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SOIL PILE SITE INVESTIGATION REPORT

Kingman Island, Washington, DC

Prepared for

Department of Energy and the Environment
Government of the District of Columbia

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Prepared by

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ATTACHMENTS

1.0 INTRODUCTION

Tetra Tech, Inc. (Tetra Tech) is pleased to provide the District of Columbia Department of Energy & Environment (DOEE) with the results of the Soil Pile Site Investigation (SI) conducted at Kingman Island, located in Washington, DC (Site). On behalf of DOEE, Tetra Tech, Inc. (Tetra Tech) prepared this Site Investigation (SI) Report consistent with the data evaluation and reporting requirements defined in the Work Plan for the Site Investigation of Soil Piles dated September 30, 2015 (Tetra Tech 2015).

1.1 Objectives

Potential areas of concern were based on the existing soil piles located at the site and generally defined in the previously completed 2007 Environmental Assessment Report (MACTEC, 2007). The objectives of this SI are to confirm findings from previous studies and to perform additional subsurface exploration and testing to further evaluate the presence or absence of hazardous materials in subsurface media in the vicinity of the soil piles. Additional characterization data was also collected in order to characterize the material in the waste piles to evaluate potential disposal methods.

SI activities included conducting a subsurface assessment around the perimeter of each of the three existing soil piles to evaluate potential impacts to subsurface media from the soil piles. Six soil borings were advanced in the vicinity of each of the soil piles for a total of 18 soil borings. Groundwater was collected from three of the six borings that were advanced in the vicinity of each soil pile for a total of nine groundwater samples. In addition, the SI included composite soil samples from each soil pile for characterization of the material to assist in determining potential disposal options.

Tetra Tech reviewed the Kingman and Heritage Islands Preferred Master Plan Concept which describes the planned future uses of Kingman Island as a public resource, which may include a nature center, a sculpture garden, an open meadow, playgrounds, nature trails, and canoe tie ups. Tetra Tech sampled for the known constituents of concern along with several other parameters in order to assist in verifying the suitability of Kingman Island as public green space described in the Preferred Master Plan Concept.

2.0 SITE DESCRIPTION

This section provides information regarding site background and geology and summarizes the preliminary conceptual site model (CSM) for the project.

2.1 Site Background

The creation of Kingman Island reportedly began in 1916 by the U.S. Army Corps of Engineers (USACE) as a result of Anacostia River dredging operations (USACE, 2002). The placement of dredged material at the site ceased prior to 1920. The original intent of the island was to provide outdoor recreational areas for surrounding city communities, but development was interrupted during World War II. During this time, the neighboring communities used the island for fishing and nature walks, and to create “victory gardens” during the war. Since then, the Site has generally been left unattended and undeveloped and has reportedly been used for unauthorized dumping of local refuse from the 1920s through present day. The unauthorized dumping and the presence of large composting piles are reportedly the only recent changes in the topography of Kingman Island. The source(s) of this later fill material are unknown, although it was suggested in the USACE Risk Assessment (RA) report that some fill material originated at the Kenilworth Landfill. The purpose of the USACE RA report was to evaluate the feasibility of proposed development plans for Kingman Island for recreational and habitat enhancement purposes. Based on information included in the report, Kingman Island consists of approximately 94 acres of land and separates Kingman Lake from the main stem of the Anacostia River. The island is approximately 1.5 miles long and is bisected by Benning Road. In addition, the East Capitol Street Bridge passes over the center of the southern portion of the island. MACTEC completed mound investigation with test pit excavations in the area south of Benning Road. This area that consists of approximately 70 acres, is owned by the District of Columbia and presently remains primarily undeveloped. A site location map is presented in Figure 1 of Attachment 1.

The RA report completed by the USACE indicated that there was no reason to alter the Preferred Master Plan, based on Site conditions at the time of the RA. The RA report stated that risks to humans were found to be acceptable and although some risks to wildlife were identified, there appeared to be no effect on overall populations. Although, predicted lead concentrations at the Site were not of concern in the blood-lead level modeling, the presence of lead concentrations at the site over 1,000 milligrams per kilogram (mg/kg) in soil were considered a concern. It was therefore recommended that lead concentrations greater than 1,000 mg/kg be removed or remediated.

To further evaluate the types of material present at the Site, identify the presence of potential contaminants of concern, and estimate the volume of soil/debris, MACTEC performed test pits within several of the larger fill mounds at the Site which were reported in the MACTEC 2007 Report. Environmental Assessment studies completed at the Site detected varying concentrations of lead, Total Petroleum Hydrocarbons - Diesel Range Organics (TPH-DRO), and polychlorinated biphenyls (PCBs) in soils from the two soil piles sampled (Soil Pile 1 and Soil Pile 2). The analytical data were evaluated from 18 test pits with depth ranging from 3 to 5 feet below ground surface (bgs).

2.2 Site Geology

Based on a review of previous reports conducted on Kingman Island, subsurface conditions in the vicinity of Kingman Island were thought to consist of primarily man-made surficial fill over dredge spoils from the Anacostia River that were deposited prior to the 1920s. The natural soil profile at the Site has been altered by past development that has resulted in the placement of man-made fill. Existing man-made fill can be variable in depth, composition and consistency, and the properties of such material can be difficult to assess. In general, the soils associated with these disturbed areas greatly vary based on specific site locations. The presence of existing fill was confirmed by the soil borings conducted by ECS Mid-Atlantic (ECS, 2009) in their investigation of the Site.

ECS identified three typical strata in their 2009 investigation, surficial fill, Stratum I, and Stratum II. The surficial fill typically consisted of concrete, brick, and asphalt fragments. The fill material extended to depths on the order of 6 to 27 feet bgs. Stratum I which underlies the existing fill material generally consisted of silt with varying amounts of clay and sand, lean clay and silty sand. Stratum II, which underlies Stratum I consisted of a generally denser soil strata that was encountered in the deeper borings extending to the maximum depth of exploration of 47 to 75 feet bgs. These soils consisted of a lean clay and sand with varying amounts of gravel and silt considered typical of coastal plain deposits.

The soil boring data collected as part of this SI confirms the ECS investigation findings to the maximum depth investigated. The surficial fill layer was evident in each boring advanced by Tetra Tech and consisted of a dark brown heterogeneous silty clay with gravel. This layer was commonly marked by inclusions of bricks and anthropogenic debris. The depth of the surficial fill material ranged from 5 to 14 feet bgs and was commonly 4 to 5 feet thicker on the southern portion of the island in the borings advanced in the vicinity of Soil Pile 3 as compared to the borings advanced in the vicinity of Soil Piles 1 and 2.

The lower extent of the surficial fill material was marked by a transition into a dark gray heterogeneous silty clay with gravel called Stratum I by ECS. This material was noted to have little to no debris and was encountered to a depth range of 13 to 23 feet bgs and appeared to be the dredge spoils. The water table was regularly encountered in this interval at a depth range of 9.5 to 18 feet bgs during this SI.

Each of the borings advanced by Tetra Tech terminated within the final layer (Stratum II) which consisted of native alluvial material. This layer was marked by a transition into a dark gray thinly laminated silty clay with low to medium plasticity. This homogenous layer was noted to commonly have an organic odor with no observed debris or course grained dredge spoils.

Stratum I and Stratum II showed textural similarities to the material encountered during the Anacostia River Remedial Investigation conducted by the DOEE and Tetra Tech. Surface and subsurface sediment samples collected from the river showed, in general, silt, silt loam or sandy loam with well-rounded gravel. The primary distinction between Stratum I and Stratum II is that stratum I has been reworked due to dredging activities and can contain anthropogenic debris.

2.3 Preliminary Conceptual Site Model

This section briefly summarizes the preliminary conceptual site model (CSM) for surface and subsurface soil and groundwater on Kingman Island. A CSM is a functional description of what is known about an area of concern and the contamination known or suspected to be present. The CSM incorporates the available geologic, hydrogeologic, hydrologic, contaminant concentration, and environmental receptor data into an integrated understanding of site conditions. The CSM serves as the primary tool to identify data gaps and is updated as new data become available.

Based on the historical background of Kingman Island, sources of contamination were brought from off site and deposited onto the ground surface as a result of unauthorized dumping. In addition, anthropogenic debris was incorporated into the dredge spoils from the Anacostia River, in places, during the creation and expansion of the island itself. Therefore contaminants in the subsurface soils may have been in place as the island was created. Additional contaminants enter the subsurface via surface water inflow through the upper layers of the dumped material.

Contaminants may mobilize into the groundwater and enter into the adjacent surface water bodies of the Anacostia River and Kingman Lake through groundwater seepage or surface water flow. Human and animal exposure can result from contact with contaminated surface soil, surface water, and/or the adjacent surface water bodies.

3.0 SUBSURFACE INVESTIGATION

This section discusses the subsurface investigation portion of the SI. **Section 3.1** presents the soil and groundwater sampling field methods, quality control criteria, and **Section 3.2** presents the field observations noted during the advancement of the soil borings.

3.1 Subsurface Investigation Field Methods

Prior to conducting the SI, Tetra Tech contacted the Washington, DC One-Call utility locator service to request identification of buried utilities on and around the Site. Tetra Tech also contracted Ground Penetrating Radar Services (GPRS) of Haymarket, Virginia to locate utilities in the vicinity of the proposed boring locations and test pits. The utility location was performed for health and safety purposes to ensure personnel completing the subsurface assessment did not encounter subsurface infrastructure.

On November 9, 2015 through November 12, 2015, Tetra Tech completed 18 soil borings (SB-1 through SB-18) at the Site. The location of the soil borings are presented in **Figure 2 of Attachment 1**. The soil borings were advanced by GSI, Mid-Atlantic, Inc. (GSI) of Bel Air, Maryland using a track-mounted direct push rig. Six borings were completed around the perimeter of each of the three soil piles. Soil borings SB-1 through SB-6 were advanced in the vicinity of Soil Pile 1, soil borings SB-7 through SB-12 were advanced in the vicinity of Soil Pile 2, and soil borings SB-13 through SB-18 were advanced in the vicinity of Soil Pile 3. The soil borings were advanced to a depth of between 20 to 30 feet bgs, and were terminated based on the depth groundwater was encountered. Refusal was not encountered in the borings advanced at the Site. The boring locations were backfilled with hydrated bentonite pellets once sampling activities had concluded. Horizontal coordinates of each soil boring location were collected with a hand-held Global Positioning System (GPS) unit to document the location of each soil boring.

Two soil samples were collected from each boring for the purpose of characterizing potential environmental impacts. Soil was continuously collected every five feet and examined in the field for lithologic classification and profiling of potential impacts by a Tetra Tech Professional Geologist. **Attachment 2** presents the soil boring logs for each soil boring.

One soil sample was collected from a depth of 0.5 to 3 feet bgs and a second soil sample was collected from the depth with the strongest field evidence of contamination (i.e. elevated photoionization detector [PID] readings or evidence of fill/debris). If no evidence of contamination was noted in the borings, a soil sample was collected from an interval located within observed fill material or soil above the water table.

3.1.1 Quality Control

Quality Assurance/Quality Control (QA/QC) samples for both soil and groundwater media were collected during sampling activities. Four duplicate soil samples [SB-1D-(1-3), SB-6D-(10-12), SB-8D-(11-13), and SB-17D-(17-19)] and one duplicate groundwater sample (SB-4D-W) were submitted for laboratory analysis. Two matrix spike/matrix spike duplicate (MS/MSD) soil samples [SB-3-(11-13) and SB-9-(1-3)] were collected and submitted for laboratory analysis.

In addition, one equipment blank and one field blank were collected and submitted for laboratory analysis. The aqueous equipment blank was collected by running laboratory-provided deionized water over decontaminated, non-dedicated sampling equipment utilized during soil sampling. One trip blank was included in each cooler containing Volatile Organic Compounds (VOC) samples shipped and submitted for laboratory analysis.

3.2 Field Observations

Soil lithology encountered at the boring locations consisted of a surficial fill layer consisting of a dark brown heterogeneous silty clay with gravel and noted debris. The surficial fill layer was underlain by Stratum I, a dark gray heterogeneous silty clay with gravel and little to no debris. Below Stratum I, the material transitioned into Stratum II, a homogeneous dark gray thinly laminated saturated silty clay with low to medium plasticity.

Subsurface soil samples were selected based on field evidence of contamination, including visual, olfactory, or elevated PID readings. No elevated PID readings were noted during the screening of the soil samples. PID readings were identified within a range of 0.0 to 0.1 parts per million (ppm).

Groundwater was observed in each of the soil borings advanced at the Site. Groundwater samples were obtained from soil borings SB-2, SB-4, SB-6, SB-7, SB-9, SB-11, SB-13, SB-15, and SB-17. All temporary wells placed in the soil borings were constructed of one-inch poly-vinyl chloride (PVC) pipe with approximately five feet of 0.010-inch slotted screen set to intersect the water table, and the remaining length set as PVC riser. Each well was purged with a disposable check valve, a minimum of approximately three borehole volumes prior to sampling. The samples were collected with a disposable check valve and dedicated tubing once the minimum volume was purged from the borehole. Each of the wells was removed from the borehole after groundwater sampling activities were completed. The boreholes were backfilled with bentonite chips and hydrated. The depth to water and total depth of each soil boring is as follows:

Depth to Water and Total Depth of Soil Borings

Soil Boring ID	Depth to Water (bgs)	Total Boring Depth (bgs)
SB-1	14 feet	25 feet
SB-2	12 feet	30 feet
SB-3	13 feet	25 feet
SB-4	12 feet	30 feet
SB-5	12 feet	25 feet
SB-6	12.5 feet	30 feet
SB-7	10 feet	20 feet
SB-8	13.5 feet	25 feet
SB-9	14.5 feet	30 feet
SB-10	9.5 feet	30 feet
SB-11	10 feet	25 feet
SB-12	11 feet	30 feet
SB-13	15 feet	30 feet

Soil Boring ID	Depth to Water (bgs)	Total Boring Depth (bgs)
SB-14	15 feet	30 feet
SB-15	14 feet	30 feet
SB-16	9 feet	30 feet
SB-17	19 feet	30 feet
SB-18	18 feet	30 feet

Tetra Tech personnel performed sample handling and soil classification. All soil and groundwater samples intended for laboratory analysis were packaged, labeled, placed on ice in a cooler, and shipped via Federal Express (FedEx) to TestAmerica Laboratories, Inc., (TestAmerica) in Pittsburgh, Pennsylvania. Chain-of-custody documentation was initiated in the field and accompanied the samples to the laboratory.

Thirty-six (36) soil samples and nine (9) groundwater samples were retrieved from the soil borings and temporary wells and were analyzed for the following parameters (consistent with the DOEE-approved work plan):

- VOCs per EPA Method 8260C;
- Polycyclic Aromatic Hydrocarbons (PAHs) per EPA Method 8270D Low Level;
- Total Petroleum Hydrocarbons (TPH) – Gasoline Range Organics (GRO) per EPA method 8015D;
- TPH – DRO per EPA method 8015D;
- TPH – Oil Range Organics (ORO) per EPA method 8015D;
- Total Metals per EPA Method 6010C;
- Mercury per EPA Method 7471B; and
- PCBs per EPA Method 8082A.

4.0 TEST PIT INVESTIGATION

This section discusses the test pit investigation portion of the SI. **Section 4.1** presents the test pit advancement and sampling field methods and **Section 4.2** presents the field observations noted during the advancement of the test pits.

4.1 Test Pit Investigation Field Methods

To further evaluate the material present within the soil piles, Tetra Tech conducted test pits within, or in the vicinity of each of the known soil piles to depths between 10 to 25 feet bgs. On November 9, 2015 through November 12, 2015, a total of twelve (12) test pits, four (4) in the vicinity of each of the three soil piles was excavated with a Komatsu PC160LC-8 excavator operated by Miller Environmental Group of Baltimore, Maryland. The final location of the test pits was based on the excavator accessibility, while prioritizing the spatial distribution of the test pits within each soil pile. Two total test pits were conducted outside of the known extent of each of the soil piles in areas where surface debris was observed. Horizontal coordinates of the corners of each test pit were collected with a hand-held GPS unit to document the test pit location. The location of the test pits is shown on **Figure 3 of Attachment 1**. The detailed location of the test pits in the vicinity of Soil Piles 1 and 2 is shown on **Figure 4 of Attachment 1**. The detailed location of the test pits in the vicinity of Soil Pile 3 is shown on **Figure 5 of Attachment 1**.

The soil texture and visual observations of the test pits were recorded on the test pit field forms included in **Attachment 3**. One composite soil sample, was collected from each of the three soil piles for waste characterization purposes. Soil grabs were obtained from the sidewalls and bottom of each of the test pits from areas with the strongest field evidence of contamination and homogenized before sampling. The composite soil samples were analyzed for the following parameters (consistent with the DOEE-approved work plan) in order to assist Tetra Tech and the DOEE in determining potential disposal options should the DOEE elect to proceed with removal of the piles:

- TPH –GRO per EPA method 8015D;
- TPH –DRO per EPA method 8015D;
- TPH – ORO per EPA method 8015D;
- Full Toxicity Characteristic Leaching Procedure (TCLP);
- PCBs per EPA Method 8082A;
- Benzene, Ethylbenzene, Toluene, and Xylene (BTEX) per EPA Method 8260B; and
- Reactivity, Corrosivity, and Ignitability.

Composite soil samples were selected based on field evidence, including visual, olfactory, or elevated PID readings. Elevated PID readings were noted primarily during the screening of the soil samples in the test pits conducted in the vicinity of Soil Pile 3. PID readings were within the range of 0.0 to 23 ppm.

4.2 Field Observations

Soil encountered in the test pits consisted primarily of surficial fill material with anthropogenic debris. The material varied significantly laterally and with depth. Generally, the material observed in the test pits was a mix of soil with an estimated 5 to 20 percent debris including construction debris, concrete, asphalt, wood, metal, and general rubbish.

Soil Pile 1, the northern-most soil pile investigated, rises to approximately 11 feet above grade. For the purposes of this report, the “grade” is established by the average elevation of the existing access road and cleared area of the island. In the vicinity of Soil Piles 1 and 2, the grade is located at an elevation of approximately 15 feet above sea level. The toe of the soil pile can be easily identified on the western and southern portions of the pile due to the steep grade of the pile walls. The test pits in Soil Pile 1 encountered significant amounts of construction debris including large slabs (over three feet in diameter) of concrete with rebar, wood, and asphalt. The soil noted in Soil Pile 1 consisted of a heterogeneous mixture of silty clay with well-rounded cobbles and boulders noted.

Soil Pile 2, located immediately to the south across the existing access road from Soil Pile 1, is approximately 20 feet above grade. Soil Pile 2 can also be easily identified on the western and northern portions of the pile due to the steep slope of the pile walls. The eastern portion of the pile slopes more gently and appears to extend to the existing walking path that trends north-south along the island. The southern boundary of Soil Pile 2 is not clearly evident as the material in the pile appears to trend into debris-free dredge spoils that were graded to a similar height as Soil Pile 2. Material encountered in test pits 5 and 6 conducted in Soil Pile 2 generally consisted of a higher organic content silty clay with a large amount of household trash and leafy debris. General household rubbish was encountered at a large percentage (approximately 20 percent or greater), consisting of plastic, construction debris, tires, and metal. The material encountered in test pit 7, conducted on the southern portion of the soil pile appeared to represent the transition from surficial fill with debris to dredge spoils. In test pit 7, the material consisted of a medium brown sandy gravel with well-rounded cobbles and no debris or trash observed below the top two feet. Based on the observations of the material encountered during advancement of the test pits, the southern extent of Soil Pile 2 is located between the location of test pit 5 and test pit 7.

Test pits 4 and 8 were conducted outside of Soil Piles 1 and 2 in the vicinity of observed surface debris. The material observed in test pit 4, located approximately 50 feet to the southeast and across the existing walking path from Soil Pile 1, consisted of a high percentage of debris including construction debris, terra cotta pieces, and textiles. In addition, a significant layer of glass fragments was noted at 10 feet bgs, below which was a saturated medium gray silty clay with well-rounded cobbles and an observed petrochemical odor. Test pit 8 was advanced in an area where a partially buried 55-gallon drum was observed, located approximately 30 feet east of Soil Pile 2, across the existing walking path. The material noted in test pit 8 was a medium brown silty clay with approximately ten percent debris consisting of construction material, brick, styrofoam, metal, and tires. No staining or odor was noted in this pit or directly under the observed 55-gallon drum, which was noted to be rusted and significantly damaged with no indications of previous contents.

Soil Pile 3 was identified in prior reports as located on the southern portion of the island, approximately 400 feet south-southwest of the East Capitol Street Bridge. The extent of Soil Pile 3 is not clearly defined due to a lack of a clear soil pile toe or significant topographic relief. For the purposes of this SI, Soil Pile 3 was defined by the slight topographic rise in the vicinity of areas noted in previous investigations. This area is currently developed with a walking path and cleared area with a sidewalk and grass cover on the southern portion of the topographic rise. The soil pile slopes downward gently to the north and south of this cleared area. The material encountered during the advancement of the test pits in the vicinity of Soil Pile 3 consisted of a brown silty sand with cobbles and some debris noted to approximately 5 to 7 feet bgs. Below approximately seven feet bgs the material consists of a gray silty clay with a larger percentage (approximately 15 percent or greater) of trash and construction debris and noted petrochemical odor. Each of the four test pits conducted in the vicinity of Soil Pile 3 had similar soil profiles and appeared to represent subsurface conditions on the southern portion of the island itself, rather than an identified soil pile as appeared to be the case with Soil Piles 1 and 2.

5.0 ANALYTICAL RESULTS

This section discusses the analytical results of the SI. **Section 5.1** summarizes regulatory standards to which the laboratory analytical results were compared. **Section 5.2** presents the soil laboratory analytical results, **Section 5.3** presents the groundwater analytical results, **Section 5.4** presents the test pit composite soil sample results, and **Section 5.5** presents the data validation results of the SI.

5.1 Regulatory Standards

The soil, groundwater, and test pit composite soil sample laboratory results are provided in **Tables 1 through 12 in Attachment 4**. In selecting the regulatory standards to which the laboratory results were compared, chemical specific Applicable or Relevant and Appropriate Requirements (ARARs) were researched. Applicable regulatory standards were obtained from EPA Region 3 and DOEE guidance.

5.1.1 Soil Screening Criteria

Tetra Tech compared the analytical results of the soil samples to the DOEE Toxic Substances Division Underground Storage Tank Branch*, District of Columbia Risk-Based Corrective Action Technical Guidance (Risk-Based Decision Making) Tables 5-8, 5-9, and 5-10, Risk Based Screening Levels (RBSLs) for a Resident Child, Adult, and Commercial Worker,* dated June 2011 (DOEE, 2011). The DOEE RBSLs for Surficial Soil Ingestion, Inhalation, and Dermal Contact and the DOEE RBSLs for Subsurface Soil Outdoor Inhalation were utilized as screening criteria due to the potential for subsurface soils to be exposed during any grading or excavation at the Site in the future, as well as the current risk of community exposure to surficial soils.

Based on the proposed uses of Kingman Island described in the Kingman and Heritage Islands Preferred Master Plan Concept as green space for use by the general public, conservative screening criteria were chosen to protect the community. The DOEE RBSLs for a resident child, adult, and commercial worker were each used as a comparison due to the use of the site by the public, which would include children and adults. The commercial worker standard was used as a screening criteria because future development of the site would likely include the reworking of surface and subsurface soils, potentially exposing site workers to impacted soil.

In addition, soil samples were compared to the November 2015 *EPA Region 3 Regional Screening Levels (RSLs) for Industrial Soil and Residential Soil (target hazard quotient of 0.1)* (EPA. 2015). The lower of the industrial soil cancer and non-cancer RSLs defined for a target risk of 1E-06 or a target hazard index of 0.1 was chosen because that represents the more conservative screening criteria.

5.1.2 Groundwater Screening Criteria

Tetra Tech compared the analytical results of the groundwater samples to the DOEE Toxic Substances Division Underground Storage Tank Branch*, District of Columbia Risk-Based Corrective Action Technical Guidance (Risk-Based Decision Making) Tables 5-8, 5-9, and 5-10, Risk Based Screening Levels (RBSLs) for a Resident Child, Adult, and Commercial Worker,* dated June 2011 (DOEE, 2011).

Groundwater samples were also compared to the July 2006 *EPA Region 3 Biological Technical Assistance Group (BTAG) Freshwater Screening Values* (EPA. 2006). Groundwater at the Site is not used as a drinking water source or as a source of irrigation water. Future development of the Site is expected to utilize municipal water as a potable water source. In addition, groundwater is located a depth of 9.5 to 18 feet below grade. Therefore, the primary human and ecological exposure pathway to contaminated groundwater is exposure to surface water that has been impacted by groundwater seepage. Although the concentrations would likely be decreased due to dilution and contaminant sorption onto soil and sediment media, in order to conservatively evaluate risk at Kingman Island, it is assumed that the concentration of contaminants in groundwater would equal the concentrations in surface water. The use of surface water screening criteria for this situation is considered conservative and appropriate for the protection of human health.

5.1.3 Composite Soil Screening Criteria

Test pit composite soil sample results were analyzed for Full TCLP, TPH, BTEX, and PCBs. Test pit composite soil samples were collected in order to assist in evaluating potential disposal options for the soil pile material. The TCLP results of the composite soil samples were compared to the EPA maximum concentration of contaminants for the toxicity characteristic as shown in *40 CFR 261.24, Table 1* to determine if the material would be classified as hazardous.

The laboratory results for constituents TPH, BTEX, and PCBs were compared to the DOEE Toxic Substances Division Underground Storage Tank Branch, *District of Columbia Risk-Based Corrective Action Technical Guidance (Risk-Based Decision Making) Tables 5-8, 5-9, and 5-10, RBSLs for a Resident Child, Adult, and Commercial Worker*, dated June 2011 (DOEE, 2011) and the November 2015 *EPA Region 3 RSLs for Industrial Soil and Residential Soil (target hazard quotient of 0.1)*. The District of Columbia RBSLs and the EPA RSLs were used as screening criteria to assist in evaluating the suitability of the soil material for potential reuse onsite.

5.2 Soil Analytical Results

Based on the soil sample analytical results, carbon disulfide and toluene were the only VOCs detected in the soil samples. Soil samples SB-17-(1-3) and SB-18-(13-15), both located in the vicinity of Soil Pile 3, had VOC detections above the laboratory method detection limit (MDL); however, the detections were below the applicable EPA RSLs. Detections were also below the DOEE RBSL for carbon disulfide. DOEE RBSLs are not published for toluene. Results of VOC analysis of the soil samples are summarized in **Table 1 of Attachment 4**.

Based on the soil sample analytical results, numerous PAHs were detected in the soil samples collected above the laboratory MDL. Of these detected concentrations benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenz(a,h)anthracene, and indeno(1,2,3-cd)pyrene were above the EPA residential RSLs. At least one PAH constituent listed above was detected at a level which exceeded the EPA residential RSLs in 36 of the 40 soil samples collected. The total of 40 soil samples includes the results of the duplicate samples. Of the 40 soil samples collected, seven samples exceeded the EPA industrial RSLs for benzo(a)anthracene, 22 samples exceeded the EPA industrial RSL for benzo(a)pyrene, six soil samples exceeded the EPA industrial RSL for benzo(b)fluoranthene, eight soil samples exceeded the EPA industrial RSL for dibenz(a,h)anthracene, and five samples exceeded the EPA industrial RSL for indeno(1,2,3-cd)pyrene. In addition, benzo(a)pyrene and benzo(b)fluoranthene were detected above the DOEE Surficial Soil Ingestion, Inhalation, and Dermal Contact RBSLs for a Commercial Worker in seven and 22 of the soil samples collected, respectively. No detections of PAHs were above the DOEE Subsurface Soil Outdoor Inhalation RBSLs in the collected soil samples. Results of PAH analysis of the soil samples are summarized in **Table 2 of Attachment 4**.

Based on the soil sample analytical results, TPH was detected above the laboratory MDL in nearly all the soil samples collected. Of these detected concentrations TPH-DRO (C10-C28) was above the EPA residential RSL (11 mg/kg) in 36 of the 40 soil samples collected. TPH-DRO was detected above the EPA industrial RSLs (60 mg/kg) in 24 of the 40 samples collected. TPH-DRO was detected in one sample, SB-10-(1-3) at a level of 2,100 mg/kg which also exceeded the DOEE Surficial Soil Ingestion, Inhalation, and Dermal Contact RBSL for a Resident Child of 1,870 mg/kg. In addition, TPH-ORO (C28-C40) was detected in 10 of the 40 soil samples collected above the EPA residential RSL of (250 mg/kg). None of the TPH-ORO detected concentrations were above the EPA industrial RSL of 3,300 mg/kg or the DOEE Surficial Soil Ingestion, Inhalation, and Dermal Contact RBSL for a Resident Child of 1,870 mg/kg. Four of the soil samples had detections of TPH-GRO (C6-C10) above the laboratory MDL, however none of the detections exceeded the EPA RSLs or the DOEE RBSLs for TPH-GRO. Results of TPH analysis of the soil samples are summarized in **Table 3 of Attachment 4**.

The soil sample laboratory results indicate numerous metals including aluminum, antimony, arsenic, barium, cobalt, iron, lead, manganese, mercury, vanadium, and zinc exceeded the EPA residential soil RSLs. DOEE RBSLs are not published for metals. Background values of soils in the region were also considered when evaluating metals in soil. There are no published values for background metals in soils in the District of Columbia; however, Tetra Tech reviewed the background metals in soils data presented in the Maryland Department of the Environment (MDE) June 2008 Cleanup Standards for Soil and Groundwater (State of Maryland, 2008).

Tetra Tech compared the analytical results for metals that exceeded the EPA residential RSLs to the anticipated typical concentration (ATC) reference levels for eastern region of the State of Maryland. The MDE Eastern Maryland Background ATCs were developed from the range of concentrations for a given metal observed from samples collected in the eastern region of Maryland. The upper limit of the range of observed concentrations for each metal was used to as a comparison to the SI soil analytical data to indicate an exceedance of expected background concentrations. A summary of metals that exceeded the EPA residential RSLs compared to the upper range of the MDE Eastern Maryland Background ATCs is presented below:

Summary of Samples that Exceed EPA RSLs and MDE ATCs for Metals

Compound	EPA Residential RSL (mg/kg)	Number of SI samples that exceed EPA Residential RSL	EPA Industrial RSL (mg/kg)	Number of SI samples that exceed EPA Industrial RSL	MDE Upper Range ATC (mg/kg)	Number of SI samples that exceed Upper Range MDE ATC
Aluminum	7,700	10	110,000	0	18,000	0
Antimony	3.1	1	47	0	16	0
Arsenic	0.68	40	3	26	6.9	5
Barium	1,500	1	22,000	0	73	18
Cobalt	2.3	40	35	0	26	0
Iron	5,500	40	82,000	0	25,000	8
Lead	400	2	800	0	150	4
Manganese	180	24	2,600	0	1,100	1
Mercury	1.2	2	4.6	0	3.5	0
Vanadium	39	4	580	0	59	1
Zinc	2,300	1	35,000	0	240	2

Based on the soil sample analytical results for metals, 24 of the 40 soil samples collected exceeded the upper range of the Eastern Maryland Background ATCs for one or more of the following metals: arsenic, barium, iron, lead, manganese, vanadium, and/or zinc. Results of metals analysis of the soil samples are summarized in **Table 4 of Attachment 4**.

Based on the soil sample analytical results, PCB-1242 was detected above the laboratory MDL in one of the 40 soil samples analyzed and PCB 1260 was detected above the laboratory MDL in 12 of the 40 soil samples analyzed. None of the detections exceeded the EPA residential soil RSLs. DOEE RBSLs are not published for PCBs. Results of the PCB analysis of the soil samples are summarized in **Table 5 of Attachment 4**.

5.3 Groundwater Analytical Results

Based on the groundwater sample analytical results, VOC constituents 2-butanone, 2-hexanone, acetone, benzene, carbon disulfide, cis-1,2-dichloroethene, toluene, and vinyl chloride were detected above the laboratory MDLs. The groundwater VOC detections were below the applicable EPA BTAG freshwater screening values and DOEE RBSLs. Results of VOC analysis of the groundwater samples are summarized in **Table 6 of Attachment 4**.

Based on the groundwater sample analytical results, numerous PAHs were detected in the groundwater samples collected above the laboratory MDL. Of these detections, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, fluoranthene, fluorine, naphthalene, phenanthrene, and pyrene were detected at levels that exceeded the applicable EPA BTAG freshwater screening value. At least eight PAH constituents were detected at levels that exceeded the EPA BTAG freshwater screening values or the DOEE RBSLs in nine of the 10 groundwater samples collected. The total of 10 groundwater samples includes the duplicate sample. Of the 10 groundwater samples collected, 10 samples exceeded the applicable DOEE Ingestion, Inhalation, and Dermal Contact RBSLs and/or the BTAG freshwater screening values for anthracene, fluoranthene, phenanthrene, and pyrene. Of the 10 groundwater samples collected, nine samples exceeded the applicable DOEE Ingestion, Inhalation, and Dermal Contact RBSLs and/or the BTAG freshwater screening values for benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, and benzo[k]fluoranthene. Nine groundwater samples also exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSLs for benzo(k)fluoranthene, including five groundwater samples that exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSLs for a Commercial Worker. Four of the 10 groundwater samples also exceeded the Ingestion, Inhalation, and Dermal Contact RBSLs for a Commercial Worker for chrysene. Results of PAH analysis of the groundwater samples are summarized in **Table 7 of Attachment 4**.

Based on the groundwater sample analytical results, TPH was detected in each of the groundwater samples collected above the laboratory MDL. Of these detected concentrations TPH-DRO (C10-C28) was detected at a level that exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSLs for a Resident Adult (438 µg/l) in each of 10 groundwater samples analyzed. None of the detected concentrations of TPH-DRO exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSLs for a commercial worker (369,000 µg/l). In addition, TPH-ORO (C28-C40) was detected in four of the ten groundwater samples, at levels that exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSL for a Resident Child of 469 µg/l. One of the TPH-ORO detected concentrations (SB-15-W) exceeded the DOEE Ingestion, Inhalation, and Dermal Contact RBSLs for a Resident Adult of 1,100 µg/l. Each of the 10 groundwater samples collected had detected concentrations of TPH-GRO (C6-C10) above the laboratory MDL; however, none of the detected concentrations exceeded the DOEE RBSLs for TPH-GRO. There are no published EPA BTAG freshwater screening values for TPH. Results of TPH analysis of the groundwater samples are summarized in **Table 8 of Attachment 4**.

The groundwater sample laboratory results indicate 21 metals including aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, potassium, selenium, silver, thallium, vanadium, and zinc exceeded the EPA BTAG freshwater screening values. The metals aluminum, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, thallium, vanadium, and zinc exceeded the respective EPA BTAG freshwater screening values in each of the 10 groundwater samples collected. The metals calcium, magnesium, potassium, and silver exceeded the respective EPA BTAG freshwater screening values in nine of the 10 groundwater samples collected. DOEE RBSLs are not published for metals. Results of metals analysis of the groundwater samples are summarized in **Table 9 of Attachment 4**.

Based on the groundwater sample analytical results PCB 1260 was detected above the laboratory MDL in three of the 10 groundwater samples analyzed. PCB-1260 was detected in SB-7-W, SB-15-W and SB17-W at levels of 2.5 µg/l, 0.35 (estimated) µg/l, and 0.47 µg/l respectively. The detected concentrations were above the EPA BTAG freshwater screening value of 0.000074 µg/l. DOEE RBSLs are not published for PCBs. Results of the PCB analysis of the groundwater samples are summarized in **Table 10 of Attachment 4**.

5.4 Test Pit Waste Characterization Analytical Results

Composite soil samples of the soil pile material were collected in order to evaluate potential off-site disposal options as well as the applicability of reusing the material onsite. The test pit soil grabs were composited into one soil sample per soil pile (Soil Comp 1, Soil Comp 2, and Soil Comp 3). Soil grabs were obtained during the test pitting process from areas of the test pit excavation that exhibited signs of contamination including odor, staining, and elevated PID readings.

Based on the composite soil sample analytical results, TPH was detected in each of the three composite soil samples collected above the laboratory MDL. Of these detected concentrations, TPH-DRO (C10-C28) exceeded the EPA residential RSL (11 mg/kg) in each of the three composite soil samples collected. TPH-DRO was detected at a level that exceeds the EPA industrial RSL (60 mg/kg) in the composite soil sample collected from Test Pit 2 at a level of 97 mg/kg. TPH-ORO (C28-C40) was detected in each of the composite soil samples collected; however, none of the TPH-ORO detected concentrations exceeds the EPA residential RSL (250 mg/kg). The composite soil sample collected from Soil Pile 1 had a detected concentration of TPH-GRO (C6-C10) above the laboratory MDL, however the detected concentration was below both the EPA RSLs and the DOEE RBSLs for TPH-GRO.

Based on the composite soil sample analytical results, PCB-1260 was detected above the laboratory MDL in the composite soil sample from Soil Piles 2 and 3 at a level of 0.027 mg/kg and 0.32 mg/kg, respectively. The detected concentration of PCB-1260 in the composite soil sample from Soil Pile 2 was below the EPA residential and industrial soil RSLs. The composite soil sample collected from Soil Pile 3 exceeded the EPA residential RSL, but was below the EPA industrial soil RSL of 0.99 mg/kg. DOEE RBSLs are not published for PCBs. Results of the TPH and PCB analysis of the composite soil samples along with the general chemistry data are summarized **in Table 11 of Attachment 4**.

Based on the composite soil sample TCLP analytical results, the soils do not leach VOCs, PAHs, organochlorine pesticides, or herbicides. The TCLP composite soil sample laboratory results indicate that the soils leach six metals including arsenic, barium, cadmium, chromium, lead, and selenium. The TCLP results were compared to the EPA maximum concentration of contaminants for the toxicity characteristic to evaluate if the material is considered hazardous. None of the detections exceeded the EPA maximum concentration of contaminants for the toxicity characteristic. DOEE RBSLs are not published for metals. Results of TCLP analysis of the composite soil samples are summarized in **Table 12 of Attachment 4**.

5.5 Data Validation

The laboratory data packages were validated by Tetra Tech with regard to the following parameters: holding times, blanks, surrogate recovery, internal standards (where applicable), matrix spike (MS)/matrix spike duplicate, laboratory control sample (LCS) or blank spike, LCS/LCS duplicate and MS/MSD relative percent difference, compound identification, and overall assessment of data. No major issues were identified with the samples submitted for laboratory analysis during the validation process. Minor issues identified during the validation process are described in the data validation report included in **Attachment 6**.

The data validation report concluded that the quality control criteria reviewed, other than the minor issues discussed in the data validation report, were met and are considered acceptable. Estimated sample results (J) are usable only for limited purposes. Based upon the data validation all results are considered valid and usable for all purposes. No data were rejected. In general, the absence of rejected data and the small number of qualifiers added to the data indicate high usability.

6.0 CONCLUSIONS BASED ON THIS SITE INVESTIGATION

Tetra Tech performed a SI of Kingman Island in Washington, DC in an effort to evaluate the presence or absence of hazardous materials in the subsurface in the vicinity of the soil piles. In addition, the soil pile material was assessed in order to characterize the material for potential disposal methods. A subsurface assessment that included the completion of soil borings at 18 locations was conducted on the Site. Two soil samples were collected for laboratory analysis from each boring and groundwater was collected from nine of the boring locations. Test pits were conducted in the soil pile material and in the vicinity of the soil piles at 12 locations throughout the Site and one composite soil sample was collected from each of the three soil piles.

6.1 Subsurface Investigation

The soil sample analytical results indicated detectable concentrations of numerous PAHs, TPH, and metals above the EPA RSLs and DOEE RBSLs in the soil samples collected at the Site. Results of the laboratory analysis of the groundwater samples also indicate detectable concentrations of numerous PAHs, TPH, and metals above the EPA BTAG freshwater screening values and DOEE RBSLs. Three of the 10 groundwater samples collected also exceeded the EPA BTAG freshwater screening values for PCB 1260.

The soil and groundwater data were generally consistent throughout the Site. Overall the constituents of concern (COCs) based on this investigation appear to be PAHs, TPH-DRO, arsenic, barium, iron, lead, manganese, vanadium, zinc, and PCB-1260.

6.2 Test Pit

The analytical results of the test pit composite soil samples indicate a source of PAHs, TPH, and metals within the soil pile waste material. The laboratory results of the composite soil samples, when compared to the laboratory results of the soil and groundwater samples collected around the soil piles, indicate that the waste material in the soil piles is, in part, a source of the contamination seen in the subsurface of the Site. Specifically, a correlation can be seen in the compounds that exceed the regulatory standards in all media including TPH-DRO, arsenic, lead, and PCB-1260.

Based on the results of the laboratory analysis of the soil pile material, the material is not ignitable, corrosive, or reactive. Based on the TCLP analysis, the soil pile material did leach the metals arsenic, barium, cadmium, chromium, lead and selenium, however not above the EPA Maximum Concentration of Contaminants for the Toxicity Characteristic, therefore the material is not considered toxic. The soil pile material can be considered non-hazardous solid waste.

Based on the variation of material in the soil piles identified during completion of the test pits, it is possible that portions of the soil pile material may be suitable for reuse on the site; however, mapping specific areas of the soil piles that would be suitable for on-site reuse was beyond the scope of this investigation. Material that exceeds the EPA RSLs or the DOEE RBSLs for PAHs, TPH, metals, or PCBs should not be used for soil cover or surficial soil material that has the potential to come in contact with community members utilizing the island.

6.3 Summary

Elevated levels of COCs were detected in soil and groundwater samples collected throughout the site. Results indicate that the subsurface has likely been impacted by the soil pile material; however, based on the widespread occurrence of COCs throughout the site, it appears that a significant source of contaminants is the subsurface of the island itself, which was built up from dredge spoils from the Anacostia River. The test pits were conducted in the soil pile material and outside of the identified soil piles in the island subsurface. Anthropogenic debris was noted outside of the identified soil pile, with debris noted at depths that intersect the water table, as was the case in Test Pit 4. Based on the material noted in the test pits as compared to the material noted in the island subsurface, it appears that the soil pile material can be considered a source of COCs. However, due to the occurrence of anthropogenic debris in the subsurface of the island itself, along with the widespread occurrence of COCs in subsurface media, it appears that the material utilized in the creation of Kingman Island is also a contributing source of contaminants.

7.0 REFERENCES

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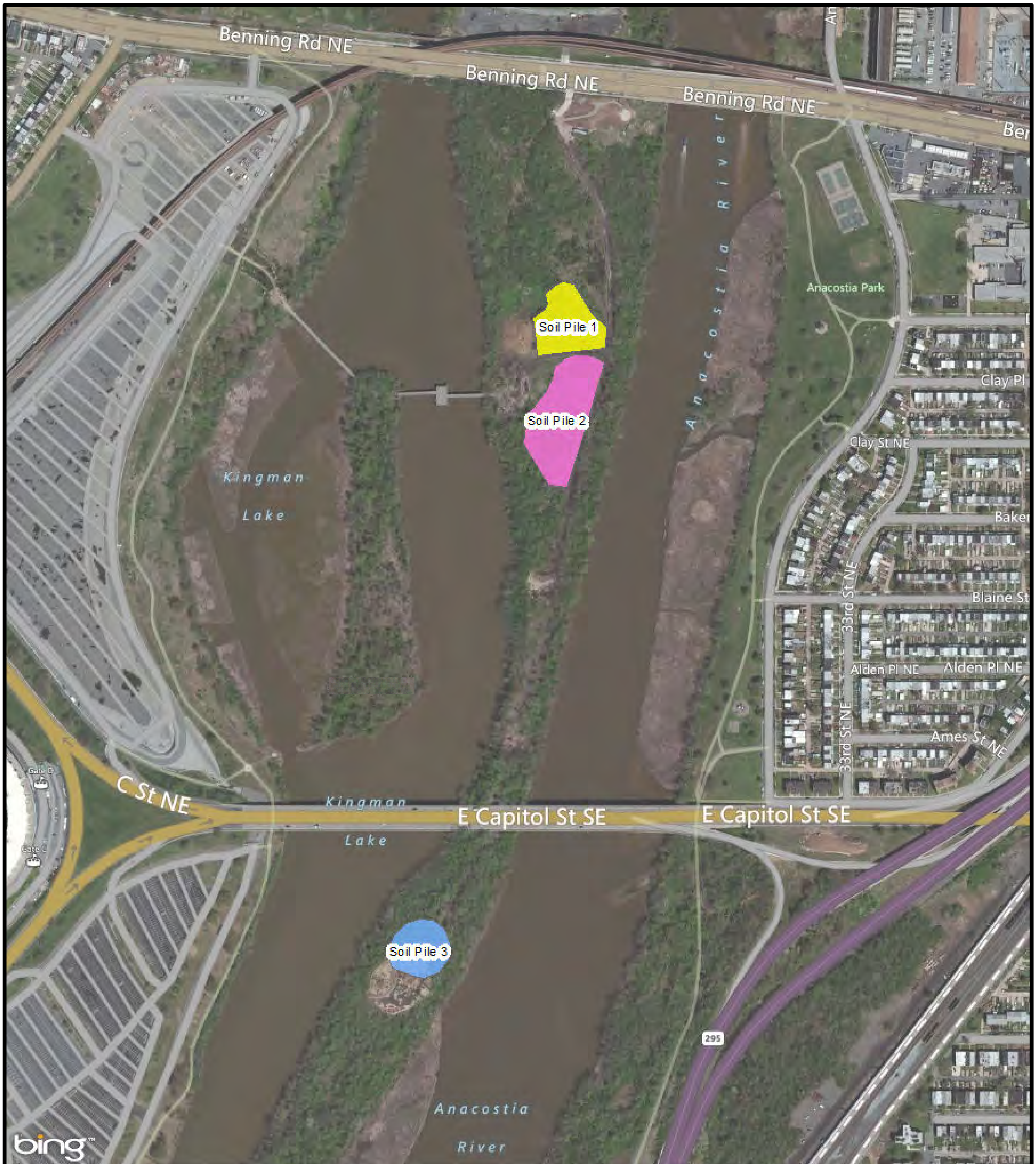
ATTACHMENT 1. FIGURES



Legend

- Soil Pile 1
- Soil Pile 2
- Soil Pile 3

N W E S

0 250 500
Feet

SOURCE: MODIFIED FROM BING MAPS HYBRID IMAGERY, 2011.

KINGMAN ISLAND
SOIL PILE INVESTIGATION
WASHINGTON, DC

FIGURE 1
SITE LOCATION MAP

TETRA TECH

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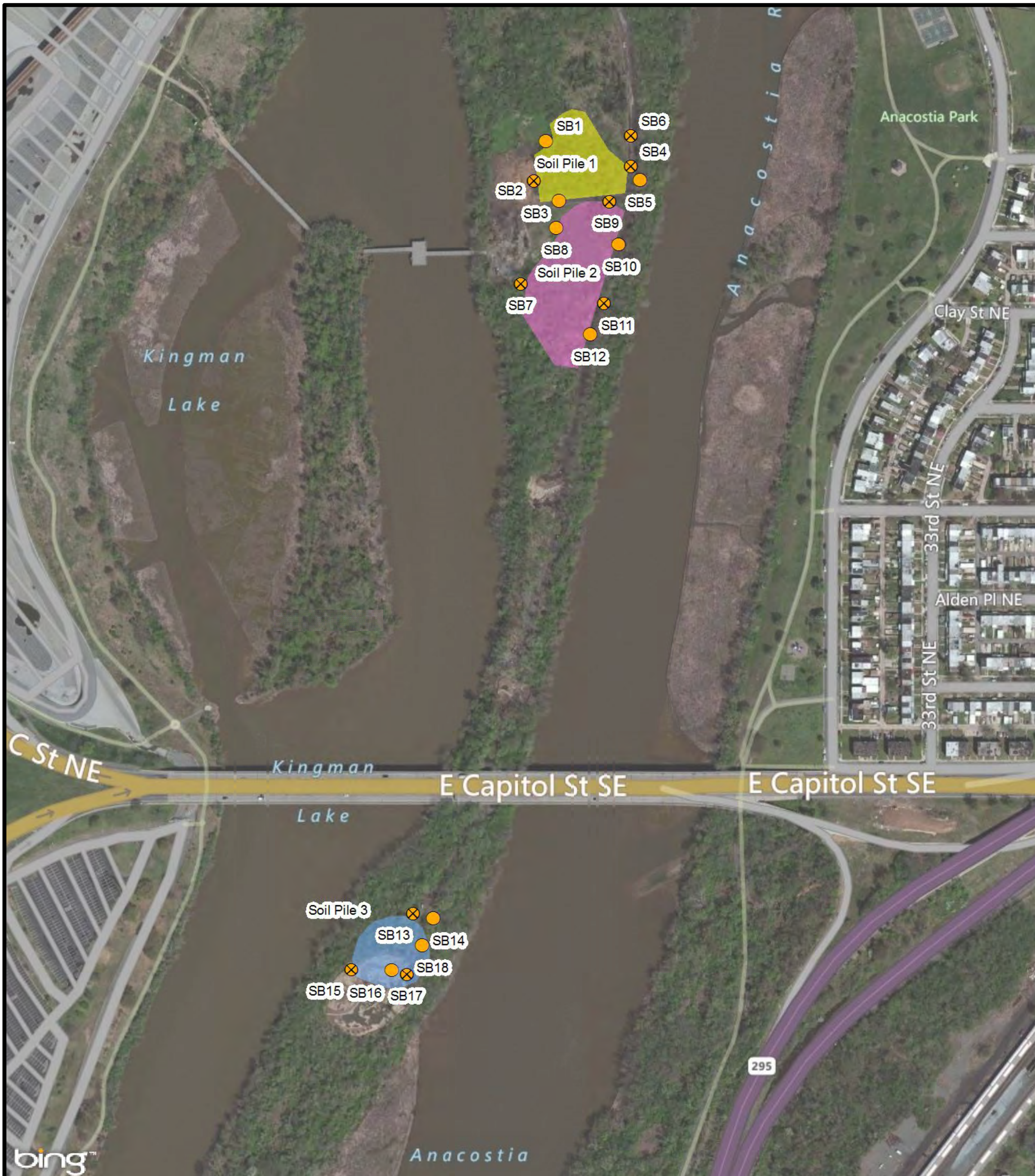

Legend

- Soil Boring Location
- Soil Boring/Groundwater Sample Location
- Soil Pile 1
- Soil Pile 2
- Soil Pile 3

N W E S

0 200 400
Feet

SOURCE: MODIFIED FROM BING MAPS HYBRID IMAGERY, 2011.

KINGMAN ISLAND
SOIL PILE INVESTIGATION
WASHINGTON, DC

FIGURE 2
SOIL BORING LOCATION MAP

TETRA TECH

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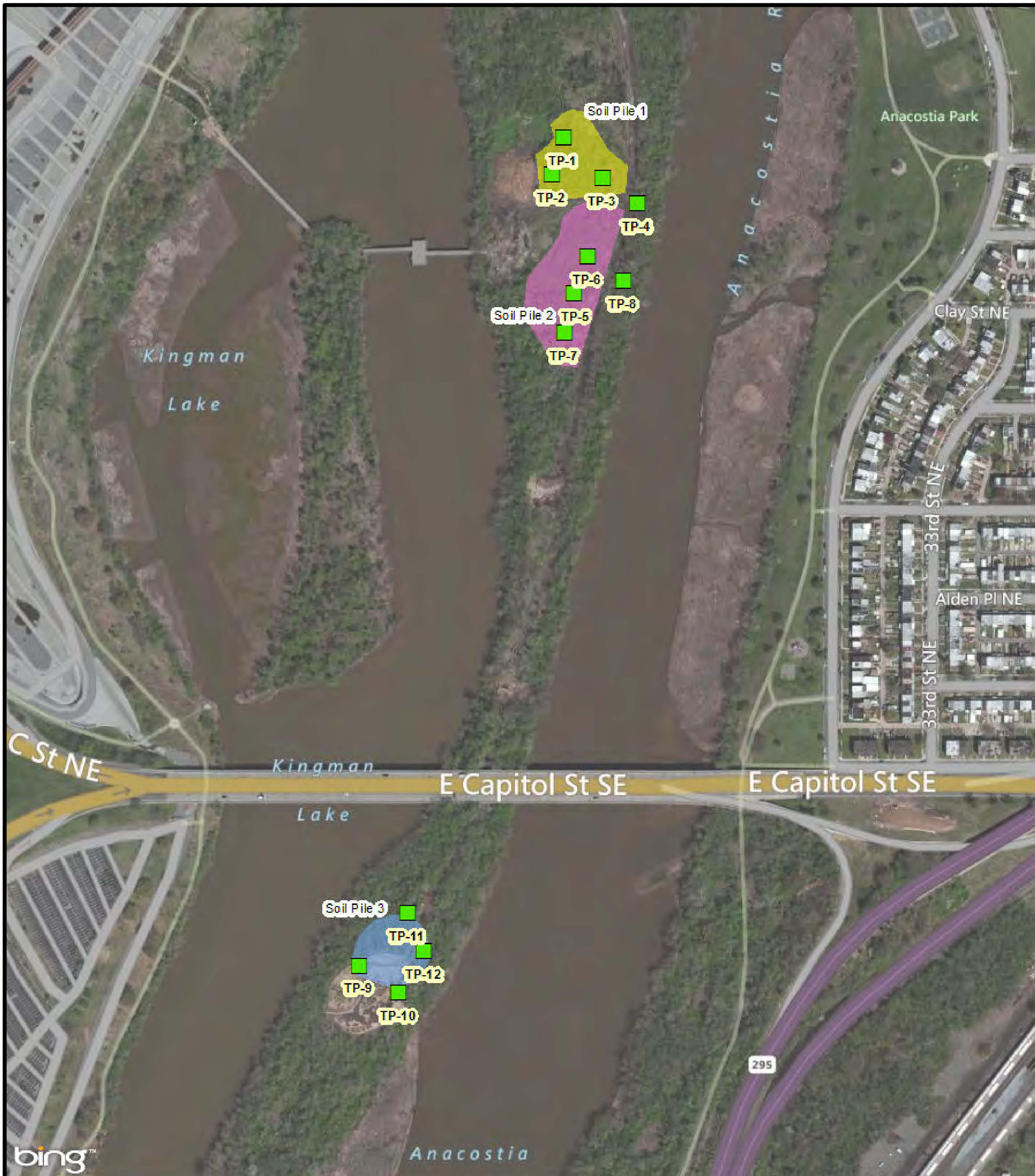

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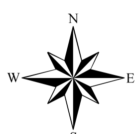
Test Pit

Soil Pile 1

Soil Pile 2

Soil Pile 3



0 200 400

Feet

SOURCE: MODIFIED FROM BING MAPS
HYBRID IMAGERY, 2011.

KINGMAN ISLAND
SOIL PILE INVESTIGATION
WASHINGTON, DC

FIGURE 3
TEST PIT LOCATIONS

TETRA TECH

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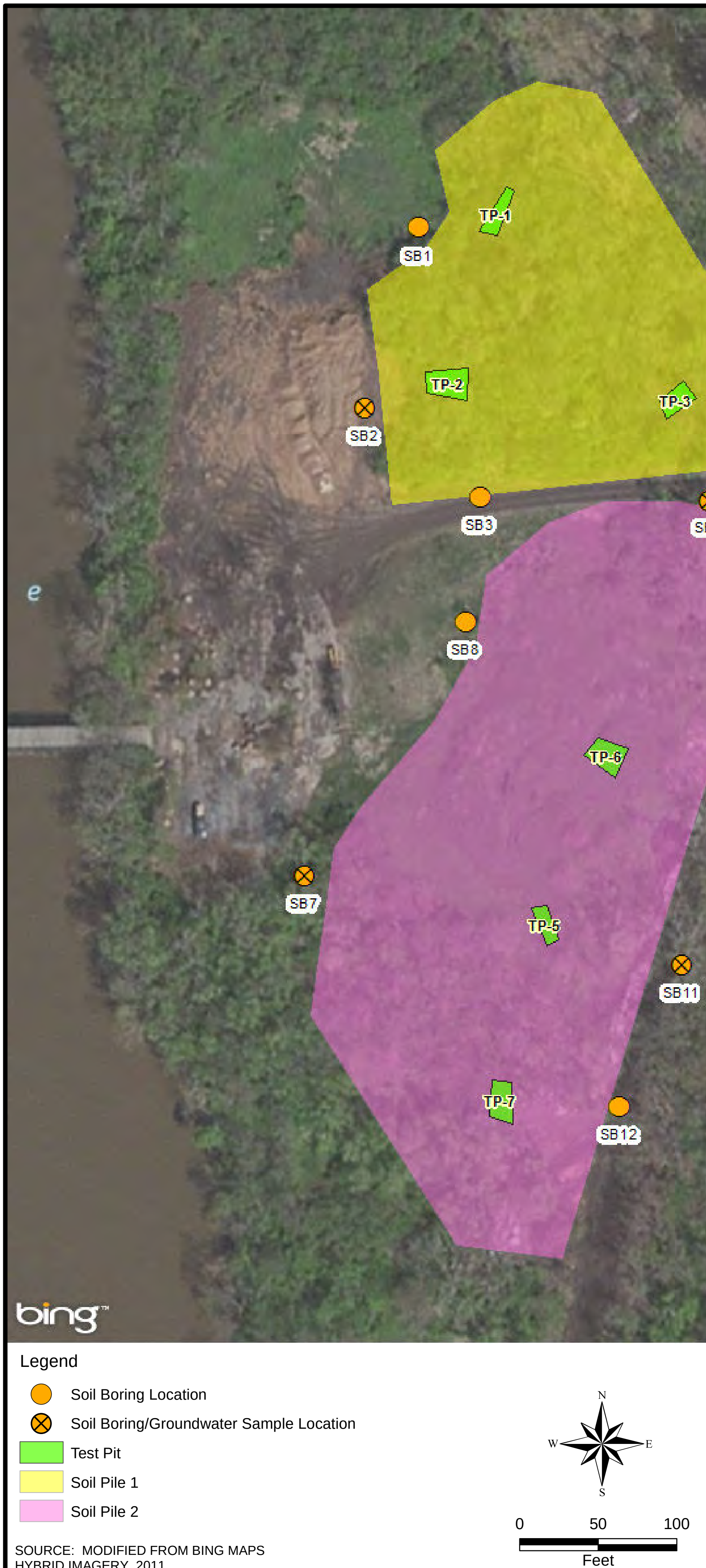

SOURCE: MODIFIED FROM BING MAPS HYBRID IMAGERY, 2011.

KINGMAN ISLAND
SOIL PILE INVESTIGATION
WASHINGTON, DC

FIGURE 4
SOIL PILES 1 AND 2 SAMPLING LOCATIONS

TETRA TECH

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Legend

- Soil Boring Location
- Soil Boring/Groundwater Sample Location
- Test Pit
- Soil Pile 3

N W E S

0 25 50
Feet

SOURCE: MODIFIED FROM BING MAPS HYBRID IMAGERY, 2011.

KINGMAN ISLAND
SOIL PILE INVESTIGATION
WASHINGTON, DC

FIGURE 5
SOIL PILE 3 SAMPLING LOCATIONS

TETRA TECH

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ATTACHMENT 2. SOIL BORING LOGS

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-1
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/10/15	**Time:** 10:00	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 10:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 25.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 14.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
1				0.0		SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
2					SB-1-(1-3) SB-1D-(1-3)			
3	1		50	0.1		GM	**Silty Gravel and Ash.** 10YR 5/4 (yellowish brown), fine to coarse, 20% silt, 20% ash and debris, heterogeneous, loose, moist, no odor.	Fill material
4							**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
5				0.0				
6						SM		
7				0.0				
8	2		70					
9				0.0			**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
10								
11				0.0				
12								
13	3		70	0.0	SB-1-(12-14)			
14								Becomes wet at 14.0'
15				0.0		CL		
16								
17				0.0				
18	4		100					
19				0.0				
20							**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
21				0.0				
22								
23	5		100	0.0		CL		
24								
25								

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-2
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/10/15	**Time:** 08:45	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 09:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 12.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
							Silty Sand. 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
1				0.0		SM		
2					SB-2-(1-3)		**Silty Gravel and Ash.** 10YR 5/4 (yellowish brown), fine to coarse, 20% silt, 20% ash and debris, heterogeneous, loose, moist, no odor.	Fill material
3	1		50	0.1		GM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
4								
5				0.0				
6						SM		
7				0.0				
8	2		70					
9				0.0	SB-2-(8-10)		**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
10								
11				0.0				
12					▽			Becomes wet at 12.0'
13	3		70	0.0				
14					SB-2-W			
15				0.0		CL		
16								
17				0.0				
18	4		100					
19				0.0				
20							**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
21				0.0				
22								
23	5		100	0.0				
24								
25				0.0		CL		
26								
27				0.0				
28	6		100					
29				0.0				
30								

TETRA TECH	Project: DOEE - Kingman Island Site Investigation		BORING ID
	Project Number: 103S3636.014.03		SB-3
	Site: Kingman Island		
	Address: Benning Road NE, Washington, DC		

Start Date: 11/10/15	**Time:** 10:45	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 11:15	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 25.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 13.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
1	1		80	0.0		SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
2					SB-3-(1-3)			
3				0.0				
4						GM	**Silty Gravel and Ash.** 10YR 5/4 (yellowish brown), fine to coarse, 20% silt, 20% ash and debris, heterogeneous, loose, moist, no odor.	Fill material
5				0.0				
6	2		90			ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
7				0.0				
8								
9				0.0				
10								
11	3		100	0.0				
12					SB-3-(11-13) MS/MSD	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
13				0.0	▽			Becomes wet at 13.0'
14								
15				0.0				
16	4		100					
17				0.0				
18								
19				0.0		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20								
21	5		100	0.0				
22								
23				0.0				
24								
25								

TETRA TECH	**Project:** DOEE - Kingman Island Site Investigation	**BORING ID**
	Project Number: 103S3636.014.03	**SB-4**
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/10/15	**Time:** 11:30	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 12:00	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 12.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
							Silty Sand. 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
1				0.0		SM		
2					SB-4-(1-3)		**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	Fill material
3	1		50	0.1				
4								
5				0.0		ML		
6								
7				0.0				
8	2		60					
9				0.0			**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
10								
11				0.0	SB-2-(10-12)			
12					▽	CL		Becomes wet at 12.0'
13	3		70	0.0				
14					SB-4-W		**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
15				0.0				
16								
17				0.0				
18	4		100					
19				0.0				
20								
21				0.0				
22						CL		
23	5		100	0.0				
24								
25				0.0				
26								
27				0.0				
28	6		100					
29				0.0				
30								

TETRA TECH		
	Project: DOEE - Kingman Island Site Investigation	**BORING ID**
	Project Number: 103S3636.014.03	**SB-5**
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/10/15	**Time:** 13:30	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 14:00	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 25.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 12.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–3	1		50	0.0, 0.0	SB-5-(1-3)	SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
3–5	1		50	0.0		GM	**Silty Gravel and Ash.** 10YR 5/4 (yellowish brown), fine to coarse, 20% silt, 20% ash and debris, heterogeneous, loose, moist, no odor.	Fill material
5–11	2 (5–10), 3 (10–11)		NR (5–10), 80 (10–11)	0.0	SB-5-(10-12)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
11–15	3		80	0.0, 0.0, 0.0	▽ (groundwater)	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material Becomes wet at 12.0'
15–25	4 (15–20), 5 (20–25)		100, 100	0.0, 0.0, 0.0, 0.0, 0.0		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material

TETRA TECH

Project: DOEE - Kingman Island Site Investigation		**BORING ID**
Project Number: 103S3636.014.03		**SB-6**
Site: Kingman Island		
Address: Benning Road NE, Washington, DC		
Start Date: 11/10/15	**Time:** 14:15	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/10/15	**Time:** 14:45	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 12.5		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
1				0.0		SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
2					SB-6-(1-3)			
3	1		50	0.1			**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	Fill material
4								
5				0.0				
6						ML		
7				0.0				
8	2		60					
9				0.0				
10							**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
11				0.0	SB-6-(10-12) SB-6D-(10-12)			
12						CL		
13	3		70	0.0				Becomes wet at 12.5'
14					SB-6-W			
15				0.0				
16							**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
17				0.0				
18	4		100					
19				0.0				
20								
21				0.0				
22								
23	5		100	0.0		CL		
24								
25				0.0				
26								
27				0.0				
28	6		100					
29				0.0				
30								

TETRA TECH

Project: DOEE - Kingman Island Site Investigation	**BORING ID**
Project Number: 103S3636.014.03	**SB-7**
Site: Kingman Island	
Address: Benning Road NE, Washington, DC	

Start Date: 11/11/15	**Time:** 07:45	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 08:20	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 20.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 10.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
1				0.0		ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
2					SB-7-(1-3)		**Silty Gravel and Ash.** 10YR 5/4 (yellowish brown), fine to coarse, 20% silt, 20% ash and debris, heterogeneous, loose, moist, no odor.	Fill material
3	1		100	0.0				
4								
5						GM		
6								
7								
8	2		20					
9				0.0	SB-7-(8-10)		**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
10					▽			Becomes wet at 10.0'
11				0.0				
12					SB-7-W			
13	3		60	0.0		CL		
14								
15				0.0				
16								
17				0.0				
18	4		70					
19				0.0		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20								

TETRA TECH

Project: DOEE - Kingman Island Site Investigation		**BORING ID**
Project Number: 103S3636.014.03		**SB-8**
Site: Kingman Island		
Address: Benning Road NE, Washington, DC		

Start Date: 11/11/15	**Time:** 08:30	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 09:10	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 25.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 13.5		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
1				0.0		ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
2					SB-8-(1-3)			
3	1		50	0.0		GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
4								
5				0.0		ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
6								
7				0.0				
8	2		70					
9				0.0		CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
10								
11								
12					SB-8-(11-13) SB-8D-(11-13)			
13	3		30	0.0	▽			Becomes wet at 13.5'
14								
15				0.0				
16								
17								
18	4		NR					
19						CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20								
21								
22								
23	5		10	0.0				
24								
25								

TETRA TECH

Project: DOEE - Kingman Island Site Investigation		**BORING ID**
Project Number: 103S3636.014.03		**SB-9**
Site: Kingman Island		
Address: Benning Road NE, Washington, DC		

Start Date: 11/11/15	**Time:** 09:30	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 10:10	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 14.5		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–2	1		70	0.0		SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
1–3					SB-9-(1-3) MS/MSD			
2–4				0.1		ML	**Clayey Silt with Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
4–6				0.0				
5–10	2		70					
6–8				0.0				
8–10				0.0				
10–15	3		40					
12–14				0.0	SB-9-(12-14)			Becomes wet at 14.5'
13–19						CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
14–16				0.0	▽ (groundwater)			
15–20	4		20					
16–18					SB-9-W			
18–20				0.0				
19–30						CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20–25	5		10					
24–26				0.0				
25–30	6		20					
28–30				0.0				

TETRA TECH

Project: DOEE - Kingman Island Site Investigation		**BORING ID**
Project Number: 103S3636.014.03		**SB-10**
Site: Kingman Island		
Address: Benning Road NE, Washington, DC		

Start Date: 11/11/15	**Time:** 10:40	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 11:20	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 9.5		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–5	1		60	0.0 (0–1); 0.0 (2–3); 0.0 (4–5)	SB-10-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	Fill material
5–10	2		40	0.0 (8–9)	SB-10-(8-10)	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material; Becomes wet at 9.5'
10–15	3		80	0.0 (10–11); 0.0 (12–13); 0.0 (14–15)		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
15–20	4		100	0.0 (16–17); 0.0 (18–19)		CL		
20–25	5		100	0.0 (20–21); 0.0 (22–23); 0.0 (24–25)		CL		
25–30	6		100	0.0 (26–27); 0.0 (28–29)		CL		

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-11
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/11/15	**Time:** 12:00	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 12:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 25.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 10.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–2	1		70	0.0	SB-11-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
2–4				0.0		GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
4–6	2		40			ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
6–8				0.0		CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
8–10				0.0	SB-11-(8-10)			
10					▽			Becomes wet at 10.0'
10–12	3		60	0.0	SB-11-W			
12–14				0.0		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
14–16	4		100	0.0				
16–18				0.0				
18–20				0.0				
20–22	5		100	0.0				
22–24				0.0				
24–25								

TETRA TECH	Project: DOEE - Kingman Island Site Investigation Project Number: 103S3636.014.03 Site: Kingman Island Address: Benning Road NE, Washington, DC	BORING ID SB-12

Start Date: 11/11/15	**Time:** 13:30	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 14:00	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 11.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0-1	1		80	0.0		ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
1-2					SB-12-(1-3)	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Fill material and Dredged material
2-4				0.0				
4-6				0.0				
6-8	2		70	0.0		CL		
8-10				0.0	SB-12-(8-10)			
10-12	3		70	0.0	▽			Becomes wet at 11.0'
12-14				0.0				
13						CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
14-16				0.0				
16-18	4		80	0.0				
18-20				0.0				
20-22	5		100	0.0				
22-24				0.0				
24-26				0.0				
26-28	6		100	0.0				
28-30				0.0				

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-13
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/11/15	**Time:** 15:45	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/11/15	**Time:** 16:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 15.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–2	1		70	0.0	SB-13-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
2–8	1 / 2		70 / 70	0.0, 0.0, 0.0		GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
8–12	2 / 3		70 / 80	0.0, 0.0		ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
12–18.5	3 / 4		80 / 100	0.0, 0.0, 0.0	SB-13-(13-15); SB-13-W	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material; Becomes wet at 15.0'
18.5–30	4 / 5 / 6		100 / 100 / 100	0.0, 0.0, 0.0, 0.0, 0.0, 0.0		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material

TETRA TECH

Project: DOEE - Kingman Island Site Investigation	**BORING ID**
Project Number: 103S3636.014.03	**SB-14**
Site: Kingman Island	
Address: Benning Road NE, Washington, DC	

Start Date: 11/12/15	**Time:** 11:00	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/12/15	**Time:** 11:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 15.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–3	1		70	0.0 (0–2); 0.0 (2–4)	SB-14-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
3–5	1		70			GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
5–10	2		40	0.0 (6–8); 0.0 (8–10)		GM		
10–12	3		60			GM		
12–15	3		60	0.0 (12–14); 0.0 (14–16)	SB-14-(13-15)	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material Becomes wet at 15.0'
15–20	4		80	0.0 (16–18); 0.0 (18–20)		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20–25	5		80	0.0 (20–22); 0.0 (22–24); 0.0 (24–26)		CL		
25–30	6		70	0.0 (26–28); 0.0 (28–30)		CL		

TETRA TECH	Project: DOEE - Kingman Island Site Investigation		BORING ID
	Project Number: 103S3636.014.03		SB-15
	Site: Kingman Island		
	Address: Benning Road NE, Washington, DC		

Start Date: 11/12/15	**Time:** 08:45	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/12/15	**Time:** 09:15	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 14.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0-4	1		60	0.0 (0-2); 0.0 (2-4)	SB-15-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
4-13	1 (4-5); 2 (5-10); 3 (10-13)		60 (4-5); 60 (5-10); 50 (10-13)	0.0 (6-8); 0.0 (8-10); 0.0 (12-14)	SB-15-(12-14)	GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
13-23	3 (13-15); 4 (15-20); 5 (20-23)		50 (13-15); 80 (15-20); 100 (20-23)	0.0 (14-16); 0.0 (16-18); 0.0 (18-20); 0.0 (20-22); 0.0 (22-24)	SB-15-W (15-17)	CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material Becomes wet at 14.0'
23-30	5 (23-25); 6 (25-30)		100 (23-25); 100 (25-30)	0.0 (24-26); 0.0 (26-28); 0.0 (28-30)		CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-16
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/12/15	**Time:** 12:00	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/12/15	**Time:** 12:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 9.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–4	1		70	0.0 (0–2), 0.0 (2–4)	SB-16-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
4–5	1		70			GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	Fill material
5–10	2		60	0.0 (6–8), 0.0 (8–10)	SB-15-(7-9)	GM		Becomes wet at 9.0'
10–14	3		60	0.0 (12–14)		GM		
14–15	3		60	0.0		CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
15–19	4		70	0.0, 0.0, 0.0		CL		
19–20	4		70			CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20–25	5		70	0.0, 0.0, 0.0		CL		
25–30	6		70	0.0, 0.0		CL		

TETRA TECH

Project: DOEE - Kingman Island Site Investigation	**BORING ID**
Project Number: 103S3636.014.03	**SB-17**
Site: Kingman Island	
Address: Benning Road NE, Washington, DC	

Start Date: 11/12/15	**Time:** 12:00	**Drilling Co.:** GSI Mid-Atlantic Inc.	**Driller:** Jeffery
Completion Date: 11/12/15	**Time:** 12:30	**Drilling Method:** DPT	**Bit Size:** 2" ID
Geologist: Joshua Coe		**Drilling Equipment:** GeoProbe	**Core Barrel(s):** N/A
Completion Depth (ft. bgs.): 30.0		**Sampling Method:** Continuous	**Sampler Type:** Dual Tube
Groundwater Elev. (ft. bgs.): 19.0		**Sample Hammer:** Auto	**Drop:** N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–1	1		70	0.0		SM	**Silty Sand.** 10YR 3/3 (dark brown), mainly fine sand, 40% silt, <10% fine gravel, heterogeneous, medium dense, moist, no odor.	
1–3				0.0	SB-17-(1-3)	ML	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	Fill material
3–5				0.0				
5–7	2		70	0.0				
7–9				0.0				
9–10				0.0				
10–12	3		60			GM	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	
12–14				0.0				
14–16				0.0		CL	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material
15–20	4		80					
16–18				0.0	SB-17-(17-19) SB-7D-(17-19)			
18–20				0.0	▽ (19.0)			Becomes wet at 19.0'
20–22	5		100	0.0	SB-17-W			
21.5–30						CL	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
22–24				0.0				
24–26				0.0				
25–30	6		100					
26–28				0.0				
28–30				0.0				

TETRA TECH	Project: DOEE - Kingman Island Site Investigation	BORING ID
	Project Number: 103S3636.014.03	SB-18
	Site: Kingman Island	
	Address: Benning Road NE, Washington, DC	

Start Date: 11/12/15	Time: 15:45	Drilling Co.: GSI Mid-Atlantic Inc.	Driller: Jeffery
Completion Date: 11/12/15	Time: 16:30	Drilling Method: DPT	Bit Size: 2" ID
Geologist: Joshua Coe		Drilling Equipment: GeoProbe	Core Barrel(s): N/A
Completion Depth (ft. bgs.): 30.0		Sampling Method: Continuous	Sampler Type: Dual Tube
Groundwater Elev. (ft. bgs.): 18.0		Sample Hammer: Auto	Drop: N/A

Depth (feet bgs)	Sample Number	Blow Counts	Recovery (%)	PID Reading (ppm)	Sample ID	USCS Classification	SOIL DESCRIPTION	NOTES
0–5	1		60	0.0 (2–4); 0.0 (4–6)	SB-18-(1-3)	ML (0–2)	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
						CL (2–5)	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Fill material
5–10	2		70	0.0 (6–8); 0.0 (8–10)		ML (5–8)	**Clayey Silt.** 10YR 33/ (dark brown), 20% clay, <10% gravel, fine to coarse, heterogenous, slight plasticity, non-sticky, moist, no odor.	
						GM (8–12)	**Silty Gravel and Debris.** 10YR 5/4 (yellowish brown) 20% silt, 15% bricks and debris, hetergeneous, loose, moist, no odor.	
10–15	3		70	0.0 (10–12); 0.0 (12–14); 0.0 (14–16)	SB-18-(13-15)	CL (12–18.5)	**Silty Clay with Gravel.** 10YR 4/1 (dark gray), 30% silt, 15% gravel, fine to coarse, heterogeneous, low plasticity, slightly sticky, soft, moist, no odor.	Dredged material; Becomes wet at 18.0'
15–20	4		40	0.0 (18–20)	▽ (18)	CL (18.5–25)	**Silty Clay.** 10YR 4/1 (dark gray), 20% silt, <10% fine sands and gravel, thinnly laminnated (<1/8"), low plasticity, slightly sticky, soft, wet, organic odor.	Top of native material
20–25	5		100	0.0 (20–22); 0.0 (22–24); 0.0 (24–26)				
25–30								