DRO/ORO
- Pesticides
- PCDD, PCDF

The samples will be screened using the PCBa and TPH results for possible forensic analysis (APAH, SHC, GBM, PCBc). See **Table 3-2** for additional details regarding the proposed samples.

3.3.9 Phase III, Task 2: NPS Property Subsurface Soil and Groundwater Sampling

If present, soil and groundwater contamination resulting from the suspected dredge spoils staged by Pepco on NPS property is expected to be restricted to surficial contamination. However, Pepco is proposing a limited DPT investigation of shallow subsurface soils and groundwater in the suspected spoils area. Pepco will advance a DPT boring in each of the three decision units described above, for a total of three borings, to a depth of 15 feet below the water table. The soils will be screened for VOCs and the geology logged in the field, and three discrete subsurface soil samples will be collected from the areas with the highest Photoionization Detector (PID) reading or the most visual or olfactory evidence of contamination. If no PID readings or evidence of contamination are present, the sample will be collected from 5, 10, and 15 ft bgs. A groundwater sample will be collected from the bottom five feet of each borehole using a temporary well or screen point sampler, for a total of three groundwater samples.

The subsurface soil and groundwater samples will be analyzed for PCBa, PAHs, TPH, and metals. See **Table 3-2** for additional details regarding the proposed samples.

3.3.10 Phase III, Task 3: NPS Property Geotechnical Boring

DOEE had previously requested that a single geotechnical boring (SB-6) be installed on the NPS property during the RI/FS. This boring was not installed during the initial round of sampling because the requisite permit from NPS was not issued until after the field investigation had been completed. If DOEE still requests this boring, and the required permits and approvals can be obtained in a reasonable time period, Pepco proposes to install SB-6 to the top of the Arundel Clay as described in Section 5.2.1 of the 2012 Work Plan.

3.4 Waterside Investigation

3.4.1 Phase I, Task 1: Sediment Profile Imaging

A Sediment Profile Imaging (SPI) survey is proposed to compliment and inform other Waterside Investigation Area sampling and analysis activities. The SPI technology provides a valuable tool to help identify the depth of the BAZ, to assess benthic faunal composition, and to better understand physical characteristics of the sediment. This imaging technique can identify chemical gradients related to the oxidative state of the sediment column and the presence of relatively large inventories of reduced gases (e.g., methane). Sediment profile imaging provides a reliable method to assess sediment-organism interactions and overall benthic habitat quality, and can be used to help define the BAZ (which has been assumed to be approximately 15 cm (~6 inches) in depth in the study area portion of the Anacostia River, but may be shallower or deeper).

The SPI survey is proposed at 15 Site locations as well as 5 background locations (**Figures 3-19 and 3-20)**. The 15 proposed Site locations are located in the vicinity of the Outfall 013 cove, where the preliminary BERA found the greatest potential risks to ecological receptors, and are colocated with 15 stations sampled during the initial Waterside investigation. The five in-River background sediment sampling locations (SEDBACK16 through SEDBACK19, plus SEDBACK24) selected for the SPI survey are located upstream from the Site.

The sampling locations will be accessed by small boat equipment with a SPI camera and the locations will be identified using GPS coordinates. At each location, the camera will be lowered to the bottom of the waterway and allowed to penetrate the sediment surface prior to photographing the cross-sectional profile of the top 15 to 30 cm of sediment. The photograph will be analyzed for physical, chemical, and biological features. Images collected during the SPI analysis will be scored for apparent redox potential discontinuity (RPD), grain size (minimum, maximum and major mode), and camera penetration depth (minimum, maximum and mean). The presence or absence of burrows, feeding tubes, infauna, successional stage, anoxia, methane bubbles, and boundary roughness will also be recorded. Relative to determining the BAZ, the apparent RPD depth is an important measurement and will help determine the depth in the sediment at which there is a change in sediment color caused by a presumed strong gradient in oxidative versus reductive processes. The RPD depth depends on a variety of physical and biological factors that affect mixing and aeration of the sediment column such as turbulence, organic loading rates, rates of oxygen supply or degassing (ebullition) of methane.

Upon completion of the SPI survey, the data will be tabulated and graphed and a brief technical memorandum will be shared with the DOEE providing recomendations for future surficial sediment sampling depths in support of the ecological risk assessment. It is possible that the proposed sampling depth will remain 0 to 6 inches, or it is possible that the SPI data will suggest that a BAZ deeper (or shallower) than 0 to 6 inches is present at the Site.

3.4.2 Phase II, Task 1: Near-Site Surface Sediment Sampling

Following the SPI survey to determine the depth of the BAZ and the surface sediment sampling interval, surface sediment samples will be collected at 15 locations adjacent to the Site to support the refined BERA and forensic evaluation. The 15 proposed near-Site locations are located in the vicinity of the Outfall 013 cove, where the preliminary BERA found the greatest potential risks to ecological receptors, and are colocated with 15 stations sampled during the initial Waterside investigation (see **Figure 3-19**).

Data will be collected from all surface sediment samples to further characterize the nature, distribution, and potential sources of chemical stressors in the surficial sediment. Surface sediment sampling will take place following the SPI survey, which will be used to determine the depth of the BAZ and the surface sediment sampling interval. A subset of ten surface sediment samples (selected based on laboratory testing results from the 15 samples collected) will also be subject to toxicological and biological sampling in support of the ecological risk assessment, as well as pore water sampling (in support of the risk assessment, as well as the overall RI/FS process). Extra sample volume will be collected at all 15 locations and placed on hold with the laboratories until the subset of ten samples on which to perform the additional testing is selected.

Samples will be collected from the 0 to 6 inch (0 to 15 cm) sampling horizon, unless the SPI survey indicates an alternative BAZ is more appropriate. A summary of the chemical, physical, and biological analysis planned at each station are presented in **Table 3-2**.

Surficial sampling methodology will be adopted from the USEPA's (2001) "Method for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual". Sampling target stations were selected based on a "Targeted Sampling Design" where prior knowledge of the Site and site related factors aided in the selection of station locations.

3.4.2.1 Surface Sediment Sampling Analyses

All 15 near-Site surficial sediment samples will be analyzed for the following parameters:

- PCBa (rapid TAT)
- Metals (rapid TAT)
- PAHs (34 Parent and Alkylated PAHs) (rapid TAT)
- TOC (rapid TAT)
- Simultaneously Extracted Metals/Acid-Volatile Sulfide (SEM/AVS)
- TPH-DRO/ORO
- PCDD/PCDF
- Pesticides
- Grain Size

In order to support the risk analysis program, all 15 Site surface sediment samples will be analyzed for key chemical stressors (PCBs, Metals, PAHs, and TOC) on a rapid turnaround basis (analytical data will be available one week from sampling). These data will be used to identify ten Site locations that display a clear gradient in COPC concentrations so that relationships between COPC concentration and benthic toxicity and community health can be better evaluated. Unvalidated analytical data from all 15 Site samples will be tabulated, graphed, and provided to DOEE with a recommendation for selection of ten samples for more exhaustive analysis. The ten identified locations will be selected (in consultation with DOEE) for pore water, biological, and toxicological testing described in subsequent sections of this document.

A subset of up to five of the 15 near-Site surface sediment samples will be selected for hydrocarbon forensics (Saturated Hydrocarbons and Geochemical Biomarkers) based on PAH and TPH results. A second subset of up to five of the 15 near-Site surface sediment samples will be selected for PCBc forensics based on the PCBa results.

3.4.2.2 Surficial Sediment Sampling Procedures

Surficial sediment samples will be collected using a petit ponar dredge, pole mounted Ekman grab sampler, Ted Young dredge or equivalent depending upon specific sampling station characteristics in accordance with the USEPA's (2001) "Method for collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis, Technical Manual".

Surficial sediment will be collected from the upper 0-6 inch (0 to 15 cm) horizon, unless the SPI work dictates otherwise. Generally, this is the sediment horizon of interest as it contains the most recently deposited sediments and the most epifaunal and infaunal organisms are found within this horizon (USEPA, 2001). In order to provide a conservative estimate of divalent metals bioavailability, the top 0 to 4 cm horizon will be collected and placed in the appropriate sampling container for SEM and AVS analyses prior to the homogenization of the remaining sample. The relatively shallow depth for SEM and AVS sampling has been selected because the AVS concentration increases dramatically below the top few inches, and therefore sampling at greater depths may fail to indicate the potential bioavailability of divalent metals in the top few centimeters (Van den Berg et al., 1998). This sampling depth will be independent of the BAZ.

The surface sediment samples used for chemical testing will be processed by personnel in the field. The samples will be screened using a PID and oversized material such as twigs, shells, leaves, stones, pieces of wood, and vegetation will be removed by hand. The appropriate sediment horizon will be removed from the appropriate sampling device using a stainless steel spoon/scoop and placed in a decontaminated 1-gallon stainless steel or pyrex glass mixing bowl. Each sample will be visually examined for physical characteristics such as composition, layering, odor, and discoloration. Samples for SEM and AVS (as discussed above), analysis will be collected prior to sediment homogenization. The remaining sample will be homogenized in the mixing bowl and placed in appropriate sample containers. When appropriate, homogenized sediment samples will be sub-sampled for biological and toxicological sampling events.

Field personnel will record field observations of the physical characteristics of the sediment encountered at each sampling station and also important observations regarding the physical characteristics of the study area. Field personnel will follow the field documentation procedures and use the associated field forms discussed in Section 5.2. Information recorded will include:

- Sample station designation;
- Presence of fill material, coal or coke, or asphalt- or tar-like materials;
- Presence or absence of aquatic vegetation;
- Sediment color, texture, and particle size; and
- Odor and presence of sheens or LNAPL and/or DNAPL.

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 labeled using the sample designation described in Section 4.3. Sample container, preservation, and holding time requirements are provided in **Table 5-4**. Field notebooks and sample collection forms (discussed in Section 5.2) 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°C), packed in coolers, and shipped under chain of custody for laboratory analysis.

The collection of sample duplicates will be consistent with the procedures outlined above for sediment sample collection. Other field QC samples will be collected as described in Section 4.6. Sample depth will be recorded for each sampling location along with sample station positioning using GPS. Data validation will be performed as specified in Section 8 of the 2012 QAPP.

3.4.2.3 Pore Water Sampling

Pore water will be sampled and analyzed from 10 near-Site and 5 background surficial sediment samples in support of the ecological and human health risk assessments, as well as in support of other RI/FS tasks.

Pore water sampling locations will be identified during the SPI sampling event and based on the rapid turnaround COPC sampling described above. Pore water will be collected at ten of the 15 site sampling locations as well as at 5 of the 6 upstream background locations, for a total of 15 pore water samples; these 15 sampling locations will also be evaluated for bulk sediment chemistry, macroinvertebrate community health, and laboratory toxicity testing in order to provide temporally and spatially synoptic data for ecological risk analysis.

Samples will be collected from the 0 to 6 inch (0 to 15 cm) horizon to provide a better delineation of potentially bioavailable constituents in the surficial sediments within the Investigation Area (this horizon may be adjusted based on the BAZ determined in the SPI survey). Pore water will be analyzed for the following parameters:

- Metals
- PAHs
- PCBc and PCBa
- Ammonia
- Dissolved Organic Carbon (DOC)
- Particulate Organic Carbon (POC)
- Hardness

These constituents were selected for pore water analysis because: (a) there are established techniques available for collection of high quality pore water samples (e.g., metals, PAHs, PCBs) or because the constituents to be evaluated (e.g. ammonia, DOC, POC, hardness) will provide valuable information relative to the potential for COPCs to be bioavailable in the system.

3.4.2.4 Pore Water Sampling Procedures

The principal goal associated with the sampling effort will be to use procedures that minimize changes to the in situ conditions of the interstitial (pore) water – all samples for pore water analysis will be collected using identical procedures from the identical surface sediment depth horizon, and will be collected using procedures outlined in the 2013 USEPA Pore Water Sampling Operating Procedure guidance document to minimize changes in the integrity of the sample. Grab sampling techniques described in Section 3.4.3.1 will be used to collect sediment for pore water; it is recognized that multiple grab samples from any one sampling station may be required to achieve the sediment volumes required for pore water chemical analysis.

In order to provide the highest quality pore water chemistry results, three different methodologies for pore water extraction have been selected. In all cases, grab sample(s) will be obtained from all 20 surficial sediment sampling locations and will be processed minimally (colocated bulk sediment chemistry will be collected from all 20 stations). These samples will be containerized in multiple 1-gallon decontaminated buckets and will be stored at 4C under chain of custody at the analytical laboratory. Once the sub-set of 15 stations for pore water analysis have been selected (10 Site plus 5 background), the following methods will be used:

- **Centrifugation/Filtration**: Pore water for metals, DOC, POC, hardness, and ammonia will be obtained via centrifugation of sediment. The POC sample will be collected from the post-centrifugation supernatant. The remaining supernatant will be filtered via a 0.45 micron filter, and the filtrate will be analyzed using the methodologies outline in **Table 3-2**.
- **Solid Phase Microextraction (SPME)**: Pore water samples for PAHs will be collected and analyzed ex situ in accordance with ASTM Method 7263, a method that involves centrifugation, flocculation, and solid phase microextraction (SPME) of the pore water. The PAHs will be analyzed using the analytical methods outlined in Table 3-2.
- **Sorbent Sampling**: The dissolved PCBs in pore water will be determined by ex situ sorbent sampling methods. EPA method 1668 will be used to measure PCBs sorbed to polyoxymethylene (POM) or polyethylene (PE) sorbents after tumbling and equilibration of a sediment/water/sorbent mixture. Literature values for PCB congener sorbent partition coefficients will be used to calculate pore water concentrations from the sorbent concentrations.

3.4.2.5 Benthic Macroinvertebrate Sampling

A benthic macroinvertebrate community analysis will be performed to provide a measurement endpoint for evaluating the *in situ* response of the benthic community to potential stressors in the Waterside Investigation

Area and at upstream background locations. The results of the benthic macroinvertebrate community analysis will provide a direct measure of the integrity of the benthic community in relation to Site-specific chemical and physical stressors. Biological impairment may be indicated by the absence of pollution-sensitive macroinvertebrate taxa, excess dominance by one taxon, low overall taxa richness, or reduced community composition relative to reference conditions. The protocols to be used for analysis of the benthic macroinvertebrate taxonomy and community results will be the metrics presented in the USEPA Rapid Bioassessment Protocol (Chapter 7; Barbour et al., 1999).

Benthic macroinvertebrate samples will be collected from all 15 near-Site sediment sampling location as well as the 5 background or reference locations. The taxonomic laboratory will be instructed to hold all samples. Once the range and distribution of chemical contaminants are known, 10 locations will be selected (based on the rapid turnaround chemistry data and in conjunction with DOEE) for benthic community analysis. At each of these sampling locations, bulk sediment chemistry, pore water, and laboratory toxicity testing data will be obtained in order to provide temporally and spatially synoptic data for ecological risk analysis.

3.4.2.6 Benthic Macroinvertebrate Sampling Procedures

The macroinvertebrate sampling technique is designed after a modified version of the USEPA (1999) Rapid Bioassessment Protocols (RBP) and will incorporate sampling method aspects from the USEPA (2000) Estuarine and Coastal Marine Waters: Bioassessment and Biocriteria Technical Guidance. In addition, the sampling methods outlined in the Maryland Biological Stream Survey (MBSS) (MDNR, 2014) will be employed. As described below, the macroinvertebrate sampling program is planned to be conducted using grab sampling technologies (i.e., using a Ted Young sampler, petite ponar dredge, or equivalent). However, if these sampling technologies prove ineffective given the substrate type, or if the grab sampling technique does not yield sufficient numbers of benthic invertebrates for meaningful statistical evaluations (ideally 100 organism sub-samples), use of artificial substrates will be considered as a contingency measure.

Prior to sampling, a physical/chemical field data sheet will be completed to document supplementary information including water quality, depth, etc. A field sketch of the sampling reach will be drawn to document major habitats, riparian habitat, and other instream attributes and weather conditions will be documented. The physical habitat assessment will be conducted at each sampling location based on the metrics outlined in the MBSS protocol (MDNR, 2014). The purpose of this assessment is to characterize the habitat quality available at each sampling location. Survey metrics will include the measurements and observations of shoreline habitat parameters such as width of riparian buffer and tree canopy shade, presence of large woody debris, evidence of channelization, and substrate quality of the river bed. In addition, water quality parameters will be documented at each location using *in situ* measurements of dissolved oxygen, temperature, pH, and specific conductance. The MBSS protocol will be adhered to in terms of collecting water quality measurements prior to any disturbance in the stream (i.e., these measurements will be made prior to sampling of the macroinvertebrate community).

A Ted Young grab, petite Ponar or equivalent will be used to collect the benthic invertebrate samples from each location. This method will permit sampling of deep habitats that preclude the use of shallow water sampling techniques such as Kick nets or Dip nets.

Sampling techniques to collect the benthic macroinvertebrates will be consistent with the technique used to collect sediment. Once the sample is collected, the top of the grab sampler will be opened to determine whether the sample collected is acceptable for analysis. In accordance with USEPA (2000a) guidance, an acceptable grab is one having relatively level, intact sediment over the entire area of the grab, and a sediment depth at the center of at least 7 centimeters. Samples deemed unacceptable may result from inadequate penetration, angle of closure, completeness of closure of the jaws, and potential loss of sample material during retrieval.

Samples will emptied into a collection bucket and any sediment remaining in the grab will be washed directly into the bucket. The bucket will be transferred to a sample-processing table where it will be sieved through a 500 micron sieve bucket to remove fine material.

Large debris (e.g., rocks) will be removed from the sample; however, no attempt will be made to remove small debris. All matter retained on the sieve will be transferred to labeled storage bottles and preserved in 95 percent ethanol to cover the sample. Sample bottles will be labeled with the site name, the station number, a unique sample identification number as described in Section 4.3, date and time of collection, depth of collection, preservative use, and name of collectors. Detailed field notes, as discussed in Section 5.2, will be kept to document the macroinvertebrate community survey.

In the event that the grab sampling technique proves ineffective (i.e., the substrate is not conducive to grab sampling or inadequate numbers of invertebrates are recovered), a contingency plan has been developed using artificial multi-plate Hester-Dendy samplers. These multi-plate samplers, which essentially mimic native substrates with narrow openings such as leaves or woody debris, would be placed in the river at the Site sampling locations and background locations and allowed to incubate for a period of time (to be determined in consultation with DOEE, but likely on the order of 4 to 6 weeks). The multi-plate samplers would be collected at the end of the incubation period, transferred to labeled storage bottles and preserved in 95 percent ethanol to cover the sampler. Bottles will be labeled with the site name, the station number, a unique sample identification number as described in Section 4.3, date and time of collection, depth of collection, preservative use, and name of collectors. Since the surface area of the multi-plate samplers is known, this alternative technique, should it be employed, allows for quantitative evaluation of macroinvertebrate communities per unit area.

Four replicate samples will be collected at each sampling location. Macroinvertebrates from three out of four replicates per location will be identified to the genus and species level, when practical. The fourth replicate at each location will serve as a potential replacement replicate if needed (e.g., in case of habitat substrate incompatibility among replicate locations). One of the remaining fourth replicate samples will be selected to serve as the replicate sample for sorting and identification to comply with the data quality objectives of the MBSS (i.e., 1 replicate sample for 10 total samples collected to achieve the requirement of 5% of all samples collected).

In accordance with the USEPA Rapid Bioassessment protocol (Barbour et al., 1999) and MDNR (2014) guidance, the preserved samples will be sent to the contract laboratory under chain-of-custody for identification and enumeration. Taxonomic analysis of the macroinvertebrate samples will be conducted on a fixed count of 100 organisms with identification to the lowest practical level (ideally to the species level when possible).

3.4.2.7 Laboratory Toxicity Testing

Laboratory toxicity tests are planned to evaluate whether direct exposures to sediments have the potential to cause toxicity to ecological receptors. All toxicity tests will be conducted under specified laboratory conditions using whole environmental media only (e.g., no dilution series or pore water toxicity testing is planned). Sub-chronic toxicity tests will be conducted to assess the toxicity of sediments to invertebrate organisms. The objective of the sediment toxicity tests will be to obtain laboratory data to evaluate potential ecological risks to invertebrate receptors. The midge (*Chironomus tentans*) and amphipod (*Hyalella azteca*) have been selected as the invertebrate species for a 10-day sediment toxicity testing program. Uncertainties associated with the duration of these tests will be explored in the ecological risk assessment uncertainty analysis.

Toxicity testing will be conducted using samples collected from ten of the 15 site sampling locations as well as all 5 background locations; at each of these sampling locations, bulk sediment chemistry, pore water, and macroinvertebrate community analysis data will be available in order to provide temporally and spatially synoptic data for ecological risk analysis.

3.4.2.8 Toxicity Testing Procedures

The sediment toxicity samples will be collected immediately following collection of the surface sediment samples for chemical analysis. The Petite Ponar grab sampler or the equivalent will be used to collect a sample from a depth of 0 to 6 inches below sediment surface, unless the SPI survey dictates an alternative sampling depth. The sample will be released directly into a previously decontaminated bucket provided by the toxicity testing laboratory.

In order to provide sufficient volume for the toxicity tests, a 1-gallon sample container will be filled at each of the 15 Site sediment sampling locations for the toxicity tests. The laboratory will be instructed to hold all samples. Once the range and distribution of chemical contaminants are known, 10 locations will be selected (based on the rapid turnaround chemistry data and in conjunction with DOEE) for toxicity testing (10 day *Chironomus dilutus* and 10 day *Hyalella azteca* laboratory tests), in accordance with the USEPA (2001) Method for Collection, Storage, and Manipulation of Sediments for Chemical and Toxicological Analysis: Technical Manual (Test Method 100.1: Hyalella azteca 10-d Survival and Growth Test for Sediments, and Test Method 100.2: Chironomus tentans 10-d Survival and Growth Test for Sediments).

3.4.3 Phase II, Task 2: Background and Forensics Surface and Subsurface Sediment Sampling

Surface and subsurface sampling will be conducted at six upstream background sediment sampling locations and 15 forensics locations located adjacent to and downstream of the Site (see **Figure 3-20**). Toxicological and biological sampling, as well as pore water sampling, will also be conducted at five of the upstream background locations (SEDBACK16 through SEDBACK20) as described above to support the refined BERA.

The objective of surface and subsurface sediment sampling is to further delineate the vertical extent of chemical constituents at the six upstream background locations, and determine the forensic characteristics of the 15 Site-adjacent and downstream locations in the Anacostia River (**Figure 3-20**). As described in Section 3.4.2 for near-Site surface sediment sampling, Background location surface sediment samples will be collected from the 0 to 6 inch (0 to 15 cm) sampling horizon, unless the SPI survey indicates an alternative BAZ is more appropriate. SPI will be conducted only at those background locations being assessed for risk purposes (SEDBACK16 through SEDBACK20).

Surficial sediments at the six upstream background locations will be analyzed for the following:

- PCBa
- Metals
- TOC
- AVS/SEM (SEDBACK16 through SEDBACK 19, plus SEDBACK24 only)
- SVOCs
- Pesticides
- PCDD/PCDF
- Grain size

Five of the six upstream background locations (SEDBACK16 through SEDBACK20) will also be subjected to pore water analysis, benthic macroinvertebrate survey, and laboratory toxicity testing, as described in the previous sections, for ecological risk assessment purposes.

Subsurface sediment samples at the six upstream background locations will be collected at intervals of 1-3, 3-5, 5-7 and 7-9 ft below the mudline, and will be analyzed for the following:

- PCBaMetals
- SVOCs
- TOC
- PCDD/PCDF
- TPH-DRO/ORO
- Pesticides
- Grain Size

A subset of up to 12 upstream background subsurface sediment samples will be selected for hydrocarbon forensics (SHC, APAHs, GBM) based on the PAH and TPH results. Another subset of up to 12 upstream background subsurface sediment samples will be selected for PCBc analysis based on the PCBa results.

3.4.3.1 Background Subsurface Sediment Sampling Procedure

Subsurface samples will be collected using a vibracore sampling device and will target cores at 1-2 ft intervals starting at 1 ft below the river bed and continuing down to 9-10 ft at each sampling station. These depth horizons are well below the BAZ, and will be selected based on field observations to provide data on the vertical distribution of contaminants.

As described in **Table 3-2**, all sub-surficial sediment samples will be evaluated for chemical and physical parameters. Additional detail regarding sampling (including sample containers, preservatives, holding times, and QC samples) and validation is presented above (in the surficial sampling sub-section). Decontamination procedures are presented in the 2012 FSP.

3.4.3.2 District of Columbia Storm Drain Sampling and Analysis

In order to provide additional insight regarding potential contributions from urban stormwater, two sediment or sludge samples will be collected from the City storm drains that discharge at outfalls F-294-739 and F-656-309 (**Figure 3-20**). It is possible that this sample will be collected from the in-river delta at the Outfall terminus; alternatively it is possible that this sample will be collected from an "up-pipe" or even an upland manhole sump location. The sample from the City storm drain will be collected using similar methodologies as those used in the surface sediment sampling effort. The samples will be analyzed for the following parameters:

- PCBc and PCBa
- Metals
- PAHs (34 Parent and Alkylated PAHs)
- TOC
- PCDD/PCDF
- Pesticides
- Grain Size
- Saturated Hydrocarbons
- Geochemical Biomarkers

In addition, the storm drain sample will be analyzed for forensic purposes using the constituent list detailed in **Table 3-2.**

3.4.4 Phase II, Task 3: High Resolution Coring

High-resolution cores will be collected from three locations within the Waterside Investigation Area and submitted for radioisotope analyses (Be-7, Cs-137, and Pb-210) for radiometric dating and chemical analysis for PCBs, PAHs, and metals. The coring locations are shown on **Figure 3-19**, and the analytes are provided on **Table 3-2**. High-resolution refers to sediment core sampling on a finer-scale, in intervals 10 cm (approximately 1/3 ft) in length and cores will be advance to 10 ft. Therefore, up to 90 samples will be collected in support of this effort (3 cores, 30 samples per core). Geochronological dating methods can be used to evaluate sedimentation and burial processes within the aquatic environment and are intended to provide information regarding the distribution of PCBs over time, as well as sediment deposition rates and stability.

High resolution coring is proposed at two locations previously sampled during the Waterside Investigation Area: SED7F and SED5B. A third high resolution core is proposed a location adjacent to Pepco Outfall 101, designated SED1.5C. SED7F is in the cove area where Outfall 013 discharges, and high resolution coring in this location will provide information regarding the onsite and offsite contributions of contamination from the outfall to the River over time. SED5B, between the cove and Benning Road Bridge, will provide mid-channel stratigraphic data of contaminant deposition quantities and rates over time. New location SED1.5C, south of the Benning Road Bridge and adjacent to Outfall 101, will provide information regarding the contribution of contamination from the outfall to the River These three locations provide good spatial coverage of the Waterside Area for obtaining high resolution coring data.

For the purposes of this study, the chronology of Anacostia River bedded sediments will be evaluated by collecting sediment cores and measuring changes in levels of atmospherically deposited radioactive isotopes over time. The following radioactive isotopes will be evaluated to provide different information about the core and the deposition of the sediment:

- Beryllium-7 can be used as a short-term tracer of sediment deposition. This naturally occurring radioisotope from cosmogenic sources in the atmosphere has a very short half-life and its activity is highest at the sediment surface and decreases rapidly with movement toward the bottom of the core. The beryllium-7 activity can be used to determine whether the surficial sediment layer is depositional as opposed to erosional.
- Cesium-137 profiles (depth, area, and shape of cesium peak) provide a means of determining the age of a sediment layer. The cesium-137 profiles are compared to the time of known cesium-137 releases and peak activity (between 1959 and 1964 due to above ground nuclear weapon testing) to provide discrete time markers with depth. These results can help determine if sediment deposition has been continuous and relatively undisturbed.
- Lead-210 profiles provide a means of estimating burial rates based upon the decay rate of lead-210 with depth (linear regression). Lead-210, a naturally-occurring radioisotope, has a relatively constant input to the environment from the decay of atmospheric radon-222 and constant decay rate, which are used in combination to calculate sedimentation rates. Radium-226 will also be measured to provide additional data to refine the lead-210 curve.

Chemical analysis of the high resolution cores will be restriced to the primary constituents of concern (TAL metals, PAHs, TPH-DRO/OROand PCBa) due to the limited sediment volume in the thin core intervals. A subset of up to 12 of the high resolution core samples will be analyzed for forensic parameters (APAH, SHC, GBM, and PCBc) using TPH and PCBa as screening tools. Forensic analysis will be contingent on demonstration of continuous deposition and adequate radiometric data to support deposition rate calculations.

3.5 Investigation-Derived Waste Management

IDW generated during Addendum #3 activities will be managed as previously documented in the 2012 Work Plan.

3.6 Data Evaluation and Validation

Data collected as part of the Addendum # 3 activities will be managed, transmitted from the field, reviewed, and validated as previously documented in the 2012 Work Plan. Additional data evaluation methodologies are documented in Technical Memoranda #2 and #3.

3.7 Risk Assessment

The preliminary BHHRA and BERA submitted with the Draft RI report will be updated per Technical Memorandum # 2 – Refined Background Evaluation Work Plan and Technical Memorandum # 3 – Baseline Human Health and Ecological Risk Assessment Work Plan (Appendix E). Updates to the BHHRA will include use of the data collected as part of the Addendum #3 activities, new landside receptors and exposure scenarios to address the potential for Site uses to change in the future, and a refined background data evaluation. Updates to the BERA will include use of the data collected as part of the Addendum #3 activities and a refined background data evaluation.

4 Field Sampling Plan

All field investigation activities described in this Addendum will be conducted in accordance with the approved 2012 FSP, Part I of the 2012 SAP. Additional or revised FSP information related to the proposed Addendum #3 field activities is presented in the following sections.

4.1 Sampling Objectives

The Addendum #3 field investigation activities are designed to characterize environmental conditions within the Study Area, refine the CSM, address data gaps and uncertainties identified during the initial field investigation, and collect data to support the refined BHHRA and BERA.

The Landside and Waterside data quality objective (DQO) development process is presented in Tables 2 and 3 of the 2012 FSP.

4.2 Sampling Location and Frequency

The AECOM Field Team Leader will use professional judgment to adjust sampling locations, as appropriate based on field conditions. Where samples cannot be collected due to obstructions or Health and Safety concerns (e.g., within an electrical substation), sample locations may be relocated or eliminated based on an evaluation of the field conditions and the sample data already collected. Any eliminations or material relocations of sampling points will be recorded in the field book and provided to DOEE for review following sampling.

4.3 Sample Designation

Sample designation is a unique label that identifies each sample under the analytical program. In general, sample designation for the Addendum #3 sampling will follow the identification system outlined in Section 4 of the 2012 SAP, with revisions or additions as required by the nature of the additional sampling. The sample designation for each of the Addendum #3 tasks is described below:

<u>Landside Phase I, Task 1: Onsite Monitoring Well Resampling</u>

During the proposed monitoring well resampling, in order to avoid duplication of sample IDs for groundwater samples previously collected, the date will be added after the well ID and before the sample type character, in the format of two digits for the month, two digits for the day, and two digits for the year. For example, the sample designation for the field (normal) groundwater sample collected from MW-01A on March 1, 2017 would be MW01A030117N.

Landside Phase I, Task 2: Surface and Subsurface Soil Delineation Sampling

The majority of surface soil delineation sampling consists of 12-point delineation sampling of previous detections in surface soils. The sampling locations for this delineation have been divided into "rings," with the 8 samples closest to the previous detection forming ring one, then next largest ring of 16 samples forming ring two, and so on. The sample locations within each ring will be identified by a letter, with "A" denoting the sample due north of the previous detection being delineated, and each sample location moving clockwise around the ring being denoted by successive letters.

The sample designation for the delineation soil samples will be as follows: sample method (Surface Soil Sample [SUS] or Direct Push Soil [DPS]), location number, ring number (1 or 2), location letter (A through H in ring one; A, E, I, or M in ring two), two-digit number indicating the top of the sample depth interval (00 for surface samples), and sample type ("N" for a normal sample, "R" for a field duplicate sample). For example, the normal surface sample collected 25 ft to the north of SUS06 would be SUS061A00N; the normal surface sample collected 50 ft to the south of SUS18 would be SUS182I00N; and the duplicate of the subsurface sample collected 25 ft northwest of DP19 at 15-16 ft bgs would be DPS191H15R.

More extensive sampling will be conducted in Target Area 1 (former coal pile area and former sludge dewatering area). This area will be gridded, with each grid line (row or column) assigned a letter or number, as shown on **Figure 3-4**. The designation for the proposed surface soil samples in the TA #1 area will be as follows: Surface Soil Sample (SUS), Target Area (TA1), grid row and column (letter and number), sample depth (00), and sample type. For example, the designation for the normal field sample collected at grid location B2 would be SUSTA1B200N.

Other sample locations (for example, in the former timber pole area and former transformer shop area), these locations will be designated a new location ID starting with SUS/DP48 (DP47 was the last ID used in the Phase 1 RI). The remainder of the sample ID will be consistent with the 2012 SAP (two-digit number indicating the top of the sample depth interval (00 for surface samples), and sample type ("N" for a normal sample, "R" for a field duplicate sample).

Landside Phase I, Task 3: Surface and Subsurface Soil Forensics Sampling

Surface and/or subsurface soils are proposed to be collected for forensic purposes at 22 locations previously sampled during the first phase of field investigation. The sample designation for these locations will use the designation scheme described in the 2012 FSP and will be identical to the original sample IDs except that a letter “F” (for forensic) will be added before the sample type. Specifically, the designation for the proposed samples will be as follows: Direct Push Soil (DPS), two-digit location number, two-digit number indicating the top of the sample depth interval, forensic (F), and sample type. For example, the designation for the forensic sample collected from 3-4 ft bgs at DP04 would be DPS0403FN. For locations that have not been drilling before, they will be assigned the next sequential SUS/DP boring ID number. The remainder of the sample ID will be consistent with the 2012 SAP.

Landside Phase I, Task 4: DPT Groundwater Sampling

DPT groundwater sampling is proposed in two areas of the site: downgradient of TA #18, and the new TA #19 in the area of MW-1 and MW-2 in the southwest corner of the Site. For the TA #19 (MW-1 and MW-2) area groundwater delineation, the area will be gridded, with each grid line (row or column) assigned a letter or number, as shown on **Figure 3-13**. The sample designation for these samples will be as follows: Direct Push Water (DPW), Target Area (TA19), grid row and column (letter and number), sample depth interval, and sample type. For example, the designation for a groundwater sample collected from 25-30 ft bgs at grid location B1 in TA #19 would be DPWTA19B125-30N.

For the MTBE delineation area downgradient of TA #18, these sample points will be assigned the next sequential DP boring ID. The remainder of the sample ID will be consistent with the 2012 SAP.

Landside Phase II, Task 1: Background Surface and Subsurface Soil Sampling

There are twenty proposed surface and subsurface soil sampling locations proposed to support the Refined Background Evaluation. As shown in **Table 3-2**, these locations are labeled SU-BK-01, SU-BK-02, and SOBACK01 through SOBACK18. The sample designation for these samples will be as follows: location name, two-digit number indicating the top of the sample depth interval, and sample type. For example, the designation for the subsurface soil sample collected from 3-4 ft bgs at location SOBACK09 would be SOBACK0903N.

Landside Phase II, Task 2: Background Monitoring Well Sampling

Up to three established background monitoring wells will be sampled to support the Refined Background Evaluation. The sample designation for these groundwater samples will be constructed from the

Department of Consumer and Regulatory Affairs (DCRA) permit number for the well, followed by sample type. For example, the designation for the groundwater sample collected from the well with DCRA permit number SB1500325 would be SB1500325N.

Landside Phase II, Task 3: Background DPT Groundwater Sampling

Thirteen background locations (Geoprobe01 through Geoprobe13) up-gradient and cross-gradient from the Site are to be evaluated for potentially drilling by direct push methods, and groundwater samples collected from the upper and lower water-bearing zones at nine of these. The sample designation for these samples will be as follows: Direct Push Water (DPW), Background (BACK), two-digit location number, top and bottom of sample depth interval separated by a dash, and sample type. For example, the designation for the groundwater sample collected from 40-45 ft bgs at location Geoprobe02 would be DPWBACK0240-45N.

Landside Phase III, Task 1: NPS Incremental Surface Soil Sampling

Pepco proposes to collect surface and subsurface soil and groundwater samples from three decision units (DUs) on NPS property, labeled 01 through 03. The surface soil samples will be composite samples of 30 incremental samples within each DU, as shown on **Figure 3-18**. The subsurface and direct push groundwater samples will be discrete grab samples. The sample designation for these samples will be as follows: sample method (Surface Soil Sample [SUS], Direct Push Soil [DPS], or Direct Push Water [DPW]), National Park Service (NPS), indicator if it is a Multi-Incremental sample (MI for Multi-Incremental samples, no indicator if it is a discrete sample) two-digit DU number, two-digit number indicating the top of the sample depth interval (or for DPW samples, the top and bottom of the sample depth interval separated by a dash), and sample type. For example, the Multi-Incremental surface soil sample collected from DU 02 would be SUSNPSMI0200N; the discrete subsurface soil sample collected from 5-6 ft bgs in DU 01 would be DPSNPS0105; and the discrete groundwater sample collected from 10-15 ft bgs DU 03 would be DPWNPS0310-15N.

Landside Phase III, Task 2: Geotechnical Boring

One geotechnical boring (SB-6) is proposed on NPS property. The sample designation for samples collected from this boring will follow the designation scheme described in the 2012 FSP. Specifically, the designation for these samples will be as follows: sample method (Soil Boring Soil [SBS] or Soil Boring Water [SBW]), two-digit boring number (06), two-digit number indicating the top of the sample depth interval (or for groundwater samples, the top and bottom of the sample depth interval separated by a dash), and sample type. For example, a soil sample collected from 20-21 ft bgs in SB-6 would be SBS0620N; a groundwater sample collected from 35-40 ft bgs in SB-6 would be SBW0635-40N.

Waterside Phase I, Task 1: Near-Site Surface Sediment Sampling

Fifteen near-Site sampling stations are proposed to be sampled for surface sediment to support the refined BERA. These 15 locations will be colocated with locations previously sampled during the initial Waterside Investigation. As such, their sample designations will be nearly identical to those of the previous samples, whose designation scheme is described in the 2012 FSP. Specifically, the designation for these samples will be as follows: sediment (SED), location identifier, two-digit number indicating the top of the sample depth interval, the letter “E” (for ecological risk assessment), and sample type. For example, the designation for the surface sediment sample collected from location 7A would be SED7A00EN.

Waterside Phase I, Task 2: Near-Site and Background Surface and Subsurface Sediment Sampling

Surface and subsurface sediment samples are proposed to be collected at six upstream background locations in the River, labeled SEDBACK16 through SEDBACK21. The designation for these samples will be as follows: sediment (SED), background (BACK), location identifier, two-digit number indicating the top of the sample depth interval, and sample type. For example, the designation for the subsurface sediment sample collected from 7-9 ft below the river bottom at background location SEDBACK18 would be SEDBACK1807N.

Surface and subsurface sediment samples are also proposed to be collected at 15 forensics reference locations. Seven of the locations are colocated with previous sediment samples (locations SED1.5B, SED4B, SED4C, SED5B, SED5C, SED6.5D, and SED7D). To distinguish these sediment sample locations from the previous locations, the designation for these samples will be as follows: sediment (SED), location identifier, two-digit number indicating the top of the sample depth interval, the letter “F” (for forensics analysis), and sample type. For example, the designation for the sediment sample collected from 2-3 ft at location SED4B would be SED4B02FN. The remaining eight downstream reference samples will be designated as follows: reference sediment (SEDREF), location identifier, two-digit number indicating the top of the sample depth interval, and sample type. For example, the designation for the sediment sample collected from 9-10 ft at location SEDREF6 would be SEDREF602N.

Additionally, sediment samples are proposed to be collected from two city storm drains that discharge to the River: outfall F-294-739, next to Pepco's Outfall 101, and outfall F-656-309, downstream of the Whitney Young Memorial Bridge . The sample designation for these samples will be SDRBACK1 and SDRBACK2, respectively.

Waterside Phase I, Task 3: High Resolution Coring

Two of the three proposed high resolution coring locations will be colocated with two sampling locations previously sampled during the initial Waterside Investigation: SED7F and SED5B. The third will be collected from adjacent to Pepco's Outfall 101. During the high resolution coring, samples will be collected in 10 cm (approximately 4 inch) slices from 0-10 ft below the river bottom, for a total of 30 samples from each core. The designation for these samples will be as follows: location identifier (SED7F, SED5B, or SED1.5C), two digits indicating the top of the sample depth interval in feet, a letter (A, B, or C) indicating from which the third of a foot the sample was collected (A for the first [0-0.3 ft], B for the second [0.3-0.7 ft], and C for the third [0.7-1.0 ft]), and sample type. For example, the sample collected from 1.0-1.3 ft below the mudline at SED7F would be SED7F01AN; the sample collected from 4.3-4.7 ft below the mudline at SED5B would be SED5B04BN; and the sample collected from 9.7 to 10.0 ft below the mudline at SED1.5C would be SED1.5C09CN.

4.4 Field Procedures

The proposed field work will include drilling of soil borings and collection of surface and subsurface soil, sediment, and groundwater samples for laboratory analyses. In general, the field techniques and procedures used will be the same as those employed during the initial phase of sampling, and described in the 2012 FSP. AECOM has developed a set of standardized Project Operating Procedures (POPs) for the various field activities, copies of which are provided in Appendix A of the 2012 FSP.

4.5 Sample Handling and Analysis

Sample handling includes packaging and shipping samples to designated laboratories upon completion of sample collection. Field teams are responsible for all aspects of sample handling and will coordinate and document the transfer of custody of samples to the laboratories. Procedures for the packaging and shipment of samples are provided in the 2012 FSP, and the analytical parameters, methods, and laboratories are described in the 2012 Quality Assurance Project Plan (QAPP).

4.6 Field Quality Control

Proper equipment preparation, cleaning, and field decontamination procedures are necessary to prevent cross contamination of samples. These procedures are discussed in Section 7 of the 2012 FSP.

Quality control (QC) samples will be collected during the additional field investigation program to estimate the precision and accuracy of the analytical results, and to examine the sources of error introduced by the field and laboratory practices. The required frequency and procedures for QC samples (field blanks, field duplicate samples, and trip and temperature blank samples) are described in Section 7 of the 2012 FSP and Section 4 of the 2012 QAPP.

5 Quality Assurance Project Plan

All field investigation activities described in this Addendum will be conducted in accordance with the 2012 QAPP, Part II of the SAP. Specifically, as noted in the last section, the POPs introduced detailed in FSP Appendix A will be followed. The 2012 QAPP contains quality assurance/quality control (QA/QC) procedures and specific protocols for sampling, sample handling and storage, chain of custody, and laboratory and field analyses. Additional or revised QAPP information related to the proposed field activities is presented in the following sections.

Control limits for the high resolution coring radioisotope analyses are provided in **Table 5-1**, which is a revision of Table 1 of the 2012 QAPP. Four additional fuel oxygenate analytes (tertiary butyl alcohol [TBA], diisopropyl ether [DIPE], tertiary ethyl butyl ether [ETBE], and tertiary amyl methyl ether [TAME]) will be added to the VOC analyte list to further define the fuel related releases where MTBE has been detected in groundwater. Reporting limits, method detection limits, and project screening levels where available are shown on **Table 5-2**, which is an addendum to Table 2 of the 2012 QAPP.

New n-alkane and isoprenoid saturated hydrocarbons and geochemical biomarker analytes will be added to better define the forensic nature and potential sources of petroleum hydrocarbons at selected Site and Background sample locations. The exact analyte lists, reporting limits and method detection limits are provided on **Table 5-2**.

The PCDD/PCDF analyte list has been expanded to include all non-2,3,7,8 isomers for the tetra to hepta homolog groups. Although these compounds are not regulated like the more toxic and previously reported 2,3,7,8 chlorinated isomers, the detailed pattern of their relative abundance can add value to the forensic determination of PCDD/PCDF sources. The revised PCDD/PCDF analyte list, reporting limits, and average estimated detection limits are provided in **Table 5-3**, a revision of Table 4 of the 2012 QAPP.

Laboratory Standard Operating Procedures for the new methods proposed in this Addendum are provided in **Appendix A**. All other lab SOPs as provided in Appendix A of the 2012 QAPP remain valid.

Laboratory control limits for the new analytes and methods are provided in **Appendix B** (addendum to Appendix B of the QAPP). Sample containers, preservation, and holding time requirements for the new analytes and methods as well as limited revisions to the 2012 QAPP are provided in **Table 5-4,** a revision of Table 6 of the 2012 QAPP.

A summary of analytical reference methods are provided in **Table 5-5**. A list of the laboratory preparation and analytical SOPs for the additional parameters being analyzed for is provided in **Table 5-6** (an addendum to Table 8 of the 2012 QAPP).

5.1 Analytical Procedures

Soil, sediment, groundwater, and surface water samples will be analyzed by the National Environmental Laboratory Accreditation Program (NELAP)-certified laboratories listed below.

Groundwater, surface water, soil, and sediment samples collected for VOCs, SVOCs, PCB Aroclors, organochlorine pesticides (OCPs), and metals will be analyzed by:

TestAmerica
301 Alpha Drive
Pittsburgh, PA 15238
412-963-7058

Groundwater and surface water samples collected for Total Petroleum Hydrocarbons will be analyzed by:

TestAmerica
4101 Shuffel Street NW
North Canton, OH
330-497-9396

All PCB congener and alkylated PAHs analyses will be performed by:

TestAmerica
5815 Middlebrook Pike
Knoxville, TN 37921
865-291-3000

All PCDD/PCDF analyses will be performed by:

SGS
5500 Business Drive
Wilmington, NC 28405
910-350-1903

All saturated hydrocarbon and geochemical biomarker analyses will be performed by:

Alpha Analytical
Woods Hole Division
320 Forbes Boulevard
Mansfield, MA 02048
508-822-9300

All radiochemical analyses will be performed by:

GEL
2040 Savage Road
Charleston, SC 29407
843-556-8171

The analysis of parent and alkylated PAHs in pore water will be performed by:

SGS
50 Deangelo Drive
Marlaborough, MA 01752
508-481-6200

Laboratory toxicity testing will be performed by:

Watershed Assessment Associates, LLC
1861 Chrisler Avenue, Suite 1
Schenectady, NY 12303

5.2 Field Documentation

The field tasks discussed in this work plan will include the sampling of a range of environmental media including soil (surface and subsurface), groundwater, sediment (surface and subsurface), and surface sediment pore water. Additional tasks include drilling boreholes for monitoring well installation and subsurface soil sampling and the development new monitoring wells and the redevelopment of existing monitoring wells. Each of field activities will be documented using an appropriate field form and in a field log book. This section discusses the field documents that will be completed for Addendum 3; sample field forms are provided in **Appendix F**.

The following paper field forms will be used, examples of which are provided in **Appendix F**:

- Soil Boring Log: a paper boring log will be used to record soil classifications, PID readings, and visual/olfactory evidence of contamination in all soil/sediment borings drilled as part of the supplemental RI, including in-river sediment sampling, background temporary well installation, and Site groundwater and subsurface sampling, Low-Flow Groundwater Sample Collection Record: all landside groundwater samples will be collected by low-flow methods, and a paper collection log will be used for each sample to record total well depth, depth to water, drawdown, and stabilization parameters (temperature, pH, specific conductivity, dissolved oxygen, oxidation-reduction potential, and turbidity).

- Calibration Sheet: all field measurement equipment (PID, YSI, etc.) will be calibrated at the beginning of each day of use, and the calibration recorded on a designated paper calibration sheet.
- Chain of Custody: all sample IDs, collection times, and requested analyses will be recorded on a laboratory-provided chain of custody

The field team leader will record all other information in the designated field log book. This information includes but is not limited to the following:

- Names of all onsite personnel, including AECOM staff, subcontractors, and regulatory representatives
- Onsite and offsite times
- Field activities being performed
- Site weather conditions
- Location, time, and IDs of environmental samples collected
- Any material change in proposed sample location
- Any change in work conditions, work area, or activities
- Any health and safety incidents

6 Schedule and Reporting

Following DOEE approval of this Work Plan Addendum #3 and a period of permit application and issuance (and securing any necessary access authorizations), the additional field investigation activities are scheduled to be conducted between January and May, 2017. The Draft Final RI Report will be submitted to DOEE within 100 days of completion of the additional field investigation.

7 References

AECOM. 2012a. Benning Road Facility Remedial Investigation and Feasibility Study (RI/FS) Work Plan (Final). December 2012.

AECOM. 2014a. Benning Road Facility RI/FS Work Plan Addendum #1 – Monitoring Well Installation Activities. March 2014.

AECOM. 2014b. Benning Road Facility RI/FS Work Plan Addendum #2 – Cooling Tower Concrete Basins Soil Sampling Activities. July 2014.

AECOM. 2014c. Draft Cooling Tower Basins Soil Removal Action Plan. December 2014.

AECOM, 2016a. Benning Road Facility Draft Remedial Investigation Report. February 2016.

AECOM, 2016b. Benning Road Facility Technical Memorandum #1 – Conceptual Site Model (draft). August 2016.

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