HHERA Review Sampling and Analysis Plan

Main Installation
Defense Depot Memphis, Tennessee
U.S. EPA I.D. Number TN4210020570

Revision 1
May 2022

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Department of the Army

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Acronyms and Abbreviations

µg	microgram
µg/kg	micrograms per kilogram
ALM	Adult Lead Model
ASTM	American Society for Testing and Materials
bgs	below ground surface
BRA	baseline risk assessment
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
COC	constituent of concern
COPC	constituent of potential concern
CVOC	chlorinated volatile organic compound
CY	cubic yards
DDMT	Defense Depot Memphis, Tennessee
DoD	Department of Defense
DQO	data quality objective
EBT	enhanced bioremediation treatment
ELAP	environmental laboratory accreditation program
EPA	United States Environmental Protection Agency
EPC	exposure point concentration
ESV	ecological freshwater screening value
ET&D	Excavation, transport and off-site disposal
ft	foot/feet
FU	functional unit
FYR	Five Year Review
HHERA	Human Health and Ecological Risk Assessment
HHRA	human health risk assessment
HI	hazard index
HQ	hazard quotient
IDW	Investigative Derived Waste
LTM	long-term monitoring
LUC	land use control
LUCIP	Land Use Control Implementation Plan
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MI	Main Installation
ng/L	nanograms per liter

NLUR	Notice of Land Use Restrictions
OU	Operable Unit
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
PCP	pentachlorophenol
pg/g	picograms per gram
ppb	parts per billion
QAPP	Quality Assurance Project Plan
QC	quality control
RI	Remedial Investigation
ROD	Record of Decision
ROS	Regression on Order Statistics
RSL	Regional Screening Level
SAP	Sampling and Analysis Plan
SLERA	screening level ecological risk assessment
SOP	Standard Operating Procedure
SVOC	semi-volatile organic compound
SWMU	Solid Waste Management Unit
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	2,3,7,8,-tetrachlorodibenzofuran
TCP	trichlorophenol
TDEC	Tennessee Department of Environment and Conservation
TDHE	Tennessee Department of Health and Environment
TEF	toxic equivalency factor
TEQ	toxicity equivalent
THQ	target hazard quotient
TR	target risk
UCL	Upper Confidence Limit
UFP	Uniform Federal Policy
USACE	United States Army Corps of Engineers
UST	underground storage tank
UU/UE	unrestricted use and unlimited exposure
VI	vapor intrusion
VOC	volatile organic compound

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Executive Summary

This *HHERA Review Risk Assessment Sampling and Analysis Plan* (SAP) was prepared by HDR, Inc. under Contract Number W91278-16-D-0061-W9127819F0090 to the United States Army Corps of Engineers (USACE), Mobile District. This SAP contains a review of historical soil, sediment, and surface water sample locations and analytical results from the 2000 Main Installation (MI) Remedial Investigation (RI; CH2M HILL, 2000) for the MI at the former Defense Depot Memphis, Tennessee (DDMT) and provides a plan for additional sampling, analysis, and risk assessment. The purpose of the SAP is to 1) perform additional review of the data gaps that were initially reviewed in the *Human Health and Ecological Risk Assessment* (HDR, 2018b and 2020a), and 2) propose focused sampling and analysis to address the data gaps.

The SAP identified the following data gaps after review of the historical analytical results:

- Individual dioxins-furans (suite of seven dioxins and 10 furans) were reported in 78 of 81 soil samples due to detections from more highly chlorinated isomers (hexa-, hepta-, and octa-) in Functional Unit 4 (FU-4) near the Former Pentachlorophenol (PCP) Dip Vat Removal Area and near drainage features along the FU-4 border. The detection limits of 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) non-detects in previous sample analyses exceeded human health screening criteria. It is unknown whether there remains soil concentrations of dioxins and furans that exceed current human health screening criteria with potential exposure to human receptors within FU-4 and MI-wide drainage features.
- Total chromium concentrations were well below the human health screening criterion for trivalent chromium but well above the human health screening criterion for hexavalent chromium. The identification of trivalent chromium as the dominant form at the MI was limited to only a few soil samples collected in FU-3 that were analyzed for chromium speciation. The species of chromium at the MI may have changed over time due to environmental conditions. It is unknown whether trivalent chromium remains the dominant form of chromium in FU-3 and FU-4 (location of metal-focused removal actions) and whether current concentrations of trivalent and hexavalent chromium are below the applicable human health criteria.
- Dioxins and furans were detected above human health screening criteria and ecological screening values (ESVs) in sediment and surface water samples in FU-2 and FU-4 and may be present in on-site drainage features. The detection limits of non-detects in previous sample analyses exceeded the applicable screening criteria. It is unknown whether there remains sediment and surface water concentrations of dioxins and furans that exceed current applicable criteria with potential exposure to on-site and off-site human receptors within drainage features in FU-2, FU-3, and FU-4. In addition, while there is minimal to no suitable ecological habitat on the MI, it is unknown what the potential influence of stormwater discharge from the on-site drainage features has on exposure conditions in off-site receiving waterbodies with ecological receptors.

A total of 81 field samples of soil, sediment, and surface water is proposed to be collected within the MI to address the above data gaps. Sample details are shown on Table 22, including media, analytical method, the number of field and quality control (QC) samples, preservative, holding

time, container, analytical turnaround time and laboratory. In addition, a sample summary of the number of field samples to be collected by environmental medium and FU is provided on Table 23.

After collection of the samples and laboratory analysis, a risk assessment screening will be performed that includes evaluations of the new analytical results from the soil, sediment, and surface water samples. A detailed report will be prepared that will describe the field activities with deviations from this SAP noted, a data quality evaluation, analytical results with final data validation flags, the risk screening, and recommendations for further action if warranted. The report will be submitted for internal review by Army and USACE; responses to comments will be provided and, following resolution of the comments, the report will be revised for submittal to the United States Environmental Protection Agency (EPA) and Tennessee Department of Environment and Conservation (TDEC).

1 Introduction

This *HHERA Review Risk Assessment Sampling and Analysis Plan* (SAP) was prepared by HDR, Inc. under Contract Number W91278-16-D-0061-W9127819F0090 to the United States Army Corps of Engineers (USACE), Mobile District. This SAP contains a review of historical soil, sediment and surface water sample locations and analytical results from the 2000 Main Installation (MI) Remedial Investigation (RI; CH2M HILL, 2000) for the MI at the former Defense Depot Memphis, Tennessee (DDMT) and provides a plan for additional sampling, analysis, and risk assessment. The purpose of the SAP is to 1) identify data gaps that may have occurred since the *Memphis Depot Main Installation Record of Decision* (MI ROD) (CH2M HILL, 2001) due to changes in toxicity values of site-related constituents, exposure factors and pathways, and risk assessment methodology and 2) propose focused sampling and analysis to address the data gaps.

The environmental restoration program at DDMT is directed by the Department of the Army (Army), Office of the Deputy Chief of Staff, G9, Environmental Division, Base Realignment and Closure (BRAC) Field Branch. The regulatory oversight agencies are United States Environmental Protection Agency (EPA), Region 4 and Tennessee Department of Environment and Conservation (TDEC). DDMT's EPA Identification Number is TN4210020570.

1.1 Location and Site History

DDMT is located in southeastern Memphis, Tennessee, and consists of approximately 634 acres at the MI and Dunn Field (Figure 1). The MI contains approximately 567 acres with open storage areas, warehouses, former military family housing, and outdoor recreational areas. Dunn Field, which is located across Dunn Avenue from the northwest section of the MI, contains approximately 67 acres with former mineral storage and waste disposal areas. An aerial photograph of DDMT and the adjacent area is shown on Figure 2.

DDMT originated as a military facility in the early 1940s to provide stock control, materiel storage, and maintenance services for the U.S. Army. It was selected for closure under BRAC in 1995; storage and distribution activities ceased in September 1997.

During operations from 1942 to 1997, DDMT received, warehoused, and distributed supplies to U.S. military services and civilian agencies. The supplies included hazardous substances; textile products; food products; electronic equipment; construction materials; and industrial, medical, and general supplies.

In 1992, DDMT was added to the National Priorities List. In 1995, EPA, TDEC, and the Defense Logistics Agency entered into the *Federal Facilities Agreement at the Defense Distribution Depot Memphis*, under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Four Operable Units (OUs) were established to outline discrete areas for investigation and cleanup. Dunn Field is identified as OU-1, the only known and documented burial area on the Depot. The MI is divided into three OUs (2 through 4) (Figure 3). OU-2 is located in the southwestern MI, an industrial area where maintenance and repair activities took

place. OU-3 is located in the southeastern quadrant of the MI area and contains the entire southeastern watershed and golf course. OU-4 is located in the north-central MI where material storage took place.

During the MI RI, functional units (FUs) were identified on the MI to evaluate risk to human health and the environment. Each FU represented an area where human health exposure was generally uniform based on operational history, expected use and location. The MI was divided into six FUs with groundwater under the MI being FU-7. The FUs are described on Table 1 and the boundaries are shown on Figure 3.

1.2 Project Organization

The project organization is shown on Figure 4, project personnel and contact information are listed on Table 2 and the project schedule is listed on Table 3.

1.3 Report Organization

This report is organized into the sections described below.

Section 1 Introduction: Identifies the site location and history, project organization, and organization of this report.

Section 2 Background: Presents the site description, history of investigations and remedial actions, existing land use controls and ownership, and the previously conducted Human Health and Ecological Risk Assessment (HHERA).

Section 3 Additional Review of Analytical Data from the 2000 MI RI: Presents additional focused review of the historical data in the MI RI (CH2M HILL, 2000) in accordance with the conclusions of the HHERA.

Section 4 Project and Data Quality Objectives (DQOs): Describes the problem statement, goals of the study, information inputs, study boundaries, analytical approach, and performance criteria.

Section 5 Sampling Design and Rationale: Describes the proposed field activities and methodology for the laboratory analysis of samples.

Section 6 Risk Screening: Describes the methodology for the proposed risk screening that will evaluate the analytical results from the proposed soil, sediment, and surface water samples.

Section 7 Reporting: Describes the report that will be prepared after completion of all planned sampling and analysis.

Section 8 References: Provides complete references for the literature cited in this report.

2 Background

2.1 Site Description

The MI contains approximately 567 acres; all the property has been transferred for reuse through public benefit and economic development conveyances. The MI is used for commercial warehousing and light manufacturing, except in the southeast quadrant of the MI where the Airways police station, veterans housing and a golf course are located (Section 2.3). Figure 5 shows the ground surface cover on the MI.

The MI is in an area of mixed residential, commercial, and industrial land use (Figure 2). Residential areas are located to the south and west. Commercial warehouses, Dunn Field, a residential area, and commercial industrial areas are located to the north. Airways Boulevard, on the east border of the MI, is the most heavily traveled thoroughfare in the vicinity and is developed with numerous small, commercial establishments, particularly in the area from DDMT south to the Interstate 240 interchange. DDMT is currently zoned for light industrial use, except for the veterans housing area; zoning for the MI and the surrounding area is shown on Figure 6.

2.1.1 Physiographic Setting

DDMT is located in the Gulf Coastal Plain approximately three miles east of the bluffs at the edge of the Mississippi Alluvial Plain. Ground surface elevations at the MI generally range from 290 to 305 feet (ft). The MI is generally level with or above surrounding terrain, so it receives little runoff from adjacent areas. There are no naturally flowing streams or creeks on the MI. Site drainage occurs by overland flow via swales, ditches, and concrete-lined or unlined drainage features; a series of storm drains and piping transport runoff to discharge points on the west, north and south.

Two perennial surface water features are located on the MI, Lake Danielson and the Golf Course Pond serve primarily as drainage reservoirs; the Lake Danielson dam failed in 2019 and was rebuilt in 2021. Surface topography and drainage at DDMT and the surrounding area is shown on Figure 7. Groundwater occurs at a depth of 75 ft below ground surface (bgs) or more throughout most of the MI and does not discharge to surface water in the immediate area of DDMT. There is no apparent effect on groundwater elevations from surface water features on the MI.

2.1.2 Geology and Hydrogeology

The geologic units of interest for this SAP are loess, including surface soil, and the fluvial deposits. The loess consists of wind-blown and deposited brown to reddish-brown, low-plasticity clayey silt to silty clay. The loess deposits on the MI are approximately 20 to 30 ft thick.

The fluvial (terrace) deposits consist of two general layers. The upper layer is silty, sandy clay to clayey sand and ranges from about 2 to 30 ft thick. The lower layer is composed of interlayered sand, sandy gravel, and gravelly sand, and ranges from 30 to 70 ft thick. The uppermost aquifer is the unconfined Fluvial Deposits Aquifer, consisting of saturated sands and gravelly sands in

the lower portion of the deposits. Depth to groundwater on the MI ranges from approximately 50 to 95 ft bgs.

2.2 Site Investigation and Remedial Action

Site investigations from 1989 to 2001 are described in the *Memphis Depot Main Installation Remedial Investigation Report, Volumes I through IV* (CH2M HILL, 2000). The MI RI, which included a human health risk assessment (HHRA) and screening level ecological risk assessment (SLERA), identified contamination in surface soil and groundwater. Soil contamination was addressed through removal actions and a remedial action identified in the MI ROD (CH2M HILL, 2001).

The following removal actions were taken prior to the MI ROD. The locations are shown on Figure 3.

- Approximately 602 cubic yards (CY) of surface and subsurface soil were removed from the Pentachlorophenol (PCP) Dip Vat Area (Building 737) in FU-4 because of elevated levels of PCP (O. H. Materials, 1986). This removal action is discussed further in Section 2.2.1.
- Approximately 60,000 gallons of hazardous and petroleum/oil/lubricants materials from damaged drums were reclaimed and repackaged at Building 873 in FU-3 in 1985. Approximately 800 55-gallon drums were recouped in this open storage area and then returned to their original location for storage and distribution. Soil sampling was conducted east of Building 873. Surficial soil contamination indicated numerous spills of limited quantities in outside storage areas. Removal and disposal of contaminated soil was within the scope but was not described in the report (O. H. Materials, 1986).
- Approximately 5,000 tons (3,700 CY) of surface soil in the Housing Area in FU-6 were removed in 1998 because of the presence of dieldrin (OHM Remediation Services, 1999). The Housing Area is an exception to the overall industrial land use for MI and cleanup levels were based on residential reuse.
- Approximately 530 tons (400 CY) of surface soil surrounding the cafeteria (Building 274) in FU-6 were removed in 1998 because of elevated levels of polychlorinated biphenyls (PCBs) (OHM Remediation Services, 1999).
- Approximately 980 CY of surface and subsurface soil from BRAC Parcels 35 and 28 in FU-3 near Buildings 1084, 1085, 1087, 1088, 1089 and 1090 were removed in 2000 because of elevated levels of metals and polycyclic aromatic hydrocarbons (PAHs) (Jacobs-Sverdrup, 2000).

The MI ROD received final approval in September 2001. The selected remedy presented in the MI ROD contained the following components:

- Excavation, transport and off-site disposal (ET&D) of lead-contaminated surface soil near Building 949 in FU-4. [Note: ET&D of approximately 300 CY of soil near Building 949 (see Figure 3) was completed prior to final execution of the ROD. The action was taken to accommodate the economic redevelopment of the site, documented in

Remediation Report, Removal Action at Building 949 (Jacobs Federal Programs, 2002) and noted as a significant change in the ROD.]

- Long-term monitoring (LTM) of groundwater to document changes in plume concentrations and to detect potential plume migration to off-site areas or into deeper aquifers.
- Enhanced bioremediation treatment (EBT) of chlorinated volatile organic compounds (CVOCs) in the most contaminated part of the groundwater plume.
- Deed restrictions and land use controls (LUCs) to prevent residential land use on the MI, except at the existing housing area; to implement daycare restrictions; to prevent production/consumptive use of groundwater in the Fluvial Deposits Aquifer and drilling into deeper aquifers on the MI; and to eliminate casual access through maintenance of a boundary fence around the golf course.

LTM of groundwater has been conducted since 2004. EBT was implemented from September 2006 to February 2009 (EBT-1). Additional EBT (EBT-2) was conducted over a wider area from November 2012 to November 2014 due to rebound in CVOC concentrations in LTM samples. While EBT reduced CVOC concentrations, it was not sufficient to meet maximum contaminant levels, which are the MI criteria for groundwater.

A Supplemental Remedial Investigation for the MI was conducted from 2015 through 2019 to address data gaps identified through EBT performance monitoring and LTM. The *2020 Supplemental Remedial Investigation Report, Revision 1* (HDR, 2021a) was submitted for regulatory review in September 2020.

During the Fourth Five-Year Review (FYR; HDR, 2018c), it was determined that significant changes in toxicity values, exposure factors and pathways, and risk assessment methodology had occurred since the HHRA and SLERA in 2000 (CH2M HILL, 2000). The changes may impact the current remedy that was selected in the MI ROD (CH2M HILL, 2001). An updated HHRA for potential groundwater exposures and reviews of the HHRA for potential soil exposures and the SLERA for the MI were performed in 2018 as the *Human Health and Ecological Risk Assessment, Revision 0* (HHERA; HDR, 2018b). Discussion of the HHERA is provided in Section 2.4.

A Focused Feasibility Study is being conducted to identify and screen remedial action alternatives for groundwater. A new decision document will be prepared as necessary to document changes to the selected remedy. Further remedial action will be conducted after the selected remedy has been confirmed or revised.

2.2.1 PCP Dip Vat

2.2.1.1 Removal Action

Wooden pallets were treated with PCP on the MI during the 1950s; operations were discontinued in 1971. Wood pallets were treated at the PCP Dip Vat Area and the Underground PCP Tank Area (Screening Sites 42 and 43) adjacent to Building 737 in FU-4. The pallets were dried near Screening Site 46, approximately 115 ft south of Building 720. A removal action was

conducted in 1985, as described in the *Summary Report, On-site Remedial Activities at the Defense Depot Memphis* (O. H. Materials, 1986). The location is shown on Figure 3. Figures from the summary report are provided in Appendix A.

Analysis of a sample of the liquid taken from the dip vat by Defense Logistics Agency personnel revealed the presence of PCP. Further analytical investigation by U.S. Army Environmental Hygiene Agency investigators of the liquid in Building 737 revealed the presence of chlorinated dioxins and furans; lower chlorinated (tetra- and penta-) dioxins and furans were not detected (<2.5 to <11 µg/kg) and higher chlorinated (hexa-, hepta- and octa-) dioxins and furans were detected at 624 to 128,000 µg/kg. Chlorinated dioxins and furans are often produced in the manufacture of the wood preservative PCP and other chlorinated organic compounds.

The liquids and sludge within the PCP dip vat tank were removed and placed in 55-gallon drums. After initial attempts to decontaminate the structure, Army and Tennessee Department of Health and Environment (TDHE, now TDEC) directed the dip vat structure and tank be disassembled for disposal. The 12,000-gallon PCP storage tank, which had only a small amount of oily liquid remaining, was excavated; the tank was then cut in pieces, sand blasted and pressure-washed prior to placement in a roll-off for storage prior to disposal. The tank was determined to be structurally sound, but leakage was apparent at joints in the piping to the dip vat based on observations during removal and presence of stained soil.

Following removal of the structure, soil samples were collected from borings on a grid within the dip vat and storage tank area to develop a depth and perimeter profile of the planned excavation. The “target soil cleanup level of 200 micrograms per kilogram (µg/kg) of total dioxins and furans” was “established in consultation between state and federal authorities” (Army, EPA and TDHE) (page 26, O. H. Materials, 1986). Soil contamination above the cleanup level was observed to a depth of 25 ft at the north end of the dip vat structure. Soil was excavated to average depths of 14 ft at the PCP storage tank; 10 ft beneath the dip vat, adjacent rollers and pump house; and 2 to 5 ft in adjacent areas. Soil with total dioxin and furan concentrations above the cleanup level was left in place below the excavated depth at the north end of the dip vat structure. Adjacent areas east and north of the excavated areas had 3 to 6 inches of soil removed and approximately 2 inches of gravel placed for cover.

The excavated soil was sampled to determine residual contamination. Soil with total dioxin and furan concentrations above the cleanup level was placed in containers and stored for off-site disposal. Soil with concentrations less than the cleanup level was used for backfill along with clean soil from off-site sources. The excavated area was backfilled and covered with gravel. In spring 1988, the contaminated soil and debris was transported and disposed at a hazardous waste disposal facility following approval by EPA and TDHE.

The dip vat liquid was suspected of having been mixed with waste oil and sprayed in the surrounding area for dust control. Samples were collected in six areas (Appendix A, Figure 3); individual soil samples were composited for each area and analyzed for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD). The sample for Area 2 contained TCDD at 5.6 µg/kg; the other sample results for TCDD were <0.05 to 0.85 µg/kg. The EPA residential cleanup level for TCDD at the time was reported to be 1 µg/kg. Area 2 was divided into six sub-areas (Appendix

A, Figure 4) and composite samples were collected from each sub-area at depth ranges of 0 to 4 inches and 4 to 8 inches; the samples were analyzed for TCDD and for other dioxin and furan isomers. The sample results for TCDD were below the cleanup level at concentrations of <0.05 to 0.5 µg/kg; other dioxin and furan isomers were detected at higher concentrations and the shallow samples had higher concentrations than the deeper samples. The maximum concentrations for the other analytes in the shallow samples were polychlorinated dibenzo-p-dioxin at 2.2 µg/kg, hexachlorodibenzo-p-dioxin at 10 µg/kg, heptachlorodibenzo-p-dioxin at 230 µg/kg, octachlorodibenzo-p-dioxin at 1600 µg/kg, 2,3,7,8,-tetrachlorodibenzofuran (TCDF) at 0.3 µg/kg, polychlorinated dibenzofuran at <0.1 µg/kg, hexachlorodibenzofuran at 23 µg/kg, heptachlorodibenzofuran at 190 µg/kg and octachlorodibenzofuran at 230 µg/kg. The Army, in consultation with TDHE and EPA, had 6 to 12 inches of gravel placed over the impacted area of 3.5 acres north of Building 737 (Appendix A, Figure 18).

Due to the presence of soils contaminated with dioxins and furans remaining in place, requirements were established for ground cover and access. TDHE letters dated 26 September 1985 and 16 October 1985 addressed the area suspected of having waste oil with PCP sprayed for dust control and TCDD concentrations below the EPA action level (5-6 parts per billion [ppb]). The October letter stated conditions for the agreed approach to place 6 to 8 inches of compacted gravel:

1. The graveled area must be placed "off limits" to any and all vehicular traffic.
2. The area must be indicated as a "non-use" area on the facility development plat.
3. Future plans for utilization of the area must be approved by TDHE.
4. Prior to placement of gravel the entire area should be sprayed with water to prevent dusting.

2.2.1.2 2003 Investigation and Dip Vat Closure

Additional investigation was performed in 2003 as required by TDEC for closure of Solid Waste Management Unit (SWMU) 42, Former PCP Dip Vat Area. The objective was to evaluate the presence or absence of PCP and PCP degradation products in soil; the PCP degradation products are 2,3,4,6-tetrachlorophenol, 2,4,5-trichlorophenol (TCP), 2,4,6-TCP, dichlorophenol, 2-chlorophenol, and phenol. In addition, four samples were collected for analysis of dioxins and furans. *Results of a Soil Investigation at the Former PCP Dip Vat and Underground PCP Storage Tank Sites* (CH2M HILL, 2004a) summarizes previous investigations and presents the 2003 soil testing results and results of fate and transport modeling for SWMU 42. The report states the area of soil contamination north of Building 737 was due to its use for drying the pallets rather than to the use of waste oil with PCPs for dust control. Also, the surface of the Former PCP Dip Vat, the PCP underground storage tank (UST) and the area to the east of the former dip vat had been covered by concrete at some time after the removal action. Soil samples were collected from four borings within the limits of the 1985 soil excavation and three borings to the southeast near the PCP UST excavation.

Of the detected dioxins and furans, the higher chlorinated, more persistent isomers were the most commonly detected. Only TCDD was reported to have an EPA Region 9 PRG of 16 µg/kg for industrial direct contact; the concentration of TCDD in all samples was below this value.

Concentrations of dioxins and furans for each sample were transformed into a total TCDD toxicity equivalent (TEQ) concentration. The toxic equivalency factors (TEFs), which relate the compound to the toxicity of TCDD, were obtained from the 1998 World Health Organization values (Van den Berg et al., 1998). For each sample, the concentration of each dioxin and furan was multiplied by its TCDD TEF and then summed to determine the total TCDD TEQ. The TCDD TEQ background values at the MI are 0.01 µg/kg in surface soil and 0.006 µg/kg in subsurface soil (CH2M HILL, 2000). TCDD TEQ values slightly exceeded these background values at sample points SB-114 (zero to 6 ft bgs) and SB-115 (6 to 13 ft bgs). The EPA action level for the TCDD TEQ was 1 µg/kg for residential soils and 5 µg/kg to 20 µg/kg for industrial soils (EPA, 1998). TCDD TEQs for all samples were below 1 µg/kg.

Restrictions on the PCP Dip Vat Area are stated in the MI Notice of Land Use Restrictions (NLUR) recorded on 26 January 2005. The MI NLUR states two site-wide restrictions and one restriction for the PCP Dip Vat Area. The site-wide restrictions are:

- No residential land use or other child-occupied facilities, and
- No production/ consumptive use of groundwater or drilling groundwater wells on the MI.

The PCP Dip Vat Area restriction is:

- No digging in soil material 10 ft below the land surface due to elevated PCP soil concentrations at the Former PCP Dip Vat Area (SWMU 42) and the Former Underground PCP Tank Area (SWMU 43). A map with surveyed coordinates of the ‘no dig’ areas was included in the NLUR.

The previous TDHE restrictions for ground cover and access were not included in the NLUR. The *Main Installation, Land Use Control Implementation Plan* (MI LUCIP) (CH2M HILL, 2004b) references the MI NLUR. TDEC approved the PCP Dip Vat Closure in July 2008.

2.3 Land Use Controls and Property Transfer

The MI LUCIP is provided in Appendix C of the *Main Installation Final Remedial Design* (MI RD) (CH2M HILL, 2004c). The LUCs prevent residential use throughout the majority of the MI; production or consumptive use of groundwater or drilling of groundwater supply wells are not allowed on the MI or, through Shelby County Health Department regulations, within 0.5 mile of the MI. In addition, there is a ‘no dig’ restriction in the Former Dip Vat Area near Building 737. The LUCs are shown on Figure 8.

FU-6 on the eastern boundary of the MI (Figure 3) contained the administrative building and parking lots, base housing, and buildings used for maintenance activities. The MI ROD states the base housing area is the only area of the MI where future residential use is allowed in accordance with the *Memphis Depot Redevelopment Plan* (Pathfinders, 1997) and that the

1998 soil removal action met risk criteria for both industrial and residential use. The MI ROD also noted the administrative building and adjacent parking lots did not contain any long-term operational areas and soil sample results were consistent with unrestricted use. These two portions of FU-6 are available for unrestricted use, except for residential use of the former administrative area (Figure 8). The MI ROD also states that FU-2, the golf course area, is available for recreational use (golf course, baseball field, playground, and soccer field), but not for residential use without access control or remediation. The remainder of the MI is stated to be restricted to commercial/industrial use. The LUCIP indicates the former administrative and housing areas are available for unrestricted use and unlimited exposure (UU/UE); it is not clear if that was an oversight or an intended change from the MI ROD.

The LUCs will remain in place until concentrations of constituents of concern (COCs) have been reduced to levels that allow for unlimited exposure and unrestricted use. Annual inspections are conducted to determine whether the required LUCs remain effective and that land use restrictions are being achieved.

All property on the MI has been transferred through deed or letter of assignment. The MI is primarily used for warehousing and logistics in the Memphis Depot Industrial Park and for operations at Barnhart Crane and Rigging (Barnhart). The former administrative area is used for offices and parking by Barnhart and for the Memphis Police Department Airways Police Station. The former MI housing area is used by Alpha Omega Veterans Services. The Memphis Depot Industrial Park is primarily owned by an investment firm, Memphis Depot TIC, LLC; Supply Chain Logistics owns two building in the Industrial park and Depot Redevelopment Corporation owns two undeveloped areas. The City of Memphis owns the golf course. The site plan is provided on Figure 9.

2.4 Human Health and Ecological Risk Assessment

The Baseline Risk Assessment (BRA) conducted in 2000 during the MI RI (CH2M HILL, 2000) included an HHRA and a SLERA for each FU. As stated in Section 2.2, the Fourth FYR (HDR, 2018c) determined that significant changes in toxicity values, exposure factors and pathways, and risk assessment methodology made since 2000 may impact the current remedy selected in the MI ROD (CH2M HILL, 2001). An updated HHRA for potential groundwater exposures and reviews of the HHRA for potential soil exposures and the SLERA for the MI were performed in 2018 as described in the *HHERA, Revision 0* (HDR, 2018b).

The updated Groundwater HHRA evaluated analytical groundwater data from samples collected between 2012 and 2017. The review confirmed the BRA finding that there is potential for receptors to experience adverse health effects from exposure to contaminated on-site groundwater, and that exposures are currently being prevented by the existing land use restrictions at the MI.

The Soil HHRA review re-evaluated soil analytical data from samples collected during the 2000 MI RI by screening the data using then current applicable human health criteria. The review concluded that most organic and inorganic constituents detected at the DDMT were present at levels that did not exceed then current Industrial EPA Regional Screening Levels (RSLs; EPA,

2021). However, additional risk assessment was recommended in a few areas to assure protectiveness of the remedy, including additional soil sampling for lead (see Section 3.5), additional sampling for chromium speciation analysis, and review of the current status of dioxin and PCP-related land use restrictions. The detection of dioxin/furans in on-site soils also warranted additional study due to potential for human health impacts.

The SLERA review re-evaluated soil, surface water, and sediment analytical data from samples collected during the 2000 MI RI by screening the data using then current applicable ecological screening values (ESVs). The review concluded that concentrations of various constituents of potential concern (COPCs), categorized as volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides, PCBs, and metals, in environmental media exceeded the EPA Region 4 ESVs (EPA, 2018a). However, the absence of suitable habitat for terrestrial and aquatic ecological receptors identified in the 2000 MI RI had not changed; without receptors, there were no complete ecological pathways of exposure. Nevertheless, the detection of dioxin/furans in on-site surface water and sediment warranted additional study due to potential off-site migration for ecological impacts in downstream receiving waterbodies.

The above reviews were compiled in the *HHERA, Revision 0* (HDR, 2018b) submitted to the EPA and TDEC in April 2018. Comments were received from EPA in July 2018, and Army submitted responses in December 2018. The responses were divided into three categories: 1) comment accepted and to be addressed in Revision 1 of the HHERA; 2) comment accepted and to be addressed through the vapor intrusion (VI) study and/or additional review, sampling and risk assessment; and 3) comment not considered to require revision to the HHERA or additional assessment.

Following further discussion in teleconferences with EPA and Army in April 2019, EPA provided conditional approval of the HHERA based on 1) revision of the report in accordance with responses to specific comments and 2) additional review, sampling and risk assessment, including VI, to be documented in a following comprehensive HHERA report. The *HHERA, Revision 1* (HDR, 2020a) was revised in accordance with the Army responses and submitted to EPA and TDEC in February 2020. The conditional approval letter from EPA and the final responses to EPA comments are provided in Appendix B. Comments were not submitted by TDEC.

Three comments from EPA (Section I, Comments 1 and 2 and Section II, Comment 15b) referred to the ongoing VI study for the MI. The VI study is being conducted separately from this SAP, which is focused on human health and ecological risk assessment of soil, sediment and surface water. The *Vapor Intrusion Conceptual Site Model* (VI CSM) (HDR, 2020b) was submitted to EPA and TDEC for review in January 2021. Following resolution of comments, a comprehensive sampling plan will be prepared and implemented following approval.

Therefore, in accordance with the conditional approval of the HHERA, this SAP presents additional review of the analytical data from the 2000 MI RI by further evaluating dioxins, furans, chromium, and lead in soil for human health exposures as well as COPCs in surface water and sediment for off-site migration for human and ecological impacts in downstream receiving waterbodies.

2.5 Regulatory Agency Review

The *HHERA Review Sampling and Analysis Plan, Revision 0* (SAP; HDR, 2021b) was submitted for agency review in July 2021. TDEC approved the report in November 2021, and EPA provided comments in February 2022. Responses to EPA comments were submitted in March 2022, and EPA provided conditional approval in April 2022 with the understanding that additional revision for four comments attached to the letter would be included in the revised SAP. Agency comments, responses and approval letters are provided in Appendix B.

This SAP Revision 1 incorporates the March 2022 responses to EPA comments and the additional responses requested in the conditional approval with one exception. The third comment included with the conditional approval stated “new data collected should be screened against conservative ecological screening values and with site-specific food-chain models as appropriate”. The new surface water and sediment data collected in the drainage channels will be screened against conservative ecological screening values for surface water and sediment to evaluate the potential influence of stormwater discharge on exposure conditions in the receiving waterbody. However, food chain modeling is not within the current statement of work. If there are exceedances and there is sufficient habitat and complete exposure pathways to semi-aquatic wildlife receptors, the need for additional evaluations, such as food chain modeling, will be considered in consultation with EPA and TDEC.

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3 Additional Review of Analytical Data from the 2000 MI RI

Additional review of the analytical data from soil, sediment, and surface water samples presented in the 2000 MI RI was performed to assure protectiveness of the remedy at the MI, in response to EPA comments as discussed in Section 2.4. The review conducted in each subsection is listed below.

- Section 3.1: Evaluation of analytical results of dioxins, furans, PCP, and dibenzofuran in soil, sediment, and surface water samples for potential exposure to an on-site industrial worker.
- Section 3.2: Calculation of cancer risks and noncancer hazards for the industrial worker exposure scenario and the residential scenario in the UU/UE section of FU-6 using the soil analytical results for COPCs (VOCs, SVOCs, pesticides, PCBs, metals) identified in the 2000 MI RI and EPA RSLs.
- Sections 3.3 to 3.5: Evaluation of analytical results of arsenic, chromium, and lead in soil samples for potential exposure to an on-site industrial worker and to a future on-site resident in the UU/UE section of FU-6.
- Section 3.6: Evaluation of sediment and surface water exceedances of ecological screening criteria from the 2000 MI RI SLERA.
- Section 3.7: Summary of uncertainties with the 2000 MI RI data set and risk assessment methodology that could have impacted the reviews performed in the HHERA (HDR, 2018b and 2020a) and this SAP.

Soil samples were collected from the surface to depths of 170 ft bgs. Samples were grouped into three depth ranges for the risk assessment: surface soil (0-2 ft), for subsurface soil (2-10 ft), and for deep soil (>10 ft). The greatest number of samples were collected from surface soil and the least in deep soil.

For the purposes of this review, use of the analytical results from the 2000 MI RI is appropriate and applicable as the results remain representative of conditions at the time Army activities ceased. The MI was selected for closure under BRAC in 1995; storage and distribution activities ceased in September 1997. Other than response actions, no activities have been performed by Army since September 1997 that would directly affect the concentration and extent of constituents. Response actions to remove contaminated soil were conducted at the locations shown on Figure 3, as discussed in Section 2.2. While dioxins, furans, and lead are persistent in the environment, arsenic, chromium and other constituents may degrade or transform through environmental conditions; potential degradation of analytes was considered in the review below.

3.1 Dioxins and Furans

3.1.1 Soil

Soil samples collected from all FUs were analyzed for PCP and dibenzofuran in the 2000 MI RI. Additional soil samples collected from FU-3 and FU-4 were also analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans. The laboratory had calculated TCDD TEQ concentrations for the dioxin and furan suite in accordance with World Health Organization guidance (Van den Berg et al., 1998) current at the time the RI was developed; the guidance has since then been updated (Van den Berg et al., 2006). In the calculations, non-detects of dioxin and dioxin-like compounds were input as zero.

The soil sample locations are shown on Figure 10. The sample location symbols on the figure are color-coded by concentration in the surface soil sample. Sample results are summarized for surface soil on Table 4, for subsurface soil on Table 5, and for deep soil on Table 6. The summary tables include a comparison of the analytical results to the EPA RSLs [target risk (TR) of 1E-06 and target hazard quotient (THQ) of 0.1 for screening; EPA, 2021] to evaluate potential human health exposure to these analytes in soil. RSLs have been established for 2,3,7,8-TCDD, dibenzofuran, and PCP. No RSLs have been established for the individual dioxins and furans, but the TCDD TEQ values (as previously calculated by the laboratory and as presented in the 2000 MI RI) are instead evaluated as compared to the RSL for 2,3,7,8-TCDD.

The complete analytical results for PCP, dibenzofuran, 2,3,7,8-TCDD and TCDD TEQ in soil samples are presented by depth range for each FU in tables in Appendix C. Figures showing analytical results for PCP, dibenzofuran and TCDD TEQ in all depth ranges for each FU are provided in Appendix D. The sample location symbols on the figures are color-coded by concentration; the sample number, depth and concentration are listed. The figures also show the area designated UU/UE in FU-6 and the excavation limits for the removal actions discussed in Section 2.2. Appendix C, Table C-17 provides a list of samples that have been excavated since the 2000 MI RI; these samples are not included in the review. The tables and figures were prepared from the DDMT analytical database.

An evaluation of the soil analytical results is provided below.

- PCP was detected in 15 (6%) of 236 surface soil (0-2 ft) samples with a maximum of 0.68 milligrams per kilogram (mg/kg), which is less than the Industrial Soil RSL of 4 mg/kg. Only six (3%) of the 221 non-detect samples have detection limits greater than the RSL; the range of detection limits is 6 to 19 mg/kg. These six samples are located across the MI in FU-1 (SB57E and SS65A), FU-3 (B[26.2]), FU-5 (SS77C and SB77A), and FU-6 (SS66A). In subsurface soil (2-10 ft), one detection was reported in 211 samples; SB42A at a depth of 8-10 ft in FU-4 had a PCP concentration of 470 mg/kg, which is well above the Industrial Soil RSL. None of the non-detect subsurface samples have detection limits greater than the RSL (maximum of 0.19 mg/kg). In deep soil , PCP was non-detect and detection limits (maximum of 2.1 mg/kg) are below the Industrial Soil RSL.

- Dibenzofuran was detected in 28 (12%) of 241 surface soil samples with a maximum of 24 mg/kg. One detection of 0.19 mg/kg was reported in 208 subsurface soil samples(2-10 ft). No detections were reported in deep soil samples. The detected concentrations and the detection limits for non-detects across all depths (maximum of 38 mg/kg) are below the Industrial Soil RSL of 120 mg/kg.
- 2,3,7,8-TCDD was detected in one (1%) of 81 soil samples across all depths. SB46A in deep soil at a depth of 38-40 ft in FU-4 had an estimated concentration of 17 J picograms per gram (pg/g), which is less than the Industrial Soil RSL of 22 pg/g. The reported detection limit of 1,000 pg/g for non-detect samples is well above the Industrial Soil RSL.
- Individual dioxins and furans were detected in 78 (96%) of 81 soil samples. TCDD TEQ concentrations were calculated from these results.
    - TCDD TEQ was reported in 33 (100%) of 33 surface soil samples with a maximum of 466.5 pg/g; 15 samples exceeded the Industrial Soil RSL of 22 pg/g. The TCDD TEQ exceedances in surface soil are in samples collected in FU-4 near the Former PCP Dip Vat Area and near the drainages leading to Frisco and Tarent Branches. In subsurface soil, 22 (88%) of 25 samples had reported TCDD TEQ concentrations with a maximum of 12,520 pg/g; two samples located near the Former PCP Dip Vat Removal Area exceeded the Industrial Soil RSL. In deep soil, 23 (100%) of 23 samples had reported TCDD TEQ concentrations with a maximum of 576.8 pg/g; two samples located near the Former PCP Dip Vat Area exceeded the Industrial Soil RSL with concentrations of 61.9 and 576.8 pg/g.
    - A review of analytical results for dioxins and furans indicates that the detections consist of the more highly chlorinated isomers (hexa-, hepta-, and octa-) in FU-3 and FU-4. FU-4 also had detections of the penta- isomers. While octachlorodibenzo-p-dioxin had the greatest concentrations, its toxicity equivalency factor is low at 0.0003. It is important, therefore, to use the calculated TCDD TEQ values (rather than just individual dioxin/furan data) to screen and assess health risks for current and potential exposure scenarios.
    - Additional investigation was performed in 2003 as required by TDEC for closure of the Former PCP Dip Vat Area (Section 2.2.1); TCDD TEQ concentrations in the four samples analyzed for dioxins and furans were below the EPA action level of 1 µg/kg (1,000 pg/g) (CH2M HILL, 2004a). However, the TCDD TEQ concentrations are greater than the current and more conservative EPA Industrial Soil RSL of 22 pg/g in locations SB-114 (0-6 ft) of 122 pg/g and SB-115 (6-13 ft) of 115 pg/g.

3.1.1.1 Summary

In summary, review of the data indicates minimal detections of PCP, dibenzofuran, and 2,3,7,8-TCDD in soils. Individual dioxins-furans (suite of seven dioxins and 10 furans) were reported in 78 of 81 of the samples due to detections from more highly chlorinated isomers (hexa-, hepta-, and octa-) in FU-4 near the Former PCP Dip Vat Removal Area and near drainage areas along the FU-4 border.

Sampling of the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans is recommended in the Former PCP Dip Vat Area in FU-4 and along drainage pathways in FU-2, FU-3 and FU-4 to identify concentrations above the Industrial Soil RSL. The need for sampling is based on the potential presence of elevated concentrations of dioxins and furans and the elevated detection limits (e.g., 1,000 pg/g for 2,3,7,8-TCDD) of non-detects in previous sample analyses of dioxins and furans. Current laboratory detection limits are expected to be lower than the detection limits from previous sampling and lower than the screening criteria. No sampling of PCP and dibenzofuran is necessary based on limited detections at concentrations below RSLs. Surface and subsurface soil samples will be collected in areas with formerly elevated TCDD TEQ concentrations and drainage areas. Additional information on the planned sampling, analysis and evaluation is provided in Section 5.

3.1.2 Sediment and Surface Water

In the 2000 MI RI, sediment and surface water samples collected from FU-2 and FU-4 were analyzed for PCP and dibenzofuran. Additional sediment and surface water samples collected from FU-4 were analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans. The laboratory calculated TCDD TEQ concentrations using the same methodology noted above for soil.

Samples collected from the sump in Building 1086 in FU-3 and the sumps in Buildings 251 and 265 in FU-6 were described as sediment; the results are not applicable to this review and are not included in this evaluation.

The sediment and surface water sample locations are shown on Figure 11. Sample results are summarized for sediment on Table 7 and for surface water on Table 8.

- The sediment summary table includes a comparison of the analytical results to human health screening criteria for soil: the EPA Industrial Soil RSLs and Residential Soil RSLs (TR of 1E-06 and THQ of 0.1 for screening; EPA, 2021). RSLs have been established for 2,3,7,8-TCDD, dibenzofuran, and PCP. No RSLs have been established for the individual dioxins and furans, but the TCDD TEQ is compared to the RSL for 2,3,7,8-TCDD. The receptor population on-site is an industrial worker and LUCs prevent residential use in FU-2 and FU-4. However, FU-2 allows for recreational use (adolescents and adults are present on-site) and there is potential for off-site impacts from on-site sources affecting the surface water and sediment; therefore, the more conservative Resident Soil RSL was also applied.
- The surface water summary table includes a comparison of the analytical results to human health screening criteria (EPA, 2018b): EPA National Recommended Water Quality Criteria for Human Health, Consumption of Organism Only (EPA, 2019) and the TDEC General Water Quality Criteria, Consumption of Organism Only (TDEC, 2019). Surface water criteria have been established for PCP and 2,3,7,8-TCDD, but not for dibenzofuran. The Water Quality Criteria for Consumption of Water and Organism were not applied as it incorporates a drinking water scenario (e.g., 2.4 liters/day), which is not applicable to the site. The surface water on-site is ephemeral and not a source of

potable water; there are no drinking water intakes in nearby off-site surface water, Frisco and Tarent Branches, and Nonconnah Creek.

The complete analytical results for PCP, dibenzofuran, 2,3,7,8-TCDD and TCDD TEQ in sediment and surface water samples are presented in tables in Appendix E. Figures showing the analytical results for PCP, dibenzofuran and TCDD TEQ are provided in Appendix F. The sample location symbols on the figures are color-coded by concentration; the sample number and concentration are listed. The tables and figures were prepared from the DDMT analytical database.

3.1.2.1 Sediment

An evaluation of the sediment analytical results for potential human health exposure is provided below.

- PCP was detected in four (14%) of 29 samples with a maximum of 0.26 mg/kg, which is well below the Industrial Soil RSL of 4 mg/kg and Residential Soil RSL of 1 mg/kg. The detection limits for non-detects in the remaining samples are less than the Industrial and Residential Soil RSLs, except for three samples with slightly higher detection limits, 1.1 mg/kg (SE56C), 4.1 mg/kg (M-SD05) and 4.8 mg/kg (SE56C).
- Dibenzofuran was detected in five (17%) of 29 samples with a maximum of 0.14 mg/kg, well below the Industrial Soil RSL of 120 mg/kg and Residential Soil RSL of 7.8 mg/kg. The detection limits for non-detects in the remaining samples (maximum of 9.5 mg/kg) are also well below the Industrial and Residential Soil RSLs, except for the maximum of 9.5 mg/kg (SE56C).
- 2,3,7,8-TCDD was not detected in the 15 samples. The detection limit (maximum of 1,000 pg/g) is greater than the Industrial Soil RSL of 22 pg/g and Residential Soil RSL of 4.8 pg/g in nine samples.
- Individual dioxins and furans were detected in all 15 samples. TCDD TEQ concentrations calculated from these results had a maximum concentration of 494.4 pg/g. Ten (67%) of the 15 samples exceeded the Industrial Soil RSL of 22 pg/g and 13 (87%) of the 15 samples exceeded the Residential Soil RSL of 4.8 pg/g. A review of analytical results for dioxins and furans indicates that the detections consist of the more highly chlorinated isomers: hexa-, hepta-, and octa-.

3.1.2.2 Surface Water

An evaluation of the surface water analytical results for potential human health exposure is provided below. The surface water analytical results are compared to conservative human health criteria that reflect recreational or drinking water exposures. An industrial worker at the MI is unlikely to come into contact with water in the on-site water bodies or drainage areas through these exposure pathways. The minimum of the criteria discussed below refers to the National Recommended Water Quality Criteria for Human Health, Organism Only (EPA, 2019).

- PCP was detected in three (12%) of 26 samples with a maximum of 0.013 milligrams per liter (mg/L) in FU-4. The detections are well above the minimum criterion of 0.00004

mg/L. The detection limits for non-detects in the remaining samples (maximum of 0.01 mg/L) in FU-2 and FU-4 are also well above the minimum criterion.

- Dibenzofuran was not detected in the 26 samples; the maximum detection limit was 0.02 mg/L. There is no criterion available for comparison.
- 2,3,7,8-TCDD was not detected in the eight samples. The detection limit of 10 nanograms per liter (ng/L) is greater than the minimum criterion of 0.0000051 ng/L.
- The eight samples analyzed for individual dioxins and furans were collected in drainage features or a detention basin in FU-4. TCDD TEQ was reported in the eight samples with a maximum of 0.5363 ng/L. The TCDD TEQ detections are well above the minimum criterion of 0.000005 ng/L. The detected dioxins and furans consist of the more highly chlorinated isomers: hexa-, hepta-, and octa-.

3.1.2.3 Summary

There are detected exceedances of TCDD TEQ in sediment and surface water in FU-2 and FU-4 and PCP in surface water in FU-4. The detection limits are also elevated.

Additional sampling of sediment and surface water sampling is recommended to evaluate potential on-site human health exposure. The sampling would also provide information on whether there are potential off-site impacts. The samples will be analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans. No sampling of PCP or dibenzofuran is necessary based on limited detections at concentrations below RSLs. Additional information on the planned sampling, analysis and evaluation is provided in Section 5. Note that the sediment and surface water samples will also be analyzed for metals, SVOCs and other pesticides based upon the Ecological Review in Section 3.6.

3.2 RSL Exceedances

Cancer risks and noncancer hazard index (HI) values in each FU were calculated for soil COPCs (VOCs, SVOCs, pesticides, PCBs, metals) identified in the 2000 MI RI. The calculations applied the exposure point concentrations (EPCs) provided in the 2000 MI RI, which were the lower of the 95% Upper Confidence Limit (UCL) on the arithmetic mean and the maximum detected concentration, and the EPA Industrial and Residential Soil RSLs, May 2021 (TR of 1E-06 and THQ of 1; EPA, 2021). In FU-2, multiple EPCs were provided by area for the ballpark, golf course, playground, and surface soil (grass adjacent to paved roadways). Tables in Appendix G list the COPCs identified for each FU with the EPCs, RSLs, screening risk and screening hazard for surface soil (0 to 2 ft) and soil (0 to 10 ft). The cumulative cancer risks and the HI values calculated for each FU are listed on Table 9. The cumulative cancer risks and HI values were compared to acceptable levels as follows:

- For known or suspected carcinogens, the acceptable level is an excess lifetime cancer risk to an individual of between one in ten thousand (1E-04) and one in a million (1E-06; EPA, 1989). EPA Region 4 further applies a level of 1E-04 for a receptor considering all exposure pathways as a trigger for remediation (EPA, 2018b). COPCs are not

considered significant contributors to a cumulative risk greater than 1E-04 if their individual cancer risk contribution is less than 1E-06 (EPA, 2018b).

- For COPCs with noncancer effects, the acceptable level is one for the HI (EPA, 1989). The COPC-specific hazard quotients (HQs) are then evaluated by target organ and target organ HI values greater than one for a receptor considering all exposure pathways is the trigger for remediation (EPA, 2018b). COPCs are not considered significant contributors to the hazard if their individual HQ is less than 0.1 (EPA, 2018b).

Lead is not included in this evaluation as it does not have established toxicity values since there has been no consensus in identifying a safe level of exposure to its concentrations (EPA, 2021). Instead, lead is typically assessed using EPA blood-lead models, which is further discussed in Section 3.5.

3.2.1 Industrial Worker Exposure Scenario

3.2.1.1 Surface Soil (0-2 ft)

For a worker's exposure to analytes in surface soil, the cumulative cancer risks range from 6E-06 in FU-3 to 4E-05 in FU-4; these values are within the acceptable risk range of 1E-06 to 1E-04 and do not exceed the remediation trigger of 1E-04.

For noncancer endpoints, the HI values do not exceed the threshold of 1 in all FUs.

3.2.1.2 Soil (0-10 ft)

For a worker's exposure to analytes in soil, the cumulative cancer risks range from 5E-06 in FU-3 to 5E-05 in FU-1; these values are within the target risk range and do not exceed the remediation trigger of 1E-04. In FU-2, no COPCs were identified in the subsurface soils and this medium was not evaluated in the risk and hazard calculations.

For noncancer endpoints, the HI values in FU-1, FU-3, FU-5 and FU-6 do not exceed 1. The HI in FU-4 is 2; the primary COPC in FU-4 is TCDD TEQ with a HQ of 1. The remaining COPCs have HQ values less than 0.1.

3.2.1.3 Summary

Based on review of the cancer risks and non-cancer hazards, additional surface soil sampling is recommended for FU-4. The primary COPC in FU-4 is TCDD TEQ.

No additional sampling is recommended for the other FUs based on review of the cancer risks and hazards for the industrial exposure scenario.

3.2.2 Residential Exposure Scenario

The former administrative and housing areas in the eastern portion of FU-6 has been designated as UU/UE. In the 2000 MI RI, soil samples collected from the housing area in the UU/UE area were excluded from the risk assessment because the locations were excavated during a removal action.

The EPCs from the 2000 MI RI, which were the lower of the 95% UCL on the arithmetic mean and the maximum detected concentration derived from samples collected in the western portion of FU-6, were applied to evaluate a resident's exposure to analytes in surface soil; the western area of FU-6 was used for equipment storage and maintenance. The cumulative cancer risk in FU-6 for a residential exposure is 1E-04 and the noncancer HI is 1, which are within the acceptable range.

3.2.2.1 Summary

No additional sampling is recommended for the UU/UE area of FU-6 based on review of the cancer risks and hazards for the residential scenario.

3.3 Arsenic Concentrations

Soil samples collected from all FUs were analyzed for arsenic in the 2000 MI RI. The sample locations are shown on Figure 13. The sample location symbols on the figure are color-coded by concentration in the surface soil sample. Sample results are summarized for surface soil, subsurface soil and deep soil on Table 10. The summary table also includes a comparison of the analytical results to the EPA RSLs (TR of 1E-06 and THQ of 0.1 for screening; EPA, 2021) to evaluate potential human health exposure to arsenic in soil.

The complete analytical results for arsenic in soil samples are presented by depth range for each FU in tables in Appendix H. Figures showing analytical results for arsenic in all depth ranges for each FU are provided in Appendix I. The sample location symbols on the figures are color-coded by concentration; the sample number, depth and concentration are listed. The figures also show the area designated UU/UE in FU-6 and the excavation limits for the removal actions discussed in Section 2.2. Appendix H, Table H-17 provides a list of samples that have been excavated since the 2000 MI RI; these samples are not included in the review. The tables and figures were prepared from the DDMT analytical database.

Elevated arsenic concentrations are widespread. The 2000 MI RI does not identify storage or use of arsenic by DDMT and states arsenic concentrations are likely associated with historic use as a pesticide for cotton farming on the site. In surface soil, arsenic concentrations in 335 (94%) of 357 samples are greater than the current Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1 for screening). In subsurface soil, arsenic concentrations in 244 (99%) of 246 samples are greater than the Industrial RSL. In deep soil , arsenic concentrations in 53 (84%) of 63 samples are greater than the Industrial RSL. The maximum concentrations decrease with depth: 66.3 mg/kg in surface soil, 34.2 mg/kg in subsurface soil, and 18.8 mg/kg in deep soil.

The soil data were compared to the background levels for arsenic presented in the 2000 MI RI, Tables 3-10 (subsurface soil) and 3-11 (surface soil). The background levels for arsenic are based on twice the mean detected value in the background data set (CH2M HILL, 1998).

- Surface soil sample concentrations exceed the background level of 16.5 mg/kg in 110 (31%) of the samples. The MI-wide mean of the detected surface soil samples of 14.1 mg/kg is less than the background level.

- Subsurface and deep soil sample concentrations exceed the background level of 17 mg/kg in 71 (29%) of subsurface samples and one (3%) of deep soil samples. The MI-wide mean of the detected subsurface and deep soil samples of 11.6 mg/kg is less than the background level.

Although no removal actions were performed for arsenic contamination, some sample locations were excavated during the removal actions discussed in Section 2.2. The *Post Removal Report, Contaminated Soil Removal, Family Housing Area* (OHM Remediation Services, 1999) states that soil was excavated up to 1 ft in the Family Housing Area of the UU/UE area in FU-6 for the purpose of removing dieldrin contamination and the excavation was backfilled with clean soil. The limits of the excavation are outlined on Figure 12. Residual soil samples collected during the removal actions showed that contamination was below detection and/or target concentrations in the area.

To further evaluate arsenic analytical data in this SAP, cancer risks and noncancer hazards were calculated for arsenic soil concentrations using the 2000 MI RI analytical data and the Housing Area post-removal action analytical results. EPCs for the surface soil were calculated using EPA ProUCL software (EPA, 2016) over the MI and in each FU. The EPCs were the lower of the 95 UCL on the arithmetic mean and maximum detected concentration. The EPCs were used with the May 2021 cancer and noncancer EPA RSLs (target cancer risk of 1E-06 and THQ of 1; EPA, 2021) to calculate risks and hazards. The ProUCL output is provided in Appendix H and the results are presented on Table 11.

- For the industrial exposure scenario, the EPCs were compared to the cancer and noncancer Industrial RSLs (3 and 480 mg/kg, respectively) to calculate cancer risks and noncancer hazards. The range of cancer risks is 4E-06 in FU-3 to 9E-06 in FU-1, which is within the acceptable risk range of 1E-06 to 1E-04. The hazards are well below the acceptable limit of 1. Therefore, no soil sampling for arsenic is proposed based on these results.
- For the residential exposure scenario in the UU/UE area of FU-6, only one sample was collected in surface soil from the administrative area; SS1A at a depth of 0-1 ft has a concentration of 16.1 mg/kg. There is uncertainty in using one data point to calculate risks and hazards with the current cancer and noncancer Residential RSLs (0.68 and 35 mg/kg, respectively) and this sample was collected outside of the Family Housing Area. The arsenic confirmation data at 1 ft from the removal action that occurred in the Family Housing Area in FU-6 was used to calculate an EPC of 14.13 mg/kg, which is less than the background concentration. Comparison of the EPC to the RSLs resulted in a cancer risk of 2E-05 that is within the acceptable risk range of 1E-06 to 1E-04 and a hazard of 0.4 that is less than the acceptable limit of 1.

3.3.1 Summary

No additional sampling for arsenic is recommended based on review of the cancer risks and hazards for the industrial and residential exposure scenarios.

3.4 Chromium Concentrations

Soil samples collected from all FUs were analyzed for total chromium in the 2000 MI RI. The sample locations are shown on Figure 14. The sample location symbols on the figure are color-coded by concentration in the surface soil sample. Sample results are summarized for surface soil, subsurface soil and deep soil on Table 12. The summary table also includes a comparison of the analytical results to the EPA RSLs (TR of 1E-06 and THQ of 0.1 for screening; EPA, 2021) to evaluate potential human health exposure to total chromium in soil.

The complete analytical results for chromium in soil samples are presented by depth range for each FU on tables in Appendix J. Figures showing analytical results for chromium in all depth ranges for each FU are provided in Appendix K. The sample location symbols on the figures are color-coded by concentration; the sample number, depth and concentration are listed. The figures also show the area designated UU/UE in FU-6 and the excavation limits for the removal actions discussed in Section 2.2. Appendix J, Table J-17 provides a list of samples that have been excavated since the 2000 MI RI; these samples are not included in the review. The tables and figures were prepared from the DDMT analytical database.

Total chromium was detected in all 673 samples with a maximum concentration of 2,230 mg/kg, which is well below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium. However, 610 (99%) samples have total chromium concentrations greater than the Industrial Soil RSL of 6.3 mg/kg for hexavalent chromium. The analytical results vary by depth and no increasing or decreasing concentration pattern is noted.

The analytical results were compared to the background levels for total chromium presented in the 2000 MI RI, Tables 3-10 (subsurface soil) and 3-11 (surface soil). The background levels for chromium are based on twice the mean detected value in the background data set (CH2M HILL, 1998).

- Surface soil sample concentrations exceed the background level of 24.8 mg/kg in 120 (30%) of the samples. The MI-wide mean of the detected surface soil samples of 33.6 mg/kg exceeds the background level.
- Subsurface and deep soil sample concentrations exceed the background level of 26.4 mg/kg in 80 (33%) of subsurface samples and 41 (65%) of deep soil samples. The MI-wide mean of the detected subsurface and deep soil samples of 23.8 mg/kg is less than the background level.

In 1998, four samples were collected and speciated for trivalent and hexavalent chromium in FU-3. The analytical results on Table 13 and Appendix K, Figure K-7 show that trivalent chromium is the dominant form. Hexavalent chromium was detected in one sample at 0.12 mg/kg; the detection limits for the other samples was 0.11 or 0.12 mg/kg. There were two removal actions for metals, including chromium, performed in FU-3 (Jacobs Federal Programs, 2002) and FU-4 (Jacobs-Sverdrup, 2000).

3.4.1 Summary

Soil sampling with chromium speciation is proposed outside the bounds of excavation for the removal actions in FU-3 and FU-4 to identify the dominant form of chromium present. Past sampling indicated that trivalent chromium is the dominant form. The species of chromium at the MI may have changed over time due to environmental conditions. The purpose of the sampling is not to delineate concentrations, but to collect samples for speciation in order to confirm that trivalent chromium remains the dominant form of chromium at the site. The sample locations were selected based on past sample results to obtain speciation results for a range of total chromium concentrations. Additional information on the planned sampling, analysis and evaluation is provided in Section 5.

3.5 Lead Concentrations

Soil samples collected from all FUs were analyzed for lead in the 2000 MI RI. The sample locations are shown on Figure 15. The sample location symbols on the figure are color-coded by concentration in the surface soil sample. Sample results are summarized for surface soil, subsurface soil and deep soil on Table 14. The summary table also includes a comparison of the analytical results to the EPA RSLs (TR of 1E-06 and THQ of 0.1 for screening; EPA, 2021) to evaluate potential human health exposure to lead in soil.

The complete analytical results for lead in soil samples are presented by depth range for each FU on tables in Appendix L. Figures showing analytical results for lead in all depth ranges for each FU are provided in Appendix M. The sample location symbols on the figures are color-coded by concentration; the sample number, depth and concentration are listed. The figures also show the area designated UU/UE in FU-6 and the excavation limits for the removal actions discussed in Section 2.2. Appendix L, Table L-17 provides a list of samples that have been excavated since the 2000 MI RI; these samples are not included in the review. The tables and figures were prepared from the DDMT analytical database.

Lead was detected in all but one of the 673 soil samples; the exception was a deep soil sample in the boring for MW-55 in FU-4. Eight samples have lead concentrations greater than the Industrial RSL of 800 mg/kg (Table 15). The samples were collected from surface soil in FU-1, FU-3 and FU-4 and the concentrations range from 878 to 10,300 mg/kg. The lateral extent of lead concentrations greater than the RSL is limited based on adjacent samples with lead concentrations less than the RSL as shown on the figures in Appendix M.

The soil data were compared to the background levels for lead presented in the 2000 MI RI, Tables 3-10 (subsurface soil) and 3-11 (surface soil). The background levels for lead are based on twice the mean detected value in the background data set (CH2M HILL, 1998).

- Surface soil sample concentrations exceed the background level of 30 mg/kg in 172 (47%) of the samples. The MI-wide mean of the detected surface soil samples of 111.3 mg/kg exceeds the background level.
- Subsurface and deep soil sample concentrations exceed the background level of 23.9 mg/kg in 53 (22%) of subsurface samples and two (3%) of deep soil samples. The MI-

wide mean of the detected subsurface and deep soil samples of 16.7 mg/kg is less than the background level.

The HHERA (HDR, 2018b) concluded that because of the eight samples that have lead concentrations greater than the Industrial Soil RSL (800 mg/kg), additional sampling and analysis for lead would better characterize concentrations in soil and identify areas requiring further remedial action to assure protectiveness in those FUs where lead has been detected above the RSL, i.e., FU 1, 3 & 4.

This SAP further evaluated the above exceedances, by FU, using the EPA Adult Lead Model (ALM) (EPA, 2017a, 2017b). The ALM is a tool used to determine if there is a potential concern for a developing fetus in a pregnant female worker who may be exposed to lead in surface soil at the MI. The mean lead concentration for each FU, derived using the 2000 MI RI analytical data shown in Appendix L, was input into the ALM along with default parameters. The ALM output for each FU is provided in Appendix L. The results (Table 16) show that the probability of a fetus having blood lead levels of 5 µg/deciliter or more through the mother's exposure is well below the EPA threshold of five percent in all FUs.

While the ALM output shows a low (acceptable) health risk based on an exposure point concentration for soil lead of 186 mg/kg in FU-3, there was a high soil lead concentration of 10,300 mg/kg in a surface sample collected at location SS19. The excavation areas shown on the figures in Appendix M were approximated based on historical reports (Jacobs-Sverdrup, 2000) and this location may have been excavated as part of the removal action. FU-3 is of a reasonable size (approximately 92 acres) that random movement by an on-site worker can be assumed across the FU. If the on-site worker were to have a smaller exposure area (e.g., the soil lead levels in closer proximity to buildings 1086, 1087, 1088, 1089 in FU-3), the EPC would still not pose an unacceptable risk.

The former administrative and housing areas are designated UU/UE. The 2000 MI RI included one surface soil sample location within the administrative area. The sample, SS1A, has a lead concentration of 14.5 mg/kg, which is less than the Residential Soil RSL of 400 mg/kg. (Appendix L). There is uncertainty in using one data point to make remedial decisions. Instead, review of the analytical data from the soil confirmation samples collected from the excavation in the Housing Area (OHM Remediation Services, 1999) was evaluated. The range of lead concentrations in the confirmation samples were 8.42 mg/kg to 54.3 mg/kg (15 samples) and the range in backfill samples was 5.99 mg/kg to 17.9 mg/kg (5 samples); these lead soil concentrations are well below the Residential Soil RSL (400 mg/kg).

3.5.1 Summary

No additional sampling for lead in soil for industrial and residential exposures is proposed based on review of the analytical results for lead in soil and the ALM evaluation.

3.6 Ecological Review

The 2001 ROD Sections 2.5.3 and 2.7.2 (CH2M HILL, 2001) stated that the natural habitat in the MI area was limited to non-existent. The 2001 ROD further stated that the FU-2 golf course

and the extensive industrialized areas did not provide natural habitat for terrestrial and aquatic wildlife. Ecological receptors, such as terrestrial or aquatic animals and plants in the ponds and streams, were not being exposed to the site groundwater (source of contamination) and were not likely to be exposed in the future. An evaluation was performed in Lake Danielson and Golf Pond in FU-2, which included a sufficient density of surface water and sediment samples and a fish tissue evaluation, and the study concluded that the ecological hazard at FU-2 was negligible. The land uses on the MI were expected to remain unchanged in the future; therefore, the potential for wildlife exposure was low. Therefore, the ROD stated that there were no unacceptable hazards posed to ecological receptors at the MI (CH2M HILL, 2001).

These exposure conditions have not changed at the MI and there are no apparent complete ecological pathways of exposure on-site. Therefore, the HHERA (HDR, 2018b) stated that an updated review of soil data to ecological criteria was not warranted and no additional sampling of soil was proposed based on ecological exposure to soil constituents. However, the HHERA (HDR, 2018b) stated that sediment and surface water data in on-site stormwater drainage features should be reviewed for potential off-site ecological exposure to downstream receiving waterbodies.

The surface cover on the MI is shown on Figure 5 and the drainage pathways are shown on Figure 7. Stormwater is collected in surface drains across the MI, captured in detention basins and discharged to concrete-lined or unlined drainage features near the site boundary. The MI was previously divided into several small drainage basins, as described in the 2000 MI RI (CH2M Hill, 2000). The primary drainage directions and outfall locations are to the west (Tarent Branch), to the east (unnamed ephemeral stream toward Frisco Branch), and to the south (unnamed ephemeral stream) (CH2M Hill, 2000). Surface drainage is directed via these features to Nonconnah Creek, approximately 0.75 miles south of the MI (CH2M Hill, 2000).

Sediment and surface water samples collected from 1989 to 1998 from the on-site water bodies and drainage features within FU-2 and FU-4 were analyzed for VOCs, total petroleum hydrocarbons, SVOCs, pesticides, PCBs, and metals in the 2000 MI RI. The sample locations from the areas listed below are shown on Figure 16:

- FU-2 – Lake Danielson and Golf Pond, which drain south into unnamed tributaries leading to the Nonconnah Creek.
- FU-4 – Detention basin in the northeast that allow drainage to Frisco Branch and drainage areas in the southwest that allow drainage to Tarent Branch.

The sediment and surface water samples are listed on Tables 17 and 18, respectively, with the analytical methods for each sample identified. In FU-2, 22 sediment samples and 64 surface water samples were collected. In FU-4, nine sediment samples and 18 surface water samples were collected. The complete analytical results for all sediment and surface water samples are presented in tables in Appendix N. Not all constituents were analyzed in each sample. The tables and figures were prepared from the DDMT analytical database.

The sediment and surface water analytical results were compared to the EPA Region 4 Freshwater ESVs (EPA, 2018a) on the tables in Appendix N. Exceedance counts are

summarized for sediment and surface water in Table N-1. Tables N-2 and N-3 provides a list of the constituents in sediment and surface water whose analytical results exceeds the ESVs in FU-2 and FU-4, respectively. Tables N-4 and N-5 present the complete analytical results for sediment and surface water samples in FU-2 and Tables N-6 and N-7 present the results for FU-4.

- In FU-2 sediment samples, 21 of 22 samples (20 field and two duplicates) showed ESV exceedances (Table N-4). The sediment exceedances are identified for two VOCs (three of 20 samples where they were analyzed), 38 SVOCs (14 of 22 samples), 17 pesticides (20 of 22 samples), one PCB (one of 17 samples), TCDD TEQ (six of six samples), and 13 metals (19 of 22 samples) (Table N-2). The three VOC exceedances for carbon disulfide and carbon tetrachloride and one PCB exceedance for Aroclor-1260 are only slightly above the ESVs. Overall, 306 of 3,226 analytical results are greater than their respective ESVs (Table N-1). TCDD TEQ concentrations exceed the ESV of 2.5 pg/g with a range of 10.45 to 147.2 pg/g (Table N-2).
- In FU-2 surface water samples, 27 of 64 samples (59 field and 5 duplicates) showed ESV exceedances (Table N-5). The exceedances are identified for two SVOCs (two of 30 samples), three pesticides (14 of 36 samples), and four metals (14 of 64 samples) (Table N-3). Overall, there are fewer exceedances in surface water with 34 of 3,678 analytical results greater than their respective ESVs (Table N-1). Dioxins and furans were not analyzed in FU-2 surface water; the major sources of contamination in FU-2 were not associated with dioxins and furans.
- In FU-4 sediment samples, all nine (eight field and one duplicate) showed ESV exceedances (Table N-6). The exceedances are identified for one VOC (one of nine samples), 19 SVOCs (eight of nine samples), five pesticides (eight of nine samples), TCDD TEQ (eight of nine samples), and five metals (six of nine samples); there is only one VOC exceedance for carbon tetrachloride whose concentration is slightly above the ESV (Table N-4). Overall, 115 of 1,435 analytical results are greater than their respective ESVs (Table N-1). TCDD TEQ concentrations exceed the ESV of 2.5 pg/g with a range of 4.696 to 494.4 pg/g (Table N-3).
- In FU-4 surface water samples, 10 of 18 samples (16 field and two duplicates) showed ESV exceedances (Table N-7). The exceedances are identified for one SVOC (one of nine samples), three pesticides (six of nine samples), TCDD TEQ (eight of eight samples), and five metals (eight of 18 samples) (Table N-5). Overall, there are fewer exceedances in surface water with 19 of 1,426 analytical results greater than their respective ESVs (Table N-1). TCDD TEQ concentrations exceed the ESV of 0.0000031 ng/L with a range of 0.000163 to 0.536 ng/L (Table N-3).

Based on review of the surface topography on Figure 7, surface drainage pathways are present in FU-2 and FU-4, and a stormwater basin in FU-3 provides storage for the stormwater drain lines.

3.6.1 Summary

Based on the exceedances of the ESVs and limited surface drainage areas on-site, the collection of sediment and surface water samples in FU-2, FU-3 and FU-4 in on-site drainage features is recommended for dioxins and furans to further evaluate potential off-site migration as dioxins and furans are associated with a former on-site source in FU-4 (i.e., PCP dip vat) and they had elevated detection limits in the historical data from the 2000 MI RI. The proposed samples will be analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans and evaluated based on TCDD TEQ values, which is consistent with current World Health Organization guidance (Van den Berg et al., 2006).

The proposed sampling will be conducted in concrete-lined or unlined drainage features of an ephemeral nature that are unlikely to support permanent benthic/aquatic communities. The purpose of the sampling is to understand potential mobility of site-related COPCs to downstream off-site ecological receptors (i.e., Nonconnah Creek [>0.5 miles south], Frisco tributary branch to the northeast, and Tarent tributary branch to the west) via stormwater discharge.

No analysis of other constituents will be performed. Area surrounding DDMT is heavily industrialized and urbanized with likely contributions to elevated concentrations of metals, SVOCs, and pesticides from industrial and urban non-point sources.

Additional information on the planned sampling, analysis and evaluation is provided in Section 5.

3.7 Uncertainty Analysis

It is important to note there are uncertainties within the 2000 MI RI data set and standard risk assessment methodology, as described in the 2000 MI RI Section 7.7, and these could have impacted the reviews performed in the HHERA (HDR, 2018b and 2020a) and this SAP. A few of these uncertainties are summarized here:

- Analytical data were compiled to characterize the nature and extent of contamination to ensure that locations where the highest chemical concentrations would be expected were sampled. Therefore, the data set may be biased toward locations with the highest concentrations.
- EPCs were estimated using one-half the detection limit value for all values that were not detected, including those samples with elevated reporting limits because of matrix interference. In comparison, current approaches utilize statistical methods, such as Kaplan Meier, to incorporate the detection limits in the EPC calculations; ProUCL software is an example of a standardized EPC calculation approach that was developed and accepted by EPA (EPA, 2016). The 2000 MI RI EPCs were used in the evaluation of RSL exceedances in Section 3.2 and the EPCs may be biased either low or high in the analytical data set by COPC.

- The samples collected and analyzed for surface water were unfiltered samples, which could have included constituent mass adsorbed to suspended sediments and the data set may be biased toward higher concentrations, particularly for dioxins and furans.

As stated in Section 3 above, for the purposes of this review, use of the analytical results from the 2000 MI RI is appropriate and applicable as the results remain representative of conditions at the time Army activities ceased.

4 Project and Data Quality Objectives

The DQOs were established in accordance with *Guidance on Systematic Planning Using the Data Quality Objectives Process* (EPA, 2006).

4.1 Problem Statement

Analytical data from the MI RI (CH2M HILL, 2000) was reviewed and evaluated using current criteria in the HHERA (HDR, 2020a). Recommendations in the report and EPA comments on the report required additional review as presented in Section 3. The review identified the following data gaps.

- Individual dioxins-furans (suite of seven dioxins and 10 furans) were reported in 78 of 81 soil samples due to detections from more highly chlorinated isomers (hexa-, hepta-, and octa-) in FU-4 near the Former PCP Dip Vat Removal Area and near drainage features along the FU-4 border. The detection limits (e.g., 1,000 pg/g for 2,3,7,8-TCDD) of non-detects in previous sample analyses exceeded the Industrial Soil RSL. It is unknown whether there remains soil concentrations of dioxins and furans that exceed the Industrial Soil RSLs with potential exposure to human receptors within FU-4 and MI-wide drainage features.
- Total chromium concentrations were well below the Industrial Soil RSL for trivalent chromium but well above the Industrial Soil RSL for hexavalent chromium. The identification of trivalent chromium as the dominant form at the MI was limited to only a few soil samples collected in FU-3 that were analyzed for chromium speciation. The species of chromium at the MI may have changed over time due to environmental conditions. It is unknown whether trivalent chromium remains the dominant form of chromium in FU-3 and FU-4 (location of metal-focused removal actions) and whether current concentrations of trivalent and hexavalent chromium are below the Industrial Soil RSLs.
- Dioxins and furans were detected above human health criteria and ESVs in sediment and surface water samples in FU-2 and FU-4 and may be present in on-site drainage features. The detection limits of non-detects in previous sample analyses exceeded applicable screening criteria. It is unknown whether there remains sediment and surface water concentrations of dioxins and furans that exceed current applicable criteria with potential exposure to on-site and off-site human receptors within FU-2, FU-3, and FU-4. In addition, while there is minimal to no suitable ecological habitat on the MI, it is unknown what the potential influence of stormwater discharge from the on-site drainage features has on exposure conditions in off-site receiving waterbodies with ecological receptors.

4.2 Goals of the Study

Additional investigation is planned to address the following data gaps:

- Are the TCDD TEQ concentrations in soil below the Industrial Soil RSL in the Former PCP Dip Vat Area and surface drainage pathways?
- Is trivalent chromium the dominant form of chromium at the MI? Are trivalent and hexavalent chromium concentrations below the Industrial Soil RSLs?
- Are the TCDD TEQ concentrations in sediment and surface water within the on-site drainage features below the human health criteria and ESVs?

4.3 Information Inputs

A total of 81 field samples is proposed to be collected to address the above data gaps. Sample details are shown on Table 22, including media, analytical method, the number of field and quality control (QC) samples, preservative, holding time, container, analytical turnaround time and laboratory. In addition, a sample summary by FU is provided on Table 23.

4.3.1 Dioxins-Furans in Soil

Twelve shallow soil borings will be advanced to depths of 6 ft: 10 borings in the Former PCP Dip Vat Area near Building 737 in FU-4, 1 boring in the detention basin in FU-4, and 1 boring in the detention basin of FU-3. Samples will be collected from 0 to 6 inches, 12 to 18 inches, and 60 to 66 inches. Surface soil samples from 0 to 1 ft will also be collected at four locations adjacent to planned sediment and surface water samples in the outfalls in FU-2 (2 samples) and FU-4 (2 samples). Samples will be analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans.

4.3.2 Chromium Speciation in Soil

Twenty soil samples will be collected in areas of former removal actions: 10 samples in FU-3 near Buildings 1086, 1087, 1088, and 1089 and 10 samples in FU-4 near Building 949. The surface soil samples will be collected from 0 to 1 ft and analyzed for total, trivalent and hexavalent chromium. Based on past sample results, surface soil samples collected from 0 to 1 ft will provide a wide range of total chromium concentrations sufficient to evaluate speciation between trivalent and hexavalent chromium on the MI.

4.3.3 Dioxins-Furans in Sediment and Surface Water

Twelve sediment and nine surface water samples will be collected at outfalls from Lake Danielson and the Golf Course Pond in FU-2, from detention basins in FU-3 and FU-4, from unlined surface drainage features in FU-4 and from outfalls of concrete-lined drainage features at the property boundary in FU-2 and FU-4. Samples will be analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans.

4.3.4 Sample Locations

Sample location coordinates will be determined with a Trimble GeoXT, or equivalent GPS capable of submeter accuracy, and documented by photographs.

4.4 Study Boundaries

The physical study area is the area within the MI property boundary.

The temporal boundaries are the initial sample dates for the site-wide RI (Law Environmental, 1990) in the DDMT database through collection of samples identified in this SAP. The schedule for the investigation is presented on Table 3.

4.5 Analytical Approach

Soil, sediment, and surface water samples will be analyzed at Department of Defense (DoD) Environmental laboratory accreditation program (ELAP) laboratories.

Soil lithology will be described using the Unified Soil Classification System (American Society for Testing and Materials [ASTM] D2487-83). Field observations (e.g., odor and staining) will be noted in the field log.

The laboratory reporting detection limits and method detection limits were compared to the human health and ecological criteria (project action levels) in Table 19 for soil, Table 20 for sediment, and Table 21 for surface water to ensure the laboratory can analyze the concentrations below the criteria. The detection limits are below the criteria in soil, sediment, and surface water.

4.6 Performance or Acceptance Criteria

Soil, sediment, and surface water analytical results must meet EPA method-specified laboratory QC criteria and be shown to be useful for the intended purpose through data verification and validation, consistent with the *DDMT Uniform Federal Policy (UFP) Quality Assurance Project Plan* (QAPP) (HDR, 2018a).

A Trimble GeoXT, or equivalent sub-meter GPS receiver, will be used to collect the locations for all field samples. Field sample locations will be exported into the Tennessee State Plane Coordinate System.

Field activities, laboratory analysis, and data validation will be conducted in accordance with:

- this SAP;
- DDMT UFP QAPP (HDR, 2018a);
- DoD General Data Validation Guidelines (DOD, 2018); and
- Environmental Quality Guidance for Evaluating Performance-Based Chemical Data, EM 200-1-10 (USACE, 2005).

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5 Sampling Design and Rationale

The sampling and analysis will be conducted in accordance with the Statement of Work (USACE, 2019) and this SAP. Sampling and laboratory analysis will be performed in accordance with the DDMT UFP QAPP (HDR, 2018a). Field activities will be conducted in accordance with Standard Operating Procedures (SOPs) in Appendix O and the Site Safety and Health Plan (SSHP) (HDR, 2019) prepared for this task order. Sample details are shown on Table 22, including media, analytical method, the number of field and QC samples, preservative, holding time, container, analytical turnaround time and laboratory. Also, a sample summary by FU is provided on Table 23. The investigation activities are summarized below.

5.1 Dioxins-Furans in Soil

Soil samples will be collected from 10 borings in the FU-4 PCP Dip Vat Area and one boring in each storm water detention basin in FU-3 and FU-4 (12 borings). Surface soil samples will be collected at four locations adjacent to sediment samples located in concrete-lined or unlined drainage features at the four outfalls along the property boundary in FU-2 and FU-4. The sample locations are shown on Figure 17. Samples will be analyzed for the suite of seven dioxins (including 2,3,7,8-TCDD) and 10 furans; sample details are provided on Table 22.

The sample locations in the PCP Dip Vat Area are located near previous samples with elevated TCDD TEQ concentrations near the excavations and in the surrounding area. The samples in the central section of the detention basins were selected to evaluate concentrations in the surface and subsurface soils and the potential impact if dioxins and furans were present in stormwater. The surface soil samples near sediment samples will be used for comparison of analytical results.

Soil sampling will be performed in accordance with SOP-11. Samples will be collected at 0 to 6 inches, 12 to 18 inches and 60 to 66 inches. The two shallow samples will allow comparison of concentrations with depth in the surface soil (0 to 2 ft), and the deeper sample will allow comparison of concentrations in surface and subsurface soil. The boring locations will be determined using the Trimble GeoXT at the coordinates derived from the locations on Figure 17.

Boring locations will be cleared for utilities prior to the field event. Sampling equipment will be decontaminated before each boring and each sample. The samples will be collected in brass or stainless-steel tubes using a slide-hammer. If surface gravel prevents use of the tubes, samples will be collected from the hand auger. The initial sample may be shifted deeper depending on the amount of gravel near the surface but will not be collected below 1 ft; the second sample will be shifted the same distance. If the boring cannot be advanced to the next sample depth with the hand auger, a power auger will be used.

The surface soil samples from 0 to 1 ft at four locations located adjacent to sediment samples will be collected in the same manner described above as the 0 to 6-inch soil boring samples.

As each sample is collected, the contents of the tube or the hand auger cuttings will be placed in a clean stainless-steel bowl and thoroughly. The homogenized soil will be placed in the laboratory-supplied container and placed in an ice chest.

Upon completion a photograph of the final boring location will be taken and the boring will be filled with the excavated soil.

5.2 Chromium Speciation in Soil

Surface soil samples will be collected at 10 locations in FU-3 and in FU-4. Total chromium concentrations were generally below 50 mg/kg on the MI except in FU-3 and FU-4 (Figure 14), where removal actions were performed for chromium and other metals. Samples collected in this area allow evaluation of chromium speciation between trivalent and hexavalent chromium over a greater range of concentrations. The sample locations, shown on Figures 18 and 19, are adjacent to previous samples collected from 0 to 1 ft with total chromium of 32.2 to 8,680 mg/kg in FU-3 and 27.3 to 16,200 mg/kg in FU-4.

The samples will be collected in the same manner as the 0 to 6-inch soil sample in Section 5.1. The samples will be collected approximately 5 ft outside the removal action excavation limits to avoid sampling clean backfill. Samples will be analyzed for total chromium and speciated for trivalent and hexavalent chromium; sample details are provided on Table 22.

5.3 Dioxins-Furans in Sediment and Surface Water

Sediment and surface water samples will be collected within the surface drainage features and outfalls on the MI boundary in FU-2 and FU-4 and in detention basins in FU-3 and FU-4 (Figure 20).

The proposed sample locations include all areas of surface drainage on the MI, which represent areas with the potential for site-related dioxins and furans to migrate off-site. The interior locations (at outfalls from Lake Danielson and the Golf Course Pond in FU-2 and within the detention basins in FU-3 and FU-4) will allow evaluation of potential source areas. The outfall locations on the MI boundary (unlined surface drainage features in FU-4 and outfalls of concrete-lined drainage features at the property boundary in FU-2 and FU-4) will allow evaluation of potential for off-site impacts.

It is important to note that the major source of the dioxins and furans at the MI was from the PCP Dip Vat Area in FU-4. Potential migration of these COPCs would have likely drained to the outfall locations in FU-4 (to the west towards Tarent Branch and to the east toward the Frisco Branch) because of the design of the MI drainage basins. However, surface water and sediment samples are proposed within drainage features in FU-2 and FU-3 to be conservative as these areas were not previously sampled for dioxins and furans in surface water and sediment during the 2000 MI RI (the major sources of contamination in these FUs were not associated with dioxins and furans), except in the FU-2 sediments of Lake Danielson and the Golf Course Pond that showed detections of dioxins (CH2M HILL, 2000).

Sediment and surface water sampling will be performed in accordance with SOP-12. Samples will be analyzed for the suite of seven dioxins and 10 furans (including 2,3,7,8-TCDD) to evaluate on-site and off-site human health exposure and to understand the potential influence of stormwater discharge on exposure conditions in off-site receiving waterbodies with ecological receptors. Sample details are provided on Table 22.

Sediment grab samples will be collected during the initial field event for soil sampling. Sediment samples in the unlined drainage features (FU-4) will be collected in depositional areas with a clean stainless-steel scoop from the upper 2 inches of sediment; samples in the concrete-lined drainage features (FU-2, FU-3, and FU-4) will be collected, if sediment deposition has occurred.

Surface water grab samples will be collected with a scoop or peristaltic pump. Surface water at the drainage points is only present during or after rainfall; a separate sample event may be required.

Visual observation of potential ephemeral or permanent ecological habitat on-site in the drainage features will be performed during the sampling event. If accessible and safe, visual observation of ecological habitat and receptors in off-site receiving waterbodies will also be performed.

5.4 Access, Equipment Decontamination and Management of Investigation Derived Waste

Access issues are not expected as all sample locations are located on the MI and access for sampling is required by the property transfer deeds. The property manager and individual property owners will be notified prior to sampling to limit disruptions to site activities.

Reusable sampling equipment will be cleaned to prevent foreign contamination of the samples and cross-contamination between sampling sites. Before use and between samples, field equipment will be decontaminated by washing with a non-phosphate detergent such as Liquinox or equivalent followed by a potable water rinse will follow the detergent washing. Specific decontamination procedures are described in Appendix O, SOP 9.

Investigation derived waste (IDW) is expected to be limited to wastewater from equipment decontamination. The wastewater will be contained and transferred to the storage tank on Dunn Field. As the tank nears capacity, water samples will be collected for analysis in accordance with guidance from TDEC. The water will be discharged to the storm sewer on Dunn Field, if analytical results meet TDEC criteria. If criteria are not met, the water will be disposed at a CERCLA-approved facility. Documentation of sample analyses and discharge will be provided to Army, EPA, and TDEC.

5.5 Quality Control

5.5.1 Sample Identification

Individual samples will be identified by a unique alphanumeric code (sample ID) which will be written on the sample label and recorded on the chain-of-custody form. The sample ID will include the media [soil (SO) sediment (SE) or surface water (SW)], location (xxx) and sampling event; the event designation will be RSK. Soil sample IDs will include the depth at the top of the sample interval.

- Soil Samples: SO-01-1-RSK for sample collected from SO-01 at 1 ft bgs.
- Sediment Samples: SE-03-RSK for sample collected at location 03.
- Surface Water Samples: SW-03-RSK sample collected at location 03.

IDW samples will include the medium (S for soil and W for water), the sample sequence and sample event (e.g., IDW-Sxx-RSK).

Prefixes will replace the location for trip blanks (TB-xx-RSK) and rinse blanks (RB-xx-RSK) and suffixes will identify the locations of matrix spikes or matrix spike duplicates (SW-xxx-RSK-MS/MSD). Additional information is provided in Appendix O, SOP 7, *Sample Control and Documentation*.

5.5.2 Quality Control Samples

Field duplicate samples will be collected and equipment rinse blanks will be prepared in accordance with Table 22 for submittal. The quality control samples will be analyzed at the frequencies shown below:

- Field duplicate: one for every 10 field samples.
- Matrix spike/matrix spike duplicate: one for every 20 soil samples.
- Trip blank: one for each shipping cooler containing samples for VOC analysis.
- Equipment/rinse bank: one per day for reusable sampling equipment.

6 Risk Assessment Screening

A full risk assessment will not be performed as many of the steps have already been completed in the 2000 MI RI and 2018 HHERA (HDR, 2018b), such as identifying the potential chemicals of concerns and exposure pathways at the MI. In addition, as stated in Section 4.2, the purpose of this investigation is to address the data gaps associated with site-related COPCs (i.e., dioxins, furans, and chromium) that were identified during the HHERA (HDR, 2018b and 2020a) and the additional review within this HHERA Review SAP. The soil, sediment, and surface water analytical data will be evaluated separately from the historical analytical data in the 2000 MI RI, as incorporating the historical data sets in re-calculated EPCs may obscure the new analytical data obtained by the proposed sampling. However, the new analytical data will be compared to the range of concentrations from the historical analytical data in the 2000 MI RI to see if there are differences in the concentrations.

Risk screening will be performed that includes evaluations of the analytical results from the soil, sediment, and surface water samples that will be collected for this focused investigation. The evaluations will include:

- Human Health, Soil, Dioxins-Furans – Comparison of the soil TCDD TEQs in FU-2 and FU-4 to the 2,3,7,8-TCDD cancer and noncancer Industrial Soil RSLs (TR of 1E-06 and THQ of 0.1 for screening) to identify exceedances.
    - If there are exceedances, an EPC will be developed for the soil samples collected in the Former PCP Dip Vat Area in FU-4 with at least 8 to 10 samples to be used in the calculation as recommended by the EPA ProUCL User Guide (EPA, 2016). The remaining soil samples will be evaluated on an individual basis.
    - For the EPC development:
        - The results of the field duplicate samples will be compared to the results of the associated parent samples and the results will be consolidated into the data set by using the maximum result if constituents are detected in both the original and duplicate samples. The detected value will be used when one result is detected and the other is reported as non-detect.
        - EPA's ProUCL software (EPA 2016) will be used to calculate 95% UCLs on the arithmetic mean for the data set in each FU. These UCLs will be applied as the EPCs. ProUCL applies the Regression on Order Statistics (ROS) methods for lognormal and gamma distributed data sets to provide a better estimate of the non-detected sample's true value based on actual detected concentrations. For normal distributions, ProUCL utilizes Kaplan-Meier estimates in lieu of the ROS methods because the ROS methods tend to yield biased and negative non-detect values for these distributions (EPA, 2015a and b).

        - If the 95% UCL on the arithmetic mean is determined to be unreliable, or if it is greater than all values in the data set, the maximum detected concentration will be used as the EPC.

    - The EPCs will be used with the current cancer and noncancer Industrial Soil RSLs (TR of 1E-06 and THQ of 1) to calculate risks and hazards for an industrial worker's exposure to dioxins and furans in the surface soil, as shown in the equations below.

$$Risk = \frac{EPC}{RSL_{Cancer}} \times Target\ Risk$$

$$Hazard = \frac{EPC}{RSL_{Noncancer}} \times Target\ Hazard\ Quotient$$

- Human Health, Soil, Chromium – Comparison of the trivalent and hexavalent chromium soil results in FU-3 and FU-4 to the Industrial Soil RSLs (TR of 1E-06 and THQ of 0.1 for screening) to identify exceedances. If there are exceedances, an EPC will be developed using ProUCL as described above for FU-3 and for FU-4. The EPCs will be used with the current cancer and noncancer Industrial Soil RSLs (TR of 1E-06 and THQ of 1) to calculate risks and hazards using the same equations above for an industrial worker exposure to chromium in the surface soil.
- Human Health, Surface Water and Sediment, Dioxins-Furans – Comparison of the sediment and surface water results from samples collected in the drainage features to current conservative human health screening criteria to evaluate the potential influence of stormwater discharge to on-site and off-site human receptors interacting with receiving waterbodies. The sediment analytical data will be screened using the EPA Residential and Industrial Soil RSLs (EPA, 2021). The surface water analytical data will be screened using EPA National Recommended Water Quality Criteria for Human Health (EPA, 2019), the National Primary Drinking Water Regulations (EPA, 2009), and the TDEC General Water Quality Criteria (TDEC, 2019).
- Ecological, Sediment and Surface Water, Dioxins-Furans – The surface water and sediment analytical results from samples collected in the drainage features will be screened using current conservative ESVs for surface water and sediment to evaluate the potential influence of stormwater discharge on exposure conditions in off-site receiving waterbodies.
    - EPA Region 4 Ecological Freshwater ESVs (EPA, 2018a) will be applied to identify exceedances; alternate sources of published ESVs may also be reviewed as provided in the Oak Ridge National Laboratory Ecological Benchmark Tool for Chemicals (ORNL, 2021) or literature-based values may also be consulted, as necessary.
    - If there are exceedances identified in these drainage features, it is not necessarily indicative of ecological hazard on-site or to ecological receptors in off-site receiving waterbodies. However, the lack of exceedances in surface

water and sediment analytical results can demonstrate protectiveness at the site boundary for off-site downstream ecological receptors.

  - As noted in Section 5.3, visual observation of ecological habitat and receptors in the on-site drainage features and off-site downstream areas (if accessible and safe to observe) will be performed during the sampling. If there are exceedances of the ESVs and there is sufficient habitat and complete exposure pathways to semi-aquatic wildlife receptors, the need for additional evaluations, such as calculation of EPCs and food chain modeling, and a SLERA will be considered at that point in consultation with EPA.

- The analytical results in soil, surface water, and sediment will be compared to historical background analytical data from the 2000 MI RI to determine whether the concentrations may be due to anthropogenic contributions.
  - The historical background samples were collected at the following locations, as noted in Section 3 and Figures 3-1 and 3-2 of the 2000 MI RI:
    - Soil samples were collected along the perimeter on-site and off-site at schools, golf courses, cemeteries, and residential neighborhoods. The locations were selected to represent ambient environmental conditions in the urban environment and would be subject to similar grounds maintenance activities.
    - Surface water and sediment were collected from four ponds in Medal of Honor Park, Audubon Park, Memphis Lake in Chickasaw Gardens, and the Botanical Gardens in Audubon Park. Surface water and sediment samples were also taken from two nearby perennial creeks: Nonconnah Creek, located south of the Depot, and Cane Creek, located northwest of the MI.
  - According to the 2000 MI RI, dioxins and furans in the background analytical data were detected in most perimeter and off-site soils, generally at higher concentrations at the surface than at depth. Dioxins also were detected in sediment and surface water samples. Most background concentrations detected were octa- and hepta-isomers, indicating that the detected concentration probably resulted from atmospheric deposition rather than from isolated surface sources.
  - It is recognized that anthropogenic contributions in the area may have changed since the original background sampling event as the area has become more urbanized. The need for an updated background sampling event will be considered after sampling has been conducted for the current scope of work.
- A table will be developed comparing the detection limits to the minimum of the human health and ecological criteria.

For the human health exposure pathways, recommendations will be provided if the calculated risks and hazards are not within the acceptable risk and hazard limits.

For the stormwater migration pathways for ecological and human health exposure, if there are no exceedances, no further work will be performed. If there are exceedances, the magnitude and location of the exceedances will be reviewed and recommendations will be provided.

7 Reporting

A detailed report will be prepared after completion of all planned sampling and analysis. The report will describe the field activities with deviations from this SAP noted; data quality evaluation; analytical results with final data validation flags; a risk screening for soil, sediment and surface water data with discussion of procedures and calculations, including estimate of EPCs, cancer risks and hazards; and recommendations for further action if warranted. The complete laboratory reports will be included with electronic copies of the report. The report will be submitted for internal review by Army and USACE; responses to comments will be provided and, following resolution of the comments, the report will be revised for submittal to EPA and TDEC.

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Tables

TABLE 1
FUNCTIONAL UNIT DESCRIPTIONS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Main Installation

Functional Unit	Name	Size[1] (Acres)	Common Past Land Use	Description
1	Twenty Typical Warehouses	89	Transportation to and storage in closed warehouses	Located in the northeastern area of the MI, consisting of about 20 large warehouses, with interspersed roadways and railroad tracks.
2	Southeast Golf Course/ Recreational Area	53	Golf, other recreation	Located in the southeastern corner of the MI, consisting of golf course (Parcel 3). This FU also includes a baseball field and a small playground in the southeastern corner. This FU includes two constructed ponds and two concrete-lined drainage ditches from the ponds leading to the off-site area.
3	Southwest Open Area	92	Transportation to and storage in open-sided warehouses, painting and sandblasting, open storage	Located in the southwestern corner of the MI, consisting of varied type of parcels and sites.
4	Northern and Open Areas	193	Open storage, and transportation to and storage in closed warehouses	Located in the north-central to northwest area of the MI, covering a large area.
5	Newer Warehouses	109	Transportation to and storage in closed warehouses	Located in the south-central area of the MI and includes 10 large warehouse buildings.
6	Administrative and Residential Areas	33	Offices, equipment storage and maintenance, on-base housing	Located along the property boundary of the Depot along the Airways Boulevard. This FU includes the old Residential Unit Area, parking lots, and other asphalt-paved areas.
7	Groundwater	-	No past use of groundwater	Includes all groundwater beneath the Main Installation.

Notes:
1) Acreage is approximate
FU: Functional Unit
MI: Main Installation

TABLE 2
PROJECT PERSONNEL AND CONTACT INFORMATION
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Name	Organization	Role	Email	Office	Mobile
James Foster	DAIN-ISE	BRAC Program Manager	james.c.foster10.civ@mail.mil	703-545-2541	
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TABLE 3
PROJECT SCHEDULE
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Task Name	Start[1]	Finish
Sampling and Analysis	15-Jun-22	27-Jul-22
Initial Sample Event for Soil, Sediment and Surface Water	15-Jun-22	19-Jun-22
Repeat 1-Day Sample Event for Sediment and Surface Water, if necessary	22-Jun-22	6-Jul-22
Laboratory Analysis for Initial Sample Event	19-Jun-22	10-Jul-22
Laboratory Analysis for Repeat Sample Event	6-Jul-22	27-Jul-22
Data Review	27-Jul-22	24-Aug-22
Data Quality Evaluation and Validation	27-Jul-22	3-Aug-22
Risk Screening and Calculations	3-Aug-22	24-Aug-22
Reporting	19-Jun-22	17-Jan-23
Internal Draft Report	19-Jun-22	7-Sep-22
Government Review	7-Sep-22	28-Sep-22
Revision 0 Report	28-Sep-22	19-Oct-22
EPA/TDEC Review	19-Oct-22	18-Dec-22
Revision 1 Report	18-Dec-22	17-Jan-23

1) Start date for initial sample event assumes HHERA Review SAP Revision 1 by 27-May-22.
2) Repeat sample event will be scheduled based on forecast of a significant rain event.

TABLE 4
SURFACE SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Surface Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL[4]	Count of Nondetects with DLs Exceeding RSL[4]
1	Pentachlorophenol	27	2	0.25	0.27	12	mg/kg	0	2
	Dibenzofuran	30	13	0.065	24	24	mg/kg	0	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ[2]	0	--	--	--	--	--	--	--
2	Pentachlorophenol	20	1	0.054	0.054	0.22	mg/kg	0	0
	Dibenzofuran	20	1	0.056	0.056	0.44	mg/kg	0	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ[2]	0	--	--	--	--	--	--	--
3	Pentachlorophenol	41	2	0.094	0.68	7.7	mg/kg	0	1
	Dibenzofuran	43	5	0.21	2.4	2.4	mg/kg	0	0
	2,3,7,8-TCDD	6	0	--	--	1000	pg/g	--	6
	TCDD TEQ[2]	6	6	2.829	13.1	--	pg/g	0	--
4	Pentachlorophenol	97	8	0.048	0.31	1	mg/kg	0	0
	Dibenzofuran	97	5	0.05	0.44	2	mg/kg	0	0
	2,3,7,8-TCDD	27	0	--	--	1000	pg/g	--	27
	TCDD TEQ[2]	27	27	1.039	466.5	--	pg/g	15	--
5	Pentachlorophenol	26	2	0.04	0.32	19	mg/kg	0	2
	Dibenzofuran	26	4	0.11	5.7	38	mg/kg	0	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ[2]	0	--	--	--	--	--	--	--
6 Industrial Area	Pentachlorophenol	11	0	--	--	6	mg/kg	--	1
	Dibenzofuran	11	0	--	--	12	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ[2]	0	--	--	--	--	--	--	--

TABLE 4
SURFACE SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Surface Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL[4]	Count of Nondetects with DLs Exceeding RSL[4]
6 UU/UE Area[3]	Pentachlorophenol	1	0	--	--	0.2	mg/kg	--	0
	Dibenzofuran	1	0	--	--	0.4	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ[2]	0	--	--	--	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	Pentachlorophenol	222	15	0.04	0.68	19	mg/kg	0	6
	Dibenzofuran	227	28	0.05	24	38	mg/kg	0	0
	2,3,7,8-TCDD	33	0	--	--	1000	pg/g	--	33
	TCDD TEQ[2]	33	33	1.039	466.5	--	pg/g	15	0

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
2) The toxic equivalency (TEQ) is a weighted quantity based on the toxicity of each member of the dioxin and furan analytes category relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

-- = Not analyzed or not applicable

DL = Detection limit

pg/g = Picogram per gram

mg/kg = Milligram per kilogram

UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
TCDD TEQ	pg/g	4.8	22
2,3,7,8-TCDD	pg/g	4.8	22
Dibenzofuran	mg/kg	7.8	120
Pentachlorophenol	mg/kg	1	4

TABLE 5
SUBSURFACE SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Subsurface Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Pentachlorophenol	31	0	--	--	0.22	mg/kg	--	0
	Dibenzofuran	31	0	--	--	0.44	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
2	Pentachlorophenol	7	0	--	--	0.44	mg/kg	--	0
	Dibenzofuran	7	0	--	--	0.88	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
3	Pentachlorophenol	37	0	--	--	0.26	mg/kg	--	0
	Dibenzofuran	37	1	0.19	0.19	0.52	mg/kg	0	0
	2,3,7,8-TCDD	9	0	--	--	1000	pg/g	--	9
	TCDD TEQ	9	9	0.167	7.874	--	pg/g	--	0
4	Pentachlorophenol	106	1	470	470	0.28	mg/kg	1	0
	Dibenzofuran	103	0	--	--	0.56	mg/kg	--	0
	2,3,7,8-TCDD	16	0	--	--	1000	pg/g	--	16
	TCDD TEQ	16	13	0.767	12,520	1000	pg/g	2	3
5	Pentachlorophenol	17	0	--	--	0.22	mg/kg	--	0
	Dibenzofuran	17	0	--	--	0.43	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
6 Industrial Area	Pentachlorophenol	13	0	--	--	0.62	mg/kg	--	0
	Dibenzofuran	13	0	--	--	1.2	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--

TABLE 5
SUBSURFACE SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Subsurface Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
6 UU/UE Area	**Pentachlorophenol**	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TEQ	0	--	--	--	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	**Pentachlorophenol**	211	1	470	470	0.62	mg/kg	1	0
	Dibenzofuran	208	1	0.19	0.19	1.2	mg/kg	0	0
	2,3,7,8-TCDD	25	0	--	--	1000	pg/g	--	25
	TCDD TEQ	25	22	0.167	12520	1000	pg/g	2	3

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

2) The toxic equivalency (TEQ) is a weighted quantity based on the toxicity of each member of the dioxin and furan analytes category relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

-- = Not analyzed or not applicable

DL = Detection limit

pg/g = Picogram per gram

mg/kg = Milligram per kilogram

UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.

4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
TCDD TEQ	pg/g	4.8	22
2,3,7,8-TCDD	pg/g	4.8	22
Dibenzofuran	mg/kg	7.8	120
Pentachlorophenol	mg/kg	1	4

TABLE 6
DEEP SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Deep Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
2	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
3	Pentachlorophenol	8	0	--	--	1	mg/kg	--	0
	Dibenzofuran	8	0	--	--	2.1	mg/kg	--	0
	2,3,7,8-TCDD	4	0	--	--	1000	pg/g	--	4
	TCDD TEQ	4	4	0.05	0.184	--	pg/g	0	--
4	Pentachlorophenol	31	0	--	--	1	mg/kg	--	0
	Dibenzofuran	30	0	--	--	2	mg/kg	--	0
	2,3,7,8-TCDD	19	1	17	17	1000	pg/g	0	18
	TCDD TEQ	19	19	0.045	576.8	--	pg/g	2	0
5	Pentachlorophenol	8	0	--	--	0.22	mg/kg	--	0
	Dibenzofuran	8	0	--	--	0.43	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
6 Industrial Area	Pentachlorophenol	12	0	--	--	0.2	mg/kg	--	0
	Dibenzofuran	12	0	--	--	0.41	mg/kg	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--

TABLE 6
DEEP SOIL SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Deep Soil							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
6 UU/UE Area	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TEQ	0	--	--	--	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	Pentachlorophenol	59	0	--	--	1	mg/kg	--	0
	Dibenzofuran	58	0	--	--	2.1	mg/kg	--	0
	2,3,7,8-TCDD	23	1	17	17	1000	pg/g	0	22
	TCDD TEQ	23	23	0.045	576.8	0	pg/g	2	0

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
2) The toxic equivalency (TEQ) is a weighted quantity based on the toxicity of each member of the dioxin and furan analytes category relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

-- = Not analyzed or not applicable

DL = Detection limit
pg/g = Picogram per gram
mg/kg = Milligram per kilogram
UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
TCDD TEQ	pg/g	4.8	22
2,3,7,8-TCDD	pg/g	4.8	22
Dibenzofuran	mg/kg	7.8	120
Pentachlorophenol	mg/kg	1	4

TABLE 7
SEDIMENT SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Sediment							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
2	Pentachlorophenol	20	2	0.12	0.14	4.1	mg/kg	0	1
	Dibenzofuran	20	5	0.022	0.14	2.1	mg/kg	0	0
	2,3,7,8-TCDD	6	0	--	--	160	pg/g	--	1
	TCDD TEQ	6	6	10.45	147.2	--	pg/g	6	--
3	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
4	Pentachlorophenol	9	2	0.08	0.26	4.8	mg/kg	0	2
	Dibenzofuran	9	0	--	--	9.5	mg/kg	--	1
	2,3,7,8-TCDD	9	0	--	--	1000	pg/g	--	8
	TCDD TEQ	9	9	0.3003	494.4	--	pg/g	7	--
5	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
6 Industrial Area	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TEQ	0	--	--	--	--	--	--	--

TABLE 7
SEDIMENT SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Sediment							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
6 UU/UE Area	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	Pentachlorophenol	29	4	0.08	0.26	4.8	mg/kg	0	3
	Dibenzofuran	29	5	0.022	0.14	9.5	mg/kg	0	1
	2,3,7,8-TCDD	15	0	--	--	1000	pg/g	--	9
	TCDD TEQ	15	15	0.3003	494.4	--	pg/g	13	--

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

2) The toxic equivalency (TEQ) is a weighted quantity based on the toxicity of each member of the dioxin and furan analytes category relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

-- = Not analyzed or not applicable

DL = Detection limit

pg/g = Picogram per gram

mg/kg = Milligram per kilogram

UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	EPA RSL Residential Soil	EPA RSL Industrial Soil
TCDD TEQ	pg/g	4.8	22
2,3,7,8-TCDD	pg/g	4.8	22
Dibenzofuran	mg/kg	7.8	120
Pentachlorophenol	mg/kg	1	4

TABLE 8
SURFACE WATER SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Surface Water							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding Criteria	Count of Nondetects with DLs Exceeding Criteria
1	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
2	Pentachlorophenol	18	0	--	--	0.005	mg/L	--	18
	Dibenzofuran	18	0	--	--	0.01	mg/L	--	0
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
3	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
4	Pentachlorophenol	8	3	0.006	0.013	0.005	mg/L	3	5
	Dibenzofuran	8	0	--	--	0.01	mg/L	--	0
	2,3,7,8-TCDD	8	0	--	--	10	ng/L	--	8
	TCDD TEQ	8	8	0.000163	0.5363	--	ng/L	8	--
5	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
6 Industrial Area	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--

TABLE 8
SURFACE WATER SAMPLE SUMMARY (2000 MI RI)
PENTACHLOROPHENOL, DIBENZOFURAN AND DIOXINS-FURANS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Analyte	Surface Water							
		Sample Count	Detection Count	Minimum Detection	Maximum Detection	Maximum Detection Limit	Units	Count of Detects Exceeding Criteria	Count of Nondetects with DLs Exceeding Criteria
6 UU/UE Area	Pentachlorophenol	0	--	--	--	--	--	--	--
	Dibenzofuran	0	--	--	--	--	--	--	--
	2,3,7,8-TCDD	0	--	--	--	--	--	--	--
	TCDD TEQ	0	--	--	--	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	Pentachlorophenol	26	3	0.006	0.013	0.01	mg/L	3	23
	Dibenzofuran	26	0	--	--	0.02	mg/L	--	0
	2,3,7,8-TCDD	8	0	--	--	10	ng/L	--	8
	TCDD TEQ	8	8	0.000163	0.5363	--	ng/L	8	--

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

2) The toxic equivalency (TEQ) is a weighted quantity based on the toxicity of each member of the dioxin and furan analytes category relative to 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD).

-- = Not analyzed or not applicable

DL = Detection limit

ng/L = Nanogram per liter

mg/L = Milligram per liter

UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) United States Environmental Protection Agency (USEPA), 2019. National Recommended Water Quality Criteria – Human Health (HH) Criteria Table. Available online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table

4) Tennessee Department of Environment and Conservation (TDEC), 2019. Chapter 0400-40-03 General Water Quality Criteria. December 19. Available online: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-tennessee

Analyte	Units	National Recommended Water Quality Criteria - HH Criteria Table, Organisms Only, 2019	TDEC General Water Quality Criteria, Organism Only, 2019
TCDD TEQ	ng/L	0.0000051	0.001
2,3,7,8-TCDD	ng/L	0.0000051	0.001
Dibenzofuran	mg/L	NA	NA
Pentachlorophenol	mg/L	0.00004	0.03

TABLE 9
CUMULATIVE CANCER RISK AND HAZARD INDEX FOR COPCS IN SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Commercial / Industrial Receptor Scenario Evaluation				Residential Receptor Scenario Evaluation		Constituent Groups Evaluated
	0-2 feet soil		0-10 feet soil		0-2 feet soil		
	Cumulative Risk	Hazard Index	Cumulative Risk	Hazard Index	Cumulative Risk	Hazard Index	
1	3E-05	0.2	5E-05	0.2	NA	NA	Metal, PCB, Pesticide, SVOC
2-Ballpark	1E-05	0.1	NA	NA	NA	NA	Metal, Pesticide, SVOC
2-Golf Course	4E-05	0.3	NA	NA	NA	NA	Metal, Pesticide, SVOC
2-Playground	1E-05	0.1	NA	NA	NA	NA	Metal, Pesticide, SVOC
2-Surface Soil	2E-05	0.2	NA	NA	NA	NA	Metal, Pesticide, SVOC
3	6E-06	0.1	5E-06	0.1	NA	NA	Dioxin, Metal, Pesticide, SVOC
4	4E-05	0.9	5E-05	**2**	NA	NA	Dioxin, Metal, PCB, Pesticide, SVOC, VOC
5	2E-05	0.1	1E-05	0.1	NA	NA	Metal, Pesticide, SVOC, VOC
6	2E-05	0.1	2E-05	0.07	1E-04	1	Metal, PCB, Pesticide, SVOC, VOC (0-10 feet only)

Notes:

1) Cumulative cancer risks and hazards were calculated for constituents of potential concern (COPCs) using exposure point concentrations (EPCs) from the 2000 Main Installation (MI) Remedial Investigation (RI) and May 2021 United States Environmental Protection Agency (USEPA) Soil Regional Screening Levels (RSLs).

2) The EPCs were the lower of the 95% upper confidence level (UCL) on the arithmetic mean and the maximum detected concentration.

3) Values greater than the acceptable limits of 1E-04 for cumulative cancer risk and 1 for noncancer hazards are shaded and bolded.

NA = Data not available to evaluate risks and hazards or not applicable.

PCB = polychlorinated biphenyl

SVOC = semivolatile organic compound

VOC = volatile organic compound

TABLE 10
SOIL SAMPLE SUMMARY (2000 MI RI)
ARSENIC
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detect Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Surface (0-2 ft.)	27	27	2.5	54.9	--	26	--
	Subsurface (2-10 ft.)	25	25	1.3	13.3	--	24	--
	All (total, max, min)	52	52	1.3	54.9	--	50	--
2	Surface (0-2 ft.)	36	36	1.7	50.5	--	35	--
	Subsurface (2-10 ft.)	11	11	4.8	24.7	--	11	--
	All (total, max, min)	47	47	1.7	50.5	--	46	--
3	Surface (0-2 ft.)	109	106	0.43	49.2	3.8	98	1
	Subsurface (2-10 ft.)	79	78	3.6	26.5	24.4	79	1
	Deep (> 10 ft.)	27	23	2.1	18.8	2.1	20	0
	All (total, max, min)	215	207	0.43	49.2	24.4	197	2
4	Surface (0-2 ft.)	148	145	1.1	66.3	1.6	139	0
	Subsurface (2-10 ft.)	107	107	4.1	34.2	--	107	--
	Deep (> 10 ft.)	26	26	1.4	16.9	--	24	--
	All (total, max, min)	281	278	1.1	66.3		270	0
5	Surface (0-2 ft.)	23	23	4	29	--	23	--
	Subsurface (2-10 ft.)	14	14	4	18.2	--	14	--
	Deep (> 10 ft.)	6	6	2.8	14.2	--	5	--
	All (total, max, min)	43	43	2.8	29	--	42	0
6 Industrial Area	Surface (0-2 ft.)	14	14	3.6	29.2	--	14	--
	Subsurface (2-10 ft.)	10	10	1.2	17.3	--	9	--
	Deep (> 10 ft.)	4	4	4.1	11.3	--	4	--
	All (total, max, min)	28	28	1.2	29.2	--	27	0
6 UU/UE Area	Surface (0-2 ft.)	1	1	16.1	16.1	--	1	--
	Subsurface (2-10 ft.)	--	--	--	--	--	--	--
	Deep (> 10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	1	1	16.1	16.1	--	1	0
Main Installation Site-Wide (excluding UU/UE Area)	Surface (0-2 ft.)	357	351	0.43	66.3	1.6	335	1
	Subsurface (2-10 ft.)	246	245	1.2	34.2	24.4	244	1
	Deep (> 10 ft.)	63	59	1.3	54.9	2.1	53	0
	All (total, max, min)	666	655	0.43	66.3	24.4	632	2

TABLE 10
SOIL SAMPLE SUMMARY (2000 MI RI)
ARSENIC
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detect Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
2) Excavated sampling locations (1 foot deep) are not included in number of samples.
-- = Not analyzed or not applicable
DL = Detection limit
ft = Foot
mg/kg = Milligram per kilogram
UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
Arsenic	mg/kg	0.68	3

TABLE 11
CUMULATIVE CANCER RISK AND HAZARD INDEX FOR ARSENIC IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Scenario	95% UCL (mg/kg)	UCL Method	USEPA RSLs (TR of 1E-06, THQ of 1)		Commercial/ Industrial		USEPA RSLs (TR of 1E-06, THQ of 1)		Residential	
			Industrial Cancer RSL (mg/kg)	Industrial Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard	Residential Cancer RSL (mg/kg)	Residential Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard
FU-1	26.54	95% Adjusted Gamma UCL	3	480	9E-06	0.06	--	--	--	--
FU-2	23.9	95% Adjusted Gamma UCL	3	480	8E-06	0.05	--	--	--	--
FU-3	12.75	KM H-UCL	3	480	4E-06	0.03	--	--	--	--
FU-4	15.4	95% GROS Approximate Gamma UCL	3	480	5E-06	0.03	--	--	--	--
FU-5	15.66	95% Student's-t UCL	3	480	5E-06	0.03	--	--	--	--
FU-6 Industrial Area	18.59	95% Student's-t UCL	3	480	6E-06	0.04	--	--	--	--
Main Installation Site-Wide (excluding UU/UE Area)	16.32	KM H-UCL	3	480	5E-06	0.03	--	--	--	--
FU-6 UU/UE Area (Data from OHM, 1999)	14.13	95% Adjusted Gamma UCL	--	--	--	--	0.68	35	2E-05	0.4

Notes:

1) For the industrial scenario, the 95% upper confidence limit (UCLs) on the arithmetic mean were calculated using arsenic concentrations in surface soil (0-2 ft) from the 2000 Main Installation (MI) Remedial Investigation (RI) after excluding excavated samples.

2) For the residential scenario, the exposure point concentration (EPC) is based on analytical data from soil samples collected at the 1 foot interval in the UU/UE area, as reported in the Post Removal Report for the Family Housing Area (OHM, 1999).

-- = Not applicable
FU = Functional Unit
mg/kg = Milligrams per kilogram
UU/UE = unlimited use/unrestricted exposure

Criteria:

3) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk (TR) of 1E-06, target hazard quotient (THQ) of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE 12
SOIL SAMPLE SUMMARY (2000 MI RI)
CHROMIUM
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detection Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Surface (0-2 ft.)	27	27	9.8	135	--	24	--
	Subsurface (2-10 ft.)	25	25	10.2	19.3	--	22	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	52	52	9.8	135	--	46	--
2	Surface (0-2 ft.)	36	36	7.6	40.3	--	32	--
	Subsurface (2-10 ft.)	11	11	10.5	53.2	--	11	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	47	47	7.6	53.2	--	43	--
3	Surface (0-2 ft.)	112	112	1.8	2230	--	97	--
	Subsurface (2-10 ft.)	79	79	8.9	81.6	--	74	--
	Deep (>10 ft.)	27	27	2.1	102	--	24	--
	All (total, max, min)	218	218	1.8	2230	--	195	--
4	Surface (0-2 ft.)	151	151	5	296	--	129	--
	Subsurface (2-10 ft.)	107	107	8.7	45.6	--	100	--
	Deep (>10 ft.)	26	26	13	140	--	26	--
	All (total, max, min)	284	284	5	296	--	255	--
5	Surface (0-2 ft.)	23	23	8.2	35	--	22	--
	Subsurface (2-10 ft.)	14	14	14.8	48.3	--	14	--
	Deep (>10 ft.)	6	6	9.6	41.6	--	6	--
	All (total, max, min)	43	43	8.2	48.3	--	42	--
6 Industrial Area	Surface (0-2 ft.)	14	14	10	27.7	--	14	--
	Subsurface (2-10 ft.)	10	10	11.7	27.6	--	10	--
	Deep (>10 ft.)	4	4	10.7	26.4	--	4	--
	All (total, max, min)	28	28	10	27.7	--	28	--
6 UU/UE Area	Surface (0-2 ft.)	1	1	14	14	--	1	--
	Subsurface (2-10 ft.)	--	--	--	--	--	--	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	1	1	14	14	--	1	--
Main Installation Site-Wide (excluding UU/UE Area)	Surface (0-2 ft.)	363	363	1.8	2230	--	318	--
	Subsurface (2-10 ft.)	246	246	8.7	81.6	--	231	--
	Deep (>10 ft.)	63	63	2.1	140	--	60	--
	All (total, max, min)	672	672	1.8	2230	--	609	--

TABLE 12
SOIL SAMPLE SUMMARY (2000 MI RI)
CHROMIUM
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detection Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
2) Excavated sampling locations (1 foot deep) are not included in number of samples.
-- = Not analyzed or not applicable
DL = Detection limit
mg/kg = Milligram per kilogram
ft = Foot
UU/UE = Unlimited use / unrestricted exposure

Criteria:

3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
Chromium (trivalent)	mg/kg	120,00	180,000
Chromium (hexavalent)	mg/kg	0.3	6.3

TABLE 13
SURFACE SOIL ANALYTICAL RESULTS (2000 MI RI)
TRIVALENT HEXAVALENT CHROMIUM
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Location	Sample ID	Depth Interval (foot)	Date	Sample Type	Analyte	Result (mg/kg)	Excavated
SS33K	MIA325	0-1	10/8/1998	Sample	Chromium, Total	**403**	Yes
SS33M	MIA327	0-1	10/8/1998	Sample	Chromium, Total	**133**	Yes
SS33M	MIA328FD	0-1	10/8/1998	Field Duplicate	Chromium, Total	**143**	Yes
SS33G	MIA333	0-1	10/8/1998	Sample	Chromium, Total	**17.1**	No
SS33I	MIA335	0-1	10/8/1998	Sample	Chromium, Total	**13**	No
SS33K	MIA325	0-1	10/8/1998	Sample	Chromium, Trivalent (III)	403	Yes
SS33M	MIA327	0-1	10/8/1998	Sample	Chromium, Trivalent (III)	133	Yes
SS33M	MIA328FD	0-1	10/8/1998	Field Duplicate	Chromium, Trivalent (III)	143	Yes
SS33G	MIA333	0-1	10/8/1998	Sample	Chromium, Trivalent (III)	17.2	No
SS33I	MIA335	0-1	10/8/1998	Sample	Chromium, Trivalent (III)	13.1	No
SS33K	MIA325	0-1	10/8/1998	Sample	Chromium, Hexavalent (VI)	0.12	Yes
SS33M	MIA327	0-1	10/8/1998	Sample	Chromium, Hexavalent (VI)	0.11 U	Yes
SS33M	MIA328FD	0-1	10/8/1998	Field Duplicate	Chromium, Hexavalent (VI)	0.11 U	Yes
SS33G	MIA333	0-1	10/8/1998	Sample	Chromium, Hexavalent (VI)	0.11 U	No
SS33I	MIA335	0-1	10/8/1998	Sample	Chromium, Hexavalent (VI)	0.12 U	No

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

2) Trivalent and hexavalent chromium analytical results were provided for samples collected in the southwest corner of Functional Unit 3 (FU-3).

3) The sampling locations marked as excavated (approximately to 1 ft bgs) have been identified based on review of the 2000 MI RI Report and historic removal actions.

mg/kg = Milligram per kilogram

Criteria:

4) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold.** None of the hexavalent chromium results exceed the RSL. All of the results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.

5) USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Analyte	Units	USEPA RSL Industrial Soil
Chromium (trivalent)	mg/kg	180,000
Chromium (hexavalent)	mg/kg	6.3

TABLE 14
SOIL SAMPLE SUMMARY (2000 MI RI)
LEAD
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detection Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
1	Surface (0-2 ft.)	27	27	7.3	1,680	--	2	--
	Subsurface (2-10 ft.)	25	25	7.3	14.4	--	0	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	52	52	7.3	1,680	--	2	--
2	Surface (0-2 ft.)	36	36	2.8	318	--	0	--
	Subsurface (2-10 ft.)	11	11	8	32.9	--	0	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	47	47	2.8	318	--	0	--
3	Surface (0-2 ft.)	113	113	2.8	10,300	--	3	--
	Subsurface (2-10 ft.)	79	79	6.2	282	--	0	--
	Deep (>10 ft.)	27	27	1.1	28.9	--	0	--
	All (total, max, min)	219	219	1.1	10,300	--	3	--
4	Surface (0-2 ft.)	151	151	4	2,420	--	3	--
	Subsurface (2-10 ft.)	107	107	6.2	38.4	--	0	--
	Deep (>10 ft.)	26	25	1.8	30.6	0.52	0	0
	All (total, max, min)	284	283	1.8	2,420	1	3	0
5	Surface (0-2 ft.)	23	23	6.8	109	--	0	--
	Subsurface (2-10 ft.)	14	14	6.4	53.8	--	0	--
	Deep (>10 ft.)	6	6	4.8	15.9	--	0	--
	All (total, max, min)	43	43	4.8	109	--	0	--
6 Industrial Area	Surface (0-2 ft.)	14	14	5	136	--	0	--
	Subsurface (2-10 ft.)	10	10	6.6	19.3	--	0	--
	Deep (>10 ft.)	4	4	4	18.9	--	0	--
	All (total, max, min)	28	28	4	136	--	0	--
6 UU/UE Area	Surface (0-2 ft.)	1	1	14.5	14.5	--	0	--
	Subsurface (2-10 ft.)	--	--	--	--	--	--	--
	Deep (>10 ft.)	--	--	--	--	--	--	--
	All (total, max, min)	1	1	14.5	14.5	--	0	--

TABLE 14
SOIL SAMPLE SUMMARY (2000 MI RI)
LEAD
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Category	Sample Count	Detection Count	Minimum Detection (mg/kg)	Maximum Detection (mg/kg)	Maximum Detection Limit (mg/kg)	Count of Detects Exceeding RSL	Count of Nondetects with DLs Exceeding RSL
Main Installation Site-Wide (excluding UU/UE Area)	Surface (0-2 ft.)	364	364	2.8	10,300	0	8	--
	Subsurface (2-10 ft.)	246	246	6.2	282	0	0	--
	Deep (>10 ft.)	63	62	1.1	30.6	0.52	0	0
	All (total, max, min)	673	672	1.1	10,300	0.52	8	0

Notes:
1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
2) Excavated sampling locations (1 foot deep) are not included in number of samples.
-- = Not analyzed or not applicable
DL = Detection limit
ft = Foot
mg/kg = Milligram per kilogram
UU/UE = Unlimited use / unrestricted exposure

Criteria:
3) Only the analytical results from the sample collected in the UU/UE Area (location SS1A) were compared to the Residential Soil RSL.
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May.

Analyte	Units	USEPA RSL Residential Soil	USEPA RSL Industrial Soil
Lead	mg/kg	400	800

TABLE 15
RSL EXCEEDANCES IN SURFACE SOIL
LEAD
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Location	Sample ID	Depth Interval (foot)	Date	Sample Type	Result (mg/kg)
1	SS11	LAWSS11	0.5-1.5	2/12/1989	Sample	**1,680**
1	SS42	LAWSS42	0-1	10/26/1989	Sample	**1,120**
3	SS15	LAWSS15	0.2-1.2	2/21/1989	Sample	**2,670**
3	SS19	LAWSS19	0.2-1.2	2/22/1989	Sample	**10,300**
3	SS34D	RHA038	0-1	1/17/1997	Sample	**960**
4	SS41	LAWSS41	0-1	10/28/1989	Sample	**878**
4	SS5	LAWSS5	0-1	2/11/1989	Sample	**2,420**
4	SS79A	SGA314	0-1	12/12/1996	Sample	**1,060**

Notes:
1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL,
2) Only analytical soil results above the Industrial Soil RSL of 800 mg/kg for lead are shown**.**
3) Location SS19, from which the sample with a result of 10,300 mg/kg was collected, is near the excavation areas in FU-3 and this location may have been excavated as part of the removal action in 2000 for Parcels 35 and 28.
mg/kg = milligram per kilogram

Criteria:
4) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE 16
EPA ADULT LEAD MODEL SUMMARY FOR SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Functional Unit	Lead Average (mg/kg)	Probability that fetal PbB exceeds target PbB of 5 ug/dL (percent)			
		GSD_i and PbB_o from Analysis of NHANES 2009-2014	GSD_i and PbB_o from Analysis of NHANES 2007-2010	GSD_i and PbB_o from Analysis of NHANES 2004-2007	GSD_i and PbB_o from Analysis of NHANES III (Phases 1&2)
1	142	**0.1%**	0.0%	0.5%	5.6%
2	53	**0.0%**	0.0%	0.3%	4.5%
3	186	**0.1%**	0.0%	0.6%	6.1%
4	84	**0.0%**	0.0%	0.3%	4.8%
5	26	**0.0%**	0.0%	0.2%	4.2%
6	38	**0.0%**	0.0%	0.2%	4.3%

Notes:

1) The lead averages were calcuated from analytical data from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

GSD_i = Geometric standard deviation of PbB

NHANES = National Health and Nutrition Examination Survey

PbB = Blood lead concentration

PbB_o = Baseline PbB

ug/dL = Microgram per deciliter

References:

2) United States Environmental Protection Agency (USEPA), 2017a. Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas. Spreadsheet. June 14, 2017.

3) USEPA, 2017b. Update of the Adult Lead Methodology's Default Baseline Blood Lead Concentration and Geometric Standard Deviation Parameter. Office of Land and Emergency Management (OLEM) Directive 9285.6-56. May 2017. Available online: https://www.epa.gov/superfund/lead-superfund-sites-software-and-users-manuals#recommend

TABLE 17
SEDIMENT SAMPLE SUMMARY (2000 MI RI)
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

					Analytical Method														
					VOC		TPH		SVOC		PAH	Pest	Pest/PCB		Metal			Dioxin/ Furan	
FU	Location	Sample ID	Sample Type	Sample Date	SW8260	CV390	SW8015 MOD	E418.1	SW8270	CSV390	SW8100	SW8080	SW8081	CP390	SW6010	SW9010	SW7471	SW8280	CDF991
2	M-SD01	M-SD1-101195	Sample	10/11/1995		x	x			x				x	x	x	x	x	
2	M-SD01	M-SD20-101195	FD	10/11/1995		x	x			x				x	x	x	x	x	
2	M-SD02	M-SD2-101195	Sample	10/11/1995		x	x			x				x	x	x	x	x	
2	M-SD03	M-SD3-101195	Sample	10/11/1995		x	x			x				x	x	x	x	x	
2	M-SD04	M-SD4-101195	Sample	10/11/1995		x	x			x				x	x	x	x	x	
2	M-SD05	M-SD5-101295	Sample	10/12/1995		x	x			x				x	x	x	x	x	
2	M-SD16	M-SD16-101095	Sample	10/10/1995		x				x				x	x	x	x		
2	M-SD17	M-SD17-101195	Sample	10/11/1995		x				x				x	x	x	x		
2	SD25A	MIA013	Sample	9/29/1998	x				x				x		x		x		
2	SD25B	MIA014	Sample	9/29/1998	x				x				x		x		x		
2	SD25C	MIA015	Sample	9/29/1998	x				x				x		x		x		
2	SD26A	MIA023	Sample	9/29/1998	x				x				x		x		x		
2	SD26B	MIA024	Sample	9/29/1998	x				x				x		x		x		
2	SD26C	MIA025	Sample	9/29/1998	x				x				x		x		x		
2	SD26C	MIA026FD	FD	9/29/1998	x				x				x		x		x		
2	SD26D	MIA027	Sample	9/29/1998	x				x				x		x		x		
2	SD26E	MIA028	Sample	9/29/1998	x				x				x		x		x		
2	SE51A	SGB011	Sample	12/19/1996	x				x		x	x			x		x		
2	SE51B	SGB012	Sample	12/19/1996	x				x		x	x			x		x		
2	SE51C	SGB013	Sample	12/19/1996	x				x		x	x			x		x		
2	SE52A	SGB001	Sample	12/19/1996							x	x			x		x		
2	SE52B	SGB002	Sample	12/19/1996							x	x			x		x		
4	M-SD19	M-SD19-101195	Sample	10/11/1995		x				x				x	x	x	x	x	
4	SE54A	SGB008	Sample	12/20/1996	x				x			x			x		x		x
4	SE54B	SGB010	Sample	12/20/1996	x				x			x			x		x		x
4	SE54C	SGB009	Sample	12/20/1996	x				x			x			x		x		x

TABLE 17
SEDIMENT SAMPLE SUMMARY (2000 MI RI)
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

					VOC		TPH		SVOC		PAH	Pest	Pest/PCB		Metal			Dioxin/ Furan	
FU	Location	Sample ID	Sample Type	Sample Date	SW8260	CV390	SW8015 MOD	E418.1	SW8270	CSV390	SW8100	SW8080	SW8081	CP390	SW6010	SW9010	SW7471	SW8280	CDF991
4	SE55A	SGB017	Sample	12/22/1996	x				x			x			x		x		x
4	SE56A	SGB019	Sample	12/20/1996	x				x			x			x		x		x
4	SE56B	SGB020	Sample	12/20/1996	x				x			x			x		x		x
4	SE56C	SGB021	Sample	12/20/1996	x				x			x			x		x		x
4	SE56C	SGB150FD1	FD	12/20/1996	x				x			x			x		x		x

Notes:
1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).
FD = Field duplicate
FU = Functional unit
PAH = Polycyclic aromatic hydrocarbon
Pest/PCB = Pesticide / Polychlorinated biphenyl
SVOC = Semi-volatile organic compound
TPH = Total petroleum hydrocarbon
VOC = Volatile organic compound

TABLE 18
SURFACE WATER SAMPLE SUMMARY (2000 MI RI)
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

					Analytical Method										
					VOC		SVOC	PAH	Pest/PCB		Metal		Dioxin/ Furan	TSS	TOC
FU	Location	Sample ID	Sample Type	Sample Date	SW8260	SW8240	SW8270	SW8100	SW8081	SW8080	SW6010	SW7470	CDF991	E160.2	E415.2
2	SW10	LAWSW10	Sample	4/5/1989		x	x			x	x				
2	SW11	LAWSW11	Sample	1/2/1989		x	x			x	x				
2	SW12	LAWSW12	Sample	1/2/1989		x	x			x	x				
2	SW13	LAWSW13	Sample	1/2/1989			x				x				
2	SW25A1	RHA101	Sample	1/15/1997						x	x	x		x	x
2	SW25A1	WSRHA101	Sample	1/15/1997							x	x			
2	SW25B1	RHA102	Sample	1/15/1997	x		x			x	x	x		x	x
2	SW25B1	RHA117FD1	FD	1/15/1997	x		x			x	x	x		x	x
2	SW25B1	WSRHA102	Sample	1/15/1997							x	x			
2	SW25B1	WSRHA117FD1	FD	1/15/1997							x	x			
2	SW25B2	RHA110	Sample	1/23/1997	x		x			x	x	x		x	x
2	SW25B2	RHA118FD1	FD	1/23/1997	x		x			x	x	x		x	x
2	SW25B2	WSRHA110	Sample	1/23/1997							x	x			
2	SW25B2	WSRHA118FD1	FD	1/23/1997							x	x			
2	SW25C1	RHA103	Sample	1/15/1997						x	x	x		x	x
2	SW25C1	WSRHA103	Sample	1/15/1997							x	x			
2	SW25C2	RHA111	Sample	1/24/1997						x	x	x		x	x
2	SW25C2	WSRHA111	Sample	1/24/1997							x	x			
2	SW25D1	RHA104	Sample	1/15/1997						x	x	x		x	x
2	SW25D1	WSRHA104	Sample	1/15/1997							x	x			
2	SW25D2	RHA112	Sample	1/24/1997						x	x	x		x	x
2	SW25D2	WSRHA112	Sample	1/24/1997							x	x			
2	SW25E	MIA007	Sample	9/29/1998	x		x		x		x	x			
2	SW25F	MIA011	Sample	9/29/1998	x		x		x		x	x			
2	SW25G	MIA012	Sample	9/29/1998	x		x		x		x	x			
2	SW26A1	RHA105	Sample	1/15/1997						x	x	x		x	x
2	SW26A1	WSRHA105	Sample	1/15/1997							x	x			
2	SW26A2	RHA113	Sample	1/24/1997						x	x	x		x	x
2	SW26A2	WSRHA113	Sample	1/24/1997							x	x			
2	SW26B1	RHA106	Sample	1/15/1997						x	x	x		x	x
2	SW26B1	WSRHA106	Sample	1/15/1997							x	x			
2	SW26B2	RHA114	Sample	1/24/1997						x	x	x		x	x
2	SW26B2	WSRHA114	Sample	1/24/1997							x	x			

TABLE 18
SURFACE WATER SAMPLE SUMMARY (2000 MI RI)
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

					VOC		SVOC	PAH	Pest/PCB		Metal		Dioxin/ Furan	TSS	TOC
FU	Location	Sample ID	Sample Type	Sample Date	SW8260	SW8240	SW8270	SW8100	SW8081	SW8080	SW6010	SW7470	CDF991	E160.2	E415.2
2	SW26C1	RHA107	Sample	1/15/1997	x		x			x	x	x		x	x
2	SW26C1	WSRHA107	Sample	1/15/1997							x	x			
2	SW26C2	RHA115	Sample	1/23/1997	x		x			x	x	x		x	x
2	SW26C2	WSRHA115	Sample	1/23/1997							x	x			
2	SW26D1	RHA108	Sample	1/15/1997						x	x	x		x	x
2	SW26D1	WSRHA108	Sample	1/15/1997							x	x			
2	SW26D2	RHA116	Sample	1/24/1997						x	x	x		x	x
2	SW26D2	WSRHA116	Sample	1/24/1997							x	x			
2	SW26E	MIA016	Sample	9/29/1998	x		x		x		x	x			
2	SW26F	MIA017	Sample	9/29/1998	x		x		x		x	x			
2	SW26G	MIA018	Sample	9/29/1998	x		x		x		x	x			
2	SW26G	MIA019FD	FD	9/29/1998	x		x		x		x	x			
2	SW26H	MIA021	Sample	9/29/1998	x		x		x		x	x			
2	SW26I	MIA022	Sample	9/29/1998	x		x		x		x	x			
2	SW3	LAWSW3	Sample	4/5/1989		x	x				x				
2	SW4	LAWSW4	Sample	4/5/1989		x	x				x				
2	SW5	LAWSW5	Sample	4/5/1989		x	x				x				
2	SW51A	SGB014	Sample	12/12/1996	x		x			x	x	x			
2	SW51A	WSSGB014	Sample	12/12/1996							x	x			
2	SW51B	SGB015	Sample	12/12/1996	x		x			x	x	x			
2	SW51B	WSSGB015	Sample	12/12/1996							x	x			
2	SW51C	SGB016	Sample	12/12/1996	x		x			x	x	x			
2	SW51C	WSSGB016	Sample	12/12/1996							x	x			
2	SW52A	SGB003	Sample	12/12/1996				x		x	x	x			
2	SW52A	WSSGB003	Sample	12/12/1996							x	x			
2	SW52B	SGB004	Sample	12/12/1996				x		x	x	x			
2	SW52B	WSSGB004	Sample	12/12/1996							x	x			
2	SW6	LAWSW6	Sample	4/5/1989						x	x				
2	SW7	LAWSW7	Sample	4/5/1989		x	x				x				
2	SW8	LAWSW8	Sample	4/5/1989		x	x				x				
2	SW9	LAWSW9	Sample	4/5/1989		x	x			x	x				
4	SW14	LAWSW14	Sample	1/2/1989		x	x				x				
4	SW2	LAWSW2	Sample	4/6/1989		x				x	x				
4	SW54A	SGB005	Sample	12/12/1996	x		x			x	x	x	x		

TABLE 18
SURFACE WATER SAMPLE SUMMARY (2000 MI RI)
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

					VOC		SVOC	PAH	Pest/PCB		Metal		Dioxin/ Furan	TSS	TOC
FU	Location	Sample ID	Sample Type	Sample Date	SW8260	SW8240	SW8270	SW8100	SW8081	SW8080	SW6010	SW7470	CDF991	E160.2	E415.2
4	SW54A	WSSGB005	Sample	12/12/1996							x	x			
4	SW54B	SGB006	Sample	12/12/1996	x		x			x	x	x	x		
4	SW54B	WSSGB006	Sample	12/12/1996							x	x			
4	SW54C	SGB007	Sample	12/12/1996	x		x			x	x	x	x		
4	SW54C	WSSGB007	Sample	12/12/1996							x	x			
4	SW55A	SGB018	Sample	12/12/1996	x		x			x	x	x	x		
4	SW55A	WSSGB018	Sample	12/12/1996							x	x			
4	SW56A	SGB022	Sample	12/12/1996	x		x			x	x	x	x		
4	SW56A	WSSGB022	Sample	12/12/1996							x	x			
4	SW56B	SGB023	Sample	12/12/1996	x		x			x	x	x	x		
4	SW56B	WSSGB023	Sample	12/12/1996							x	x			
4	SW56C	SGB024	Sample	12/12/1996	x		x			x	x	x	x		
4	SW56C	SGB091FD1	FD	12/12/1996	x		x			x	x	x	x		
4	SW56C	WSSGB024	Sample	12/12/1996							x	x			
4	SW56C	WSSGB091FD1	FD	12/12/1996							x	x			

Notes:

1) The analytical data are summarized from the 2000 Main Installation (MI) Remedial Investigation (RI) (CH2M HILL, 2000).

FD = Field duplicate

FU = Functional unit

PAH = Polycyclic aromatic hydrocarbon

Pest/PCB = Pesticide / Polychlorinated biphenyl

SVOC = Semi-volatile organic compound

TOC = Total organic carbon

TSS = Total suspended solids

VOC = Volatile organic compound

TABLE 19
SOIL PROJECT ACTION LIMITS AND LABORATORY LIMITS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Medium	Analyte	CASRN	Unit	Method	Residential Soil Regional Screening Level[1]	Industrial Soil Regional Screening Level[1]	Laboratory Limits	
							Reporting Limit	Method Detection Limit
Soil	Chromium(III), Insoluble Salts	16065-83-1	mg/kg	6010, SW7196/3060, calc.	12000	180000	Not provided. See note.[2]	
Soil	Chromium(VI)	18540-29-9	mg/kg	6010, SW7196/3060, calc.	0.3	6.3	1.0	0.20
Soil	Chromium, Total	7440-47-3	mg/kg	6010, SW7196/3060, calc.	NC	NC	3.5	0.14
Soil	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	pg/g	8290A	4.8	22	5.0	.0.01
Soil	1,2,3,7,8-PeCDD		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,4,7,8-HxCDD		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,6,7,8-HxCDD		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,7,8,9-HxCDD		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,4,6,7,8-HpCDD		pg/g	8290A	NC	NC	12.5	0.01
Soil	OCDD		pg/g	8290A	NC	NC	25.0	0.01
Soil	2,3,7,8-Tetrachlorodibenzofuran (TCDF)		pg/g	8290A	NC	NC	5.0	.0.01
Soil	1,2,3,7,8-PeCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	2,3,4,7,8-PeCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,4,7,8-HxCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,6,7,8-HxCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,7,8,9-HxCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	2,3,4,6,7,8-HxCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,4,6,7,8-HpCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	1,2,3,4,7,8,9-HpCDF		pg/g	8290A	NC	NC	12.5	0.01
Soil	OCDF		pg/g	8290A	NC	NC	25.0	0.01
Soil	Total TCDDs	41903-57-5	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total PeCDDs	36088-22-9	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total HxCDDs	34465-46-8	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total HpCDDs	37871-00-4	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total TCDFs	55722-27-5	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total PeCDFs	30402-15-4	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total HxCDFs	55684-94-1	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	Total HpCDFs	38998-75-3	pg/g	8290A	NC	NC	Not provided. See note.[2]	
Soil	TCDD Equivalent	DIOXIN-TEQ	pg/g	8290A	4.8	22	Not provided. See note.[2]	

Criteria:
1) United States Environmental Protection Agency (USEPA), 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1

Notes:
2) These results are calculated. There are no applicable reporting limits or method detection limits.

Abbreviations:
mg/kg = milligrams per kilogram
NC = no criterion available
pg/g = picogram per gram

TABLE 20
SEDIMENT PROJECT ACTION LIMITS AND LABORATORY LIMITS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Medium	Analyte	CASRN	Unit	Method	Residential Soil Regional Screening Level, 2021[2]	Industrial Soil Regional Screening Level, 2021[2]	USEPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018[1]	USEPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018[1]	Laboratory Limits	
									Reporting Limit	Method Detection Limit
Sediment	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	pg/g	8290A	4.8	22	NC	0.5	5.0	.0.01
Sediment	1,2,3,7,8-PeCDD	40321-76-4	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,4,7,8-HxCDD	39227-28-6	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,6,7,8-HxCDD	57653-85-7	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,7,8,9-HxCDD	19408-74-3	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,4,6,7,8-HpCDD	35822-46-9	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	OCDD	3268-87-9	pg/g	8290A	NC	NC	NC	NC	25.0	0.01
Sediment	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9	pg/g	8290A	NC	NC	NC	NC	5.0	.0.01
Sediment	1,2,3,7,8-PeCDF	57117-41-6	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	2,3,4,7,8-PeCDF	57117-31-4	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,4,7,8-HxCDF	70648-26-9	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,6,7,8-HxCDF	57117-44-9	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,7,8,9-HxCDF	72918-21-9	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	2,3,4,6,7,8-HxCDF	60851-34-5	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,4,6,7,8-HpCDF	67562-39-4	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	1,2,3,4,7,8,9-HpCDF	55673-89-7	pg/g	8290A	NC	NC	NC	NC	12.5	0.01
Sediment	OCDF	39001-02-0	pg/g	8290A	NC	NC	NC	NC	25.0	0.01
Sediment	Total TCDDs	41903-57-5	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total PeCDDs	36088-22-9	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total HxCDDs	34465-46-8	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total HpCDDs	37871-00-4	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total TCDFs	55722-27-5	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total PeCDFs	30402-15-4	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total HxCDFs	55684-94-1	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	Total HpCDFs	38998-75-3	pg/g	8290A	NC	NC	NC	NC	Not provided. See note.[3]	
Sediment	TCDD Equivalent	DIOXIN-TEQ	pg/g	8290A	4.8	22	NC	0.5	Not provided. See note.[3]	

Criteria:

1) United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

2) USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

Note:

3) These results are calculated. There are no applicable reporting limits or method detection limits.

Abbreviations:

NC = no criterion available
pg/g = picogram per gram

TABLE 21
SURFACE WATER PROJECT ACTION LIMITS AND LABORATORY LIMITS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis Tennessee

Medium	Analyte	CASRN	Unit	Method	EPA R4 Ecological Freshwater Surface Water Screening Value Acute, 2018[3]	EPA R4 Ecological Freshwater Surface Water Screening Value Chronic, 2018[3]	National Recommended Water Quality Criteria - HH Criteria Table, 2019[4]		National Primary Drinking Water Regulations, 2009[2]	TDEC General Water Quality Criteria, 2019[5]	Laboratory Limits	
							Human Health Water+Organism	Human Health for Organism Only			Reporting Limit	Method Detection Limit
Surface Water	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6	ng/L	8290A	NC	3.10E-06	5.00E-06	5.10E-06	0.03	0.03	0.050	0.00001
Surface Water	1,2,3,7,8-PeCDD	40321-76-4	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,4,7,8-HxCDD	39227-28-6	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,6,7,8-HxCDD	57653-85-7	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,7,8,9-HxCDD	19408-74-3	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,4,6,7,8-HpCDD	35822-46-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	OCDD	3268-87-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.250	0.00001
Surface Water	2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.050	0.00001
Surface Water	1,2,3,7,8-PeCDF	57117-41-6	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	2,3,4,7,8-PeCDF	57117-31-4	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,4,7,8-HxCDF	70648-26-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,6,7,8-HxCDF	57117-44-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,7,8,9-HxCDF	72918-21-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	2,3,4,6,7,8-HxCDF	60851-34-5	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,4,6,7,8-HpCDF	67562-39-4	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	1,2,3,4,7,8,9-HpCDF	55673-89-7	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.125	0.00001
Surface Water	OCDF	39001-02-0	ng/L	8290A	NC	NC	NC	NC	NC	NC	0.250	0.00001
Surface Water	Total TCDDs	41903-57-5	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total PeCDDs	36088-22-9	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total HxCDDs	34465-46-8	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total HpCDDs	37871-00-4	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total TCDFs	55722-27-5	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total PeCDFs	30402-15-4	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total HxCDFs	55684-94-1	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	Total HpCDFs	38998-75-3	ng/L	8290A	NC	NC	NC	NC	NC	NC	Not provided. See note.[1]	
Surface Water	TCDD Equivalent	DIOXIN-TEQ	ng/L	8290A	NC	3.10E-06	5.00E-06	5.10E-06	0.03	0.03	Not provided. See note.[1]	

Note:
1) These results are calculated. There are no applicable reporting limits or method detection limits.

Criteria:
2) United States Environmental Protection Agency (USEPA), 2009. National Primary Drinking Water Regulation Table. May 2009. Available online: https://www.epa.gov/ground-water-and-drinking-water/national-primary-drinking-water-regulations
3) USEPA, 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
4) USEPA, 2019. National Recommended Water Quality Criteria – Human Health (HH) Criteria Table. Available online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
5) Tennessee Department of Environment and Conservation (TDEC), 2019. Chapter 0400-40-03 General Water Quality Criteria. December 19. Available online: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-tennessee

Abbreviations:
NC = No criterion available
ng/L = Nanogram per liter

TABLE 22
SAMPLING PLAN DETAIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis, Tennessee

Media	Analytes	Analytical Method	Borings/ Locations	Field Samples	Field Duplicates	MS	MSD	Trip Blanks	Equipment Blanks	Total No. of Samples	Preservative	Holding Time[2]	Container Size and Type	Turn Around Time	Analytical Laboratory
Surface & Subsurface Soil [1]	Dioxins-Furans Suite, TCDD Equivalent	8290A	16	40	4	2	2	0	4	52	Cool ≤6 degrees C, dark	30/45 days	4-ounce glass jar with Teflon-lined cap	6-8 weeks	APPL, Inc.
Soil (0-1 foot)	Chromium (III), Insoluble Salts Chromium (VI) Chromium, Total	6010/ SW7196/ 3060 Calc.	20	20	2	1	1	0	4	28	Cool ≤6 degrees C	30 days	4-ounce glass jar with Teflon-lined cap	2 weeks	APPL, Inc.
Sediment (0-2 inches)	Dioxins-Furans Suite, TCDD Equivalent	8290A	12	12	2	1	1	0	4	20	Cool ≤6 degrees C, dark	30/45 days	4-ounce glass jar with Teflon-lined cap	6-8 weeks	APPL, Inc.
Surface Water	Dioxins-Furans Suite, TCDD Equivalent	8290A	9	9	1	1	1	0	2	14	Cool ≤6 degrees C, dark	30/45 days	1-liter amber glass with Teflon-lined cap	6-8 weeks	APPL, Inc.

Notes:
1) Samples that will be analyzed for dioxins/furans will be collected at 0 to 6 inches, 12 to 18 inches and 60 to 66 inches.
2) 30/45 days = 30 days from collection to extraction, 45 days from extraction to analysis
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
C = Centigrade
MS = Matrix spike
MSD = Matrix spike duplicate

TABLE 23
FIELD SAMPLE SUMMARY BY FUNCTIONAL UNIT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
Main Installation, Defense Depot Memphis, Tennessee

Functional Unit	Media	Field Sample Count for Dioxins-Furans Suite, TCDD Equivalent	Sample Location Description	Field Sample Count for Chromium (III), Insoluble Salts Chromium (VI) Chromium, Total	Sample Location Description
4	Surface & Subsurface Soil	33	10 soil borings in the former PCP dip vat area near Building 737. 1 soil boring in the holding pond. 3 samples collected at each boring by depth, 0 to 6, 12 to 18, and 60 to 66 inches.	--	--
4	Soil (0-1 foot)	2	2 surface soil samples at the outfalls in concrete-lined and unlined drainage features.	10	Near Building 949, the location of the former removal action.
4	Surface Water	4	Concrete-lined and unlined drainage features	--	--
4	Sediment	6	5 in the concrete-lined and unlined drainage features. 1 in an intermittently wet area near the former PCP dip vat area.	--	--
2	Soil (0-1 foot)	2	Outfalls of the concrete-lined drainage features	--	--
2	Surface Water	4	Concrete-lined drainage features / outfalls	--	--
2	Sediment	5	Concrete-lined drainage features / outfalls	--	--
3	Soil (0-1 foot)	3	1 soil boring in the holding pond. 3 samples collected in the boring by depth, 0 to 6, 12 to 18, and 60 to 66 inches.	10	Near Buildings 1086, 1087, 1088, and 1089, the location of the former removal action.
3	Surface Water	1	Concrete-lined drainage feature / outfall	--	--
3	Sediment	1	Concrete-lined drainage feature / outfall	--	--
Total Samples:		61		20	

Notes:
-- = Not applicable
TCDD = 2,3,7,8-Tetrachlorodibenzo-p-dioxin

Figures

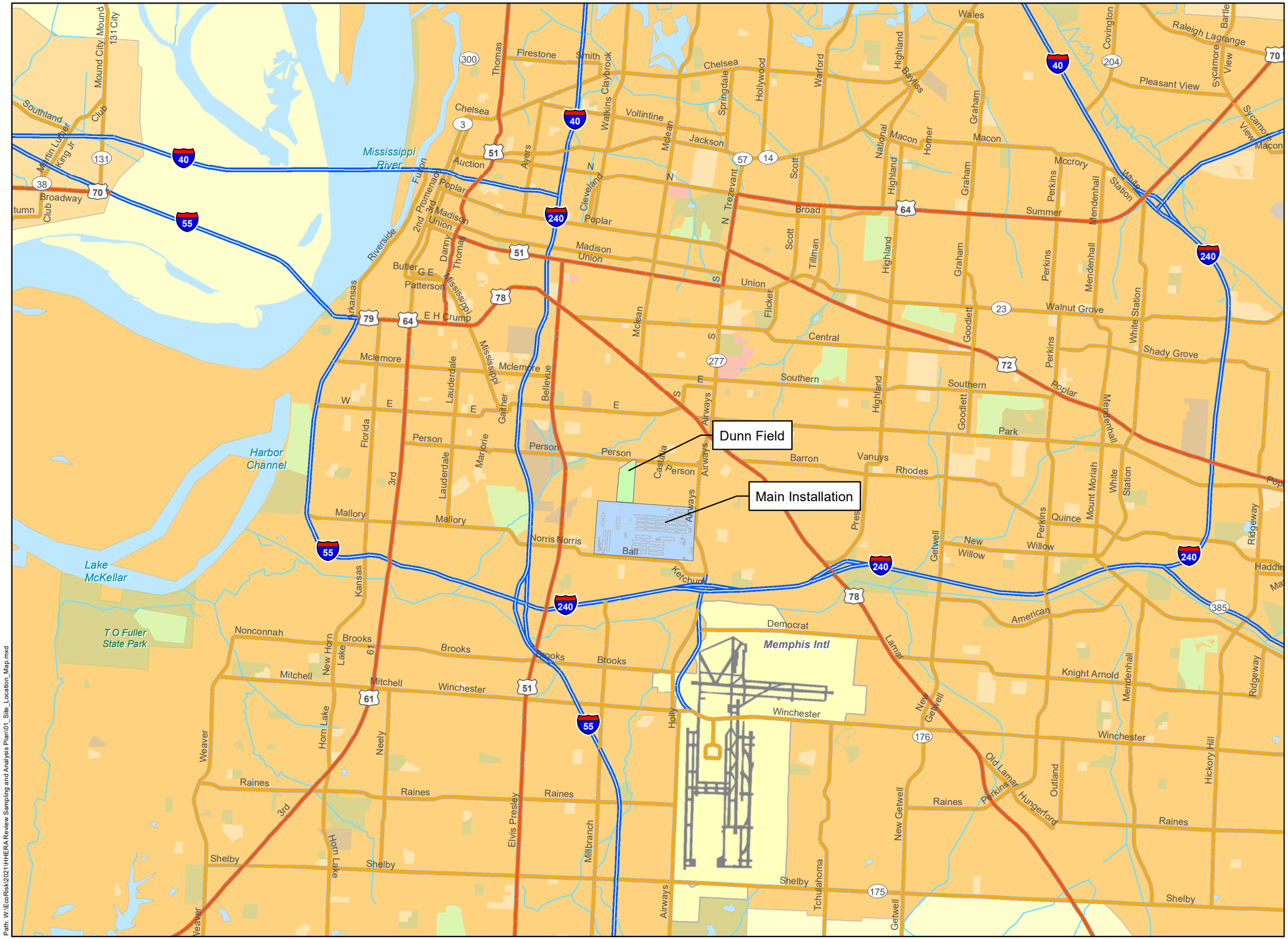


Figure 1

Site Location Map

HHERA Review
Sampling and Analysis Plan

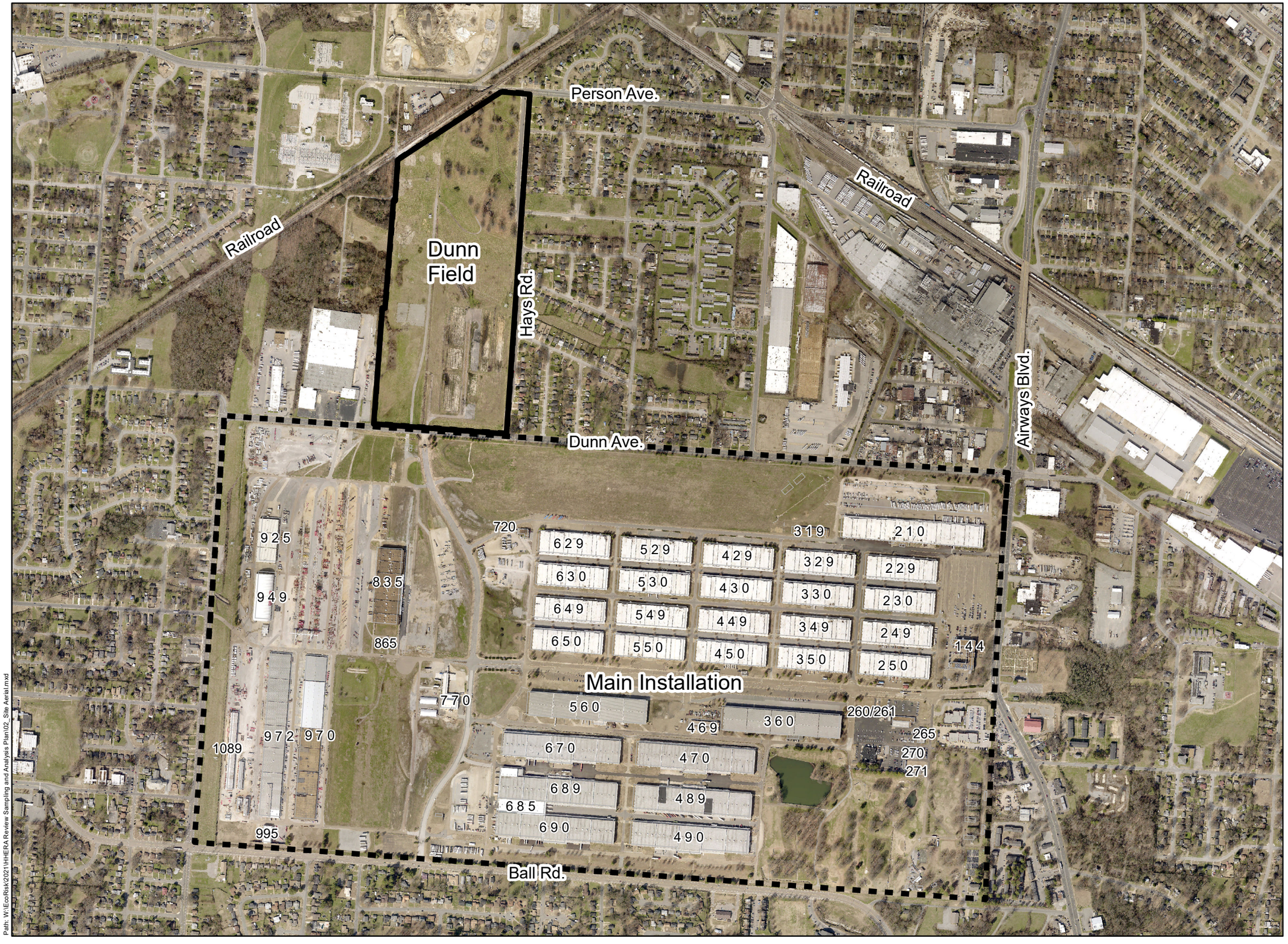
Main Installation
Defense Depot
Memphis, Tennessee

N
W E
S

0 1 2
Miles

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/27/2021
Edition: Rev 0



Path: W:\Eco\Risk\2021\HHERA Review Sampling and Analysis Plan\02_Site Aerial.mxd

Figure 2

Site Aerial Photograph

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

Legend

- Main Installation Perimeter
- Dunn Field Perimeter

Notes:
1. Aerial date: 2019.
2. Source: Shelby County TN Regional GIS Department.

N
W E
S

0 500 1,000
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/27/2021
Edition: Rev 0

Figure 3

Main Installation Unit Boundaries and Response Actions

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

OU-1
OU-2
OU-3
OU-4
FU-1
FU-2
FU-3
FU-4
FU-5
FU-6
Bldg. 949 Surface Soil Removal Action (2001)
Former PCP Dip Vat Soil Removal Action (1985)
Cafeteria (Bldg 274) Surface Soil Removal Action (1998)
BRAC Parcels 35 & 28 Surface Soil Removal Action (2000)
Building 873 Recoupment (1985)
Housing Area Surface Soil Removal Action (1998)
Hays St
Castalia
Dunn Ave
Airways Blvd
Perry Rd
W E Freeman
Memphis Depot Pkwy
Amido
Ball Rd
Vista
Ketchum
925
949
835
865
970
972
1089
1086
1088
1087
1091
995
720
737
629
630
649
650
529
530
549
550
429
430
449
450
329
330
349
350
229
230
249
250
319
210
144
756
770
560
469
468
360
670
689
685
690
470
489
490
263
261
260
265
270
271
274
0
500
1,000
Feet
N
W
E
S
Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88
Date: 5/28/2021
Edition: Rev 0

Legend

- Operable Units (OU-#)
- Past Response Actions
- Functional Unit Boundary (FU-#)
- Area Available for Unrestricted Use
- Buildings *490 - DDMT Assigned Number*
- Roads

Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\03_MI Units and Actions.mxd

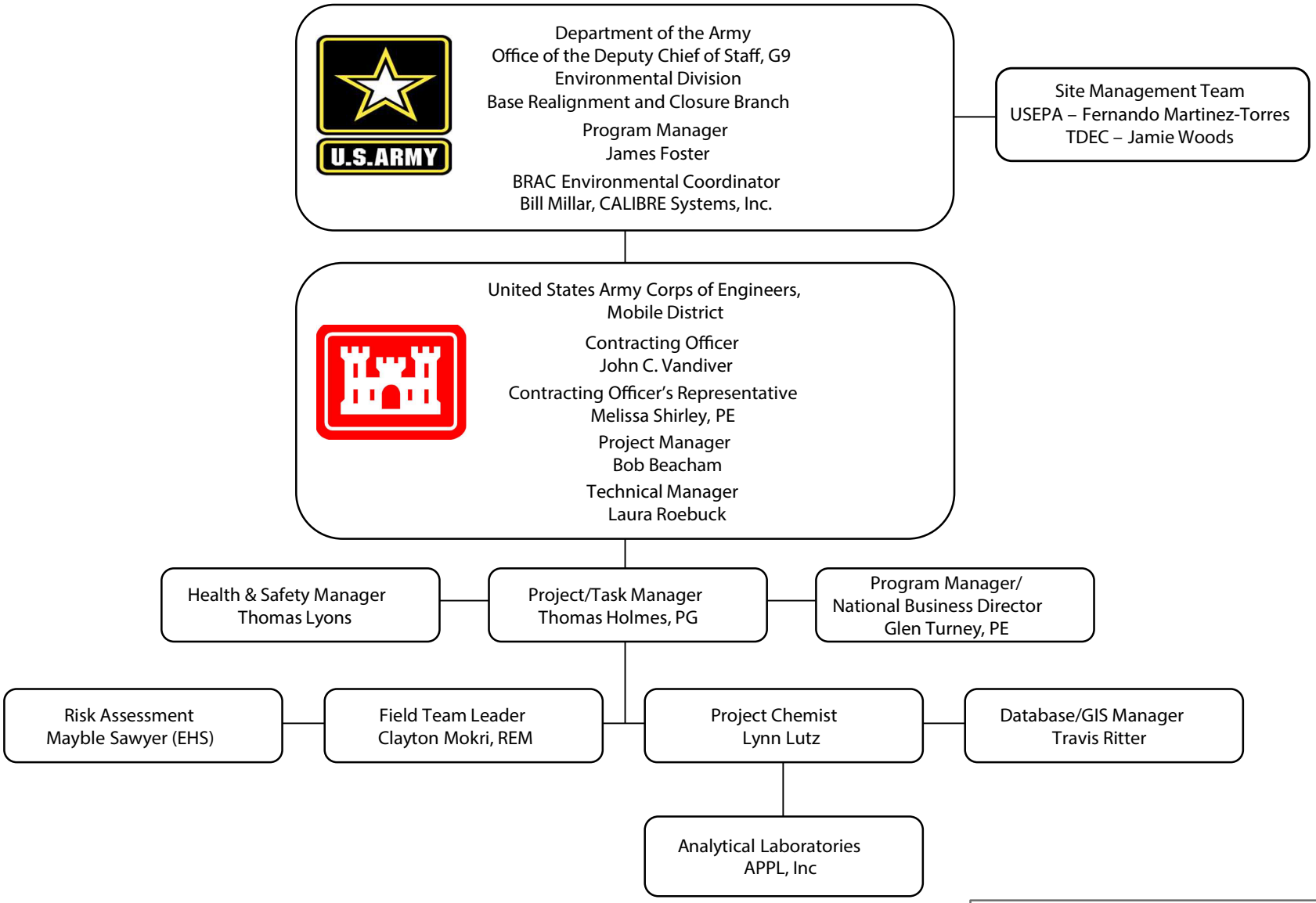


Figure 4

Project Organization

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

Date: 5/11/2022
Edition: Rev 1

Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\04_Org Chart.mxd



Legend

Category

- Golf Course
- Gravel
- Landscape
- Open Space
- Paved
- Holding Pond
- Roads
- Buildings *490 - DDMT Assigned Number*
- Surface Water

Figure 5

Surface Cover

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

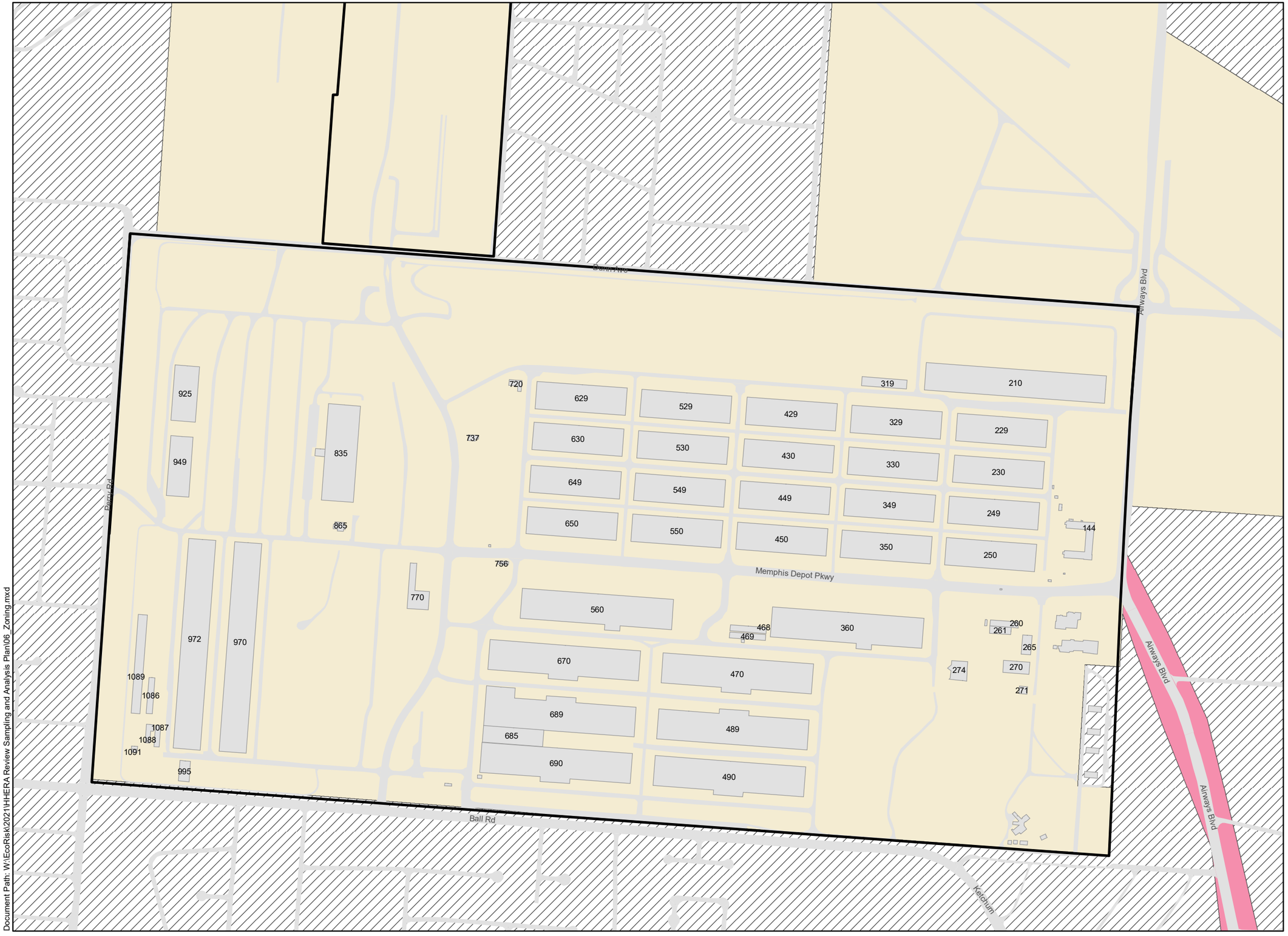
0 250 500

Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\05_MISurface Cover.mxd



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Figure 6

Area Zoning Map

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

Legend

- EMP: Commercial/Industrial
- CMU: Commercial
- R: Residential
- Buildings
- Roads
- Property Boundary

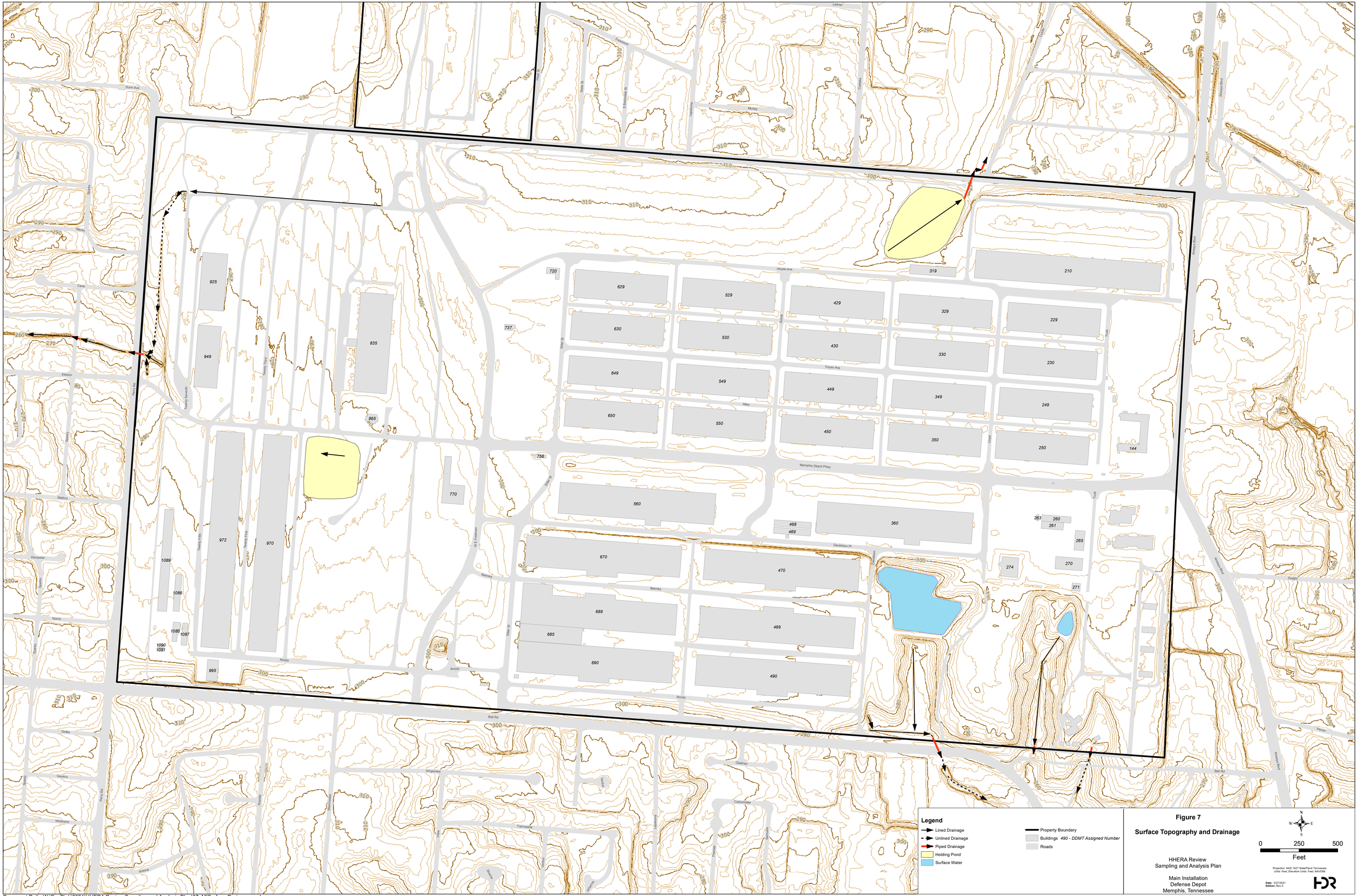
Source: Shelby County Zoning Atlas
https://gis.shelbycountytn.gov/zoning/

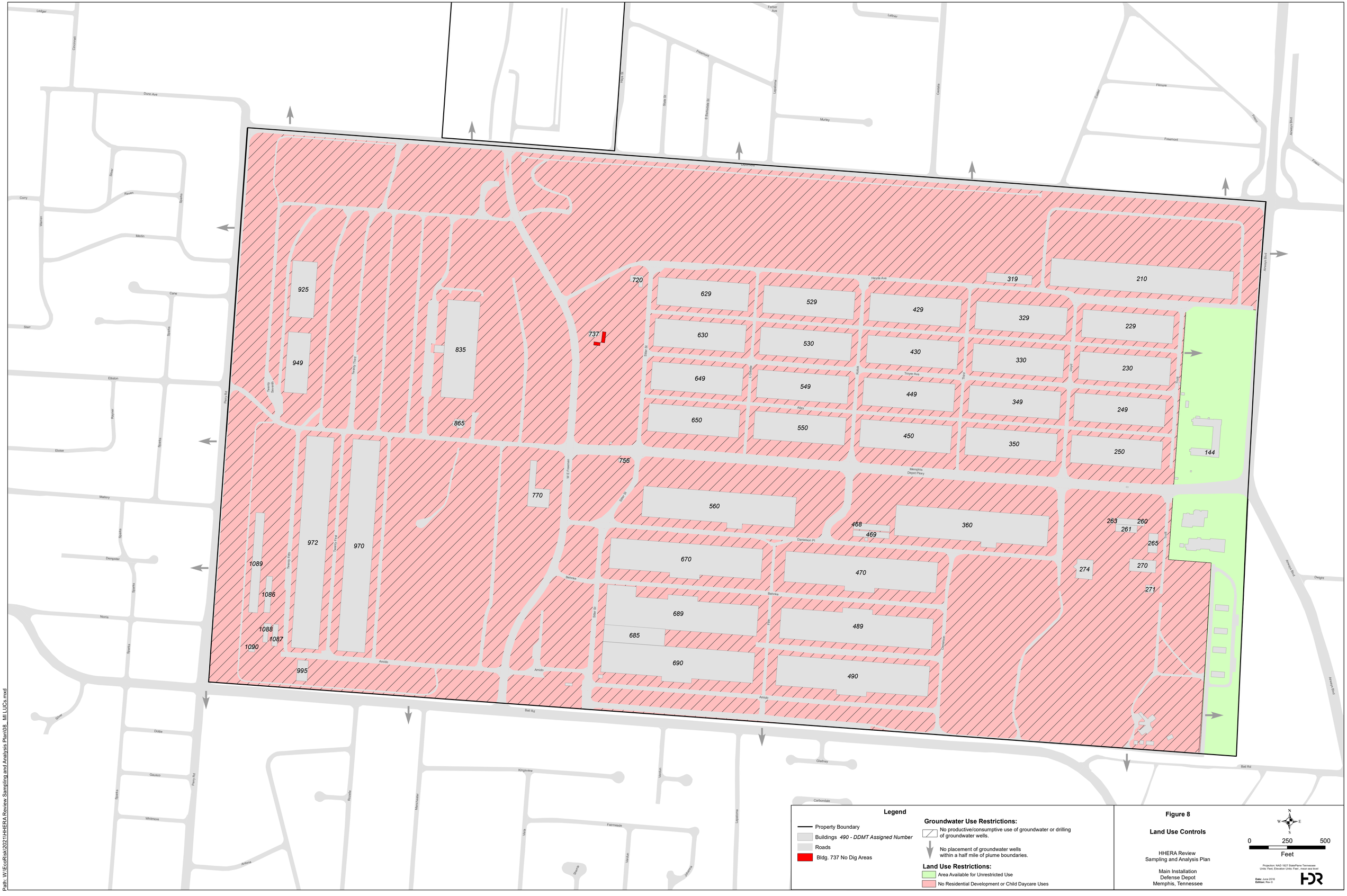
N
W E
S

0 500 1,000
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/27/2021
Edition: Rev 0


Legend
Lined Drainage
Unlined Drainage
Piped Drainage
Holding Pond
Surface Water
Property Boundary
Buildings 490 - DDMT Assigned Number
Roads
Figure 7
Surface Topography and Drainage
HHERA Review
Sampling and Analysis Plan
Main Installation
Defense Depot
Memphis, Tennessee
0 250 500
Feet
Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88
Date: 5/27/2021
Edition: Rev 0
Memphis Depot Pkwy
Ball Rd
Amido
Behnke
Troyer Ave
Alley
Heyde Ave
Davidson Pl
Dunn Ave
Mallory
Dempster
Spikes
Norris
Dolbie
Gloucco
Whitmore
Perry Rd
Ellston
Cane
Merlin
Skyler
Kingview
Fairmeade
Gladney
Carbondale
Arkansas Blvd
Pecan
Jeffries Blvd
Lamar Ave
Florida St
Stiles St
Lauderdale St
Lindbergh
Leitner
Murtey
Cedars
Trigg
Thies
Lloyd
Trull
Twenty Fifth
Twenty First
Twenty Second
Twenty Third
W.F. Freeman
Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\07_MISurface Drainage.mxd



Legend

- Property Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Bldg. 737 No Dig Areas

Groundwater Use Restrictions:

- No productive/consumptive use of groundwater or drilling of groundwater wells.
- No placement of groundwater wells within a half mile of plume boundaries.

Land Use Restrictions:

- Area Available for Unrestricted Use
- No Residential Development or Child Daycare Uses

Figure 8

Land Use Controls

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet , mean sea level

Date: June 2016
Edition: Rev 0

HDR

Path: W:\Eco\Risk\2021\HHERA Review Sampling and Analysis Plan\08_MI LUCs.mxd



Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\09_Site Plan.mxd

Legend

- Alpha Omega Veterans' Housing
- Barnhart Crane Administrative Area
- Barnhart Crane Operations Area
- DRC-Undeveloped
- Detention Basin
- Golf Course
- Memphis Depot Industrial Park
- Memphis PD Airport Precinct
- Supply Chain Solutions
- Property Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads

Figure 9

Site Plan

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N
W E
S

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 9/27/2021
Edition: Rev 0

HDR



Legend

- Dibenzofuran
- Dioxins - Furans
- PCP Locations Soils
- Property Boundary
- Roads
- Buildings
- ClayArea — *Clay Elevation Exceeds Groundwater Elevation*
- Excavations
- Area Available for Unrestricted Use
- Functional Unit Boundary
- 3 — Functional Unit Number

Figure 10

PCP and Dioxins-Furans Soil Sample Locations

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\10_PCP and Dioxins_Furans_SO.mxd



Legend

- Sediment
- Surface Water
- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 11

PCP and Dioxins-Furans Sediment and Surface Water Sample Locations

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\11_PCP_Diox_Fur_SD_SW.mxd



Figure 12

1998 FU-6 Family Housing Area Excavation

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

Legend

- 12" Deep Excavation
- 6" Deep Excavation

N
W E
S

0 50 100
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\12_HousingArea.mxd



Notes
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Arsenic (mg/Kg)
- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

- Property Boundary
- Holding Pond
- Excavations
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 13

Arsenic Analytical Results in Surface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\13_SS_Arsenic.mxd



Notes:
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

- Property Boundary
- Holding Pond
- Excavations
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 14

Total Chromium Analytical Results in Surface Soil

HHERA Review
Sampling and Analysis Plan

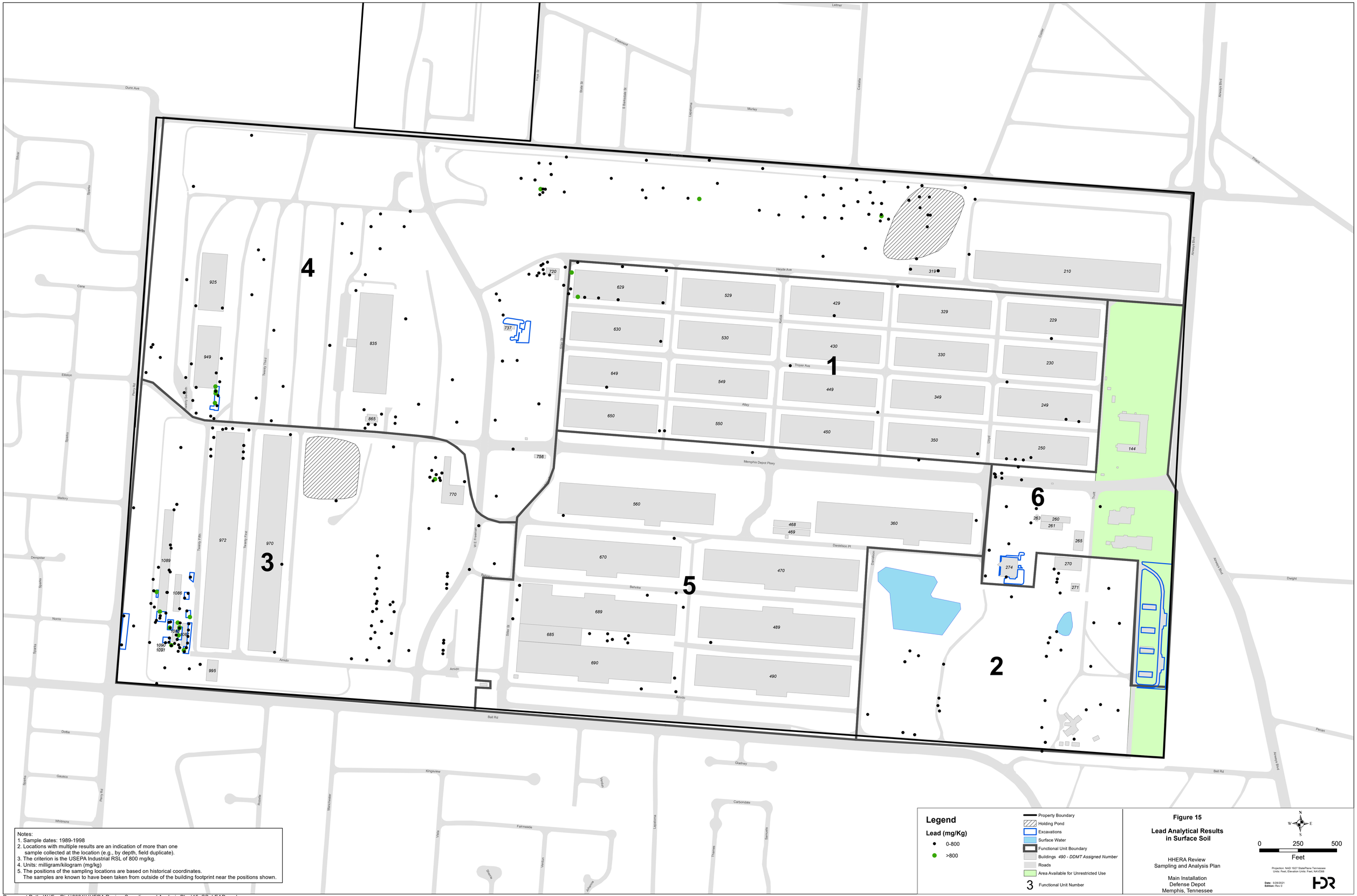
Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\14_SS_Total CH.mxd



Notes:
1. Sample dates: 1989-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Lead (mg/Kg)
- 0-800
- >800

- Property Boundary
- Holding Pond
- Excavations
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 15

Lead Analytical Results in Surface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Legend

- Sediment
- Surface Water
- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 16

Sediment and Surface Water Sample Locations

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\16_SW_SE_Locations.mxd



Note:
Soil samples will be collected at three depth s: 0-1', 1-2' and 5-6', except where identified as a surface sample only.

Legend

- Previous Sample Locations
- Proposed Soil Boring Location
- Proposed Surface Sample Location
- Property Boundary
- Excavations
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure 17

Proposed Sampling Locations for Dioxins and Furans in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

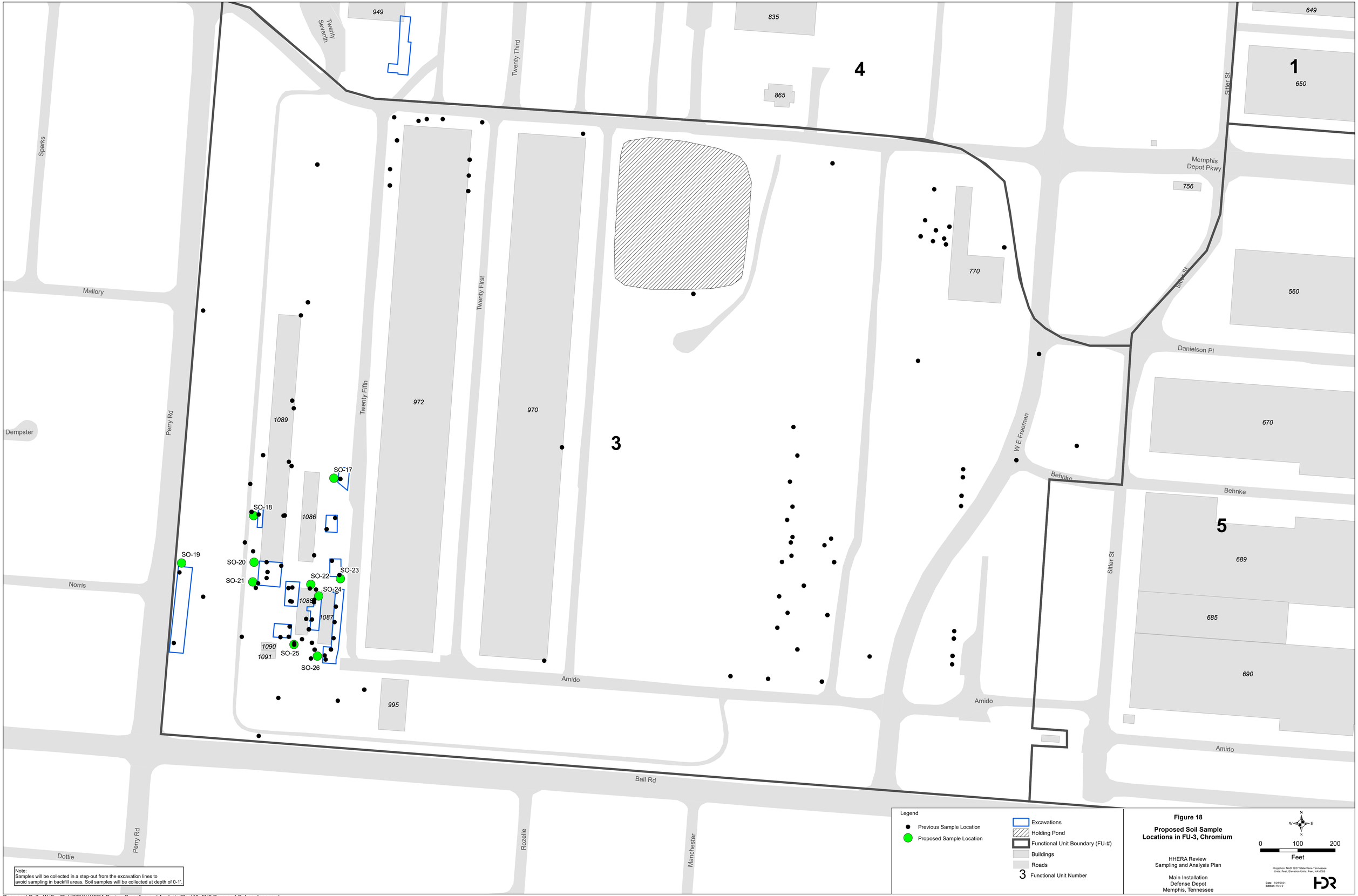
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Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 6/1/2021
Edition: Rev 0

HDR

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\17_Proposed Locations.mxd



Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\18_FU3 Proposed Cr Locations.mxd



Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\19_ FU4 Proposed Cr Locations.mxd

FU-1
FU-2
FU-3
FU-4
FU-5
FU-6
SE-01 SW-01
SE-02
SW-02
SE-03
SW-03
SE-04
SW-04
SE-05
SW-05
SE-06
SW-06
SE-07
SW-07
SE-08
SW-08
SW-09
SE-09
SE-10
SE-11
SE-12

Note:
Proposed co-located surface water and sediment samples will be collected from depositional areas in the piped drainage on-site.

Legend

- Proposed Sediment Sample Location
- Proposed Surface Water Sample Location
- Previous Sediment Sample Location
- Previous Surface Water Sample Location
- Lined Drainage
- Unlined Drainage
- Piped Drainage
- Surface Water
- Holding Pond
- Property Boundary
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- 3 Functional Unit Numbe

Figure 20

Proposed Sediment and Surface Water Sample Locations

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\20_SW_SD_Proposed Sample Locations.mxd

A

Appendix A

PCP Dip Vat Removal Action Figures

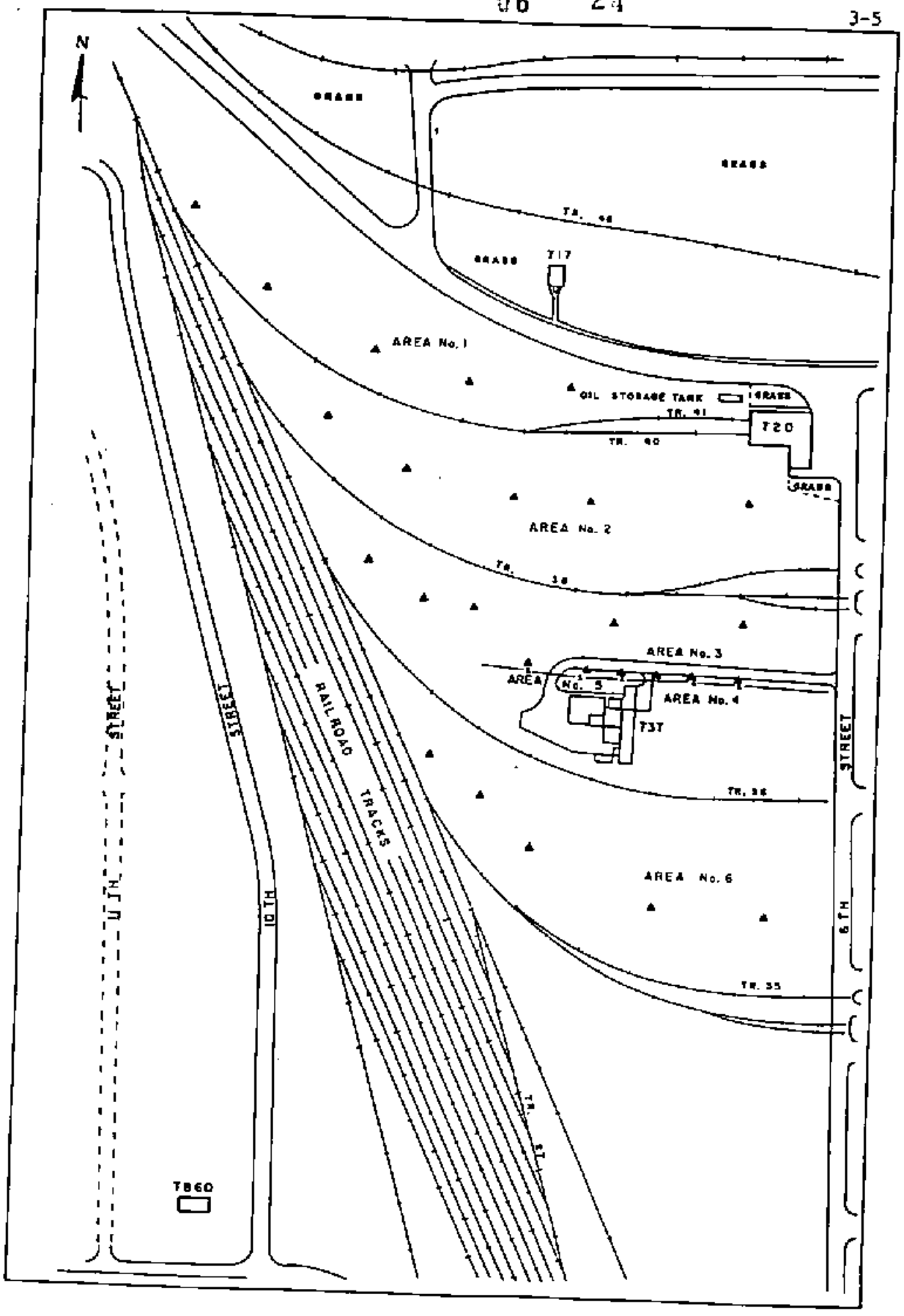


Figure 3. Sample Points of Gravelled Areas.

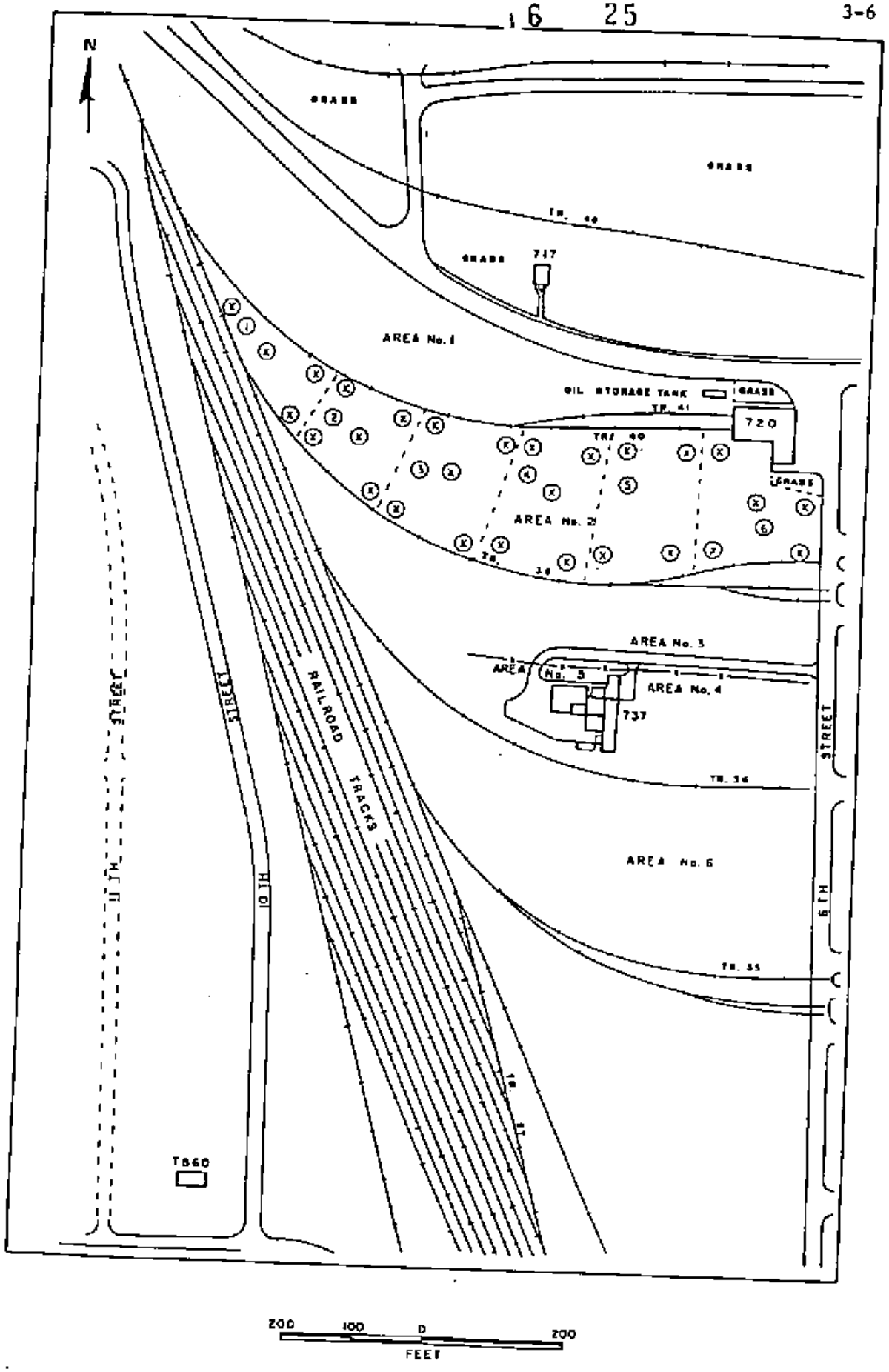


Figure 4. Additional Sampling of Gravel Area No. 2

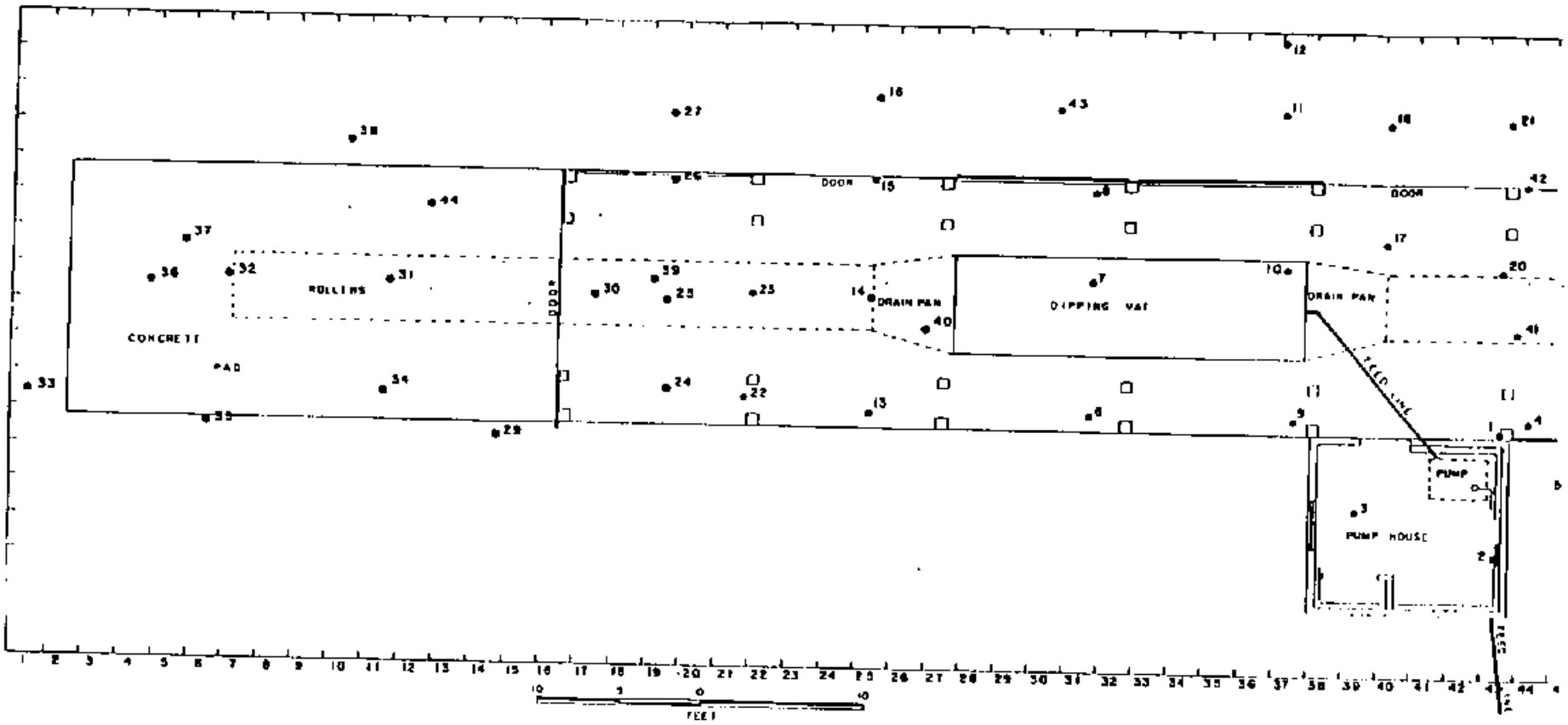


Figure 5. Borehole Locations in Building 7.

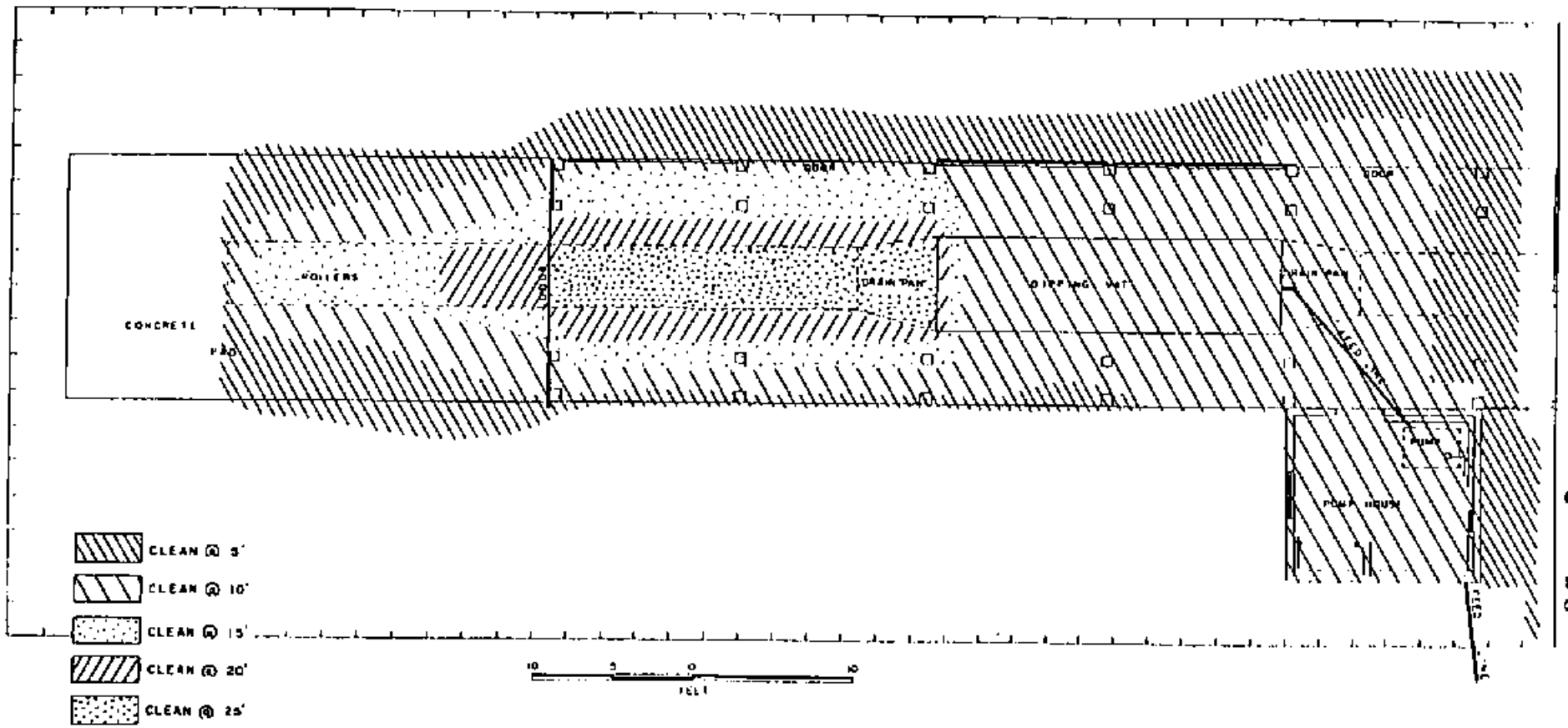
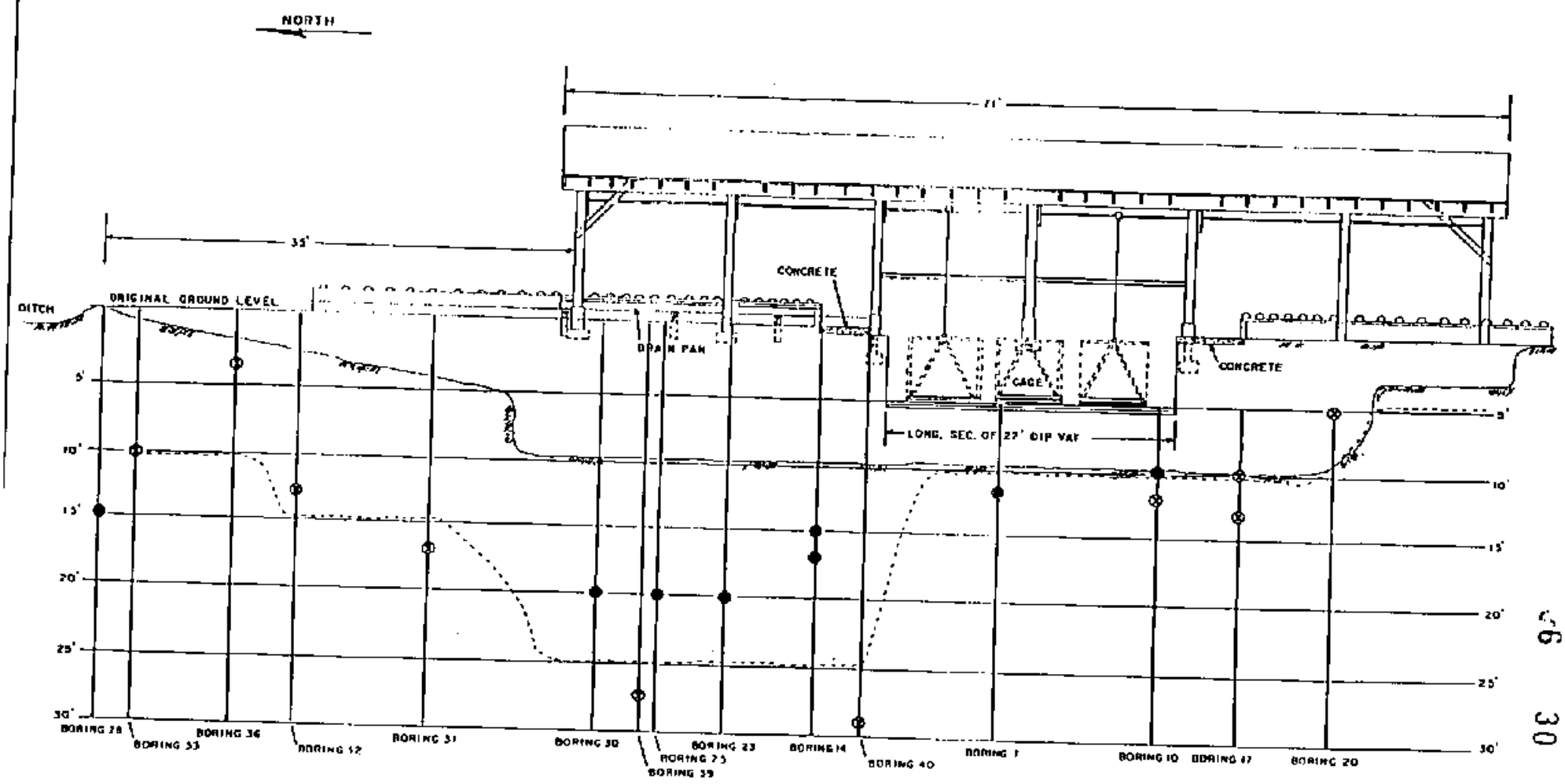


Figure 6.

Soil Contamination Profile - Building 737



RED SAMPLE POINT=>200 PPB TOTAL DIOXINS AND FURANS
BLUE SAMPLE POINT=<200 PPB TOTAL DIOXINS AND FURANS
------ THEORIZED CONTAMINATION LIMITS (SEE FIGURE 6)

Figure 7.
Longitudinal Cross-Section of
Building 737 Showing Extent
of Contamination

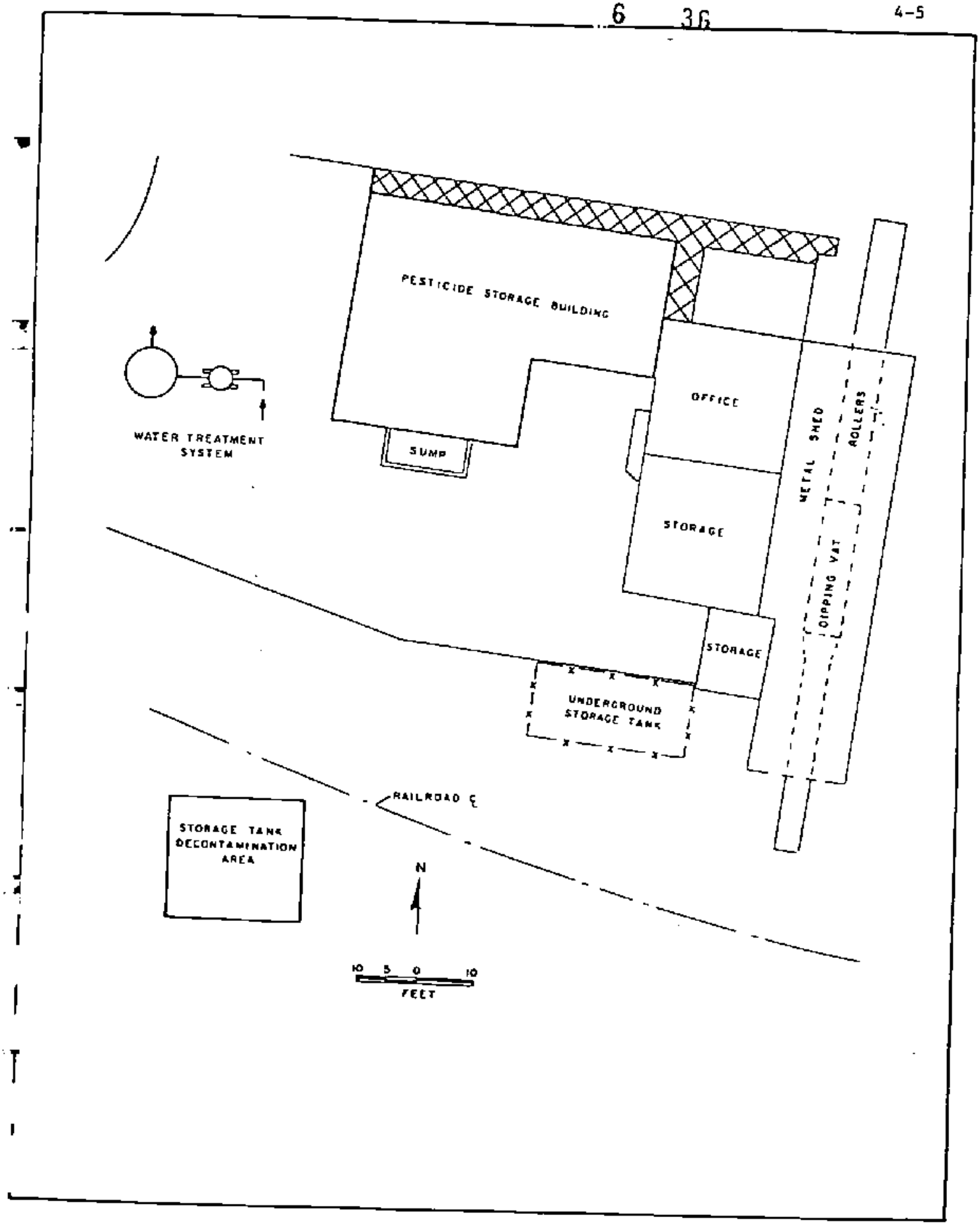


Figure 8. Layout of Building 737 Work Area.

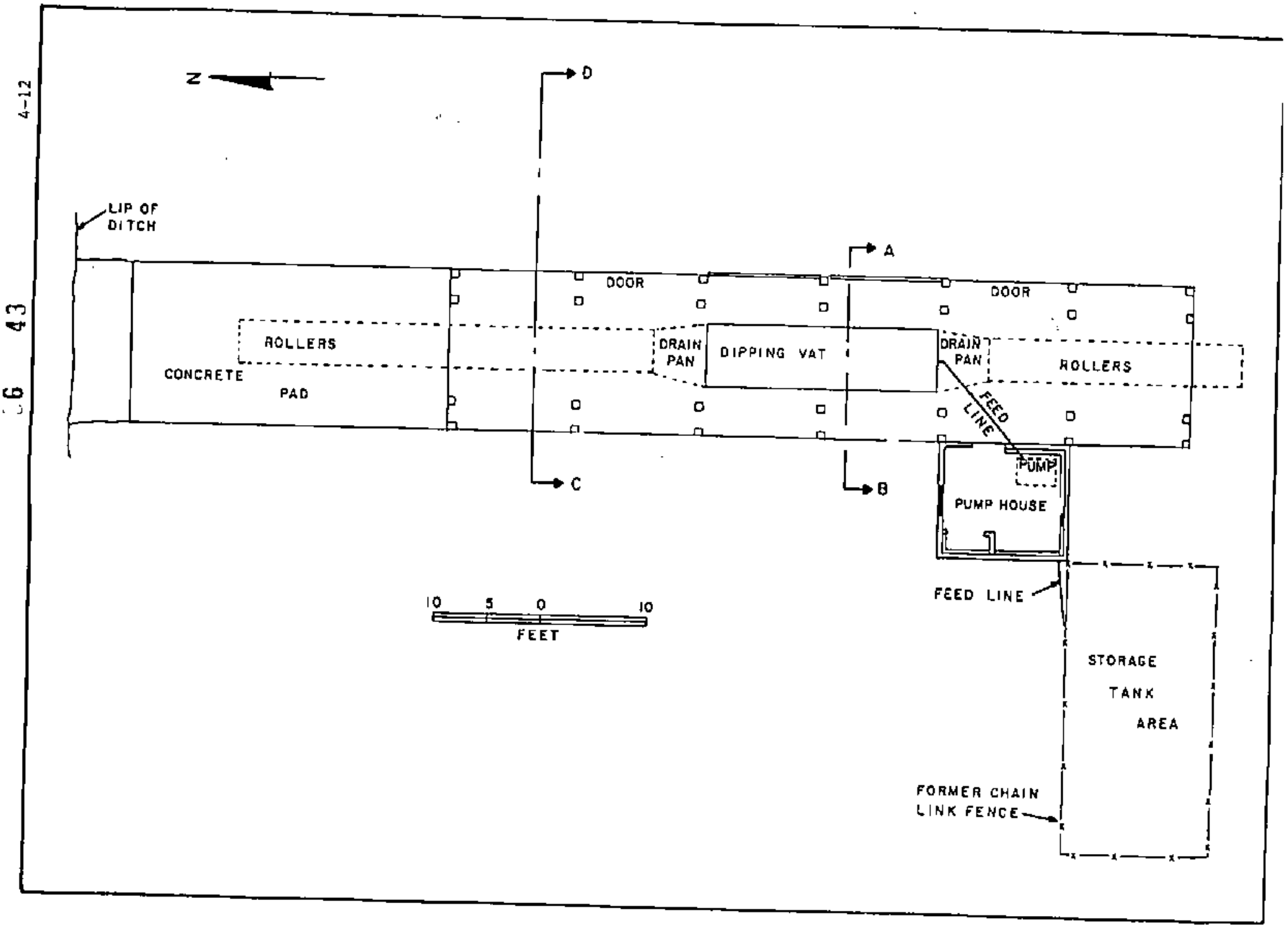


Figure 3. Excavation Activity Areas.

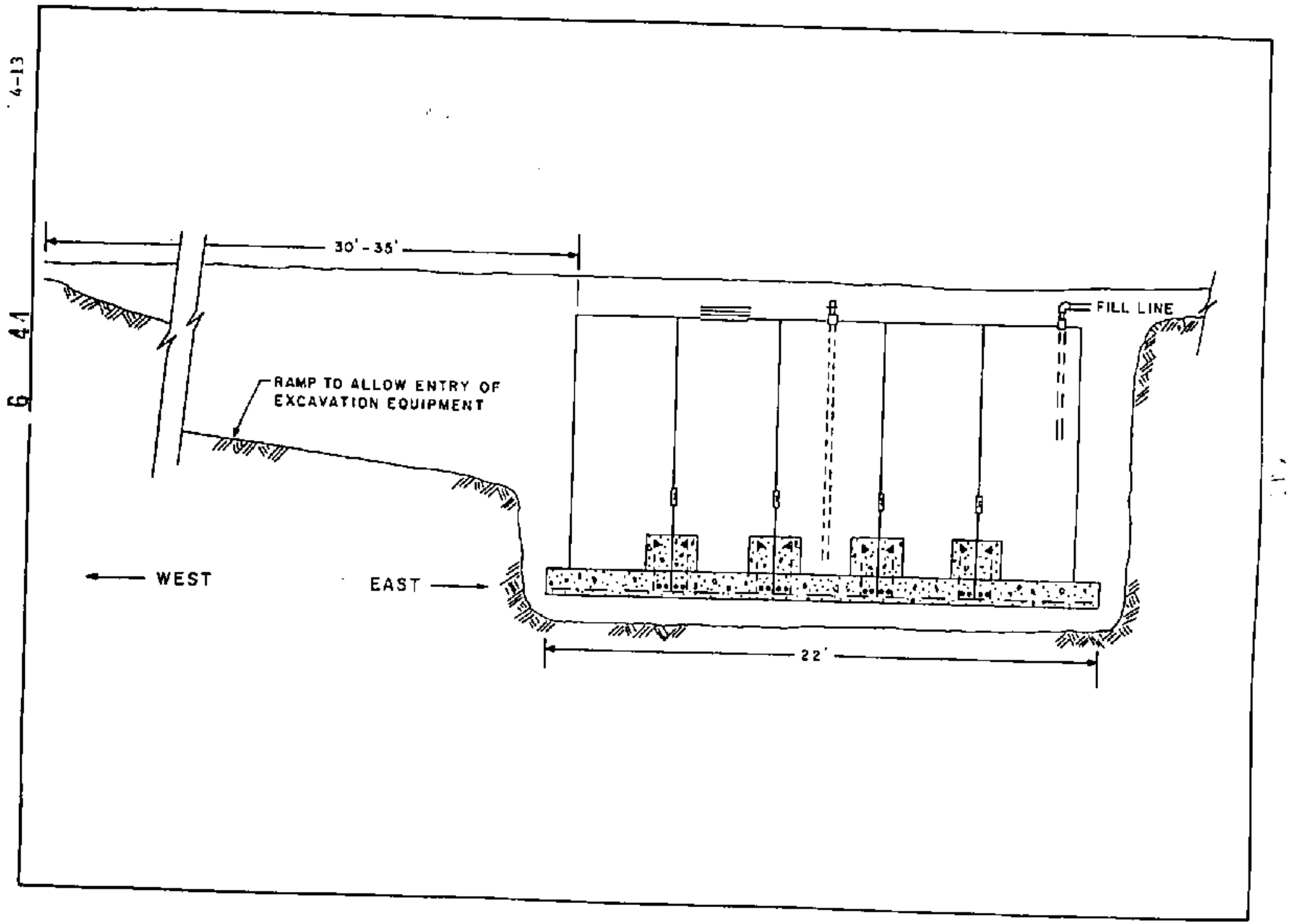


Figure 10. Longitudinal View of PCP Storage Tank Excavation.

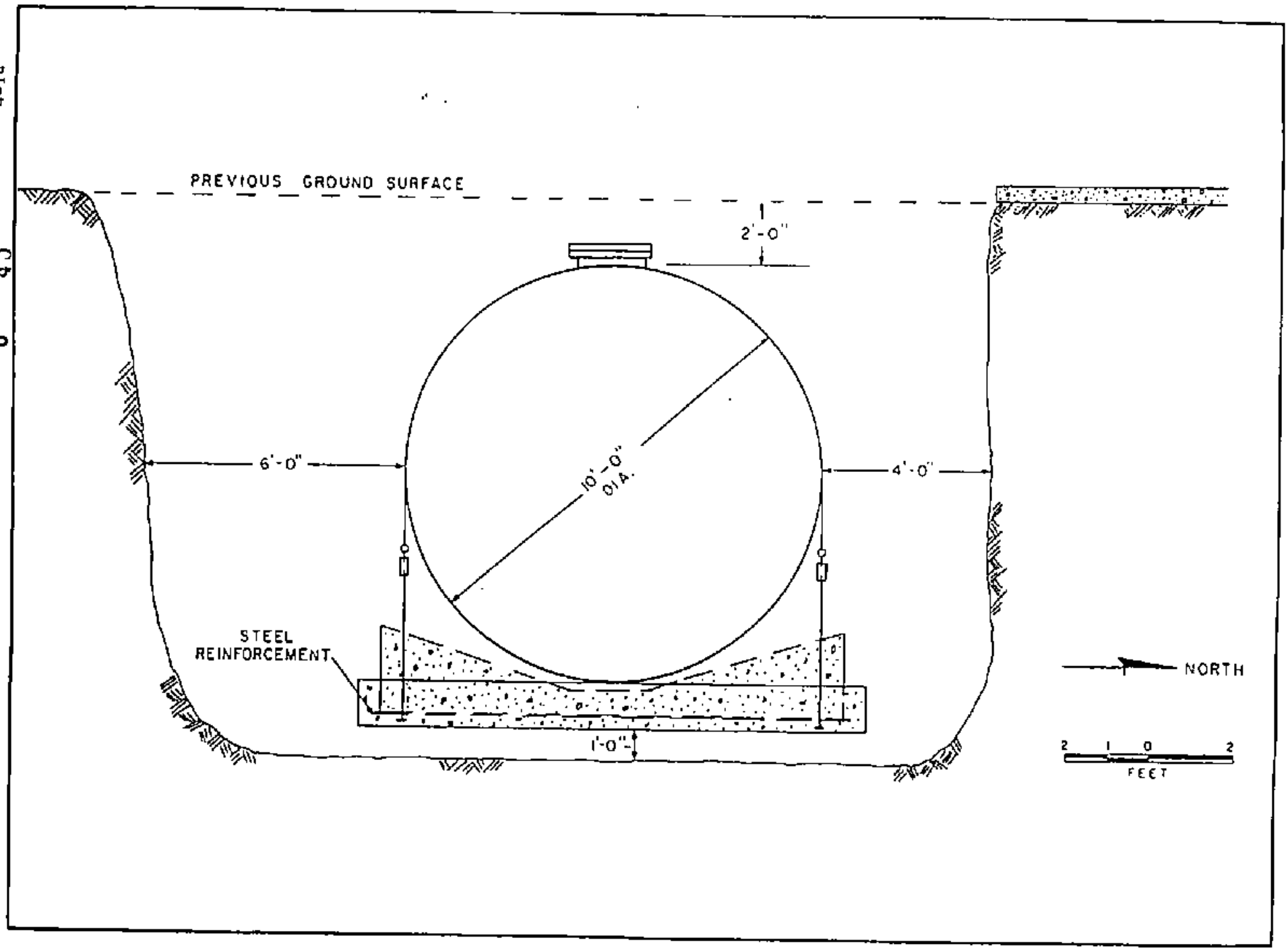


Figure 11. East-West View of Storage Tank Excavation.

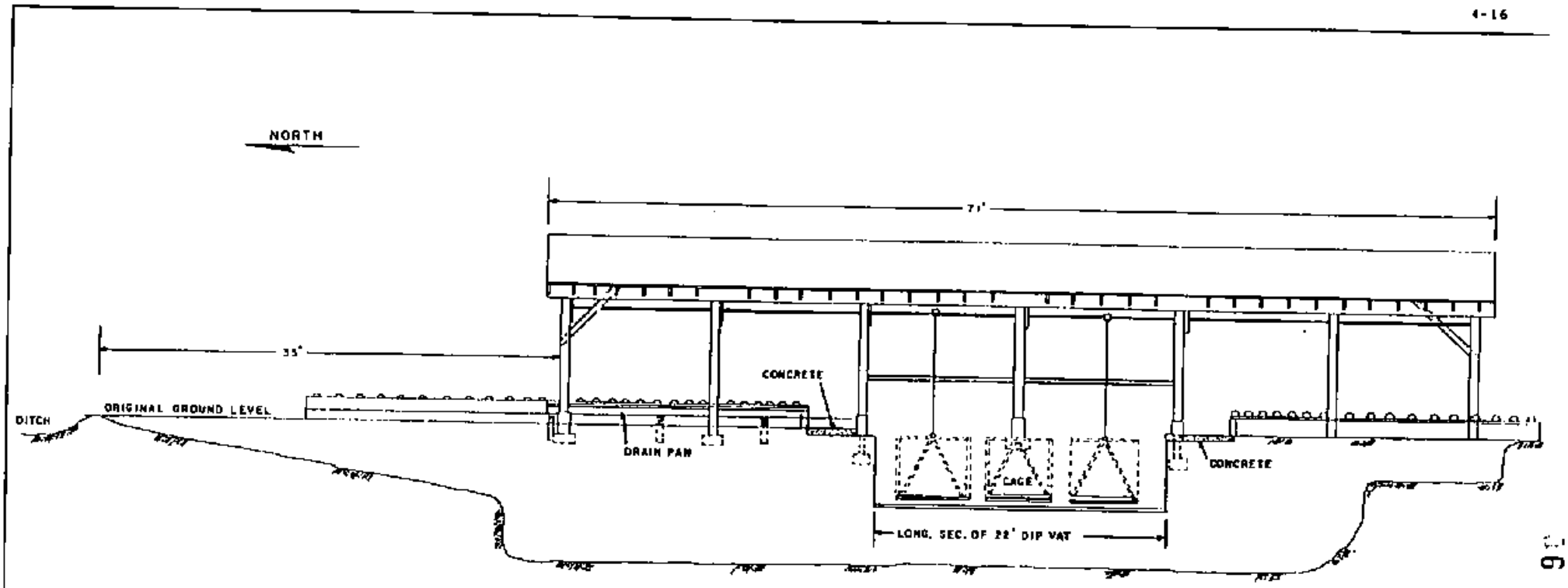


Figure 12. Longitudinal View of Building 737 Excavation

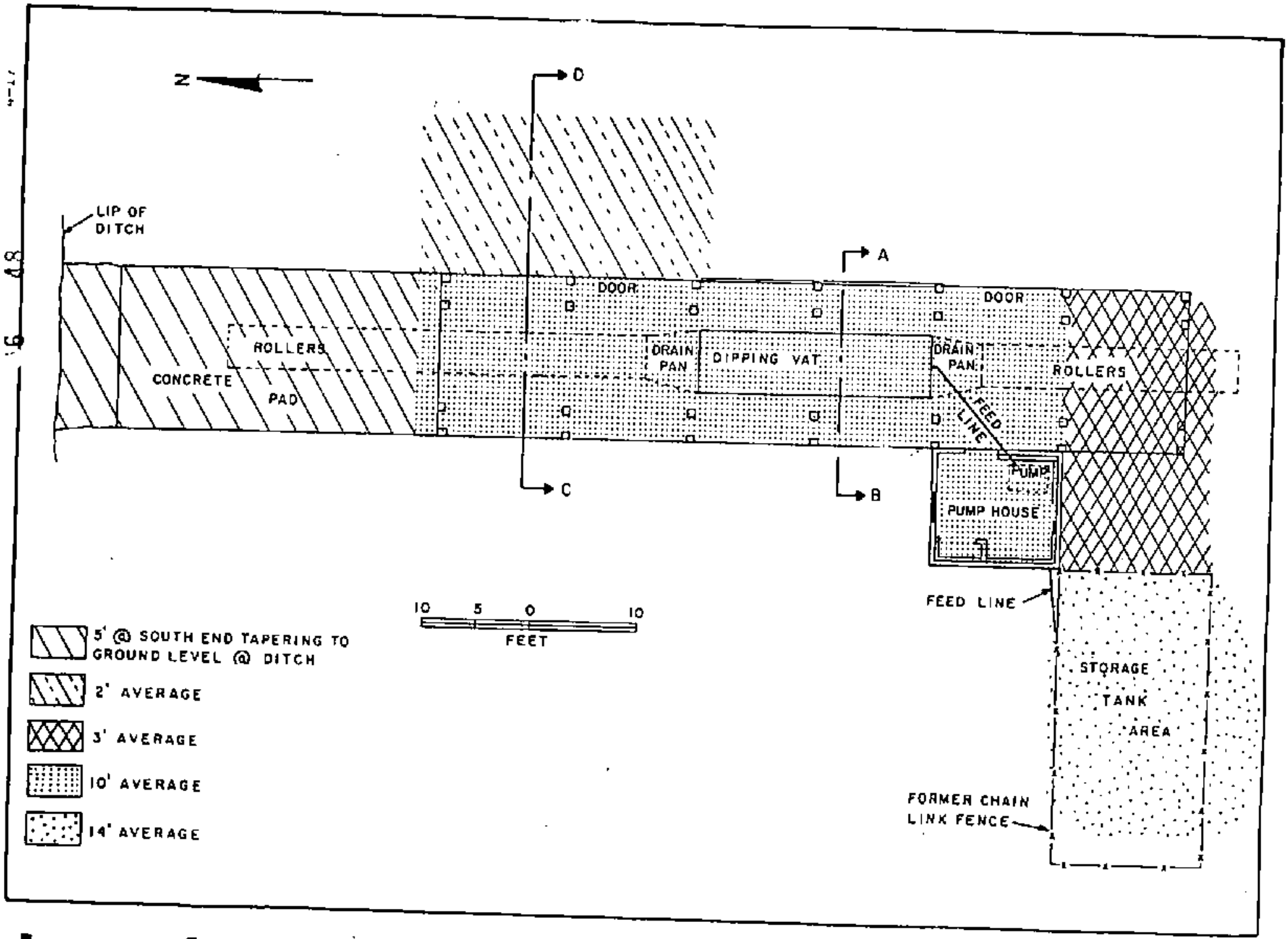


Figure 3. Top View of L ation - Building 737.

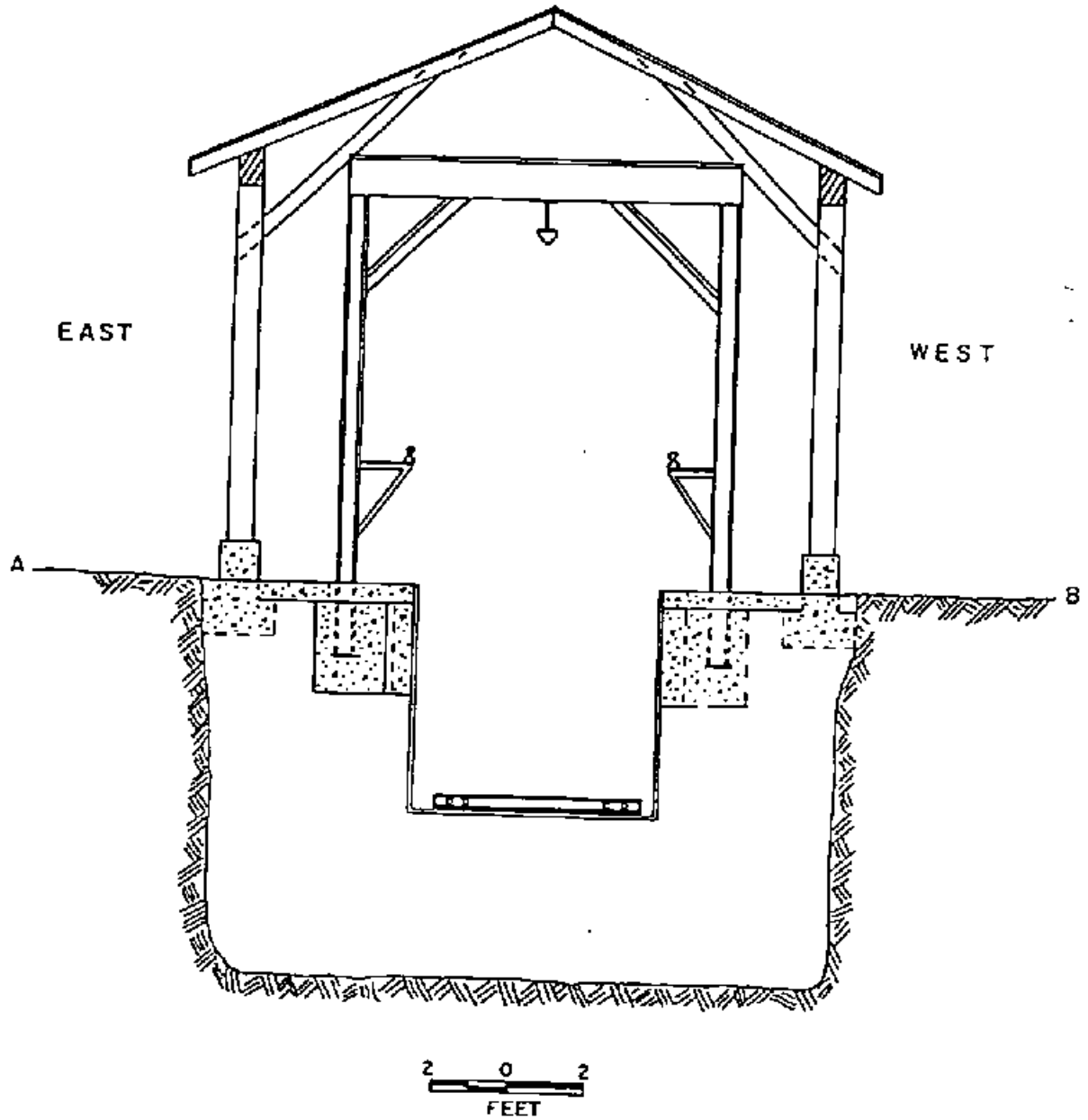


Figure 14. Cross-Section of Excavation - Building 737: A-B Axis.

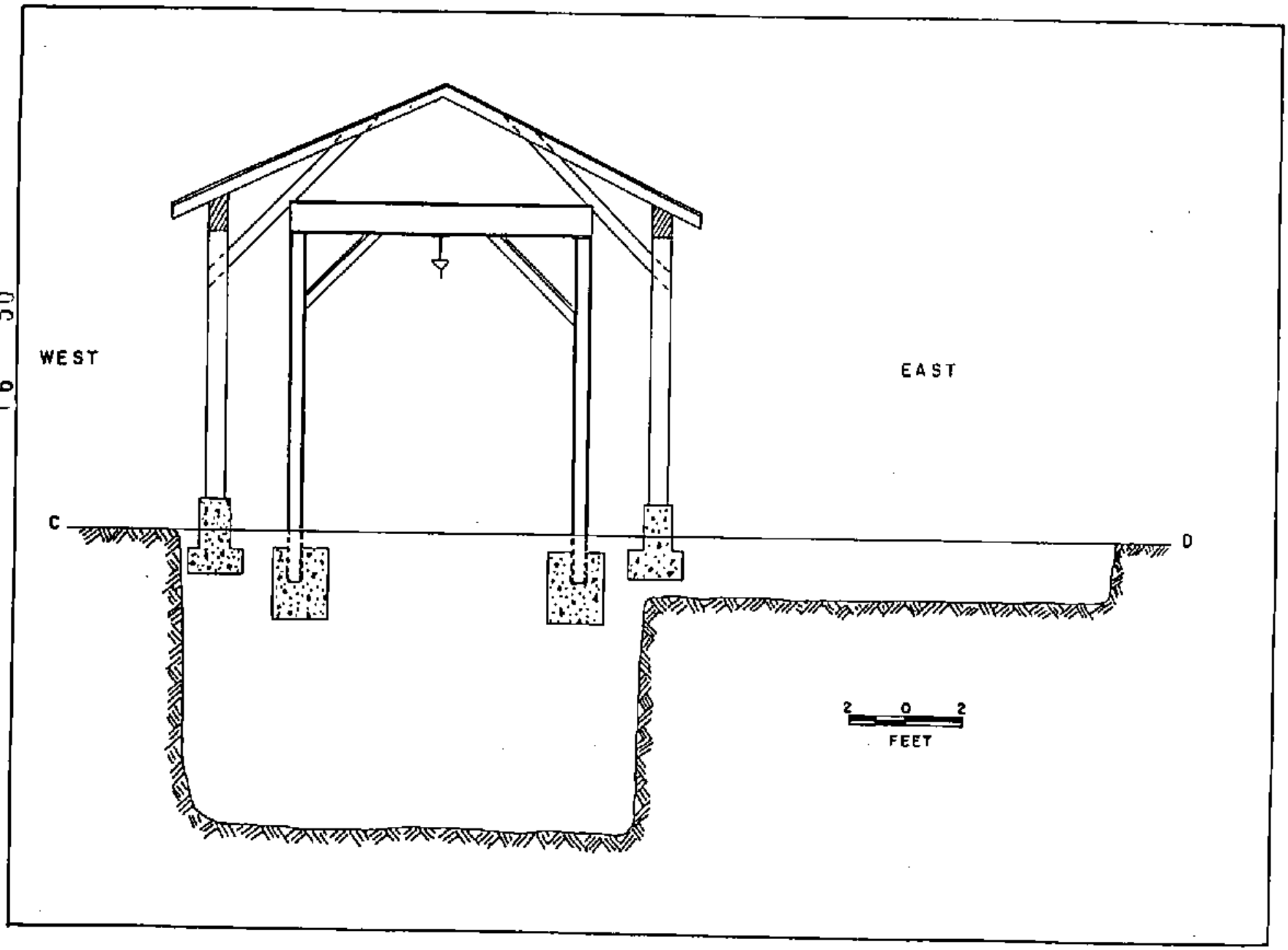


Figure 15. Cross-Section of Excavation - Building 737: C-D Axis.

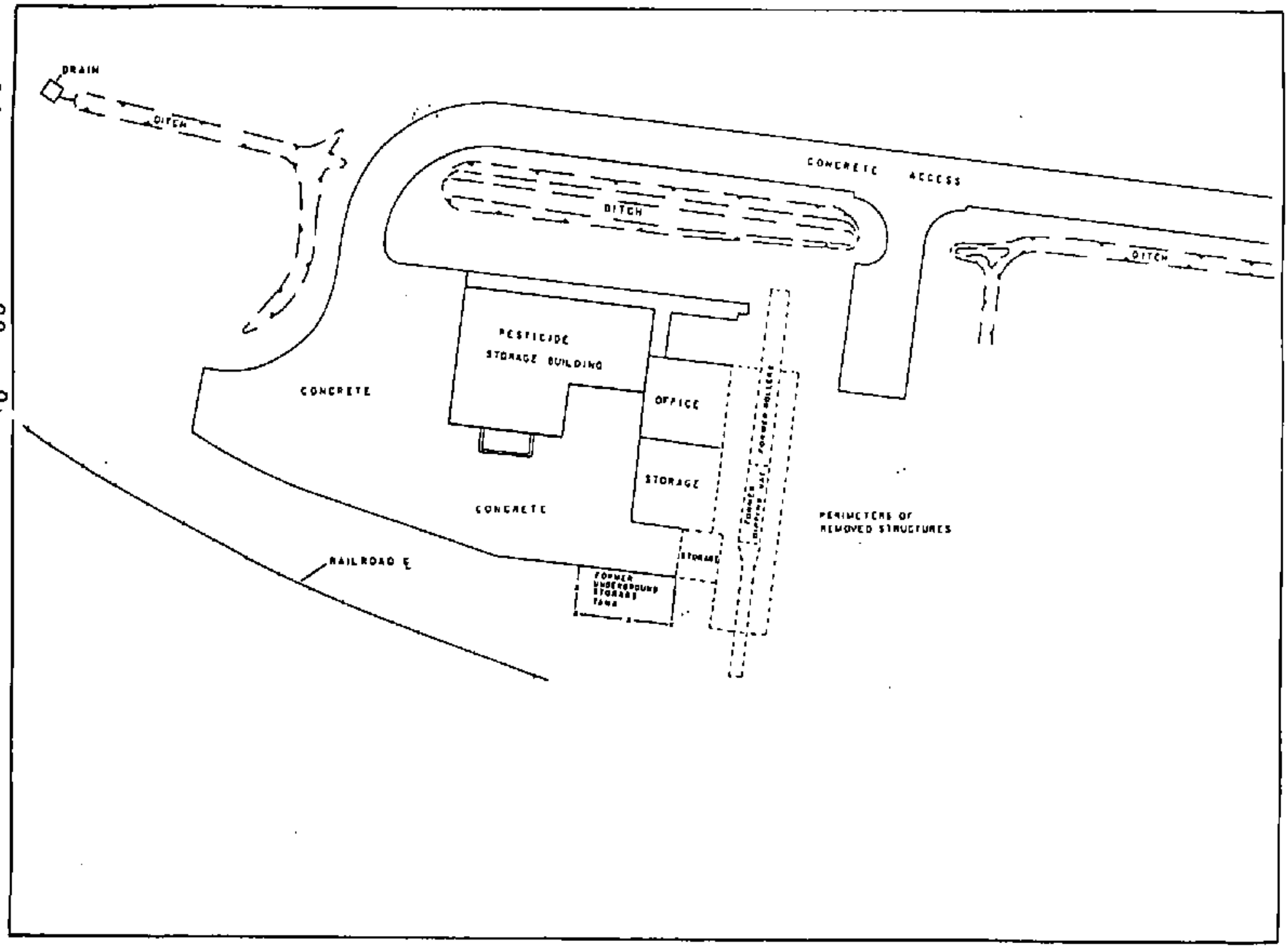
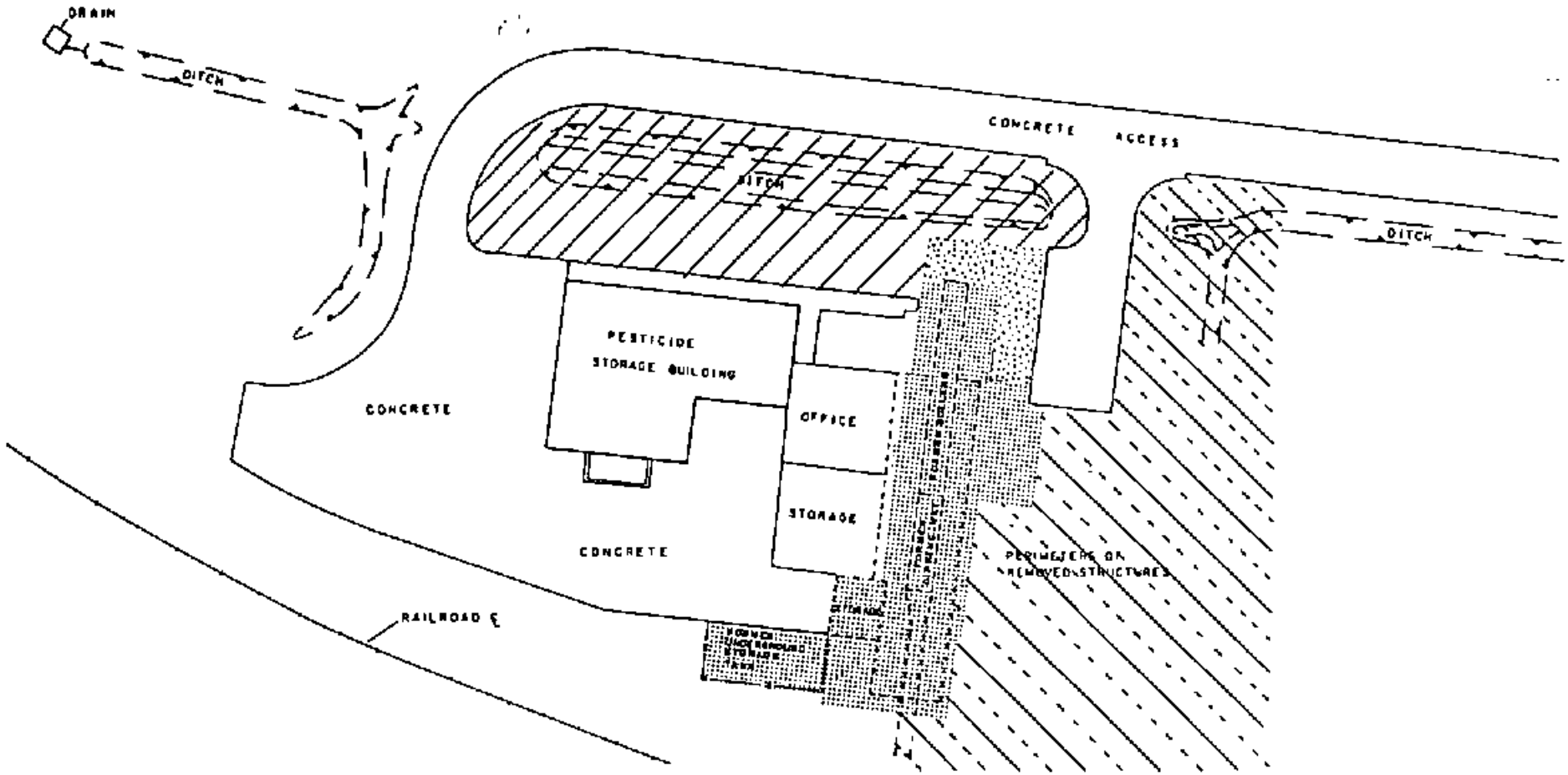


Figure 15. View of Building Environs at Project Completion



KEY:

- 4-6" SOIL REMOVED NO BACKFILL
- 4" PEA GRAVEL
- BACKFILL AREAS
- SCRAPED AVERAGE OF 3"

Figure 17. Closure of Building 737 Immediate Area.

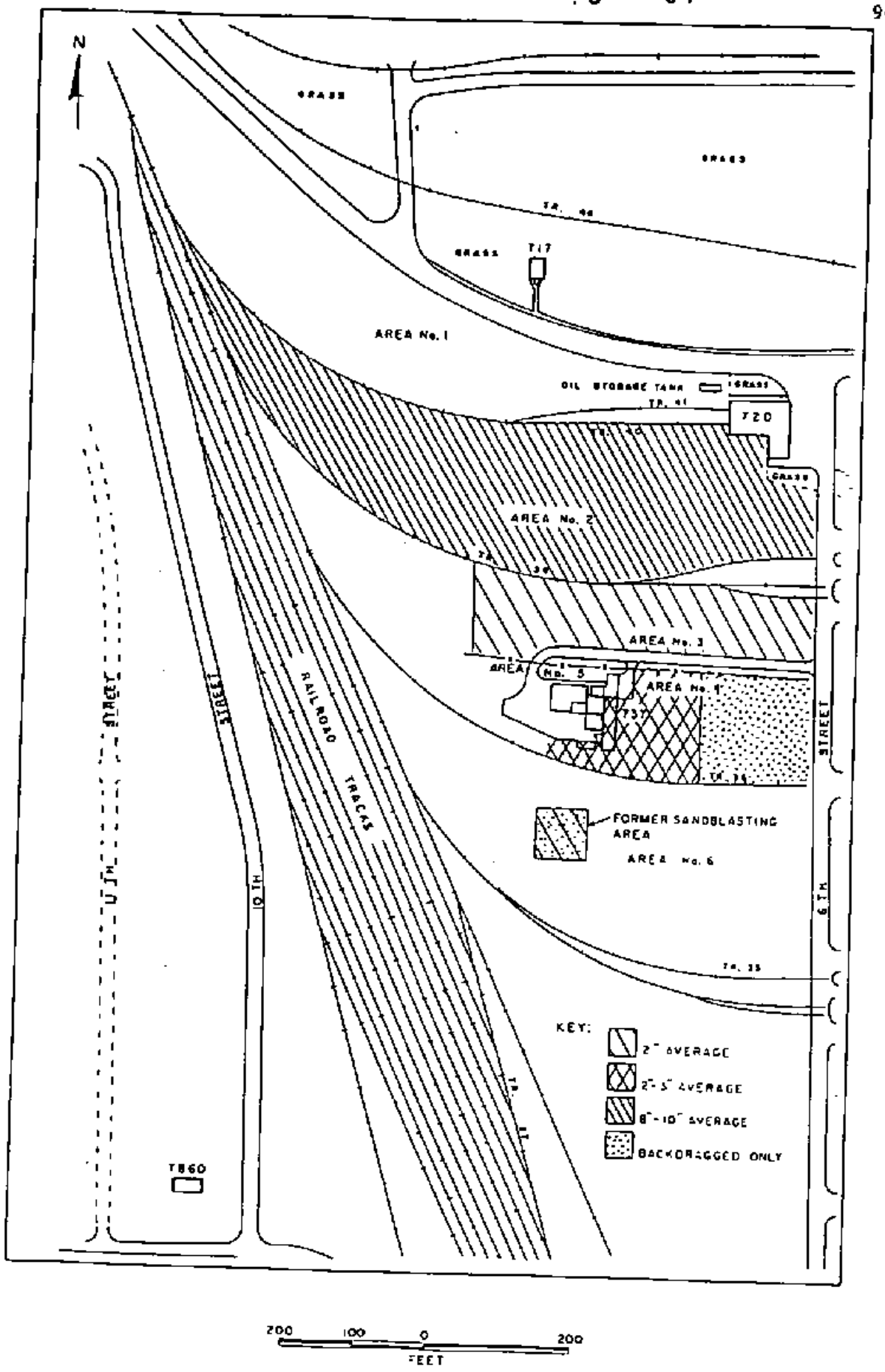


Figure 18. Final Gravelling of Site-Vicinity of Building 737.

B

Appendix B

Regulatory Agency Comments, Responses and Approval Letters

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

April 29, 2019

Mr. James Foster
Base Realignment and Closure Division (ACSIM-ODB)
2530 Crystal Drive (Taylor Building), Room 5000
Arlington, VA 22202-3940

Dear Mr. Foster:

The U.S. Environmental Protection Agency (EPA) has received and reviewed the U.S. Department of the Army's Revised Responses to EPA Comments dated December 11, 2018 which were in response to EPA Comments, dated July 23, 2018 on the Human Health and Ecological Risk Assessment (HHERA) dated April 2018.

The U.S. EPA and the U.S. Army had several teleconferences on April 12, 2019 and April 26, 2019 to discuss the previously noted concerns outlined by EPA Comment Letter dated April 08, 2019. EPA and the Army .,have agreed upon path forward based on our April 2019 teleconferences and EPA has agreed to extend a conditional approval for the above mentioned report with the understanding that the comments noted below will be addressed in future HHERA submittals. EPA has reattached the comments below for reference and clarity only.

- US Army will address EPA comments I. 5, 6, 7, 10; II. 3, 6, 7, 15a, 16; IV. 1, 2 and 4 through Revision 1 of the 2018 HHERA
- US Army will address the remaining EPA comments through the upcoming VI study and/or additional review, sampling and risk assessment performed under the new task order and this data will be captured in the future HHERA submittal

Should you have any questions or concerns, please feel free to call me at on my cell number 404-229-9500.

Sincerely,

Diedre Lloyd
Remedial Project Manager
Restoration & Sustainability Branch
Region 4, Superfund Division

US EPA RESPONSES TO US ARMY COMMENTS (December 11, 2018) on the HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT REVISION 0

MAIN INSTALLATION
APRIL 2018

DEFENSE DEPOT
MEMPHIS, TENNESSEE

General Comments:

1) EPA notes that a revised HHERA was not provided for review; therefore, the revisions to the HHERA proposed in the US Army responses to EPA could not be fully evaluated. The US Army provided three proposed resolutions as outlined in three bullets below in italics:

a) Comment accepted and will be addressed through changes made in Revision 1 of the 2018 HHERA: Comments I. 5, 6, 7, 10; II. 3, 6, 7, 15a, 16; IV. 1, 2 and 4.

b) Comment accepted and will be addressed through the VI study and/or additional review, sampling and risk assessment performed under the new task order: I. 1, 2, 4, 8, 9; II. 1, 2, 8 – 14, 15b; III. 1; IV. 3; V.1-5.

c) Comment not considered to require revision to the 2018 HHERA or additional assessment: I. 3; II. 4, 5; VI. 1.

Bullet 1: EPA awaits the opportunity to provide review of the HHERA revisions outlined in this bullet

Bullet 2: See Comment # 3 below, inclusive of all subparts

Bullet 3: See responses below and EPA ecological risk assessor responses below (previously sent in a preliminary email)

2) Evaluation of the Response to Human Health Risk Assessment (HHRA) General Comment 6: The response partially addresses the comment. Noting that concentrations of dieldrin, Aroclor 1260, arsenic, and various polycyclic aromatic hydrocarbons are present in soil at Functional Unit (FU) 6 at concentrations exceeding the EPA Regional Screening Level (RSL) for residential soil, it is unclear if the unrestricted use designation for a portion of FU-6 is appropriate. It is noted that Section 8.5, Conclusions, and Section 10.2, Soil HHRA Review, state, "the current Soil HHRA review found that most organic and inorganic constituents detected at the former Depot are present at levels that do not exceed current Industrial RSLs. Therefore…it does not appear that a revised soils-only HHRA is necessary in order to adequately assess potential incremental health risks and assure protectiveness of the remedy." However, no assessment regarding whether the conclusions of the Soils HHRA remain valid for the unrestricted use portions of FU-6 is presented, including whether the remedial actions completed since that time are protective of applicable receptor populations (which have the potential to include residential users).

a) Ensure that revisions to the Human Health and Ecological Risk Assessment, Revision 0, Main Installation, dated April 2018 (the HHERA) include an evaluation of whether the conclusions of the 2000 Soils HHRA are still valid for the unrestricted use portion of FU-6,

and discuss whether the remedial actions completed since that time are protective of applicable receptor populations.

3) **Evaluation of the Response to Ecological Risk Assessment (ERA) General Comment 1 and Specific Comment 3:** The response partially addresses the comment. For example, the responses indicate that the need for conducting a Screening Level Ecological Risk Assessment (SLERA) will be evaluated and recommendations provided in an updated HHERA. However, this is a vague statement and should be further described. It is generally accepted that conducting a SLERA is one of the first steps in the ERA process. A situation in which this might not be the case is during the first site visit and problem formulation steps, which determines that there are no complete ecological receptor exposure pathways associated with the site. This is often documented in using a formal ecological scoping checklist/evaluation.
    a) It is recommend that the SLERA-related evaluation of responses to comments include specific references to ERA methods (EPA and/or site-specific) and location/application of scientific management decision points (with respect to the 8-step ERA process) associated with evaluating the need to conduct a SLERA. This inclusion will be useful in saving time and resources needed to comment/respond to any potential issues associated with inappropriate application of standard or site-specific guidance in the updated HHERA.
    b) As noted in Human Health Risk Assessment (HHRA) General Comment (GC) 2, an assessment of vapor intrusion (VI) potential predicated on residential exposure assumptions have not been conducted for the eastern parcel, which is available for unrestricted use. GC 2 requested that groundwater concentrations detected on and in the vicinity of this parcel be evaluated for VI potential using residential-use based screening criteria. The response to GC 2 states that no change to the HHERA is necessary, as a VI study is ongoing [as documented in the Memorandum: Soil Vapor Sampling, Main Installation Vapor Intrusion Study, dated January 15, 2019 (hereinafter the 2019 VI Memo). The response goes on to state that soil gas samples collected in August 2018 were collected at locations considered most likely to contain volatile organic compounds in soil and/or groundwater at concentrations that may result in unacceptable vapor intrusion risk, and that soil gas data will be evaluated using residential use-based screening criteria. However, EPA notes that numerous issues were identified in review of the 2019 VI Memo related to the response to GC 2. These included the following:

        - No soil gas sampling was conducted at the eastern parcel specifically; and,
        - It is unclear if the current assessment did, in fact, characterize those areas that had the potential to present the greatest vapor intrusion risk as stated in the response to GC 2.

    c) EPA understands that additional vapor intrusion sampling is currently proposed based on the results of the initial soil gas sampling presented in the 2019 VI Memo. As part of that effort, EPA strongly recommends that the potential for VI to occur on the eastern parcel of the property be properly assessed to ensure the protection of human health and the environment.

1ST Iteration – Sharon Thom's Comments, as outlined in preliminary EPA email dated February 18, 2019 at 8:40 am (DOD and Army have been used interchangeably in this section)

4) The DoD in their responses said they were in the process of conducting a vapor intrusion study. DoD agreed to review the existing data and decide whether to collect additional analytical data, in which case DoD would prepare a QAPP. The comment pertains primarily to the areas where dioxins/furans were detected in shallow and deeper soils of a portion of FU3 and FU4 as well as in other media. This was **comment 13 in Section II.** The DoD response lacks specificity and does not fully address

EPA's comment that requests a complete description with figures showing where the dioxin/furan exceedances occur and to identify the other media that are impacted. Figures are needed for the off-site waterways that are impacted by dioxin/furans in sediment.

a) EPA requests more than a data review - an update to the conceptual site model is needed to address potential transport of site-related contamination to off-site waterways.

5) **In Comment 1 in Section III**
   a) EPA requests that DoD calculate hazard quotients (HQs) for constituents that exceed their respective ecological screening levels
6) **Appendix G:** DoD responded that the recommendation to perform a screening-level ecological risk assessment (SLERA) will be evaluated following additional sampling and human health risk assessment.
   a) The EPA comment requests that data presented in Appendix G be screened against the March 2018 Region 4 Supplemental Ecological Risk Assessment Guidance. However, the data in Appendix G was screened against the current RSLs for human health.
      i. Please ensure that a revised Table as described above, specifically, a table that is screened against the March 2018 R4 Supplemental Ecological Risk Assessment Guidance is included in the revised submittal.
   b) The text described the constituents that exceeded the screening values, but the backup information to support the conclusions was not presented in Appendix G.
   c) The DoD response did not agree to revise Appendix G to address this deficiency unless new data were collected at which time probably only the new data would be screened, if and only if there was some indication this was necessary based on the human health risk assessment conclusions.
      i. Please indicate that this table will also be revised in subsequent submittals
   d) In order for EPA to evaluate this issue, DOD needs to provide the requested data as outlined in this comment DOD stated purpose of the submitted HHERA was to evaluate the former risk assessments against updates to the EPA risk assessment guidances. The results of the screening with the 2018 guidance compared to the results of the 2000 SLERA are not substantially different from the calculations that EPA Ecological Risk Assessor (S. Thom) has completed. However, DoD has not adequately supported their conclusions in the main text and had not provided the supporting information in the Appendix G data table.
      i. Please provide the requested information and additional specificity as requested.
7) **Comment 3 in Section IV** contains contradictory information and data appears to be missing that potentially obscures the implications. The comment refers to Section 9.4 of the HHERA that stated:
   a) There is the potential for COCs to be conveyed off-site via stormwater runoff, as noted in the MI RI. While the watershed assessment indicates that runoff from the MI is not likely to have a significant impact on the ability of local surface water bodies to support wildlife and aquatic-dependent species or habitat, the detection of dioxin/furans in on-site soil, as well as in surface water and sediment in local streams warrants additional study.
      i. Please provide additional data that clarifies this issue
8) **Comment 3 in Section IV** requested an evaluation of the exposure to offsite receptors from dioxin/furans in surface soils and on-site drainage pathways through erosion and transport to offsite waterways. The DoD response stated that inconsistencies would be eliminated.
   a) However, the response did not clarify how they would be eliminated. It is unclear if there are ecological exposures to the contaminants on-site. However, the site is not protective if site-related contamination is washing off and entering off-site waterways where there is the potential for downstream transport and exposure to receptors. The DoD response is not specific and does not describe what actions will be taken to address the EPA comment.

i. DoD needs to support assertions that the pentachlorophenol and dioxin/furans detected in the sediments and/or surface water of the off-site waterways do not present an ecological risk. EPA requests that DoD include a SLERA at a minimum to address this concern.
ii. If DoD thinks that the data is old, they might want to collect more sediment and analyze for pentachlorophenol and dioxins/furans.

9) **Section V Comments 1 – 5 were not addressed**. EPA requests the rationale for a SLERA subsequent to the evaluation and updated HHERA. EPA is concerned that contamination in surface water and sediments could present an ecological and potentially human health risk from an off-site waterway.
10) **In comment 5, Section V**, I was trying to give a relatively simple way to think about soil contamination as a potential source of contamination in surface water runoff. The guidance document that was cited in the DoD response pertains to estimating the amount of pollution reduced by a Superfund remedy. It does not apply to the particular situation here.
    a) Because the DDMT site is mainly buildings and pavement with some grass, most rainfall will become runoff. The sediments delivered in the runoff will have contaminant concentrations reflecting the concentrations in the top inch or so of soil. The average concentration in the surface soil is a good predictor of the concentrations in the sediment that is washed off the site. A remedy to address stormwater runoff and sediment transport could serve this site well.
        i. EPA suggests: A more thorough method to address this comment would be to run the universal soil loss equation.
11) In conclusion:
    a) The Army needs to outline specifically what actions and data will be collected to characterize dioxins/furans and pentachlorophenol in FU3 & FU4 soils or in sediments and surface water of the off-site waterways.
    b) The Army needs to outline specifically what actions, reports and data will be collected in the upcoming HHRA to ensure that all parties are "on the same page" to ensure DQOs are met to ensure site protectiveness of human health and the environment
    c) The Army needs to revise the HHERA to include the updated SLERA with the new ecological screening values.

Responses to Comments from
U.S. Environmental Protection Agency (EPA) Region 4 on:
Human Health and Ecological Risk Assessment (HHERA), Revision 0
Defense Depot Memphis, Tennessee
Comments Received 23 July 2018
Responses Revised 11 December 2018

The baseline risk assessment for the Main Installation at DDMT was presented in the Main Installation Remedial Investigation (CH2M HILL 2000). The primary task of the HHERA was to update the groundwater component of the 2000 HHRA; secondary tasks were to review the soil component of the 2000 HHRA and the 2000 SLERAs based on current conditions and guidance.

Responses to EPA comments on the HHERA Rev0 are provided below. Many of the comments identify issues that were not fully considered in the HHERA. In many cases, that is because the HHERA did not include updates to the soil HHRA or the SLERA. Section 10 of the HHERA presents recommendations for additional work which is to be performed in a separate task order to be awarded in late 2018.

As noted in the specific responses below, the comments have one of three proposed resolutions:

- Comment accepted and will be addressed through changes made in Revision 1 of the 2018 HHERA: Comments I. 5, 6, 7, 10; II. 3, 6, 7, 15a, 16; IV. 1, 2 and 4.
- Comment accepted and will be addressed through the VI study and/or additional review, sampling and risk assessment performed under the new task order: I. 1, 2, 4, 8, 9; II. 1, 2, 8 – 14, 15b; III. 1; IV. 3; V.1-5.
- Comment not considered to require revision to the 2018 HHERA or additional assessment: I. 3; II. 4, 5; VI. 1.

COVER LETTER

The cover letter states: “No new data was collected for this reporting effort and all assumptions are based on previously collected data that is 18 years old. “

Response: The groundwater HHRA update evaluated data from samples collected by HDR from 2012 to 2017, consisting of 1,424 groundwater field samples from wells on or adjacent to the MI. The statement of work included only a review of the soil HHRA and the SLERA; no new samples were collected for soil, surface water and sediment. Based on the findings of the MI RI and the selected remedy in the ROD, only limited sampling and analysis of soil samples from the MI has been conducted since completion of the MI RI, and no surface water or sediment samples have been collected since that time.

I. EPA HUMAN HEALTH RISK ASSESSMENT (HHRA) GENERAL COMMENTS:

1. Review of the Attachment C, Vapor Intrusion Screening Level Assessment, indicates that only select volatile organic compounds (VOCs) were evaluated for vapor intrusion (VI) potential. However, sufficient rationale for use of a truncated list of contaminants of potential concern (COPCs) is not provided, and it is unclear if projected risk and hazard has been underestimated. Revise the VI assessment to include a presentation of risk and hazard predicated on all VOCs that exceed health-based screening criteria, as opposed to select VOCs, or provide data and figures that support use of the truncated list.

Response: No change to the 2018 HHERA report, including the VISL assessment, is considered necessary for this comment. Analytical results and risk assessment from the ongoing VI study will be incorporated in an updated HHERA following additional data collection and risk assessment as described in Section 10 of the HHERA Rev0 and in response to these comments.

The VISL assessment was based on identified ground water contaminants, comprised of the VOCs in

groundwater identified in the ROD as requiring remediation. The VOCs identified in the ROD consisted of PCE and TCE; cDCE, vinyl chloride, carbon tetrachloride and chloroform were added based on LTM sample results indicating the presence of additional VOCs, including degradation products following enhanced bioremediation.

Soil gas samples were collected in August 2018 in accordance with the MI VI Soil Gas Sampling QAPP (HDR 2018). Analyses of soil gas included all TO-15 VOCs. All detected constituents will be compared to screening criteria and laboratory limits will be compared to screening criteria for non-detected analytes. The VI analyses and risk assessment findings will be provided in a technical memorandum for regulatory agency review.

2. As discussed in Section 4.2, Receptors, and stated in Attachment C, Vapor Intrusion Screening Level Assessment, land use controls (LUCs) which prevent residential use of the site have been established for the majority of the Main Installation, except the eastern parcel, which is available for unrestricted use. However, an assessment of VI potential predicated on residential exposure assumptions has not been conducted for the eastern parcel. It is noted that groundwater concentrations detected on and within 100 feet of the eastern parcel exceed residential-use based screening criteria [e.g., trichloroethene has been detected in well MW-50 at a concentration of 3.58 micrograms per Liter (µg/L), which exceeds the residential vapor intrusion screening level of 1.2 µg/L]. Given that the eastern parcel of the Main Installation is available for unrestricted land use, groundwater concentrations detected on and in the vicinity of this parcel should be evaluated for VI potential using residential-use based screening criteria. Revise the human health risk assessment (HHRA) to include this assessment, or provide sufficient rationale for why this assessment is not necessary. Until such time as subsurface soil gas samples are collected, groundwater concentrations of TCE should be compared to both the VI based screening level and the drinking water MCL.

Response: No change to the 2018 HHERA report is considered necessary for this comment. Analytical results and risk assessment from the ongoing VI study will be incorporated in an updated HHERA following additional data collection and risk assessment including comparison to residential screening levels.

Soil gas samples were collected in August 2018 at locations considered most likely to contain VOCs in soil and/or groundwater at concentrations that may present a VI human health risk. The soil gas concentrations will be evaluated based on consideration of VOC concentrations in soil and/or groundwater at that location and other factors such as depth to water and soil layering between the water table and the ground surface. Correlation of soil gas and groundwater concentrations should indicate whether additional soil gas samples in areas with lower groundwater concentrations is necessary.

The soil gas analytical results will be evaluated for VI risk based on current and reasonably expected future conditions including use of residential-use based screening criteria. The VI analyses and risk assessment findings will be provided in a technical memorandum for regulatory agency review and will be incorporated in a later HHERA following additional data collection. MCLs are the remediation goals for groundwater at DDMT and the plume maps use the MCL to identify contaminant extent. Since the VI based screening level for TCE (7.5 µg/L) is higher than the MCL (5 µg/L), the current maps provide a conservative estimate for potential VI risk.

3. Review of the Attachment C, Vapor Intrusion Screening Level Assessment, indicates that risk and hazard to a commercial worker were estimated using the Johnson and Ettinger Model (JEM) in addition to EPA's Vapor Intrusion Screening Level Calculator. It should be noted that EPA no longer supports the use of the JEM to contraindicate VI potential where concentrations of contaminants in contributing media (e.g., groundwater) exceed generic VI-based screening levels. The JEM may be used as a supporting line of evidence, but is more often used as a prioritization tool when selecting sampling locations for a VI assessment. It is understood that soil gas sampling to assess the VI pathway is currently planned. Ensure that the JEM is not used as a sole line of evidence to contraindicate VI potential in any forthcoming VI assessment when contributing source concentrations exceed health-based VI screening criteria.

Response: No change to the 2018 HHERA report is considered necessary for this comment.

This comment was previously addressed following EPA review of the VI Soil Gas Sampling QAPP. Army agrees that JEM should not be used as a sole line of evidence for VI potential. JEM was used with EPA's VISL calculator to provide a comparison incorporating site-specific information (e.g. depth to water, soil lithology). Use of JEM was discussed with EPA and included in the VI study statement of work (SOW). JEM identified potential VI risk at the MI, although up to an order of magnitude lower than indicated by the VISL calculator results. JEM will also be used with the VISL calculator to evaluate VOC concentrations in soil gas samples in accordance with the SOW.

4. As discussed in Section 8.0, Review of 2000 Soils HHRA, the soil component of the 2000 HHRA was reviewed to determine if "the conclusions of the Soils HHRA are still valid and whether or not the remedial actions completed since that time are protective." The HHRA does not discuss or evaluate if the data used in the 2000 HHRA remain representative of current conditions. As such, it is unclear if the conclusions drawn in review of the 2000 HHRA are appropriate and applicable. Revise Section 8.0 to discuss and evaluate if the data used in the 2000 HHRA remain representative of current conditions.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

Additional soil sampling and risk assessment was recommended in Section 10.2 of the HHERA. A more detailed review of existing analytical data will be performed prior to developing the sampling plan. The review will include evaluating whether the 2000 HHRA data remains representative; the data review and the sampling plan will be provided in a QAPP submitted for EPA review.

5. Section 8.0, Review of 2000 Soils HHRA, presents a comparison of exposure point concentrations (EPCs) for contaminants of potential concern (COPCs) selected in the 2000 HHRA to the current EPA Regional Screening Levels (RSLs) for industrial soil. It is unclear if COPCs were appropriately selected in the 2000 HHRA based on review of Section 8.1.2, Soils HHRA Methodology. Therefore, it is unclear if data were inappropriately excluded from the current comparison of EPCs to RSLs. For example, Section 8.1.2 states that frequency of detection and historical use were considered in the selection of COPCs. It is noted that factors such as frequency of detection and historical use are generally inappropriate for use in the selection of COPCs (as opposed to refinement of a target analyte list), unless specifically approved by EPA. If previous agreement has been reached with EPA on this issue, it should be clearly explained in the HHRA. Revise Section 8.0 to provide a table which presents the COPC

selection process used in the 2000 HHRA such that it can be independently reviewed, and to support the appropriateness of the COPC list used in the evaluation of EPCs against the current RSLs.

Response: The language in Section 8.1.2 of the 2018 HHERA will be revised.

In the 2000 HHRA, Section 7.2 incorrectly indicates that frequency of detection and historical use were used as criteria for COPC elimination. Review of Section 7.3 and Appendix D, Table D.1 of 2000 HHRA indicates these criteria were not used to eliminate COPCs.

6. Review of Figure 1-1, Unit Boundaries, indicates that a portion of functional unit (FU)-6 is available for unrestricted use; however, no assessment of the FU-6 soil data used in the 2000 HHRA is presented to demonstrate that the conclusions of the 2000 HHRA are still valid and the remedy remains protective. It is noted that Section 8.3.6, FU6, indicates that concentrations of dieldrin, Aroclor 1260, arsenic, and benzo(a)pyrene remain in FU-6 soil at concentrations that exceed the current RSL for industrial soil; no screening of data in comparison to current RSLs for residential soil is presented. To demonstrate that the conclusions of the 2000 HHRA are still valid and the remedy remains protective at FU-6 it appears that data warrant screening in comparison to current RSLs for residential soil at FU-6. Revise the HHRA to conduct this screening or explain why this is not necessary.

Response: Text in Section 8.3.6 of the 2018 HHERA will be revised.

Screening of EPC data, as compared to current RSLs for residential soil is presented in Attachment F, Table 1. Text in Section 8.3.6 will be revised to include the residential assessment for those limited areas of FU-6 as shown on Figure 2-3b of the MI ROD.

7. Based on review of Section 8.3, Review of Current Conditions using 2000 MI RI Data by FU, no assessment of data used in the 2000 HHRA in comparison to current RSLs for residential soil is presented. With the exception of FU-6, it is presumed that this assessment was not conducted as land use controls are in place to preclude residential land use; however, this is not explicitly stated. Revise Section 8.3 to clarify why no assessment of data used in the 2000 HHRA in comparison to current RSLs for residential soil was conducted.

Response: Text in Section 8.3 of the 2018 HHERA will be revised.

Text in Section 8.3 will be revised to state the FUs are designated for industrial use by land use controls (except for areas of FU-6). A comparison of the 2000 MI RI soil data to current RSLs for residential use was provided in Attachment F, Table 1.

8. Insufficient data and information are presented in Section 8.0, Review of 2000 Soils HHRA, to allow the reader to understand the concentrations of dioxins/furans that remain onsite and what data set was used in the updated assessment (i.e., selection of maximum concentrations for comparison to current RSLs), and to demonstrate that the dioxin/furan data were appropriately assessed as part of the current HHRA. For example,

    a. Section 8.2.2.1, Removal Action, states that contamination from the pentachlorophenol (PCP) dip vat and storage tank area was removed to meet a cleanup goal of 200 micrograms per kilogram (ug/kg) for total dioxins/furans. Based on this cleanup level, it

is unclear if contamination remains onsite that exceeds the current RSL for industrial soil of 0.022 ug/kg for 2,3,7,8-tetrachlorodibenzo-p-dioxin (TCDD) equivalence.

b. Section 8.2.2.1 also states that contamination was left onsite at concentrations that exceed 200 ug/kg. It is unclear if these data were considered in the current screening of dioxin/furan data.

c. Section 8.2.2.1 indicates that soil with concentrations below the cleanup goal of 200 ug/kg was used as backfill. It is unclear if these data were considered in the current screening.

d. The first paragraph on page 8-5 identifies maximum detected concentrations of several dioxins/furans in samples collected from Area 2 that were subsequently covered with gravel. It is unclear if these data were considered in the current screening of dioxin/furan data.

e. Section 8.2.2.4, Conclusions, indicates that only surface soil data was evaluated as part of the current assessment. It is unclear why subsurface soil data were not evaluated.

Revise Section 8.0 to clarify the data set used in the updated assessment of dioxin/furan data, and provide rationale for the selected data set.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

Section 10.2 of the HHERA recommends sampling and additional risk assessment of PCP and dioxins/furans in soils on the Main Installation. A more detailed review of existing analytical data will be performed prior to developing a sampling plan. The review will include the issues raised in the above comments; the data review and the sampling plan will be provided in a QAPP submitted for EPA review.

9. The HHRA concludes that “most organic and inorganic constituents detected at the former Depot are present at levels that do not exceed current Industrial RSLs.” The basis for this conclusion is unclear. Review of Sections 8.3.1 through 8.3.6 indicates that polynuclear aromatic hydrocarbons (PAHs), pesticides, polychlorinated biphenyls (PCBs), dioxins, and metals are present in one or more FUs at concentrations that exceed applicable RSLs for industrial soil. Based on this, additional analysis is warranted to demonstrate that the remedy remains protective of an industrial worker. Revise the HHRA to provide this analysis.

Response: Additional evaluation of exceedances will be incorporated in an updated HHERA following additional data collection and risk assessment.

The phrase in text stating that “most...constituents are detected …at levels that do not exceed current Industrial RSLs” indicates that some do, as noted in this comment. Review of Attachment F, Table 1 indicates that approximately 30-40% of the EPCs exceed a RSL. To further evaluate these exceedances, “screening” risks will be calculated by comparing the EPCs to the noncancer and cancer Industrial Soil RSLs in Attachment F, as shown below. The evaluation will be presented in the updated HHERA following additional data collection and risk assessment.

Screening Risk = $\frac{EPC}{RSLcancer} \times Target\ Risk$ and

Screening Hazard = $\frac{EPC}{RSLnoncancer} \times Target\ Hazard\ Quotient.$

10. Several issues were identified in review of Figure 4-1, Human Health Conceptual Site Model:

    a. Figure 4-1 does not identify the groundwater inhalation exposure pathway (e.g., inhalation of VOCs during showering) as complete for a future potential resident, as discussed in Section 4.2.2, Future On-Site Resident. Rather, it appears that the inhalation exposure pathway identified on Figure 4-1 is that associated with the vapor intrusion pathway. It is noted that the groundwater inhalation exposure pathway and vapor intrusion pathway should be listed separately on Figure 4-1.

    b. Figure 4-1 indicates that the vapor intrusion pathway was evaluated for a future potential resident; however, review of the HHRA indicates that this assessment was not completed.

    c. Figure 4-1 does not indicate that the groundwater inhalation exposure pathway was considered to be insignificant for an on-site worker, and was not evaluated in the HHRA, as discussed in Section 4.2.1, Current/Future On-site Worker.

    Revise Figure 4-1 to address these issues.

Response: Figure 4-1 of the 2018 HHERA will be revised to list groundwater inhalation exposure and vapor intrusion pathways separately; and to indicate that the groundwater inhalation exposure pathway was considered insignificant for an on-site worker.

The VI pathway is presently considered to be incomplete based on depth to groundwater. Previous studies have indicated groundwater contamination beneath the MI should not present a VI risk based on site conditions; however, additional lines of evidence are needed to support the lack of a complete VI pathway. A VI study is currently being performed as a separate task. Soil gas samples were collected in August 2018. The VI analyses and risk assessment findings will be provided in a technical memorandum for regulatory agency review and will be incorporated in a later HHERA following additional data collection.

II. EPA HUMAN HEALTH RISK ASSESSMENT (HHRA) SPECIFIC COMMENTS

1. Section 3.1.2, Data Usability, Page 3-2

This section indicates that the detection limits for up to six VOCs (depending on the date of the data set) were greater than the applicable groundwater screening criteria (i.e., RSLs or the Maximum Contaminant Levels). Noting that the HHRA utilizes data from multiple years (2012-2017) and multiple aquifers, and that data sensitivity issues were not reported for all years, it is unclear if and how this impacted the selection of COPCs. Non-detect chemicals should be retained as COPCs in all instances when a detection limit exceeds the most relevant screening criterion to highlight data gaps and for the purposes of the public record. Revise the HHRA, as applicable, to ensure that non-detect chemicals are retained as COPCs in all instances when a detection limit exceeds the most relevant screening criterion (for every sample collected from a given contact medium), and include a qualitative evaluation of the non-detect COPCs and their influence on the risk assessment in the Uncertainty Analysis (e.g., degree to which the exceedance occurs, likelihood of the contaminant being present above a level capable of eliciting an adverse health effect, etc.). If elevated detection limits do not impact the selection of COPCs due to the availability of multiple data sets, clarify this condition.

Response: An updated HHERA will be prepared following additional data collection and risk assessment. The Uncertainty section will provide a table comparing the detection limits to the minimum of the criteria used in the COPC screening, and information explaining the added uncertainties associated with inclusion of these non-detect chemicals and elevated detection limits.

Evaluating non-detected chemicals as COPCs adds uncertainty to the cumulative risks and noncancer hazards. As noted in RAGS Part A Section 5.3.5:

"Generally eliminate those chemicals that have not been detected in any samples of a particular medium. The outcome of this step is a data set that only contains chemicals for which positive data (i.e., analytical results for which measurable concentrations are reported) are available in at least one sample from each medium. Unless otherwise indicated, assume at this point in the evaluation of data that positive data to which no uncertainties are attached concerning either the assigned identity of the chemical or the reported concentration (i.e., data that are not "tentative," "uncertain," or "qualitative") are appropriate for use in the quantitative risk assessment."

Further, the 2018 USEPA Region 4 HHRA Guidance does not indicate non-detect chemicals with elevated detection limits should be added as COPCs.

2. <u>Section 3.3, Identification of COPCs, Page 3-4</u>

Review of this section and Table 2.1, Occurrence, Distribution, and Selection of Human Health COPCs for Site-Wide Groundwater, indicates that contaminants detected in less than five percent of samples were eliminated as COPCs. This method of selection of COPCs is generally perceived as dated and was in use prior to the widespread and ready-availability of regulatory agency-promulgated health-based screening criteria (e.g., the RSLs). In developing a site-specific COPC list, any contaminant detected at a concentration in excess of the most relevant health-based screening criterion should be retained as a site COPC and evaluated quantitatively and/or qualitatively within the Risk Characterization section of the HHRA. This screening should be conducted irrespective of frequency of detection results for individual constituents. Revise the HHRA accordingly.

Response: An updated HHERA will be prepared following additional data collection and risk assessment. Contaminants detected in less than five percent of samples will not be eliminated from the COPC list.

3. <u>Section 4.4.1.2, Dermal Contact Pathway of Exposure, Page 4-5 and Section 4.4.1.3, Inhalation Pathway of Exposure, Page 4-6</u>

Two issues were identified in review of these sections:

- **a.** The first sentence of Section 4.4.1.2 indicates that it is assumed that risk/hazard attributable to dermal/inhalation exposures are equivalent to those attributable to ingestion exposures; however, the second sentence states that the risk/hazard estimates for dermal/inhalation exposures will be double that of the ingestion risk/hazard estimates.
- **b.** Review of the risk and hazard estimates in Attachment A-1, RAGS Part D Planning Tables 0 to 7.3B, indicates that risk and hazard estimates attributable to dermal

exposures were generated for an industrial worker. This is not discussed in Section 4.4.1.2 and Section 4.4.1.3.

Revise these sections to clarify that it is assumed that risk/hazard attributable to dermal/inhalation exposures are equivalent to those attributable to ingestion exposures (not double), and that risk and hazard estimates attributable to dermal exposures were generated for an industrial worker.

Response: The referenced sections in the 2018 HHERA will be revised in accordance with the comment.

4. Section 6.4.1, COC Summary by Aquifer and Receptor, Page 6-8

The third paragraph in this section states, "The constituent 1,2,3-trichloropropane is an artifact of the EBT [enhanced bioremediation treatment] remedy and was detected in only eight wells within the TTA-2 TA [treatment area], with a detected range of 0.694 to 83.3 µg/L between 2012 and 2017. In April 2017, sampling indicated that 1,2,3-trichloropropane was detected in only four wells with a range of 0.694 to 15.9 µg/L." The significance of these statements and/or the conclusions that can be drawn based on this information are unclear, as they are not discussed. Revise this section to clarify the significance of these statements and/or the conclusions that can be drawn based on this information.

Response: No change to the 2018 HHERA report is considered necessary for this comment.

1,2,3-trichloropropane had not been detected prior to the start of enhanced bioremediation treatment and has only been detected in one area (TTA-2) that was impacted by other solvents. Detection may result from being present as a production contaminant in these other solvents; however, if this has occurred, it is limited in scope. TCP will continue to be analyzed during site monitoring, with concentrations and trend analysis to be reported and the need for any remedial action evaluated.

5. Section 8.1.2, Soils HHRA Methodology, Page 8-2

The third paragraph on this page concludes that the methodology used in the 2000 HHRA was "relevant and appropriate." No data or comparison of historical methodology to current methodology are provided to support this statement. For example, no comparison of risk assessment methodology, risk-based screening levels, exposure factor values, or toxicity values used in the 2000 HHRA to current risk assessment methodology, risk-based screening levels, exposure factor values, or toxicity values is presented. Revise the HHRA to provide a comparison of the historical methodology used in the 2000 HHRA to current methodology to support the conclusion that the methodology used in the 2000 HHRA was relevant and appropriate.

Response: No change to the 2018 HHERA report is considered necessary for this comment.

The results of the 2000 RA were compared to applicable requirements and criteria based on current guidance to present a forward looking assessment of protectiveness. As noted in Section 6.3.4 of the report, Comparison of Current Risks to the 2000 MI RI Risks, the groundwater component of the 2000 HHRA follows the same general risk methodology and uses the same primary USEPA guidance as the groundwater HHRA update. However, numerous changes in USEPA guidance since 2000 are noted. It is also noted in this section that these and other site-related changes can result in an increase or

decrease in the calculated risk for the COPCs. The HHRA update was performed to re-evaluate the risks to COPCs in the groundwater to help determine whether or not the remedy remains protective of the potential risks to receptors at DDMT. It is not a straightforward comparison between the 2000 and current risk estimates. See Section 6.3.4 for detailed information in this subject.

6. Section 8.1.2, Soils HHRA Methodology, Page 8-2

This section states that the methodology for assessing the toxicity of PAHs and dioxins/furans has changed since completion of the 2000 HHRA. While it appears that data for dioxins/furans was reassessed using current methodology in subsequent sections of Section 8.0, Review of 2000 Soils HHRA, it is unclear if PAH data were reassessed, as this is not discussed further in the HHRA. Revise this section to clarify if PAH data were reassessed, and provide supporting data tables. If they were not, provide rationale for absence of a supporting assessment.

Response: Section 8.1.2 in the 2018 HHERA will be revised to clarify that this reassessment was completed in Attachment F, Table 1. The PAHs were assessed by comparing data to current RSLs. The current RSLs incorporate the potency factors for PAHs.

7. Section 8.2.1, Background Concentrations, Page 8-2

This section states that background concentrations were calculated as part of the 2000 HHRA; however, it is unclear how the background data were used in the 2000 HHRA as this is not discussed. Revise this section to clarify how background data were used in the 2000 HHRA.

Response: Section 8.2.1 in the 2018 HHERA will be revised to clarify the use of background data. Background data is included as a criterion in Section 7.3 text and in the FU-specific COPC selection tables of the 2000 RI. However, no constituents were eliminated as COPCs based on background.

8. Section 8.2.1, Background Concentrations, Page 8-3

This section states, “Dioxins and furans were detected in most background soil samples, generally at higher concentrations at the surface than at depth and included octa- and hepta-isomers, indicating an atmospheric deposition source.” The range of concentrations detected and the selected background concentrations are not discussed or evaluated. For clarity and completeness, revise this section to present the range of concentrations detected and the selected background concentrations.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

As noted in the response to General Comment #8, sampling and additional risk assessment of PCP and dioxins/furans on the MI is planned. A more detailed review of existing analytical data will be performed prior to developing a sampling plan. The data review and the sampling plan will be provided in a QAPP submitted for EPA review.

9. Section 8.2.2.4, Conclusions, Page 8-7

According to this section, “The maximum concentration in subsurface soils for TCDD

equivalents is reported as 13 µg/kg (MI RI Table 22-7); given that the range of other values for the UCLs [upper confidence limit] and EPCs in the 2000 MI RI is orders of magnitude lower, this is considered to be a typographical error." The conclusion that this value is an error is not supported. A data review is not presented to support that this value is an error. In addition, the range of other values is unclear. Revise this discussion to provide additional data analysis to support the conclusion that this value is an error.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

Army agrees this error cannot be verified given the documentation available. This comment will be addressed during the additional review and data collection.

10. Section 8.2.2.4, Conclusions, Page 8-7

This section states, "There are no exceedances of human health screening levels [for dioxins/furans] in sediment, as there are no generic human health sediment criteria." If industrial workers and/or future potential residents are expected to be exposed to sediment it may be appropriate to screen sediment data against the RSLs for industrial and/or residential soil. Revise this section to clarify which receptor populations are expected to be exposed to sediment, and present a screening of sediment data for dioxins/furans against the RSLs for industrial and/or residential soil. Alternatively, clarify why this is not necessary.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

The dioxins/furans sediment data will be reviewed against soil RSLs during the additional review. Text will be provided in the updated HHERA with additional details on potential exposure scenarios and a determination of the need for further screening.

11. Section 8.2.2.4, Conclusions, Page 8-7

This section indicates that concentrations of dioxins/furans detected in surface water "were compared to their respective state and USEPA water quality criteria…." No tables are presented to support this discussion. Therefore, the concentrations relative to the screening criteria are unclear. Revise this section to provide supporting surface water screening data tables.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

Surface water screening data tables with current state and USEPA water quality criteria will be provided following the additional review.

12. Section 8.5, Conclusions, Page 8-12

The last bulleted item on this page concludes that further investigation of arsenic in soil is not warranted as concentrations are "within the range of background concentrations," although they exceed the RSL for industrial soil. Additional discussion is needed to support this conclusion. For example, this section does not discuss the range of detected arsenic concentrations compared to the range of site background concentrations. In addition, no evaluation as to

whether historical operations at the site could have contributed to arsenic contamination is presented. Revise the HHRA to provide additional data and discussion to support the conclusion that no further investigation of arsenic in soil is warranted.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

The available data for the range of detected arsenic concentrations compared to the range of site background concentrations and potential for arsenic contamination by historical operations at the site will be provided in the QAPP following the additional review.

13. Section 8.5, Conclusions, Page 8-13

The first bulleted item on this page states, "Other areas where dioxins/furans were detected but no LUCs were instituted may also require review and additional risk management decisions based on analytical results. This includes shallow and deeper soils within a portion of FU3 and FU4, as well as other media to ensure both human health and ecological risks are properly addressed." The areas to which this statement is referring are unclear, as no figures are provided that depict the locations of dioxin/furan exceedances and/or areas at which LUCs due to dioxin/furan contamination have been implemented or are required. In addition, it is unclear what other media are of concern. Revise the HHRA to address these issues.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

This comment, including preparation of figures showing sample locations for existing dioxins/furans data and the areas where associated LUCs were implemented, will be provided in the QAPP following the additional review.

14. Section 8.5, Conclusions, Page 8-13

The last bulleted item on this page states, "These restricted areas are largely co-located, as PCP use is a likely source of the dioxins in soil." It is unclear to what areas this statement is referring. Revise this statement to clarify this and provide a supporting figure.

Response: A more detailed review of existing analytical data will be performed; the data review and a sampling plan, if warranted, will be provided in a QAPP.

The requested figure will be provided in the QAPP following the additional review.

15. Attachment A-1, RAGS Part D Planning Tables 0 to 7.3B, Table 1, Selection of Exposure Pathways. Two issues were identified in review of this table:

a. Section 4.2.2, Future On-Site Resident, indicates that the groundwater inhalation exposure pathway was quantitatively evaluated for a future potential resident, as does the "Rationale for Selection or Exclusion of Exposure Pathway" column of Table 1; however, the "Type of Evaluation" column of Table 1 indicates that this pathway was qualitatively evaluated.

b. The "Rationale for Selection or Exclusion of Exposure Pathway" column of Table 1 states that the VI pathway was evaluated for a future potential resident; however, review of the HHRA indicates that this assessment was not completed.

Revise Table 1 to address these issues.

Response: Table 1 of the 2018 HHERA will be revised in accordance with comment 15.a.

Analytical results and risk assessment from the ongoing VI study will be incorporated in an updated HHERA following additional data collection and risk assessment. Comment 15.b will be addressed in the update.

16. **Attachment A-1, RAGS Part D Planning Tables 0 to 7.3B, Tables 3.1 through 3.3, Exposure Point Concentration Summary for Groundwater** These tables indicate that risk and hazard to a construction worker were evaluated in the HHRA; however, this is not the case. Revise these tables to remove reference to assessment of construction worker exposures.

Response: Tables 3.1-3.3 of the 2018 HHERA will be revised in accordance with the comment.

III. ECOLOGICAL RISK ASSESSMENT (ERA) GENERAL COMMENT:

1. Based on review of the tables included in Appendix G, it is unclear why hazard quotients (HQs), especially for the chemicals of potential concern (COPCs) that exceed screening levels are not calculated. Revise the tables in Appendix G to calculate HQs for those COPCs that exceed their respective screening levels. This requested change will greatly facilitate the review process.

Response: The need for a SLERA will be evaluated and recommendations provided following additional sampling and risk assessment. Calculation of HQs for the ERA was outside the SOW for the 2018 HHERA.

IV. ECOLOGICAL RISK ASSESSMENT (ERA) SPECIFIC COMMENTS:

1. Section 9.2.3, Off-site Surface Water Transport, Page 9-5:

The link to the Nonconnah Creek Watershed (08010211) of the Mississippi River Basin Water Quality Management Plan does not work and should be updated to the include the following link: https://www.tn.gov/content/dam/tn/environment/water/documents/wr-ws_watershed-plan-nonconnah-2002.pdf. Revise accordingly.

Response: The link will be updated in the 2018 HHERA.

2. Section 9.2.3, Off-site Surface Water Transport, Page 9-5:

The last paragraph in this section indicates that the potential transport of dioxin/furans warrants additional evaluation in accordance with the Tri-Service Environmental Risk Assessment Workgroup Questions/Answers on Dioxin (TSERAWQ, 2013). The link to TSERAWQ, 2013 is provided in Section 8.2.2.4, Conclusions, and Page 8-7 of the HH/ERA, but did not work.

Revise the HH/ERA to include the appropriate link such that the applicability of the protocol for further ecological risk evaluation can be determined.

Response: The link will be updated in the 2018 HHERA.

3. Section 9.4, Conclusions, Page 9-12:

The first paragraph in this section indicates that the levels of certain COPCs in surface soil, sediment, and surface water collected in 2000 exceed the current March 2018 USEPA Region 4 ecological screening levels. However, because complete ecological exposure pathways are not present, on-site ecological risk at the Main Installation (MI) is considered minimal. While, this statement is accurate, select sections of the HH/ERA present contradictory information. For example, Section 9.3.3.2, Current Review Conclusions, Page 9-8 states, "HDR's review of the 2018 ecotoxicity criteria, detected COPC concentrations and site conditions support the general conclusion in the 2000 MI RI. However, further review is recommended for COPCs in soil that exceed current criteria, as described in Section 9.4." Therefore, it is unclear how COPCs that exceed current ecological screening levels will be evaluated. Revise Section 9 of the HH/ERA to clarify how COPCs that exceed screening levels will be evaluated.

Response: Text will be reviewed based on available information and inconsistencies will be eliminated in the 2018 HHERA revision.

Additional data collection and risk assessment for site contamination is planned, and an updated HHERA will be prepared. The need for a SLERA will be evaluated and recommendations provided in the updated HHERA.

4. Figure 2-21, Conceptual Site Model for Potential Human and Ecological Exposures: Function Units 1-6, Memphis Depot Main Installation ROD:

An apparent typographical error is present on Figure 2-21. For example, the last two blocks under "Secondary Source of Contamination" should be Onsite Surface Water and Onsite Sediment as opposed to Onsite Surface Soils and Onsite Subsurface Soils. Revise Figure 2-21 to address this typographical error.

Response: Figure 2-21 in the 2018 HHERA will be revised in accordance with the comment.

Responses to Comments from
U.S. Environmental Protection Agency (EPA) Region 4 on:
Human Health and Ecological Risk Assessment (HHERA), Revision 0
Defense Depot Memphis, Tennessee
Comments Received 23 July 2018
Responses Revised 11 December 2018

REVIEW OF ECOLOGICAL ASPECTS OF THE REVISION 0 HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT, MAIN INSTALLATION, DEFENSE DEPOT, MEMPHIS, TENNESSEE

From EPA Scientific Support Section, Sharon R. Thoms, June 18, 2018.

General Comments to RPM on pages 1 to 6 provide a brief summary of site conditions and the SLERA review within the HHERA report. Responses to comments in this section are not considered necessary, with the exception of Item 2 on page 2, which states "The text described the BERA step as having begun, however, the document did not complete the elements of the BERA." Army notes that the statement of work was limited to a review of the SLERA based on changes in applicable guidance since the time the original document was prepared. Army requests that the USEPA RPM forward any other comments in this section which require response.

V. GENERAL COMMENTS TO DoD:

1. Conclusions underemphasize chemicals exceeding ESVs and industrial RSLs at multiple FUs. Often the same chemicals that exceeded the industrial RSLs exceeded the ESVs. Please revise the document to include itemized data tables and figures for each FU showing the locations of exceedances of ESVs and industrial RSLs with respect to site features, land cover, land use, greenspaces, waterbodies, and footprints of removal actions.

Response: This comment will be addressed in the updated HHERA following additional data collection and risk assessment.

2. Figures showing the locations of surface water and sediment samples should be provided along with tables of itemized data.

Response: Updated figures to address this comment will be provided in the updated HHERA following additional data collection and risk assessment.

3. The 2018 Region 4 Supplemental Ecological Risk Assessment Guidance has narrowed the set of circumstances where a site can exit the ERA process after completing the SLERA to sites having buildings and parking lots with vegetation limited to grassy strips and sites where addressing human health risks will adequately address ecological risk concerns. The review has not addressed this aspect of the revised guidance. The screening level problem formulation is not of sufficient detail to support a discussion of potentially complete exposure pathways to various receptor groups, as this occurs in the BERA. The discussion of incomplete exposure pathways depends on how the land is being managed to exclude exposure to wildlife. If the property will be turned over to private use, the land use will likely change. It is uncertain whether the reduced use by wildlife will continue or whether land use controls are needed.

Response: The need for a SLERA will be evaluated and recommendations provided in the updated HHERA report. The assumption that future land use is likely to change may be inaccurate; it is more likely to remain industrial based on current and proposed activity, facility management plans and zoning.

4. The ecological risk assessment review of the 2000 SLERA should contain an uncertainty section and discuss how sediment and surface water samples were available from drainage pathways leading from FU2 and FU4 but not from the other functional areas. Other limitations such as the age of the data should be discussed.

Response: The need for a SLERA will be evaluated and recommendations provided in the updated HHERA report.

5. The report recommended additional assessment of COPCs in soils exceeding the ecological criteria for their potential to serve as sources of contamination delivered by stormwater runoff to off-site surface water bodies. The exposure pathway to ecological receptors of soil contamination from the DDMT washing off into the off-site waterways is complete. Several chemicals detected in surface water exceeded TDEC standards for fish and aquatic life. Please estimate the total mass of CERCLA contaminants in each FU to evaluate whether there is a potential source to the waterways.

Response: The need for a SLERA will be evaluated and recommendations provided in the updated HHERA report.

The assumptions that the exposure pathway is complete and the site is a continuing source of runoff to surface water are in question and require further analysis. Estimating total mass of CERCLA contaminants to evaluate if there is a potential source to the waterways is not recommended, as noted in EPA guidance at https://icis.zendesk.com/hc/en-us/article_attachments/202335086/ref10vcmaappendixa.pdf.

VI. SPECIFIC COMMENTS TO DoD:

1. Tables F-1 and G-1. The exposure point concentration for lead in FU3 in Table F-1 is 311 mg/kg, whereas the exposure point concentration for lead in FU3 in Table G-1 is 4,160 mg/kg. Please address this inconsistency.

Response: No change to the 2018 HHERA report is considered necessary for this comment.

Review of the original data in the 2000 MI RI, Table 18-1 indicates the range of detected concentrations for lead is 2.8 mg/kg to 4,150 mg/kg (value of 4,160 appears to be a typo in comment) and the arithmetic mean is 244 mg/kg. Table F-1 presents the 95% UCL data, which is the upper estimate of the true population mean. For the HHRA, applying the maximum detected concentration of 4,150 mg/kg in the COPC screening step and then applying the EPC (e.g., 95% UCL) in the risk calculations is standard national USEPA practice. In comparison, for the SLERA, only the maximum detected concentrations (i.e., 4,150 mg/kg) were used in the comparison for this screening assessment, which is standard practice and explains the difference in EPC values between the HHRA and SLERA. Applying 95% UCLs as an estimate of exposure is typically not done until Step 3A or in a full BERA.

STATE OF TENNESSEE
DEPARTMENT OF ENVIRONMENT AND CONSERVATION
Division of Remediation
Memphis Environmental Field Office
8383 Wolf Lake Drive
Bartlett, TN 38133-4119

November 9, 2021

James C. Foster
BRAC Program Manager
Headquarters Department of the Army,
Assistant Chief of Staff for
Installation Management (DAIM-ODB)
Army Pentagon,
2530 Crystal Drive,
Arlington, VA 22202-3934

Subject: **HHERA Review Sampling and Analysis Plan, Rev. 0**
Defense Depot Memphis, Tennessee
TDoR ID # 79-736
TN4210020570

Mr. Foster,

TDEC-DoR has reviewed the **HHERA Review Sampling and Analysis Plan (Rev. 0)** and has no general/specific comments regarding the document. If there are questions regarding the approval, please contact me at (901) 371-3041 or at jamie.woods@tn.gov .

Regards,



Jamie A. Woods, P.G.
Project Manager
Division of Remediation
Memphis Environmental Field Office

cc: Joan Hutton (CALIBRE)
T. Holmes (HDR Inc)
D. Lloyd (EPA-PM)

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 4
ATLANTA FEDERAL CENTER
61 FORSYTH STREET
ATLANTA, GEORGIA 30303-8960

April 11, 2022

Mr. James Foster
Base Realignment and Closure Division (ACSIM-ODB)
2530 Crystal Drive (Taylor Building), Room 5000
Arlington, VA 22202-3940

Dear Mr. Foster:

The U.S. Environmental Protection Agency (EPA) has reviewed the U.S. Department of the Army's Responses to EPA Comments on the Human Health and Ecological Risk Assessment (HHERA) Sampling and Analysis Plan (SAP), Revision 0 (July 2021) for the Defense Depot Memphis, Tennessee. The response to comments were received via email on March 14, 2022.

EPA provides conditional approval for the reported referenced above with the understanding that the comments below are addressed and included in the HHERA SAP. Should you have any questions or concerns or wish to discuss the below comments, please feel free to call me at on my cell number 404-229-9500.

Sincerely,

Diedre Lloyd

Diedre Lloyd
Remedial Project Manager
Restoration & Sustainability Branch
Region 4, Superfund Division

cc: Mr. James Foster, (Signed Original), United Parcel Service, Return Receipt
Mr. Jamie A. Woods, PG, Tennessee, Department of Environment and Conservation, Memphis Environmental Field Office, 8383 Wolf Lake Drive, Bartlett, TN 38133-4119
Mr. Bill Millar, bill.millar@calibresys.com
Mr. Thomas Holmes, HDR Environmental, P.O. Box 728, Highlands, NC 28741

Above Letter was also emailed to list below and can be found at the e-file location noted below.

ec: james.c.foster10.civ@mail.mil; jamie.woods@tn.gov; bill.millar@calibresys.com; thomas.holmes@hdrinc.com;

e-bbc: Terrell.tina@epa.gov

C:\DDMT\DDMT_HHERA

U.S. EPA RESPONSES TO U.S. ARMY COMMENTS
submitted to EPA on March 14, 2022 via email on the

HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENT
REVISION 0

MAIN INSTALLATION
APRIL 2018

DEFENSE DEPOT
MEMPHIS, TENNESSEE

EPA Response to Army Response to EPA General Comment 2: The response partially addresses the comment; although acceptable, the verbiage included in the response should be added to the revised document to clarify that the new soil, sediment and surface water data will be evaluated separately from the historical data.

EPA Response to Army Response to EPA Specific Comment 4: The response partially addresses the comment; the "O.H. Materials 1986 report" should be quoted if this is the source of the target cleanup level of 200 micrograms per kilogram of total dioxin and furan isomers.

EPA Response to Army Response to EPA General Comments 4 and 5:
The U.S. Army referred back to comment 5 to address EPA comment 4 and as a result both comment responses will be addressed in this combined comment response:

> EPA requested statements of the number of samples that exceeded the screening values out of the entire samples collected. Please include this information in the HHERA SAP since EPA expects this document to be a "stand alone" document.
>
> EPA Response to Army Response to EPA Comment 4: Samples are proposed for concrete-lined drainage channels. Concrete-lined drainage channels may provide limited ecological habitat. However, Section 3.6 indicated that stormwater is directed to lined or unlined drainage features. The new data collected should be screened against conservative ecological screening values and with site-specific food-chain models as appropriate. After the screening assessment discuss the complete or potentially complete exposure pathways to ecological receptors. If after the screening-level assessment is performed on the new data, the drainage ditches are assumed not to provide ecological habitat, a full discussion of the habitat is required to support that conclusion. The discussion should consider the potential transport to downstream areas that do provide ecological habitat.

Overall EPA Comment for future SAP above mentioned HHERA SAP: Please acknowledge that an explanation of how new data to be collected will be evaluated for ecological risk.

Responses to Comments from
U.S. Environmental Protection Agency (EPA) Region 4 on:
HHERA Review Sampling and Analysis Plan, Revision 0 (July 2021)
Defense Depot Memphis, Tennessee
Comments Received 14 February 2022

EPA GENERAL COMMENTS:

1. The HHERA [Human Health and Ecological Risk Assessment] Review Sampling and Analysis Plan, dated July 2021 (the SAP) for the Defense Depot, Memphis, Tennessee (DDMT) Main Installation (MI), would benefit from edits that support better readability of the document. It is important to preview upcoming sections so that the reader understands the organization and structure of the overall document, thereby enhancing the clarity of the material being presented. For example:

    a) Section 1, Introduction, should enumerate and describe the proceeding main sections of the document;
    b) Section 2.2, Site Investigation and Remedial Action, should introduce the previous human health and ecological risk assessments and then refer the reader to the discussion in Section 2.4 (Human Health and Ecological Risk Assessments); and
    c) Section 2.4, Human Health and Ecological Risk Assessment, should preview the review of the HHERA data presented below in Section 3, Additional Review. Also, consider renaming Section 3 to clarify what is specifically being reviewed in this section (e.g., Review of HHERA Data).

    Additionally, the introduction should clearly state the objectives of the investigation (i.e., to fill data gaps, sampling for specific constituents of concern, etc.), such as that described in Section 4, Project and Data Quality Objectives, and name the agencies (and pertinent guidance documents) under whose auspices this work is being performed. Finally, in light of the length of the HHERA review and the fact that the SAP is dependent upon its results, the document should have an Executive Summary. Therefore, it is recommend to revise the SAP to perform the edits described above.

    Response G1: The text will be revised for clarity as described above.

2. It is unclear how the collection of soil, sediment and surface water data from samples proposed in the SAP will be applied to the *Human Health and Ecological Risk Assessment, Revision 1* (HDR, 2020). Although a conditional approval for the document was given by the USEPA in 2019 (and shown in Appendix B of the SAP), there is no verbiage to describe how the analysis of new data at the DDMT MI will be handled with respect to the existing report. Section 6, Risk Screening, indicates that a full risk assessment will not be performed based on new data, as many of the steps have already been completed. However, the previous HHERA has not been finalized to date, and therefore, there should be a road map for the augmentation of the existing report as it relates to the potential new site data. Revise the SAP to discuss how the new media data will be added to the HHERA Revision 1 to finalize the previous risk assessments.

    Response G2: The soil, sediment, and surface water analytical data will be evaluated separately from the historical data in the MI RI (CHM2 HILL, 2000) because the purpose of the proposed sampling is a risk screening to identify remaining issues with the site-related COPCs (e.g., dioxins, furans). Incorporating the historical data sets in re-calculated EPCs may obscure the new data for COPCs obtained by the proposed sampling. However, the new analytical data will be compared to the range of concentrations from the historical analytical data set to see if there are differences in the concentrations.

3. The Integrated Exposure Uptake Biokinetic (IEUBK) Model should be used to evaluate the presence of lead in soils at DDMT MI. As discussed in Section 3.5, Lead Concentrations, lead exceedances in soils were evaluated using the EPA Adult Lead Model (ALM), which is used to determine potential lead risks to a developing fetus in a pregnant female worker. However, residential child lead risks should also be investigated at all functional units (FUs) and especially within FU-6 because of the area designated Unrestricted Use/Unrestricted Exposure (UU/UE). Therefore, revise the SAP to include an analysis of potential lead exposure risks to residential children using the IEUBK Model. Note that lead at all depth intervals should be modeled for residential receptors.

   Response G3: As indicated in SAP Section 2.3, LUCs prevent residential use throughout the MI, except in the UU/UE area in FU-6. The LUCs are specified in the property deeds either by inclusion or through reference to the recorded Notice of Land Use Restrictions. A current/future residential child's exposure to lead in soil at the MI is not a complete pathway, except potentially in the UU/UE area in FU-6. For residential exposure in the UU/UE area, response to EPA Comment S2 provides further discussion on this topic.

4. It is unclear whether uncertainties were taken into account when the 2000 HHERA was reviewed. As discussed in Section 3.3, Arsenic Concentrations, the residential exposure of arsenic in soil was predicated on only one soil sample collected from the administrative area of UU/UE area of FU-6. However, it is unknown whether there were additional uncertainties within the dataset that could have impacted the review performed on the 2000 data. The uncertainty analysis is important for placing the results of a risk assessment in the proper context. Therefore, revise the SAP to include a discussion of the uncertainties of the dataset as described in the 2000 HHERA and include any uncertainties that were generated as the result of performing the present analysis (e.g., use of old data, etc.).

   Response G4: Please note that as stated in the SAP Section 3.3, there is uncertainty in using one sample in the administrative area to calculate risks and hazards for the residential exposure scenario in the UU/UE area. The text further states that the arsenic confirmation data at 1 ft from the 1999 removal action that occurred in the Family Housing Area (within the UU/UE area, data set described in the SAP Section 3.2.2.1) was instead used to calculate an EPC of 14.13 mg/kg. The calculation consisted of 15 composite confirmation samples (no analysis for arsenic on the individual confirmation samples was performed) with a range of 6.73 to 27.7 mg/kg. Upon re-review of the 1999 removal action report, the range of arsenic concentrations for the clean backfill (5 samples) was 3.41 to 11.5 mg/kg. The text will be revised in SAP Section 3.3 to include this information.
   The text will be revised to described uncertainties associated with use of the data set.

5. The approach presented in Sections 3.6, Ecological Review, and 3.6.1, Summary, is too simplistic. The cited tables summarize numbers of "analytical results" that are greater than Ecological Screening Values (ESVs), however, the analysis should be focused on the number of samples exceeding criteria vs. numbers of samples analyzed for each of the identified sediment and surface water COPCs. Without this information reviewers cannot determine the significance of statements such as "one PCB exceedance" and the validity of the recommendation to not sample for PCBs. For example, one exceedance might be substantial if only a few samples were analyzed for PCBs. Revise the summary and associated tables to include the number of samples and respective detections and exceedances for each analyte/COPC.

Response G5: SAP Section 3.6 was meant to be a summary of the ecological review conducted for the 2018 HHERA and updated in the February 2020, Revision 1. The summary states the proposed sampling in SAP Section 5 is based on the conclusions of the 2018 HHERA and is intended to evaluate the potential for COPCs to be conveyed off-site via stormwater runoff. The text will be revised to clarify and better connect the two sections.

Also, please note the following as a reminder of the extensive investigations that were performed and the conclusions that were previously made in the MI RI (CH2M HILL, 2000), Record of Decision (ROD; CHM2 HILL, 2001), and HHERA (HDR, 2018 & 2020) to refocus the conversation on the purpose behind the proposed surface water and sediment sampling in the SAP:

- The 2001 ROD Section 2.12.6 required a re-evaluation of *groundwater and soil* in the Five-Year Review (FYR) process, through which the 2018 HHERA came about after the Fourth FYR. The Fifth FYR is to be completed by the beginning of January 2023.
- The 2001 ROD Sections 2.5.3 and 2.7.2 indicated the natural habitat in the MI area is very limited to non-existent. The FU-2 golf course and the extensive industrialized areas do not provide natural habitat for wildlife. Ecological receptors, such as terrestrial or aquatic animals and plants in the ponds and streams, are not being exposed to the site groundwater (source of contamination) and are not likely to be exposed in the future. An evaluation was performed in the two ponds in FU-2, which included a sufficient density of surface water and sediment samples and a fish tissue evaluation, and concluded that the ecological risk at FU2 was negligible. The land uses on the MI were expected to remain unchanged in the future; therefore, the potential for wildlife exposure was low. There were no unacceptable risks posed to ecological receptors at the MI.
- The 2018 HHERA included a review of ecological exposures in surface water and sediment based solely on a comparison of historical data to current ecological screening levels, updated in March 2018. The review indicated that the levels of certain COPCs in environmental media exceed their respective screening levels. However, there remains minimal to no suitable ecological habitat throughout the MI and there are no apparent complete ecological pathways of exposure on-site.
- However, because there is potential for COPCs to be conveyed off-site via stormwater runoff and there were previous detections of dioxin/furans in on-site soil, surface water, and sediment, the 2018 HHERA recommended additional study of the drainage pathways, which was to be proposed in this SAP.
- The SAP's proposed sampling will be conducted in lined drainage channels of an ephemeral nature that are unlikely to support permanent benthic/aquatic communities. The sampling is meant to understand potential mobility of site-related COPCs to downstream off-site ecological receptors (i.e., Nonconnah Creek [>0.5 miles south], Frisco tributary branch to the northeast, and Tarent tributary branch to the west). If there are exceedances identified in these drainage channels, it is not necessarily indicative of ecological risk on-site or to ecological receptors in off-site receiving waterbodies. However, the lack of exceedances in surface water and sediment can demonstrate protectiveness at the site boundary for off-site downstream ecological receptors.
- The 2018 HHERA also indicated that an initial review of limited mobility of dioxins and furans, detected COPC concentrations, site conditions (including the status of the Nonconnah Creek watershed as having limited ecological resource value), and the surrounding industrial and urban environment (with off-site anthropogenic

sources of contamination and the presence of permitted stormwater discharges) largely supports the conclusion in the 2000 MI RI that there is negligible ecological risk from stormwater runoff or other potential ecological exposure pathways emanating from site-related contaminants at DDMT.

- After re-review of the previous reports through responses to EPA comments, the SAP text will be revised to focus surface water and sediment sampling in drainage ditches for dioxins and furans, as was concluded in the 2018 HHERA, and to remove analyses for metals, SVOCs, and pesticides. As noted above, the area surrounding DDMT is heavily industrialized and urbanized with likely contributions to elevated concentrations of metals, SVOCs, and pesticides from industrial and urban non-point sources. The 2018 HHERA had proposed surface water and sediment sampling specifically for dioxins and furans to further evaluate potential off-site migration as dioxins and furans are associated with a former on-site source in FU-4 and they had significantly elevated detection limits in previous sampling events.

6. It is unclear how many proposed samples of each matrix and analysis will be collected per FU. Assuming that exposure point concentrations (EPCs) will be calculated on an FU by FU basis, it is important to ensure that there are enough samples for each FU. Note that ProUCL recommends that at least 10 samples are used to calculate 95UCLs. Therefore, revise the SAP to clarify how many samples will be collected at each FU.

   Response G6: The text in the SAP Section 4.3 will be revised to clarify the proposed samples of each matrix and analysis; a Table 23 will be added to summarize the number of samples by FU as shown on SAP Figures 17 to 20. The text will also be revised to indicate that the EPCs for soil will be calculated by FU, with at least 8 to 10 samples per calculation (as recommended by ProUCL User Guide). The surface water and sediment data will be evaluated on an individual basis for potential off-site migration through stormwater runoff and a MI-wide EPC can also be calculated. The number of samples are listed below.

   - FU-4 –
     - Soil evaluation for dioxins/furans:
       - 10 soil locations in the former PCP dip vat area (3 samples at each location by depth, 0 to 6, 12 to 18, and 60 to 66 inches = 30 samples).
       - 1 surface soil location in the holding pond.
       - 2 surface soil locations in concrete-lined drainage ditches at the outfalls.
     - Soil evaluation for chromium: 10 surface soil samples near Building 949, the location of the former removal action.
     - Surface water and sediment evaluation for dioxins/furans:
       - 4 surface water in the concrete-lined drainage ditches
       - 6 sediment – 5 in the concrete-lined drainage ditches and 1 in an intermittently wet area near the former PCP dip vat area.
   - FU-2 –
     - Soil evaluation for dioxins/furans
       - 2 soil locations for dioxins/furans near the concrete-lined drainage ditches at the outfalls.
     - Sediment/surface water evaluation for dioxins/furans:
       - 4 surface water in in the concrete-lined drainage ditches
       - 5 sediment in the concrete-lined drainage ditches
   - FU-3 –

- Soil evaluation for chromium: 10 surface soil samples in the southwest corner.
- Sediment/surface water evaluation for dioxins/furans: 1 surface water and 1 sediment sample in the concrete-lined drainage ditch in the holding pond.

EPA SPECIFIC COMMENTS:

1. **Section 2.4, Human Health and Ecological Risk Assessment, Paragraph 1, Page 2-7:** There is no reference cited for the 2018 updated HHRA and screening ecological risk assessment (SLERA) where it is first mentioned at the end of Paragraph 1. Revise Section 2.4, Paragraph 1, to include the reference to this document.

   Response S1: The text will be revised.

2. **Section 2.4, Human Health and Ecological Risk Assessment, Page 2-7:** This section states that additional risk assessment was recommended for lead in soil based on the results of the 2000 HHERA, but this is not proposed herein. It is unclear how the revised lead review (Section 3.5) relate to what was done in the 2000 HHERA. The review now states that lead is not a problem and no new sampling is proposed. Revise Sections 2.4 and 3.5 to more fully discuss how the 2000 and 2021 analyses for lead differ, in the context of sampling recommendations.

   Response S2: The text in Sections 2.4 and 3.5 will be revised to better connect the sections. To clarify,
   - The 2018 HHERA's review identified which concentrations from the 2000 MI RI lead soil data set exceeded the soil RSLs (current at the time the HHERA was written) and stated, "Additional sampling and analysis for lead will better characterize lead concentrations and identify areas requiring further remedial action to assure protectiveness in those FUs where lead has been detected above the RSL, i.e., FU-1, 3 & 4".
   - After further discussion with EPA, additional review of the potential issues raised in the 2018 HHERA was performed, which was included in the SAP.
   - In the SAP, the lead data were further evaluated using the ALM and this demonstrated that that the probability of a fetus having blood lead levels of 5 µg/deciliter or more through the mother's exposure is well below the EPA threshold of five percent in FU-1 to FU-6. Therefore, sampling was not proposed in FU-1 to FU-6 for industrial exposure.
   - For the UU/UE portion of FU-6 and residential exposure, while the SAP Section 3.5 only notes the one sample as having a concentration of 14.5 mg/kg, which was well below the Residential Soil RSL of 400 mg/kg, the text can benefit from being revised to include the data from the confirmation samples collected from the excavation in the Housing Area as part of the 1999 removal report (as was done for arsenic in the SAP Section 3.3). The range of concentrations was 8.42 to 54.3 mg/kg (15 samples), the backfill samples were 5.99 to 17.9 mg/kg (5 samples), and these are well below the Residential RSL. Therefore, sampling was not proposed in the FU-6 UU/UE area for residential exposure.

3. **Section 2.2.1, PCP Dip Vat, Subsection 2.2.1.1, Removal Action, Paragraph 2, Page 2-3:** It is unclear what is meant by this statement: "Further analytical investigation by U.S. Army Environmental Hygiene Agency investigators of the liquid in Building 737

revealed the *presence of appreciable levels* of higher chlorinated dioxins and furans…" If this statement is meant to suggest concentrations in exceedance of a screening level, it should be stated as such. Revise Section 2.2.1.1 to clarify what is meant by "appreciable levels".

Response S3: The text is a verbatim excerpt from the O. H. Materials 1986 report (Section 1.3, pg 1-3) referenced in the preceding paragraph of Section 2.2.1.1. Table 6 from that report lists the following analytical results in micrograms per kilogram (µg/kg):

TCDD	PCDD	HxCDD	HpCDD	OCDD	TCDF	PCDF	HxCDF	HpCDF	OCDF
<2.5	<11.0	624.0	58,400	128,000	<2.0	<3.0	3,800	91,600	116,000

The text will be revised to state that lower chlorinated (tetra- and penta-) dioxins and furans were not detected (<2.5 to <11 µg/kg) and higher chlorinated (hexa-, hepta- and octa-) were detected at 624 to 128,000 µg/kg.

4. **Section 2.2.1, PCP Dip Vat, Subsection 2.2.1.1, Removal Action, Paragraph 2, Page 2-4:** A reference is required for the target cleanup level of 200 micrograms per kilogram (µg/kg) of total dioxin and furan isomers, as established in consultation between Army, EPA and TDHE, if this appears in a document or written correspondence. Revise Section 2.2.1.1 to provide a reference for this cleanup level, if applicable.

   Response S4: The statement was a verbatim excerpt from the O. H. Materials 1986 report (Section 3.2.3, pg 3-7). The report did not provide a reference and the report can be provided to EPA if desired.

5. **Section 2.4, Human Health and Ecological Risk Assessment, Paragraph 3, Page 2-7:** The second sentence states that the (2018) soil HHRA found that most organic and inorganic constituents detected at the DDMT are present at levels that do not exceed current Industrial EPA Regional Screening Levels. Revise this sentence to "then current".

   Response S5: The text will be revised as suggested.

6. **Section 3.1.2, Sediment and Surface Water, Page 3-4:** Revise this section to ensure that the names of the FUs are rendered consistently; both hyphenated (FU-3) and non-hyphenated (FU2; FU4) names are shown on this page. Check the remainder of the document for consistency as well.

   Response S6: The text will be revised and the rest of the document will be checked.

7. **Section 3.2, RSL Exceedances, Paragraph 1, Page 3-6:** This is the first usage of "COPC" but it is not defined in text. Revise this section to include the definition of this acronym.

   Response S7: COPC is defined as "constituents of potential concern (COPCs)" on page 3-1 and "COPC" in "Acronyms and Abbreviations".

8. **Section 3.2, RSL Exceedances, Paragraph 1, Page 3-6:** Revise this section to define the EPCs mentioned herein (i.e., 95UCL, etc.)

Response S8: The text will be revised to clarify that the EPC is the lower of the 95% upper confidence limit on the arithmetic mean and the maximum detected concentration, based upon review of the tables provided in the 2000 MI RI for each FU.

9. **Section 3.2.1, Industrial Worker Exposure Scenario; Section 3.2.1.1 Surface Soil (0-2 ft), Page 3-6:** The acceptable risk range of 1E-06 to 1E-04 is presented in this section with no introduction or context. It should be moved up into the introductory paragraph (i.e., Paragraph 1 on this page) and described more thoroughly; revise the document accordingly.

   Response S9: The text will be revised to improve clarity.

10. **Section 3.2.1, Industrial Worker Exposure Scenario; Section 3.2.1.3, Discussion of Primary Contributors, Page 3-7:** It is unclear what is meant by the primary contributors to *the higher numbers*. Revise this section to clarify this statement.

    Response S10: The text will be revised to remove that portion of the sentence.

11. **Section 3.2.2, Residential Exposure Scenario; Section 3.2.2.1, Discussion of Primary Contributors, second bullet, Page 3-8:** Although it is assumed that the ProUCL-calculated EPC is the 95% upper confidence limit of the arithmetic mean (95UCL), it is not explicitly stated. Revise this section to define the EPC.

    Response S11: The text will be revised to clarify that the EPC is lower of the 95% upper confidence limit on the arithmetic mean and the maximum detected concentration, based upon review of Table 30-6 of the 2000 MI RI.

12. **Section 3.4, Chromium Concentrations, Page 3-10:** It is not stated whether the background concentrations of (total) chromium have been quantified for DDMT. Revise this section to describe the chromium background concentration, if one is present. If not, state as such.

    Response S12: The text will be revised. Table 3-11 of the 2000 MI RI provides a background level of 24.8 mg/kg for surface soil and 26.4 mg/kg for subsurface soil.

13. **Section 6, Risk Screening, first sub-bullet, Page 6-1:** The 95UCL is on the arithmetic mean; revise this bullet to include the word “arithmetic”.

    Response S13: The text will be revised here and in the second sub-bullet.

14. **Section 6, Risk Screening, third bullet, Page 6-1**: There is no alternate source of criteria or surrogate procedure cited in the event that a constituent detection in sediment or surface water has no corresponding Region 4 Ecological Freshwater Screening Value. Alternative sources of criteria could include Los Alamos National Laboratory (LANL) ESVs ECORISK Database, USEPA Ambient Water Quality Criteria, etc.). Revise this section to include one or more alternate sources of sediment and surface water ESVs.

    Response S15: The text will be revised to indicate that the Oak Ridge National Laboratory (ORNL) Risk Assessment Information System (RAIS) Ecological Benchmark Tool for Chemicals (2021 Updates,

https://rais.ornl.gov/tools/eco_search.php?select=chem) that is available on the ORNL website will be used as it includes sediment and surface water ESVs from various sources including LANL and the EPA Regions. In addition, literature-based values will also be consulted, as necessary, for COPCs not included in the RAIS Ecological Benchmark Tool for Chemicals.

15. **Section 6, Risk Screening**. Revise this section to include further details on the calculation of EPCs, including the use of ProUCL Kaplan-Meier statistics for datasets that have non-detected values.

    Response S15: The text will be revised.

16. **Section 6, Risk Screening**, and **Section 7, Reporting**. It is unclear whether or not proposed sampling data will be combined with 2000 HHRA data when calculating EPCs in the final revision of the risk assessment (assumed Revision 2.0). Revise these sections to clarify how the new data will be used, and how they will be reflected in the HHERA.

    Response S16: The text will be revised in Section 6. See response to EPA Comment G2. The data will be evaluated separately from the 2000 MI RI data in a standalone report. However, a qualitative comparison will be made to the old data to see if there are differences.

17. **Section 6, Risk Screening**. Revise this section to describe how field duplicate samples results will be handled/processed when calculating EPCs.

    Response S17: The text will be revised. The results of the parent and field duplicate samples will be consolidated into the data set by using the maximum result of each pair if constituents are detected in both the parent and duplicate samples. The detected value will be used when one result is detected, and the other is reported as non-detect.

18. **Tables 4-8**: The names of these tables should be revised to clarify that the samples were collected as part of the 2000 HHERA. Additionally, the dashes should be defined. Note that for these and all tables in the document, definitions should be added to the Table Notes, including all units, abbreviations, etc., as well as references for cited criteria.

    Response S18: The tables will be revised.

Further EPA Comments from Kevin Koporec:

My review is focused on the human health risk assessment aspects of this report. I offer the following comments.

1. *Section 3.1, pgs 3-1,3-2- Dioxins and Furans in soil; Section 8- References, pg 8-3*. The *Van den Berg et al., 1998* reference is cited in the text and listed in the Reference section in regard to the toxic equivalency factors (TEFs) used to calculate the dioxin toxicity equivalent (TEQ) for chlorinated dioxin/furan data. This is an outdated reference. The TEFs listed in Table 2 in the EPA 2010b reference (see listed reference below) should be used for calculation of dioxin TEQ values for human health risk assessment purposes. This EPA guidance document recommends values from a *Van den Berg et al.*

(WHO), 2006 publication. Recommended TEF values for four of the congeners were changed in the later publication.

Response K1: The clarification regarding the more recent TEF values in 2006 is understood. Please note that only a review of the original 2000 data and their TEQs was performed, as stated in the SAP Section 3.1. New TEQ values using the 2006 TEFs were not calculated. Rather than re-calculate the TEQs at this time, sampling is proposed that will utilize newer analytical methods that can achieve lower detection limits and TEQs using the 2006 TEFs will be calculated (i.e., by the laboratory or using the EPA TEQ calculator) to evaluate the current concentrations of dioxins and furans at the MI.

2. *Section 3.1, pgs 3-3, Dioxins and Furans in soil.*
The 2nd hollow bullet on pg 3-3 makes a point to state that octachlorodibenzo-p-dioxin is lower in toxicity than the lower chlorinated dioxin/furan congeners. While this is true, this factor is accounted for in the TEF/TEQ approach for assessment of dioxins/furans. It would improve the clarity of the report text to add a statement at the end of this bullet as follows: "It is important, therefore, to use the calculated TEQ values (rather than just individual dioxin/furan data) to screen and assess health risks for current and potential exposure scenarios."

   Response K2: The text will be revised.

3. *Section 3.2.1.1, pg 3-6, RSL Exceedances, Industrial Worker Exposure Scenario, Surface Soil (0-2 ft): "In FU-3, the HI is 1.1; the primary exceedances are TPH with a HQ of 0.65 and Lead with a HQ of 0.39."*
EPA Risk Assessment Guidance (EPA 1989, 2010a) states that cancer risk and Hazard Index (HI) values should be rounded to 1 significant figure when making any remedial decisions. A HI value of 1.1, when properly rounded, does not exceed 1 and would therefore be in the EPA acceptable range.
Also, Lead does not have a reference dose (RfD) but is instead assessed using EPA Lead models. Without a RfD for Lead, there is no HQ from Lead exposure to be added to other HQ value(s).
In the case where there are multiple HQ values to be summed, any initial HI exceeding 1 should always have separate HI values determined for each target organ (toxic effect) prior to making any remedial decisions (EPA 1989, 2010a).

   Response K3: The text will be revised regarding rounding and the HQs for lead will be removed (which were accidentally calculated and included in the HI summation).

4. *Section 3.2.1.2, pg 3-7, RSL Exceedances, Industrial Worker Exposure Scenario, Soil (0-10 ft): "The HI in FU-4 is 4.7; the primary contributors are TPH with a HQ of 3.1 and TEQ with a HQ of 1.3."*
See previous comment regarding rounding of risk and HI values as well as separating HI values by toxic effect before making remedial decisions. Since TPH does not have its own RfD but is instead based on a surrogate approach, this would be considered as a "screening HQ" and EPA recommends keeping any such generated HQ as a separate HI. And in situations with an HI from TPH that exceeds 1, the full analytical data should be examined to see if the actual chemicals that might be responsible for the elevated TPH level can possibly be teased out.

Response K4: The text will be revised. Initial re-review indicates that individual chemicals that may be associated with TPH at the Site (e.g., benzo[a]pyrene) are within acceptable risk levels. In addition, an overly conservative TPH RSL (low aromatics [EPA RSLs, 2021], associated with BTEX [PPRTV 2009]) was applied to the calculation. Considering the general laboratory analysis for petroleum hydrocarbons used at the time, which can capture an assortment of chemicals including nontoxic oils, and that the 2000 RI MI did not identify TPH as a primary chemical in the conclusions for FU-4, the TPH rows will be removed in favor of evaluating individual chemicals identified as COPCs in FU-4.

5. *Section 3.2.2, pg 3-7, Residential Exposure Scenario: "…cancer risk in FU-6 for a residential exposure is 1.5E-04, which is slightly above the acceptable range."*
   See previous comment regarding rounding of risk. A closer examination of the summed risk should be done here to determine if this value rounds to 1E-04 (acceptable risk) or to 2E-04 (unacceptable risk).

   Response K5: The text will be revised here, and rounding will be checked in the rest of the evaluations. The risk is 1.46E-04, which rounds down to 1E-04 to one significant figure.

6. *Section 3.2.2, pg 3-7, Residential Exposure Scenario: "…in FU-6 for a residential exposure …the HI is 1.4…"*
   See previous comment regarding rounding of risk. A HI value of 1.4, when properly rounded, does not exceed 1 and would therefore be in the EPA acceptable range.

   Response K6: The text will be revised.

7. *Section 3.5, pgs 3-11, 3-12, Lead Concentrations; Tables 14, 15, 16; Appendix L; Appendix M.*
   While the Adult Lead Methodology (ALM) results correctly show a low (acceptable) health risk based on an exposure point concentration for soil lead of 186 ppm in FU-3, the high soil lead concentration of 10,300 in surface sample SS19 raises some potential concern. While a single high detection does not drive the risk (especially for lead), it would be beneficial in this regard to add some discussion regarding the size (acreage) of FU-3 (i.e., is FU-3 a reasonable size [exposure area] to assume random movement by a future onsite worker across the FU?). It might then provide more clarity to state that even if the future onsite worker were to have a smaller exposure area (e.g., the soil lead levels in closer proximity to buildings 1086, 1087, 1088, 1089), the exposure point concentration would still not pose an unacceptable risk.
   Also, it appears that some high surface soil lead concentrations shown on Figure M-3 were not used to calculate the exposure point concentration for FU-3. For example, the following data points exceed the RSL: SS-15, 2670 ppm; SS-18, 2060 ppm; SS-16, 17,500 ppm; SB32A, 4150 ppm; SS89J, 2250 ppm; SS89H, 2470 ppm. If these samples represent soil areas that have previously been excavated/remediated (?), it would be much clearer to either omit these sample data from the figure, or to at least show them with a different color designation.

   Response K7: The text will be revised to add more discussion regarding the FU size and potential exposure.

Correct, the concentrations noted above were not used to calculate the EPC at FU-3 because they were excavated, except for location SS-15 (included in Table 15 RSL Exceedances in Surface Soil – Lead). This is shown in Figure M-3 as the locations are within the blue lines that indicates an excavation. For transparency, the excavated concentrations are shown to help give context to the remaining concentrations in place.

Also, please note that the excavation areas were approximated in the 2018 HHERA based on historical reports and the 2018 HHERA stated regarding sample SS19, "The location of the sample with a result of 10,300 mg/kg is near the excavation areas in FU-3, and it may have been excavated as part of the removal action." A note can be added to Table 15 indicating this for sample SS-19.

References:

EPA 1989, 2010a*. *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual, Part A*. Interim Final, EPA OERR, December 1989.
[*updates have been added to the electronic version of RAGS-A:
http://www.epa.gov/oswer/riskassessment/ragsa/index.htm]

EPA 2010b. Recommended Toxic Equivalency Factors (TEFs) for Human Health Risk Assessments of 2,3,7,8-Tetrachloridibenzo-*p*-dioxin and Dioxin-Like Compounds. Risk Assessment Forum, U.S. Environmental Protection Agency, Washington, DC. EPA/600/R-10/005.

Further EPA Comments from Ecological Risk Assessor, Sharon Thoms:

My review is focused on the ecological risk assessment aspects of this report. I offer the following comments.

1. Revise the SAP to include analysis of hardness in surface water and dissolved organic carbon for interpretation of metals concentrations in dissolved and total surface water samples. Enhance the screening of metals in surface water for potential adverse effects on aquatic life by adjusting criteria for site-specific water quality parameters. The national recommended aluminum criteria are also hardness and dissolved organic carbon dependent. This will help refine the evaluation of potential offsite impacts.

   Response T1: As noted above in response to EPA GC #5, metals will no longer be analyzed in the surface water and sediment and this comment is no longer applicable.

2. Background samples are recommended as part of the investigation because many of these constituents have anthropogenic contributions. A background evaluation was not included in the SAP or in the discussion of how data will be interpreted. Revise the SAP to describe historical background data and how it will be used.

   Response T2: The text will be revised to indicate that the surface water and sediment data will be compared to the historical background data to determine whether the concentrations may be due to anthropogenic contributions. The historical background samples were collected at the following locations, as noted in Section 3 and Figure 3-2 of the 2000 MI RI (CH2M HILL, 2000):

- Four ponds were sampled for surface water and sediment during the background sampling field effort. The ponds were located in Medal of Honor Park, Audubon Park, Memphis Lake in Chickasaw Gardens, and the Botanical Gardens in Audubon Park.
- Surface water and sediment samples were taken from two perennial creeks located near the site: Nonconnah Creek, located south of the Depot, and Cane Creek, located northwest of the Depot.

However, it is recognized that anthropogenic contributions in the area may have changed since then as the area has become more urbanized. The need for a background sampling event will be considered after sampling has been conducted for the current scope of evaluating potential migration of dioxins/furans through stormwater runoff.

3. Dioxin/furans and total equivalents (TEQs) are one of the main reasons for assessing the potential for off-site impacts from migration of surface water and sediment from the MI. To provide context and for the data quality objectives process it is helpful to identify data gaps when designing the study. For the ecological review in Section 3.6 please note that sediment samples for dioxin/furans were available from the 2000 MI RI for five locations (M-SD01 through M-SD05) in the onsite ponds of FU-2. Table 8 indicated there were no surface water samples for 2,3,7,8-TCDD in FU-2. Apparently surface water of the ponds in FU-2 was not previously sampled for dioxin/furans. Several sediment and surface water samples were collected for FU-4 but none historically from the onsite pond in FU-3. The sediments of the drainage ditches leading from the onsite ponds offsite, however, were not sampled for dioxin/furans in the 2000 MI RI. These and other data gaps should be discussed. Also, because the on-site pond in FU-3 was not previously sampled for pentachlorophenol, consider adding this parameter to surface water and sediment of FU-3. Consider more than one sample in the FU-3 onsite pond to develop the exposure point concentration since other onsite ponds have a minimum of two samples.

   Response T3: As described in Section 12.3 of the MI RI (CH2M Hill, 2000), the sources of contamination in FU-2 are the golf course, flamethrower testing area, lawn equipment and supplies (or supposed magazine storage), and pistol range area. These sources were not associated with dioxins and furans, which is why dioxins and furans were not as extensively investigated as pesticides and metals in FU-2. Please note that the MI was divided into several small drainage basins and that the source of the dioxins and furans in the PCP Dip Vat area in FU-4 will have likely drained to the outfall locations in FU-4 (to the west towards Tarrent Branch and to the east toward the Frisco Branch) rather than to the two manmade stormwater ponds in FU-2. The text will be revised to describe data gaps such as the above noted limited sampling in terms of understanding potential migration of on-site dioxins and furans to off-site.

4. Enhance the discussion of how the data will be evaluated if the constituent exceeds the ecological screening values (ESV) as these are conservative values that are likely to be exceeded. Describe how exposure point concentrations will be averaged by functional unit and how the 95% upper confidence limit on the mean will be evaluated. Describe whether food-chain modeling or other evaluations will follow. Discuss whether the old data will be combined with the new data in averages. Revise Section 6 to clarify how chemicals of potential concern that exceed ESVs will be evaluated.

Response T4: The text will be revised to provide more details. Please also see response to EPA General Comment #5.

5. Describe whether the proposed sediment sampling locations are depositional in nature. If not choose locations downstream to sample where sediments from the MI may have settled out to represent where sediments migrating from the MI are most likely to reside. Discuss why locations were chosen to sample and what they represent. Discuss how the study will link potential onsite sources to migration pathways leading offsite.

   Response T5: The text will be revised to indicate that samples will be collected in depositional areas within the drainage channels where possible and to provide additional detail regarding the basis for these sampling locations and the potential for site-related COPCs to migrate off-site.

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Appendix C

PCP and Dioxins-Furans Soil Analytical Results Tables

TABLE C-1
FU-1 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SS11	LAWSS11	0.5-1.5	2/12/1989	Sample	Dibenzofuran	132-64-9	**9.7**	mg/kg	=	0.15	120	n
SS65A	SS65ABL	0	3/31/1999	Sample	Dibenzofuran	132-64-9	**1**	mg/kg	=	0.15	120	n
SS65H	MIA189FD	0-1	10/9/1998	FD	Dibenzofuran	132-64-9	**0.44**	mg/kg	=	0.15	120	n
SS65A	SS65ABL	0	3/31/1999	Sample	Pentachlorophenol	87-86-5	0.25	mg/kg	=	2.1	4	c*
E(10.2)	E(10_2)	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	0.12	mg/kg	J	0.15	120	n
SS10	LAWSS10	0.5-1.5	2/12/1989	Sample	Dibenzofuran	132-64-9	**1.3**	mg/kg	J	0.15	120	n
SS11A	MIA302	0-1	10/13/1998	Sample	Dibenzofuran	132-64-9	**0.73**	mg/kg	J	0.15	120	n
SS42	LAWSS42	0-1	10/26/1989	Sample	Dibenzofuran	132-64-9	**24**	mg/kg	J	0.15	120	n
SS43	LAWSS43	0-1	10/26/1989	Sample	Dibenzofuran	132-64-9	**0.34**	mg/kg	J	0.15	120	n
SS65E	SGB025	0-1	12/6/1996	Sample	Dibenzofuran	132-64-9	**1.9**	mg/kg	J	0.15	120	n
SS65H	MIA188	0-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**0.54**	mg/kg	J	0.15	120	n
SS6A	MIA137	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	0.065	mg/kg	J	0.15	120	n
SS8A	MIA138	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**2**	mg/kg	J	0.15	120	n
SS8A	MIA139FD	0-1	10/7/1998	FD	Dibenzofuran	132-64-9	**2.2**	mg/kg	J	0.15	120	n
SS43	LAWSS43	0-1	10/26/1989	Sample	Pentachlorophenol	87-86-5	0.27	mg/kg	J	2.1	4	c*
Non-Detected Results												
F(10.2)	F(10_2)	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.44**	mg/kg	U	0.15	120	n
SB57A	RHA072	0-2	1/22/1997	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB57D	RHA081	0-2	1/22/1997	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB57E	RHA085	0-2	1/22/1997	Sample	Dibenzofuran	132-64-9	**24**	mg/kg	U	0.15	120	n
SB57F	RHA088	0-2	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB57G	RHA091	0-2	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB57H	RHA095	0-2	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB57I	RHA098	0-2	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB65A	SGA119	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**6.9**	mg/kg	U	0.15	120	n
SB65B	SGA122	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB65C	SGA125	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SS65A	SGA114	0-1	12/6/1996	Sample	Dibenzofuran	132-64-9	**15**	mg/kg	U	0.15	120	n
SS65B	SGB026	0-1	12/5/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SS65C	SGA116	0-1	12/5/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS65D	SGA117	0-1.25	12/6/1996	Sample	Dibenzofuran	132-64-9	**7.2**	mg/kg	U	0.15	120	n
SS65I	MIA193	0-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS9A	MIA141	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
E(10.2)	E(10_2)	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.42	mg/kg	U	2.1	4	c*
F(10.2)	F(10_2)	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	2.1	4	c*
SB57A	RHA072	0-2	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB57D	RHA081	0-2	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB57E	RHA085	0-2	1/22/1997	Sample	Pentachlorophenol	87-86-5	**12**	mg/kg	U	2.1	4	c*

TABLE C-1
FU-1 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SB57F	RHA088	0-2	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB57G	RHA091	0-2	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB57H	RHA095	0-2	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB57I	RHA098	0-2	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB65A	SGA119	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	**3.5**	mg/kg	U	2.1	4	c*
SB65B	SGA122	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB65C	SGA125	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS11A	MIA302	0-1	10/13/1998	Sample	Pentachlorophenol	87-86-5	0.79	mg/kg	U	2.1	4	c*
SS65A	SGA114	0-1	12/6/1996	Sample	Pentachlorophenol	87-86-5	**7.5**	mg/kg	U	2.1	4	c*
SS65B	SGB026	0-1	12/5/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS65C	SGA116	0-1	12/5/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS65D	SGA117	0-1.25	12/6/1996	Sample	Pentachlorophenol	87-86-5	**3.6**	mg/kg	U	2.1	4	c*
SS65E	SGB025	0-1	12/6/1996	Sample	Pentachlorophenol	87-86-5	1.8	mg/kg	U	2.1	4	c*
SS65H	MIA188	0-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.88	mg/kg	U	2.1	4	c*
SS65H	MIA189FD	0-1	10/9/1998	FD	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
SS65I	MIA193	0-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS6A	MIA137	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS8A	MIA138	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	2	mg/kg	U	2.1	4	c*
SS8A	MIA139FD	0-1	10/7/1998	FD	Pentachlorophenol	87-86-5	2	mg/kg	U	2.1	4	c*
SS9A	MIA141	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

FD = Field duplicate
J = Result is estimated
mg/kg = Milligrams per kilogram
U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-2
FU-1 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
SB57A	RHA073	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57A	RHA074	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57D	RHA082	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57D	RHA083FD1	3-5	1/22/1997	FD	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57D	RHA084	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57E	RHA086	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57E	RHA087	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57F	RHA089	3-5	1/23/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57F	RHA090	8-10	1/23/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57G	RHA092	3-5	1/23/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57G	RHA093	8-10	1/23/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57G	RHA094FD1	3-5	1/23/1997	FD	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57H	RHA096	3-5	1/23/1997	Sample	Dibenzofuran	132-64-9	0.37	mg/kg	U	120	n
SB57H	RHA097	8-10	1/23/1997	Sample	Dibenzofuran	132-64-9	0.38	mg/kg	U	120	n
SB57I	RHA099	3-5	1/23/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57I	RHA100	8-10	1/23/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB65A	SGA120	4-6	12/9/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB65A	SGA121	8-10	12/9/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB65B	SGA123	4-6	12/9/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB65B	SGA124	9.5-11	12/9/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB65C	SGA126	4-6	12/9/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB65C	SGA127	9-11	12/9/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70F	RHA167	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70F	RHA168	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70H	RHA171	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.44	mg/kg	U	120	n
SB70H	RHA172	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70I	RHA173	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB70I	RHA174FD1	3-5	1/22/1997	FD	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB70I	RHA175	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB70J	RHA176	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70J	RHA177	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57A	RHA073	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57A	RHA074	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57D	RHA083FD1	3-5	1/22/1997	FD	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB57D	RHA082	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57D	RHA084	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57E	RHA086	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*

TABLE C-2
FU-1 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB57E	RHA087	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57F	RHA089	3-5	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57F	RHA090	8-10	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57G	RHA092	3-5	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57G	RHA093	8-10	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57G	RHA094FD1	3-5	1/23/1997	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57H	RHA097	8-10	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB57H	RHA096	3-5	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	4	c*
SB57I	RHA099	3-5	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB57I	RHA100	8-10	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB65A	SGA120	4-6	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB65A	SGA121	8-10	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB65B	SGA123	4-6	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB65B	SGA124	9.5-11	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB65C	SGA127	9-11	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB65C	SGA126	4-6	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70F	RHA167	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70F	RHA168	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70H	RHA171	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB70H	RHA172	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70I	RHA173	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70I	RHA174FD1	3-5	1/22/1997	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70I	RHA175	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70J	RHA176	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70J	RHA177	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the human health criteria are shown in underline.

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

FD = Field duplicate

mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-3
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
M(3.5)	M3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	0.056	mg/kg	J	0.15	120	n
SS51B	SGA166	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.054	mg/kg	J	2.1	4	c*
Non-Detected Results												
G(3.5)	G3_5	0	9/25/1997	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
H(3.5)	H3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
I(3.5)	I3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
J(3.5)	J3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
K(3.5)	K3_5	0	9/26/1997	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
L(3.5)	L3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
N(3.5)	N3_5	0	9/28/1997	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB51A	SGA168	0-1	12/19/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB51B	SGA171	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB51C	SGA174	0-1	12/19/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS51A	SGB048	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	120	n
SS51B	SGA166	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.43**	mg/kg	U	0.15	120	n
SS51C	SGB116	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SS52A	SGB085	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.44**	mg/kg	U	0.15	120	n
SS59H	RHA070	0-1	1/19/1997	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS69A	SGB046	0-1	12/6/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
TEC92A	MIA128	0-1	10/13/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
TEC92A	MIA129FD	0-1	10/13/1998	FD	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
TEC92B	MIA132	0-1	10/13/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
G(3.5)	G3_5	0	9/25/1997	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
H(3.5)	H3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
I(3.5)	I3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
J(3.5)	J3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
K(3.5)	K3_5	0	9/26/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
L(3.5)	L3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
M(3.5)	M3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
N(3.5)	N3_5	0	9/28/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB51A	SGA168	0-1	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB51B	SGA171	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB51C	SGA174	0-1	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS51A	SGB048	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
SS51C	SGB116	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SS52A	SGB085	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	2.1	4	c*
SS59H	RHA070	0-1	1/19/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS69A	SGB046	0-1	12/6/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*

TABLE C-3
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
TEC92A	MIA128	0-1	10/13/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
TEC92A	MIA129FD	0-1	10/13/1998	FD	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
TEC92B	MIA132	0-1	10/13/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

FD = Field duplicate
mg/kg = Milligrams per kilogram
J = Result is estimated
U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-4
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
SB51A	SGA170	9-11	12/19/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB51A	SGB147	5-7	12/19/1996	Sample	Dibenzofuran	132-64-9	0.88	mg/kg	U	120	n
SB51B	SGA172	6-8	12/12/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB51B	SGA173	9-12	12/12/1996	Sample	Dibenzofuran	132-64-9	0.45	mg/kg	U	120	n
SB51C	SGA175	5-6	12/19/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB51C	SGA176	8-10	12/19/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB59C	MIA182	8-10	10/9/1998	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB51A	SGB147	5-7	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.44	mg/kg	U	4	c*
SB51A	SGA170	9-11	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB51B	SGA173	9-12	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB51B	SGA172	6-8	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB51C	SGA175	5-6	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB51C	SGA176	8-10	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB59C	MIA182	8-10	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.
FD = Field duplicate
mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-5
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SB82A	SGB098	0-1	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	2.829	pg/g	=	3.15	22	c**
SB82B	SGB101	0.5-2	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**3.287**	pg/g	=	3.15	22	c**
SB82C	SGB105	0-1	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**4.238**	pg/g	=	3.15	22	c**
SB82D	SGB109	0-1	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**13.1**	pg/g	=	3.15	22	c**
SB82D	SGB095	0-1	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**9.657**	pg/g	=	3.15	22	c**
SS82A	SGB050	0-1	12/7/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**10.31**	pg/g	=	3.15	22	c**
SS27H	RHA149	0-1	1/21/1997	Sample	Dibenzofuran	132-64-9	**0.49**	mg/kg	=	0.15	120	n
SS27H	RHA149	0-1	1/21/1997	Sample	Pentachlorophenol	87-86-5	0.68	mg/kg	=	2.1	4	c*
SB82D	SGB109	0-1	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7275	pg/g	=	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	6168	pg/g	=	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	10250	pg/g	=	NA	NA	--
A(26.2)	970A	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**1**	mg/kg	J	0.15	120	n
B(26.2)	970B	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**2.4**	mg/kg	J	0.15	120	n
SS19	LAWSS19	0.2-1.2	2/22/1989	Sample	Dibenzofuran	132-64-9	**0.21**	mg/kg	J	0.15	120	n
SS39	LAWSS39	0-1	3/30/1989	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	J	0.15	120	n
B(24.2)	B97	0-0.5	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.094	mg/kg	J	2.1	4	c*
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	5	pg/g	J	NA	NA	--
SB82B	SGB101	0.5-2	35410.6389	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	4	pg/g	J	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	39	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	290	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	199	pg/g	J	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	5	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	3	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	4	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	4	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	1	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	8	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	5	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	5	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	3	pg/g	J	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	7	pg/g	J	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	6	pg/g	J	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	81	pg/g	J	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	697	pg/g	J	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	479	pg/g	J	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	10	pg/g	J	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2772	pg/g	J	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3241	pg/g	J	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3767	pg/g	J	NA	NA	--

TABLE C-5
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
Non-Detected Results												
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
SB82B	SGB101	0.5-2	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
SB82C	SGB105	0-1	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
SB82D	SGB095	0-1	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
SB82D	SGB109	0-1	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
SS82A	SGB050	0-1	12/7/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	3.15	22	c**
A(23.9)	A93	0-0.5	10/19/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
A(23.9)	AA0014	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
A(24.2)	A97	0-1	10/18/1996	Sample	Dibenzofuran	132-64-9	**1.9**	mg/kg	U	0.15	120	n
A(24.2)	DUP8	0-1	10/18/1996	FD	Dibenzofuran	132-64-9	**2.2**	mg/kg	U	0.15	120	n
A(24.2)	AA0048	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	0.15	120	n
A(25.2)	A101	0-0.5	10/18/1996	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	0.15	120	n
A(25.2)	AA0053	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
A(28.1)	A106	0-0.7	10/18/1996	Sample	Dibenzofuran	132-64-9	**0.34**	mg/kg	U	0.15	120	n
A(28.1)	DUP9	0-0.7	10/18/1996	FD	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	0.15	120	n
A(28.1)	AA0017	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.51**	mg/kg	U	0.15	120	n
B(24.2)	B97	0-0.5	10/18/1996	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	0.15	120	n
B(24.2)	AA0045	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
B(28.1)	B106	0-0.7	10/18/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	120	n
B(28.1)	AA0020	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SB82A	SGA217	0-1	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB82A	SGA477FD1	0-1	12/11/1996	FD	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB82B	SGA221	0-1	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB82C	SGA225	0-1	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB82D	SGB095	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.43**	mg/kg	U	0.15	120	n
SB84A	SGA382	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB84A	SGA478FD1	0-1	12/12/1996	FD	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	120	n
SB84B	SGA386	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB84B	SGA481FD1	0-1	12/13/1996	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB84C	SGA390	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**1.2**	mg/kg	U	0.15	120	n
SB84D	SGA394	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS33B	SGB067	0.2-1.2	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SS82A	SGB050	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS82B	SGB059	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS82C	SGA215	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS82D	SGB060	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SS84A	SGB070	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS84B	SGB069	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SS84C	SGA280	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**2.4**	mg/kg	U	0.15	120	n
SS84D	SGA281	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n

TABLE C-5
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SS84E	SGA282	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	0.15	120	n
SS84F	SGA283	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	0.15	120	n
SS84H	MIA032	0.4-1	9/30/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	120	n
SS89A	SGB044	0-1	12/6/1996	Sample	Dibenzofuran	132-64-9	**0.77**	mg/kg	U	0.15	120	n
A(23.9)	A93	0-0.5	10/19/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
A(23.9)	AA0014	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
A(24.2)	DUP8	0-1	10/18/1996	FD	Pentachlorophenol	87-86-5	1.1	mg/kg	U	2.1	4	c*
A(24.2)	A97	0-1	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.96	mg/kg	U	2.1	4	c*
A(24.2)	AA0048	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	2.1	4	c*
A(25.2)	A101	0-0.5	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
A(25.2)	AA0053	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
A(26.2)	970A	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	**2.8**	mg/kg	U	2.1	4	c*
A(28.1)	DUP9	0-0.7	10/18/1996	FD	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
A(28.1)	A106	0-0.7	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	2.1	4	c*
A(28.1)	AA0017	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.26	mg/kg	U	2.1	4	c*
B(24.2)	AA0045	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
B(26.2)	970B	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	**7.7**	mg/kg	U	2.1	4	c*
B(28.1)	B106	0-0.7	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
B(28.1)	AA0020	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SB82A	SGA217	0-1	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB82A	SGA477FD1	0-1	12/11/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB82B	SGA221	0-1	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB82C	SGA225	0-1	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB82D	SGB095	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB84A	SGA382	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB84A	SGA478FD1	0-1	12/12/1996	FD	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SB84B	SGA386	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB84B	SGA481FD1	0-1	12/13/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB84C	SGA390	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.61	mg/kg	U	2.1	4	c*
SB84D	SGA394	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS33B	SGB067	0.2-1.2	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS82A	SGB050	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS82B	SGB059	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS82C	SGA215	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS82D	SGB060	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS84A	SGB070	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS84B	SGB069	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS84C	SGA280	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	1.2	mg/kg	U	2.1	4	c*
SS84D	SGA281	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS84E	SGA282	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
SS84F	SGA283	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*
SS84H	MIA032	0.4-1	9/30/1998	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	4	c*

TABLE C-5
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SS89A	SGB044	0-1	12/6/1996	Sample	Pentachlorophenol	87-86-5	0.38	mg/kg	U	2.1	4	c*
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--

TABLE C-5
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SB82D	SGB095	0-1	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SS82A	SGB050	0-1	12/7/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	--
SB82A	SGB098	0-1	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	UJ	NA	NA	--
SB82B	SGB101	0.5-2	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	NA	--
SB82C	SGB105	0-1	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	NA	--
SB82D	SGB109	0-1	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.

FD = Field duplicate

mg/kg = Milligrams per kilogram

pg/g = Picogram per gram

J = Result is estimated

U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82A	SGB099	4-6	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	7.874	pg/g	=	22	c**
SB82A	SGB100	9-10.5	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.167	pg/g	=	22	c**
SB82B	SGB102	4-6	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	4.909	pg/g	=	22	c**
SB82B	SGB103	9-10.5	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.355	pg/g	=	22	c**
SB82C	SGB106	5-7	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	3.198	pg/g	=	22	c**
SB82C	SGB107	9-10.5	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.862	pg/g	=	22	c**
SB82D	SGB111	9-11	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	3.061	pg/g	=	22	c**
SB82D	SGB110	4-6	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	2.836	pg/g	=	22	c**
SB82D	SGB094	9-11	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.29	pg/g	=	22	c**
SB82A	SGB099	4-6	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7869	pg/g	=	NA	--
TEC90B	MIA075	6.5-8.5	10/7/1998	Sample	Dibenzofuran	132-64-9	0.19	mg/kg	J	120	n
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3	pg/g	J	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2	pg/g	J	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	1	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	3	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2	pg/g	J	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	8	pg/g	J	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5	pg/g	J	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	7	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	6	pg/g	J	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	3	pg/g	J	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	4	pg/g	J	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	3	pg/g	J	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2	pg/g	J	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	129	pg/g	J	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	4909	pg/g	J	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	348	pg/g	J	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3195	pg/g	J	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	26	pg/g	J	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3038	pg/g	J	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2834	pg/g	J	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1266	pg/g	J	NA	--
Non-Detected Results											
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82A	SGB100	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82B	SGB102	4-6	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82B	SGB103	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82C	SGB106	5-7	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82C	SGB107	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82D	SGB094	9-11	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82D	SGB110	4-6	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82D	SGB111	9-11	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
A(23.9)	AA0015	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(23.9)	AA0016	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.52	mg/kg	U	120	n
A(24.2)	AA0049	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	120	n
A(25.2)	AA0054	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
A(25.2)	AA0055	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(28.1)	AA0018	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(28.1)	AA0019	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
B(24.2)	AA0046	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
B(24.2)	AA0047	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
B(28.1)	AA0021	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.38	mg/kg	U	120	n
B(28.1)	AA0022	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
C(35.2)	AA0012	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
C(35.2)	AA0013	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB34B	RHA026	3-5	1/21/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70A	RHA156	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70A	RHA157	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70B	RHA158	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB70B	RHA159	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB82A	SGA218	4-6	12/11/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB82A	SGA219	9-10.5	12/11/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB82B	SGA222	4-6	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82B	SGA223	9-10.5	12/11/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB82C	SGA226	5-7	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82C	SGA227	9-10.5	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82D	SGA230	4-6	12/12/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82D	SGB094	9-11	12/12/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB84A	SGA384	8.5-11	12/12/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB84A	SGB096	4-6	12/12/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84B	SGA388	8-10	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84B	SGB120	4-6	12/13/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB84C	SGA391	4-6	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84C	SGA392	8-10	12/13/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB84D	SGA395	4-6	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84D	SGA396	8-10	12/13/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
TEC90A	MIA074	5-7	10/7/1998	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
TEC90B	MIA076	9-11	10/7/1998	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(23.9)	AA0016	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.26	mg/kg	U	4	c*
A(23.9)	AA0015	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
A(24.2)	AA0049	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(25.2)	AA0054	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(25.2)	AA0055	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(28.1)	AA0018	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(28.1)	AA0019	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
B(24.2)	AA0046	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
B(24.2)	AA0047	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
B(28.1)	AA0022	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
B(28.1)	AA0021	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
C(35.2)	AA0012	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
C(35.2)	AA0013	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB34B	RHA026	3-5	1/21/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70A	RHA156	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB70A	RHA157	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70B	RHA159	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70B	RHA158	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB82A	SGA218	4-6	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82A	SGA219	9-10.5	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82B	SGA222	4-6	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82B	SGA223	9-10.5	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82C	SGA226	5-7	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB82C	SGA227	9-10.5	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82D	SGA230	4-6	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82D	SGB094	9-11	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB84A	SGA384	8.5-11	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84A	SGB096	4-6	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84B	SGA388	8-10	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84B	SGB120	4-6	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84C	SGA391	4-6	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84C	SGA392	8-10	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84D	SGA395	4-6	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84D	SGA396	8-10	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
TEC90A	MIA074	5-7	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
TEC90B	MIA075	6.5-8.5	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
TEC90B	MIA076	9-11	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82C	SGB107	9-10.5	35410.7014	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--

TABLE C-6
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82A	SGB100	9-10.5	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB82D	SGB094	9-11	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	UJ	NA	--
SB82A	SGB099	4-6	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82A	SGB100	9-10.5	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82B	SGB102	4-6	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82B	SGB103	9-10.5	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82C	SGB106	5-7	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82C	SGB107	9-10.5	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82D	SGB110	4-6	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82D	SGB111	9-11	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.

mg/kg = Milligrams per kilogram
pg/g = Picogram per gram
J = Result is estimated
U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-7
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82A	SGB113	18-20	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.05	pg/g	=	22	c**
SB82B	SGB104	18-20	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.184	pg/g	=	22	c**
SB82C	SGB108	18-20	12/11/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.127	pg/g	=	22	c**
SB82D	SGB112	18-20	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.136	pg/g	=	22	c**
SB82A	SGB113	18-20	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	50	pg/g	J	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	184	pg/g	J	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	127	pg/g	J	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	136	pg/g	J	NA	--
Non-Detected Results											
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82B	SGB104	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82C	SGB108	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82D	SGB112	18-20	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB82A	SGA220	18-20	12/11/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB82B	SGA224	18-20	12/11/1996	Sample	Dibenzofuran	132-64-9	2.1	mg/kg	U	120	n
SB82C	SGA228	18-20	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82D	SGA232	18-20	12/12/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB84A	SGA385	18-20	12/12/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84B	SGA389	18-20	35412.3819	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB84C	SGA393	18-21	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB84D	SGA397	18-20	12/13/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB82A	SGA220	18-20	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82B	SGA224	18-20	12/11/1996	Sample	Pentachlorophenol	87-86-5	1	mg/kg	U	4	c*
SB82C	SGA228	18-20	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82D	SGA232	18-20	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB84A	SGA385	18-20	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84B	SGA389	18-20	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB84C	SGA393	18-21	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB84D	SGA397	18-20	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--

TABLE C-7
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--

TABLE C-7
FU-3 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB82D	SGB112	18-20	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB82A	SGB113	18-20	12/11/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	UJ	NA	--
SB82B	SGB104	18-20	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82C	SGB108	18-20	12/11/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB82D	SGB112	18-20	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.
mg/kg = Milligrams per kilogram J = Result is estimated
pg/g = Picogram per gram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SB54A	SGA456	0-1	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**250.8**	pg/g	=	No	3.15	22	c**
SB54B	SGA459	0-1	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**128.4**	pg/g	=	No	3.15	22	c**
SB54B	SGA483FD1	0-1	12/16/1996	FD	TCDD Equivalent	DIOXIN-TEQ	1.039	pg/g	=	No	3.15	22	c**
SB55A	SGB123	0-1	12/21/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**38.99**	pg/g	=	No	3.15	22	c**
SB56A	SGA404	0-1	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**47.37**	pg/g	=	No	3.15	22	c**
SS42A	SGA293	0-1	12/8/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**170.5**	pg/g	=	No	3.15	22	c**
SS42B	SGA294	0-1	12/8/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**37.23**	pg/g	=	No	3.15	22	c**
SS42C	SGA295	0-1	12/8/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**13.53**	pg/g	=	No	3.15	22	c**
SS42D	SGA296	0-1	12/8/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**6.483**	pg/g	=	No	3.15	22	c**
SS42D	SGA370	0-1	12/8/1996	FD	TCDD Equivalent	DIOXIN-TEQ	**5.525**	pg/g	=	No	3.15	22	c**
SS42E	SGA297	0-1	12/8/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**6.074**	pg/g	=	No	3.15	22	c**
SS43A	SGA301	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**21.57**	pg/g	=	No	3.15	22	c**
SS43B	SGA302	0-1	12/9/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**349.8**	pg/g	=	No	3.15	22	c**
SS43C	SGA411	0-1	12/9/1996	FD	TCDD Equivalent	DIOXIN-TEQ	**31.05**	pg/g	=	No	3.15	22	c**
SS43C	SGA303	0-1	12/9/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**20.62**	pg/g	=	No	3.15	22	c**
SS43D	SGA304	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**5.569**	pg/g	=	No	3.15	22	c**
SS43E	SGA305	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**19.76**	pg/g	=	No	3.15	22	c**
SS46A	SGA306	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**136.6**	pg/g	=	No	3.15	22	c**
SS46B	SGA307	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**122.4**	pg/g	=	No	3.15	22	c**
SS46C	SGA308	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**170.7**	pg/g	=	No	3.15	22	c**
SS46D	SGA309	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**284.1**	pg/g	=	No	3.15	22	c**
SS46E	SGA310	0-1	12/10/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**466.5**	pg/g	=	No	3.15	22	c**
SS54A	SGA369	0-1	12/13/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**173.9**	pg/g	=	No	3.15	22	c**
SS54A	SGA480FD1	0-1	12/13/1996	FD	TCDD Equivalent	DIOXIN-TEQ	**72.9**	pg/g	=	No	3.15	22	c**
SS56A	SGB062	0-1	12/13/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**5.393**	pg/g	=	No	3.15	22	c**
SS56B	SGA289	0-1	12/13/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.078	pg/g	=	No	3.15	22	c**
SS56C	SGA290	0-1	12/13/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**7.525**	pg/g	=	No	3.15	22	c**
SS79A	SGA314	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.3	mg/kg	=	No	2.1	4	c*
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	10210	pg/g	=	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2565	pg/g	=	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	12000	pg/g	=	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3901	pg/g	=	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	9934	pg/g	=	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	5241	pg/g	=	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	6944	pg/g	=	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	19810	pg/g	=	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	4972	pg/g	=	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	4306	pg/g	=	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	5012	pg/g	=	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	23400	pg/g	=	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	7504	pg/g	=	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	3118	pg/g	=	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	39750	pg/g	=	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5737	pg/g	=	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	26780	pg/g	=	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS46D	SGA309	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	32270	pg/g	=	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	8431	pg/g	=	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	17600	pg/g	=	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	56150	pg/g	=	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	10860	pg/g	=	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	35620	pg/g	=	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	9298	pg/g	=	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7685	pg/g	=	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7129	pg/g	=	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	72100	pg/g	=	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	12750	pg/g	=	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	8666	pg/g	=	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	6838	pg/g	=	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	35030	pg/g	=	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	26510	pg/g	=	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	31850	pg/g	=	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	53750	pg/g	=	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	21740	pg/g	=	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5337	pg/g	=	No	NA	NA	--
B(30.2)	925B	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.44**	mg/kg	J	No	0.15	120	n
SS13A	MIA303	0-1	10/13/1998	Sample	Dibenzofuran	132-64-9	**0.2**	mg/kg	J	No	0.15	120	n
SS14A	MIA304	0-1	10/13/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	J	No	0.15	120	n
SS43C	SGB079	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	0.05	mg/kg	J	No	0.15	120	n
SS5	LAWSS5	0-1	2/11/1989	Sample	Dibenzofuran	132-64-9	**0.29**	mg/kg	J	No	0.15	120	n
C(31.1)	C(31_1)	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.048	mg/kg	J	No	2.1	4	c*
C(31.1)	DUP_1	0-1	1/8/1998	FD	Pentachlorophenol	87-86-5	0.048	mg/kg	J	No	2.1	4	c*
SB36H	SGA086	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.11	mg/kg	J	No	2.1	4	c*
SS14A	MIA304	0-1	10/13/1998	Sample	Pentachlorophenol	87-86-5	0.11	mg/kg	J	No	2.1	4	c*
SS21	LAWSS21	0.5-1.5	2/22/1989	Sample	Pentachlorophenol	87-86-5	0.31	mg/kg	J	No	2.1	4	c*
SS81A	SGA205	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.08	mg/kg	J	No	2.1	4	c*
SS81C	SGA207	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.11	mg/kg	J	No	2.1	4	c*
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1094	pg/g	J	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	378	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	403	pg/g	J	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	78	pg/g	J	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	21	pg/g	J	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	10	pg/g	J	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	46	pg/g	J	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	250	pg/g	J	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1976	pg/g	J	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	296	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	212	pg/g	J	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	32	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	362	pg/g	J	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1860	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1668	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2448	pg/g	J	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1691	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	753	pg/g	J	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	5	pg/g	J	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	49	pg/g	J	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	1650	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	18	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	1569	pg/g	J	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	482	pg/g	J	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	75	pg/g	J	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	39	pg/g	J	No	NA	NA	--
SS42E	SGA297	0-1	35407.5938	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	194	pg/g	J	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	807	pg/g	J	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	1118	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	630	pg/g	J	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	281	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	617	pg/g	J	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	421	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	43	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	9	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	57	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	32	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	54	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	180	pg/g	J	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	33	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	17	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	40	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	12	pg/g	J	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	9	pg/g	J	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	22	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	10	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	10	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	90	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	111	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	172	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	401	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	14	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	35	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	22	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	22	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	33	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	131	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	6	pg/g	J	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	39	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	6	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	5	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	30	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	41	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	66	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	135	pg/g	J	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	16	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	6	pg/g	J	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	97	pg/g	J	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	51	pg/g	J	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	23	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	115	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	35	pg/g	J	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	22	pg/g	J	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	330	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	15	pg/g	J	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	15	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	12	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	83	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	79	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	129	pg/g	J	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	1318	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	442	pg/g	J	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	87	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	48	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	12	pg/g	J	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	50	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	69	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	18	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	6	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	40	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	44	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	86	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	292	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	18	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	12	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	12	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	55	pg/g	J	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	8	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	414	pg/g	J	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	38	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	28	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	37	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	63	pg/g	J	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS46E	SGA310	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	89	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	9	pg/g	J	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	14	pg/g	J	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	3805	pg/g	J	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	553	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	3	pg/g	J	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	1113	pg/g	J	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	248	pg/g	J	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2149	pg/g	J	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	17	pg/g	J	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	78	pg/g	J	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	771	pg/g	J	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	464	pg/g	J	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	344	pg/g	J	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	523	pg/g	J	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	433	pg/g	J	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	3419	pg/g	J	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2403	pg/g	J	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2837	pg/g	J	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	2182	pg/g	J	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	6	pg/g	J	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	161	pg/g	J	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	239	pg/g	J	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	4557	pg/g	J	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	4658	pg/g	J	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3734	pg/g	J	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3596	pg/g	J	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1916	pg/g	J	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1078	pg/g	J	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2664	pg/g	J	No	NA	NA	--
Non-Detected Results													
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	35415.6111	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SB54B	SGA459	0-1	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SB54B	SGA483FD1	0-1	12/16/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SB55A	SGB123	0-1	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SB56A	SGA404	0-1	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42A	SGA293	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42B	SGA294	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42C	SGA295	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42D	SGA296	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42D	SGA370	0-1	12/8/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS42E	SGA297	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS43A	SGA301	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS43B	SGA302	0-1	12/9/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43C	SGA303	0-1	12/9/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS43C	SGA411	0-1	12/9/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS43D	SGA304	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS43E	SGA305	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS46A	SGA306	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS46B	SGA307	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS46C	SGA308	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS46D	SGA309	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS46E	SGA310	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS54A	SGA369	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS54A	SGA480FD1	0-1	12/13/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS56A	SGB062	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS56B	SGA289	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
SS56C	SGA290	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	No	3.15	22	c**
A(29.2)	A109	0-0.5	10/17/1996	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	No	0.15	120	n
A(29.2)	DUP3	0-0.5	10/17/1996	FD	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	No	0.15	120	n
A(29.2)	AA0023	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
A(30.2)	925A	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
A(31.1)	A116	0-0.5	10/16/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	No	0.15	120	n
A(31.1)	AA0036	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
A(32.1)	A117	0-0.5	10/16/1996	Sample	Dibenzofuran	132-64-9	**0.34**	mg/kg	U	No	0.15	120	n
A(32.1)	AA0030	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
A(33.9)	A125	0-0.5	10/18/1996	Sample	Dibenzofuran	132-64-9	**2**	mg/kg	U	No	0.15	120	n
A(33.9)	AA0042	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
B(29.2)	B109	0-0.5	10/17/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
B(29.2)	AA0027	0-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
B(32.1)	B117	0-0.5	10/16/1996	Sample	Dibenzofuran	132-64-9	**0.72**	mg/kg	U	No	0.15	120	n
B(32.1)	AA0033	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
B(33.9)	B125	0-0.5	10/18/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
B(33.9)	AA0056	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
C(31.1)	C(31_1)	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
C(31.1)	DUP_1	0-1	1/8/1998	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
C(33.9)	C125	0-0.5	10/19/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
C(33.9)	AA0039	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
D(33.9)	D125	0-0.5	10/19/1996	Sample	Dibenzofuran	132-64-9	**0.35**	mg/kg	U	No	0.15	120	n
D(33.9)	AA0062	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
E(31.1)	E(31_1)	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
E(33.9)	E125	0-0.8	10/19/1996	Sample	Dibenzofuran	132-64-9	**0.72**	mg/kg	U	No	0.15	120	n
E(33.9)	AA0059	0-4	10/24/1996	Sample	Dibenzofuran	132-64-9	**0.49**	mg/kg	U	No	0.15	120	n
SB28A	SGA003	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB28B	SGA006	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB28C	SGA009	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
SB35A	SGB159	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB35B	SGA050	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB35C	SGA054	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SB36A	SGA058	0-1	12/19/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB36B	SGA062	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36B	SGA493FD1	0-1	12/20/1996	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36D	SGB163	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36D	SGB166FD1	0-1	12/20/1996	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36E	SGB165	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB36F	SGA078	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
SB36F	SGA494FD1	0-1	12/20/1996	FD	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
SB36G	SGA082	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB36G	SGA495FD1	0-1	12/20/1996	FD	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB36H	SGA086	0-1	12/20/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36I	SGA090	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36J	SGA094	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB36J	SGA496FD1	0-1	12/21/1996	FD	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB36K	SGA098	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB36L	SGA102	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36M	SGA106	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
SB36M	SGA497FD1	0-1	12/21/1996	FD	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB36N	SGA110	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB36N	SGA502FD1	0-1	12/21/1996	FD	Dibenzofuran	132-64-9	**1.6**	mg/kg	U	No	0.15	120	n
SB54A	SGA456	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB54B	SGA459	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB54B	SGA483FD1	0-1	12/16/1996	FD	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB55A	SGB123	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB56A	SGA404	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.43**	mg/kg	U	No	0.15	120	n
SB57B	RHA075	0-2	1/22/1997	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SB57C	RHA078	0-2	1/22/1997	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB74A	SGB156	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB74B	SGA466	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SB74C	SGA470	0-1	12/21/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB79A	SGA441	0-1	12/17/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SB79B	SGB137	0-1	12/17/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB79C	SGA449	0-1	12/17/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB81A	SGA208	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB81A	SGA479FD1	0-1	12/12/1996	FD	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SB83A	SGA398	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
SB83A	SGA482FD1	0-1	12/13/1996	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SS28A	SGA291	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SS28B	SGA292	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	No	0.15	120	n
SS36B	MIA005	0.2-1	9/28/1998	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	No	0.15	120	n
SS36C	MIA006	0-1	9/28/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
SS42D	SGB071	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SS42D	SGB072FD1	0-1	12/8/1996	FD	Dibenzofuran	132-64-9	**0.5**	mg/kg	U	No	0.15	120	n
SS42F	MIA275	0-1	10/12/1998	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	No	0.15	120	n
SS43C	SGB084	0-1	12/9/1996	FD	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS46E	SGB080	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
SS54A	SGA369	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SS54A	SGA480FD1	0-1	12/13/1996	FD	Dibenzofuran	132-64-9	**0.43**	mg/kg	U	No	0.15	120	n
SS56A	SGB062	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SS56B	SGA289	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	No	0.15	120	n
SS56C	SGA290	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.46**	mg/kg	U	No	0.15	120	n
SS72C	SGB088	0-1	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SS79A	SGA314	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.46**	mg/kg	U	No	0.15	120	n
SS79B	SGA315	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	No	0.15	120	n
SS79C	SGB097	0-1	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	No	0.15	120	n
SS80A	SGB081	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.36**	mg/kg	U	No	0.15	120	n
SS81A	SGA205	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	No	0.15	120	n
SS81B	SGB117	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
SS81C	SGA207	0-1	12/13/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	No	0.15	120	n
SS83A	SGA284	0.7-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	No	0.15	120	n
A(29.2)	A109	0-0.5	10/17/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
A(29.2)	DUP3	0-0.5	10/17/1996	FD	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
A(29.2)	AA0023	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
A(30.2)	925A	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
A(31.1)	A116	0-0.5	10/16/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
A(31.1)	AA0036	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
A(32.1)	A117	0-0.5	10/16/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	No	2.1	4	c*
A(32.1)	AA0030	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
A(33.9)	A125	0-0.5	10/18/1996	Sample	Pentachlorophenol	87-86-5	1	mg/kg	U	No	2.1	4	c*
A(33.9)	AA0042	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
B(29.2)	B109	0-0.5	10/17/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
B(29.2)	AA0027	0-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
B(30.2)	925B	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.84	mg/kg	U	No	2.1	4	c*
B(32.1)	B117	0-0.5	10/16/1996	Sample	Pentachlorophenol	87-86-5	0.36	mg/kg	U	No	2.1	4	c*
B(32.1)	AA0033	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
B(33.9)	B125	0-0.5	10/18/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
B(33.9)	AA0056	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
C(33.9)	C125	0-0.5	10/19/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
C(33.9)	AA0039	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
D(33.9)	D125	0-0.5	10/19/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
D(33.9)	AA0062	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
E(31.1)	E(31_1)	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
E(33.9)	E125	0-0.8	10/19/1996	Sample	Pentachlorophenol	87-86-5	0.36	mg/kg	U	No	2.1	4	c*
E(33.9)	AA0059	0-4	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.24	mg/kg	U	No	2.1	4	c*
SB28A	SGA003	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB28B	SGA006	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB28C	SGA009	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SB35A	SGB159	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB35B	SGA050	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB35C	SGA054	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SB36A	SGA058	0-1	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB36B	SGA062	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36B	SGA493FD1	0-1	12/20/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36D	SGB163	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36D	SGB166FD1	0-1	12/20/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36E	SGB165	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB36F	SGA078	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB36F	SGA494FD1	0-1	12/20/1996	FD	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB36G	SGA082	0-1	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36G	SGA495FD1	0-1	12/20/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36I	SGA090	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36J	SGA094	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36J	SGA496FD1	0-1	12/21/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36K	SGA098	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB36L	SGA102	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36M	SGA497FD1	0-1	12/21/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB36M	SGA106	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB36N	SGA502FD1	0-1	12/21/1996	FD	Pentachlorophenol	87-86-5	0.79	mg/kg	U	No	2.1	4	c*
SB36N	SGA110	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB54A	SGA456	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB54B	SGA483FD1	0-1	12/16/1996	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB54B	SGA459	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB55A	SGB123	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB56A	SGA404	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	No	2.1	4	c*
SB57B	RHA075	0-2	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB57C	RHA078	0-2	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SB74A	SGB156	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB74B	SGA466	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB74C	SGA470	0-1	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB79A	SGA441	0-1	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SB79B	SGB137	0-1	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB79C	SGA449	0-1	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB81A	SGA208	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB81A	SGA479FD1	0-1	12/12/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB83A	SGA482FD1	0-1	12/13/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SB83A	SGA398	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS13A	MIA303	0-1	10/13/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS28A	SGA291	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SS28B	SGA292	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS36B	MIA005	0.2-1	9/28/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS36C	MIA006	0-1	9/28/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SS42D	SGB072FD1	0-1	12/8/1996	FD	Pentachlorophenol	87-86-5	0.25	mg/kg	U	No	2.1	4	c*
SS42D	SGB071	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS42F	MIA275	0-1	10/12/1998	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS43C	SGB079	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43C	SGB084	0-1	12/9/1996	FD	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SS46E	SGB080	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SS54A	SGA369	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SS54A	SGA480FD1	0-1	12/13/1996	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SS56A	SGB062	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS56B	SGA289	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	No	2.1	4	c*
SS56C	SGA290	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.23	mg/kg	U	No	2.1	4	c*
SS72C	SGB088	0-1	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS79B	SGA315	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS79C	SGB097	0-1	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	No	2.1	4	c*
SS80A	SGB081	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS81B	SGB117	0-1	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	No	2.1	4	c*
SS83A	SGA284	0.7-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	No	2.1	4	c*
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	35415.4583	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43A	SGA301	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SS43C	SGA303	0-1	12/9/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	No	NA	NA	--
SB54A	SGA456	0-1	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SB54B	SGA459	0-1	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SB56A	SGA404	0-1	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42A	SGA293	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42B	SGA294	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42C	SGA295	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42D	SGA296	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42D	SGA370	0-1	12/8/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS42E	SGA297	0-1	12/8/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43A	SGA301	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43B	SGA302	0-1	12/9/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43C	SGA303	0-1	12/9/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43C	SGA411	0-1	12/9/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43D	SGA304	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS43E	SGA305	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS46A	SGA306	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS46B	SGA307	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS46C	SGA308	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS46D	SGA309	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS46E	SGA310	0-1	12/10/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS54A	SGA369	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS54A	SGA480FD1	0-1	12/13/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SS56C	SGA290	0-1	12/13/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	No	NA	NA	--
SB54B	SGA483FD1	0-1	12/16/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	No	NA	NA	--
SS56B	SGA289	0-1	12/13/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	No	NA	NA	--
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	No	NA	NA	--
D(31.1)	D(31_1)	0-1	1/8/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	UJ	No	0.15	120	n
D(31.1)	D(31_1)	0-1	1/8/1998	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	UJ	No	2.1	4	c*
SB55A	SGB123	0-1	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	No	NA	NA	--

TABLE C-8
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	Excavated	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
												Value	Basis
SB55A	SGB123	0-1	12/21/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	No	NA	NA	--
SS56A	SGB062	0-1	12/13/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	No	NA	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.
FD = Field duplicate
mg/kg = Milligrams per kilogram
pg/g = Picogram per gram
J = Result is estimated
U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42A	SGB143	8-10	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	12520	pg/g	=	22	c**
SB42B	SGA413	8-10	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	4.713	pg/g	=	22	c**
SB43B	SGA421	8-10	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	2.418	pg/g	=	22	c**
SB43B	SGA489FD1	8-10	12/19/1996	FD	TCDD Equivalent	DIOXIN-TEQ	1.761	pg/g	=	22	c**
SB46A	SGB146	8-10	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	6.152	pg/g	=	22	c**
SB46B	SGA429	8-10	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	2.157	pg/g	=	22	c**
SB54A	SGA458	8-10	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	4.666	pg/g	=	22	c**
SB54A	SGA457	5-7	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.613	pg/g	=	22	c**
SB54B	SGA461	8-10	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	53.06	pg/g	=	22	c**
SB54B	SGA460	5-7	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	18.37	pg/g	=	22	c**
SB55A	SGB122	8-10	12/21/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.5	pg/g	=	22	c**
SB56A	SGA406	8-10	12/16/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	11.15	pg/g	=	22	c**
SB56A	SGA405	5-7	35415.4653	Sample	TCDD Equivalent	DIOXIN-TEQ	0.767	pg/g	=	22	c**
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	6637	pg/g	=	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	6611	pg/g	=	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	6152	pg/g	=	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	16360	pg/g	=	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	9288	pg/g	=	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	Pentachlorophenol	87-86-5	470	mg/kg	J	4	c*
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	104700	pg/g	J	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	128	pg/g	J	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3	pg/g	J	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	90	pg/g	J	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	5	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	480	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	155	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	487600	pg/g	J	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	151	pg/g	J	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	52	pg/g	J	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	7	pg/g	J	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	161	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2320	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	577	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	13	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	1696	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	10	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	504	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	6	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	26	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	6	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	12	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	496	pg/g	J	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	15	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	3	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	9	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	7	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	344	pg/g	J	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	11	pg/g	J	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4	pg/g	J	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	14	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	18	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	5	pg/g	J	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	15	pg/g	J	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	111	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	6	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2311000	pg/g	J	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	333	pg/g	J	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	10	pg/g	J	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	2	pg/g	J	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	179	pg/g	J	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	7	pg/g	J	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	1065	pg/g	J	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	361	pg/g	J	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3246000	pg/g	J	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1590	pg/g	J	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1289	pg/g	J	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	758	pg/g	J	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2157	pg/g	J	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1977	pg/g	J	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	156	pg/g	J	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	767	pg/g	J	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	53	pg/g	J	NA	--
Non-Detected Results											
SB43A	SGB145	8-10	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1000	pg/g	U	22	c**
SB55A	SGB124	3-5	12/21/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1000	pg/g	U	22	c**
SB55A	SGB168FD1	3-5	12/21/1996	FD	TCDD Equivalent	DIOXIN-TEQ	1000	pg/g	U	22	c**
SB42A	SGB143	8-10	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42B	SGA413	8-10	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43A	SGB145	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43B	SGA421	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43B	SGA489FD1	8-10	12/19/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46A	SGB146	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46B	SGA429	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB54A	SGA457	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB54A	SGA458	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB54B	SGA460	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB54B	SGA461	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB55A	SGB122	8-10	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB55A	SGB124	3-5	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB55A	SGB168FD1	3-5	12/21/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB56A	SGA405	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB56A	SGA406	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
A(29.2)	AA0024	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(29.2)	AA0025	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(31.1)	AA0037	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(31.1)	AA0038	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(32.1)	AA0031	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(32.1)	AA0032	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(33.9)	AA0043	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
A(33.9)	AA0044	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
B(29.2)	AA0029	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
B(29.2)	AA0028	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
B(32.1)	AA0034	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
B(32.1)	AA0035	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
B(33.9)	AA0057	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
B(33.9)	AA0058	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
C(33.9)	AA0040	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.51	mg/kg	U	120	n
C(33.9)	AA0041	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
D(33.9)	AA0063	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
D(33.9)	AA0064	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
E(33.9)	AA0060	4-7	10/24/1996	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	120	n
E(33.9)	AA0061	7-10	10/24/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB28A	SGA004	3-5	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB28A	SGA005	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB28B	SGA008	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB28B	SGB133	3-5	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB28C	SGA010	3-5	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB28C	SGA368	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB35A	SGA047	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB35A	SGA048	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB35A	SGA501FD1	8-10	12/21/1996	FD	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB35B	SGA051	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB35B	SGB158	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB35C	SGA055	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB35C	SGA056	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB35C	SGA500FD1	8-10	12/21/1996	FD	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB36A	SGA059	4-6	12/19/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36A	SGA060	8-10	12/19/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB36B	SGB161	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36D	SGA071	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB36D	SGB164	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB36E	SGA075	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36E	SGA076	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36F	SGA079	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36F	SGA080	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB36G	SGA083	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36G	SGA084	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36H	SGA087	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36H	SGA088	8-10	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36I	SGA091	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36I	SGA092	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36J	SGA095	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36J	SGA096	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36K	SGA099	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36K	SGA100	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB36L	SGA103	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36L	SGA104	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36M	SGA107	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36M	SGA108	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36N	SGA111	4-6	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36N	SGA112	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.35	mg/kg	U	120	n
SB54A	SGA457	5-7	12/16/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB54A	SGA458	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB54B	SGA460	5-7	12/16/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB54B	SGA461	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB55A	SGB122	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB55A	SGB124	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB55A	SGB168FD1	3-5	12/21/1996	FD	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB56A	SGA405	5-7	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB56A	SGA406	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57B	RHA076	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57B	RHA077	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB57B	RHA181FD1	3-5	1/22/1997	FD	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57C	RHA079	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB57C	RHA080	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70D	RHA162	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70D	RHA163	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB70E	RHA164	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB70E	RHA165	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB70E	RHA166FD1	3-5	1/22/1997	FD	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB70G	RHA169	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB70G	RHA170	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB74A	SGA463	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB74A	SGA464	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74B	SGA467	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.44	mg/kg	U	120	n
SB74B	SGB157	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74B	SGB167FD1	8-10	12/21/1996	FD	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74C	SGA472	8-10	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74C	SGA499FD1	8-10	12/21/1996	FD	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB74C	SGB155	3-5	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB79A	SGA442	4-6	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB79A	SGA443	8-10	12/17/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB79B	SGA447	8-10	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB79B	SGB138	4-5.5	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB79C	SGA450	4-6	12/17/1996	Sample	Dibenzofuran	132-64-9	0.56	mg/kg	U	120	n
SB79C	SGA451	8-10	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB81A	SGA209	4-6	12/12/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB81A	SGA210	9-11	12/12/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB83A	SGA400	9-11	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB83A	SGB121	4-6	12/13/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB83B	SGA402	4-6.5	12/13/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB83B	SGA403	9-11	12/13/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(29.2)	AA0024	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(29.2)	AA0025	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(31.1)	AA0038	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(31.1)	AA0037	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(32.1)	AA0031	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(32.1)	AA0032	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
A(33.9)	AA0043	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(33.9)	AA0044	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
B(29.2)	AA0029	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
B(29.2)	AA0028	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
B(32.1)	AA0035	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
B(32.1)	AA0034	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
B(33.9)	AA0057	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
B(33.9)	AA0058	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
C(33.9)	AA0040	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.26	mg/kg	U	4	c*
C(33.9)	AA0041	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
D(33.9)	AA0063	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
D(33.9)	AA0064	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
E(33.9)	AA0060	4-7	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
E(33.9)	AA0061	7-10	10/24/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB28A	SGA005	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB28A	SGA004	3-5	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB28B	SGA008	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB28B	SGB133	3-5	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB28C	SGA010	3-5	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB28C	SGA368	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35A	SGA048	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB35A	SGA501FD1	8-10	12/21/1996	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB35A	SGA047	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35B	SGB158	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB35B	SGA051	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35C	SGA055	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35C	SGA056	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35C	SGA500FD1	8-10	12/21/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36A	SGA060	8-10	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB36A	SGA059	4-6	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36B	SGB161	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36D	SGA071	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36D	SGB164	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36E	SGA075	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36E	SGA076	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36F	SGA079	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36F	SGA080	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36G	SGA083	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36G	SGA084	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36H	SGA088	8-10	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36H	SGA087	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36I	SGA092	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36I	SGA091	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36J	SGA095	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36J	SGA096	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36K	SGA099	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36K	SGA100	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36L	SGA104	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36L	SGA103	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36M	SGA107	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36M	SGA108	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36N	SGA111	4-6	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36N	SGA112	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
SB43A	SGB145	8-10	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.13	mg/kg	U	4	c*

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB46A	SGB146	8-10	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.12	mg/kg	U	4	c*
SB54A	SGA457	5-7	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB54A	SGA458	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB54B	SGA460	5-7	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB54B	SGA461	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB55A	SGB122	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB55A	SGB168FD1	3-5	12/21/1996	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB55A	SGB124	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB56A	SGA406	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB56A	SGA405	5-7	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB57B	RHA076	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57B	RHA077	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57B	RHA181FD1	3-5	1/22/1997	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB57C	RHA080	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB57C	RHA079	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70D	RHA162	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70D	RHA163	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70E	RHA164	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70E	RHA165	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70E	RHA166FD1	3-5	1/22/1997	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB70G	RHA169	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB70G	RHA170	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74A	SGA463	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74A	SGA464	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74B	SGA467	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB74B	SGB157	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74B	SGB167FD1	8-10	12/21/1996	FD	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74C	SGA472	8-10	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74C	SGB155	3-5	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74C	SGA499FD1	8-10	12/21/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB79A	SGA442	4-6	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB79A	SGA443	8-10	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB79B	SGA447	8-10	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB79B	SGB138	4-5.5	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB79C	SGA450	4-6	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.28	mg/kg	U	4	c*
SB79C	SGA451	8-10	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB81A	SGA210	9-11	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB81A	SGA209	4-6	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB83A	SGA400	9-11	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB83A	SGB121	4-6	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB83B	SGA402	4-6.5	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB83B	SGA403	9-11	12/13/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42A	SGB143	8-10	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB42B	SGA413	8-10	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43B	SGA421	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43B	SGA489FD1	8-10	12/19/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB54A	SGA457	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB54A	SGA458	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB54B	SGA460	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB54B	SGA461	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB55A	SGB168FD1	3-5	12/21/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46B	SGA429	8-10	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB56A	SGA405	5-7	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB56A	SGA406	8-10	12/16/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5000	pg/g	U	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5000	pg/g	U	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5000	pg/g	U	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5000	pg/g	U	NA	--
SB36B	SGB162	4-6	12/20/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	UJ	120	n
SB70C	RHA160	3-5	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	UJ	120	n
SB70C	RHA161	8-10	1/22/1997	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	UJ	120	n
SB36B	SGB162	4-6	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	UJ	4	c*
SB70C	RHA160	3-5	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	UJ	4	c*
SB70C	RHA161	8-10	1/22/1997	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	UJ	4	c*
SB43A	SGB145	8-10	35418.3542	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	--
SB55A	SGB122	8-10	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	UJ	NA	--
SB43A	SGB145	8-10	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB46A	SGB146	8-10	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--

TABLE C-9
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB55A	SGB122	8-10	35420.6979	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB55A	SGB124	3-5	12/21/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--
SB55A	SGB168FD1	3-5	12/21/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.
FD = Field duplicate
mg/kg = Milligrams per kilogram
pg/g = Picogram per gram
J = Result is estimated
U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42A	SGA409	28-30	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	576.8	pg/g	=	22	c**
SB42A	SGA408	18-20	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	10.35	pg/g	=	22	c**
SB42A	SGA410	38-40	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	3.414	pg/g	=	22	c**
SB42B	SGA415	28-30	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	3.693	pg/g	=	22	c**
SB42B	SGA416	38-40	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.428	pg/g	=	22	c**
SB42B	SGA414	18-20	12/18/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.504	pg/g	=	22	c**
SB43A	SGA490FD1	18-20	12/19/1996	FD	TCDD Equivalent	DIOXIN-TEQ	1.159	pg/g	=	22	c**
SB43A	SGA418	18-20	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.478	pg/g	=	22	c**
SB43A	SGA419	28-30	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.433	pg/g	=	22	c**
SB43A	SGA420	38-40	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.426	pg/g	=	22	c**
SB43B	SGA424	38-40	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	12	pg/g	=	22	c**
SB43B	SGA422	18-20	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	1.205	pg/g	=	22	c**
SB43B	SGA423	28-30	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.68	pg/g	=	22	c**
SB46A	SGA428	38-40	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	61.9	pg/g	=	22	c**
SB46A	SGA427	28-30	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	2.961	pg/g	=	22	c**
SB46A	SGA426	18-20	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.064	pg/g	=	22	c**
SB46B	SGA431	28-30	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.614	pg/g	=	22	c**
SB46B	SGA432	38-40	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.08	pg/g	=	22	c**
SB46B	SGA430	18-20	12/19/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	0.045	pg/g	=	22	c**
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	7715	pg/g	=	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	24970	pg/g	=	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	30690	pg/g	=	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	61770	pg/g	=	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7776	pg/g	=	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	17	pg/g	J	22	c**
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	68	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	23	pg/g	J	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	22	pg/g	J	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	5	pg/g	J	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	3	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	27	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	83	pg/g	J	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	4	pg/g	J	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2	pg/g	J	NA	--
SB42A	SGA408	18-20	35417.5903	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	102	pg/g	J	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	94	pg/g	J	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	42	pg/g	J	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	11	pg/g	J	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	6	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	9	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	123	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	302	pg/g	J	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	12	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	43	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	262	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	12	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	40	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	6	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	39	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	186	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	12	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	33	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	478	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	4	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	11	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	48	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	133	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	13	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	42	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	243	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	5	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	24	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	55	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	19	pg/g	J	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	243	pg/g	J	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	3	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2	pg/g	J	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4	pg/g	J	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4	pg/g	J	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	3	pg/g	J	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	3	pg/g	J	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	3	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	15	pg/g	J	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	8	pg/g	J	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	6	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	51	pg/g	J	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	6	pg/g	J	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	6	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	38	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	8	pg/g	J	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	208	pg/g	J	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	27	pg/g	J	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	66	pg/g	J	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42B	SGA416	38-40	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	10	pg/g	J	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	6	pg/g	J	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	16	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	59	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	173	pg/g	J	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5	pg/g	J	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1286	pg/g	J	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2987	pg/g	J	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1258	pg/g	J	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	98	pg/g	J	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	653	pg/g	J	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	178	pg/g	J	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	133	pg/g	J	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	126	pg/g	J	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	405	pg/g	J	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	264	pg/g	J	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	80	pg/g	J	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2341	pg/g	J	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	1133	pg/g	J	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	19	pg/g	J	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	80	pg/g	J	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	45	pg/g	J	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	14	pg/g	J	NA	--
Non-Detected Results											
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42A	SGA409	28-30	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42A	SGA410	38-40	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42B	SGA414	18-20	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42B	SGA415	28-30	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB42B	SGA416	38-40	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43A	SGA418	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43A	SGA419	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43A	SGA420	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43A	SGA490FD1	18-20	12/19/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43B	SGA422	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43B	SGA423	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB43B	SGA424	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46A	SGA426	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46A	SGA427	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46B	SGA430	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
SB46B	SGA431	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB46B	SGA432	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	1000	pg/g	U	22	c**
MW-108	MW-108-170	170-170	10/22/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-108	MW-108-170	170-170	10/22/2001	Sample	Dibenzofuran	132-64-9	0.0162	mg/kg	U	120	n
MW-108	MW-108-83.5	83.5-83.5	10/22/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-108	MW-108-83.5	83.5-83.5	10/22/2001	Sample	Dibenzofuran	132-64-9	0.0143	mg/kg	U	120	n
MW-108	MW-108-97	97-97	10/22/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-108	MW-108-97	97-97	10/22/2001	Sample	Dibenzofuran	132-64-9	0.0147	mg/kg	U	120	n
MW-55	SBMW55	32-34	2/10/1996	Sample	Dibenzofuran	132-64-9	0.38	mg/kg	U	120	n
SB35A	SGA049	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB35B	SGA053	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB35C	SGA057	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36A	SGA061	18-20	12/19/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36B	SGA065	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36D	SGA073	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36E	SGA077	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	2	mg/kg	U	120	n
SB36F	SGA081	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36G	SGA085	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36H	SGA089	18-20	12/20/1996	Sample	Dibenzofuran	132-64-9	0.52	mg/kg	U	120	n
SB36I	SGA093	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB36J	SGA097	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36K	SGA101	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB36L	SGA105	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36M	SGA109	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB36N	SGA113	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74A	SGA465	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74B	SGA469	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB74C	SGA473	18-20	12/21/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB79A	SGA444	18-20	12/17/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB79B	SGA448	18-20	12/17/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB79C	SGA452	18-20	12/17/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB81A	SGA211	18-20	12/12/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
MW-108	MW-108-170	170-170	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-108	MW-108-83.5	83.5-83.5	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-108	MW-108-97	97-97	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-108	MW-108-170	170-170	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.0342	mg/kg	U	4	c*
MW-108	MW-108-97	97-97	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.0312	mg/kg	U	4	c*
MW-108	MW-108-83.5	83.5-83.5	10/22/2001	Sample	Pentachlorophenol	87-86-5	0.0302	mg/kg	U	4	c*
MW-141	6/16/2004	-	6/16/2004	Sample	Pentachlorophenol	87-86-5	0.38	mg/kg	U	4	c*
MW-55	SBMW55	32-34	2/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB35A	SGA049	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35B	SGA053	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB35C	SGA057	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB36A	SGA061	18-20	12/19/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36B	SGA065	18-20	35419.3958	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36D	SGA073	18-20	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36E	SGA077	18-20	12/20/1996	Sample	Pentachlorophenol	87-86-5	1	mg/kg	U	4	c*
SB36F	SGA081	18-20	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36G	SGA085	18-20	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36H	SGA089	18-20	12/20/1996	Sample	Pentachlorophenol	87-86-5	0.26	mg/kg	U	4	c*
SB36I	SGA093	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36J	SGA097	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36K	SGA101	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB36L	SGA105	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36M	SGA109	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB36N	SGA113	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74A	SGA465	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74B	SGA469	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB74C	SGA473	18-20	12/21/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB79A	SGA444	18-20	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB79B	SGA448	18-20	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB79C	SGA452	18-20	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB81A	SGA211	18-20	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	35418.3819	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	35418.4861	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42A	SGA409	28-30	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42A	SGA409	28-30	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46A	SGA428	38-40	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	--
SB42A	SGA408	18-20	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--

TABLE C-10
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB42A	SGA409	28-30	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB42A	SGA410	38-40	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB42B	SGA414	18-20	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB42B	SGA415	28-30	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB42B	SGA416	38-40	12/18/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGA490FD1	18-20	12/19/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43B	SGA424	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46A	SGA426	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	--
SB43A	SGA418	18-20	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB43A	SGA419	28-30	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB43A	SGA420	38-40	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB43B	SGA422	18-20	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB43B	SGA423	28-30	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46A	SGA427	28-30	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46B	SGA430	18-20	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46B	SGA431	28-30	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--
SB46B	SGA432	38-40	12/19/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	U	NA	--

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated
pg/g = Picogram per gram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-11
FU-5 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SS77C	SS77CBL	0	3/31/1999	Sample	Dibenzofuran	132-64-9	**5.7**	mg/kg	=	0.15	120	n
SS77D	SGB061	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.32	mg/kg	=	2.1	4	c*
A(20.6)	AA0007	0.5-1	10/23/1996	Sample	Dibenzofuran	132-64-9	**1.2**	mg/kg	J	0.15	120	n
SS75A	SGA183	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	0.11	mg/kg	J	0.15	120	n
TEC91A	MIA098	0.6-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**0.31**	mg/kg	J	0.15	120	n
TEC91A	MIA098	0.6-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.04	mg/kg	J	2.1	4	c*
Non-Detected Results												
A(20.6)	AA0008	1-4	10/23/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB75A	SGB076	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SB75B	SGA189	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SB76A	SGA347	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SB76B	SGA350	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SB76C	SGA353	0-1	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB77A	SGA197	0-1	12/8/1996	Sample	Dibenzofuran	132-64-9	**38**	mg/kg	U	0.15	120	n
SB77B	SGA201	0-1	12/9/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB77B	SGA412	0-1	12/9/1996	FD	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB78A	SGA356	1-3	12/10/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SB78B	SGA359	1-3	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	120	n
SB78C	SGA362	1-3	12/11/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS16A	MIA142	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS17A	MIA143	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS18A	MIA144	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	120	n
SS34A	MIA145	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
SS75B	SGA184	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS75D	MIA037	0.2-1	9/30/1998	Sample	Dibenzofuran	132-64-9	**0.38**	mg/kg	U	0.15	120	n
SS77A	SGB049	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	120	n
SS77B	SGA194	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	120	n
SS77C	SGA195	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**15**	mg/kg	U	0.15	120	n
SS77D	SGB061	0-1	12/7/1996	Sample	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	120	n
A(20.6)	AA0007	0.5-1	10/23/1996	Sample	Pentachlorophenol	87-86-5	**2.8**	mg/kg	U	2.1	4	c*
A(20.6)	AA0008	1-4	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB75A	SGB076	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB75B	SGA189	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SB76A	SGA347	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB76B	SGA350	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB76C	SGA353	0-1	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB77A	SGA197	0-1	12/8/1996	Sample	Pentachlorophenol	87-86-5	**19**	mg/kg	U	2.1	4	c*
SB77B	SGA201	0-1	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*

TABLE C-11
FU-5 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Industrial Soil, 2021	
											Value	Basis
SB77B	SGA412	0-1	12/9/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB78A	SGA356	1-3	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SB78B	SGA359	1-3	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	4	c*
SB78C	SGA362	1-3	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS16A	MIA142	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS17A	MIA143	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS18A	MIA144	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS34A	MIA145	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS75A	SGA183	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.43	mg/kg	U	2.1	4	c*
SS75B	SGA184	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS75D	MIA037	0.2-1	9/30/1998	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	2.1	4	c*
SS77A	SGB049	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS77B	SGA194	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	4	c*
SS77C	SGA195	0-1	12/7/1996	Sample	Pentachlorophenol	87-86-5	**7.7**	mg/kg	U	2.1	4	c*
SS77C	SS77CBL	0	3/31/1999	Sample	Pentachlorophenol	87-86-5	0.16	mg/kg	U	2.1	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

FD = Field duplicate
J = Result is estimated
mg/kg = Milligrams per kilogram
U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-12
FU-5 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
A(20.6)	AA0009	4-7	10/23/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
A(20.6)	AA0010	7-10	10/23/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB75A	SGA186	4-6	12/9/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB75A	SGA187	9-11	12/9/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB75B	SGA191	9-11	12/10/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB75B	SGB082	4-6	12/10/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB76A	SGA348	4-6	12/10/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB76B	SGA351	4-6	12/10/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB76C	SGA354	4-6	12/10/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB77A	SGA198	4-5	12/8/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB77A	SGA199	9.5-10	12/8/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB77B	SGA202	4-5	12/9/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB77B	SGA203	9-10	12/9/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB78A	SGA357	4-6	12/10/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB78B	SGB087	4-6	12/11/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB78C	SGA363	4-6	12/11/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
TEC91A	MIA099	3-5	10/9/1998	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
A(20.6)	AA0009	4-7	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
A(20.6)	AA0010	7-10	10/23/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB75A	SGA186	4-6	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB75A	SGA187	9-11	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB75B	SGB082	4-6	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB75B	SGA191	9-11	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB76A	SGA348	4-6	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB76B	SGA351	4-6	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB76C	SGA354	4-6	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB77A	SGA198	4-5	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB77A	SGA199	9.5-10	12/8/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB77B	SGA202	4-5	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB77B	SGA203	9-10	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB78A	SGA357	4-6	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

TABLE C-12
FU-5 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
SB78B	SGB087	4-6	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB78C	SGA363	4-6	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
TEC91A	MIA099	3-5	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.
mg/kg = Milligrams per kilogram
U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-13
FU-5 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
SB75A	SGA188	18-20	12/9/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB75B	SGA192	18-20	12/10/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB76A	SGA349	18-20	12/10/1996	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	120	n
SB76B	SGA352	18-20	12/10/1996	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	120	n
SB76C	SGB083	18-20	12/10/1996	Sample	Dibenzofuran	132-64-9	0.37	mg/kg	U	120	n
SB78A	SGA358	18-21	12/10/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB78B	SGB086	18-20	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB78C	SGA364	18-21	12/11/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB75A	SGA188	18-20	12/9/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB75B	SGA192	18-20	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB76A	SGA349	18-20	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB76B	SGA352	18-20	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB76C	SGB083	18-20	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB78A	SGA358	18-21	12/10/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB78B	SGB086	18-20	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.22	mg/kg	U	4	c*
SB78C	SGA364	18-21	12/11/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the human health criteria are shown in underline.

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

mg/kg = Milligrams per kilogram

U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-14
FU-6 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA R4 Ecological Soil Screening Level, 2018	USEPA RSL Residential Soil, 2021		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
Non-Detected Results														
SB58A	MIA174	0-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	N/A	--	120	n
SB58B	MIA179	0-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**0.37**	mg/kg	U	0.15	N/A	--	120	n
SB66A	SGA326	0-1	12/17/1996	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	N/A	--	120	n
SB66A	SGA486FD1	0-1	12/17/1996	FD	Dibenzofuran	132-64-9	**0.39**	mg/kg	U	0.15	N/A	--	120	n
SB66B	SGA331	0-1	12/16/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	N/A	--	120	n
SB66C	SGA336	0-1	12/18/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	N/A	--	120	n
SB66D	SGA341	0-1	12/17/1996	Sample	Dibenzofuran	132-64-9	**0.42**	mg/kg	U	0.15	N/A	--	120	n
SB68C	MIA183	0-1	10/9/1998	Sample	Dibenzofuran	132-64-9	**3.5**	mg/kg	U	0.15	N/A	--	120	n
SS1A	MIA134	0-1	10/7/1998	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	7.8	n	120	n
SS58C	RHA049	0-1	1/19/1997	Sample	Dibenzofuran	132-64-9	**0.41**	mg/kg	U	0.15	N/A	--	120	n
SS66A	SGB063	0-1	12/22/1996	Sample	Dibenzofuran	132-64-9	**12**	mg/kg	U	0.15	N/A	--	120	n
SS67B	SGB043	0-1	12/6/1996	Sample	Dibenzofuran	132-64-9	**0.4**	mg/kg	U	0.15	N/A	--	120	n
SB58A	MIA174	0-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	N/A	--	4	c*
SB58B	MIA179	0-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.18	mg/kg	U	2.1	N/A	--	4	c*
SB66A	SGA326	0-1	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	N/A	--	4	c*
SB66A	SGA486FD1	0-1	12/17/1996	FD	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	N/A	--	4	c*
SB66B	SGA331	0-1	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	N/A	--	4	c*
SB66C	SGA336	0-1	12/18/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	N/A	--	4	c*
SB66D	SGA341	0-1	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	2.1	N/A	--	4	c*
SB68C	MIA183	0-1	10/9/1998	Sample	Pentachlorophenol	87-86-5	1.8	mg/kg	U	2.1	N/A	--	4	c*
SS1A	MIA134	0-1	10/7/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	1	c*	4	c*
SS58C	RHA049	0-1	1/19/1997	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	N/A	--	4	c*
SS66A	SGB063	0-1	12/22/1996	Sample	Pentachlorophenol	87-86-5	**6**	mg/kg	U	2.1	N/A	--	4	c*
SS67B	SGB043	0-1	12/6/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	2.1	N/A	--	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the ecological criteria are shown in bold and results above the human health (residential and industrial) criteria are shown in underline.

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

4) Location SS1A is in the Unlimited Use/Unrestricted Exposure (UU/UE) area of Functional Unit 6 (FU-6) and its results are compared to the Residential RSLs.

N/A = Residential RSLs are not applicable to locations outside of the UU/UE area.

FD = Field duplicate

mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-15
FU-6 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
SB58A	MIA177	3-5	10/9/1998	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB58A	MIA178	8-10	10/9/1998	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB58B	MIA180	3-5	10/9/1998	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB58B	MIA181	8-10	10/9/1998	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB66A	SGA328	8-10	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB66A	SGB134	3-5	12/17/1996	Sample	Dibenzofuran	132-64-9	0.4	mg/kg	U	120	n
SB66B	SGA332	3-5	12/16/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB66B	SGA333	8-10	12/16/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB66C	SGA338	8-10	12/18/1996	Sample	Dibenzofuran	132-64-9	1.2	mg/kg	U	120	n
SB66C	SGB141	3-5	12/18/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	120	n
SB66D	SGA342	3-5	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB67A	SGB136	8-10	12/17/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	120	n
SB68C	MIA184	8-10	10/9/1998	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB58A	MIA177	3-5	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB58A	MIA178	8-10	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB58B	MIA180	3-5	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB58B	MIA181	8-10	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB66A	SGA328	8-10	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB66A	SGB134	3-5	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB66B	SGA332	3-5	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB66B	SGA333	8-10	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB66C	SGA338	8-10	12/18/1996	Sample	Pentachlorophenol	87-86-5	0.62	mg/kg	U	4	c*
SB66C	SGB141	3-5	12/18/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB66D	SGA342	3-5	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB67A	SGB136	8-10	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.21	mg/kg	U	4	c*
SB68C	MIA184	8-10	10/9/1998	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the human health criteria are shown in underline.
3) RSL basis defintions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.
mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-16
FU-6 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	USEPA RSL Industrial Soil, 2021	
										Value	Basis
Non-Detected Results											
MW-105	MW-105-83	83-83	10/15/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-105	MW-105-83	83-83	10/15/2001	Sample	Dibenzofuran	132-64-9	0.0154	mg/kg	U	120	n
MW-105	MW-105-92	92-92	10/15/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-105	MW-105-92	92-92	10/15/2001	Sample	Dibenzofuran	132-64-9	0.0147	mg/kg	U	120	n
MW-105	MW-105-97	97-97	10/15/2001	Sample	Dibenzofuran	132-64-9	0.17	mg/kg	U	120	n
MW-105	MW-105-97	97-97	10/15/2001	Sample	Dibenzofuran	132-64-9	0.0151	mg/kg	U	120	n
SB66A	SGA329	18-20	12/17/1996	Sample	Dibenzofuran	132-64-9	0.38	mg/kg	U	120	n
SB66A	SGA330	38-40	12/17/1996	Sample	Dibenzofuran	132-64-9	0.35	mg/kg	U	120	n
SB66B	SGA334	18-20	12/16/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB66B	SGA335	38-40	12/16/1996	Sample	Dibenzofuran	132-64-9	0.35	mg/kg	U	120	n
SB66C	SGA339	18-20	12/18/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	120	n
SB66C	SGA340	38-40	12/18/1996	Sample	Dibenzofuran	132-64-9	0.35	mg/kg	U	120	n
MW-105	MW-105-83	83-83	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-105	MW-105-92	92-92	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-105	MW-105-97	97-97	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
MW-105	MW-105-83	83-83	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.0326	mg/kg	U	4	c*
MW-105	MW-105-97	97-97	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.0319	mg/kg	U	4	c*
MW-105	MW-105-92	92-92	10/15/2001	Sample	Pentachlorophenol	87-86-5	0.0312	mg/kg	U	4	c*
SB66A	SGA329	18-20	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.19	mg/kg	U	4	c*
SB66A	SGA330	38-40	12/17/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
SB66B	SGA334	18-20	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB66B	SGA335	38-40	12/16/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*
SB66C	SGA339	18-20	12/18/1996	Sample	Pentachlorophenol	87-86-5	0.2	mg/kg	U	4	c*
SB66C	SGA340	38-40	12/18/1996	Sample	Pentachlorophenol	87-86-5	0.17	mg/kg	U	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the human health criteria are shown in underline.

3) RSL basis defintions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL.

mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE C-17
SUMMARY OF EXCAVATED SAMPLE LOCATIONS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Sample Date	Start Depth (feet)	End Depth (feet)	Analyte	CASRN	Result (mg/kg)	Qualifier	Detection Limit (mg/kg)
FU-3 Parcels 35 and 28									
A(35.2)	A129	10/18/1996	0	0.5	Dibenzofuran	132-64-9	0.37	U	0.37
A(35.2)	DUP11	10/18/1996	0	0.5	Dibenzofuran	132-64-9	0.37	U	0.37
B(35.2)	B129	10/18/1996	0	0.5	Dibenzofuran	132-64-9	0.37	U	0.37
C(35.2)	AA0011	10/23/1996	0	4	Dibenzofuran	132-64-9	0.39	U	0.39
C(35.2)	C129	10/18/1996	0	0.5	Dibenzofuran	132-64-9	0.37	U	0.37
SB83B	SGA401	12/13/1996	0	1	Dibenzofuran	132-64-9	0.56	U	0.56
SS31D	SGB058	12/7/1996	0.5	1	Dibenzofuran	132-64-9	0.39	U	0.39
SS32E	RHA018	1/18/1997	0	1	Dibenzofuran	132-64-9	0.39	U	0.39
SS33E	SGB068	12/8/1996	0	1	Dibenzofuran	132-64-9	0.39	U	0.39
SS33M	MIA327	10/8/1998	0	1	Dibenzofuran	132-64-9	0.35	U	0.35
SS33M	MIA328FD	10/8/1998	0	1	Dibenzofuran	132-64-9	0.37	U	0.37
C(35.2)	AA0011	10/23/1996	0	4	Pentachlorophenol	87-86-5	0.2	U	0.2
SS32E	RHA018	1/18/1997	0	1	Pentachlorophenol	87-86-5	0.2	U	0.2
SS33E	SGB068	12/8/1996	0	1	Pentachlorophenol	87-86-5	0.2	U	0.2
SS31D	SGB058	12/7/1996	0.5	1	Pentachlorophenol	87-86-5	0.19	U	0.19
A(35.2)	A129	10/18/1996	0	0.5	Pentachlorophenol	87-86-5	0.18	U	0.18
A(35.2)	DUP11	10/18/1996	0	0.5	Pentachlorophenol	87-86-5	0.18	U	0.18
B(35.2)	B129	10/18/1996	0	0.5	Pentachlorophenol	87-86-5	0.18	U	0.18
C(35.2)	C129	10/18/1996	0	0.5	Pentachlorophenol	87-86-5	0.18	U	0.18
SS33M	MIA327	10/8/1998	0	1	Pentachlorophenol	87-86-5	0.18	U	0.18
SS33M	MIA328FD	10/8/1998	0	1	Pentachlorophenol	87-86-5	0.18	U	0.18
FU-4 Building 949									
SB83B	SGA401	12/13/1996	0	1	Dibenzofuran	132-64-9	0.56	U	0.56
SS83B	SGB075	12/9/1996	0	1	Dibenzofuran	132-64-9	0.37	U	0.37
SS83C	SGA286	12/9/1996	0	1	Dibenzofuran	132-64-9	0.36	U	0.36
SB83B	SGA401	12/13/1996	0	1	Pentachlorophenol	87-86-5	0.28	U	0.28
SS83B	SGB075	12/9/1996	0	1	Pentachlorophenol	87-86-5	0.19	U	0.19
SS83C	SGA286	12/9/1996	0	1	Pentachlorophenol	87-86-5	0.18	U	0.18
FU-6 Cafeteria									
SS48A	RHA041	1/23/1997	0	1	Dibenzofuran	132-64-9	0.4	U	0.4
SS48A	RHA041	1/23/1997	0	1	Pentachlorophenol	87-86-5	0.2	U	0.2

Notes:

The sampling locations marked as excavated (approximately to 1 foot) have been identified based on review of the 2000 Main Installation (MI) Remedial Investigation (RI) report and historic removal actions.

mg/kg = Miligram per kilogram U = Result is not detected

D

Appendix D

PCP and Dioxins-Furans Soil Analytical Results Figures



Notes:
1. Sample dates: 1989 – 1999.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Soil SL of 2.1 mg/kg and the USEPA Industrial RSL of 4 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Units mg/Kg
- <1
- 1 to <2.1
- 2.1 to <4
- 4 to 20
- >20

- Property Boundary
- Excavations
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-1

PCP Analytical Results in Surface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample dates: 1996 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criterion is the USEPA Industrial RSL of 4 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Units mg/Kg

- <1
- 1 to <2.1
- 2.1 to <4
- 4 to 20
- >20

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings 490 - DDMT Assigned Number
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-2

PCP Analytical Results in Subsurface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample dates: 1996 – 2004.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criterion is the USEPA Industrial RSL of 4 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Units mg/Kg
- <1
- 1 to <2.1
- 2.1 to <4
- 4 to 20
- >20

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-3

PCP Analytical Results in Deep Soil

HHERA Review
Sampling and Analysis Plan

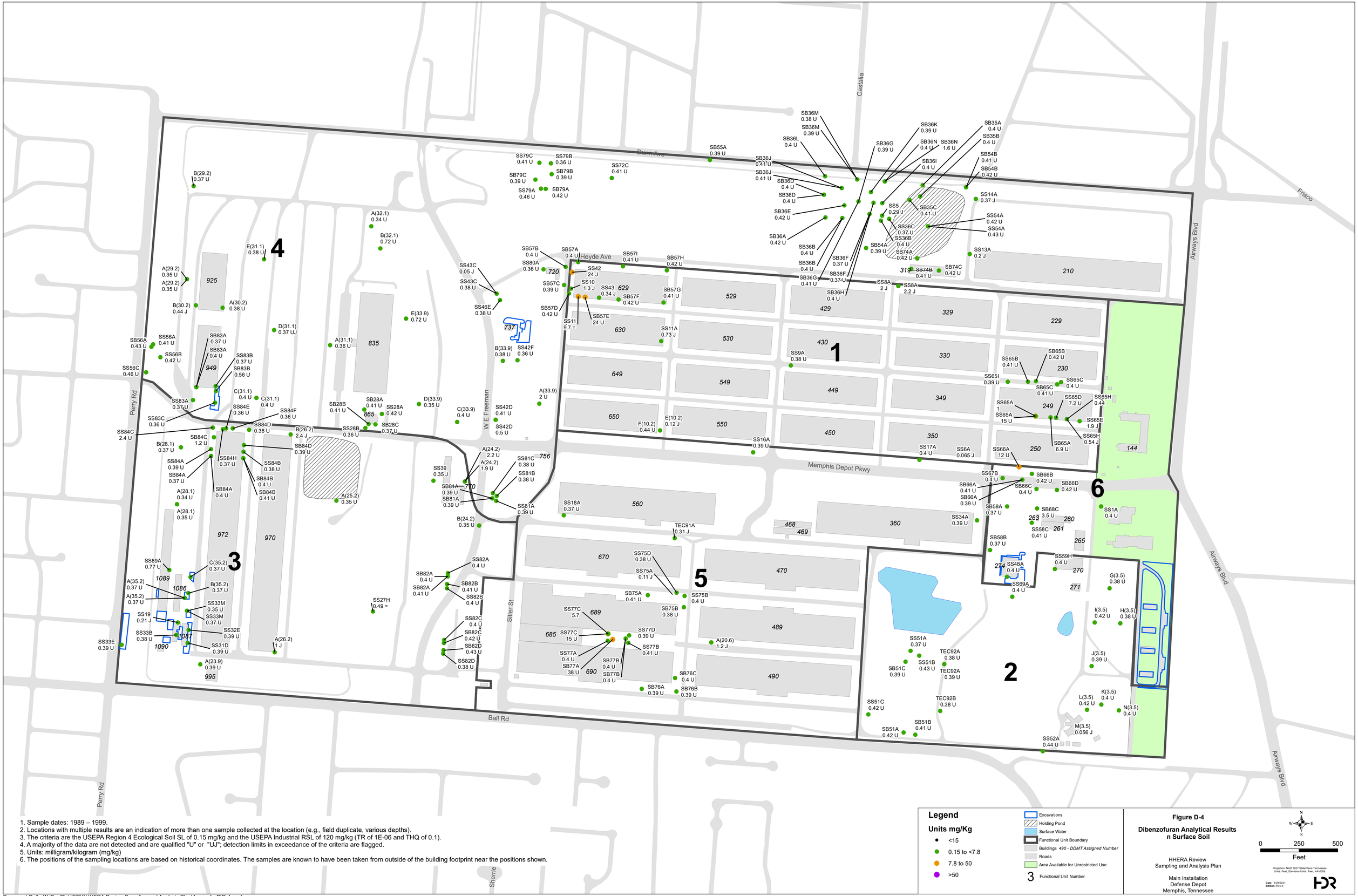
Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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1. Sample dates: 1989 – 1999.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Soil SL of 0.15 mg/kg and the USEPA Industrial RSL of 120 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.



1. Sample dates: 1996 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criterion is the USEPA Industrial RSL of 120 mg/kg (TR of 1E-06 and THQ of 0.1).
4. All of the data are not detected and are qualified "U" or "UJ", except for one concentration of 0.19 mg/kg in location TEC90B in FU-3.
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.



1. Sample dates: 1996 – 2001.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criterion is the USEPA Industrial RSL of 120 mg/kg (TR of 1E-06 and THQ of 0.1).
4. All of the data are not detected and are qualified "U".
5. Units: milligram/kilogram (mg/kg)
6. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Units mg/Kg

- <15
- 0.15 to <7.8
- 7.8 to 50
- >50

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-6

Dibenzofuran Analytical Results in Deep Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. TCDD: 2,3,7,8-tetrachlorodibenzo-para-dioxin
2. Sample dates: 12/7-21/1996
3. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth or as a duplicate).
4. The criteria are the USEPA Industrial RSL of 22 pg/g (TR of 1E-06, THQ of 0.1) and the USEPA Region 4 Ecological Soil SL of 3.15 pg/g.
5. Units: picogram/gram (pg/g)

Legend

Units pg/g

- <3.15
- 3.15 - <22
- 22 - <100
- 100 - <500

- Property Boundary
- Excavations
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-7

2,3,7,8 TCDD Analytical Results in Surface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. TCDD: 2,3,7,8-tetrachlorodibenzo-para-dioxin
2. Sample dates: 12/7-21/1996
3. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth or as a duplicate).
4. The criteria are the USEPA Industrial RSL of 22 pg/g (TR of 1E-06, THQ of 0.1).
5. Units: picogram/gram (pg/g)

Legend

Units pg/g
- <3.15
- 3.15 - <22
- 22 - <100
- 100-1000
- >1000

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-8

2,3,7,8 TCDD Analytical Results in Subsurface Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 6/1/2021
Edition: Rev 0

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Notes:
1. TCDD: 2,3,7,8-tetrachlorodibenzo-para-dioxin
2. Sample dates: 12/7-21/1996
3. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth or as a duplicate).
4. The criterion is the USEPA Industrial RSL of 22 pg/g (TR of 1E-06, THQ of 0.1).
5. Units: picogram/gram (pg/g)

Legend

Units pg/g
- <3.15
- 3.15 - <22
- 22 - <100
- 100-1000
- >1000

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure D-9

2,3,7,8 TCDD Analytical Results in Deep Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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E

Appendix E

PCP and Dioxins-Furans Sediment and Surface Water Analytical Results Tables

TABLE E-1
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
M-SD01	M-SD1-101195	10/11/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	**147.2**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD01	M-SD20-101195	10/11/1995	FD	TCDD Equivalent	DIOXIN-TEQ	**144.1**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD02	M-SD2-101195	10/11/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	**32.63**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD03	M-SD3-101195	10/11/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	**21.94**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD04	M-SD4-101195	10/11/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	**10.45**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD05	M-SD5-101295	10/12/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	**47.9**	pg/g	=	NA	0.5	4.8	c**	22	c**
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	556	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	427	pg/g	=	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	307	pg/g	=	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	450	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	6440	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	6080	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	76.7	pg/g	=	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	17.5	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	78.2	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**1980**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**1670**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**883**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**780**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**166**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**12600**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**12300**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**2620**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**1450**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**780**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**4300**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**598**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**495**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**345**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**289**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**1030**	pg/g	=	NA	2.5	100	c	470	c
M-SD01	M-SD20-101195	10/11/1995	FD	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**649**	pg/g	=	NA	2.5	100	c	470	c
M-SD02	M-SD2-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**170**	pg/g	=	NA	2.5	100	c	470	c
M-SD03	M-SD3-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**178**	pg/g	=	NA	2.5	100	c	470	c
M-SD04	M-SD4-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**55.9**	pg/g	=	NA	2.5	100	c	470	c
M-SD01	M-SD20-101195	10/11/1995	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	61600	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	51000	pg/g	=	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	15400	pg/g	=	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	8440	pg/g	=	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	20000	pg/g	=	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**106**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**82.9**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**34.2**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**43.4**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**12.8**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**12.3**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**8.7**	pg/g	=	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.073	mg/kg	J	0.51	NA	7.8	n	120	n
M-SD01	M-SD20-101195	10/11/1995	FD	Dibenzofuran	132-64-9	0.056	mg/kg	J	0.51	NA	7.8	n	120	n
M-SD03	M-SD3-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.022	mg/kg	J	0.51	NA	7.8	n	120	n
SD25C	MIA015	9/29/1998	Sample	Dibenzofuran	132-64-9	0.11	mg/kg	J	0.51	NA	7.8	n	120	n
SD26E	MIA028	9/29/1998	Sample	Dibenzofuran	132-64-9	0.14	mg/kg	J	0.51	NA	7.8	n	120	n
SD26A	MIA023	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.14**	mg/kg	J	NA	0.01	1	c*	4	c*
SD26E	MIA028	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.12**	mg/kg	J	NA	0.01	1	c*	4	c*
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	226	pg/g	J	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	59.6	pg/g	J	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	1310	pg/g	J	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	630	pg/g	J	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	385	pg/g	J	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2100	pg/g	J	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	92.9	pg/g	J	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	11.6	pg/g	J	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	146	pg/g	J	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	23.6	pg/g	J	NA	NA	NA	--	NA	--

TABLE E-1
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	4.3	pg/g	J	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**1300**	pg/g	J	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2360	pg/g	J	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	OCTACHLORODIBENZOFURAN	39001-02-0	1900	pg/g	J	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	1060	pg/g	J	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	831	pg/g	J	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	117	pg/g	J	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2400	pg/g	J	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	4300	pg/g	J	NA	NA	NA	--	NA	--
Non-Detected Results														
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	130	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD01	M-SD20-101195	10/11/1995	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**2**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD02	M-SD2-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**3**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD03	M-SD3-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**2**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD04	M-SD4-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**3**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD05	M-SD5-101295	10/12/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**160**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD02	M-SD2-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.37	mg/kg	U	0.51	NA	7.8	n	120	n
M-SD04	M-SD4-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.38	mg/kg	U	0.51	NA	7.8	n	120	n
M-SD05	M-SD5-101295	10/12/1995	Sample	Dibenzofuran	132-64-9	**1.7**	mg/kg	U	0.51	NA	7.8	n	120	n
M-SD16	M-SD16-101095	10/10/1995	Sample	Dibenzofuran	132-64-9	0.34	mg/kg	U	0.51	NA	7.8	n	120	n
SD25A	MIA013	9/29/1998	Sample	Dibenzofuran	132-64-9	**2.1**	mg/kg	U	0.51	NA	7.8	n	120	n
SD25B	MIA014	9/29/1998	Sample	Dibenzofuran	132-64-9	0.49	mg/kg	U	0.51	NA	7.8	n	120	n
SD26A	MIA023	9/29/1998	Sample	Dibenzofuran	132-64-9	0.44	mg/kg	U	0.51	NA	7.8	n	120	n
SD26B	MIA024	9/29/1998	Sample	Dibenzofuran	132-64-9	0.44	mg/kg	U	0.51	NA	7.8	n	120	n
SD26C	MIA025	9/29/1998	Sample	Dibenzofuran	132-64-9	0.47	mg/kg	U	0.51	NA	7.8	n	120	n
SD26C	MIA026FD	9/29/1998	FD	Dibenzofuran	132-64-9	0.48	mg/kg	U	0.51	NA	7.8	n	120	n
SD26D	MIA027	9/29/1998	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	0.51	NA	7.8	n	120	n
SE51A	SGB011	12/19/1996	Sample	Dibenzofuran	132-64-9	0.41	mg/kg	U	0.51	NA	7.8	n	120	n
SE51B	SGB012	12/19/1996	Sample	Dibenzofuran	132-64-9	0.42	mg/kg	U	0.51	NA	7.8	n	120	n
SE51C	SGB013	12/19/1996	Sample	Dibenzofuran	132-64-9	0.43	mg/kg	U	0.51	NA	7.8	n	120	n
M-SD01	M-SD1-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.86**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD01	M-SD20-101195	10/11/1995	FD	Pentachlorophenol	87-86-5	**0.86**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD02	M-SD2-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.9**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD04	M-SD4-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.91**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD05	M-SD5-101295	10/12/1995	Sample	Pentachlorophenol	87-86-5	**4.1**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD16	M-SD16-101095	10/10/1995	Sample	Pentachlorophenol	87-86-5	**0.82**	mg/kg	U	NA	0.01	1	c*	4	c*
SD25A	MIA013	9/29/1998	Sample	Pentachlorophenol	87-86-5	**1**	mg/kg	U	NA	0.01	1	c*	4	c*
SD25B	MIA014	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.24**	mg/kg	U	NA	0.01	1	c*	4	c*
SD25C	MIA015	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.33**	mg/kg	U	NA	0.01	1	c*	4	c*
SD26B	MIA024	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.22**	mg/kg	U	NA	0.01	1	c*	4	c*
SD26C	MIA026FD	9/29/1998	FD	Pentachlorophenol	87-86-5	**0.24**	mg/kg	U	NA	0.01	1	c*	4	c*
SD26C	MIA025	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.23**	mg/kg	U	NA	0.01	1	c*	4	c*
SD26D	MIA027	9/29/1998	Sample	Pentachlorophenol	87-86-5	**0.21**	mg/kg	U	NA	0.01	1	c*	4	c*
SE51A	SGB011	12/19/1996	Sample	Pentachlorophenol	87-86-5	**0.2**	mg/kg	U	NA	0.01	1	c*	4	c*
SE51B	SGB012	12/19/1996	Sample	Pentachlorophenol	87-86-5	**0.21**	mg/kg	U	NA	0.01	1	c*	4	c*
SE51C	SGB013	12/19/1996	Sample	Pentachlorophenol	87-86-5	**0.21**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	92	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	77	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	96	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	38	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	420	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	13	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	9	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	10	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	8	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	280	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	9	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	15	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	11	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	400	pg/g	U	NA	NA	NA	--	NA	--

TABLE E-1
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	14	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	9	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	11	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	8	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	3	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	500	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	7	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	1800	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	28	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	20	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	22	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	173	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	5	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	200	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	10	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	500	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	5	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	3	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	300	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	3	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	3	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	300	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	23	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	16	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	18	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	14	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	480	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	3	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	650	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	2	pg/g	U	NA	NA	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	4	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	5	pg/g	U	NA	NA	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	140	pg/g	U	NA	NA	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	**200**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**400**	pg/g	U	NA	2.5	100	c	470	c
M-SD04	M-SD4-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**4**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	**300**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**4**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	2	pg/g	U	NA	2.5	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**300**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**4**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**4**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD04	M-SD4-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**5**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	**140**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD01	M-SD1-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	1	pg/g	U	NA	2.5	NA	--	NA	--
M-SD01	M-SD20-101195	10/11/1995	FD	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	2	pg/g	U	NA	2.5	NA	--	NA	--
M-SD02	M-SD2-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD03	M-SD3-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	2	pg/g	U	NA	2.5	NA	--	NA	--

TABLE E-1
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
M-SD04	M-SD4-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD05	M-SD5-101295	10/12/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	**160**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD17	M-SD17-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	UJ	0.51	NA	7.8	n	120	n
M-SD03	M-SD3-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.84**	mg/kg	UJ	NA	0.01	1	c*	4	c*
M-SD17	M-SD17-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.94**	mg/kg	UJ	NA	0.01	1	c*	4	c*

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline (single underline for Residential).

3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.

FD = Field duplicate
NA = Not available
J = Result is estimated
pg/g = Picogram per gram
mg/kg = Milligram per kilogram
U = Result is not detected

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE E-2
FU-2 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Surface Water Screening Value Acute, 2018	EPA R4 Ecological Freshwater Surface Water Screening Value Chronic, 2018	National Recommended Water Quality Criteria - HH Criteria Table, Organisms Only, 2019	TDEC General Water Quality Criteria, Organism Only, 2019
Non-Detected Results												
SW25B1	RHA102	1/15/1997	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25B1	RHA117FD1	1/15/1997	FD	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25B2	RHA110	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25E	MIA007	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25F	MIA011	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25G	MIA012	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26C1	RHA107	1/15/1997	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26C2	RHA115	1/23/1997	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26E	MIA016	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26F	MIA017	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26G	MIA018	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26G	MIA019FD	9/29/1998	FD	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26H	MIA021	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW26I	MIA022	9/29/1998	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW51A	SGB014	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW51B	SGB015	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW51C	SGB016	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW25B1	RHA102	1/15/1997	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25B1	RHA117FD1	1/15/1997	FD	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25B2	RHA110	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25E	MIA007	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25F	MIA011	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25G	MIA012	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26C1	RHA107	1/15/1997	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26C2	RHA115	1/23/1997	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26E	MIA016	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26F	MIA017	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26G	MIA018	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26G	MIA019FD	9/29/1998	FD	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26H	MIA021	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW26I	MIA022	9/29/1998	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW51A	SGB014	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW51B	SGB015	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW51C	SGB016	12/12/1996	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW25B2	RHA118FD1	1/23/1997	FD	Dibenzofuran	132-64-9	**0.01**	mg/L	UJ	0.036	0.004	NA	NA
SW25B2	RHA118FD1	1/23/1997	FD	Pentachlorophenol	87-86-5	0.005	mg/L	UJ	19	15	0.00004	0.03

Notes:
1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.
FD = Field duplicate
U = Result is not detected
J = Result is estimated
mg/L = Milligram per liter
NA = Not available

Criteria:
United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2019. National Recommended Water Quality Criteria – Human Health (HH) Criteria Table. Available online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
Tennessee Department of Environment and Conservation (TDEC), 2019. Chapter 0400-40-03 General Water Quality Criteria. December 19. Available online: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-tennessee

TABLE E-3
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
M-SD19	M-SD19-101195	10/11/1995	Sample	TCDD Equivalent	DIOXIN-TEQ	0.3003	pg/g	=	NA	0.5	4.8	c**	22	c**
SE54A	SGB008	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**29.82**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE54B	SGB010	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**494.4**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE54C	SGB009	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**38.22**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE55A	SGB017	12/22/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**48.67**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE56A	SGB019	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**170.2**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE56B	SGB020	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**10.16**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE56C	SGB150FD1	12/20/1996	FD	TCDD Equivalent	DIOXIN-TEQ	**40.29**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE56C	SGB021	12/20/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**4.696**	pg/g	=	NA	0.5	4.8	c**	22	c**
SE54B	SGB010	12/20/1996	Sample	Pentachlorophenol	87-86-5	**0.26**	mg/kg	=	NA	0.01	1	c*	4	c*
SE54B	SGB010	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	6989	pg/g	=	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	23800	pg/g	=	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2523	pg/g	=	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	7862	pg/g	=	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	**6.9**	pg/g	=	NA	2.5	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7954	pg/g	=	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	16840	pg/g	=	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	17690	pg/g	=	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	66770	pg/g	=	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	5248	pg/g	=	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	29300	pg/g	=	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	Pentachlorophenol	87-86-5	**0.08**	mg/kg	J	NA	0.01	1	c*	4	c*
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	6.9	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	293	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	506	pg/g	J	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	468	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	1400	pg/g	J	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	92	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	480	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	1253	pg/g	J	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	384	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	180	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	110	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	57	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	21	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	10	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	74	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	42	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	18	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	8	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	13	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	14	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	4	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	79	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	14	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	12	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	8	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	20	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	260	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	44	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	7	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	15	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	150	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	18	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	22	pg/g	J	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	24.3	pg/g	J	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	707	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	14860	pg/g	J	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2252	pg/g	J	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	1063	pg/g	J	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	2989	pg/g	J	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	153	pg/g	J	NA	NA	NA	--	NA	--

TABLE E-3
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
SE56C	SGB150FD1	12/20/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	1085	pg/g	J	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	207	pg/g	J	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	114300	pg/g	J	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2896	pg/g	J	NA	NA	NA	--	NA	--
Non-Detected Results														
SE56C	SGB021	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**2**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE54B	SGB010	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE54C	SGB009	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE55A	SGB017	12/22/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE56A	SGB019	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE56B	SGB020	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE56C	SGB021	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
SE56C	SGB150FD1	12/20/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	U	NA	0.5	4.8	c**	22	c**
M-SD19	M-SD19-101195	10/11/1995	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	0.51	NA	7.8	n	120	n
SE54A	SGB008	12/20/1996	Sample	Dibenzofuran	132-64-9	0.37	mg/kg	U	0.51	NA	7.8	n	120	n
SE54B	SGB010	12/20/1996	Sample	Dibenzofuran	132-64-9	0.36	mg/kg	U	0.51	NA	7.8	n	120	n
SE54C	SGB009	12/20/1996	Sample	Dibenzofuran	132-64-9	0.39	mg/kg	U	0.51	NA	7.8	n	120	n
SE55A	SGB017	12/22/1996	Sample	Dibenzofuran	132-64-9	0.45	mg/kg	U	0.51	NA	7.8	n	120	n
SE56A	SGB019	12/20/1996	Sample	Dibenzofuran	132-64-9	0.36	mg/kg	U	0.51	NA	7.8	n	120	n
SE56B	SGB020	12/20/1996	Sample	Dibenzofuran	132-64-9	**2**	mg/kg	U	0.51	NA	7.8	n	120	n
SE56C	SGB021	12/20/1996	Sample	Dibenzofuran	132-64-9	**2.3**	mg/kg	U	0.51	NA	7.8	n	120	n
SE56C	SGB150FD1	12/20/1996	FD	Dibenzofuran	132-64-9	**9.5**	mg/kg	U	0.51	NA	7.8	n	120	n
M-SD19	M-SD19-101195	10/11/1995	Sample	Pentachlorophenol	87-86-5	**0.95**	mg/kg	U	NA	0.01	1	c*	4	c*
SE54A	SGB008	12/20/1996	Sample	Pentachlorophenol	87-86-5	**0.18**	mg/kg	U	NA	0.01	1	c*	4	c*
SE54C	SGB009	12/20/1996	Sample	Pentachlorophenol	87-86-5	**0.2**	mg/kg	U	NA	0.01	1	c*	4	c*
SE55A	SGB017	12/22/1996	Sample	Pentachlorophenol	87-86-5	**0.22**	mg/kg	U	NA	0.01	1	c*	4	c*
SE56B	SGB020	12/20/1996	Sample	Pentachlorophenol	87-86-5	**1**	mg/kg	U	NA	0.01	1	c*	4	c*
SE56C	SGB150FD1	12/20/1996	FD	Pentachlorophenol	87-86-5	**4.8**	mg/kg	U	NA	0.01	1	c*	4	c*
SE56C	SGB021	12/20/1996	Sample	Pentachlorophenol	87-86-5	**1.1**	mg/kg	U	NA	0.01	1	c*	4	c*
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	24	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	7	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	8	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	4	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	5	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	5	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2	pg/g	U	NA	NA	NA	--	NA	--

TABLE E-3
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis
SE54B	SGB010	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	3	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	2	pg/g	U	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE54C	SGB009	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	1000	pg/g	U	NA	NA	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	HEPTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	37871-00-4	**24**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	2	pg/g	U	NA	2.5	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	HEXACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	34465-46-8	**4**	pg/g	U	NA	2.5	100	c	470	c
M-SD19	M-SD19-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	2	pg/g	U	NA	2.5	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	PENTACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	36088-22-9	**3**	pg/g	U	NA	2.5	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	2	pg/g	U	NA	2.5	NA	--	NA	--
M-SD19	M-SD19-101195	10/11/1995	Sample	TETRACHLORINATED DIBENZO-p-DIOXINS, (TOTAL)	41903-57-5	2	pg/g	U	NA	2.5	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**1000**	pg/g	UJ	NA	0.5	4.8	c**	22	c**
SE56B	SGB020	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56C	SGB150FD1	12/20/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE54B	SGB010	12/20/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56B	SGB020	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56A	SGB019	12/20/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE54A	SGB008	12/20/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE55A	SGB017	12/22/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	2500	pg/g	UJ	NA	NA	NA	--	NA	--
SE56C	SGB021	12/20/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	5000	pg/g	UJ	NA	NA	NA	--	NA	--

TABLE E-3
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SEDIMENT
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Sediment Screening Value Narcotic Mode, 2018	EPA R4 Ecological Freshwater Sediment Screening Value Non-Narcotic Mode, 2018	USEPA RSL Residential Soil		USEPA RSL Industrial Soil, 2021	
											Value	Basis	Value	Basis

Notes:
1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).
2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline (single underline for Residential).
3) RSL basis definitions: c = cancer-based RSL, n = noncancer-based RSL, * = noncancer-based RSL < 100x cancer-based RSL, ** = noncancer-based RSL <10x cancer-based RSL.
FD = Field duplicate
J = Result is estimated
mg/kg = Milligram per kilogram
NA = Not available
pg/g = Picogram per gram
U = Result is not detected

Criteria:
United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE E-4
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Surface Water Screening Value Acute, 2018	EPA R4 Ecological Freshwater Surface Water Screening Value Chronic, 2018	National Recommended Water Quality Criteria - HH Criteria Table, Organism Only, 2019	TDEC General Water Quality Criteria, Organism Only, 2019
SW54A	SGB005	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.004349**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW54B	SGB006	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.004086**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW54C	SGB007	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.2012**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW55A	SGB018	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.1962**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW56A	SGB022	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.237**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW56B	SGB023	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.5363**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW56C	SGB091FD1	12/12/1996	FD	TCDD Equivalent	DIOXIN-TEQ	**0.5084**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW56C	SGB024	12/12/1996	Sample	TCDD Equivalent	DIOXIN-TEQ	**0.000163**	ng/L	=	NA	3.10E-06	5.10E-06	0.001
SW54A	SGB005	35411.432	Sample	Pentachlorophenol	87-86-5	0.007	mg/L	=	19	15	0.00004	0.03
SW54B	SGB006	35411.446	Sample	Pentachlorophenol	87-86-5	0.006	mg/L	=	19	15	0.00004	0.03
SW55A	SGB018	35411.389	Sample	Pentachlorophenol	87-86-5	0.013	mg/L	=	19	15	0.00004	0.03
SW54A	SGB005	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	0.104	ng/L	J	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	0.707	ng/L	J	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	0.116	ng/L	J	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	0.071	ng/L	J	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	0.06	ng/L	J	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	0.075	ng/L	J	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	0.225	ng/L	J	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	0.26	ng/L	J	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	1.931	ng/L	J	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	1.532	ng/L	J	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	2.286	ng/L	J	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	5.065	ng/L	J	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	4.822	ng/L	J	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	0.133	ng/L	J	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	0.221	ng/L	J	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	0.081	ng/L	J	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	1.301	ng/L	J	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	0.224	ng/L	J	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	0.179	ng/L	J	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3.176	ng/L	J	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	3.865	ng/L	J	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	2.019	ng/L	J	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	27.15	ng/L	J	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	7.035	ng/L	J	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	6.413	ng/L	J	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	0.236	ng/L	J	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	OCTACHLORODIBENZO-p-DIOXIN	3268-87-9	0.163	ng/L	J	NA	NA	NA	NA
Non-Detected Results												
SW54A	SGB005	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW54C	SGB007	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW55A	SGB018	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW56A	SGB022	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW56B	SGB023	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW56C	SGB024	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW56C	SGB091FD1	12/12/1996	FD	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	U	NA	3.10E-06	5.10E-06	0.001
SW54A	SGB005	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW54B	SGB006	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW54C	SGB007	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW55A	SGB018	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW56A	SGB022	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW56B	SGB023	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW56C	SGB024	12/12/1996	Sample	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	Dibenzofuran	132-64-9	**0.01**	mg/L	U	0.036	0.004	NA	NA
SW54C	SGB007	35411.424	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW56A	SGB022	35411.375	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW56B	SGB023	35411.354	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW56C	SGB024	35411.319	Sample	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW56C	SGB091FD1	35411.319	FD	Pentachlorophenol	87-86-5	0.005	mg/L	U	19	15	0.00004	0.03
SW54C	SGB007	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA

TABLE E-4
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Surface Water Screening Value Acute, 2018	EPA R4 Ecological Freshwater Surface Water Screening Value Chronic, 2018	National Recommended Water Quality Criteria - HH Criteria Table, Organism Only, 2019	TDEC General Water Quality Criteria, Organism Only, 2019
SW56B	SGB023	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW54C	SGB007	35411.424	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	25	ng/L	U	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA

TABLE E-4
FU-4 PCP AND DIOXIN-FURAN ANALYTICAL RESULTS IN SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Date	Sample Type	Analyte	CASRN	Result	Units	Qualifier	EPA R4 Ecological Freshwater Surface Water Screening Value Acute, 2018	EPA R4 Ecological Freshwater Surface Water Screening Value Chronic, 2018	National Recommended Water Quality Criteria - HH Criteria Table, Organism Only, 2019	TDEC General Water Quality Criteria, Organism Only, 2019
SW54C	SGB007	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	U	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	OCTACHLORODIBENZOFURAN	39001-02-0	50	ng/L	U	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	OCTACHLORODIBENZOFURAN	39001-02-0	50	ng/L	U	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZO-p-DIOXIN	1746-01-6	**10**	ng/L	UJ	NA	3.10E-06	5.10E-06	0.001
SW54B	SGB006	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW54C	SGB007	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW55A	SGB018	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW56A	SGB022	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW56B	SGB023	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW56C	SGB024	12/12/1996	Sample	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW56C	SGB091FD1	12/12/1996	FD	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-p-DIOXIN	35822-39-4	25	ng/L	UJ	NA	NA	NA	NA
SW54A	SGB005	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,4,7,8-HEXACHLORODIBENZO-p-DIOXIN	39227-28-6	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	25	ng/L	UJ	NA	NA	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	1,2,3,7,8-PENTACHLORODIBENZO-p-DIOXIN	109333-34-8	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	**25**	ng/L	UJ	NA	15	NA	NA
SW54B	SGB006	12/12/1996	Sample	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	10	ng/L	UJ	NA	15	NA	NA

Notes:

1) Results are sorted in the following general hierarchy: Qualifier (detected followed by non-detected), Analyte (TCDD Equivalent, 2,3,7,8-TCDD, Dibenzofuran, PCP, remaining), and Location (alphabetically).

2) Results above the ecological criteria are shown in bold and results above the human health criteria are shown in underline.

FD = Field duplicate
U = Result is not detected
J = Result is estimated
mg/L = Milligram per liter
NA = Not available
ng/L = nanogram per liter

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance
USEPA, 2019. National Recommended Water Quality Criteria – Human Health (HH) Criteria Table. Available online: https://www.epa.gov/wqc/national-recommended-water-quality-criteria-human-health-criteria-table
Tennessee Department of Environment and Conservation (TDEC), 2019. Chapter 0400-40-03 General Water Quality Criteria. December 19. Available online: https://www.epa.gov/wqs-tech/water-quality-standards-regulations-tennessee

F

Appendix F

PCP and Dioxins-Furans Sediment and Surface Water Analytical Results Figures



Notes:
1. Sample dates: 1995 - 1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Freshwater Sediment SL of 0.01 mg/kg and the USEPA Industrial RSL of 4 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. The sediment samples in FU-3 and FU-6 were collected from sumps (within Building 1086 in FU-3 and within Buildings 251 and 265 in FU-6).
6. Units: milligram/kilogram (mg/kg)

Legend

Units mg/Kg
- <0.01
- 0.01 to <1
- 1 to <4
- >4

Stream/Drainage Flow Line Type
- Lined Drainage
- Unlined Drainage
- Piped Drainage

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use

3 Functional Unit Number

Figure F-1

PCP Analytical Results in Sediment

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

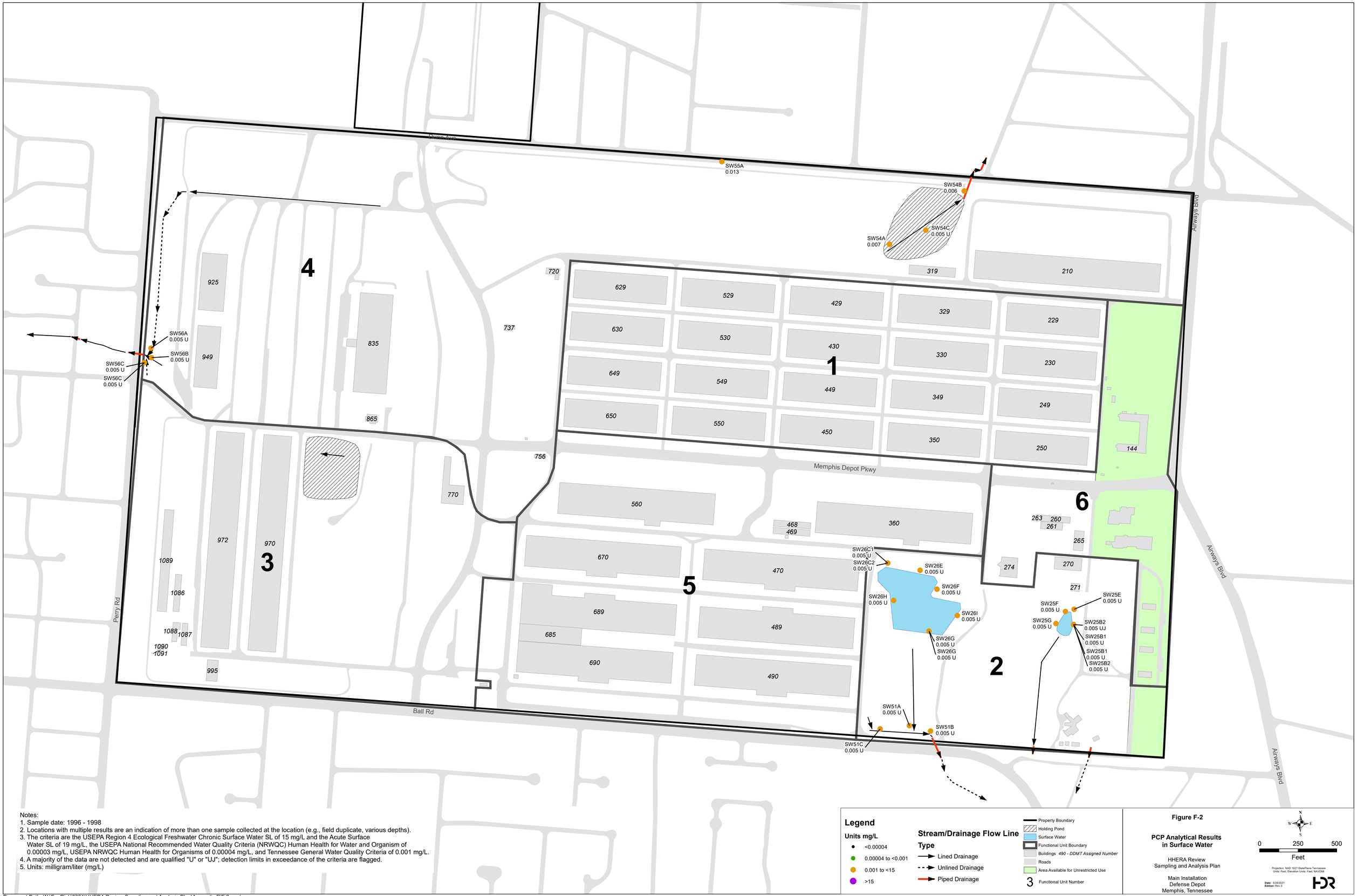
0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\Appendix F\F-1.mxd



Notes:
1. Sample date: 1996 - 1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Freshwater Chronic Surface Water SL of 15 mg/L and the Acute Surface Water SL of 19 mg/L, the USEPA National Recommended Water Quality Criteria (NRWQC) Human Health for Water and Organism of 0.00003 mg/L, USEPA NRWQC Human Health for Organisms of 0.00004 mg/L, and Tennessee General Water Quality Criteria of 0.001 mg/L.
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. Units: milligram/liter (mg/L)

Legend

Units mg/L
- <0.00004
- 0.00004 to <0.001
- 0.001 to <15
- >15

Stream/Drainage Flow Line Type
- Lined Drainage
- Unlined Drainage
- Piped Drainage

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure F-2

PCP Analytical Results in Surface Water

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

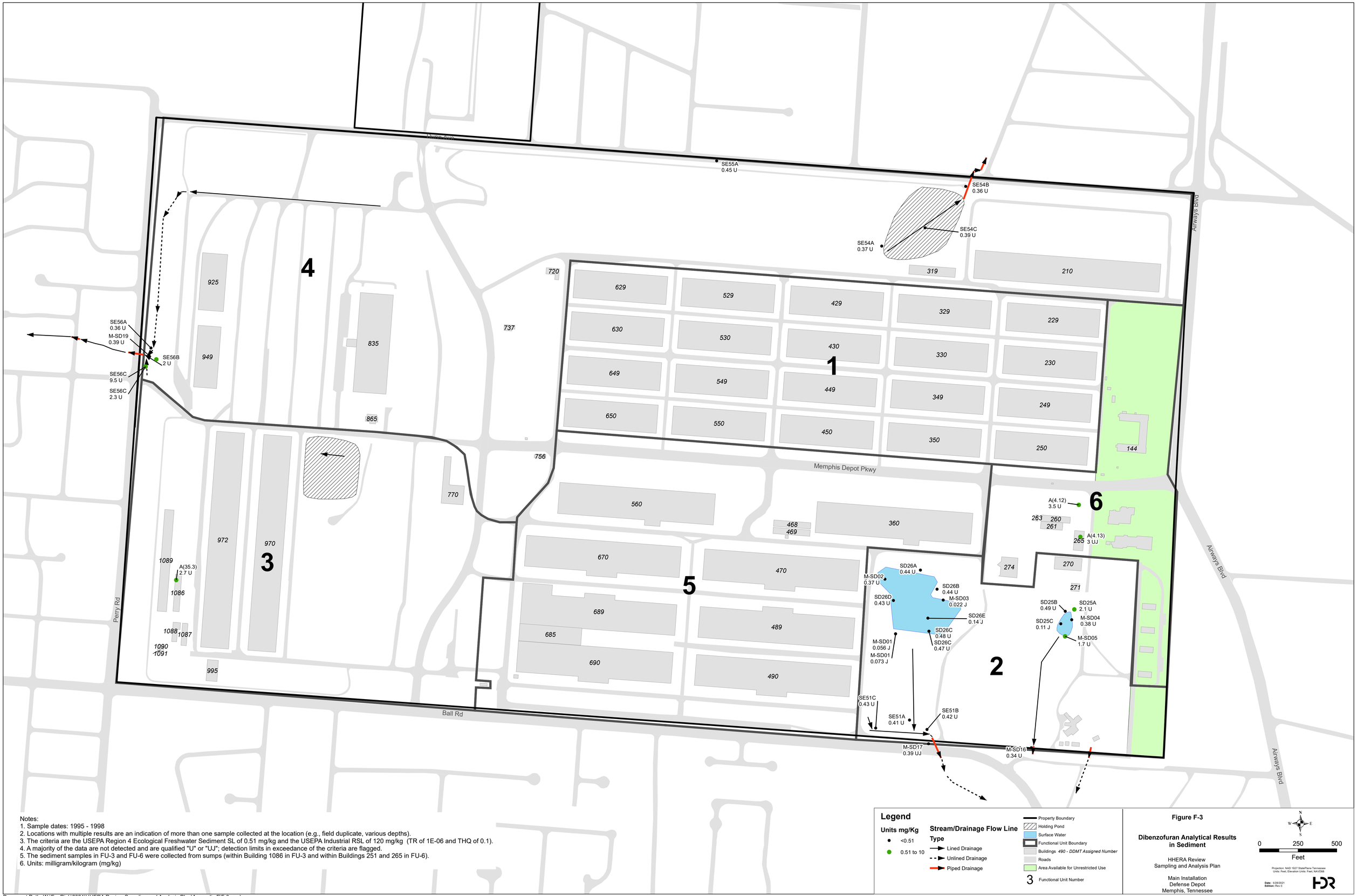
N W E S
0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

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Notes:
1. Sample dates: 1995 - 1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Freshwater Sediment SL of 0.51 mg/kg and the USEPA Industrial RSL of 120 mg/kg (TR of 1E-06 and THQ of 0.1).
4. A majority of the data are not detected and are qualified "U" or "UJ"; detection limits in exceedance of the criteria are flagged.
5. The sediment samples in FU-3 and FU-6 were collected from sumps (within Building 1086 in FU-3 and within Buildings 251 and 265 in FU-6).
6. Units: milligram/kilogram (mg/kg)

Legend

Units mg/Kg
- <0.51
- 0.51 to 10

Stream/Drainage Flow Line Type
- Lined Drainage
- Unlined Drainage
- Piped Drainage

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use

3 Functional Unit Number

Figure F-3

Dibenzofuran Analytical Results in Sediment

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample date: 1996 - 1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate, various depths).
3. The criteria are the USEPA Region 4 Ecological Freshwater Chronic Surface Water SL of 0.004 mg/L and the Acute Surface Water SL of 0.036 mg/L.
4. All of the data are not detected and qualified "U" or "UJ"; all of the detection limits exceed the Chronic SL of 0.004 mg/L.
5. Units: milligram/liter (mg/L)

Legend

Units mg/L
- <0.004
- 0.004 to <0.036

Stream/Drainage Flow Line Type
- Lined Drainage
- Unlined Drainage
- Piped Drainage

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure F-4

Dibenzofuran Analytical Results in Surface Water

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

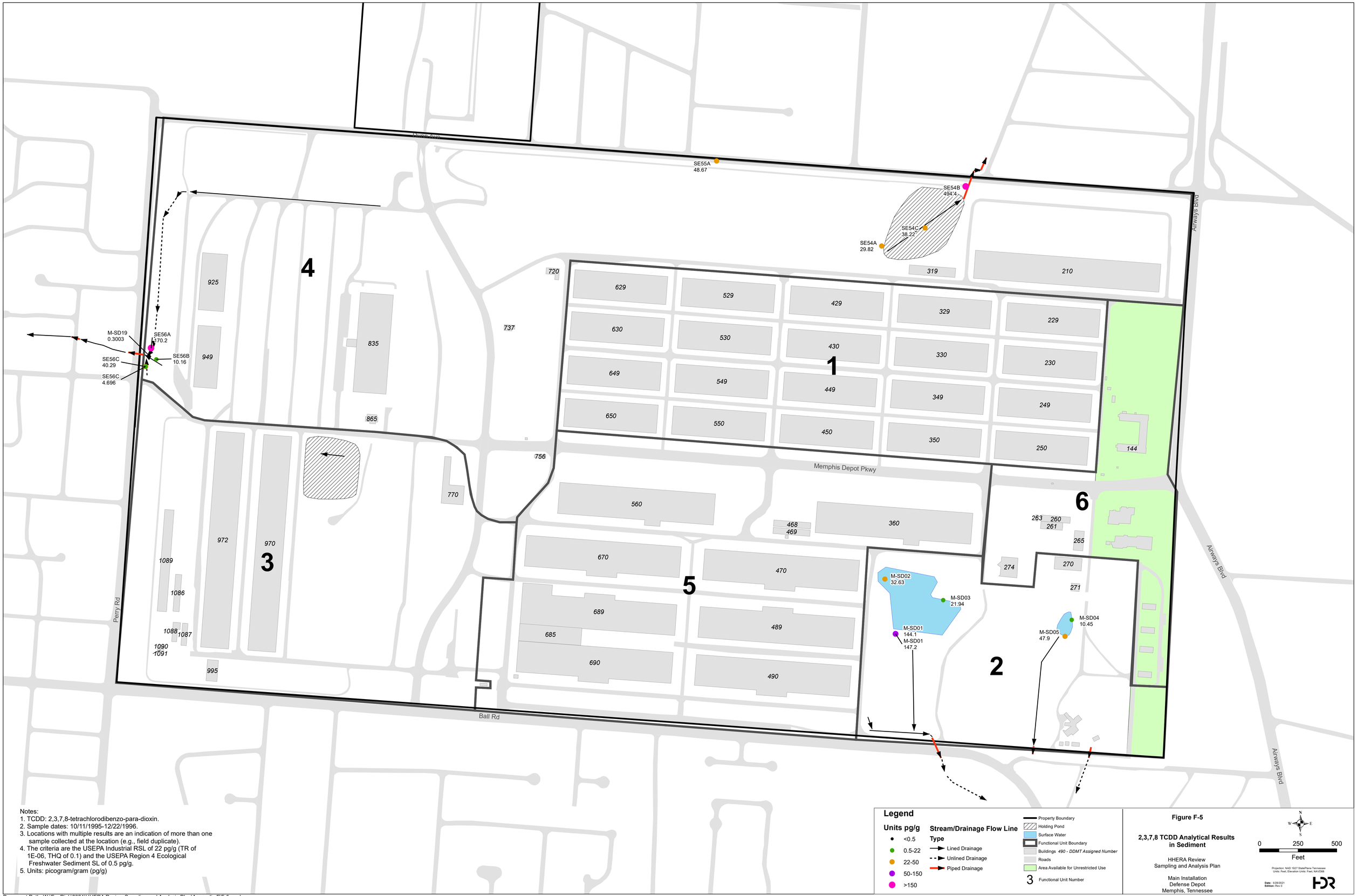
0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. TCDD: 2,3,7,8-tetrachlorodibenzo-para-dioxin.
2. Sample dates: 10/11/1995-12/22/1996.
3. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate).
4. The criteria are the USEPA Industrial RSL of 22 pg/g (TR of 1E-06, THQ of 0.1) and the USEPA Region 4 Ecological Freshwater Sediment SL of 0.5 pg/g.
5. Units: picogram/gram (pg/g)

Legend

Units pg/g
- <0.5
- 0.5-22
- 22-50
- 50-150
- >150

Stream/Drainage Flow Line Type
- Lined Drainage
- Unlined Drainage
- Piped Drainage

- Property Boundary
- Holding Pond
- Surface Water
- Functional Unit Boundary
- Buildings *490 - DDMT Assigned Number*
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure F-5

2,3,7,8 TCDD Analytical Results in Sediment

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N, W, E, S

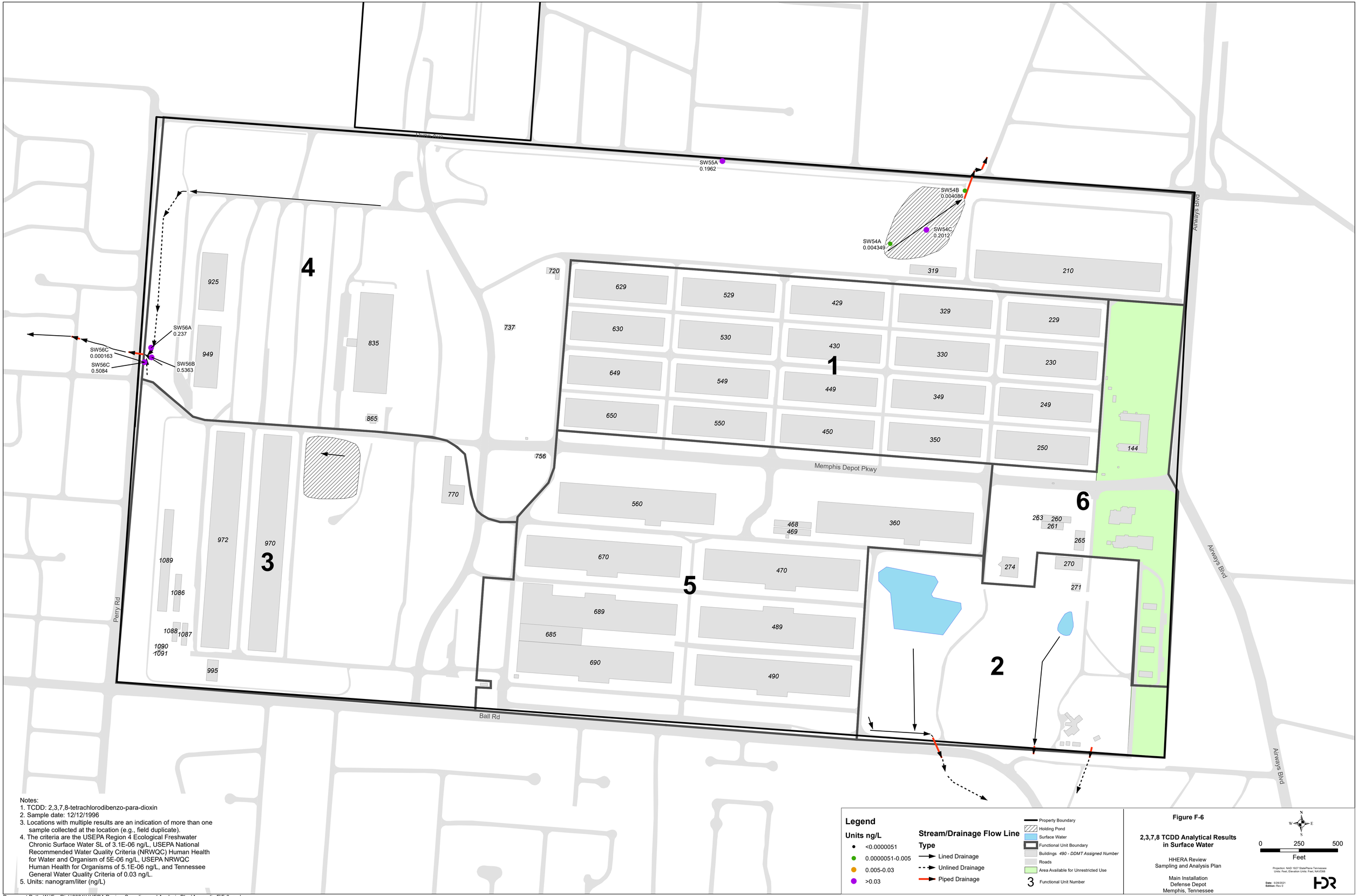
0 250 500
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

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Notes:
1. TCDD: 2,3,7,8-tetrachlorodibenzo-para-dioxin
2. Sample date: 12/12/1996
3. Locations with multiple results are an indication of more than one sample collected at the location (e.g., field duplicate).
4. The criteria are the USEPA Region 4 Ecological Freshwater Chronic Surface Water SL of 3.1E-06 ng/L, USEPA National Recommended Water Quality Criteria (NRWQC) Human Health for Water and Organism of 5E-06 ng/L, USEPA NRWQC Human Health for Organisms of 5.1E-06 ng/L, and Tennessee General Water Quality Criteria of 0.03 ng/L.
5. Units: nanogram/liter (ng/L)

G

Appendix G

Cumulative Cancer Risks and Hazards in Soil for COPCs

TABLE G-1
COMPARISON OF SOIL EPCS TO HUMAN HEALTH CRITERIA FOR COPCS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

					RSLs (TR of 1E-06, THQ of 0.1)				Exposure Point Concentrations	
FU	COPC Group	COPC	CASRN	Units	Residential Soil		Industrial Soil		EPC Soil (0-2 ft)	EPC Soil (0-10 ft)
					Value	Basis	Value	Basis		
1	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	11	18
1	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	13	19
1	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	13	20
1	SVOC	Benzo(k)fluoranthene	207-08-9	mg/kg	Not Applicable		210	c	13	21
1	SVOC	Carbazole	86-74-8	mg/kg	Not Applicable		NA		3.1	0.97
1	SVOC	Chrysene	218-01-9	mg/kg	Not Applicable		2100	c	14	26
1	SVOC	Dibenz(a,h)anthracene	53-70-3	mg/kg	Not Applicable		2.1	c	3	2.1
1	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	mg/kg	Not Applicable		21	c	9	12
1	Pesticide	4,4'-DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	5.8	3.2
1	Pesticide	4,4'-DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	2.3	3.2
1	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	0.81	4
1	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	mg/kg	Not Applicable		0.99	c	3.2	6.3
1	Metal	Antimony	7440-36-0	mg/kg	Not Applicable		47	n	4.6	2.4
1	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	26	15
1	Metal	Mercury	7439-97-6	mg/kg	Not Applicable		4.6	ns	0.12	0.076
2-Surface Soil	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	29	Not a COPC
2-Surface Soil	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	22	Not a COPC
2-Surface Soil	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	31	Not a COPC
2-Surface Soil	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	76	Not a COPC
2-Surface Soil	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		983	Not a COPC
2-Surface Soil	Metal	Nickel	7440-02-0	mg/kg	Not Applicable		2200	n	26	Not a COPC
2-Surface Soil	Pesticide	Alpha-Chlordane	5103-71-9	mg/kg	Not Applicable		50	n	0.23	Not a COPC
2-Surface Soil	Pesticide	DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	0.8	Not a COPC
2-Surface Soil	Pesticide	DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	0.96	Not a COPC
2-Surface Soil	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	2	Not a COPC
2-Surface Soil	Pesticide	Gamma-Chlordane	5566-34-7	mg/kg	Not Applicable		50	n	0.27	Not a COPC
2-Surface Soil	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	0.25	Not a COPC
2-Surface Soil	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	0.26	Not a COPC
2-Surface Soil	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	0.28	Not a COPC
2-Ballpark	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	22	Not a COPC
2-Ballpark	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	19	Not a COPC
2-Ballpark	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	25	Not a COPC
2-Ballpark	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	49	Not a COPC
2-Ballpark	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		970	Not a COPC
2-Ballpark	Metal	Nickel	7440-02-0	mg/kg	Not Applicable		2200	n	21	Not a COPC
2-Ballpark	Pesticide	DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	0.09	Not a COPC
2-Ballpark	Pesticide	DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	0.07	Not a COPC
2-Ballpark	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	1	Not a COPC
2-Ballpark	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	0.08	Not a COPC
2-Ballpark	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	0.08	Not a COPC
2-Ballpark	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	0.09	Not a COPC
2-Playground	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	19	Not a COPC
2-Playground	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	16	Not a COPC
2-Playground	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	55	Not a COPC
2-Playground	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	69	Not a COPC

TABLE G-1
COMPARISON OF SOIL EPCS TO HUMAN HEALTH CRITERIA FOR COPCS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU	COPC Group	COPC	CASRN	Units	RSLs (TR of 1E-06, THQ of 0.1)				Exposure Point Concentrations	
					Residential Soil		Industrial Soil		EPC Soil (0-2 ft)	EPC Soil (0-10 ft)
					Value	Basis	Value	Basis		
2-Playground	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		899	Not a COPC
2-Playground	Metal	Nickel	7440-02-0	mg/kg	Not Applicable		2200	n	21	Not a COPC
2-Playground	Pesticide	DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	0.43	Not a COPC
2-Playground	Pesticide	DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	0.2	Not a COPC
2-Playground	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	0.71	Not a COPC
2-Playground	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	0.57	Not a COPC
2-Playground	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	0.44	Not a COPC
2-Playground	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	0.46	Not a COPC
2-Golf Course	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	43	Not a COPC
2-Golf Course	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	26	Not a COPC
2-Golf Course	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	29	Not a COPC
2-Golf Course	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	123	Not a COPC
2-Golf Course	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		1860	Not a COPC
2-Golf Course	Metal	Nickel	7440-02-0	mg/kg	Not Applicable		2200	n	32	Not a COPC
2-Golf Course	Pesticide	Alpha-Chlordane	5103-71-9	mg/kg	Not Applicable		50	n	0.35	Not a COPC
2-Golf Course	Pesticide	DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	1	Not a COPC
2-Golf Course	Pesticide	DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	1	Not a COPC
2-Golf Course	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	3	Not a COPC
2-Golf Course	Pesticide	Gamma-Chlordane	5566-34-7	mg/kg	Not Applicable		50	n	0.4	Not a COPC
2-Golf Course	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	0.23	Not a COPC
2-Golf Course	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	0.23	Not a COPC
2-Golf Course	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	0.28	Not a COPC
3	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	1.4	0.69
3	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	1.3	0.65
3	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	1.4	0.68
3	SVOC	Benzo(k)fluoranthene	207-08-9	mg/kg	Not Applicable		210	c	1.4	0.69
3	SVOC	Carbazole	86-74-8	mg/kg	Not Applicable		NA		0.55	0.34
3	SVOC	Chrysene	218-01-9	mg/kg	Not Applicable		2100	c	1.6	0.74
3	SVOC	Dibenz(a,h)anthracene	53-70-3	mg/kg	Not Applicable		2.1	c	0.54	0.36
3	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	mg/kg	Not Applicable		21	c	1.1	0.56
3	SVOC	Pentachlorophenol	87-86-5	mg/kg	Not Applicable		4	c*	0.24	0.16
3	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	0.037	0.017
3	Metal	Antimony	7440-36-0	mg/kg	Not Applicable		47	n	3	3.5
3	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	13	12
3	Metal	Cadmium	7440-43-9	mg/kg	Not Applicable		98	n	1.3	0.89
3	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	72	49
3	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	Not a COPC	31
3	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	311	143
3	Metal	Mercury	7439-97-6	mg/kg	Not Applicable		4.6	ns	0.062	0.056
3	Metal	Selenium	7782-49-2	mg/kg	Not Applicable		580	n	0.82	0.72
3	Metal	Vanadium	7440-62-2	mg/kg	Not Applicable		580	n	26	27
3	Metal	Zinc	7440-66-6	mg/kg	Not Applicable		35000	n	273	170
3	Dioxin	TCDD Equivalent	NA	mg/kg	Not Applicable		0.000022	c**	0.000013	0.00001
4	VOC	1,1,2,2-Tetrachloroethane	79-34-5	mg/kg	Not Applicable		2.7	c	0.0059	0.0063
4	VOC	1,2-Dichloroethylene, Total	540-59-0	mg/kg	Not Applicable		2,300 / 230	ns / n	Not a COPC	0.0066

TABLE G-1
COMPARISON OF SOIL EPCS TO HUMAN HEALTH CRITERIA FOR COPCS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU	COPC Group	COPC	CASRN	Units	RSLs (TR of 1E-06, THQ of 0.1)				Exposure Point Concentrations	
					Residential Soil		Industrial Soil		EPC Soil (0-2 ft)	EPC Soil (0-10 ft)
					Value	Basis	Value	Basis		
4	VOC	Trichloroethylene	79-01-6	mg/kg	Not Applicable		1.9	n	Not a COPC	0.0064
4	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	0.54	0.32
4	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	0.54	0.32
4	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	0.54	0.32
4	SVOC	Carbazole	86-74-8	mg/kg	Not Applicable		NA		0.26	0.23
4	SVOC	Chrysene	218-01-9	mg/kg	Not Applicable		2100	c	0.58	0.33
4	SVOC	Dibenz(a,h)anthracene	53-70-3	mg/kg	Not Applicable		2.1	c	0.37	0.27
4	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	mg/kg	Not Applicable		21	c	0.49	0.31
4	SVOC	Pentachlorophenol	87-86-5	mg/kg	Not Applicable		4	c*	0.12	0.14
4	Pesticide	Alpha-Chlordane	5103-71-9	mg/kg	Not Applicable		50	n	0.074	0.011
4	Pesticide	4,4'-DDE	72-55-9	mg/kg	Not Applicable		9.3	c**	0.15	0.021
4	Pesticide	4,4'-DDT	50-29-3	mg/kg	Not Applicable		8.5	c**	0.31	0.035
4	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	0.39	0.034
4	Pesticide	Gamma-Chlordane	5566-34-7	mg/kg	Not Applicable		50	n	0.087	0.012
4	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	mg/kg	Not Applicable		0.99	c	6.6	0.87
4	Metal	Aluminum	7429-90-5	mg/kg	Not Applicable		110000	nm	12727	12390
4	Metal	Antimony	7440-36-0	mg/kg	Not Applicable		47	n	4.3	3.5
4	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	17	16
4	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	67	38
4	Metal	Cobalt	7440-48-4	mg/kg	Not Applicable		35	n	Not a COPC	10
4	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	34	29
4	Metal	Lead	7439-92-1	mg/kg	Not Applicable		800	L	162	65
4	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		718	787
4	Metal	Selenium	7782-49-2	mg/kg	Not Applicable		580	n	1.1	0.8
4	Metal	Thallium	7440-28-0	mg/kg	Not Applicable		1.2	n	0.98	0.93
4	Metal	Zinc	7440-66-6	mg/kg	Not Applicable		35000	n	222	141
4	Dioxin	TCDD Equivalent	NA	mg/kg	Not Applicable		0.000022	c**	0.00047	0.00096
5	VOC	1,2-Dichloroethylene, Total	540-59-0	mg/kg	Not Applicable		2,300 / 230	ns / n	Not a COPC	0.002
5	VOC	Trichloroethylene	79-01-6	mg/kg	Not Applicable		1.9	n	Not a COPC	0.012
5	SVOC	4-Methylphenol (p-Cresol)	106-44-5	mg/kg	Not Applicable		8200	n	0.056	0.056
5	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	Not Applicable		21	c	9	2.1
5	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	Not Applicable		2.1	c*	8.4	2
5	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	Not Applicable		21	c	8.1	2
5	SVOC	Benzo(k)fluoranthene	207-08-9	mg/kg	Not Applicable		210	c	7.8	1.9
5	SVOC	Carbazole	86-74-8	mg/kg	Not Applicable		NA		1.1	0.46
5	SVOC	Chrysene	218-01-9	mg/kg	Not Applicable		2100	c	10	2
5	SVOC	Dibenz(a,h)anthracene	53-70-3	mg/kg	Not Applicable		2.1	c	1.3	0.61
5	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	mg/kg	Not Applicable		21	c	6.5	1.6
5	SVOC	Pentachlorophenol	87-86-5	mg/kg	Not Applicable		4	c*	0.32	0.23
5	Pesticide	Dieldrin	60-57-1	mg/kg	Not Applicable		0.14	c*	1.1	1.1
5	Metal	Antimony	7440-36-0	mg/kg	Not Applicable		47	n	6.3	4.3
5	Metal	Arsenic	7440-38-2	mg/kg	Not Applicable		3	c*R	15	14
5	Metal	Cadmium	7440-43-9	mg/kg	Not Applicable		98	n	Not a COPC	2.6
5	Metal	Chromium (Total)	7440-47-3	mg/kg	Not Applicable		180,000 / 6.3	nm / c*	Not a COPC	25
5	Metal	Copper	7440-50-8	mg/kg	Not Applicable		4700	n	Not a COPC	26

TABLE G-1
COMPARISON OF SOIL EPCS TO HUMAN HEALTH CRITERIA FOR COPCS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU	COPC Group	COPC	CASRN	Units	RSLs (TR of 1E-06, THQ of 0.1)				Exposure Point Concentrations	
					Residential Soil		Industrial Soil		EPC Soil (0-2 ft)	EPC Soil (0-10 ft)
					Value	Basis	Value	Basis		
5	Metal	Manganese	7439-96-5	mg/kg	Not Applicable		2600		Not a COPC	1147
6	VOC	Benzene	71-43-2	mg/kg	1.2	c**	5.1	c**	Not a COPC	0.068
6	VOC	Methylene chloride	75-09-2	mg/kg	35	n	320	n	Not a COPC	0.009
6	VOC	Xylenes (Total)	1330-20-7	mg/kg	58	n	250	n	Not a COPC	0.047
6	SVOC	Benzo(a)anthracene	56-55-3	mg/kg	1.1	c	21	c	**4.5**	1
6	SVOC	Benzo(a)pyrene	50-32-8	mg/kg	0.11	c*	2.1	c*	**4.4**	1
6	SVOC	Benzo(b)fluoranthene	205-99-2	mg/kg	1.1	c	21	c	**6.2**	1.2
6	SVOC	Carbazole	86-74-8	mg/kg	NA		NA		1	0.38
6	SVOC	Chrysene	218-01-9	mg/kg	110	c	2100	c	6.3	1.2
6	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	mg/kg	1.1	c	21	c	**5.3**	1.1
6	Pesticide	4,4'-DDE	72-55-9	mg/kg	2	c**	9.3	c**	1.2	0.72
6	Pesticide	4,4'-DDT	50-29-3	mg/kg	1.9	c**	8.5	c**	1.8	1.7
6	Pesticide	Dieldrin	60-57-1	mg/kg	0.034	c**	0.14	c*	**0.73**	0.73
6	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	mg/kg	0.24	c	0.99	c	**6.3**	6.3
6	Metal	Arsenic	7440-38-2	mg/kg	0.68	c**R	3	c*R	**29**	22
6	Metal	Copper	7440-50-8	mg/kg	310	n	4700	n	Not a COPC	28

Notes:
Exposure point concentrations (EPCs) for constituents of potential concern (COPC) were taken from the 2000 DDMT Main Installation (MI) Remedial Investigation (RI) report tables and compared to the current Regional Screening Levels (RSL) to determine if there are any exceedances. Values are estimated due to unclear scanned version of data.

RSLs at a target cancer risk (TR) of 1E-06 and target hazard quotient (THQ) of 0.1 are applied as a conservative screening to identify exceedances. The RSLs listed for chromium are Cr (III) and Cr (VI), respectively; data were compared to the Cr(VI) RSLs. The RSLs listed for 1,2-Dichloroethene (DCE) are trans-1,2-DCE and cis-1,2-DCE, respectively; data were compared to the cis-1,2-DCE RSLs.

A majority of the Site, FU-1 to FU-5, is designated for industrial use by land use controls (LUCs) and the evaluation applies the Industrial Soil RSLs to identify exceedances. Limited areas of FU-6 are designated as residential and the evaluation applies both of the Industrial and Residential Soil RSLs to identify exceedances in FU-6.

Exceedances of the Residential Soil RSL are highlighted and bold.

Exceedances of the Industrial Soil RSLs are highlighted and underlined.

Total petroleum hydrocarbon (TPH) results were not included so as to evaluate individual constituents of TPH.

Abbreviations:
ft -- feet
FU -- functional unit
mg/kg -- milligrams per kilogram
NA -- Not available
PCB -- polychlorinated biphenyl
SVOC -- semivolatile organic compound
VOC -- volatile organic compound

RSL Basis:
* -- Where noncancer RSL < 100 times cancer RSL
** -- Where noncancer RSL < 10 times cancer RSL
c -- Cancer
L -- See RSL User's Guide - RSL calculated using blood-lead modeling
m -- RSL may exceed ceiling limit
n -- Noncancer
R -- See RSL User's Guide - RSL calculated using relative bioavailability factor
s -- RSL may exceed Csat

References:
United States Environmental Protection Agency (USEPA). 2021. Regional Screening Levels (RSLs) - Generic Tables. May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls

TABLE G-2
CALCULATION OF CANCER RISKS AND HAZARDS FOR COPCS IN SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

						Commericial/Industrial Receptor Scenario Evaluation						Residential Receptor Scenario Evaluation			
						RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft		EPC 0-10 ft		RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft	
FU	COPC Group	COPC	CASRN	EPC Soil (0-2 ft) (mg/kg)	EPC Soil (0-10 ft) (mg/kg)	Industrial Cancer RSL (mg/kg)	Industrial Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard	Screening Risk	Screening Hazard	Residential Cancer RSL (mg/kg)	Residential Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard
1	SVOC	Carbazole	86-74-8	3.1E+00	9.7E-01	Not Available	Not Available	No Criterion	No Criterion	No Criterion	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Benzo(a)anthracene	56-55-3	1.1E+01	1.8E+01	2.1E+01	Not Available	5.2E-07	No Criterion	8.6E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Benzo(a)pyrene	50-32-8	1.3E+01	1.9E+01	2.1E+00	2.2E+02	6.2E-06	5.9E-02	9.0E-06	8.6E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Benzo(b)fluoranthene	205-99-2	1.3E+01	2.0E+01	2.1E+01	Not Available	6.2E-07	No Criterion	9.5E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Benzo(k)fluoranthene	207-08-9	1.3E+01	2.1E+01	2.1E+02	Not Available	6.2E-08	No Criterion	1.0E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Chrysene	218-01-9	1.4E+01	2.6E+01	2.1E+03	Not Available	6.7E-09	No Criterion	1.2E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Dibenz(a,h)anthracene	53-70-3	3.0E+00	2.1E+00	2.1E+00	Not Available	1.4E-06	No Criterion	1.0E-06	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	9.0E+00	1.2E+01	2.1E+01	Not Available	4.3E-07	No Criterion	5.7E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	3.2E+00	6.3E+00	9.9E-01	Not Available	3.2E-06	No Criterion	6.4E-06	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Pesticide	4,4'-DDE	72-55-9	5.8E+00	3.2E+00	9.3E+00	3.5E+02	6.2E-07	1.7E-02	3.4E-07	9.1E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Pesticide	4,4'-DDT	50-29-3	2.3E+00	3.2E+00	8.5E+00	5.2E+02	2.7E-07	4.4E-03	3.8E-07	6.2E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Pesticide	Dieldrin	60-57-1	8.1E-01	4.0E+00	1.4E-01	4.1E+01	5.8E-06	2.0E-02	2.9E-05	9.8E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Metal	Arsenic	7440-38-2	2.6E+01	1.5E+01	3.0E+00	4.8E+02	8.7E-06	5.4E-02	5.0E-06	3.1E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Metal	Mercury	7439-97-6	1.2E-01	7.6E-02	Not Available	4.6E+01	No Criterion	2.6E-03	No Criterion	1.7E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
1	Metal	Antimony	7440-36-0	4.6E+00	2.4E+00	Not Available	4.7E+02	No Criterion	9.8E-03	No Criterion	5.1E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Metal	Arsenic	7440-38-2	2.2E+01	Not a COPC	3.0E+00	4.8E+02	7.3E-06	4.6E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Metal	Nickel	7440-02-0	2.1E+01	Not a COPC	6.4E+04	2.2E+04	3.3E-10	9.5E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Pesticide	DDE	72-55-9	9.0E-02	Not a COPC	9.3E+00	3.5E+02	9.7E-09	2.6E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Pesticide	DDT	50-29-3	7.0E-02	Not a COPC	8.5E+00	5.2E+02	8.2E-09	1.3E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Pesticide	Dieldrin	60-57-1	1.0E+00	Not a COPC	1.4E-01	4.1E+01	7.1E-06	2.4E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	SVOC	Benzo(a)pyrene	50-32-8	8.0E-02	Not a COPC	2.1E+00	2.2E+02	3.8E-08	3.6E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Metal	Manganese	7439-96-5	9.7E+02	Not a COPC	Not Available	2.6E+04	No Criterion	3.7E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Metal	Copper	7440-50-8	2.5E+01	Not a COPC	Not Available	4.7E+04	No Criterion	5.3E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	Metal	Chromium (Total)	7440-47-3	1.9E+01	Not a COPC	Not Available	1,800,000 / 3,500	No Criterion	5.4E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	SVOC	Benzo(a)anthracene	56-55-3	8.0E-02	Not a COPC	2.1E+01	Not Available	3.8E-09	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Ballpark	SVOC	Benzo(b)fluoranthene	205-99-2	9.0E-02	Not a COPC	2.1E+01	Not Available	4.3E-09	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Pesticide	Alpha-Chlordane	5103-71-9	3.5E-01	Not a COPC	7.7E+00	5.0E+02	4.5E-08	7.0E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Pesticide	Gamma-Chlordane	5566-34-7	4.0E-01	Not a COPC	7.7E+00	5.0E+02	5.2E-08	8.0E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Metal	Arsenic	7440-38-2	4.3E+01	Not a COPC	3.0E+00	4.8E+02	1.4E-05	9.0E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Metal	Nickel	7440-02-0	3.2E+01	Not a COPC	6.4E+04	2.2E+04	5.0E-10	1.5E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Pesticide	DDE	72-55-9	1.0E+00	Not a COPC	9.3E+00	3.5E+02	1.1E-07	2.9E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Pesticide	DDT	50-29-3	1.0E+00	Not a COPC	8.5E+00	5.2E+02	1.2E-07	1.9E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Pesticide	Dieldrin	60-57-1	3.0E+00	Not a COPC	1.4E-01	4.1E+01	2.1E-05	7.3E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	SVOC	Benzo(a)pyrene	50-32-8	2.3E-01	Not a COPC	2.1E+00	2.2E+02	1.1E-07	1.0E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Metal	Manganese	7439-96-5	1.9E+03	Not a COPC	Not Available	2.6E+04	No Criterion	7.2E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Metal	Copper	7440-50-8	2.9E+01	Not a COPC	Not Available	4.7E+04	No Criterion	6.2E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	Metal	Chromium (Total)	7440-47-3	2.6E+01	Not a COPC	Not Available	1,800,000 / 3,500	No Criterion	7.4E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	SVOC	Benzo(a)anthracene	56-55-3	2.3E-01	Not a COPC	2.1E+01	Not Available	1.1E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Golf Course	SVOC	Benzo(b)fluoranthene	205-99-2	2.8E-01	Not a COPC	2.1E+01	Not Available	1.3E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Metal	Arsenic	7440-38-2	1.9E+01	Not a COPC	3.0E+00	4.8E+02	6.3E-06	4.0E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Metal	Nickel	7440-02-0	2.1E+01	Not a COPC	6.4E+04	2.2E+04	3.3E-10	9.5E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Pesticide	DDE	72-55-9	4.3E-01	Not a COPC	9.3E+00	3.5E+02	4.6E-08	1.2E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Pesticide	DDT	50-29-3	2.0E-01	Not a COPC	8.5E+00	5.2E+02	2.4E-08	3.8E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Pesticide	Dieldrin	60-57-1	7.1E-01	Not a COPC	1.4E-01	4.1E+01	5.1E-06	1.7E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	SVOC	Benzo(a)pyrene	50-32-8	4.4E-01	Not a COPC	2.1E+00	2.2E+02	2.1E-07	2.0E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Metal	Manganese	7439-96-5	9.0E+02	Not a COPC	Not Available	2.6E+04	No Criterion	3.5E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Metal	Copper	7440-50-8	5.5E+01	Not a COPC	Not Available	4.7E+04	No Criterion	1.2E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	Metal	Chromium (Total)	7440-47-3	1.6E+01	Not a COPC	Not Available	1,800,000 / 3,500	No Criterion	4.6E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	SVOC	Benzo(a)anthracene	56-55-3	5.7E-01	Not a COPC	2.1E+01	Not Available	2.7E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Playground	SVOC	Benzo(b)fluoranthene	205-99-2	4.6E-01	Not a COPC	2.1E+01	Not Available	2.2E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Pesticide	Alpha-Chlordane	5103-71-9	2.3E-01	Not a COPC	7.7E+00	5.0E+02	3.0E-08	4.6E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Metal	Arsenic	7440-38-2	2.9E+01	Not a COPC	3.0E+00	4.8E+02	9.7E-06	6.0E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Pesticide	Gamma-Chlordane	5566-34-7	2.7E-01	Not a COPC	7.7E+00	5.0E+02	3.5E-08	5.4E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Metal	Nickel	7440-02-0	2.6E+01	Not a COPC	6.4E+04	2.2E+04	4.1E-10	1.2E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Pesticide	DDE	72-55-9	8.0E-01	Not a COPC	9.3E+00	3.5E+02	8.6E-08	2.3E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Pesticide	DDT	50-29-3	9.6E-01	Not a COPC	8.5E+00	5.2E+02	1.1E-07	1.8E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Pesticide	Dieldrin	60-57-1	2.0E+00	Not a COPC	1.4E-01	4.1E+01	1.4E-05	4.9E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	SVOC	Benzo(a)pyrene	50-32-8	2.6E-01	Not a COPC	2.1E+00	2.2E+02	1.2E-07	1.2E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Metal	Manganese	7439-96-5	9.8E+02	Not a COPC	Not Available	2.6E+04	No Criterion	3.8E-02	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Metal	Copper	7440-50-8	3.1E+01	Not a COPC	Not Available	4.7E+04	No Criterion	6.6E-04	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	SVOC	Benzo(a)anthracene	56-55-3	2.5E-01	Not a COPC	2.1E+01	Not Available	1.2E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	SVOC	Benzo(b)fluoranthene	205-99-2	2.8E-01	Not a COPC	2.1E+01	Not Available	1.3E-08	No Criterion	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
2-Surface Soil	Metal	Chromium (Total)	7440-47-3	2.2E+01	Not a COPC	Not Available	1,800,000 / 3,500	No Criterion	6.3E-03	No EPC	No EPC	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Benzo(a)anthracene	56-55-3	1.4E+00	6.9E-01	2.1E+01	Not Available	6.7E-08	No Criterion	3.3E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Benzo(b)fluoranthene	205-99-2	1.4E+00	6.8E-01	2.1E+01	Not Available	6.7E-08	No Criterion	3.2E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Benzo(k)fluoranthene	207-08-9	1.4E+00	6.9E-01	2.1E+02	Not Available	6.7E-09	No Criterion	3.3E-09	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Chromium (Total)	7440-47-3	7.2E+01	4.9E+01	Not Available	1,800,000 / 3,500	No Criterion	2.1E-02	No Criterion	1.4E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable

TABLE G-2
CALCULATION OF CANCER RISKS AND HAZARDS FOR COPCS IN SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

						Commericial/Industrial Receptor Scenario Evaluation						Residential Receptor Scenario Evaluation			
						RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft		EPC 0-10 ft		RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft	
FU	COPC Group	COPC	CASRN	EPC Soil (0-2 ft) (mg/kg)	EPC Soil (0-10 ft) (mg/kg)	Industrial Cancer RSL (mg/kg)	Industrial Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard	Screening Risk	Screening Hazard	Residential Cancer RSL (mg/kg)	Residential Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard
3	SVOC	Carbazole	86-74-8	5.5E-01	3.4E-01	Not Available	Not Available	No Criterion	No Criterion	No Criterion	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Chrysene	218-01-9	1.6E+00	7.4E-01	2.1E+03	Not Available	7.6E-10	No Criterion	3.5E-10	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Dibenz(a,h)anthracene	53-70-3	5.4E-01	3.6E-01	2.1E+00	Not Available	2.6E-07	No Criterion	1.7E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Mercury	7439-97-6	6.2E-02	5.6E-02	Not Available	4.6E+01	No Criterion	1.3E-03	No Criterion	1.2E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Antimony	7440-36-0	3.0E+00	3.5E+00	Not Available	4.7E+02	No Criterion	6.4E-03	No Criterion	7.4E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Copper	7440-50-8	Not a COPC	3.1E+01	Not Available	4.7E+04	No EPC	No EPC	No Criterion	6.6E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	1.1E+00	5.6E-01	2.1E+01	Not Available	5.2E-08	No Criterion	2.7E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Vanadium	7440-62-2	2.6E+01	2.7E+01	Not Available	5.8E+03	No Criterion	4.5E-03	No Criterion	4.7E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Zinc	7440-66-6	2.7E+02	1.7E+02	Not Available	3.5E+05	No Criterion	7.8E-04	No Criterion	4.9E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Selenium	7782-49-2	8.2E-01	7.2E-01	Not Available	5.8E+03	No Criterion	1.4E-04	No Criterion	1.2E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Benzo(a)pyrene	50-32-8	1.3E+00	6.5E-01	2.1E+00	2.2E+02	6.2E-07	5.9E-03	3.1E-07	3.0E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	SVOC	Pentachlorophenol	87-86-5	2.4E-01	1.6E-01	4.0E+00	2.8E+03	6.0E-08	8.6E-05	4.0E-08	5.7E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Pesticide	Dieldrin	60-57-1	3.7E-02	1.7E-02	1.4E-01	4.1E+01	2.6E-07	9.0E-04	1.2E-07	4.1E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Arsenic	7440-38-2	1.3E+01	1.2E+01	3.0E+00	4.8E+02	4.3E-06	2.7E-02	4.0E-06	2.5E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Metal	Cadmium	7440-43-9	1.3E+00	8.9E-01	9.3E+03	9.8E+02	1.4E-10	1.3E-03	9.6E-11	9.1E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
3	Dioxin	TCDD Equivalent	NA	1.3E-05	1.0E-05	2.2E-05	7.2E-04	5.9E-07	1.8E-02	4.5E-07	1.4E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Pesticide	Alpha-Chlordane	5103-71-9	7.4E-02	1.1E-02	7.7E+00	5.0E+02	9.6E-09	1.5E-04	1.4E-09	2.2E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Pesticide	Gamma-Chlordane	5566-34-7	8.7E-02	1.2E-02	7.7E+00	5.0E+02	1.1E-08	1.7E-04	1.6E-09	2.4E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Aluminum	7429-90-5	1.3E+04	1.2E+04	Not Available	1.1E+06	No Criterion	1.2E-02	No Criterion	1.1E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Manganese	7439-96-5	7.2E+02	7.9E+02	Not Available	2.6E+04	No Criterion	2.8E-02	No Criterion	3.0E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	VOC	1,2-Dichloroethylene, Total	540-59-0	Not a COPC	6.6E-03	Not Available	2,300 / 23,000	No EPC	No EPC	No Criterion	2.9E-06	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Chromium (Total)	7440-47-3	6.7E+01	3.8E+01	Not Available	1,800,000 / 3,500	No Criterion	1.9E-02	No Criterion	1.1E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Thallium	7440-28-0	9.8E-01	9.3E-01	Not Available	1.2E+01	No Criterion	8.2E-02	No Criterion	7.8E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Antimony	7440-36-0	4.3E+00	3.5E+00	Not Available	4.7E+02	No Criterion	9.1E-03	No Criterion	7.4E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Carbazole	86-74-8	2.6E-01	2.3E-01	Not Available	Not Available	No Criterion	No Criterion	No Criterion	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Benzo(a)anthracene	56-55-3	5.4E-01	3.2E-01	2.1E+01	Not Available	2.6E-08	No Criterion	1.5E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Copper	7440-50-8	3.4E+01	2.9E+01	Not Available	4.7E+04	No Criterion	7.2E-04	No Criterion	6.2E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Benzo(b)fluoranthene	205-99-2	5.4E-01	3.2E-01	2.1E+01	Not Available	2.6E-08	No Criterion	1.5E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Chrysene	218-01-9	5.8E-01	3.3E-01	2.1E+03	Not Available	2.8E-10	No Criterion	1.6E-10	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Dibenz(a,h)anthracene	53-70-3	3.7E-01	2.7E-01	2.1E+00	Not Available	1.8E-07	No Criterion	1.3E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Zinc	7440-66-6	2.2E+02	1.4E+02	Not Available	3.5E+05	No Criterion	6.3E-04	No Criterion	4.0E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Selenium	7782-49-2	1.1E+00	8.0E-01	Not Available	5.8E+03	No Criterion	1.9E-04	No Criterion	1.4E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	4.9E-01	3.1E-01	2.1E+01	Not Available	2.3E-08	No Criterion	1.5E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	6.6E+00	8.7E-01	9.9E-01	Not Available	6.7E-06	No Criterion	8.8E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	VOC	1,1,2,2-Tetrachloroethane	79-34-5	5.9E-03	6.3E-03	2.7E+00	2.3E+04	2.2E-09	2.6E-07	2.3E-09	2.7E-07	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	VOC	Trichloroethylene	79-01-6	Not a COPC	6.4E-03	6.0E+00	1.9E+01	No EPC	No EPC	1.1E-09	3.4E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Benzo(a)pyrene	50-32-8	5.4E-01	3.2E-01	2.1E+00	2.2E+02	2.6E-07	2.5E-03	1.5E-07	1.5E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	SVOC	Pentachlorophenol	87-86-5	1.2E-01	1.4E-01	4.0E+00	2.8E+03	3.0E-08	4.3E-05	3.5E-08	5.0E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Pesticide	4,4'-DDE	72-55-9	1.5E-01	2.1E-02	9.3E+00	3.5E+02	1.6E-08	4.3E-04	2.3E-09	6.0E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Pesticide	4,4'-DDT	50-29-3	3.1E-01	3.5E-02	8.5E+00	5.2E+02	3.6E-08	6.0E-04	4.1E-09	6.7E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Pesticide	Dieldrin	60-57-1	3.9E-01	3.4E-02	1.4E-01	4.1E+01	2.8E-06	9.5E-03	2.4E-07	8.3E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Arsenic	7440-38-2	1.7E+01	1.6E+01	3.0E+00	4.8E+02	5.7E-06	3.5E-02	5.3E-06	3.3E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Metal	Cobalt	7440-48-4	Not a COPC	1.0E+01	1.9E+03	3.5E+02	No EPC	No EPC	5.3E-09	2.9E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
4	Dioxin	TCDD Equivalent	NA	4.7E-04	9.6E-04	2.2E-05	7.2E-04	2.1E-05	6.5E-01	4.4E-05	1.3E+00	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	4-Methylphenol (p-Cresol)	106-44-5	5.6E-02	5.6E-02	Not Available	8.2E+04	No Criterion	6.8E-07	No Criterion	6.8E-07	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Manganese	7439-96-5	Not a COPC	1.1E+03	Not Available	2.6E+04	No EPC	No EPC	No Criterion	4.4E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Antimony	7440-36-0	6.3E+00	4.3E+00	Not Available	4.7E+02	No Criterion	1.3E-02	No Criterion	9.1E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	VOC	1,2-Dichloroethylene, Total	540-59-0	Not a COPC	2.0E-03	Not Available	2,300 / 23,000	No EPC	No EPC	No Criterion	8.7E-07	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Chromium (Total)	7440-47-3	Not a COPC	2.5E+01	Not Available	1,800,000 / 3,500	No EPC	No EPC	No Criterion	7.1E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Carbazole	86-74-8	1.1E+00	4.6E-01	Not Available	Not Available	No Criterion	No Criterion	No Criterion	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Benzo(a)anthracene	56-55-3	9.0E+00	2.1E+00	2.1E+01	Not Available	4.3E-07	No Criterion	1.0E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Benzo(b)fluoranthene	205-99-2	8.1E+00	2.0E+00	2.1E+01	Not Available	3.9E-07	No Criterion	9.5E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Benzo(k)fluoranthene	207-08-9	7.8E+00	1.9E+00	2.1E+02	Not Available	3.7E-08	No Criterion	9.0E-09	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Chrysene	218-01-9	1.0E+01	2.0E+00	2.1E+03	Not Available	4.8E-09	No Criterion	9.5E-10	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Dibenz(a,h)anthracene	53-70-3	1.3E+00	6.1E-01	2.1E+00	Not Available	6.2E-07	No Criterion	2.9E-07	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	6.5E+00	1.6E+00	2.1E+01	Not Available	3.1E-07	No Criterion	7.6E-08	No Criterion	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Copper	7440-50-8	Not a COPC	2.6E+01	Not Available	4.7E+04	No EPC	No EPC	No Criterion	5.5E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	VOC	Trichloroethylene	79-01-6	Not a COPC	1.2E-02	6.0E+00	1.9E+01	No EPC	No EPC	2.0E-09	6.3E-04	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Benzo(a)pyrene	50-32-8	8.4E+00	2.0E+00	2.1E+00	2.2E+02	4.0E-06	3.8E-02	9.5E-07	9.1E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	SVOC	Pentachlorophenol	87-86-5	3.2E-01	2.3E-01	4.0E+00	2.8E+03	8.0E-08	1.1E-04	5.8E-08	8.2E-05	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Pesticide	Dieldrin	60-57-1	1.1E+00	1.1E+00	1.4E-01	4.1E+01	7.9E-06	2.7E-02	7.9E-06	2.7E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Arsenic	7440-38-2	1.5E+01	1.4E+01	3.0E+00	4.8E+02	5.0E-06	3.1E-02	4.7E-06	2.9E-02	Not Applicable	Not Applicable	Not Applicable	Not Applicable
5	Metal	Cadmium	7440-43-9	Not a COPC	2.6E+00	9.3E+03	9.8E+02	No EPC	No EPC	2.8E-10	2.7E-03	Not Applicable	Not Applicable	Not Applicable	Not Applicable
6	VOC	Xylenes (Total)	1330-20-7	Not a COPC	4.7E-02	Not Available	2.5E+03	No EPC	No EPC	No Criterion	1.9E-05	Not Available	5.8E+02	No EPC	No EPC
6	SVOC	Carbazole	86-74-8	1.0E+00	3.8E-01	Not Available	Not Available	No Criterion	No Criterion	No Criterion	No Criterion	Not Available	Not Available	No Criterion	No Criterion
6	SVOC	Benzo(a)anthracene	56-55-3	4.5E+00	1.0E+00	2.1E+01	Not Available	2.1E-07	No Criterion	4.8E-08	No Criterion	1.1E+00	Not Available	4.1E-06	No Criterion
6	SVOC	Benzo(b)fluoranthene	205-99-2	6.2E+00	1.2E+00	2.1E+01	Not Available	3.0E-07	No Criterion	5.7E-08	No Criterion	1.1E+00	Not Available	5.6E-06	No Criterion

TABLE G-2
CALCULATION OF CANCER RISKS AND HAZARDS FOR COPCS IN SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

						Commericial/Industrial Receptor Scenario Evaluation						Residential Receptor Scenario Evaluation			
						RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft		EPC 0-10 ft		RSLs (TR of 1E-06, THQ of 1)		EPC 0-2 ft	
FU	COPC Group	COPC	CASRN	EPC Soil (0-2 ft) (mg/kg)	EPC Soil (0-10 ft) (mg/kg)	Industrial Cancer RSL (mg/kg)	Industrial Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard	Screening Risk	Screening Hazard	Residential Cancer RSL (mg/kg)	Residential Noncancer RSL (mg/kg)	Screening Risk	Screening Hazard
6	SVOC	Chrysene	218-01-9	6.3E+00	1.2E+00	2.1E+03	Not Available	3.0E-09	No Criterion	5.7E-10	No Criterion	1.1E+02	Not Available	5.7E-08	No Criterion
6	SVOC	Indeno (1,2,3-cd)pyrene	193-39-5	5.3E+00	1.1E+00	2.1E+01	Not Available	2.5E-07	No Criterion	5.2E-08	No Criterion	1.1E+00	Not Available	4.8E-06	No Criterion
6	PCB	PCB-1260 (Aroclor 1260)	11096-82-5	6.3E+00	6.3E+00	9.9E-01	Not Available	6.4E-06	No Criterion	6.4E-06	No Criterion	2.4E-01	Not Available	2.6E-05	No Criterion
6	Metal	Copper	7440-50-8	Not a COPC	2.8E+01	Not Available	4.7E+04	No EPC	No EPC	No Criterion	6.0E-04	Not Available	3.1E+03	No EPC	No EPC
6	VOC	Benzene	71-43-2	Not a COPC	6.8E-02	5.1E+00	4.2E+02	No EPC	No EPC	1.3E-08	1.6E-04	1.2E+00	8.2E+01	No EPC	No EPC
6	VOC	Methylene chloride	75-09-2	Not a COPC	9.0E-03	1.0E+03	3.2E+03	No EPC	No EPC	9.0E-12	2.8E-06	5.7E+01	3.5E+02	No EPC	No EPC
6	SVOC	Benzo(a)pyrene	50-32-8	4.4E+00	1.0E+00	2.1E+00	2.2E+02	2.1E-06	2.0E-02	4.8E-07	4.5E-03	1.1E-01	1.8E+01	4.0E-05	2.4E-01
6	Pesticide	4,4'-DDE	72-55-9	1.2E+00	7.2E-01	9.3E+00	3.5E+02	1.3E-07	3.4E-03	7.7E-08	2.1E-03	2.0E+00	2.3E+01	6.0E-07	5.2E-02
6	Pesticide	4,4'-DDT	50-29-3	1.8E+00	1.7E+00	8.5E+00	5.2E+02	2.1E-07	3.5E-03	2.0E-07	3.3E-03	1.9E+00	3.7E+01	9.5E-07	4.9E-02
6	Pesticide	Dieldrin	60-57-1	7.3E-01	7.3E-01	1.4E-01	4.1E+01	5.2E-06	1.8E-02	5.2E-06	1.8E-02	3.4E-02	3.2E+00	2.1E-05	2.3E-01
6	Metal	Arsenic	7440-38-2	2.9E+01	2.2E+01	3.0E+00	4.8E+02	9.7E-06	6.0E-02	7.3E-06	4.6E-02	6.8E-01	3.5E+01	4.3E-05	8.3E-01

Notes:
Exposure point concentrations (EPCs) for constituents of potential concern (COPC) were taken from the 2000 DDMT Main Installation (MI) Remedial Investigation (RI) report tables and compared to the current Regional Screening Levels (RSL). Values are estimated due to unclear scanned version of data.

RSLs at a target cancer risk (TR) of 1E-06 and target hazard quotient (THQ) of 1 are applied to calculate screening risks and hazards. The RSLs listed for chromium are Cr (III) and Cr (VI), respectively; data were compared to the Cr(VI) RSLs. The RSLs listed for 1,2-Dichloroethene (DCE) are trans-1,2-DCE and cis-1,2-DCE, respectively; data were compared to the cis-1,2-DCE RSLs.
A majority of the Site is designated for industrial use by land use controls (LUCs) and the evaluation applies the Industrial Soil RSLs to calculate screening risks and hazards. Limited areas of FU-6 are designated as residential and the evaluation applies the Residential Soil RSLs to calculate screening risks and hazards in FU-6.
The risk and hazard equations are as follows:

$$Risk = \frac{EPC}{RSL_{Cancer}} \times Target\ Risk$$ and $$Hazard = \frac{EPC}{RSL_{Noncancer}} \times Target\ Hazard\ Quotient$$ where target risk is 1E-06 and target hazard quotient is 1.

Abbreviations:
ft -- feet
FU -- functional unit
mg/kg -- milligrams per kilogram
PCB -- polychlorinated biphenyl
SVOC -- semivolatile organic compound
TPH -- total petroleum hydrocarbon
VOC -- volatile organic compound

References:
United States Environmental Protection Agency (USEPA). 2021. Regional Screening Levels (RSLs) - Generic Tables. May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls

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Appendix H

Arsenic Soil Analytical Results Tables

TABLE H-1
FU-1 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
E(10.2)	E(10_2)	0-1	1/8/1998	Sample	**39.6**	
F(10.2)	F(10_2)	0-1	1/8/1998	Sample	**54.9**	
SB57A	RHA072	0-2	1/22/1997	Sample	**10.1**	
SB57D	RHA081	0-2	1/22/1997	Sample	**13.7**	
SB57E	RHA085	0-2	1/22/1997	Sample	2.5	
SB57F	RHA088	0-2	1/23/1997	Sample	**10.6**	
SB57G	RHA091	0-2	1/23/1997	Sample	**8.7**	
SB57H	RHA095	0-2	1/23/1997	Sample	**9.3**	
SB57I	RHA098	0-2	1/23/1997	Sample	**6.2**	
SS10	LAWSS10	0.5-1.5	2/12/1989	Sample	**12**	
SS11	LAWSS11	0.5-1.5	2/12/1989	Sample	**20**	
SS11A	MIA302	0-1	10/13/1998	Sample	**25.5**	
SS42	LAWSS42	0-1	10/26/1989	Sample	**12**	
SS43	LAWSS43	0-1	10/26/1989	Sample	**26**	
SS65E	SGB025	0-1	12/6/1996	Sample	**4**	J
SS65H	MIA188	0-1	10/9/1998	Sample	**5.2**	
SS65H	MIA189FD	0-1	10/9/1998	FD	**6**	
SS65I	MIA193	0-1	10/9/1998	Sample	**14.1**	
SS66B	MIA218	0-1	10/10/1998	Sample	**29.2**	
SS66C	MIA220	0-1	10/10/1998	Sample	**34**	
SS66D	MIA221	0-1	10/10/1998	Sample	**28.2**	
SS66E	MIA222	0-1	10/10/1998	Sample	**34.8**	
SS66E	MIA223FD	0-1	10/10/1998	FD	**38.4**	
SS6A	MIA137	0-1	10/7/1998	Sample	**16.3**	
SS8A	MIA138	0-1	10/7/1998	Sample	**29.5**	
SS8A	MIA139FD	0-1	10/7/1998	FD	**2-**	
SS9A	MIA141	0-1	10/7/1998	Sample	**7**	

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-2
FU-1 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
SB57A	RHA073	3-5	1/22/1997	Sample	**5.9**
SB57A	RHA074	8-10	1/22/1997	Sample	**4.3**
SB57D	RHA082	3-5	1/22/1997	Sample	**9.8**
SB57D	RHA083FD1	3-5	1/22/1997	FD	**11**
SB57D	RHA084	8-10	1/22/1997	Sample	**8**
SB57E	RHA086	3-5	1/22/1997	Sample	**9.1**
SB57E	RHA087	8-10	1/22/1997	Sample	**7.7**
SB57F	RHA089	3-5	1/23/1997	Sample	**8.6**
SB57F	RHA090	8-10	1/23/1997	Sample	**5.5**
SB57G	RHA092	3-5	1/23/1997	Sample	**6.9**
SB57G	RHA093	8-10	1/23/1997	Sample	**4.7**
SB57G	RHA094FD1	3-5	1/23/1997	FD	**8.5**
SB57H	RHA096	3-5	1/23/1997	Sample	1.3
SB57H	RHA097	8-10	1/23/1997	Sample	**4.4**
SB57I	RHA099	3-5	1/23/1997	Sample	**7.2**
SB57I	RHA100	8-10	1/23/1997	Sample	**4.8**
SB70F	RHA167	3-5	1/22/1997	Sample	**13.3**
SB70F	RHA168	8-10	1/22/1997	Sample	**9.4**
SB70H	RHA171	3-5	1/22/1997	Sample	**5.5**
SB70H	RHA172	8-10	1/22/1997	Sample	**4.9**
SB70I	RHA173	3-5	1/22/1997	Sample	**8**
SB70I	RHA174FD1	3-5	1/22/1997	FD	**10**
SB70I	RHA175	8-10	1/22/1997	Sample	**9.9**
SB70J	RHA176	3-5	1/22/1997	Sample	**8.5**
SB70J	RHA177	8-10	1/22/1997	Sample	**9**

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-3
FU-2 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(3.10)	A9	0-0.5	10/18/1996	Sample	**50.5**	J
G(3.5)	G3_5	0-0	9/25/1997	Sample	**10.5**	
H(3.5)	H3_5	0-0	9/28/1997	Sample	**16**	
I(3.5)	I3_5	0-0	9/28/1997	Sample	**21.8**	
J(3.5)	J3_5	0-0	9/28/1997	Sample	**13**	
K(3.5)	K3_5	0-0	9/26/1997	Sample	**12.4**	
L(3.5)	L3_5	0-0	9/28/1997	Sample	**12.3**	
M(3.5)	M3_5	0-0	9/28/1997	Sample	**9.6**	
N(3.5)	N3_5	0-0	9/28/1997	Sample	**19.4**	
SB51A	SGA168	0-1	12/19/1996	Sample	**20.1**	
SB51B	SGA171	0-1	12/12/1996	Sample	**14.5**	
SB51C	SGA174	0-1	12/19/1996	Sample	**17.1**	
SB52A	SGB148	0-1	12/19/1996	Sample	**23.2**	
SB52A	SGB149FD1	0-1	12/19/1996	FD	**9.4**	
SB52B	SGA158	0-1	12/19/1996	Sample	**11.9**	
SB52B	SGA491FD1	0-1	12/19/1996	FD	**8.6**	
SS12	LAWSS12	0.2-1.2	2/21/1989	Sample	**33**	
SS13	LAWSS13	0-1	2/21/1989	Sample	**22**	
SS14	LAWSS14	0-1	2/21/1989	Sample	**41**	
SS37	LAWSS37	1-2	3/30/1989	Sample	**42**	
SS50	LAWSS50	0-1	10/27/1989	Sample	**12**	
SS51A	SGB048	0-1	12/13/1996	Sample	1.7	
SS51B	SGA166	0-1	12/13/1996	Sample	**17.4**	
SS51C	SGB116	0-1	12/13/1996	Sample	**15.7**	
SS51D	MIA033	0-1	9/30/1998	Sample	**39**	
SS51D	MIA034FD	0-1	9/30/1998	FD	**21.3**	
SS52A	SGB085	0-1	12/7/1996	Sample	**12**	
SS52B	SGB041	0-1	12/6/1996	Sample	**45.1**	
SS52C	SGB042	0-1	12/6/1996	Sample	**19.7**	
SS52D	SGA153	0-1	12/6/1996	Sample	**31.2**	
SS52E	SGB045	0-1	12/6/1996	Sample	**14.8**	
SS59H	RHA070	0-1	1/19/1997	Sample	**11.6**	
SS69A	SGB046	0-1	12/6/1996	Sample	**13.5**	J
TEC92A	MIA128	0-1	10/13/1998	Sample	**20**	
TEC92A	MIA129FD	0-1	10/13/1998	FD	**25.8**	
TEC92B	MIA132	0-1	10/13/1998	Sample	**14.6**	

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate

mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-4
FU-2 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
SB51A	SGA170	9-11	12/19/1996	Sample	**24.7**
SB51A	SGB147	5-7	12/19/1996	Sample	**4.8**
SB51B	SGA172	6-8	12/12/1996	Sample	**7.7**
SB51B	SGA173	9-12	12/12/1996	Sample	**9**
SB51C	SGA176	8-10	12/19/1996	Sample	**19.5**
SB51C	SGA175	5-6	12/19/1996	Sample	**15.4**
SB52A	SGA156	4-6	12/19/1996	Sample	**17.2**
SB52A	SGA157	8-10	12/19/1996	Sample	**19**
SB52B	SGA159	4-6	12/19/1996	Sample	**17.9**
SB52B	SGA160	8-10	12/19/1996	Sample	**7.7**
SB59C	MIA182	8-10	10/9/1998	Sample	**7.8**

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-5
FU-3 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(23.9)	AA0014	0-4	10/23/1996	Sample	**3.8**	J
A(24.2)	A97	0-1	10/18/1996	Sample	**4.1**	J
A(24.2)	DUP8	0-1	10/18/1996	FD	**5.9**	J
A(24.2)	AA0048	0-4	10/24/1996	Sample	1.9	J
A(25.2)	A101	0-0.5	10/18/1996	Sample	2.4	J
A(25.2)	AA0053	0-4	10/24/1996	Sample	**10**	J
A(28.1)	A106	0-0.7	10/18/1996	Sample	**6.2**	J
A(28.1)	DUP9	0-0.7	10/18/1996	FD	**3.4**	J
A(28.1)	AA0017	0-4	10/23/1996	Sample	**11.4**	J
B(24.2)	AA0045	0-4	10/24/1996	Sample	**10.2**	J
B(24.2)	B97	0-0.5	10/18/1996	Sample	**42.1**	J
B(26.2)	970B	0-1	1/8/1998	Sample	0.43	J
B(28.1)	B106	0-0.7	10/18/1996	Sample	**8.8**	J
B(28.1)	AA0020	0-4	10/23/1996	Sample	**8.6**	J
SB27A	RHA134	0-1	1/21/1997	Sample	**5.1**	
SB27A	RHA135	1-2	1/21/1997	Sample	**11.1**	
SB27B	RHA136	0-1	1/21/1997	Sample	**4.1**	
SB27B	RHA137	1-2	1/21/1997	Sample	**11.5**	
SB27C	RHA138	0-1	1/21/1997	Sample	**3.6**	
SB27C	RHA139	1-2	1/21/1997	Sample	**10**	
SB27D	RHA140	0-1	1/21/1997	Sample	1.9	
SB27D	RHA141	1-2	1/21/1997	Sample	**8.7**	
SB27E	RHA142	0-1	1/21/1997	Sample	2.8	
SB27E	RHA143	1-2	1/21/1997	Sample	**8.7**	
SB31B	SGA020	0-1	12/18/1996	Sample	**14.9**	
SB33A	SGA031	0-1	12/18/1996	Sample	**10.2**	
SB33B	SGA036	0-1	12/18/1996	Sample	**9.9**	
SB33B	SGA488FD1	0-1	12/18/1996	FD	**13.9**	
SB34A	RHA035	0-1	1/18/1997	Sample	1.7	J
SB34B	RHA036	0-1	1/18/1997	Sample	**8.8**	
SB34C	RHA037	0-1	1/18/1997	Sample	**8.5**	
SB82A	SGA217	0-1	12/11/1996	Sample	**22.9**	
SB82A	SGA477FD1	0-1	12/11/1996	FD	**25.7**	
SB82B	SGA221	0-1	12/11/1996	Sample	**20.2**	
SB82C	SGA225	0-1	12/11/1996	Sample	**22.1**	
SB82D	SGB095	0-1	12/12/1996	Sample	**10.7**	
SB84A	SGA382	0-1	12/12/1996	Sample	**17.8**	
SB84A	SGA478FD1	0-1	12/12/1996	FD	**7.6**	
SB84B	SGA386	0-1	12/13/1996	Sample	**15.5**	
SB84B	SGA481FD1	0-1	12/13/1996	FD	**5.6**	
SB84C	SGA390	0-1	12/13/1996	Sample	**9.7**	
SB84D	SGA394	0-1	12/13/1996	Sample	**8.9**	
SS15	LAWSS15	0.2-1.2	2/21/1989	Sample	**6**	
SS26	LAWSS26	1-2	3/19/1989	Sample	**28**	
SS27	LAWSS27	1-2	3/19/1989	Sample	**36**	
SS27F	RHA144	0-1	1/21/1997	Sample	**5**	
SS27F	RHA146	1-2	1/21/1997	Sample	**9.5**	
SS27G	RHA147	0-1	1/21/1997	Sample	**4.9**	
SS27G	RHA148	1-2	1/21/1997	Sample	**9.8**	
SS27H	RHA149	0-1	1/21/1997	Sample	**4.6**	
SS27H	RHA150	1-2	1/21/1997	Sample	**9.9**	
SS27I	RHA151	0-1	1/21/1997	Sample	**10**	
SS27I	RHA152	1-2	1/21/1997	Sample	**9**	
SS27J	RHA153	0-1	1/21/1997	Sample	2.1	
SS27J	RHA154	1-2	1/21/1997	Sample	**9**	
SS27J	RHA155FD1	1-2	1/21/1997	FD	**9**	
SS27K	MIA042	0-1	10/1/1998	Sample	**4.7**	
SS27L	MIA044	0-1	10/1/1998	Sample	**5**	
SS27M	MIA045	0-1	10/1/1998	Sample	**6.2**	
SS27P	MIA048	0-1	10/1/1998	Sample	**6.7**	
SS27Q	MIA049	0-1	10/1/1998	Sample	**3.8**	
SS27Q	MIA050FD	0-1	10/1/1998	FD	**3.5**	
SS27R	MIA355	0.1-1	10/1/1998	Sample	**5.9**	
SS27S	MIA051	0-1	10/1/1998	Sample	**4.7**	
SS27T	MIA052	0.5-1	10/1/1998	Sample	**8.7**	
SS28	LAWSS28	1-2	3/19/1989	Sample	**17**	
SS29	LAWSS29	1-2	3/19/1989	Sample	**23**	

TABLE H-5
FU-3 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SS31B	SGA012	0-0.83	12/7/1996	Sample	**4.2**	
SS31C	SGA300FD1	0-1	12/7/1996	FD	**16.2**	
SS31C	SGA013	0-1	12/7/1996	Sample	**12.6**	
SS32C	RHA016	0-1	1/18/1997	Sample	**11**	
SS33A	SGA025	0-1	12/8/1996	Sample	**8.1**	
SS33B	SGB067	0.2-1.2	12/8/1996	Sample	**8.2**	J
SS33C	SGA027	0-1	12/8/1996	Sample	**11.8**	
SS33F	SGA030	0-1	12/8/1996	Sample	**18.4**	
SS33G	MIA333	0-1	10/8/1998	Sample	**8.2**	
SS33I	MIA335	0-1	10/8/1998	Sample	**12.1**	
SS33J	MIA336	0-1	10/8/1998	Sample	**9.3**	
SS33L	MIA326	0-1	10/8/1998	Sample	**6**	
SS33N	MIA330	0-1	10/8/1998	Sample	**6.9**	
SS33O	MIA331	0-1	10/8/1998	Sample	**6.3**	
SS34D	RHA038	0-1	1/17/1997	Sample	**49.2**	
SS34E	RHA039	0-1	1/17/1997	Sample	**10.9**	
SS34E	RHA180FD1	0-1	1/17/1997	FD	**11.3**	
SS34F	RHA040	0-1	1/17/1997	Sample	**4.3**	
SS38	LAWSS38	0-1	3/30/1989	Sample	**9**	
SS39	LAWSS39	0-1	3/30/1989	Sample	**13**	
SS82A	SGB050	0-1	12/7/1996	Sample	**11.5**	J
SS82B	SGB059	0-1	12/7/1996	Sample	**9**	J
SS82C	SGA215	0-1	12/7/1996	Sample	**24.3**	
SS82D	SGB060	0-1	12/7/1996	Sample	**9.1**	J
SS84A	SGB070	0-1	12/8/1996	Sample	**9.9**	J
SS84B	SGB069	0-1	12/8/1996	Sample	**10.1**	J
SS84C	SGA280	0-1	12/8/1996	Sample	**15.8**	
SS84D	SGA281	0-1	12/8/1996	Sample	**14.6**	
SS84E	SGA282	0-1	12/8/1996	Sample	**9.6**	
SS84F	SGA283	0-1	12/8/1996	Sample	**11**	
SS84H	MIA032	0.4-1	9/30/1998	Sample	**6.5**	
SS89B	SGB039	0-1	12/6/1996	Sample	**5.7**	J
SS89C	SGA250	0-1	12/6/1996	Sample	**4.6**	
SS89D	SGA251	0-1	12/6/1996	Sample	2.7	
SS89I	SGA258	0-1	12/6/1996	Sample	**12.5**	
SS89K	MIA153	0-1	10/8/1998	Sample	**6.2**	
SS89L	MIA155	0-1	10/8/1998	Sample	**7.8**	
SS89M	MIA156	0-1	10/8/1998	Sample	**10.8**	
TEC93A	MIA332	0-1	10/8/1998	Sample	**10.6**	
A(23.9)	A93	0-0.5	10/19/1996	Sample	1.7	UJ
A(26.2)	970A	0-1	1/8/1998	Sample	0.3	U
SS89A	SGB044	0-1	12/6/1996	Sample	**3.8**	UJ

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate
mg/kg = Milligrams per kilogram
J = Result is estimated
U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-6
FU-3 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(23.9)	AA0015	4-7	10/23/1996	Sample	**6.1**	J
A(23.9)	AA0016	7-10	10/23/1996	Sample	**7.2**	J
A(24.2)	AA0049	7-10	10/24/1996	Sample	**6.7**	J
A(25.2)	AA0054	4-7	10/24/1996	Sample	**10.7**	J
A(25.2)	AA0055	7-10	10/24/1996	Sample	**8.6**	J
A(28.1)	AA0018	4-7	10/23/1996	Sample	**7.7**	J
A(28.1)	AA0019	7-10	10/23/1996	Sample	**6.6**	J
B(24.2)	AA0046	4-7	10/24/1996	Sample	**11**	J
B(24.2)	AA0047	7-10	10/24/1996	Sample	**7.2**	J
B(28.1)	AA0021	4-7	10/23/1996	Sample	**7.9**	J
B(28.1)	AA0022	7-10	10/23/1996	Sample	**4.8**	J
C(35.2)	AA0012	4-7	10/23/1996	Sample	**3.6**	J
C(35.2)	AA0013	7-10	10/23/1996	Sample	**8.8**	J
SB27A	RHA001	3-5	1/21/1997	Sample	**9**	
SB27A	RHA002	8-10	1/21/1997	Sample	**5.8**	
SB27B	RHA003	3-5	1/21/1997	Sample	**8.9**	
SB27B	RHA004	8-10	1/21/1997	Sample	**5.5**	
SB27C	RHA005	3-5	1/21/1997	Sample	**8.8**	
SB27C	RHA006	8-10	1/21/1997	Sample	**5.5**	
SB27D	RHA007	3-5	1/21/1997	Sample	**8.4**	
SB27D	RHA008	8-10	1/21/1997	Sample	**5.2**	
SB27D	RHA145FD1	3-5	1/21/1997	FD	**8.1**	
SB27E	RHA009	3-5	1/21/1997	Sample	**7.8**	
SB27E	RHA010	8-10	1/21/1997	Sample	**4.2**	
SB27E	RHA011FD1	3-5	1/21/1997	FD	**7.7**	
SB31A	SGA016	4-6	12/18/1996	Sample	**9.5**	
SB31A	SGA017	8-10	12/18/1996	Sample	**15.7**	
SB31B	SGA021	4-6	12/18/1996	Sample	**9.8**	
SB32A	RHA013	3-5	1/22/1997	Sample	**4.8**	
SB32A	RHA014	8-10	1/22/1997	Sample	**7.9**	
SB33B	SGA037	4-6	12/18/1996	Sample	**9**	
SB33C	SGA042	3-5	12/19/1996	Sample	**9.3**	
SB33C	SGA043	8-10	12/19/1996	Sample	**14.9**	
SB34A	RHA022	3-5	1/21/1997	Sample	**11.7**	
SB34A	RHA023	8-10	1/21/1997	Sample	**8.2**	
SB34B	RHA026	3-5	1/21/1997	Sample	**13.4**	
SB34B	RHA027	8-10	1/21/1997	Sample	**9**	
SB34C	RHA030	3-5	1/21/1997	Sample	**10.8**	
SB34C	RHA031	8-10	1/21/1997	Sample	**10.1**	
SB34C	RHA034FD1	3-5	1/21/1997	FD	**9**	
SB31B	SGA022	8-10	12/18/1996	Sample	**17.9**	
SB33A	SGA032	4-6	12/18/1996	Sample	**19.2**	
SB33A	SGA033	8-10	12/18/1996	Sample	**22.3**	
SB33B	SGA038	8-10	12/18/1996	Sample	**17.6**	
SB82A	SGA218	4-6	12/11/1996	Sample	**23.5**	
SB82A	SGA219	9-10.5	12/11/1996	Sample	**16.1**	
SB82B	SGA222	4-6	12/11/1996	Sample	**26.2**	
SB70A	RHA156	3-5	1/22/1997	Sample	**5.9**	
SB70A	RHA157	8-10	1/22/1997	Sample	**4.5**	
SB70B	RHA158	3-5	1/22/1997	Sample	**9.3**	
SB70B	RHA159	8-10	1/22/1997	Sample	**14.5**	
SB82B	SGA223	9-10.5	12/11/1996	Sample	**19.3**	
SB82C	SGA226	5-7	12/11/1996	Sample	**19.5**	
SB82C	SGA227	9-10.5	12/11/1996	Sample	**17.5**	
SB82D	SGA230	4-6	12/12/1996	Sample	**26.5**	
SB84A	SGA384	8.5-11	12/12/1996	Sample	**17.4**	
SB84B	SGA388	8-10	12/13/1996	Sample	**17.7**	
SB84C	SGA391	4-6	12/13/1996	Sample	**22.4**	
SB84C	SGA392	8-10	12/13/1996	Sample	**22.1**	
SB84D	SGA396	8-10	12/13/1996	Sample	**18.6**	
SB89B	SGA377	8-10	12/21/1996	Sample	**20**	
SB82D	SGB094	9-11	12/12/1996	Sample	**7.9**	
SB84A	SGB096	4-6	12/12/1996	Sample	**11.2**	
SB84B	SGB120	4-6	12/13/1996	Sample	**6.6**	
SB89A	SGA374	3-5	12/21/1996	Sample	**8.8**	
SB89A	SGA375	8-10	12/21/1996	Sample	**7.9**	
SB89B	SGA376	3-5	12/21/1996	Sample	**9.2**	

TABLE H-6
FU-3 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SB89B	SGA492FD1	3-5	12/21/1996	FD	**14.7**	
SB89C	SGA378	3-5	12/21/1996	Sample	**7.8**	
SB89C	SGA379	8-10	12/21/1996	Sample	**15.8**	
SB89D	SGA380	3-5	12/21/1996	Sample	**9.4**	
SB89D	SGA381	8-10	12/21/1996	Sample	**8.4**	
SB89E	MIA146	3-5	10/6/1998	Sample	**4**	
SB89E	MIA147FD	3-5	10/6/1998	FD	**4.2**	
SB89E	MIA149	8-10	10/6/1998	Sample	**9.2**	
TEC90A	MIA074	5-7	10/7/1998	Sample	**10.7**	
TEC90B	MIA075	6.5-8.5	10/7/1998	Sample	**5.2**	
TEC90B	MIA076	9-11	10/7/1998	Sample	**7.9**	
SB84D	SGA395	4-6	12/13/1996	Sample	**24.4**	U

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
FD = Field duplicate
mg/kg = Milligrams per kilogram
J = Result is estimated
U = Result is not detected

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-7
FU-3 ARSENIC ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SB31A	SGA018	18-20	12/18/1996	Sample	**5.6**	
SB31B	SGB140	18-20	12/18/1996	Sample	**3.3**	
SB33A	SGA034	18-20	12/18/1996	Sample	**5**	
SB33B	SGA039	18-20	12/18/1996	Sample	**3.9**	
SB33B	SGA040	38-40	12/18/1996	Sample	2.1	
SB33C	SGA044	18-20	12/19/1996	Sample	**6.9**	
SB33C	SGA045	38-40	12/19/1996	Sample	**5.6**	
SB34A	RHA024	13-15	1/21/1997	Sample	**5**	
SB34A	RHA025	18-20	1/21/1997	Sample	**4.4**	
SB34B	RHA028	13-15	1/21/1997	Sample	**5.1**	
SB34B	RHA029	18-20	1/21/1997	Sample	**4.3**	
SB34C	RHA032	13-15	1/21/1997	Sample	**5.4**	
SB34C	RHA033	18-20	1/21/1997	Sample	**4.3**	
SB84D	SGA397	18-20	12/13/1996	Sample	**18.8**	
SB82A	SGA220	18-20	12/11/1996	Sample	**8.5**	
SB82B	SGA224	18-20	12/11/1996	Sample	**12.5**	
SB82C	SGA228	18-20	12/11/1996	Sample	**11.9**	
SB82D	SGA232	18-20	12/12/1996	Sample	**15.1**	
SB84A	SGA385	18-20	12/12/1996	Sample	**9.8**	
SB84B	SGA389	18-20	12/13/1996	Sample	**8.6**	
SB84C	SGA393	18-21	12/13/1996	Sample	**11.3**	
SB89E	MIA150	18-20	10/6/1998	Sample	2.6	
SB89E	MIA151	28-30	10/6/1998	Sample	2.4	
SB31A	SGA019	38-40	12/18/1996	Sample	2.1	U
SB31B	SGA024	38-40	12/18/1996	Sample	2.1	U
SB33A	SGA035	38-40	12/18/1996	Sample	2	U
SB89E	MIA152	36-38	10/6/1998	Sample	0.15	U

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-8
FU-4 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(29.2)	A109	0-0.5	10/17/1996	Sample	**3.2**	J
A(29.2)	DUP3	0-0.5	10/17/1996	FD	**3.7**	J
A(29.2)	AA0023	0-4	10/23/1996	Sample	**9.5**	J
A(30.2)	925A	0-1	1/8/1998	Sample	**6.9**	
A(31.1)	A116	0-0.5	10/16/1996	Sample	**5.8**	J
A(31.1)	AA0036	0-4	10/24/1996	Sample	**11.2**	J
A(32.1)	A117	0-0.5	10/16/1996	Sample	**3.1**	J
A(32.1)	AA0030	0-4	10/23/1996	Sample	**7.6**	J
A(33.8)	A(33_8)	0-1	1/8/1998	Sample	1.1	J
A(33.9)	A125	0-0.5	10/18/1996	Sample	**31.5**	J
A(33.9)	AA0042	0-4	10/24/1996	Sample	**10.1**	J
B(29.2)	B109	0-0.5	10/17/1996	Sample	**6.4**	J
B(29.2)	AA0027	0-4	10/23/1996	Sample	**8.1**	J
B(30.2)	925B	0-1	1/8/1998	Sample	**6.8**	
B(31.1)	B(31_1)	0-1	1/8/1998	Sample	**3.7**	
B(32.1)	B117	0-0.5	10/16/1996	Sample	**14.8**	J
B(32.1)	AA0033	0-4	10/24/1996	Sample	**8.5**	J
B(33.9)	B125	0-0.5	10/18/1996	Sample	**4.2**	J
B(33.9)	AA0056	0-4	10/24/1996	Sample	**9.8**	J
C(31.1)	C(31_1)	0-1	1/8/1998	Sample	2.4	J
C(31.1)	DUP_1	0-1	1/8/1998	FD	2.9	J
C(33.9)	C125	0-0.5	10/19/1996	Sample	**4.5**	J
C(33.9)	AA0039	0-4	10/24/1996	Sample	**7.9**	J
D(33.9)	AA0062	0-4	10/24/1996	Sample	**9**	J
E(31.1)	E(31_1)	0-1	1/8/1998	Sample	**4.3**	
E(33.9)	E125	0-0.8	10/19/1996	Sample	2.2	J
E(33.9)	AA0059	0-4	10/24/1996	Sample	**8.5**	J
SB28A	SGA003	0-1	12/16/1996	Sample	**21.5**	
SB28B	SGA006	0-1	12/16/1996	Sample	**15.7**	
SB28C	SGA009	0-1	12/16/1996	Sample	**5.9**	
SB35A	SGB159	0-1	12/21/1996	Sample	**9.2**	J
SB35B	SGA050	0-1	12/21/1996	Sample	**15.9**	
SB35C	SGA054	0-1	12/21/1996	Sample	**17.3**	
SB36A	SGA058	0-1	12/19/1996	Sample	**26.1**	
SB36B	SGA062	0-1	12/20/1996	Sample	**18.5**	
SB36B	SGA493FD1	0-1	12/20/1996	FD	**17.5**	
SB36D	SGB163	0-1	12/20/1996	Sample	**11.4**	J
SB36D	SGB166FD1	0-1	12/20/1996	FD	**12.1**	J
SB36E	SGB165	0-1	12/20/1996	Sample	**13.5**	J
SB36F	SGA494FD1	0-1	12/20/1996	FD	**15.1**	
SB36F	SGA078	0-1	12/20/1996	Sample	**18.4**	
SB36G	SGA495FD1	0-1	12/20/1996	FD	**15.9**	
SB36G	SGA082	0-1	12/20/1996	Sample	**18.1**	
SB36H	SGA086	0-1	12/20/1996	Sample	**17.8**	
SB36I	SGA090	0-1	12/21/1996	Sample	**16.4**	
SB36J	SGA094	0-1	12/21/1996	Sample	**25.3**	
SB36J	SGA496FD1	0-1	12/21/1996	FD	**27.2**	
SB36K	SGA098	0-1	12/21/1996	Sample	**22.9**	
SB36L	SGA102	0-1	12/21/1996	Sample	**27.7**	
SB36M	SGA106	0-1	12/21/1996	Sample	**22.6**	
SB36M	SGA497FD1	0-1	12/21/1996	FD	**25.4**	
SB36N	SGA110	0-1	12/21/1996	Sample	**22.4**	
SB36N	SGA502FD1	0-1	12/21/1996	FD	**24.9**	
SB54A	SGA456	0-1	12/16/1996	Sample	**15.8**	
SB54B	SGA483FD1	0-1	12/16/1996	FD	**13.3**	
SB54B	SGA459	0-1	12/16/1996	Sample	**27.3**	
SB55A	SGB123	0-1	12/21/1996	Sample	**8.8**	J
SB56A	SGA404	0-1	12/16/1996	Sample	**10.5**	
SB57B	RHA075	0-2	1/22/1997	Sample	**9.3**	
SB57C	RHA078	0-2	1/22/1997	Sample	**11.6**	
SB74A	SGB156	0-1	12/21/1996	Sample	**11.9**	J
SB74B	SGA466	0-1	12/21/1996	Sample	**13.7**	
SB74C	SGA470	0-1	12/21/1996	Sample	**13.5**	
SB79A	SGA441	0-1	12/17/1996	Sample	**15.8**	
SB79B	SGB137	0-1	12/17/1996	Sample	**7.6**	
SB79C	SGA449	0-1	12/17/1996	Sample	**8.5**	
SB80A	SGB154	0-1	12/21/1996	Sample	**8.9**	J

TABLE H-8
FU-4 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SB80B	SGA437	0-1	12/21/1996	Sample	**8.9**	
SB83A	SGA398	0-1	12/13/1996	Sample	**8.9**	
SB83A	SGA482FD1	0-1	12/13/1996	FD	**9.9**	
SS1	LAWSS1	0.2-1.2	2/9/1989	Sample	**4**	
SS13A	MIA303	0-1	10/13/1998	Sample	**27.1**	
SS14A	MIA304	0-1	10/13/1998	Sample	**66.3**	
SS2	LAWSS2	0-1	2/9/1989	Sample	**18**	
SS23	LAWSS23	0.5-1.5	2/22/1989	Sample	**23**	
SS24	LAWSS24	0.5-1.5	3/19/1989	Sample	**30**	
SS28A	SGA291	0-1	12/8/1996	Sample	**21.1**	
SS28B	SGA292	0-1	12/8/1996	Sample	**14.3**	
SS3	LAWSS3	0-1	2/9/1989	Sample	**26**	
SS32	LAWSS32	1-2	3/19/1989	Sample	**8**	
SS33	LAWSS33	1-2	3/19/1989	Sample	**26**	
SS34	LAWSS34	1-2	3/19/1989	Sample	**8**	
SS35	LAWSS35	1-2	3/19/1989	Sample	**30**	
SS35A	MIA264	0-1	10/12/1998	Sample	**7.1**	J
SS35B	MIA265	0-1	10/12/1998	Sample	**5**	J
SS35C	MIA269	0-1	10/12/1998	Sample	**11**	J
SS35D	MIA270	0-1	10/12/1998	Sample	**6.6**	J
SS36	LAWSS36	1-2	3/19/1989	Sample	**25**	
SS36A	MIA001	0.1-1	9/28/1998	Sample	**20.2**	
SS36B	MIA005	0.2-1	9/28/1998	Sample	**17.2**	
SS36C	MIA006	0-1	9/28/1998	Sample	**20.8**	
SS4	LAWSS4	0-1	2/11/1989	Sample	**33**	
SS40	LAWSS40	0.2-1.2	3/30/1989	Sample	**21**	
SS42D	SGB071	0-1	12/8/1996	Sample	**12.5**	J
SS42D	SGB072FD1	0-1	12/8/1996	FD	**16**	J
SS42F	MIA275	0-1	10/12/1998	Sample	**4.9**	J
SS43C	SGB079	0-1	12/9/1996	Sample	**9.9**	
SS43C	SGB084	0-1	12/9/1996	FD	**28**	
SS46E	SGB080	0-1	12/10/1996	Sample	**25**	
SS47	LAWSS47	0-1	10/27/1989	Sample	**19**	
SS5	LAWSS5	0-1	2/11/1989	Sample	**20**	
SS54A	SGA369	0-1	12/13/1996	Sample	**18.4**	
SS54A	SGA480FD1	0-1	12/13/1996	FD	**15.5**	
SS56A	SGB062	0-1	12/13/1996	Sample	**10.5**	
SS56B	SGA289	0-1	12/13/1996	Sample	**20.2**	
SS56C	SGA290	0-1	12/13/1996	Sample	**18.3**	
SS72A	SGA317	0-1	12/11/1996	Sample	**29**	
SS72B	SGA318	0-1	12/11/1996	Sample	**17.4**	
SS72C	SGB088	0-1	12/11/1996	Sample	**13.3**	
SS72D	SGA320	0-1	12/11/1996	Sample	**18.1**	
SS72E	SGA321	0-1	12/11/1996	Sample	**27.7**	
SS72F	SGA322	0-1	12/11/1996	Sample	**22.8**	
SS72F	SGA476FD1	0-1	12/11/1996	FD	**22.8**	
SS72G	SGA323	0-1	12/11/1996	Sample	**17.2**	
SS72H	SGA324	0-1	12/11/1996	Sample	**15.9**	
SS72I	SGA325	0-1	12/11/1996	Sample	**24**	
SS72J	MIA040	0-1	9/30/1998	Sample	**7.4**	
SS72K	MIA041	0-1	9/30/1998	Sample	**6.4**	
SS79A	SGA314	0-1	12/12/1996	Sample	**37.7**	
SS79B	SGA315	0-1	12/12/1996	Sample	**10.5**	
SS79C	SGB097	0-1	12/12/1996	Sample	**10.6**	
SS79D	MIA277	0-1	10/11/1998	Sample	**9.9**	J
SS79D	MIA278FD	0-1	10/11/1998	FD	**10.5**	J
SS79E	MIA280	0-1	10/11/1998	Sample	**13.4**	J
SS79F	MIA281	0-1	10/11/1998	Sample	**8.2**	J
SS79F	MIA282FD	0-1	10/11/1998	FD	**8.4**	J
SS80A	SGB081	0-1	12/10/1996	Sample	**19**	
SS80B	SGA312	0-1	12/10/1996	Sample	**17.2**	
SS80C	SGA313	0-1	12/10/1996	Sample	**15.9**	
SS80C	SGA474FD1	0-1	12/10/1996	FD	**15.5**	
SS80E	MIA295	0-1	10/13/1998	Sample	**10**	
SS80F	MIA296	0-1	10/13/1998	Sample	**4.4**	
SS80F	MIA297FD	0-1	10/13/1998	FD	**5.4**	
SS80G	MIA299	0-1	10/13/1998	Sample	**7**	

TABLE H-8
FU-4 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SS81B	SGB117	0-1	12/13/1996	Sample	**10.3**	
SS83A	SGA284	0.7-1	12/9/1996	Sample	**8.9**	
SS83D	MIA234	0-1	10/10/1998	Sample	2.6	
SS83F	MIA237	0-1	10/10/1998	Sample	**10.6**	
SS83G	MIA238	0-1	10/10/1998	Sample	**4.1**	
SS83H	MIA239	0-1	10/10/1998	Sample	**6.3**	
SS83I	MIA240	0-1	10/10/1998	Sample	2.6	
SS83J	MIA241	0-1	10/11/1998	Sample	**6.6**	J
SS83K	MIA242	0-1	10/11/1998	Sample	**3.2**	J
SS83L	MIA243	0-1	10/12/1998	Sample	**12.4**	J
SS83N	MIA245	0-1	10/11/1998	Sample	**6.6**	J
B(33.8)	B(33_8)	0-1	1/8/1998	Sample	0.3	U
D(31.1)	D(31_1)	0-1	1/8/1998	Sample	0.3	U
D(33.9)	D125	0-0.5	10/19/1996	Sample	1.6	UJ

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate
mg/kg = Milligrams per kilogram
J = Result is estimated
U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-9
FU-4 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(29.2)	AA0024	4-7	10/23/1996	Sample	**7.4**	J
A(29.2)	AA0025	7-10	10/23/1996	Sample	**4.9**	J
A(31.1)	AA0037	4-7	10/24/1996	Sample	**9.4**	J
A(31.1)	AA0038	7-10	10/24/1996	Sample	**7.3**	J
A(32.1)	AA0031	4-7	10/23/1996	Sample	**6.8**	J
A(32.1)	AA0032	7-10	10/23/1996	Sample	**4.1**	J
A(33.9)	AA0043	4-7	10/24/1996	Sample	**8.1**	J
A(33.9)	AA0044	7-10	10/24/1996	Sample	**8.6**	J
B(29.2)	AA0028	4-7	10/23/1996	Sample	**6.7**	J
B(29.2)	AA0029	7-10	10/23/1996	Sample	**5**	J
B(32.1)	AA0035	7-10	10/24/1996	Sample	**5.8**	J
B(32.1)	AA0034	4-7	10/24/1996	Sample	**7.3**	J
B(33.9)	AA0057	4-7	10/24/1996	Sample	**11.2**	J
B(33.9)	AA0058	7-10	10/24/1996	Sample	**8.3**	J
C(33.9)	AA0040	4-7	10/24/1996	Sample	**10.9**	J
C(33.9)	AA0041	7-10	10/24/1996	Sample	**10.3**	J
D(33.9)	AA0063	4-7	10/24/1996	Sample	**8.4**	J
D(33.9)	AA0064	7-10	10/24/1996	Sample	**11.1**	J
E(33.9)	AA0060	4-7	10/24/1996	Sample	**7.8**	J
E(33.9)	AA0061	7-10	10/24/1996	Sample	**12.7**	J
SB28A	SGA004	3-5	12/16/1996	Sample	**21.6**	
SB28A	SGA005	8-10	12/16/1996	Sample	**24.8**	
SB28B	SGA008	8-10	12/16/1996	Sample	**12.2**	
SB28B	SGB133	3-5	12/16/1996	Sample	**12.4**	
SB28C	SGA368	8-10	12/16/1996	Sample	**13.2**	
SB28C	SGA010	3-5	12/16/1996	Sample	**20.9**	
SB35A	SGA047	3-5	12/21/1996	Sample	**15.5**	
SB35A	SGA048	8-10	12/21/1996	Sample	**23.9**	
SB35A	SGA501FD1	8-10	12/21/1996	FD	**26.1**	
SB35B	SGA051	4-6	12/21/1996	Sample	**15.9**	
SB35B	SGB158	8-10	12/21/1996	Sample	**4.3**	J
SB35C	SGA055	3-5	12/21/1996	Sample	**14**	
SB35C	SGA056	8-10	12/21/1996	Sample	**11.3**	
SB35C	SGA500FD1	8-10	12/21/1996	FD	**11.9**	
SB36A	SGA059	4-6	12/19/1996	Sample	**21.4**	
SB36A	SGA060	8-10	12/19/1996	Sample	**18.4**	
SB36B	SGB161	8-10	12/20/1996	Sample	**12.4**	J
SB36B	SGB162	4-6	12/20/1996	Sample	**9.2**	J
SB36D	SGB164	8-10	12/20/1996	Sample	**8.3**	J
SB36D	SGA071	4-6	12/20/1996	Sample	**20.1**	
SB36E	SGA075	4-6	12/20/1996	Sample	**26.7**	
SB36E	SGA076	8-10	12/20/1996	Sample	**16.6**	
SB36F	SGA080	8-10	12/20/1996	Sample	**13.6**	
SB36F	SGA079	4-6	12/20/1996	Sample	**19.8**	
SB36G	SGA083	4-6	12/20/1996	Sample	**26.7**	
SB36G	SGA084	8-10	12/20/1996	Sample	**17**	
SB36H	SGA087	4-6	12/20/1996	Sample	**29.9**	
SB36H	SGA088	8-10	12/20/1996	Sample	**22.7**	
SB36I	SGA092	8-10	12/21/1996	Sample	**10.4**	
SB36I	SGA091	4-6	12/21/1996	Sample	**17.1**	
SB36J	SGA095	4-6	12/21/1996	Sample	**24**	
SB36J	SGA096	8-10	12/21/1996	Sample	**18.4**	
SB36K	SGA099	4-6	12/21/1996	Sample	**25.1**	
SB36K	SGA100	8-10	12/21/1996	Sample	**21.5**	
SB36L	SGA103	4-6	12/21/1996	Sample	**26.7**	
SB36L	SGA104	8-10	12/21/1996	Sample	**18.5**	
SB36M	SGA107	4-6	12/21/1996	Sample	**26.8**	
SB36M	SGA108	8-10	12/21/1996	Sample	**19.1**	
SB36N	SGA111	4-6	12/21/1996	Sample	**28.2**	
SB36N	SGA112	8-10	12/21/1996	Sample	**17.2**	
SB54A	SGA457	5-7	12/16/1996	Sample	**15**	
SB54A	SGA458	8-10	12/16/1996	Sample	**8.6**	

TABLE H-9
FU-4 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SB54B	SGA460	5-7	12/16/1996	Sample	**11.1**	
SB54B	SGA461	8-10	12/16/1996	Sample	**13.6**	
SB55A	SGB122	8-10	12/21/1996	Sample	**10**	J
SB55A	SGB124	3-5	12/21/1996	Sample	**10.8**	J
SB55A	SGB168FD1	3-5	12/21/1996	FD	**11.6**	J
SB56A	SGA405	5-7	12/16/1996	Sample	**13**	
SB56A	SGA406	8-10	12/16/1996	Sample	**25.9**	
SB57B	RHA076	3-5	1/22/1997	Sample	**8.6**	
SB57B	RHA077	8-10	1/22/1997	Sample	**4.7**	
SB57B	RHA181FD1	3-5	1/22/1997	FD	**8.9**	
SB57C	RHA079	3-5	1/22/1997	Sample	**9.6**	
SB57C	RHA080	8-10	1/22/1997	Sample	**8.9**	
SB70C	RHA160	3-5	1/22/1997	Sample	**13.1**	
SB70C	RHA161	8-10	1/22/1997	Sample	**9**	
SB70D	RHA162	3-5	1/22/1997	Sample	**9.2**	
SB70D	RHA163	8-10	1/22/1997	Sample	**14.1**	
SB70E	RHA164	3-5	1/22/1997	Sample	**8.9**	
SB70E	RHA165	8-10	1/22/1997	Sample	**6.9**	
SB70E	RHA166FD1	3-5	1/22/1997	FD	**10.1**	
SB70G	RHA169	3-5	1/22/1997	Sample	**9.8**	
SB70G	RHA170	8-10	1/22/1997	Sample	**6.6**	
SB74A	SGA463	3-5	12/21/1996	Sample	**23.5**	
SB74A	SGA464	8-10	12/21/1996	Sample	**26.4**	
SB74B	SGB157	8-10	12/21/1996	Sample	**11.5**	J
SB74B	SGB167FD1	8-10	12/21/1996	FD	**11.3**	J
SB74B	SGA467	3-5	12/21/1996	Sample	**25.4**	
SB74C	SGA472	8-10	12/21/1996	Sample	**28.3**	
SB74C	SGA499FD1	8-10	12/21/1996	FD	**22.4**	
SB74C	SGB155	3-5	12/21/1996	Sample	**17.1**	J
SB79A	SGA442	4-6	12/17/1996	Sample	**27.6**	
SB79A	SGA443	8-10	12/17/1996	Sample	**20**	
SB79B	SGB138	4-5.5	12/17/1996	Sample	**7.7**	
SB79B	SGA447	8-10	12/17/1996	Sample	**28.7**	
SB79C	SGA450	4-6	12/17/1996	Sample	**34.2**	
SB79C	SGA451	8-10	12/17/1996	Sample	**16.1**	
SB79D	MIA125	4-6	10/7/1998	Sample	**11.2**	
SB79D	MIA126	8-10	10/7/1998	Sample	**7.8**	
SB80A	SGA434	3-5	12/21/1996	Sample	**17.1**	
SB80A	SGA435	8-10	12/21/1996	Sample	**25.8**	
SB80B	SGA438	3-5	12/21/1996	Sample	**21.4**	
SB80B	SGA439	8-10	12/21/1996	Sample	**18.9**	
SB83A	SGB121	4-6	12/13/1996	Sample	**6**	
SB83A	SGA400	9-11	12/13/1996	Sample	**19.1**	
SB83B	SGA402	4-6.5	12/13/1996	Sample	**20.2**	
SB83B	SGA403	9-11	12/13/1996	Sample	**25.7**	

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate

mg/kg = Milligrams per kilogram

J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-10
FU-4 ARSENIC ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
MW-55	SBMW55	32-34	2/10/1996	Sample	2.3
SB35A	SGA049	18-20	12/21/1996	Sample	**8.4**
SB35B	SGA053	18-20	12/21/1996	Sample	**12.4**
SB35C	SGA057	18-20	12/21/1996	Sample	**8.4**
SB36A	SGA061	18-20	12/19/1996	Sample	**6.9**
SB36B	SGA065	18-20	12/20/1996	Sample	**3.7**
SB36D	SGA073	18-20	12/20/1996	Sample	**9.5**
SB36E	SGA077	18-20	12/20/1996	Sample	**3.2**
SB36F	SGA081	18-20	12/20/1996	Sample	**10.3**
SB36G	SGA085	18-20	12/20/1996	Sample	**10.7**
SB36H	SGA089	18-20	12/20/1996	Sample	**10.8**
SB36I	SGA093	18-20	12/21/1996	Sample	**9**
SB36J	SGA097	18-20	12/21/1996	Sample	**10.1**
SB36K	SGA101	18-20	12/21/1996	Sample	**10.5**
SB36L	SGA105	18-20	12/21/1996	Sample	**10.7**
SB36M	SGA109	18-20	12/21/1996	Sample	**10.5**
SB36N	SGA113	18-20	12/21/1996	Sample	**8.4**
SB74A	SGA465	18-20	12/21/1996	Sample	1.4
SB74B	SGA469	18-20	12/21/1996	Sample	**16.9**
SB74C	SGA473	18-20	12/21/1996	Sample	**10.2**
SB79A	SGA444	18-20	12/17/1996	Sample	**9.9**
SB79B	SGA448	18-20	12/17/1996	Sample	**8.2**
SB79C	SGA452	18-20	12/17/1996	Sample	**15.8**
SB79D	MIA127	16-18	10/7/1998	Sample	**4.5**
SB80A	SGA436	18-20	12/21/1996	Sample	**10.5**
SB80B	SGA440	18-20	12/21/1996	Sample	**10.5**

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-11
FU-5 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(20.6)	AA0007	0.5-1	10/23/1996	Sample	**13.2**	J
A(20.6)	AA0008	1-4	10/23/1996	Sample	**4**	J
SB75A	SGB076	0-1	12/9/1996	Sample	**10.5**	
SB76A	SGA347	0-1	12/10/1996	Sample	**12**	
SB76B	SGA350	0-1	12/10/1996	Sample	**13.4**	
SB76C	SGA353	0-1	12/10/1996	Sample	**13.2**	
SB77A	SGA197	0-1	12/8/1996	Sample	**11.5**	
SB77B	SGA201	0-1	12/9/1996	Sample	**18.7**	
SB77B	SGA412	0-1	12/9/1996	FD	**22.9**	
SB78A	SGA356	1-3	12/10/1996	Sample	**15**	
SB78B	SGA359	1-3	12/11/1996	Sample	**20.4**	
SB78C	SGA362	1-3	12/11/1996	Sample	**22.2**	
SS16A	MIA142	0-1	10/7/1998	Sample	**14.4**	
SS17A	MIA143	0-1	10/7/1998	Sample	**16.1**	
SS18A	MIA144	0-1	10/7/1998	Sample	**6.9**	
SS34A	MIA145	0-1	10/7/1998	Sample	**9.5**	
SS75D	MIA037	0.2-1	9/30/1998	Sample	**29**	
SS77A	SGB049	0-1	12/7/1996	Sample	**8.3**	J
SS77B	SGA194	0-1	12/7/1996	Sample	**14.8**	
SS77C	SGA195	0-1	12/7/1996	Sample	**11.4**	
SS77D	SGB061	0-1	12/7/1996	Sample	**9.4**	J
SS77F	MIA225	0-1	10/10/1998	Sample	**8.4**	
TEC91A	MIA098	0.6-1	10/9/1998	Sample	**5.5**	

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

FD = Field duplicate

mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-12
FU-5 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
A(20.6)	AA0009	4-7	10/23/1996	Sample	**6.2**	J
A(20.6)	AA0010	7-10	10/23/1996	Sample	**10.3**	J
SB75B	SGB082	4-6	12/10/1996	Sample	**4**	
SB76A	SGA348	4-6	12/10/1996	Sample	**10.3**	
SB76B	SGA351	4-6	12/10/1996	Sample	**14.6**	
SB76C	SGA354	4-6	12/10/1996	Sample	**13**	
SB77A	SGA199	9.5-10	12/8/1996	Sample	**12.3**	
SB77A	SGA198	4-5	12/8/1996	Sample	**17.9**	
SB77B	SGA202	4-5	12/9/1996	Sample	**12.6**	
SB77B	SGA203	9-10	12/9/1996	Sample	**9**	
SB78A	SGA357	4-6	12/10/1996	Sample	**18.2**	
SB78B	SGB087	4-6	12/11/1996	Sample	**11**	
SB78C	SGA363	4-6	12/11/1996	Sample	**17.2**	
TEC91A	MIA099	3-5	10/9/1998	Sample	**5.7**	

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-13
FU-5 ARSENIC ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
SB76A	SGA349	18-20	12/10/1996	Sample	**7**
SB76B	SGA352	18-20	12/10/1996	Sample	**7.7**
SB76C	SGB083	18-20	12/10/1996	Sample	2.8
SB78A	SGA358	18-21	12/10/1996	Sample	**14.2**
SB78B	SGB086	18-20	12/11/1996	Sample	**5.1**
SB78C	SGA364	18-21	12/11/1996	Sample	**10.9**

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-14
FU-6 ARSENIC ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier
SB58A	MIA174	0-1	10/9/1998	Sample	**15.6**	
SB58B	MIA179	0-1	10/9/1998	Sample	**8.8**	
SB67A	SGA484	0-1	12/17/1996	Sample	**16.9**	
SB67A	SGA485FD1	0-1	12/17/1996	FD	**17.2**	
SB67B	SGB065	0-1	12/18/1996	Sample	**9.1**	
SB68C	MIA183	0-1	10/9/1998	Sample	**7.7**	
SS1A	MIA134	0-1	10/7/1998	Sample	**16.1**	
SS25	LAWSS25	1-2	3/19/1989	Sample	**25**	
SS30	LAWSS30	1-2	3/19/1989	Sample	**19**	
SS31	LAWSS31	1-2	3/19/1989	Sample	**12**	
SS58C	RHA049	0-1	1/19/1997	Sample	**8.4**	
SS66A	SGB063	0-1	12/22/1996	Sample	**3.6**	J
SS67A	SGA128	0-1	12/6/1996	Sample	**25.1**	
SS67A	SGA261FD1	0-1	12/6/1996	FD	**29.2**	
SS67B	SGB043	0-1	12/6/1996	Sample	**12.5**	J

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold and Residential Soil RSL of 0.68 mg/kg (applied to evaluate the unrestricted area in FU-6 in location SS1A) are shown in underline.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-15
FU-6 ARSENIC ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
SB58A	MIA177	3-5	10/9/1998	Sample	**5.9**
SB58A	MIA178	8-10	10/9/1998	Sample	**3.8**
SB58B	MIA180	3-5	10/9/1998	Sample	**9**
SB58B	MIA181	8-10	10/9/1998	Sample	**4.7**
SB66A	SGB134	3-5	12/17/1996	Sample	1.2
SB67A	SGA131	4-6	12/17/1996	Sample	**12.4**
SB67A	SGB136	8-10	12/17/1996	Sample	**4.2**
SB67B	SGA136	3-5	12/18/1996	Sample	**13.1**
SB67B	SGA137	8-10	12/18/1996	Sample	**17.3**
SB68C	MIA184	8-10	10/9/1998	Sample	**5.6**

Notes:

1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.

mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-16
FU-6 ARSENIC ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)
SB67A	SGA133	18-20	12/17/1996	Sample	**11.3**
SB67A	SGA134	38-40	12/17/1996	Sample	**6.5**
SB67B	SGA139	38-40	12/18/1996	Sample	**4.1**
SB67B	SGB142	18-20	12/18/1996	Sample	**7.4**

Notes:
1) Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 3 mg/kg for arsenic are shown in bold.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE H-17
SUMMARY OF EXCAVATED SAMPLE LOCATIONS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Sample Date	Sample Type	Result (mg/kg)	Qualifier	Detection Limit (mg/kg)
FU-3 Parcels 35 and 28							
A(35.2)	A129	0-0.5	10/18/1996	Sample	8.3	J	0.58
A(35.2)	DUP11	0-0.5	10/18/1996	FD	7.2	J	0.58
B(35.2)	B129	0-0.5	10/18/1996	Sample	3.3	J	1.14
C(35.2)	AA0011	0-4	10/23/1996	Sample	3.8	J	1.14
C(35.2)	C129	0-0.5	10/18/1996	Sample	35.8	J	1.14
SB31A	SGA015	0-1	12/18/1996	Sample	20.6		2.4
SB31A	SGA487FD1	0-1	12/18/1996	FD	8.5		2.4
SB32A	RHA012	0-1	1/18/1997	Sample	42.5		2.2
SB33C	SGA041	0-1	12/19/1996	Sample	8.7		2.4
SS18	LAWSS18	0.2-1.2	2/22/1989	Sample	15		N/A
SS31A	SGA011	0-1	12/7/1996	Sample	10.7		2.2
SS31D	SGB058	0.5-1	12/7/1996	Sample	6.2	J	0.19
SS32B	RHA015	0-1	1/18/1997	Sample	14.9		2.4
SS32D	RHA017	0-1	1/18/1997	Sample	14.6		2.3
SS32E	RHA018	0-1	1/18/1997	Sample	7.7		1.8
SS32F	RHA019	0-1	1/18/1997	Sample	8.2		2.1
SS32G	RHA020	0-1	1/18/1997	Sample	17.1		2.2
SS32G	RHA021FD1	0-1	1/18/1997	FD	15.6		2.4
SS33D	SGA028	0-1	12/8/1996	Sample	19.6		2.3
SS33E	SGB068	0-1	12/8/1996	Sample	13.8	J	0.19
SS33H	MIA334	0-1	10/8/1998	Sample	7.2		0.16
SS33K	MIA325	0-1	10/8/1998	Sample	22		0.63
SS33M	MIA327	0-1	10/8/1998	Sample	5.5		0.15
SS33M	MIA328FD	0-1	10/8/1998	FD	7.2		0.15
SS89F	SGA253	0-1	12/6/1996	Sample	10.5		2.2
SS89H	SGA257	0-1	12/6/1996	Sample	23.9		2.3
SS89J	SGA259	0-1	12/6/1996	Sample	10.2		2.3
SS89J	SGA260FD1	0-1	12/6/1996	FD	10.4		2.4
SS89N	MIA157	0-1	10/8/1998	Sample	6.8		0.16
SS89O	MIA158	0-1	10/8/1998	Sample	7.1		0.16
FU-4 Building 949							
SB83B	SGA401	0-1	12/13/1996	Sample	8.7		3.3
SS20	LAWSS20	0-1	2/22/1989	Sample	15		N/A
SS83B	SGB075	0-1	12/9/1996	Sample	2.6	J	0.37
SS83C	SGA286	0-1	12/9/1996	Sample	7.7		2.2
SS83E	MIA236	0-1	10/10/1998	Sample	5.9		0.15
SS83M	MIA244	0-1	10/11/1998	Sample	8	J	0.15
FU-6 Cafeteria							
SS48A	RHA041	0-1	1/23/1997	Sample	13.2		0.2

Note:

The sampling locations marked as excavated (approximately to 1 foot) have been identified based on review of the 2000 Main Installation (MI) Remedial Investigation (RI) report and historic removal actions.

FD = Field duplicate
FU = Functional unit
J = Result is estimated
mg/kg = Milligrams per kilogram
N/A = Not available

TABLE H-18
PROUCL OUTPUT FOR THE CALCULATION OF 95% UCLS FOR ARSENIC SOIL DATA
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

UCL Statistics for Data Sets with Non-Detects

User Selected Options	
Date/Time of Computation	ProUCL 5.15/25/2021 1:50:25 PM
From File	WorkSheet.xls
Full Precision	OFF
Confidence Coefficient	95%
Number of Bootstrap Operations	2000

result (FU-1)

General Statistics

Total Number of Observations	27	Number of Distinct Observations	26
		Number of Missing Observations	0
Minimum	2.5	Mean	20.14
Maximum	54.9	Median	14.1
SD	14.31	Std. Error of Mean	2.755
Coefficient of Variation	0.711	Skewness	0.765

Normal GOF Test

Shapiro Wilk Test Statistic	0.912	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.182	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.167	Data Not Normal at 5% Significance Level	

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	24.84	95% Adjusted-CLT UCL (Chen-1995)	25.11
		95% Modified-t UCL (Johnson-1978)	24.91

Gamma GOF Test

A-D Test Statistic	0.372	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.758	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.126	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.171	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	1.916	k star (bias corrected MLE)	1.728
Theta hat (MLE)	10.51	Theta star (bias corrected MLE)	11.66
nu hat (MLE)	103.5	nu star (bias corrected)	93.29
MLE Mean (bias corrected)	20.14	MLE Sd (bias corrected)	15.33
		Approximate Chi Square Value (0.05)	72.02
Adjusted Level of Significance	0.0401	Adjusted Chi Square Value	70.82

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	26.1	95% Adjusted Gamma UCL (use when n<50)	26.54

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.963	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.923	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.145	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.167	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.916	Mean of logged Data	2.72
Maximum of Logged Data	4.006	SD of logged Data	0.816

Assuming Lognormal Distribution

95% H-UCL	30.56	90% Chebyshev (MVUE) UCL	31.66
95% Chebyshev (MVUE) UCL	36.56	97.5% Chebyshev (MVUE) UCL	43.36
99% Chebyshev (MVUE) UCL	56.72		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	24.68	95% Jackknife UCL	24.84
95% Standard Bootstrap UCL	24.57	95% Bootstrap-t UCL	25.19
95% Hall's Bootstrap UCL	25.1	95% Percentile Bootstrap UCL	24.66

95% BCA Bootstrap UCL	24.94		
90% Chebyshev(Mean, Sd) UCL	28.41	95% Chebyshev(Mean, Sd) UCL	32.15
97.5% Chebyshev(Mean, Sd) UCL	37.35	99% Chebyshev(Mean, Sd) UCL	47.55

Suggested UCL to Use

95% Adjusted Gamma UCL 26.54

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-2)

General Statistics

Total Number of Observations	36	Number of Distinct Observations	35
		Number of Missing Observations	0
Minimum	1.7	Mean	20.1
Maximum	50.5	Median	16.55
SD	11.44	Std. Error of Mean	1.906
Coefficient of Variation	0.569	Skewness	1.179

Normal GOF Test

Shapiro Wilk Test Statistic	0.873	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.184	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.145	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	23.32	95% Adjusted-CLT UCL (Chen-1995)	23.64
		95% Modified-t UCL (Johnson-1978)	23.39

Gamma GOF Test

A-D Test Statistic	0.762	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.754	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.113	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.148	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.272	k star (bias corrected MLE)	3.017
Theta hat (MLE)	6.145	Theta star (bias corrected MLE)	6.662
nu hat (MLE)	235.6	nu star (bias corrected)	217.3
MLE Mean (bias corrected)	20.1	MLE Sd (bias corrected)	11.57
		Approximate Chi Square Value (0.05)	184.1
Adjusted Level of Significance	0.0428	Adjusted Chi Square Value	182.8

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	23.72	95% Adjusted Gamma UCL (use when n<50)	23.9

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.903	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.935	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.125	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.145	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	0.531	Mean of logged Data	2.84
Maximum of Logged Data	3.922	SD of logged Data	0.618

Assuming Lognormal Distribution

95% H-UCL	25.55	90% Chebyshev (MVUE) UCL	27.4
95% Chebyshev (MVUE) UCL	30.48	97.5% Chebyshev (MVUE) UCL	34.76
99% Chebyshev (MVUE) UCL	43.17		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	23.24	95% Jackknife UCL	23.32
95% Standard Bootstrap UCL	23.2	95% Bootstrap-t UCL	23.66
95% Hall's Bootstrap UCL	23.69	95% Percentile Bootstrap UCL	23.22
95% BCA Bootstrap UCL	23.74		
90% Chebyshev(Mean, Sd) UCL	25.82	95% Chebyshev(Mean, Sd) UCL	28.41
97.5% Chebyshev(Mean, Sd) UCL	32.01	99% Chebyshev(Mean, Sd) UCL	39.07

Suggested UCL to Use

95% Adjusted Gamma UCL 23.9

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-3)

General Statistics

Total Number of Observations	109	Number of Distinct Observations	83
Number of Detects	106	Number of Non-Detects	3
Number of Distinct Detects	82	Number of Distinct Non-Detects	3
Minimum Detect	0.43	Minimum Non-Detect	0.3
Maximum Detect	49.2	Maximum Non-Detect	3.8
Variance Detects	59.85	Percent Non-Detects	2.752%
Mean Detects	10.31	SD Detects	7.736
Median Detects	9	CV Detects	0.751
Skewness Detects	2.496	Kurtosis Detects	8.453
Mean of Logged Detects	2.106	SD of Logged Detects	0.705

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.779	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.212	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0863	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	10.05	KM Standard Error of Mean	0.746
KM SD	7.749	95% KM (BCA) UCL	11.36
95% KM (t) UCL	11.28	95% KM (Percentile Bootstrap) UCL	11.34
95% KM (z) UCL	11.27	95% KM Bootstrap t UCL	11.55
90% KM Chebyshev UCL	12.28	95% KM Chebyshev UCL	13.3
97.5% KM Chebyshev UCL	14.7	99% KM Chebyshev UCL	17.47

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	1.381	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.763	Detected Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.122	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0889	Detected Data Not Gamma Distributed at 5% Significance Level

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.354	k star (bias corrected MLE)	2.294
Theta hat (MLE)	4.378	Theta star (bias corrected MLE)	4.493
nu hat (MLE)	499.1	nu star (bias corrected)	486.3
Mean (detects)	10.31		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	10.03
Maximum	49.2	Median	8.9
SD	7.802	CV	0.778
k hat (MLE)	1.608	k star (bias corrected MLE)	1.57
Theta hat (MLE)	6.24	Theta star (bias corrected MLE)	6.392
nu hat (MLE)	350.5	nu star (bias corrected)	342.2
Adjusted Level of Significance (β)	0.0478		

Approximate Chi Square Value (342.17, α)	300.3	Adjusted Chi Square Value (342.17, β)	299.8
95% Gamma Approximate UCL (use when n>=50)	11.43	95% Gamma Adjusted UCL (use when n<50)	11.45

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	10.05	SD (KM)	7.749
Variance (KM)	60.04	SE of Mean (KM)	0.746
k hat (KM)	1.681	k star (KM)	1.641
nu hat (KM)	366.5	nu star (KM)	357.8
theta hat (KM)	5.976	theta star (KM)	6.122
80% gamma percentile (KM)	15.39	90% gamma percentile (KM)	20.48
95% gamma percentile (KM)	25.4	99% gamma percentile (KM)	36.45

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (357.78, α)	315	Adjusted Chi Square Value (357.78, β)	314.4
95% Gamma Approximate KM-UCL (use when n>=50)	11.41	95% Gamma Adjusted KM-UCL (use when n<50)	11.43

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.966	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0647	Detected Data appear Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.115	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.0863	Detected Data Not Lognormal at 5% Significance Level

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	10.07	Mean in Log Scale	2.063
SD in Original Scale	7.755	SD in Log Scale	0.742
95% t UCL (assumes normality of ROS data)	11.3	95% Percentile Bootstrap UCL	11.31
95% BCA Bootstrap UCL	11.5	95% Bootstrap t UCL	11.51
95% H-UCL (Log ROS)	11.95		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.031	KM Geo Mean	7.626
KM SD (logged)	0.834	95% Critical H Value (KM-Log)	2.068
KM Standard Error of Mean (logged)	0.0807	95% H-UCL (KM -Log)	12.75
KM SD (logged)	0.834	95% Critical H Value (KM-Log)	2.068
KM Standard Error of Mean (logged)	0.0807		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	10.05	Mean in Log Scale	2.035
SD in Original Scale	7.782	SD in Log Scale	0.833
95% t UCL (Assumes normality)	11.29	95% H-Stat UCL	12.78

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL 12.75

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-4)

General Statistics

Total Number of Observations	148	Number of Distinct Observations	110
Number of Detects	145	Number of Non-Detects	3
Number of Distinct Detects	108	Number of Distinct Non-Detects	2
Minimum Detect	1.1	Minimum Non-Detect	0.3
Maximum Detect	66.3	Maximum Non-Detect	1.6
Variance Detects	81.56	Percent Non-Detects	2.027%
Mean Detects	14.3	SD Detects	9.031
Median Detects	12.4	CV Detects	0.632
Skewness Detects	1.644	Kurtosis Detects	6.413
Mean of Logged Detects	2.454	SD of Logged Detects	0.687

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.903	**Normal GOF Test on Detected Observations Only**
5% Shapiro Wilk P Value	8.504E-14	Detected Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.114	**Lilliefors GOF Test**

5% Lilliefors Critical Value	0.074	Detected Data Not Normal at 5% Significance Level

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	14.02	KM Standard Error of Mean	0.752
KM SD	9.121	95% KM (BCA) UCL	15.23
95% KM (t) UCL	15.26	95% KM (Percentile Bootstrap) UCL	15.29
95% KM (z) UCL	15.26	95% KM Bootstrap t UCL	15.42
90% KM Chebyshev UCL	16.28	95% KM Chebyshev UCL	17.3
97.5% KM Chebyshev UCL	18.72	99% KM Chebyshev UCL	21.5

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.409	**Anderson-Darling GOF Test**
5% A-D Critical Value	0.762	Detected data appear Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.0603	**Kolmogorov-Smirnov GOF**
5% K-S Critical Value	0.0786	Detected data appear Gamma Distributed at 5% Significance Level

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.577	k star (bias corrected MLE)	2.528
Theta hat (MLE)	5.549	Theta star (bias corrected MLE)	5.656
nu hat (MLE)	747.4	nu star (bias corrected)	733.2
Mean (detects)	14.3		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.661	Mean	14.03
Maximum	66.3	Median	12
SD	9.134	CV	0.651
k hat (MLE)	2.257	k star (bias corrected MLE)	2.215
Theta hat (MLE)	6.218	Theta star (bias corrected MLE)	6.333
nu hat (MLE)	667.9	nu star (bias corrected)	655.7
Adjusted Level of Significance (β)	0.0484		
Approximate Chi Square Value (655.73, α)	597.3	Adjusted Chi Square Value (655.73, β)	596.8
95% Gamma Approximate UCL (use when n>=50)	15.4	95% Gamma Adjusted UCL (use when n<50)	15.42

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	14.02	SD (KM)	9.121
Variance (KM)	83.2	SE of Mean (KM)	0.752
k hat (KM)	2.362	k star (KM)	2.319
nu hat (KM)	699.1	nu star (KM)	686.3
theta hat (KM)	5.935	theta star (KM)	6.046
80% gamma percentile (KM)	20.62	90% gamma percentile (KM)	26.34
95% gamma percentile (KM)	31.75	99% gamma percentile (KM)	43.65

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (686.28, α)	626.5	Adjusted Chi Square Value (686.28, β)	625.9
95% Gamma Approximate KM-UCL (use when n>=50)	15.36	95% Gamma Adjusted KM-UCL (use when n<50)	15.37

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.969	**Shapiro Wilk GOF Test**
5% Shapiro Wilk P Value	0.0495	Detected Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.0895	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.074	Detected Data Not Lognormal at 5% Significance Level

Detected Data Not Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	14.05	Mean in Log Scale	2.419
SD in Original Scale	9.103	SD in Log Scale	0.722
95% t UCL (assumes normality of ROS data)	15.29	95% Percentile Bootstrap UCL	15.33
95% BCA Bootstrap UCL	15.39	95% Bootstrap t UCL	15.29
95% H-UCL (Log ROS)	16.4		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.383	KM Geo Mean	10.83
KM SD (logged)	0.841	95% Critical H Value (KM-Log)	2.066
KM Standard Error of Mean (logged)	0.0696	95% H-UCL (KM -Log)	17.81
KM SD (logged)	0.841	95% Critical H Value (KM-Log)	2.066
KM Standard Error of Mean (logged)	0.0696		

DL/2 Statistics

DL/2 Normal		DL/2 Log-Transformed	
Mean in Original Scale	14.02	Mean in Log Scale	2.377
SD in Original Scale	9.153	SD in Log Scale	0.873
95% t UCL (Assumes normality)	15.26	95% H-Stat UCL	18.34

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Gamma Distributed at 5% Significance Level

Suggested UCL to Use

95% KM Approximate Gamma UCL	15.36	95% GROS Approximate Gamma UCL	15.4

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-5)

General Statistics

Total Number of Observations	23	Number of Distinct Observations	22
		Number of Missing Observations	0
Minimum	4	Mean	13.51
Maximum	29	Median	13.2
SD	6.007	Std. Error of Mean	1.253
Coefficient of Variation	0.445	Skewness	0.821

Normal GOF Test

Shapiro Wilk Test Statistic	0.954	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.141	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		95% UCLs (Adjusted for Skewness)	
95% Student's-t UCL	15.66	95% Adjusted-CLT UCL (Chen-1995)	15.8
		95% Modified-t UCL (Johnson-1978)	15.7

Gamma GOF Test

A-D Test Statistic	0.135	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.746	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0878	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.182	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	5.253	k star (bias corrected MLE)	4.597
Theta hat (MLE)	2.572	Theta star (bias corrected MLE)	2.939
nu hat (MLE)	241.6	nu star (bias corrected)	211.5
MLE Mean (bias corrected)	13.51	MLE Sd (bias corrected)	6.301
		Approximate Chi Square Value (0.05)	178.8
Adjusted Level of Significance	0.0389	Adjusted Chi Square Value	176.6

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	15.98	95% Adjusted Gamma UCL (use when n<50)	16.17

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.982	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.914	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0914	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.18	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.386	Mean of logged Data	2.505
Maximum of Logged Data	3.367	SD of logged Data	0.468

Assuming Lognormal Distribution

95% H-UCL	16.58	90% Chebyshev (MVUE) UCL	17.7

95% Chebyshev (MVUE) UCL	19.56	97.5% Chebyshev (MVUE) UCL	22.15
99% Chebyshev (MVUE) UCL	27.23		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	15.57	95% Jackknife UCL	15.66
95% Standard Bootstrap UCL	15.49	95% Bootstrap-t UCL	16.05
95% Hall's Bootstrap UCL	16.22	95% Percentile Bootstrap UCL	15.57
95% BCA Bootstrap UCL	15.89		
90% Chebyshev(Mean, Sd) UCL	17.27	95% Chebyshev(Mean, Sd) UCL	18.97
97.5% Chebyshev(Mean, Sd) UCL	21.33	99% Chebyshev(Mean, Sd) UCL	25.97

Suggested UCL to Use

95% Student's-t UCL 15.66

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-6)

General Statistics

Total Number of Observations	14	Number of Distinct Observations	14
		Number of Missing Observations	0
Minimum	3.6	Mean	15.01
Maximum	29.2	Median	14.05
SD	7.564	Std. Error of Mean	2.022
Coefficient of Variation	0.504	Skewness	0.48

Normal GOF Test

Shapiro Wilk Test Statistic	0.949	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data appear Normal at 5% Significance Level	
Lilliefors Test Statistic	0.14	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.226	Data appear Normal at 5% Significance Level	

Data appear Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	18.59	95% Adjusted-CLT UCL (Chen-1995)	18.61
		95% Modified-t UCL (Johnson-1978)	18.63

Gamma GOF Test

A-D Test Statistic	0.23	**Anderson-Darling Gamma GOF Test**	
5% A-D Critical Value	0.74	Detected data appear Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.124	**Kolmogorov-Smirnov Gamma GOF Test**	
5% K-S Critical Value	0.23	Detected data appear Gamma Distributed at 5% Significance Level	

Detected data appear Gamma Distributed at 5% Significance Level

Gamma Statistics

k hat (MLE)	3.852	k star (bias corrected MLE)	3.074
Theta hat (MLE)	3.896	Theta star (bias corrected MLE)	4.882
nu hat (MLE)	107.8	nu star (bias corrected)	86.07
MLE Mean (bias corrected)	15.01	MLE Sd (bias corrected)	8.559
		Approximate Chi Square Value (0.05)	65.69
Adjusted Level of Significance	0.0312	Adjusted Chi Square Value	63.33

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50))	19.66	95% Adjusted Gamma UCL (use when n<50)	20.4

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.95	**Shapiro Wilk Lognormal GOF Test**	
5% Shapiro Wilk Critical Value	0.874	Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.12	**Lilliefors Lognormal GOF Test**	
5% Lilliefors Critical Value	0.226	Data appear Lognormal at 5% Significance Level	

Data appear Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.281	Mean of logged Data	2.573
Maximum of Logged Data	3.374	SD of logged Data	0.571

Assuming Lognormal Distribution

95% H-UCL	21.62	90% Chebyshev (MVUE) UCL	22.45
95% Chebyshev (MVUE) UCL	25.72	97.5% Chebyshev (MVUE) UCL	30.26
99% Chebyshev (MVUE) UCL	39.18		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	18.33	95% Jackknife UCL	18.59
95% Standard Bootstrap UCL	18.17	95% Bootstrap-t UCL	18.82
95% Hall's Bootstrap UCL	18.7	95% Percentile Bootstrap UCL	18.26
95% BCA Bootstrap UCL	18.39		
90% Chebyshev(Mean, Sd) UCL	21.07	95% Chebyshev(Mean, Sd) UCL	23.82
97.5% Chebyshev(Mean, Sd) UCL	27.63	99% Chebyshev(Mean, Sd) UCL	35.12

Suggested UCL to Use

95% Student's-t UCL 18.59

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (MI-wide)

General Statistics

Total Number of Observations	357	Number of Distinct Observations	203
Number of Detects	351	Number of Non-Detects	6
Number of Distinct Detects	201	Number of Distinct Non-Detects	4
Minimum Detect	0.43	Minimum Non-Detect	0.3
Maximum Detect	66.3	Maximum Non-Detect	3.8
Variance Detects	95.16	Percent Non-Detects	1.681%
Mean Detects	14.11	SD Detects	9.755
Median Detects	11.4	CV Detects	0.691
Skewness Detects	1.643	Kurtosis Detects	3.872
Mean of Logged Detects	2.417	SD of Logged Detects	0.717

Normal GOF Test on Detects Only

Shapiro Wilk Test Statistic	0.871	**Normal GOF Test on Detected Observations Only**	
5% Shapiro Wilk P Value	0	Detected Data Not Normal at 5% Significance Level	
Lilliefors Test Statistic	0.136	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0477	Detected Data Not Normal at 5% Significance Level	

Detected Data Not Normal at 5% Significance Level

Kaplan-Meier (KM) Statistics using Normal Critical Values and other Nonparametric UCLs

KM Mean	13.89	KM Standard Error of Mean	0.52
KM SD	9.812	95% KM (BCA) UCL	14.77
95% KM (t) UCL	14.75	95% KM (Percentile Bootstrap) UCL	14.74
95% KM (z) UCL	14.74	95% KM Bootstrap t UCL	14.8
90% KM Chebyshev UCL	15.45	95% KM Chebyshev UCL	16.16
97.5% KM Chebyshev UCL	17.14	99% KM Chebyshev UCL	19.06

Gamma GOF Tests on Detected Observations Only

A-D Test Statistic	0.821	**Anderson-Darling GOF Test**	
5% A-D Critical Value	0.764	Detected Data Not Gamma Distributed at 5% Significance Level	
K-S Test Statistic	0.0551	**Kolmogorov-Smirnov GOF**	
5% K-S Critical Value	0.0491	Detected Data Not Gamma Distributed at 5% Significance Level	

Detected Data Not Gamma Distributed at 5% Significance Level

Gamma Statistics on Detected Data Only

k hat (MLE)	2.324	k star (bias corrected MLE)	2.306
Theta hat (MLE)	6.074	Theta star (bias corrected MLE)	6.122
nu hat (MLE)	1631	nu star (bias corrected)	1619
Mean (detects)	14.11		

Gamma ROS Statistics using Imputed Non-Detects

GROS may not be used when data set has > 50% NDs with many tied observations at multiple DLs
GROS may not be used when kstar of detects is small such as <1.0, especially when the sample size is small (e.g., <15-20)
For such situations, GROS method may yield incorrect values of UCLs and BTVs
This is especially true when the sample size is small.
For gamma distributed detected data, BTVs and UCLs may be computed using gamma distribution on KM estimates

Minimum	0.01	Mean	13.88
Maximum	66.3	Median	11.1
SD	9.833	CV	0.708
k hat (MLE)	1.858	k star (bias corrected MLE)	1.844
Theta hat (MLE)	7.474	Theta star (bias corrected MLE)	7.53
nu hat (MLE)	1326	nu star (bias corrected)	1317
Adjusted Level of Significance (β)	0.0493		
Approximate Chi Square Value (N/A, α)	1233	Adjusted Chi Square Value (N/A, β)	1233
95% Gamma Approximate UCL (use when n>=50)	14.82	95% Gamma Adjusted UCL (use when n<50)	14.83

Estimates of Gamma Parameters using KM Estimates

Mean (KM)	13.89	SD (KM)	9.812
Variance (KM)	96.28	SE of Mean (KM)	0.52
k hat (KM)	2.004	k star (KM)	1.989
nu hat (KM)	1431	nu star (KM)	1420
theta hat (KM)	6.932	theta star (KM)	6.985
80% gamma percentile (KM)	20.81	90% gamma percentile (KM)	27.05
95% gamma percentile (KM)	33	99% gamma percentile (KM)	46.22

Gamma Kaplan-Meier (KM) Statistics

Approximate Chi Square Value (N/A, α)	1333	Adjusted Chi Square Value (N/A, β)	1333
95% Gamma Approximate KM-UCL (use when n>=50)	14.79	95% Gamma Adjusted KM-UCL (use when n<50)	14.79

Lognormal GOF Test on Detected Observations Only

Shapiro Wilk Approximate Test Statistic	0.979	**Shapiro Wilk GOF Test**	
5% Shapiro Wilk P Value	0.113	Detected Data appear Lognormal at 5% Significance Level	
Lilliefors Test Statistic	0.0701	**Lilliefors GOF Test**	
5% Lilliefors Critical Value	0.0477	Detected Data Not Lognormal at 5% Significance Level	

Detected Data appear Approximate Lognormal at 5% Significance Level

Lognormal ROS Statistics Using Imputed Non-Detects

Mean in Original Scale	13.91	Mean in Log Scale	2.387
SD in Original Scale	9.798	SD in Log Scale	0.747
95% t UCL (assumes normality of ROS data)	14.77	95% Percentile Bootstrap UCL	14.82
95% BCA Bootstrap UCL	14.86	95% Bootstrap t UCL	14.79
95% H-UCL (Log ROS)	15.53		

Statistics using KM estimates on Logged Data and Assuming Lognormal Distribution

KM Mean (logged)	2.363	KM Geo Mean	10.62
KM SD (logged)	0.828	95% Critical H Value (KM-Log)	1.994
KM Standard Error of Mean (logged)	0.044	95% H-UCL (KM -Log)	16.32
KM SD (logged)	0.828	95% Critical H Value (KM-Log)	1.994
KM Standard Error of Mean (logged)	0.044		

DL/2 Statistics

DL/2 Normal		**DL/2 Log-Transformed**	
Mean in Original Scale	13.89	Mean in Log Scale	2.361
SD in Original Scale	9.826	SD in Log Scale	0.84
95% t UCL (Assumes normality)	14.75	95% H-Stat UCL	16.5

DL/2 is not a recommended method, provided for comparisons and historical reasons

Nonparametric Distribution Free UCL Statistics

Detected Data appear Approximate Lognormal Distributed at 5% Significance Level

Suggested UCL to Use

KM H-UCL 16.32

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

result (FU-6_UU-UE_12in)

General Statistics

Total Number of Observations	15	Number of Distinct Observations	15
		Number of Missing Observations	0
Minimum	6.73	Mean	11.77
Maximum	27.7	Median	10.3
SD	4.845	Std. Error of Mean	1.251
Coefficient of Variation	0.412	Skewness	2.795

Normal GOF Test

TABLE H-18
PROUCL OUTPUT FOR THE CALCULATION OF 95% UCLS FOR ARSENIC SOIL DATA
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Shapiro Wilk Test Statistic	0.677	**Shapiro Wilk GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Normal at 5% Significance Level
Lilliefors Test Statistic	0.232	**Lilliefors GOF Test**
5% Lilliefors Critical Value	0.22	Data Not Normal at 5% Significance Level

Data Not Normal at 5% Significance Level

Assuming Normal Distribution

95% Normal UCL		**95% UCLs (Adjusted for Skewness)**	
95% Student's-t UCL	13.97	95% Adjusted-CLT UCL (Chen-1995)	14.79
		95% Modified-t UCL (Johnson-1978)	14.12

Gamma GOF Test

A-D Test Statistic	1.062	**Anderson-Darling Gamma GOF Test**
5% A-D Critical Value	0.738	Data Not Gamma Distributed at 5% Significance Level
K-S Test Statistic	0.198	**Kolmogorov-Smirnov Gamma GOF Test**
5% K-S Critical Value	0.222	Detected data appear Gamma Distributed at 5% Significance Level

Detected data follow Appr. Gamma Distribution at 5% Significance Level

Gamma Statistics

k hat (MLE)	9.273	k star (bias corrected MLE)	7.463
Theta hat (MLE)	1.269	Theta star (bias corrected MLE)	1.577
nu hat (MLE)	278.2	nu star (bias corrected)	223.9
MLE Mean (bias corrected)	11.77	MLE Sd (bias corrected)	4.307
		Approximate Chi Square Value (0.05)	190.3
Adjusted Level of Significance	0.0324	Adjusted Chi Square Value	186.4

Assuming Gamma Distribution

95% Approximate Gamma UCL (use when n>=50)	13.85	95% Adjusted Gamma UCL (use when n<50)	14.13

Lognormal GOF Test

Shapiro Wilk Test Statistic	0.85	**Shapiro Wilk Lognormal GOF Test**
5% Shapiro Wilk Critical Value	0.881	Data Not Lognormal at 5% Significance Level
Lilliefors Test Statistic	0.199	**Lilliefors Lognormal GOF Test**
5% Lilliefors Critical Value	0.22	Data appear Lognormal at 5% Significance Level

Data appear Approximate Lognormal at 5% Significance Level

Lognormal Statistics

Minimum of Logged Data	1.907	Mean of logged Data	2.41
Maximum of Logged Data	3.321	SD of logged Data	0.317

Assuming Lognormal Distribution

95% H-UCL	13.75	90% Chebyshev (MVUE) UCL	14.58
95% Chebyshev (MVUE) UCL	15.89	97.5% Chebyshev (MVUE) UCL	17.72
99% Chebyshev (MVUE) UCL	21.3		

Nonparametric Distribution Free UCL Statistics

Data appear to follow a Discernible Distribution at 5% Significance Level

Nonparametric Distribution Free UCLs

95% CLT UCL	13.82	95% Jackknife UCL	13.97
95% Standard Bootstrap UCL	13.76	95% Bootstrap-t UCL	16.15
95% Hall's Bootstrap UCL	22.69	95% Percentile Bootstrap UCL	13.87
95% BCA Bootstrap UCL	15.16		
90% Chebyshev(Mean, Sd) UCL	15.52	95% Chebyshev(Mean, Sd) UCL	17.22
97.5% Chebyshev(Mean, Sd) UCL	19.58	99% Chebyshev(Mean, Sd) UCL	24.21

Suggested UCL to Use

95% Adjusted Gamma UCL	14.13

When a data set follows an approximate (e.g., normal) distribution passing one of the GOF test
When applicable, it is suggested to use a UCL based upon a distribution (e.g., gamma) passing both GOF tests in ProUCL

Note: Suggestions regarding the selection of a 95% UCL are provided to help the user to select the most appropriate 95% UCL.
Recommendations are based upon data size, data distribution, and skewness.
These recommendations are based upon the results of the simulation studies summarized in Singh, Maichle, and Lee (2006).
However, simulations results will not cover all Real World data sets; for additional insight the user may want to consult a statistician.

Appendix I

Arsenic Soil Analytical Results Figures



Notes
1. Sample dates: 1989– 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Arsenic (mg/Kg)
- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

Location
(Depth Interval, feet) Arsenic (mg/kg)

- Area Available for Unrestricted Use
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure I-1

FU-1 Arsenic Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

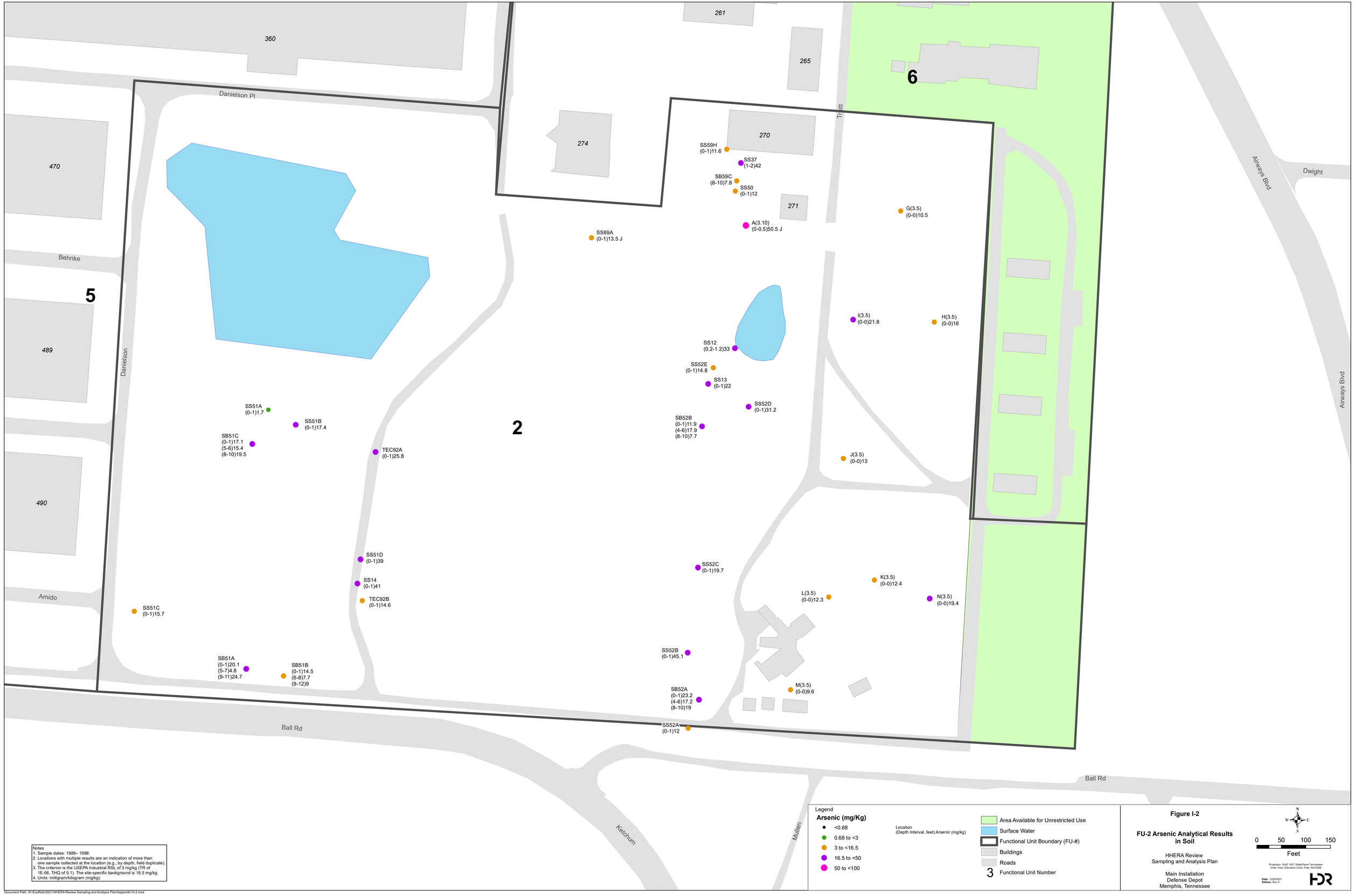
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Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes
1. Sample dates: 1989– 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)

Legend

Arsenic (mg/Kg)

- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

Location
(Depth Interval, feet) Arsenic (mg/kg)

- Area Available for Unrestricted Use
- Surface Water
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure I-2

FU-2 Arsenic Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

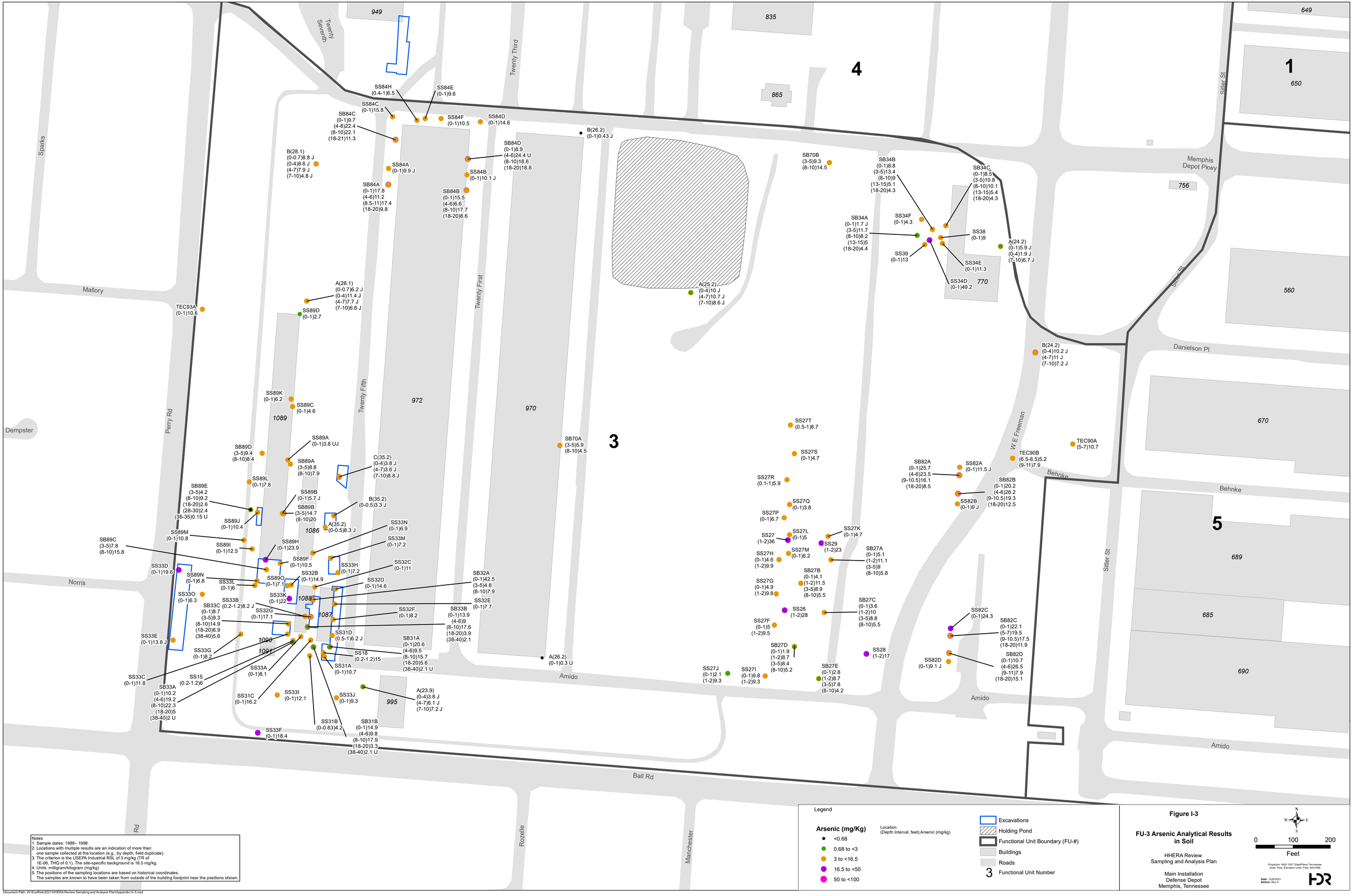
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Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes
1. Sample dates: 1989– 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Arsenic (mg/Kg)
- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

Location (Depth Interval, feet) Arsenic (mg/kg)

- Excavations
- Holding Pond
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure I-3

FU-3 Arsenic Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

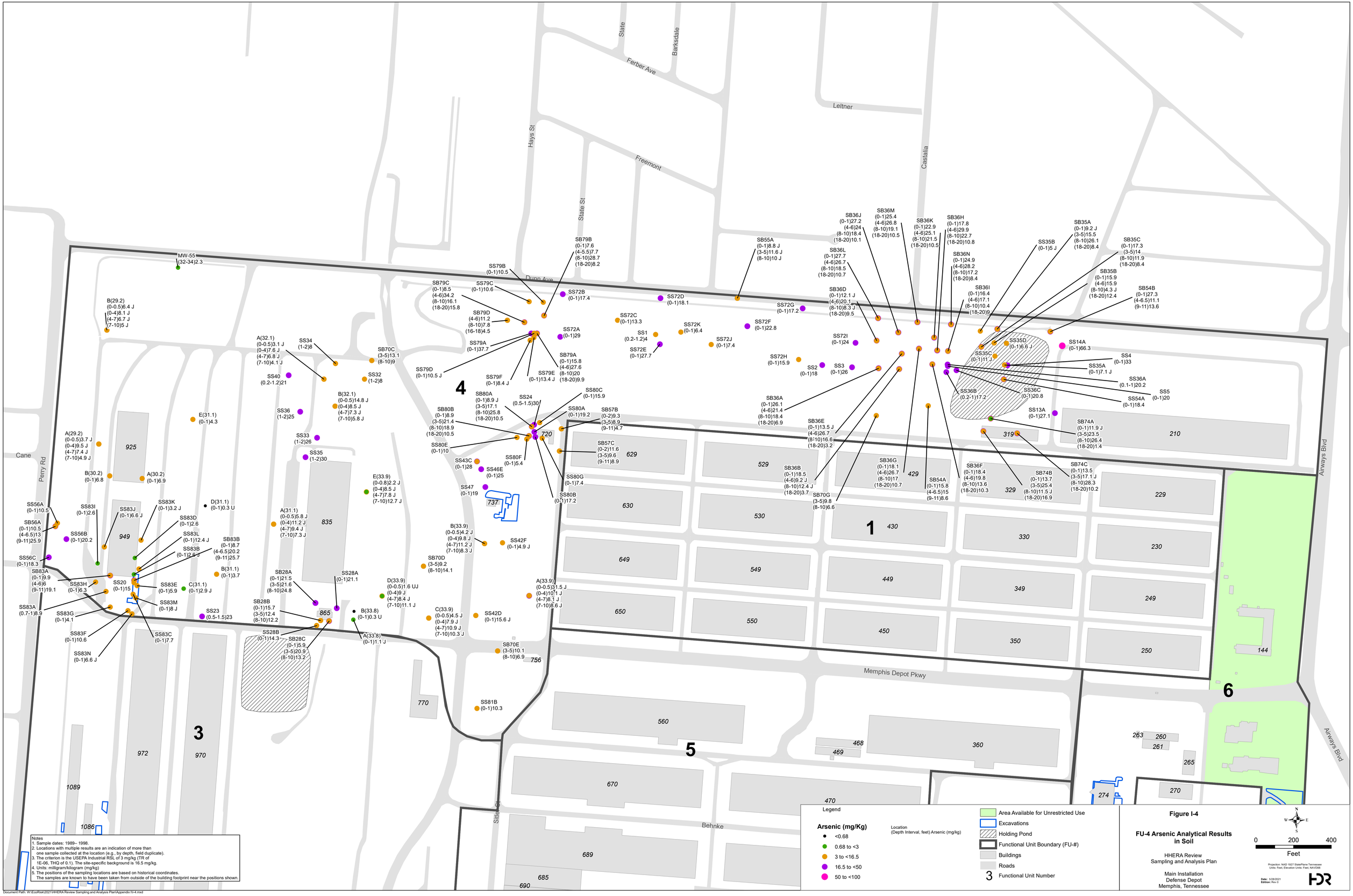
N W E S

0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes
1. Sample dates: 1989– 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)

Legend

Arsenic (mg/Kg)
- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

Location
(Depth Interval, feet) Arsenic (mg/kg)

Functional Unit Boundary (FU-#)
Buildings
Roads
3 Functional Unit Number

Figure I-5

FU-5 Arsenic Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N
W E
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0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Heyde Ave
Troyer Ave
Kolick
Third
Third
Airways Blvd
Frisco
Memphis Depot Pkwy
Danielson Pl
Behnke
Danielson
Amido
Ball Rd
Airways Blvd
Dwight
Airways Blvd

319
210
529
429
329
229
530
430
330
230
549
449
349
249
550
450
350
250
144
468
469
360
470
489
490
263
260
261
265
274
270
271

1
2
4
5
6

SB67B
(0-1)9.1
(3-5)13.1
(8-10)17.3
(18-20)7.4
(38-40)4.1

SS67A
(0-1)29.2

SS66A
(0-1)3.6 J

SS25
(1-2)25

SS67B
(0-1)12.5 J

SB66A
(3-5)1.2

SB67A
(0-1)17.2
(4-6)12.4
(8-10)4.2
(18-20)11.3
(38-40)6.5

SB58A
(0-1)15.6
(3-5)5.9
(8-10)3.8

SB68C
(0-1)7.7
(8-10)5.6

SS1A
(0-1)16.1

SS58C
(0-1)8.4

SB58B
(0-1)8.8
(3-5)9
(8-10)4.7

SS31
(1-2)12

SS30
(1-2)19

SS48A
(0-1)3.2

Notes
1. Sample dates: 1989– 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 3 mg/kg (TR of 1E-06, THQ of 0.1). The site-specific background is 16.5 mg/kg.
4. Units: milligram/kilogram (mg/kg)

Legend

Arsenic (mg/Kg)
- <0.68
- 0.68 to <3
- 3 to <16.5
- 16.5 to <50
- 50 to <100

Location
(Depth Interval, feet) Arsenic (mg/kg)

- Area Available for Unrestricted Use
- Excavations
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure I-6

FU-6 Arsenic Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N
W E
S

0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

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J

Appendix J

Chromium Soil Analytical Results Tables

TABLE J-1
FU-1 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
E(10.2)	E(10_2)	0-1	1/8/1998	Sample	**12.7**
F(10.2)	F(10_2)	0-1	1/8/1998	Sample	**11.9**
SS10	LAWSS10	0.5-1.5	2/12/1989	Sample	**24**
SS11	LAWSS11	0.5-1.5	2/12/1989	Sample	**135**
SS42	LAWSS42	0-1	10/26/1989	Sample	**39**
SS43	LAWSS43	0-1	10/26/1989	Sample	**15**
SS6A	MIA137	0-1	10/7/1998	Sample	**13.1 J**
SS8A	MIA138	0-1	10/7/1998	Sample	**13.8 J**
SS8A	MIA139FD	0-1	10/7/1998	FD	**13 J**
SS9A	MIA141	0-1	10/7/1998	Sample	**11.6 J**
SS65H	MIA188	0-1	10/9/1998	Sample	**9.8**
SS65H	MIA189FD	0-1	10/9/1998	FD	**13.1**
SS65I	MIA193	0-1	10/9/1998	Sample	**12.6**
SS66B	MIA218	0-1	10/10/1998	Sample	**13.1**
SS66C	MIA220	0-1	10/10/1998	Sample	**11.9**
SS66D	MIA221	0-1	10/10/1998	Sample	**12.6**
SS66E	MIA222	0-1	10/10/1998	Sample	**15.3**
SS66E	MIA223FD	0-1	10/10/1998	FD	**15.1**
SS11A	MIA302	0-1	10/13/1998	Sample	**14.3**
SB57A	RHA072	0-2	1/22/1997	Sample	**11.8**
SB57D	RHA081	0-2	1/22/1997	Sample	**17.8**
SB57E	RHA085	0-2	1/22/1997	Sample	**9.9**
SB57F	RHA088	0-2	1/23/1997	Sample	**14.1**
SB57G	RHA091	0-2	1/23/1997	Sample	**11.9**
SB57H	RHA095	0-2	1/23/1997	Sample	**15.9**
SB57I	RHA098	0-2	1/23/1997	Sample	**11.1**
SS65E	SGB025	0-1	12/6/1996	Sample	**29.9 J**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-2
FU-1 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB57A	RHA073	3-5	1/22/1997	Sample	**10.9**
SB57A	RHA074	8-10	1/22/1997	Sample	**13.1**
SB57D	RHA082	3-5	1/22/1997	Sample	**10.2**
SB57D	RHA083FD1	3-5	1/22/1997	FD	**11.9**
SB57D	RHA084	8-10	1/22/1997	Sample	**10.6**
SB57E	RHA086	3-5	1/22/1997	Sample	**12.8**
SB57E	RHA087	8-10	1/22/1997	Sample	**10.8**
SB57F	RHA089	3-5	1/23/1997	Sample	**11.8**
SB57F	RHA090	8-10	1/23/1997	Sample	**11.3**
SB57G	RHA092	3-5	1/23/1997	Sample	**13**
SB57G	RHA093	8-10	1/23/1997	Sample	**14**
SB57G	RHA094FD1	3-5	1/23/1997	FD	**14**
SB57H	RHA096	3-5	1/23/1997	Sample	**14.5**
SB57H	RHA097	8-10	1/23/1997	Sample	**16.7**
SB57I	RHA099	3-5	1/23/1997	Sample	**10.8**
SB57I	RHA100	8-10	1/23/1997	Sample	**15**
SB70F	RHA167	3-5	1/22/1997	Sample	**14.9**
SB70F	RHA168	8-10	1/22/1997	Sample	**12.9**
SB70H	RHA171	3-5	1/22/1997	Sample	**12**
SB70H	RHA172	8-10	1/22/1997	Sample	**19.3**
SB70I	RHA173	3-5	1/22/1997	Sample	**13.9**
SB70I	RHA174FD1	3-5	1/22/1997	FD	**12.9**
SB70I	RHA175	8-10	1/22/1997	Sample	**17.5**
SB70J	RHA176	3-5	1/22/1997	Sample	**12**
SB70J	RHA177	8-10	1/22/1997	Sample	**12.5**

Notes:
1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-3
FU-2 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(3.10)	A9	0-0.5	10/18/1996	Sample	**19.7 J**
G(3.5)	G3_5	0-0	9/25/1997	Sample	**13.6**
H(3.5)	H3_5	0-0	9/28/1997	Sample	**18.9**
I(3.5)	I3_5	0-0	9/28/1997	Sample	**14.2**
J(3.5)	J3_5	0-0	9/28/1997	Sample	**16.3**
K(3.5)	K3_5	0-0	9/26/1997	Sample	**15.3**
L(3.5)	L3_5	0-0	9/28/1997	Sample	**16.3**
SS12	LAWSS12	0.2-1.2	2/21/1989	Sample	**20**
SS13	LAWSS13	0-1	2/21/1989	Sample	**13**
SS14	LAWSS14	0-1	2/21/1989	Sample	**16**
SS37	LAWSS37	1-2	3/30/1989	Sample	**13**
SS50	LAWSS50	0-1	10/27/1989	Sample	**17**
M(3.5)	M3_5	0-0	9/28/1997	Sample	**12**
SS51D	MIA033	0-1	9/30/1998	Sample	**13.2 J**
SS51D	MIA034FD	0-1	9/30/1998	FD	**9.5 J**
TEC92A	MIA128	0-1	10/13/1998	Sample	**11.5**
TEC92A	MIA129FD	0-1	10/13/1998	FD	**13.2**
TEC92B	MIA132	0-1	10/13/1998	Sample	**9.6**
N(3.5)	N3_5	0-0	9/28/1997	Sample	**13.7**
SS59H	RHA070	0-1	1/19/1997	Sample	**16.1**
SS52D	SGA153	0-1	12/6/1996	Sample	**17.5**
SB52B	SGA158	0-1	12/19/1996	Sample	**22.5**
SS51B	SGA166	0-1	12/13/1996	Sample	**29.4**
SB51A	SGA168	0-1	12/19/1996	Sample	**25.8**
SB51B	SGA171	0-1	12/12/1996	Sample	**21.8**
SB51C	SGA174	0-1	12/19/1996	Sample	**27.6**
SB52B	SGA491FD1	0-1	12/19/1996	FD	**20**
SS52B	SGB041	0-1	12/6/1996	Sample	**40.3**
SS52C	SGB042	0-1	12/6/1996	Sample	**20.3**
SS52E	SGB045	0-1	12/6/1996	Sample	**21**
SS69A	SGB046	0-1	12/6/1996	Sample	**12.6 J**
SS51A	SGB048	0-1	12/13/1996	Sample	**7.6**
SS52A	SGB085	0-1	12/7/1996	Sample	**13.1**
SS51C	SGB116	0-1	12/13/1996	Sample	**11.3**
SB52A	SGB148	0-1	12/19/1996	Sample	**12.6**
SB52A	SGB149FD1	0-1	12/19/1996	FD	**13.8**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-4
FU-2 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB51A	SGB147	5-7	12/19/1996	Sample	**10.5**
SB51A	SGA170	9-11	12/19/1996	Sample	**32.7**
SB51B	SGA172	6-8	12/12/1996	Sample	**17.1**
SB51B	SGA173	9-12	12/12/1996	Sample	**17.2**
SB51C	SGA175	5-6	12/19/1996	Sample	**25.6**
SB51C	SGA176	8-10	12/19/1996	Sample	**49.1**
SB52A	SGA156	4-6	12/19/1996	Sample	**37.6**
SB52A	SGA157	8-10	12/19/1996	Sample	**53.2**
SB52B	SGA159	4-6	12/19/1996	Sample	**31**
SB52B	SGA160	8-10	12/19/1996	Sample	**32.9**
SB59C	MIA182	8-10	10/9/1998	Sample	**12.9**

Notes:
Notes:
1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-5
FU-3 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(23.9)	A93	0-0.5	10/19/1996	Sample	**14.8 J**
A(23.9)	AA0014	0-4	10/23/1996	Sample	**17.6 J**
A(24.2)	A97	0-1	10/18/1996	Sample	**10.6 J**
A(24.2)	DUP8	0-1	10/18/1996	FD	**13.4 J**
A(24.2)	AA0048	0-4	10/24/1996	Sample	1.8 J
A(25.2)	A101	0-0.5	10/18/1996	Sample	5.5 J
A(25.2)	AA0053	0-4	10/24/1996	Sample	**12.9 J**
A(26.2)	970A	0-1	1/8/1998	Sample	**12.2**
A(28.1)	DUP9	0-0.7	10/18/1996	FD	**18.7 J**
A(28.1)	A106	0-0.7	10/18/1996	Sample	**19.9 J**
A(28.1)	AA0017	0-4	10/23/1996	Sample	**13.5 J**
B(24.2)	B97	0-0.5	10/18/1996	Sample	5.6 J
B(24.2)	AA0045	0-4	10/24/1996	Sample	**11.5 J**
B(26.2)	970B	0-1	1/8/1998	Sample	**12**
B(28.1)	B106	0-0.7	10/18/1996	Sample	**13 J**
B(28.1)	AA0020	0-4	10/23/1996	Sample	**10.2 J**
SB27A	RHA134	0-1	1/21/1997	Sample	**13.8**
SB27A	RHA135	1-2	1/21/1997	Sample	**13.6**
SB27B	RHA136	0-1	1/21/1997	Sample	**15.8**
SB27B	RHA137	1-2	1/21/1997	Sample	**12.5**
SB27C	RHA138	0-1	1/21/1997	Sample	**10.8**
SB27C	RHA139	1-2	1/21/1997	Sample	**12.3**
SB27D	RHA140	0-1	1/21/1997	Sample	**6.8**
SB27D	RHA141	1-2	1/21/1997	Sample	**12.8**
SB27E	RHA143	1-2	1/21/1997	Sample	**12.5**
SB27E	RHA142	0-1	1/21/1997	Sample	**12.7**
SB31B	SGA020	0-1	12/18/1996	Sample	**29.8**
SB33A	SGA031	0-1	12/18/1996	Sample	**32.2**
SB33B	SGA488FD1	0-1	12/18/1996	FD	**40.5**
SB33B	SGA036	0-1	12/18/1996	Sample	**28.3**
SB34A	RHA035	0-1	1/18/1997	Sample	**18.8**
SB34B	RHA036	0-1	1/18/1997	Sample	**107**
SB34C	RHA037	0-1	1/18/1997	Sample	**40.2**
SB82A	SGA477FD1	0-1	12/11/1996	FD	**31**
SB82A	SGA217	0-1	12/11/1996	Sample	**25.8**
SB82B	SGA221	0-1	12/11/1996	Sample	**26.3**
SB82C	SGA225	0-1	12/11/1996	Sample	**26.8**
SB82D	SGB095	0-1	12/12/1996	Sample	**14.2**
SB84A	SGA478FD1	0-1	12/12/1996	FD	**12.9**
SB84A	SGA382	0-1	12/12/1996	Sample	**25.5**
SB84B	SGA386	0-1	12/13/1996	Sample	**145**
SB84B	SGA481FD1	0-1	12/13/1996	FD	**17.4**
SB84C	SGA390	0-1	12/13/1996	Sample	**41.3**
SB84D	SGA394	0-1	12/13/1996	Sample	**49.3**
SS15	LAWSS15	0.2-1.2	2/21/1989	Sample	**714**
SS19	LAWSS19	0.2-1.2	2/22/1989	Sample	**2230**
SS26	LAWSS26	1-2	3/19/1989	Sample	**16**
SS27	LAWSS27	1-2	3/19/1989	Sample	**17**
SS27F	RHA146	1-2	1/21/1997	Sample	**13.5**
SS27F	RHA144	0-1	1/21/1997	Sample	**27**
SS27G	RHA148	1-2	1/21/1997	Sample	**13.2**
SS27G	RHA147	0-1	1/21/1997	Sample	**13.6**
SS27H	RHA149	0-1	1/21/1997	Sample	**18.9**
SS27H	RHA150	1-2	1/21/1997	Sample	**10**
SS27I	RHA152	1-2	1/21/1997	Sample	**12.5**
SS27I	RHA151	0-1	1/21/1997	Sample	**11.6**
SS27J	RHA155FD1	1-2	1/21/1997	FD	**11.7**
SS27J	RHA153	0-1	1/21/1997	Sample	**9.9**
SS27J	RHA154	1-2	1/21/1997	Sample	**13.1**
SS27K	MIA042	0-1	10/1/1998	Sample	**20.2**
SS27L	MIA044	0-1	10/1/1998	Sample	**25.6**
SS27M	MIA045	0-1	10/1/1998	Sample	**11.8**
SS27P	MIA048	0-1	10/1/1998	Sample	**13.9**

TABLE J-5
FU-3 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SS27Q	MIA049	0-1	10/1/1998	Sample	**10.9**
SS27Q	MIA050FD	0-1	10/1/1998	FD	**10.8**
SS27R	MIA355	0.1-1	10/1/1998	Sample	**13**
SS27S	MIA051	0-1	10/1/1998	Sample	**11.5**
SS27T	MIA052	0.5-1	10/1/1998	Sample	**24.5**
SS28	LAWSS28	1-2	3/19/1989	Sample	6
SS29	LAWSS29	1-2	3/19/1989	Sample	**10**
SS31B	SGA012	0-0.83	12/7/1996	Sample	**66.1**
SS31C	SGA300FD1	0-1	12/7/1996	FD	**32.2**
SS31C	SGA013	0-1	12/7/1996	Sample	**39.4**
SS32C	RHA016	0-1	1/18/1997	Sample	**275**
SS33A	SGA025	0-1	12/8/1996	Sample	**44.9**
SS33B	SGB067	0.2-1.2	12/8/1996	Sample	**77.1 J**
SS33C	SGA027	0-1	12/8/1996	Sample	**53.8**
SS33F	SGA030	0-1	12/8/1996	Sample	**40.8**
SS33G	MIA333	0-1	10/8/1998	Sample	**17.1**
SS33I	MIA335	0-1	10/8/1998	Sample	**13**
SS33J	MIA336	0-1	10/8/1998	Sample	**11**
SS33L	MIA326	0-1	10/8/1998	Sample	**47.9**
SS33N	MIA330	0-1	10/8/1998	Sample	**23.8**
SS33O	MIA331	0-1	10/8/1998	Sample	**10.8**
SS34D	RHA038	0-1	1/17/1997	Sample	**124**
SS34E	RHA180FD1	0-1	1/17/1997	FD	**77.2**
SS34E	RHA039	0-1	1/17/1997	Sample	**51.3**
SS34F	RHA040	0-1	1/17/1997	Sample	**34.8**
SS38	LAWSS38	0-1	3/30/1989	Sample	**10**
SS46	LAWSS46	0-1	10/27/1989	Sample	**78**
SS48	LAWSS48	0-1	10/27/1989	Sample	**19**
SS49	LAWSS49	0-1	10/27/1989	Sample	6
SS82A	SGB050	0-1	12/7/1996	Sample	**13.7 J**
SS82B	SGB059	0-1	12/7/1996	Sample	**11.3 J**
SS82C	SGA215	0-1	12/7/1996	Sample	**25.9**
SS82D	SGB060	0-1	12/7/1996	Sample	**19.4 J**
SS84A	SGB070	0-1	12/8/1996	Sample	**14.5 J**
SS84B	SGB069	0-1	12/8/1996	Sample	**13.2 J**
SS84C	SGA280	0-1	12/8/1996	Sample	**56.4**
SS84D	SGA281	0-1	12/8/1996	Sample	**24.5**
SS84E	SGA282	0-1	12/8/1996	Sample	**28.9**
SS84F	SGA283	0-1	12/8/1996	Sample	**37.4**
SS84H	MIA032	0.4-1	9/30/1998	Sample	**12.2 J**
SS89A	SGB044	0-1	12/6/1996	Sample	**14.5 J**
SS89B	SGB039	0-1	12/6/1996	Sample	**43.8 J**
SS89C	SGA250	0-1	12/6/1996	Sample	**56.1**
SS89D	SGA251	0-1	12/6/1996	Sample	**15.5**
SS89I	SGA258	0-1	12/6/1996	Sample	**29**
SS89K	MIA153	0-1	10/8/1998	Sample	**22.1**
SS89L	MIA155	0-1	10/8/1998	Sample	**22.1**
SS89M	MIA156	0-1	10/8/1998	Sample	**63.5**
TEC93A	MIA332	0-1	10/8/1998	Sample	**12.4**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-6
FU-3 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(23.9)	AA0015	4-7	10/23/1996	Sample	**14.8 J**
A(23.9)	AA0016	7-10	10/23/1996	Sample	**16.2 J**
A(24.2)	AA0049	7-10	10/24/1996	Sample	**12.1 J**
A(25.2)	AA0054	4-7	10/24/1996	Sample	**11.6 J**
A(25.2)	AA0055	7-10	10/24/1996	Sample	**12 J**
A(28.1)	AA0018	4-7	10/23/1996	Sample	**10.2 J**
A(28.1)	AA0019	7-10	10/23/1996	Sample	**10.3 J**
B(24.2)	AA0046	4-7	10/24/1996	Sample	**9.7 J**
B(24.2)	AA0047	7-10	10/24/1996	Sample	**8.9 J**
B(28.1)	AA0021	4-7	10/23/1996	Sample	**10.3 J**
B(28.1)	AA0022	7-10	10/23/1996	Sample	**9.8 J**
C(35.2)	AA0012	4-7	10/23/1996	Sample	**16.7 J**
C(35.2)	AA0013	7-10	10/23/1996	Sample	**27.2 J**
SB27A	RHA001	3-5	1/21/1997	Sample	**23.2**
SB27A	RHA002	8-10	1/21/1997	Sample	**26**
SB27B	RHA003	3-5	1/21/1997	Sample	**23.5**
SB27B	RHA004	8-10	1/21/1997	Sample	**23**
SB27C	RHA005	3-5	1/21/1997	Sample	**22.7**
SB27C	RHA006	8-10	1/21/1997	Sample	**22.5**
SB27D	RHA007	3-5	1/21/1997	Sample	**24.7**
SB27D	RHA008	8-10	1/21/1997	Sample	**25**
SB27D	RHA145FD1	3-5	1/21/1997	FD	**11.4**
SB27E	RHA009	3-5	1/21/1997	Sample	**24.6**
SB27E	RHA010	8-10	1/21/1997	Sample	**14.8**
SB27E	RHA011FD1	3-5	1/21/1997	FD	**26.8**
SB31A	SGA016	4-6	12/18/1996	Sample	**36.2**
SB31A	SGA017	8-10	12/18/1996	Sample	**53.3**
SB31B	SGA021	4-6	12/18/1996	Sample	**37**
SB31B	SGA022	8-10	12/18/1996	Sample	**50.3**
SB32A	RHA013	3-5	1/22/1997	Sample	**17.4**
SB32A	RHA014	8-10	1/22/1997	Sample	**21**
SB33A	SGA032	4-6	12/18/1996	Sample	**58.6**
SB33A	SGA033	8-10	12/18/1996	Sample	**49.7**
SB33B	SGA037	4-6	12/18/1996	Sample	**44.1**
SB33B	SGA038	8-10	12/18/1996	Sample	**43.1**
SB33C	SGA042	3-5	12/19/1996	Sample	**40.1**
SB33C	SGA043	8-10	12/19/1996	Sample	**40.7**
SB34A	RHA022	3-5	1/21/1997	Sample	**15.8**
SB34A	RHA023	8-10	1/21/1997	Sample	**24.4**
SB34B	RHA026	3-5	1/21/1997	Sample	**16.3**
SB34B	RHA027	8-10	1/21/1997	Sample	**24.9**
SB34C	RHA030	3-5	1/21/1997	Sample	**12.8**
SB34C	RHA031	8-10	1/21/1997	Sample	**27.9**
SB34C	RHA034FD1	3-5	1/21/1997	FD	**27.4**
SB70A	RHA156	3-5	1/22/1997	Sample	**9.5**
SB70A	RHA157	8-10	1/22/1997	Sample	**16**
SB70B	RHA158	3-5	1/22/1997	Sample	**14.2**
SB70B	RHA159	8-10	1/22/1997	Sample	**18.4**
SB82A	SGA218	4-6	12/11/1996	Sample	**28**
SB82A	SGA219	9-10.5	12/11/1996	Sample	**23.3**
SB82B	SGA222	4-6	12/11/1996	Sample	**31.4**
SB82B	SGA223	9-10.5	12/11/1996	Sample	**28.8**
SB82C	SGA226	5-7	12/11/1996	Sample	**27.8**
SB82C	SGA227	9-10.5	12/11/1996	Sample	**24.3**
SB82D	SGA230	4-6	12/12/1996	Sample	**29.9**
SB82D	SGB094	9-11	12/12/1996	Sample	**14.9**
SB84A	SGB096	4-6	12/12/1996	Sample	**13**
SB84A	SGA384	8.5-11	12/12/1996	Sample	**28.5**
SB84B	SGA388	8-10	12/13/1996	Sample	**22.4**
SB84B	SGB120	4-6	12/13/1996	Sample	**11.8**
SB84C	SGA391	4-6	12/13/1996	Sample	**21.6**
SB84C	SGA392	8-10	12/13/1996	Sample	**27.6**
SB84D	SGA395	4-6	12/13/1996	Sample	**25.1**

TABLE J-6
FU-3 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB84D	SGA396	8-10	12/13/1996	Sample	**22.6**
SB89A	SGA374	3-5	12/21/1996	Sample	**26.5**
SB89A	SGA375	8-10	12/21/1996	Sample	**38.1**
SB89B	SGA376	3-5	12/21/1996	Sample	**33.4**
SB89B	SGA377	8-10	12/21/1996	Sample	**81.6**
SB89B	SGA492FD1	3-5	12/21/1996	FD	**51.3**
SB89C	SGA378	3-5	12/21/1996	Sample	**31.3**
SB89C	SGA379	8-10	12/21/1996	Sample	**29.4**
SB89D	SGA380	3-5	12/21/1996	Sample	**30.5**
SB89D	SGA381	8-10	12/21/1996	Sample	**30.7**
SB89E	MIA146	3-5	10/6/1998	Sample	**15.3**
SB89E	MIA147FD	3-5	10/6/1998	FD	**13.9**
SB89E	MIA149	8-10	10/6/1998	Sample	**23.3**
TEC90A	MIA074	5-7	10/7/1998	Sample	**14 J**
TEC90B	MIA075	6.5-8.5	10/7/1998	Sample	**10.4 J**
TEC90B	MIA076	9-11	10/7/1998	Sample	**12.5 J**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-7
FU-3 CHROMIUM TOTAL ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB31A	SGA018	18-20	12/18/1996	Sample	**17.1**
SB31A	SGA019	38-40	12/18/1996	Sample	**6.3**
SB31B	SGA024	38-40	12/18/1996	Sample	**18.7**
SB31B	SGB140	18-20	12/18/1996	Sample	**8.4**
SB33A	SGA034	18-20	12/18/1996	Sample	**18.4**
SB33A	SGA035	38-40	12/18/1996	Sample	**7.5**
SB33B	SGA039	18-20	12/18/1996	Sample	**16**
SB33B	SGA040	38-40	12/18/1996	Sample	**12.5**
SB33C	SGA044	18-20	12/19/1996	Sample	**24.9**
SB33C	SGA045	38-40	12/19/1996	Sample	**26.6**
SB34A	RHA024	13-15	1/21/1997	Sample	**22.8**
SB34A	RHA025	18-20	1/21/1997	Sample	**40.8**
SB34B	RHA029	18-20	1/21/1997	Sample	**30.1**
SB34B	RHA028	13-15	1/21/1997	Sample	**26.7**
SB34C	RHA032	13-15	1/21/1997	Sample	**21.6**
SB34C	RHA033	18-20	1/21/1997	Sample	**35.5**
SB82A	SGA220	18-20	12/11/1996	Sample	**35.6**
SB82B	SGA224	18-20	12/11/1996	Sample	**45.4**
SB82C	SGA228	18-20	12/11/1996	Sample	**79.2**
SB82D	SGA232	18-20	12/12/1996	Sample	**102**
SB84A	SGA385	18-20	12/12/1996	Sample	**44.1**
SB84B	SGA389	18-20	12/13/1996	Sample	**33.2**
SB84C	SGA393	18-21	12/13/1996	Sample	**24.1**
SB84D	SGA397	18-20	12/13/1996	Sample	**32.7**
SB89E	MIA152	36-38	10/6/1998	Sample	2.1
SB89E	MIA150	18-20	10/6/1998	Sample	**6.7**
SB89E	MIA151	28-30	10/6/1998	Sample	4.7

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-8
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(29.2)	DUP3	0-0.5	10/17/1996	FD	**13.1 J**
A(29.2)	A109	0-0.5	10/17/1996	Sample	**13.2 J**
A(29.2)	AA0023	0-4	10/23/1996	Sample	**11.4 J**
A(30.2)	925A	0-1	1/8/1998	Sample	**15.4**
A(31.1)	A116	0-0.5	10/16/1996	Sample	**15.4 J**
A(31.1)	AA0036	0-4	10/24/1996	Sample	**12.8 J**
A(32.1)	A117	0-0.5	10/16/1996	Sample	**6.3 J**
A(32.1)	AA0030	0-4	10/23/1996	Sample	**8.9 J**
A(33.8)	A(33_8)	0-1	1/8/1998	Sample	**8**
A(33.9)	A125	0-0.5	10/18/1996	Sample	**12.2 J**
A(33.9)	AA0042	0-4	10/24/1996	Sample	**13.7 J**
B(29.2)	B109	0-0.5	10/17/1996	Sample	**27.4 J**
B(29.2)	AA0027	0-4	10/23/1996	Sample	**10.8 J**
B(30.2)	925B	0-1	1/8/1998	Sample	**18.6**
B(31.1)	B(31_1)	0-1	1/8/1998	Sample	**21.5**
B(32.1)	B117	0-0.5	10/16/1996	Sample	**22.7 J**
B(32.1)	AA0033	0-4	10/24/1996	Sample	**10.2 J**
B(33.8)	B(33_8)	0-1	1/8/1998	Sample	5 J
B(33.9)	B125	0-0.5	10/18/1996	Sample	**6.3 J**
B(33.9)	AA0056	0-4	10/24/1996	Sample	**13.6 J**
C(31.1)	DUP_1	0-1	1/8/1998	FD	**33.2**
C(31.1)	C(31_1)	0-1	1/8/1998	Sample	**35.3**
C(33.9)	C125	0-0.5	10/19/1996	Sample	**12.4 J**
C(33.9)	AA0039	0-4	10/24/1996	Sample	**9.9 J**
D(31.1)	D(31_1)	0-1	1/8/1998	Sample	**7 J**
D(33.9)	D125	0-0.5	10/19/1996	Sample	**9.7 J**
D(33.9)	AA0062	0-4	10/24/1996	Sample	**10.6 J**
E(31.1)	E(31_1)	0-1	1/8/1998	Sample	**29.5**
E(33.9)	E125	0-0.8	10/19/1996	Sample	**20.7 J**
E(33.9)	AA0059	0-4	10/24/1996	Sample	**14.6 J**
SB28A	SGA003	0-1	12/16/1996	Sample	**29**
SB28B	SGA006	0-1	12/16/1996	Sample	**25.3**
SB28C	SGA009	0-1	12/16/1996	Sample	**30.6**
SB35A	SGB159	0-1	12/21/1996	Sample	**14.6**
SB35B	SGA050	0-1	12/21/1996	Sample	**26.8**
SB35C	SGA054	0-1	12/21/1996	Sample	**24.3**
SB36A	SGA058	0-1	12/19/1996	Sample	**27.7**
SB36B	SGA062	0-1	12/20/1996	Sample	**25.1**
SB36B	SGA493FD1	0-1	12/20/1996	FD	**26.9**
SB36D	SGB163	0-1	12/20/1996	Sample	**12.4**
SB36D	SGB166FD1	0-1	12/20/1996	FD	**12.3**
SB36E	SGB165	0-1	12/20/1996	Sample	**18.9**
SB36F	SGA494FD1	0-1	12/20/1996	FD	**27.2**
SB36F	SGA078	0-1	12/20/1996	Sample	**28.2**
SB36G	SGA082	0-1	12/20/1996	Sample	**28.1**
SB36G	SGA495FD1	0-1	12/20/1996	FD	**25.8**
SB36H	SGA086	0-1	12/20/1996	Sample	**28.5**
SB36I	SGA090	0-1	12/21/1996	Sample	**24.9**
SB36J	SGA094	0-1	12/21/1996	Sample	**32**
SB36J	SGA496FD1	0-1	12/21/1996	FD	**33.5**
SB36K	SGA098	0-1	12/21/1996	Sample	**30.3**
SB36L	SGA102	0-1	12/21/1996	Sample	**25.2**
SB36M	SGA497FD1	0-1	12/21/1996	FD	**34**
SB36M	SGA106	0-1	12/21/1996	Sample	**32**
SB36N	SGA110	0-1	12/21/1996	Sample	**29.9**
SB36N	SGA502FD1	0-1	12/21/1996	FD	**28.1**
SB54A	SGA456	0-1	12/16/1996	Sample	**18.8**
SB54B	SGA483FD1	0-1	12/16/1996	FD	**20.2**
SB54B	SGA459	0-1	12/16/1996	Sample	**27.1**
SB55A	SGB123	0-1	12/21/1996	Sample	**11.9**
SB56A	SGA404	0-1	12/16/1996	Sample	**24.7**
SB57B	RHA075	0-2	1/22/1997	Sample	**11.3**
SB57C	RHA078	0-2	1/22/1997	Sample	**11.2**

TABLE J-8
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB74A	SGB156	0-1	12/21/1996	Sample	**16.9**
SB74B	SGA466	0-1	12/21/1996	Sample	**25.5**
SB74C	SGA470	0-1	12/21/1996	Sample	**26.6**
SB79A	SGA441	0-1	12/17/1996	Sample	**23.9**
SB79B	SGB137	0-1	12/17/1996	Sample	**28**
SB79C	SGA449	0-1	12/17/1996	Sample	**23.8**
SB80A	SGB154	0-1	12/21/1996	Sample	**12.8**
SB80B	SGA437	0-1	12/21/1996	Sample	**57.3**
SB83A	SGA482FD1	0-1	12/13/1996	FD	**71.5**
SB83A	SGA398	0-1	12/13/1996	Sample	**22**
SS1	LAWSS1	0.2-1.2	2/9/1989	Sample	**15**
SS13A	MIA303	0-1	10/13/1998	Sample	**15.5**
SS14A	MIA304	0-1	10/13/1998	Sample	**17.2**
SS2	LAWSS2	0-1	2/9/1989	Sample	**19**
SS21	LAWSS21	0.5-1.5	2/22/1989	Sample	**115**
SS22	LAWSS22	0.5-1.5	2/22/1989	Sample	**30**
SS23	LAWSS23	0.5-1.5	2/22/1989	Sample	**34**
SS24	LAWSS24	0.5-1.5	3/19/1989	Sample	**28**
SS28A	SGA291	0-1	12/8/1996	Sample	**30.8**
SS28B	SGA292	0-1	12/8/1996	Sample	**29.5**
SS3	LAWSS3	0-1	2/9/1989	Sample	**17**
SS32	LAWSS32	1-2	3/19/1989	Sample	**10**
SS33	LAWSS33	1-2	3/19/1989	Sample	**13**
SS34	LAWSS34	1-2	3/19/1989	Sample	**10**
SS35	LAWSS35	1-2	3/19/1989	Sample	**13**
SS35A	MIA264	0-1	10/12/1998	Sample	**9.7 J**
SS35B	MIA265	0-1	10/12/1998	Sample	**7.5 J**
SS35C	MIA269	0-1	10/12/1998	Sample	**27.8 J**
SS35D	MIA270	0-1	10/12/1998	Sample	**13.8 J**
SS36	LAWSS36	1-2	3/19/1989	Sample	**15**
SS36A	MIA001	0.1-1	9/28/1998	Sample	**18.7**
SS36B	MIA005	0.2-1	9/28/1998	Sample	**22.6**
SS36C	MIA006	0-1	9/28/1998	Sample	**15.7**
SS4	LAWSS4	0-1	2/11/1989	Sample	**14**
SS40	LAWSS40	0.2-1.2	3/30/1989	Sample	**32**
SS41	LAWSS41	0-1	10/28/1989	Sample	**144**
SS42D	SGB071	0-1	12/8/1996	Sample	**15.2 J**
SS42D	SGB072FD1	0-1	12/8/1996	FD	**19.3 J**
SS42F	MIA275	0-1	10/12/1998	Sample	**9.2 J**
SS43C	SGB079	0-1	12/9/1996	Sample	**11.7**
SS43C	SGB084	0-1	12/9/1996	FD	**10.3**
SS46E	SGB080	0-1	12/10/1996	Sample	**9.2**
SS47	LAWSS47	0-1	10/27/1989	Sample	**9**
SS5	LAWSS5	0-1	2/11/1989	Sample	**296**
SS54A	SGA369	0-1	12/13/1996	Sample	**32.5**
SS54A	SGA480FD1	0-1	12/13/1996	FD	**22.2**
SS56A	SGB062	0-1	12/13/1996	Sample	**11.9**
SS56B	SGA289	0-1	12/13/1996	Sample	**71.6**
SS56C	SGA290	0-1	12/13/1996	Sample	**27.3**
SS72A	SGA317	0-1	12/11/1996	Sample	**31.5**
SS72B	SGA318	0-1	12/11/1996	Sample	**27.9**
SS72C	SGB088	0-1	12/11/1996	Sample	**15.8**
SS72D	SGA320	0-1	12/11/1996	Sample	**28.6**
SS72E	SGA321	0-1	12/11/1996	Sample	**29.6**
SS72F	SGA322	0-1	12/11/1996	Sample	**31**
SS72F	SGA476FD1	0-1	12/11/1996	FD	**32.9**
SS72G	SGA323	0-1	12/11/1996	Sample	**23.5**
SS72H	SGA324	0-1	12/11/1996	Sample	**24.9**
SS72I	SGA325	0-1	12/11/1996	Sample	**28.9**
SS72J	MIA040	0-1	9/30/1998	Sample	**16.5 J**
SS72K	MIA041	0-1	9/30/1998	Sample	**16.7 J**
SS79A	SGA314	0-1	12/12/1996	Sample	**78.1**
SS79B	SGA315	0-1	12/12/1996	Sample	**27.7**

TABLE J-8
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SS79C	SGB097	0-1	12/12/1996	Sample	**12.2**
SS79D	MIA278FD	0-1	10/11/1998	FD	**14.2**
SS79D	MIA277	0-1	10/11/1998	Sample	**10.6**
SS79E	MIA280	0-1	10/11/1998	Sample	**59.2**
SS79F	MIA281	0-1	10/11/1998	Sample	**18.7**
SS79F	MIA282FD	0-1	10/11/1998	FD	**19**
SS80A	SGB081	0-1	12/10/1996	Sample	**9.9**
SS80B	SGA312	0-1	12/10/1996	Sample	**39**
SS80C	SGA313	0-1	12/10/1996	Sample	**21.9**
SS80C	SGA474FD1	0-1	12/10/1996	FD	**19.3**
SS80E	MIA295	0-1	10/13/1998	Sample	**11.6**
SS80F	MIA297FD	0-1	10/13/1998	FD	**11.5**
SS80F	MIA296	0-1	10/13/1998	Sample	**9.3**
SS80G	MIA299	0-1	10/13/1998	Sample	**9**
SS81B	SGB117	0-1	12/13/1996	Sample	**12.6**
SS83A	SGA284	0.7-1	12/9/1996	Sample	**131**
SS83D	MIA234	0-1	10/10/1998	Sample	**66.2**
SS83F	MIA237	0-1	10/10/1998	Sample	**192**
SS83G	MIA238	0-1	10/10/1998	Sample	**11.5**
SS83H	MIA239	0-1	10/10/1998	Sample	**14.2**
SS83I	MIA240	0-1	10/10/1998	Sample	**13.5**
SS83J	MIA241	0-1	10/11/1998	Sample	**15.5**
SS83K	MIA242	0-1	10/11/1998	Sample	**67.9**
SS83L	MIA243	0-1	10/12/1998	Sample	**81 J**
SS83N	MIA245	0-1	10/11/1998	Sample	**249**

Notes:

1) Chromium total results above the USEPA Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
2) RSLs are based on a target risk of 1E-06 and target hazard quotient of 0.1, May 2021.
FD = Field duplicate

TABLE J-9
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(29.2)	AA0024	4-7	10/23/1996	Sample	**10.3 J**
A(29.2)	AA0025	7-10	10/23/1996	Sample	**9.5 J**
A(31.1)	AA0037	4-7	10/24/1996	Sample	**10 J**
A(31.1)	AA0038	7-10	10/24/1996	Sample	**9.4 J**
A(32.1)	AA0031	4-7	10/23/1996	Sample	**9.6 J**
A(32.1)	AA0032	7-10	10/23/1996	Sample	**8.7 J**
A(33.9)	AA0043	4-7	10/24/1996	Sample	**10.5 J**
A(33.9)	AA0044	7-10	10/24/1996	Sample	**11 J**
B(29.2)	AA0028	4-7	10/23/1996	Sample	**9.3 J**
B(29.2)	AA0029	7-10	10/23/1996	Sample	**9 J**
B(32.1)	AA0034	4-7	10/24/1996	Sample	**8.9 J**
B(32.1)	AA0035	7-10	10/24/1996	Sample	**8.7 J**
B(33.9)	AA0057	4-7	10/24/1996	Sample	**12.3 J**
B(33.9)	AA0058	7-10	10/24/1996	Sample	**11.3 J**
C(33.9)	AA0040	4-7	10/24/1996	Sample	**13 J**
C(33.9)	AA0041	7-10	10/24/1996	Sample	**13.8 J**
D(33.9)	AA0063	4-7	10/24/1996	Sample	**13.1 J**
D(33.9)	AA0064	7-10	10/24/1996	Sample	**12.5 J**
E(33.9)	AA0060	4-7	10/24/1996	Sample	**10.4 J**
E(33.9)	AA0061	7-10	10/24/1996	Sample	**16.2 J**
SB28A	SGA004	3-5	12/16/1996	Sample	**22.8**
SB28A	SGA005	8-10	12/16/1996	Sample	**32.2**
SB28B	SGA008	8-10	12/16/1996	Sample	**24.7**
SB28B	SGB133	3-5	12/16/1996	Sample	**15.2**
SB28C	SGA010	3-5	12/16/1996	Sample	**28.3**
SB28C	SGA368	8-10	12/16/1996	Sample	**22.5**
SB35A	SGA047	3-5	12/21/1996	Sample	**24.9**
SB35A	SGA048	8-10	12/21/1996	Sample	**32.6**
SB35A	SGA501FD1	8-10	12/21/1996	FD	**32.6**
SB35B	SGA051	4-6	12/21/1996	Sample	**25.1**
SB35B	SGB158	8-10	12/21/1996	Sample	**9.9**
SB35C	SGA055	3-5	12/21/1996	Sample	**25.6**
SB35C	SGA056	8-10	12/21/1996	Sample	**19.1**
SB35C	SGA500FD1	8-10	12/21/1996	FD	**19.3**
SB36A	SGA059	4-6	12/19/1996	Sample	**26.2**
SB36A	SGA060	8-10	12/19/1996	Sample	**26.9**
SB36B	SGB161	8-10	12/20/1996	Sample	**11.6**
SB36B	SGB162	4-6	12/20/1996	Sample	**10.3**
SB36D	SGA071	4-6	12/20/1996	Sample	**28.9**
SB36D	SGB164	8-10	12/20/1996	Sample	**13.1**
SB36E	SGA075	4-6	12/20/1996	Sample	**28.6**
SB36E	SGA076	8-10	12/20/1996	Sample	**26.5**
SB36F	SGA079	4-6	12/20/1996	Sample	**25.1**
SB36F	SGA080	8-10	12/20/1996	Sample	**22.5**
SB36G	SGA083	4-6	12/20/1996	Sample	**28.5**
SB36G	SGA084	8-10	12/20/1996	Sample	**24.7**
SB36H	SGA087	4-6	12/20/1996	Sample	**31.8**
SB36H	SGA088	8-10	12/20/1996	Sample	**33.4**
SB36I	SGA091	4-6	12/21/1996	Sample	**19.5**
SB36I	SGA092	8-10	12/21/1996	Sample	**17.3**
SB36J	SGA095	4-6	12/21/1996	Sample	**30**
SB36J	SGA096	8-10	12/21/1996	Sample	**27.7**
SB36K	SGA099	4-6	12/21/1996	Sample	**28.6**
SB36K	SGA100	8-10	12/21/1996	Sample	**26.6**
SB36L	SGA103	4-6	12/21/1996	Sample	**27.4**
SB36L	SGA104	8-10	12/21/1996	Sample	**26.9**
SB36M	SGA107	4-6	12/21/1996	Sample	**25.2**
SB36M	SGA108	8-10	12/21/1996	Sample	**26.7**
SB36N	SGA111	4-6	12/21/1996	Sample	**30.5**

TABLE J-9
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB36N	SGA112	8-10	12/21/1996	Sample	**21.1**
SB54A	SGA457	5-7	12/16/1996	Sample	**20.3**
SB54A	SGA458	8-10	12/16/1996	Sample	**26.1**
SB54B	SGA460	5-7	12/16/1996	Sample	**17.7**
SB54B	SGA461	8-10	12/16/1996	Sample	**17.4**
SB55A	SGB122	8-10	12/21/1996	Sample	**14.9**
SB55A	SGB124	3-5	12/21/1996	Sample	**13.7**
SB55A	SGB168FD1	3-5	12/21/1996	FD	**14.8**
SB56A	SGA405	5-7	12/16/1996	Sample	**30.8**
SB56A	SGA406	8-10	12/16/1996	Sample	**35**
SB57B	RHA076	3-5	1/22/1997	Sample	**11.7**
SB57B	RHA077	8-10	1/22/1997	Sample	**11.3**
SB57B	RHA181FD1	3-5	1/22/1997	FD	**11.8**
SB57C	RHA079	3-5	1/22/1997	Sample	**12.1**
SB57C	RHA080	8-10	1/22/1997	Sample	**13.2**
SB70C	RHA160	3-5	1/22/1997	Sample	**15.3**
SB70C	RHA161	8-10	1/22/1997	Sample	**13.2**
SB70D	RHA162	3-5	1/22/1997	Sample	**15.4**
SB70D	RHA163	8-10	1/22/1997	Sample	**22.5**
SB70E	RHA164	3-5	1/22/1997	Sample	**14.6**
SB70E	RHA165	8-10	1/22/1997	Sample	**13.5**
SB70E	RHA166FD1	3-5	1/22/1997	FD	**15.4**
SB70G	RHA169	3-5	1/22/1997	Sample	**14**
SB70G	RHA170	8-10	1/22/1997	Sample	**11.1**
SB74A	SGA463	3-5	12/21/1996	Sample	**22.4**
SB74A	SGA464	8-10	12/21/1996	Sample	**25.3**
SB74B	SGA467	3-5	12/21/1996	Sample	**34.9**
SB74B	SGB157	8-10	12/21/1996	Sample	**17.7**
SB74B	SGB167FD1	8-10	12/21/1996	FD	**18.9**
SB74C	SGA472	8-10	12/21/1996	Sample	**28.2**
SB74C	SGA499FD1	8-10	12/21/1996	FD	**26.9**
SB74C	SGB155	3-5	12/21/1996	Sample	**16.8**
SB79A	SGA442	4-6	12/17/1996	Sample	**27.1**
SB79A	SGA443	8-10	12/17/1996	Sample	**25.9**
SB79B	SGA447	8-10	12/17/1996	Sample	**32.3**
SB79B	SGB138	4-5.5	12/17/1996	Sample	**15.4**
SB79C	SGA450	4-6	12/17/1996	Sample	**39.1**
SB79C	SGA451	8-10	12/17/1996	Sample	**24.2**
SB79D	MIA125	4-6	10/7/1998	Sample	**13.5 J**
SB79D	MIA126	8-10	10/7/1998	Sample	**12 J**
SB80A	SGA434	3-5	12/21/1996	Sample	**24.6**
SB80A	SGA435	8-10	12/21/1996	Sample	**30.7**
SB80B	SGA438	3-5	12/21/1996	Sample	**26.5**
SB80B	SGA439	8-10	12/21/1996	Sample	**23.1**
SB83A	SGB121	4-6	12/13/1996	Sample	**11.2**
SB83A	SGA400	9-11	12/13/1996	Sample	**22.9**
SB83B	SGA402	4-6.5	12/13/1996	Sample	**45.6**
SB83B	SGA403	9-11	12/13/1996	Sample	**26.8**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.

FD = Field duplicate

mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-10
FU-4 CHROMIUM TOTAL ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
MW-55	SBMW55	32-34	2/10/1996	Sample	**23.1 J**
SB35A	SGA049	18-20	12/21/1996	Sample	**29.9**
SB35B	SGA053	18-20	12/21/1996	Sample	**40.6**
SB35C	SGA057	18-20	12/21/1996	Sample	**31.5**
SB36A	SGA061	18-20	12/19/1996	Sample	**32**
SB36B	SGA065	18-20	12/20/1996	Sample	**27.8**
SB36D	SGA073	18-20	12/20/1996	Sample	**40.2**
SB36E	SGA077	18-20	12/20/1996	Sample	**39.7**
SB36F	SGA081	18-20	12/20/1996	Sample	**27.2**
SB36G	SGA085	18-20	12/20/1996	Sample	**43.6**
SB36H	SGA089	18-20	12/20/1996	Sample	**39.4**
SB36I	SGA093	18-20	12/21/1996	Sample	**31.2**
SB36J	SGA097	18-20	12/21/1996	Sample	**38.1**
SB36K	SGA101	18-20	12/21/1996	Sample	**37.3**
SB36L	SGA105	18-20	12/21/1996	Sample	**33.6**
SB36M	SGA109	18-20	12/21/1996	Sample	**43.7**
SB36N	SGA113	18-20	12/21/1996	Sample	**27.8**
SB74A	SGA465	18-20	12/21/1996	Sample	**46.3**
SB74B	SGA469	18-20	12/21/1996	Sample	**29.3**
SB74C	SGA473	18-20	12/21/1996	Sample	**33.5**
SB79A	SGA444	18-20	12/17/1996	Sample	**39.9**
SB79B	SGA448	18-20	12/17/1996	Sample	**32**
SB79C	SGA452	18-20	12/17/1996	Sample	**140**
SB79D	MIA127	16-18	10/7/1998	Sample	**13 J**
SB80A	SGA436	18-20	12/21/1996	Sample	**38.9**
SB80B	SGA440	18-20	12/21/1996	Sample	**41.2**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-11
FU-5 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(20.6)	AA0007	0.5-1	10/23/1996	Sample	**14.8 J**
A(20.6)	AA0008	1-4	10/23/1996	Sample	**13.8 J**
SB75A	SGB076	0-1	12/9/1996	Sample	**13**
SB76A	SGA347	0-1	12/10/1996	Sample	**31.1**
SB76B	SGA350	0-1	12/10/1996	Sample	**33**
SB76C	SGA353	0-1	12/10/1996	Sample	**35**
SB77A	SGA197	0-1	12/8/1996	Sample	**19**
SB77B	SGA201	0-1	12/9/1996	Sample	**27.1**
SB77B	SGA412	0-1	12/9/1996	FD	**37**
SB78A	SGA356	1-3	12/10/1996	Sample	**19.4**
SB78B	SGA359	1-3	12/11/1996	Sample	**28.7**
SB78C	SGA362	1-3	12/11/1996	Sample	**31.4**
SS16A	MIA142	0-1	10/7/1998	Sample	**13.9 J**
SS17A	MIA143	0-1	10/7/1998	Sample	**10.4 J**
SS18A	MIA144	0-1	10/7/1998	Sample	**8.2 J**
SS34A	MIA145	0-1	10/7/1998	Sample	**10.4 J**
SS75D	MIA037	0.2-1	9/30/1998	Sample	**14.9 J**
SS77A	SGB049	0-1	12/7/1996	Sample	**12.4 J**
SS77B	SGA194	0-1	12/7/1996	Sample	**24.6**
SS77C	SGA195	0-1	12/7/1996	Sample	**25.3**
SS77D	SGB061	0-1	12/7/1996	Sample	**12.5 J**
SS77F	MIA225	0-1	10/10/1998	Sample	**12.3**
TEC91A	MIA098	0.6-1	10/9/1998	Sample	**12.4**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-12
FU-5 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(20.6)	AA0009	4-7	10/23/1996	Sample	**48.3 J**
A(20.6)	AA0010	7-10	10/23/1996	Sample	**22.9 J**
SB75B	SGB082	4-6	12/10/1996	Sample	**16.6**
SB76A	SGA348	4-6	12/10/1996	Sample	**27.7**
SB76B	SGA351	4-6	12/10/1996	Sample	**39.7**
SB76C	SGA354	4-6	12/10/1996	Sample	**36.5**
SB77A	SGA198	4-5	12/8/1996	Sample	**29.1**
SB77A	SGA199	9.5-10	12/8/1996	Sample	**27.9**
SB77B	SGA202	4-5	12/9/1996	Sample	**29.5**
SB77B	SGA203	9-10	12/9/1996	Sample	**33.7**
SB78A	SGA357	4-6	12/10/1996	Sample	**29.8**
SB78B	SGB087	4-6	12/11/1996	Sample	**14.8**
SB78C	SGA363	4-6	12/11/1996	Sample	**28.7**
TEC91A	MIA099	3-5	10/9/1998	Sample	**19.5**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-13
FU-5 CHROMIUM TOTAL ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB76A	SGA349	18-20	12/10/1996	Sample	**41.6**
SB76B	SGA352	18-20	12/10/1996	Sample	**41.1**
SB76C	SGB083	18-20	12/10/1996	Sample	**9.6**
SB78A	SGA358	18-21	12/10/1996	Sample	**36.5**
SB78B	SGB086	18-20	12/11/1996	Sample	**12**
SB78C	SGA364	18-21	12/11/1996	Sample	**29.6**

Notes:
1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-14
FU-6 CHROMIUM TOTAL ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB58A	MIA174	0-1	10/9/1998	Sample	**17.1**
SB58B	MIA179	0-1	10/9/1998	Sample	**20.6**
SB67A	SGA484	0-1	12/17/1996	Sample	**25.2**
SB67A	SGA485FD1	0-1	12/17/1996	FD	**22.3**
SB67B	SGB065	0-1	12/18/1996	Sample	**13**
SB68C	MIA183	0-1	10/9/1998	Sample	**11.3**
SS1A	MIA134	0-1	10/7/1998	Sample	**14 J**
SS25	LAWSS25	1-2	3/19/1989	Sample	**14**
SS30	LAWSS30	1-2	3/19/1989	Sample	**14**
SS31	LAWSS31	1-2	3/19/1989	Sample	**10**
SS58C	RHA049	0-1	1/19/1997	Sample	**12.5**
SS66A	SGB063	0-1	12/22/1996	Sample	**22.8**
SS67A	SGA261FD1	0-1	12/6/1996	FD	**26**
SS67A	SGA128	0-1	12/6/1996	Sample	**27.7**
SS67B	SGB043	0-1	12/6/1996	Sample	**15.7 J**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
2) Location SS1A is in the Unlimited Use/Unrestricted Exposure (UU/UE) area of FU-6 and its result is compared to the Residential RSLs of 0.3 mg/kg for hexavalent chromium (**bold**) and 12,000 mg/kg for trivalent chromium.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-15
FU-6 CHROMIUM TOTAL ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB58A	MIA177	3-5	10/9/1998	Sample	**11.7**
SB58A	MIA178	8-10	10/9/1998	Sample	**14.7**
SB58B	MIA180	3-5	10/9/1998	Sample	**14.6**
SB58B	MIA181	8-10	10/9/1998	Sample	**15.4**
SB66A	SGB134	3-5	12/17/1996	Sample	**14.3**
SB67A	SGA131	4-6	12/17/1996	Sample	**27.6**
SB67A	SGB136	8-10	12/17/1996	Sample	**13.7**
SB67B	SGA136	3-5	12/18/1996	Sample	**26.7**
SB67B	SGA137	8-10	12/18/1996	Sample	**27.4**
SB68C	MIA184	8-10	10/9/1998	Sample	**17.9**

Notes:
1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-16
FU-6 CHROMIUM TOTAL ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB67A	SGA134	38-40	12/17/1996	Sample	**11.3**
SB67A	SGA133	18-20	12/17/1996	Sample	**26.4**
SB67B	SGA139	38-40	12/18/1996	Sample	**10.7**
SB67B	SGB142	18-20	12/18/1996	Sample	**12.3**

Notes:

1) Chromium total results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 6.3 mg/kg for hexavalent chromium are shown in **bold**. All results are below the Industrial Soil RSL of 180,000 mg/kg for trivalent chromium.
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE J-17
SUMMARY OF EXCAVATED SAMPLE LOCATIONS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Sample Date	Start Depth (feet)	End Depth (feet)	Chromium Result (mg/kg)	Detection Limit (mg/kg)
FU-3 Parcels 35 and 28						
A(35.2)	A129	10/18/1996	0	0.5	27.3	0.24
A(35.2)	DUP11	10/18/1996	0	0.5	27	0.24
B(35.2)	B129	10/18/1996	0	0.5	49	2.2
C(35.2)	C129	10/18/1996	0	0.5	60.9	2.2
C(35.2)	AA0011	10/23/1996	0	4	17	2.4
SB31A	SGA015	12/18/1996	0	1	38.7	2.4
SB31A	SGA487FD1	12/18/1996	0	1	34.7	2.4
SB32A	RHA012	1/18/1997	0	1	915	2.2
SB33C	SGA041	12/19/1996	0	1	37.6	2.4
SS16	LAWSS16	2/21/1989	0.2	1.2	6710	N/A
SS17	LAWSS17	2/22/1989	0.2	1.2	109	N/A
SS18	LAWSS18	2/22/1989	0.2	1.2	8680	N/A
SS31A	SGA011	12/7/1996	0	1	530	2.2
SS31D	SGB058	12/7/1996	0.5	1	37.4	0.26
SS32B	RHA015	1/18/1997	0	1	138	2.4
SS32D	RHA017	1/18/1997	0	1	207	2.3
SS32E	RHA018	1/18/1997	0	1	26.6	0.26
SS32F	RHA019	1/18/1997	0	1	45.2	2.1
SS32G	RHA020	1/18/1997	0	1	336	2.2
SS32G	RHA021FD1	1/18/1997	0	1	164	2.4
SS33D	SGA028	12/8/1996	0	1	158	2.3
SS33E	SGB068	12/8/1996	0	1	22.5	0.26
SS33H	MIA334	10/8/1998	0	1	265	0.12
SS33K	MIA325	10/8/1998	0	1	403	0.12
SS33M	MIA328FD	10/8/1998	0	1	143	0.11
SS33M	MIA327	10/8/1998	0	1	133	0.11
SS45	LAWSS45	10/27/1989	0	1	138	N/A
SS89F	SGA253	12/6/1996	0	1	67.5	2.2
SS89H	SGA257	12/6/1996	0	1	443	2.3
SS89J	SGA259	12/6/1996	0	1	539	2.3
SS89J	SGA260FD1	12/6/1996	0	1	273	2.4
SS89N	MIA157	10/8/1998	0	1	67.9	0.12
SS89O	MIA158	10/8/1998	0	1	42	0.12
FU-4 Building 949						
SB83B	SGA401	12/13/1996	0	1	1750	3.3
SS20	LAWSS20	2/22/1989	0	1	16200	N/A
SS83B	SGB075	12/9/1996	0	1	1310	0.25
SS83C	SGA286	12/9/1996	0	1	610	2.2
SS83E	MIA236	10/10/1998	0	1	131	0.11
SS83M	MIA244	10/11/1998	0	1	245	0.11
FU-6 Cafeteria						
SS48A	RHA041	1/23/1997	0	1	16	0.057

Notes:

The sampling locations marked as excavated (approximately to 1 foot) have been identified based on review of the 2000 Main Installation (MI) Remedial Investigation (RI) report and historic removal actions.

FU = Functional unit

mg/kg = Milligram per kilogram

N/A = Not available

K

Appendix K

Chromium Soil Analytical Results Figures



Notes:
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates.
   The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

Callout Legend:

Location
(Depth Interval, feet) Total Cr (mg/kg)

- Area Available for Unrestricted Use
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure K-1

FU-1 Chromium Total Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N
W E
S

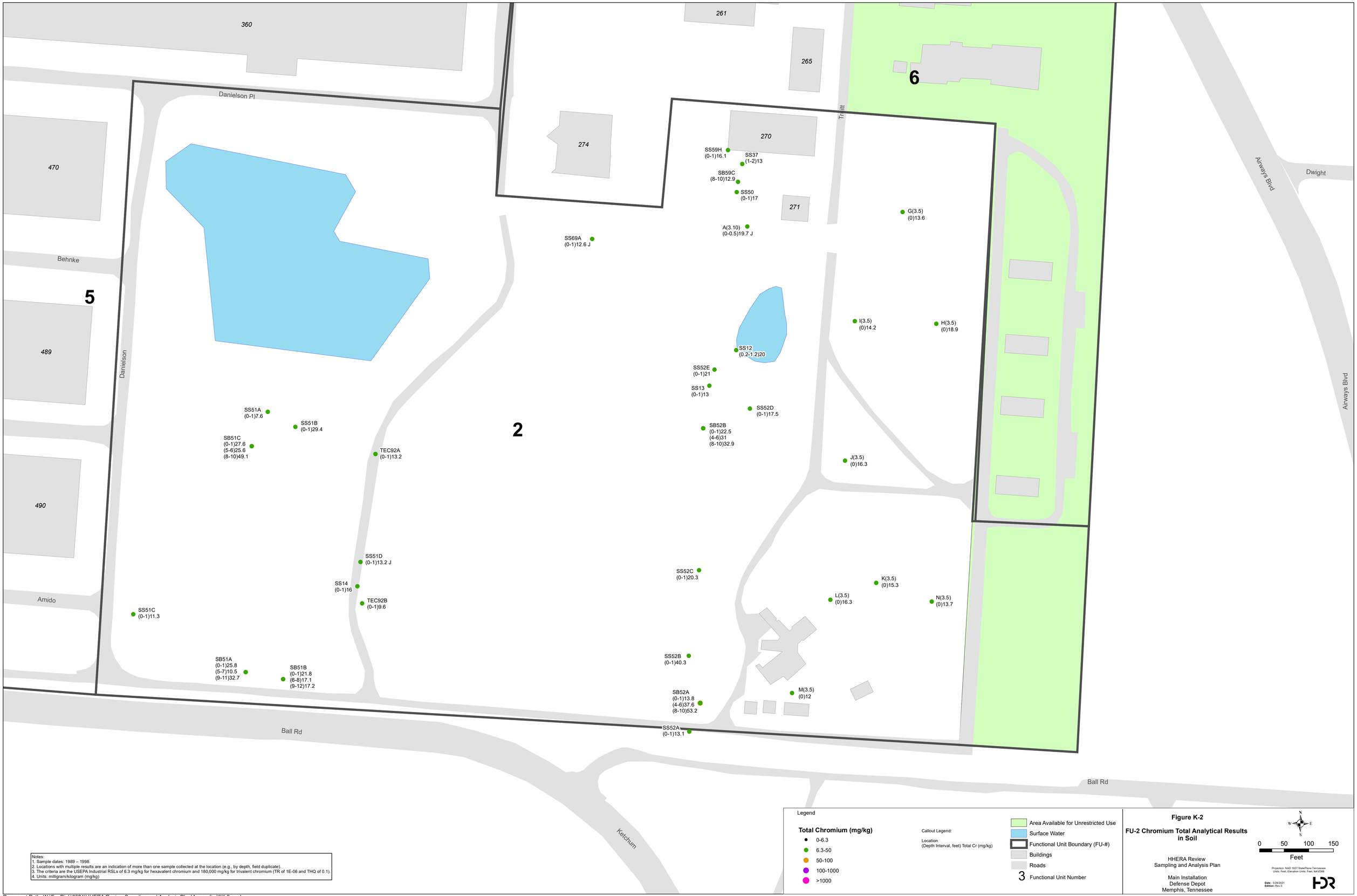
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Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

Callout Legend:

Location
(Depth Interval, feet) Total Cr (mg/kg)

- Area Available for Unrestricted Use
- Surface Water
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure K-2

FU-2 Chromium Total Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

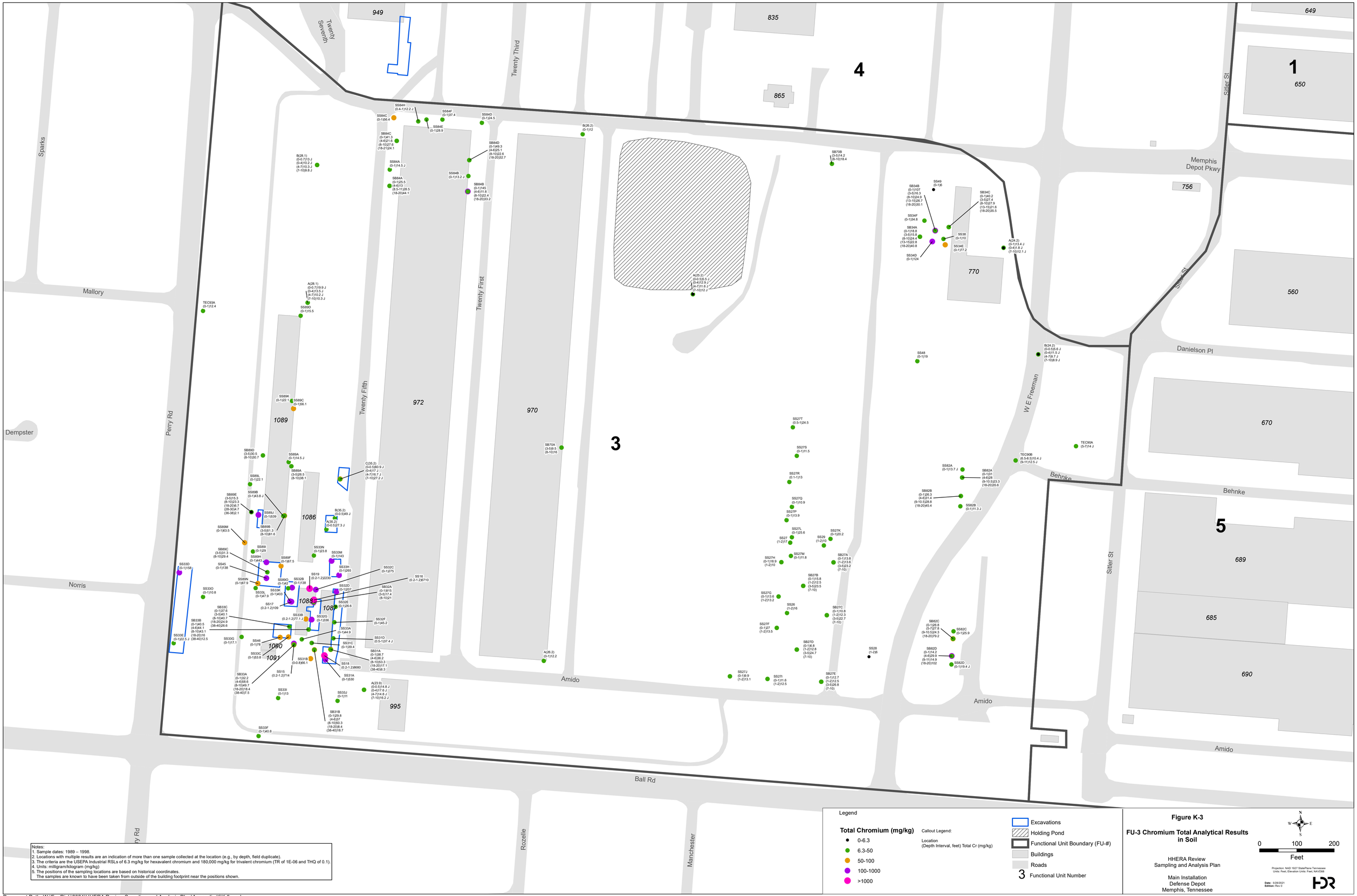
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Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

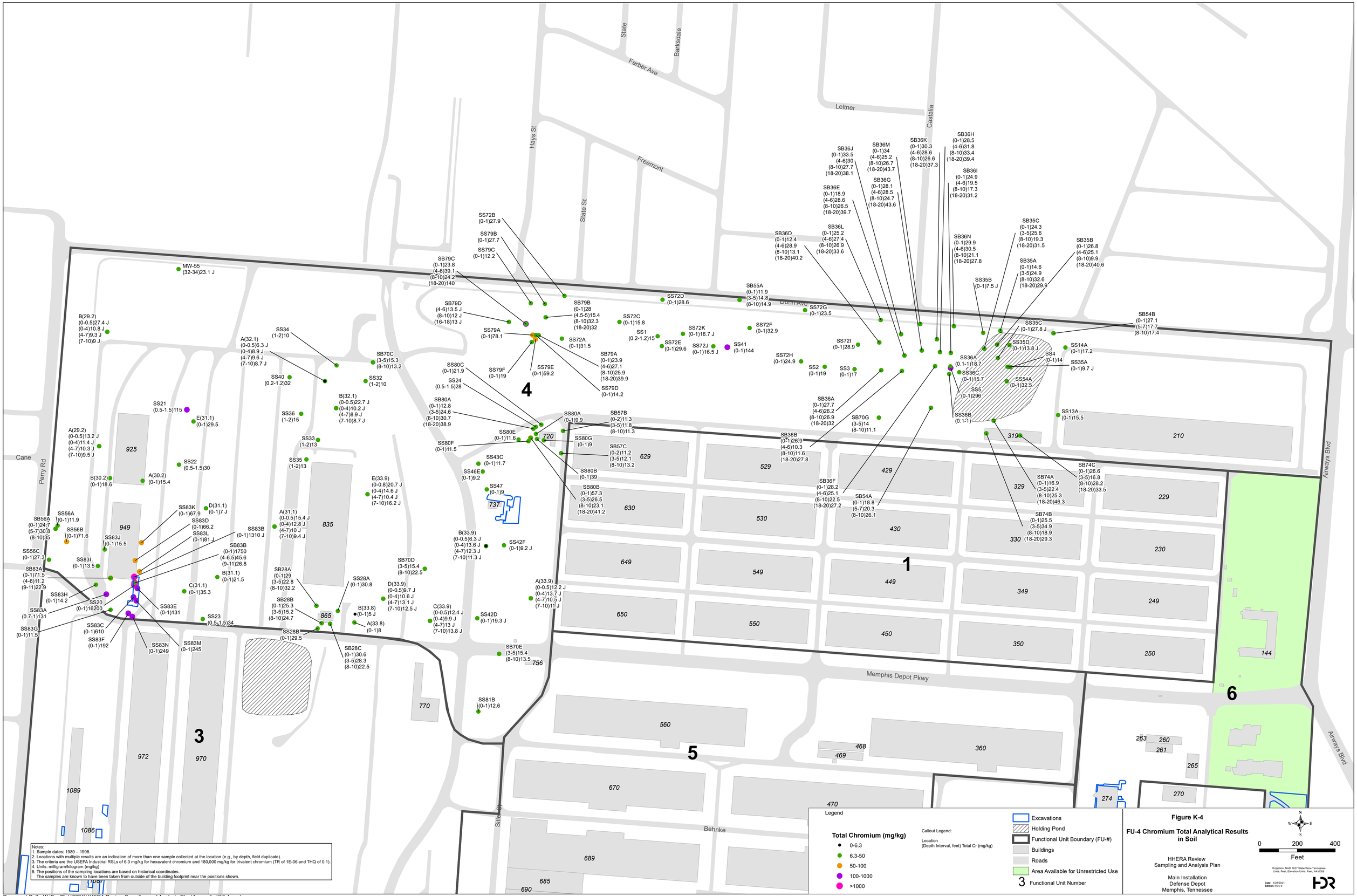
Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates.
The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

Callout Legend:
Location
(Depth Interval, feet) Total Cr (mg/kg)

- Excavations
- Holding Pond
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure K-4

FU-4 Chromium Total Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 200 400
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

FDR

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Notes:
1. Sample dates: 1996 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

Callout Legend:

Location
(Depth Interval, feet) Total Cr (mg/kg)

- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure K-5

FU-5 Chromium Total Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

FDR

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Notes:
1. Sample dates: 1989 – 1998.
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criteria are the USEPA Industrial RSLs of 6.3 mg/kg for hexavalent chromium and 180,000 mg/kg for trivalent chromium (TR of 1E-06 and THQ of 0.1).
4. Units: milligram/kilogram (mg/kg)

Legend

Total Chromium (mg/kg)
- 0-6.3
- 6.3-50
- 50-100
- 100-1000
- >1000

Callout Legend:

Location
(Depth Interval, feet) Total Cr (mg/kg)

- Excavations
- Area Available for Unrestricted Use
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure K-6

FU-6 Chromium Total Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

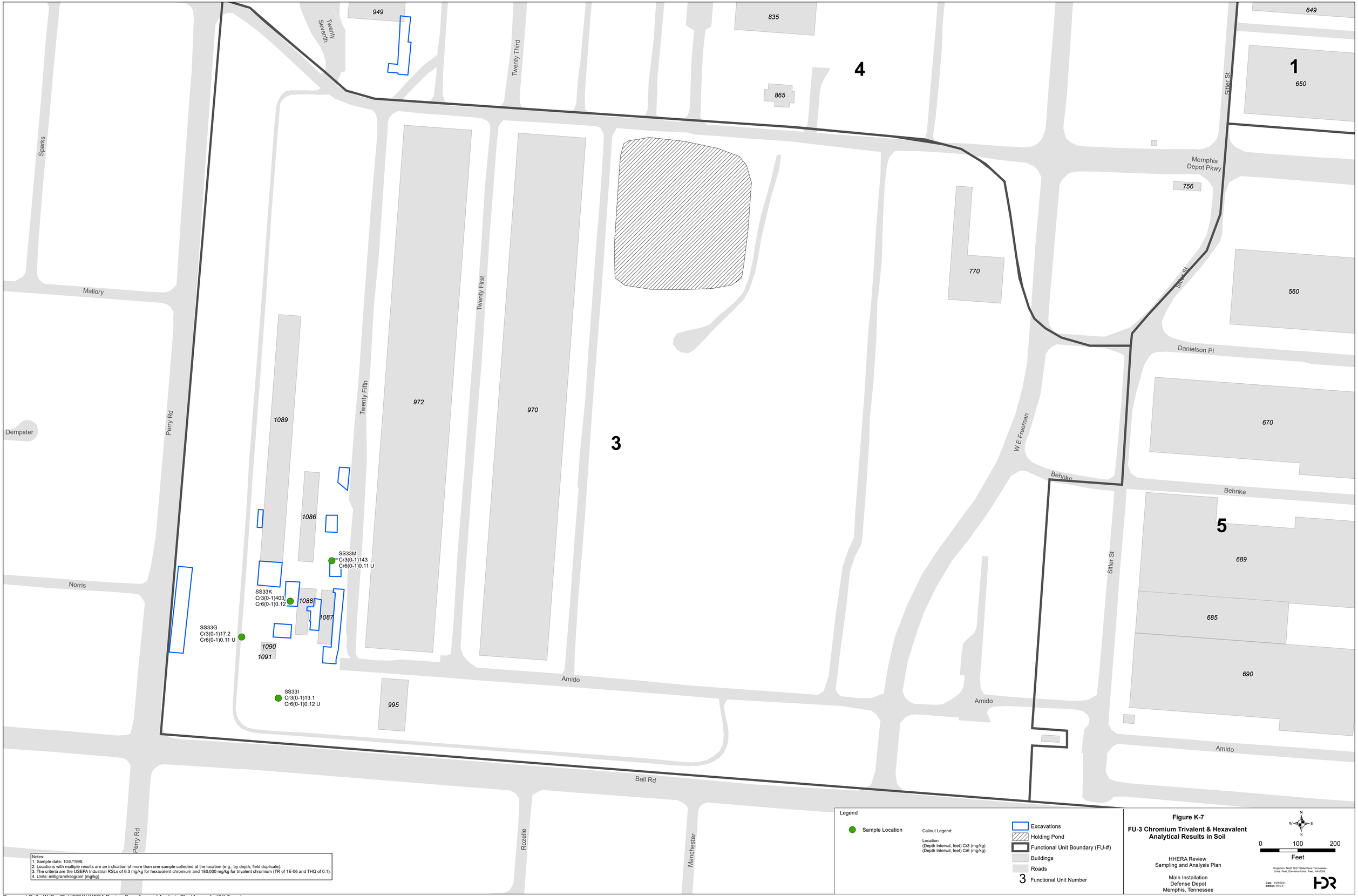
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Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Appendix L

Lead Soil Analytical Results Tables

TABLE L-1
FU-1 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
E(10.2)	E(10_2)	0-1	1/8/1998	Sample	37.9 J
F(10.2)	F(10_2)	0-1	1/8/1998	Sample	31.1 J
SB57A	RHA072	0-2	1/22/1997	Sample	10.5
SB57D	RHA081	0-2	1/22/1997	Sample	16
SB57E	RHA085	0-2	1/22/1997	Sample	33.2
SB57F	RHA088	0-2	1/23/1997	Sample	11.7
SB57G	RHA091	0-2	1/23/1997	Sample	14.2
SB57H	RHA095	0-2	1/23/1997	Sample	19.8
SB57I	RHA098	0-2	1/23/1997	Sample	7.3
SS10	LAWSS10	0.5-1.5	2/12/1989	Sample	81
SS11	LAWSS11	0.5-1.5	2/12/1989	Sample	**1,680**
SS11A	MIA302	0-1	10/13/1998	Sample	29.2 J
SS42	LAWSS42	0-1	10/26/1989	Sample	**1,120**
SS43	LAWSS43	0-1	10/26/1989	Sample	126
SS65E	SGB025	0-1	12/6/1996	Sample	97.7
SS65H	MIA189FD	0-1	10/9/1998	FD	53.6 J
SS65H	MIA188	0-1	10/9/1998	Sample	43.7 J
SS65I	MIA193	0-1	10/9/1998	Sample	15.4 J
SS66B	MIA218	0-1	10/10/1998	Sample	38.4 J
SS66C	MIA220	0-1	10/10/1998	Sample	41.6 J
SS66D	MIA221	0-1	10/10/1998	Sample	34.3 J
SS66E	MIA223FD	0-1	10/10/1998	FD	56.5 J
SS66E	MIA222	0-1	10/10/1998	Sample	49.9 J
SS6A	MIA137	0-1	10/7/1998	Sample	22.9
SS8A	MIA139FD	0-1	10/7/1998	FD	76.8
SS8A	MIA138	0-1	10/7/1998	Sample	65.4
SS9A	MIA141	0-1	10/7/1998	Sample	13.4

Notes:
Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg for lead are shown in **bold.**
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-2
FU-1 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB57A	RHA073	3-5	1/22/1997	Sample	8.1
SB57A	RHA074	8-10	1/22/1997	Sample	7.4
SB57D	RHA083FD1	3-5	1/22/1997	FD	13.1
SB57D	RHA082	3-5	1/22/1997	Sample	11
SB57D	RHA084	8-10	1/22/1997	Sample	8.8
SB57E	RHA086	3-5	1/22/1997	Sample	10.5
SB57E	RHA087	8-10	1/22/1997	Sample	8.4
SB57F	RHA089	3-5	1/23/1997	Sample	9.8
SB57F	RHA090	8-10	1/23/1997	Sample	7.5
SB57G	RHA094FD1	3-5	1/23/1997	FD	9.4
SB57G	RHA092	3-5	1/23/1997	Sample	8.5
SB57G	RHA093	8-10	1/23/1997	Sample	8.3
SB57H	RHA096	3-5	1/23/1997	Sample	8.4
SB57H	RHA097	8-10	1/23/1997	Sample	10
SB57I	RHA099	3-5	1/23/1997	Sample	8.5
SB57I	RHA100	8-10	1/23/1997	Sample	9.5
SB70F	RHA167	3-5	1/22/1997	Sample	13.2
SB70F	RHA168	8-10	1/22/1997	Sample	10.1
SB70H	RHA171	3-5	1/22/1997	Sample	7.3
SB70H	RHA172	8-10	1/22/1997	Sample	8.2
SB70I	RHA173	3-5	1/22/1997	Sample	11
SB70I	RHA174FD1	3-5	1/22/1997	FD	10.6
SB70I	RHA175	8-10	1/22/1997	Sample	14.4
SB70J	RHA176	3-5	1/22/1997	Sample	9.1
SB70J	RHA177	8-10	1/22/1997	Sample	9.5

Notes:
No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
FD = Field duplicate
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-3
FU-2 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(3.10)	A9	0-0.5	10/18/1996	Sample	83.4 J
G(3.5)	G3_5	0-0	9/25/1997	Sample	12.2
H(3.5)	H3_5	0-0	9/28/1997	Sample	48.6
I(3.5)	I3_5	0-0	9/28/1997	Sample	16.8
J(3.5)	J3_5	0-0	9/28/1997	Sample	14.6
K(3.5)	K3_5	0-0	9/26/1997	Sample	15.6
L(3.5)	L3_5	0-0	9/28/1997	Sample	20
M(3.5)	M3_5	0-0	9/28/1997	Sample	38.1
N(3.5)	N3_5	0-0	9/28/1997	Sample	68.8
SB51A	SGA168	0-1	12/19/1996	Sample	63.2
SB51B	SGA171	0-1	12/12/1996	Sample	62.2
SB51C	SGA174	0-1	12/19/1996	Sample	41.5
SB52A	SGB148	0-1	12/19/1996	Sample	24.4
SB52A	SGB149FD1	0-1	12/19/1996	FD	16.8
SB52B	SGA491FD1	0-1	12/19/1996	FD	23.8
SB52B	SGA158	0-1	12/19/1996	Sample	17.9
SS12	LAWSS12	0.2-1.2	2/21/1989	Sample	80
SS13	LAWSS13	0-1	2/21/1989	Sample	50
SS14	LAWSS14	0-1	2/21/1989	Sample	80
SS37	LAWSS37	1-2	3/30/1989	Sample	71
SS50	LAWSS50	0-1	10/27/1989	Sample	157
SS51A	SGB048	0-1	12/13/1996	Sample	2.8
SS51B	SGA166	0-1	12/13/1996	Sample	138
SS51C	SGB116	0-1	12/13/1996	Sample	22.1
SS51D	MIA033	0-1	9/30/1998	Sample	318
SS51D	MIA034FD	0-1	9/30/1998	FD	34.6
SS52A	SGB085	0-1	12/7/1996	Sample	18.5
SS52B	SGB041	0-1	12/6/1996	Sample	150
SS52C	SGB042	0-1	12/6/1996	Sample	32.2
SS52D	SGA153	0-1	12/6/1996	Sample	33.8
SS52E	SGB045	0-1	12/6/1996	Sample	29.9
SS59H	RHA070	0-1	1/19/1997	Sample	14.9
SS69A	SGB046	0-1	12/6/1996	Sample	11.4
TEC92A	MIA128	0-1	10/13/1998	Sample	36.3 J
TEC92A	MIA129FD	0-1	10/13/1998	FD	35.4 J
TEC92B	MIA132	0-1	10/13/1998	Sample	11.4 J

Notes:

No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-4
FU-2 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB51A	SGB147	5-7	12/19/1996	Sample	9.6
SB51A	SGA170	9-11	12/19/1996	Sample	32.9
SB51B	SGA172	6-8	12/12/1996	Sample	17.5
SB51B	SGA173	9-12	12/12/1996	Sample	15.9
SB51C	SGA175	5-6	12/19/1996	Sample	19.8
SB51C	SGA176	8-10	12/19/1996	Sample	24.7
SB52A	SGA156	4-6	12/19/1996	Sample	31.7
SB52A	SGA157	8-10	12/19/1996	Sample	27.4
SB52B	SGA159	4-6	12/19/1996	Sample	22.9
SB52B	SGA160	8-10	12/19/1996	Sample	24.2
SB59C	MIA182	8-10	10/9/1998	Sample	8

Notes:
No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-5
FU-3 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(23.9)	A93	0-0.5	10/19/1996	Sample	11.1 J
A(23.9)	AA0014	0-4	10/23/1996	Sample	8.6 J
A(24.2)	DUP8	0-1	10/18/1996	FD	47.4 J
A(24.2)	A97	0-1	10/18/1996	Sample	39.6 J
A(24.2)	AA0048	0-4	10/24/1996	Sample	4.6 J
A(25.2)	A101	0-0.5	10/18/1996	Sample	2.8 J
A(25.2)	AA0053	0-4	10/24/1996	Sample	15.8 J
A(26.2)	970A	0-1	1/8/1998	Sample	15.4 J
A(28.1)	A106	0-0.7	10/18/1996	Sample	58.8 J
A(28.1)	DUP9	0-0.7	10/18/1996	FD	48.1 J
A(28.1)	AA0017	0-4	10/23/1996	Sample	12.9 J
B(24.2)	B97	0-0.5	10/18/1996	Sample	5 J
B(24.2)	AA0045	0-4	10/24/1996	Sample	13.8 J
B(26.2)	970B	0-1	1/8/1998	Sample	42.3 J
B(28.1)	B106	0-0.7	10/18/1996	Sample	14.3 J
B(28.1)	AA0020	0-4	10/23/1996	Sample	9.8 J
SB27A	RHA134	0-1	1/21/1997	Sample	11.9
SB27A	RHA135	1-2	1/21/1997	Sample	12
SB27B	RHA136	0-1	1/21/1997	Sample	16.1
SB27B	RHA137	1-2	1/21/1997	Sample	15.8
SB27C	RHA138	0-1	1/21/1997	Sample	7.6
SB27C	RHA139	1-2	1/21/1997	Sample	11.2
SB27D	RHA140	0-1	1/21/1997	Sample	9.7
SB27D	RHA141	1-2	1/21/1997	Sample	9.3
SB27E	RHA142	0-1	1/21/1997	Sample	25
SB27E	RHA143	1-2	1/21/1997	Sample	9.7
SB31B	SGA020	0-1	12/18/1996	Sample	37.3
SB33A	SGA031	0-1	12/18/1996	Sample	46.9
SB33B	SGA488FD1	0-1	12/18/1996	FD	119
SB33B	SGA036	0-1	12/18/1996	Sample	20.1
SB34A	RHA035	0-1	1/18/1997	Sample	94.1
SB34B	RHA036	0-1	1/18/1997	Sample	702
SB34C	RHA037	0-1	1/18/1997	Sample	93.6
SB82A	SGA477FD1	0-1	12/11/1996	FD	35.9
SB82A	SGA217	0-1	12/11/1996	Sample	26.2
SB82B	SGA221	0-1	12/11/1996	Sample	22.9
SB82C	SGA225	0-1	12/11/1996	Sample	33.5
SB82D	SGB095	0-1	12/12/1996	Sample	13.9
SB84A	SGA382	0-1	12/12/1996	Sample	21.5
SB84A	SGA478FD1	0-1	12/12/1996	FD	15.1
SB84B	SGA386	0-1	12/13/1996	Sample	72.8
SB84B	SGA481FD1	0-1	12/13/1996	FD	25.6
SB84C	SGA390	0-1	12/13/1996	Sample	104
SB84D	SGA394	0-1	12/13/1996	Sample	81
SS15	LAWSS15	0.2-1.2	2/21/1989	Sample	**2,670**
SS19	LAWSS19	0.2-1.2	2/22/1989	Sample	**10,300**
SS26	LAWSS26	1-2	3/19/1989	Sample	17
SS27	LAWSS27	1-2	3/19/1989	Sample	13
SS27F	RHA144	0-1	1/21/1997	Sample	156
SS27F	RHA146	1-2	1/21/1997	Sample	10.5
SS27G	RHA147	0-1	1/21/1997	Sample	60.3
SS27G	RHA148	1-2	1/21/1997	Sample	10.9
SS27H	RHA149	0-1	1/21/1997	Sample	40.5
SS27H	RHA150	1-2	1/21/1997	Sample	10.4
SS27I	RHA151	0-1	1/21/1997	Sample	12.6
SS27I	RHA152	1-2	1/21/1997	Sample	9.9
SS27J	RHA153	0-1	1/21/1997	Sample	27.5
SS27J	RHA155FD1	1-2	1/21/1997	FD	9.9
SS27J	RHA154	1-2	1/21/1997	Sample	9.4
SS27K	MIA042	0-1	10/1/1998	Sample	58.5
SS27L	MIA044	0-1	10/1/1998	Sample	41
SS27M	MIA045	0-1	10/1/1998	Sample	16.6
SS27P	MIA048	0-1	10/1/1998	Sample	42.6

TABLE L-5
FU-3 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SS27Q	MIA050FD	0-1	10/1/1998	FD	19.4
SS27Q	MIA049	0-1	10/1/1998	Sample	19.3
SS27R	MIA355	0.1-1	10/1/1998	Sample	30.4
SS27S	MIA051	0-1	10/1/1998	Sample	26.3
SS27T	MIA052	0.5-1	10/1/1998	Sample	24
SS28	LAWSS28	1-2	3/19/1989	Sample	15
SS29	LAWSS29	1-2	3/19/1989	Sample	11
SS31B	SGA012	0-0.83	12/7/1996	Sample	85.5
SS31C	SGA013	0-1	12/7/1996	Sample	84.6
SS31C	SGA300FD1	0-1	12/7/1996	FD	71.2
SS32C	RHA016	0-1	1/18/1997	Sample	693
SS33A	SGA025	0-1	12/8/1996	Sample	129
SS33B	SGB067	0.2-1.2	12/8/1996	Sample	321
SS33C	SGA027	0-1	12/8/1996	Sample	200
SS33F	SGA030	0-1	12/8/1996	Sample	79.3
SS33G	MIA333	0-1	10/8/1998	Sample	34.6
SS33I	MIA335	0-1	10/8/1998	Sample	22.8
SS33J	MIA336	0-1	10/8/1998	Sample	10
SS33L	MIA326	0-1	10/8/1998	Sample	114
SS33N	MIA330	0-1	10/8/1998	Sample	62.3
SS33O	MIA331	0-1	10/8/1998	Sample	13.2
SS34D	RHA038	0-1	1/17/1997	Sample	**960**
SS34E	RHA180FD1	0-1	1/17/1997	FD	505
SS34E	RHA039	0-1	1/17/1997	Sample	340
SS34F	RHA040	0-1	1/17/1997	Sample	145
SS38	LAWSS38	0-1	3/30/1989	Sample	48
SS39	LAWSS39	0-1	3/30/1989	Sample	24
SS46	LAWSS46	0-1	10/27/1989	Sample	166
SS48	LAWSS48	0-1	10/27/1989	Sample	90
SS49	LAWSS49	0-1	10/27/1989	Sample	4
SS82A	SGB050	0-1	12/7/1996	Sample	19.2
SS82B	SGB059	0-1	12/7/1996	Sample	24.3
SS82C	SGA215	0-1	12/7/1996	Sample	50.8
SS82D	SGB060	0-1	12/7/1996	Sample	11.8
SS84A	SGB070	0-1	12/8/1996	Sample	12.5
SS84B	SGB069	0-1	12/8/1996	Sample	12
SS84C	SGA280	0-1	12/8/1996	Sample	45.5
SS84D	SGA281	0-1	12/8/1996	Sample	26.7
SS84E	SGA282	0-1	12/8/1996	Sample	60.8
SS84F	SGA283	0-1	12/8/1996	Sample	31
SS84H	MIA032	0.4-1	9/30/1998	Sample	17.7
SS89A	SGB044	0-1	12/6/1996	Sample	24.6
SS89B	SGB039	0-1	12/6/1996	Sample	139
SS89C	SGA250	0-1	12/6/1996	Sample	227
SS89D	SGA251	0-1	12/6/1996	Sample	14.9
SS89I	SGA258	0-1	12/6/1996	Sample	30.2
SS89K	MIA153	0-1	10/8/1998	Sample	39.9
SS89L	MIA155	0-1	10/8/1998	Sample	64.7
SS89M	MIA156	0-1	10/8/1998	Sample	256
TEC93A	MIA332	0-1	10/8/1998	Sample	15.4

Notes:
Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg for lead are shown in **bold.**
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-6
FU-3 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(23.9)	AA0015	4-7	10/23/1996	Sample	8.4 J
A(23.9)	AA0016	7-10	10/23/1996	Sample	12.2 J
A(24.2)	AA0049	7-10	10/24/1996	Sample	10.1 J
A(25.2)	AA0054	4-7	10/24/1996	Sample	11.9 J
A(25.2)	AA0055	7-10	10/24/1996	Sample	9.8 J
A(28.1)	AA0018	4-7	10/23/1996	Sample	8.9 J
A(28.1)	AA0019	7-10	10/23/1996	Sample	7.6 J
B(24.2)	AA0046	4-7	10/24/1996	Sample	11.1 J
B(24.2)	AA0047	7-10	10/24/1996	Sample	8.5 J
B(28.1)	AA0021	4-7	10/23/1996	Sample	10.1 J
B(28.1)	AA0022	7-10	10/23/1996	Sample	6.2 J
C(35.2)	AA0012	4-7	10/23/1996	Sample	7.7 J
C(35.2)	AA0013	7-10	10/23/1996	Sample	11.9 J
SB27A	RHA001	3-5	1/21/1997	Sample	9.7
SB27A	RHA002	8-10	1/21/1997	Sample	6.9
SB27B	RHA003	3-5	1/21/1997	Sample	9.8
SB27B	RHA004	8-10	1/21/1997	Sample	7.9
SB27C	RHA005	3-5	1/21/1997	Sample	9.4
SB27C	RHA006	8-10	1/21/1997	Sample	7.5
SB27D	RHA007	3-5	1/21/1997	Sample	9.1
SB27D	RHA145FD1	3-5	1/21/1997	FD	8.4
SB27D	RHA008	8-10	1/21/1997	Sample	7.8
SB27E	RHA009	3-5	1/21/1997	Sample	8.7
SB27E	RHA011FD1	3-5	1/21/1997	FD	8.3
SB27E	RHA010	8-10	1/21/1997	Sample	7.4
SB31A	SGA016	4-6	12/18/1996	Sample	22.6
SB31A	SGA017	8-10	12/18/1996	Sample	26.6
SB31B	SGA021	4-6	12/18/1996	Sample	23
SB31B	SGA022	8-10	12/18/1996	Sample	26.2
SB32A	RHA013	3-5	1/22/1997	Sample	9.1
SB32A	RHA014	8-10	1/22/1997	Sample	10.9
SB33A	SGA032	4-6	12/18/1996	Sample	30
SB33A	SGA033	8-10	12/18/1996	Sample	28.5
SB33B	SGA037	4-6	12/18/1996	Sample	20.4
SB33B	SGA038	8-10	12/18/1996	Sample	30.8
SB33C	SGA042	3-5	12/19/1996	Sample	19.3
SB33C	SGA043	8-10	12/19/1996	Sample	20
SB34A	RHA022	3-5	1/21/1997	Sample	13
SB34A	RHA023	8-10	1/21/1997	Sample	9.1
SB34B	RHA026	3-5	1/21/1997	Sample	13.7
SB34B	RHA027	8-10	1/21/1997	Sample	9.2
SB34C	RHA030	3-5	1/21/1997	Sample	13.5
SB34C	RHA034FD1	3-5	1/21/1997	FD	11.1
SB34C	RHA031	8-10	1/21/1997	Sample	10.4
SB70A	RHA156	3-5	1/22/1997	Sample	7.5
SB70A	RHA157	8-10	1/22/1997	Sample	7.5
SB70B	RHA158	3-5	1/22/1997	Sample	10.4
SB70B	RHA159	8-10	1/22/1997	Sample	15.1
SB82A	SGA218	4-6	12/11/1996	Sample	29.3
SB82A	SGA219	9-10.5	12/11/1996	Sample	17.4
SB82B	SGA222	4-6	12/11/1996	Sample	31.1
SB82B	SGA223	9-10.5	12/11/1996	Sample	20.2
SB82C	SGA226	5-7	12/11/1996	Sample	19
SB82C	SGA227	9-10.5	12/11/1996	Sample	19.7
SB82D	SGA230	4-6	12/12/1996	Sample	27.9
SB82D	SGB094	9-11	12/12/1996	Sample	7.4
SB84A	SGB096	4-6	12/12/1996	Sample	13.1
SB84A	SGA384	8.5-11	12/12/1996	Sample	29.5
SB84B	SGB120	4-6	12/13/1996	Sample	8.9
SB84B	SGA388	8-10	12/13/1996	Sample	24.8
SB84C	SGA391	4-6	12/13/1996	Sample	25.5
SB84C	SGA392	8-10	12/13/1996	Sample	27.1
SB84D	SGA395	4-6	12/13/1996	Sample	282

TABLE L-6
FU-3 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB84D	SGA396	8-10	12/13/1996	Sample	19.3
SB89A	SGA374	3-5	12/21/1996	Sample	14.8
SB89A	SGA375	8-10	12/21/1996	Sample	14.2
SB89B	SGA492FD1	3-5	12/21/1996	FD	25.1
SB89B	SGA376	3-5	12/21/1996	Sample	17.6
SB89B	SGA377	8-10	12/21/1996	Sample	20.3
SB89C	SGA378	3-5	12/21/1996	Sample	17.2
SB89C	SGA379	8-10	12/21/1996	Sample	24.7
SB89D	SGA380	3-5	12/21/1996	Sample	15.6
SB89D	SGA381	8-10	12/21/1996	Sample	20.7
SB89E	MIA146	3-5	10/6/1998	Sample	8.4
SB89E	MIA147FD	3-5	10/6/1998	FD	7.5
SB89E	MIA149	8-10	10/6/1998	Sample	11.6
TEC90A	MIA074	5-7	10/7/1998	Sample	10.1
TEC90B	MIA075	6.5-8.5	10/7/1998	Sample	114
TEC90B	MIA076	9-11	10/7/1998	Sample	10.9

Notes:

No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-7
FU-3 LEAD ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB31A	SGA018	18-20	12/18/1996	Sample	11.1
SB31A	SGA019	38-40	12/18/1996	Sample	2
SB31B	SGB140	18-20	12/18/1996	Sample	6.3
SB31B	SGA024	38-40	12/18/1996	Sample	7.5
SB33A	SGA034	18-20	12/18/1996	Sample	10.4
SB33A	SGA035	38-40	12/18/1996	Sample	1.1
SB33B	SGA039	18-20	12/18/1996	Sample	7.7
SB33B	SGA040	38-40	12/18/1996	Sample	3.1
SB33C	SGA044	18-20	12/19/1996	Sample	12.3
SB33C	SGA045	38-40	12/19/1996	Sample	28.9
SB34A	RHA024	13-15	1/21/1997	Sample	7.3
SB34A	RHA025	18-20	1/21/1997	Sample	8
SB34B	RHA028	13-15	1/21/1997	Sample	7.9
SB34B	RHA029	18-20	1/21/1997	Sample	9
SB34C	RHA032	13-15	1/21/1997	Sample	6.8
SB34C	RHA033	18-20	1/21/1997	Sample	7.9
SB82A	SGA220	18-20	12/11/1996	Sample	15.4
SB82B	SGA224	18-20	12/11/1996	Sample	20.1
SB82C	SGA228	18-20	12/11/1996	Sample	17.3
SB82D	SGA232	18-20	12/12/1996	Sample	17.5
SB84A	SGA385	18-20	12/12/1996	Sample	16.1
SB84B	SGA389	18-20	12/13/1996	Sample	11.8
SB84C	SGA393	18-21	12/13/1996	Sample	15.3
SB84D	SGA397	18-20	12/13/1996	Sample	19.3
SB89E	MIA150	18-20	10/6/1998	Sample	4.6
SB89E	MIA151	28-30	10/6/1998	Sample	3.1
SB89E	MIA152	36-38	10/6/1998	Sample	1.7

Notes:
No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-8
FU-4 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(29.2)	DUP3	0-0.5	10/17/1996	FD	35.5 J
A(29.2)	A109	0-0.5	10/17/1996	Sample	29.7 J
A(29.2)	AA0023	0-4	10/23/1996	Sample	10.9 J
A(30.2)	925A	0-1	1/8/1998	Sample	25.6 J
A(31.1)	A116	0-0.5	10/16/1996	Sample	22.4 J
A(31.1)	AA0036	0-4	10/24/1996	Sample	14.8 J
A(32.1)	A117	0-0.5	10/16/1996	Sample	5.2 J
A(32.1)	AA0030	0-4	10/23/1996	Sample	10 J
A(33.8)	A(33_8)	0-1	1/8/1998	Sample	6.6 J
A(33.9)	A125	0-0.5	10/18/1996	Sample	23.7 J
A(33.9)	AA0042	0-4	10/24/1996	Sample	14 J
B(29.2)	B109	0-0.5	10/17/1996	Sample	112 J
B(29.2)	AA0027	0-4	10/23/1996	Sample	10 J
B(30.2)	925B	0-1	1/8/1998	Sample	44 J
B(31.1)	B(31_1)	0-1	1/8/1998	Sample	67.2 J
B(32.1)	B117	0-0.5	10/16/1996	Sample	13.5 J
B(32.1)	AA0033	0-4	10/24/1996	Sample	10.4 J
B(33.8)	B(33_8)	0-1	1/8/1998	Sample	5.6 J
B(33.9)	B125	0-0.5	10/18/1996	Sample	9.9 J
B(33.9)	AA0056	0-4	10/24/1996	Sample	13.1 J
C(31.1)	DUP_1	0-1	1/8/1998	FD	233 J
C(31.1)	C(31_1)	0-1	1/8/1998	Sample	208 J
C(33.9)	C125	0-0.5	10/19/1996	Sample	11.1 J
C(33.9)	AA0039	0-4	10/24/1996	Sample	10.8 J
D(31.1)	D(31_1)	0-1	1/8/1998	Sample	8.7 J
D(33.9)	D125	0-0.5	10/19/1996	Sample	22.9 J
D(33.9)	AA0062	0-4	10/24/1996	Sample	11.4 J
E(31.1)	E(31_1)	0-1	1/8/1998	Sample	63.7 J
E(33.9)	E125	0-0.8	10/19/1996	Sample	72.3 J
E(33.9)	AA0059	0-4	10/24/1996	Sample	11 J
SB28A	SGA003	0-1	12/16/1996	Sample	43.5
SB28B	SGA006	0-1	12/16/1996	Sample	39.1
SB28C	SGA009	0-1	12/16/1996	Sample	28.2
SB35A	SGB159	0-1	12/21/1996	Sample	10.6 J
SB35B	SGA050	0-1	12/21/1996	Sample	22.4
SB35C	SGA054	0-1	12/21/1996	Sample	20.3
SB36A	SGA058	0-1	12/19/1996	Sample	34.6
SB36B	SGA062	0-1	12/20/1996	Sample	23.8
SB36B	SGA493FD1	0-1	12/20/1996	FD	20.7
SB36D	SGB166FD1	0-1	12/20/1996	FD	15.1 J
SB36D	SGB163	0-1	12/20/1996	Sample	13.6 J
SB36E	SGB165	0-1	12/20/1996	Sample	13.1 J
SB36F	SGA494FD1	0-1	12/20/1996	FD	25.5
SB36F	SGA078	0-1	12/20/1996	Sample	21.2
SB36G	SGA495FD1	0-1	12/20/1996	FD	27.2
SB36G	SGA082	0-1	12/20/1996	Sample	24
SB36H	SGA086	0-1	12/20/1996	Sample	131
SB36I	SGA090	0-1	12/21/1996	Sample	20.5
SB36J	SGA496FD1	0-1	12/21/1996	FD	34.9
SB36J	SGA094	0-1	12/21/1996	Sample	26.7
SB36K	SGA098	0-1	12/21/1996	Sample	25.9
SB36L	SGA102	0-1	12/21/1996	Sample	33.6
SB36M	SGA106	0-1	12/21/1996	Sample	26.1
SB36M	SGA497FD1	0-1	12/21/1996	FD	25.8
SB36N	SGA502FD1	0-1	12/21/1996	FD	26.6
SB36N	SGA110	0-1	12/21/1996	Sample	24.5
SB54A	SGA456	0-1	12/16/1996	Sample	26.1
SB54B	SGA459	0-1	12/16/1996	Sample	213
SB54B	SGA483FD1	0-1	12/16/1996	FD	20.8
SB55A	SGB123	0-1	12/21/1996	Sample	10.3 J
SB56A	SGA404	0-1	12/16/1996	Sample	23.7
SB57B	RHA075	0-2	1/22/1997	Sample	10.4
SB57C	RHA078	0-2	1/22/1997	Sample	13.7

TABLE L-8
FU-4 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB74A	SGB156	0-1	12/21/1996	Sample	13.6 J
SB74B	SGA466	0-1	12/21/1996	Sample	26
SB74C	SGA470	0-1	12/21/1996	Sample	32.5
SB79A	SGA441	0-1	12/17/1996	Sample	32.9
SB79B	SGB137	0-1	12/17/1996	Sample	208
SB79C	SGA449	0-1	12/17/1996	Sample	27.1
SB80A	SGB154	0-1	12/21/1996	Sample	10.5 J
SB80B	SGA437	0-1	12/21/1996	Sample	115
SB83A	SGA482FD1	0-1	12/13/1996	FD	73
SB83A	SGA398	0-1	12/13/1996	Sample	14.7
SS1	LAWSS1	0.2-1.2	2/9/1989	Sample	66
SS13A	MIA303	0-1	10/13/1998	Sample	32 J
SS14A	MIA304	0-1	10/13/1998	Sample	74.9 J
SS2	LAWSS2	0-1	2/9/1989	Sample	96
SS21	LAWSS21	0.5-1.5	2/22/1989	Sample	137
SS22	LAWSS22	0.5-1.5	2/22/1989	Sample	43
SS23	LAWSS23	0.5-1.5	2/22/1989	Sample	112
SS24	LAWSS24	0.5-1.5	3/19/1989	Sample	98
SS28A	SGA291	0-1	12/8/1996	Sample	45.8
SS28B	SGA292	0-1	12/8/1996	Sample	43.4
SS3	LAWSS3	0-1	2/9/1989	Sample	129
SS32	LAWSS32	1-2	3/19/1989	Sample	4
SS33	LAWSS33	1-2	3/19/1989	Sample	12
SS34	LAWSS34	1-2	3/19/1989	Sample	4
SS35	LAWSS35	1-2	3/19/1989	Sample	12
SS35A	MIA264	0-1	10/12/1998	Sample	20.2 J
SS35B	MIA265	0-1	10/12/1998	Sample	11.8 J
SS35C	MIA269	0-1	10/12/1998	Sample	187 J
SS35D	MIA270	0-1	10/12/1998	Sample	82.1 J
SS36	LAWSS36	1-2	3/19/1989	Sample	21
SS36A	MIA001	0.1-1	9/28/1998	Sample	39.1
SS36B	MIA005	0.2-1	9/28/1998	Sample	142
SS36C	MIA006	0-1	9/28/1998	Sample	55.9
SS4	LAWSS4	0-1	2/11/1989	Sample	22
SS40	LAWSS40	0.2-1.2	3/30/1989	Sample	19
SS41	LAWSS41	0-1	10/28/1989	Sample	**878**
SS42D	SGB072FD1	0-1	12/8/1996	FD	18.1
SS42D	SGB071	0-1	12/8/1996	Sample	14.9
SS42F	MIA275	0-1	10/12/1998	Sample	14.8 J
SS43C	SGB084	0-1	12/9/1996	FD	34.5
SS43C	SGB079	0-1	12/9/1996	Sample	33.1
SS46E	SGB080	0-1	12/10/1996	Sample	26
SS47	LAWSS47	0-1	10/27/1989	Sample	4
SS5	LAWSS5	0-1	2/11/1989	Sample	**2,420**
SS54A	SGA369	0-1	12/13/1996	Sample	62.5
SS54A	SGA480FD1	0-1	12/13/1996	FD	57.9
SS56A	SGB062	0-1	12/13/1996	Sample	21.4
SS56B	SGA289	0-1	12/13/1996	Sample	308
SS56C	SGA290	0-1	12/13/1996	Sample	44.9
SS72A	SGA317	0-1	12/11/1996	Sample	98.2
SS72B	SGA318	0-1	12/11/1996	Sample	100
SS72C	SGB088	0-1	12/11/1996	Sample	15.1
SS72D	SGA320	0-1	12/11/1996	Sample	33.1
SS72E	SGA321	0-1	12/11/1996	Sample	46.5
SS72F	SGA322	0-1	12/11/1996	Sample	33.5
SS72F	SGA476FD1	0-1	12/11/1996	FD	33
SS72G	SGA323	0-1	12/11/1996	Sample	28
SS72H	SGA324	0-1	12/11/1996	Sample	45.9
SS72I	SGA325	0-1	12/11/1996	Sample	31.3
SS72J	MIA040	0-1	9/30/1998	Sample	51.2
SS72K	MIA041	0-1	9/30/1998	Sample	97.9
SS79A	SGA314	0-1	12/12/1996	Sample	**1,060**
SS79B	SGA315	0-1	12/12/1996	Sample	105

TABLE L-8
FU-4 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SS79C	SGB097	0-1	12/12/1996	Sample	12.2
SS79D	MIA278FD	0-1	10/11/1998	FD	270
SS79D	MIA277	0-1	10/11/1998	Sample	269
SS79E	MIA280	0-1	10/11/1998	Sample	506
SS79F	MIA281	0-1	10/11/1998	Sample	83.9
SS79F	MIA282FD	0-1	10/11/1998	FD	80.8
SS80A	SGB081	0-1	12/10/1996	Sample	23.2
SS80B	SGA312	0-1	12/10/1996	Sample	237
SS80C	SGA313	0-1	12/10/1996	Sample	34.6
SS80C	SGA474FD1	0-1	12/10/1996	FD	34.1
SS80E	MIA295	0-1	10/13/1998	Sample	22.6 J
SS80F	MIA297FD	0-1	10/13/1998	FD	13.7 J
SS80F	MIA296	0-1	10/13/1998	Sample	12.7 J
SS80G	MIA299	0-1	10/13/1998	Sample	14.3 J
SS81B	SGB117	0-1	12/13/1996	Sample	15.2
SS83A	SGA284	0.7-1	12/9/1996	Sample	67.5
SS83D	MIA234	0-1	10/10/1998	Sample	93.2 J
SS83F	MIA237	0-1	10/10/1998	Sample	120 J
SS83G	MIA238	0-1	10/10/1998	Sample	24.9 J
SS83H	MIA239	0-1	10/10/1998	Sample	12.5 J
SS83I	MIA240	0-1	10/10/1998	Sample	22 J
SS83J	MIA241	0-1	10/11/1998	Sample	21.8
SS83K	MIA242	0-1	10/11/1998	Sample	80.2
SS83L	MIA243	0-1	10/12/1998	Sample	188 J
SS83N	MIA245	0-1	10/11/1998	Sample	437

Notes:
Results above the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg for lead are shown in **bold.**
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:
USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-9
FU-4 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(29.2)	AA0024	4-7	10/23/1996	Sample	8.8 J
A(29.2)	AA0025	7-10	10/23/1996	Sample	9.8 J
A(31.1)	AA0037	4-7	10/24/1996	Sample	10.9 J
A(31.1)	AA0038	7-10	10/24/1996	Sample	8.9 J
A(32.1)	AA0031	4-7	10/23/1996	Sample	8.4 J
A(32.1)	AA0032	7-10	10/23/1996	Sample	6.2 J
A(33.9)	AA0043	4-7	10/24/1996	Sample	18.6 J
A(33.9)	AA0044	7-10	10/24/1996	Sample	10.2 J
B(29.2)	AA0028	4-7	10/23/1996	Sample	8.7 J
B(29.2)	AA0029	7-10	10/23/1996	Sample	6.5 J
B(32.1)	AA0034	4-7	10/24/1996	Sample	8.6 J
B(32.1)	AA0035	7-10	10/24/1996	Sample	7.7 J
B(33.9)	AA0057	4-7	10/24/1996	Sample	12.5 J
B(33.9)	AA0058	7-10	10/24/1996	Sample	9.9 J
C(33.9)	AA0040	4-7	10/24/1996	Sample	13.4 J
C(33.9)	AA0041	7-10	10/24/1996	Sample	21.8 J
D(33.9)	AA0063	4-7	10/24/1996	Sample	10.6 J
D(33.9)	AA0064	7-10	10/24/1996	Sample	13.3 J
E(33.9)	AA0060	4-7	10/24/1996	Sample	12.5 J
E(33.9)	AA0061	7-10	10/24/1996	Sample	13.4 J
SB28A	SGA004	3-5	12/16/1996	Sample	24.9
SB28A	SGA005	8-10	12/16/1996	Sample	26.7
SB28B	SGB133	3-5	12/16/1996	Sample	15.5
SB28B	SGA008	8-10	12/16/1996	Sample	24
SB28C	SGA010	3-5	12/16/1996	Sample	27.5
SB28C	SGA368	8-10	12/16/1996	Sample	17
SB35A	SGA047	3-5	12/21/1996	Sample	21.9
SB35A	SGA501FD1	8-10	12/21/1996	FD	33.7
SB35A	SGA048	8-10	12/21/1996	Sample	29.2
SB35B	SGA051	4-6	12/21/1996	Sample	26.2
SB35B	SGB158	8-10	12/21/1996	Sample	7.9 J
SB35C	SGA055	3-5	12/21/1996	Sample	18.2
SB35C	SGA500FD1	8-10	12/21/1996	FD	19.2
SB35C	SGA056	8-10	12/21/1996	Sample	14.9
SB36A	SGA059	4-6	12/19/1996	Sample	23.2
SB36A	SGA060	8-10	12/19/1996	Sample	19.7
SB36B	SGB162	4-6	12/20/1996	Sample	10.7 J
SB36B	SGB161	8-10	12/20/1996	Sample	12 J
SB36D	SGA071	4-6	12/20/1996	Sample	21.8
SB36D	SGB164	8-10	12/20/1996	Sample	10.2 J
SB36E	SGA075	4-6	12/20/1996	Sample	29.1
SB36E	SGA076	8-10	12/20/1996	Sample	19.6
SB36F	SGA079	4-6	12/20/1996	Sample	22.2
SB36F	SGA080	8-10	12/20/1996	Sample	24.5
SB36G	SGA083	4-6	12/20/1996	Sample	28.7
SB36G	SGA084	8-10	12/20/1996	Sample	18.9
SB36H	SGA087	4-6	12/20/1996	Sample	31.6
SB36H	SGA088	8-10	12/20/1996	Sample	21.3
SB36I	SGA091	4-6	12/21/1996	Sample	17.3
SB36I	SGA092	8-10	12/21/1996	Sample	15.1
SB36J	SGA095	4-6	12/21/1996	Sample	21.7
SB36J	SGA096	8-10	12/21/1996	Sample	18.6
SB36K	SGA099	4-6	12/21/1996	Sample	26.9
SB36K	SGA100	8-10	12/21/1996	Sample	22.1
SB36L	SGA103	4-6	12/21/1996	Sample	25.3
SB36L	SGA104	8-10	12/21/1996	Sample	18.6
SB36M	SGA107	4-6	12/21/1996	Sample	27.3
SB36M	SGA108	8-10	12/21/1996	Sample	19.8
SB36N	SGA111	4-6	12/21/1996	Sample	30.4
SB36N	SGA112	8-10	12/21/1996	Sample	17.3
SB54A	SGA457	5-7	12/16/1996	Sample	17.2
SB54A	SGA458	8-10	12/16/1996	Sample	16.8
SB54B	SGA460	5-7	12/16/1996	Sample	24.2

TABLE L-9
FU-4 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB54B	SGA461	8-10	12/16/1996	Sample	21.8
SB55A	SGB124	3-5	12/21/1996	Sample	13.2 J
SB55A	SGB168FD1	3-5	12/21/1996	FD	13 J
SB55A	SGB122	8-10	12/21/1996	Sample	11.4 J
SB56A	SGA405	5-7	12/16/1996	Sample	24.7
SB56A	SGA406	8-10	12/16/1996	Sample	22
SB57B	RHA181FD1	3-5	1/22/1997	FD	9.6
SB57B	RHA076	3-5	1/22/1997	Sample	9.3
SB57B	RHA077	8-10	1/22/1997	Sample	7.4
SB57C	RHA079	3-5	1/22/1997	Sample	10.8
SB57C	RHA080	8-10	1/22/1997	Sample	10
SB70C	RHA160	3-5	1/22/1997	Sample	13.6
SB70C	RHA161	8-10	1/22/1997	Sample	9.5
SB70D	RHA162	3-5	1/22/1997	Sample	12.2
SB70D	RHA163	8-10	1/22/1997	Sample	15.2
SB70E	RHA166FD1	3-5	1/22/1997	FD	11.2
SB70E	RHA164	3-5	1/22/1997	Sample	10
SB70E	RHA165	8-10	1/22/1997	Sample	10.3
SB70G	RHA169	3-5	1/22/1997	Sample	11
SB70G	RHA170	8-10	1/22/1997	Sample	8
SB74A	SGA463	3-5	12/21/1996	Sample	25.6
SB74A	SGA464	8-10	12/21/1996	Sample	38.3
SB74B	SGA467	3-5	12/21/1996	Sample	28
SB74B	SGB157	8-10	12/21/1996	Sample	12.8 J
SB74B	SGB167FD1	8-10	12/21/1996	FD	12.2 J
SB74C	SGB155	3-5	12/21/1996	Sample	14.9 J
SB74C	SGA472	8-10	12/21/1996	Sample	33.9
SB74C	SGA499FD1	8-10	12/21/1996	FD	25.6
SB79A	SGA442	4-6	12/17/1996	Sample	31.9
SB79A	SGA443	8-10	12/17/1996	Sample	25.1
SB79B	SGB138	4-5.5	12/17/1996	Sample	14.3
SB79B	SGA447	8-10	12/17/1996	Sample	21.5
SB79C	SGA450	4-6	12/17/1996	Sample	38.4
SB79C	SGA451	8-10	12/17/1996	Sample	19.6
SB79D	MIA125	4-6	10/7/1998	Sample	12.1
SB79D	MIA126	8-10	10/7/1998	Sample	8.1
SB80A	SGA434	3-5	12/21/1996	Sample	20.6
SB80A	SGA435	8-10	12/21/1996	Sample	29.8
SB80B	SGA438	3-5	12/21/1996	Sample	24.9
SB80B	SGA439	8-10	12/21/1996	Sample	20.8
SB83A	SGB121	4-6	12/13/1996	Sample	8.8
SB83A	SGA400	9-11	12/13/1996	Sample	22.2
SB83B	SGA402	4-6.5	12/13/1996	Sample	36.3
SB83B	SGA403	9-11	12/13/1996	Sample	26.2

Notes:
No results are greater than the United States Environmental Protection Agency (USEPA) Industrial
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-10
FU-4 LEAD ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
MW-55	SBMW55	32-34	2/10/1996	Sample	0.52 U
SB35A	SGA049	18-20	12/21/1996	Sample	12.4
SB35B	SGA053	18-20	12/21/1996	Sample	30.6
SB35C	SGA057	18-20	12/21/1996	Sample	17.3
SB36A	SGA061	18-20	12/19/1996	Sample	14.8
SB36B	SGA065	18-20	12/20/1996	Sample	7.6
SB36D	SGA073	18-20	12/20/1996	Sample	16.7
SB36E	SGA077	18-20	12/20/1996	Sample	20.8
SB36F	SGA081	18-20	12/20/1996	Sample	16.2
SB36G	SGA085	18-20	12/20/1996	Sample	19.1
SB36H	SGA089	18-20	12/20/1996	Sample	19.9
SB36I	SGA093	18-20	12/21/1996	Sample	13.7
SB36J	SGA097	18-20	12/21/1996	Sample	15.7
SB36K	SGA101	18-20	12/21/1996	Sample	17.8
SB36L	SGA105	18-20	12/21/1996	Sample	15.1
SB36M	SGA109	18-20	12/21/1996	Sample	14.5
SB36N	SGA113	18-20	12/21/1996	Sample	18.5
SB74A	SGA465	18-20	12/21/1996	Sample	1.8
SB74B	SGA469	18-20	12/21/1996	Sample	20.3
SB74C	SGA473	18-20	12/21/1996	Sample	16.8
SB79A	SGA444	18-20	12/17/1996	Sample	17.3
SB79B	SGA448	18-20	12/17/1996	Sample	14.8
SB79C	SGA452	18-20	12/17/1996	Sample	17
SB79D	MIA127	16-18	10/7/1998	Sample	6.5
SB80A	SGA436	18-20	12/21/1996	Sample	20.2
SB80B	SGA440	18-20	12/21/1996	Sample	17.7

Notes:

No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram U = Result is not detected

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-11
FU-5 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(20.6)	AA0007	0.5-1	10/23/1996	Sample	109 J
A(20.6)	AA0008	1-4	10/23/1996	Sample	6.8 J
SB75A	SGB076	0-1	12/9/1996	Sample	9.7
SB76A	SGA347	0-1	12/10/1996	Sample	17.5
SB76B	SGA350	0-1	12/10/1996	Sample	37.3
SB76C	SGA353	0-1	12/10/1996	Sample	25.3
SB77A	SGA197	0-1	12/8/1996	Sample	38.1
SB77B	SGA412	0-1	12/9/1996	FD	26.9
SB77B	SGA201	0-1	12/9/1996	Sample	20.9
SB78A	SGA356	1-3	12/10/1996	Sample	21
SB78B	SGA359	1-3	12/11/1996	Sample	27.3
SB78C	SGA362	1-3	12/11/1996	Sample	25.5
SS16A	MIA142	0-1	10/7/1998	Sample	18.7
SS17A	MIA143	0-1	10/7/1998	Sample	15.9
SS18A	MIA144	0-1	10/7/1998	Sample	8.7
SS34A	MIA145	0-1	10/7/1998	Sample	10.1
SS75D	MIA037	0.2-1	9/30/1998	Sample	23.2
SS77A	SGB049	0-1	12/7/1996	Sample	14.2
SS77B	SGA194	0-1	12/7/1996	Sample	32.8
SS77C	SGA195	0-1	12/7/1996	Sample	71.3
SS77D	SGB061	0-1	12/7/1996	Sample	12.4
SS77F	MIA225	0-1	10/10/1998	Sample	21 J
TEC91A	MIA098	0.6-1	10/9/1998	Sample	10.8

Notes:
No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-12
FU-5 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
A(20.6)	AA0009	4-7	10/23/1996	Sample	7.5 J
A(20.6)	AA0010	7-10	10/23/1996	Sample	15.3 J
SB75B	SGB082	4-6	12/10/1996	Sample	7.6
SB76A	SGA348	4-6	12/10/1996	Sample	14.7
SB76B	SGA351	4-6	12/10/1996	Sample	53.8
SB76C	SGA354	4-6	12/10/1996	Sample	18.6
SB77A	SGA198	4-5	12/8/1996	Sample	21.3
SB77A	SGA199	9.5-10	12/8/1996	Sample	15.3
SB77B	SGA202	4-5	12/9/1996	Sample	15.7
SB77B	SGA203	9-10	12/9/1996	Sample	16.1
SB78A	SGA357	4-6	12/10/1996	Sample	28.1
SB78B	SGB087	4-6	12/11/1996	Sample	13
SB78C	SGA363	4-6	12/11/1996	Sample	24.4
TEC91A	MIA099	3-5	10/9/1998	Sample	6.4

Notes:

No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-13
FU-5 LEAD ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB76A	SGA349	18-20	12/10/1996	Sample	11.5
SB76B	SGA352	18-20	12/10/1996	Sample	12.4
SB76C	SGB083	18-20	12/10/1996	Sample	4.8
SB78A	SGA358	18-21	12/10/1996	Sample	15.5
SB78B	SGB086	18-20	12/11/1996	Sample	7.5
SB78C	SGA364	18-21	12/11/1996	Sample	15.9

Notes:

No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-14
FU-6 LEAD ANALYTICAL RESULTS IN SURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB58A	MIA174	0-1	10/9/1998	Sample	41.4
SB58B	MIA179	0-1	10/9/1998	Sample	136
SB67A	SGA484	0-1	12/17/1996	Sample	20.5
SB67A	SGA485FD1	0-1	12/17/1996	FD	19.2
SB67B	SGB065	0-1	12/18/1996	Sample	11.9
SB68C	MIA183	0-1	10/9/1998	Sample	9.5
SS1A	MIA134	0-1	10/7/1998	Sample	14.5
SS25	LAWSS25	1-2	3/19/1989	Sample	16
SS30	LAWSS30	1-2	3/19/1989	Sample	81
SS31	LAWSS31	1-2	3/19/1989	Sample	5
SS58C	RHA049	0-1	1/19/1997	Sample	11.5
SS66A	SGB063	0-1	12/22/1996	Sample	67.1 J
SS67A	SGA261FD1	0-1	12/6/1996	FD	48.5
SS67A	SGA128	0-1	12/6/1996	Sample	38.4
SS67B	SGB043	0-1	12/6/1996	Sample	51.9

Notes:

1) No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL, May 2021) of 800 mg/kg and Residential Soil RSL of 400 mg/kg (applied to location SS1A to evaluate the unrestricted area in FU-6).
FD = Field duplicate
mg/kg = Milligrams per kilogram J = Result is estimated

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-15
FU-6 LEAD ANALYTICAL RESULTS IN SUBSURFACE SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB58A	MIA177	3-5	10/9/1998	Sample	7
SB58A	MIA178	8-10	10/9/1998	Sample	6.7
SB58B	MIA180	3-5	10/9/1998	Sample	9.4
SB58B	MIA181	8-10	10/9/1998	Sample	6.6
SB66A	SGB134	3-5	12/17/1996	Sample	10.5
SB67A	SGA131	4-6	12/17/1996	Sample	16.2
SB67A	SGB136	8-10	12/17/1996	Sample	7.8
SB67B	SGA136	3-5	12/18/1996	Sample	19.1
SB67B	SGA137	8-10	12/18/1996	Sample	19.3
SB68C	MIA184	8-10	10/9/1998	Sample	8.8

Notes:

1) No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-16
FU-6 LEAD ANALYTICAL RESULTS IN DEEP SOIL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Depth Interval (feet)	Date	Sample Type	Result (mg/kg)
SB67A	SGA133	18-20	12/17/1996	Sample	18.9
SB67A	SGA134	38-40	12/17/1996	Sample	4
SB67B	SGB142	18-20	12/18/1996	Sample	13.1
SB67B	SGA139	38-40	12/18/1996	Sample	5.6

Notes:

1) No results are greater than the United States Environmental Protection Agency (USEPA) Industrial Soil Regional Screening Level (RSL) of 800 mg/kg.
mg/kg = Milligrams per kilogram

Criteria:

USEPA, 2021. Regional Screening Levels (RSLs). Target risk of 1E-06, target hazard quotient of 0.1 May. Available online: https://www.epa.gov/risk/regional-screening-levels-rsls.

TABLE L-17
SUMMARY OF EXCAVATED SAMPLE LOCATIONS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Location	Sample ID	Sample Date	Start Depth (feet)	End Depth (feet)	Lead Result (mg/kg)	Detection Limit (mg/kg)
FU-3 Parcels 35 and 28						
A(35.2)	A129	10/18/1996	0	0.5	201	0.18
A(35.2)	DUP11	10/18/1996	0	0.5	144	0.18
B(35.2)	B129	10/18/1996	0	0.5	372	0.18
C(35.2)	C129	10/18/1996	0	0.5	275	0.18
C(35.2)	AA0011	10/23/1996	0	4	6.9	0.18
SB31A	SGA487FD1	12/18/1996	0	1	57.2	0.73
SB31A	SGA015	12/18/1996	0	1	51.4	0.71
SB32A	RHA012	1/18/1997	0	1	4150	0.66
SB33C	SGA041	12/19/1996	0	1	16.1	0.72
SS16	LAWSS16	2/21/1989	0.2	1.2	17500	N/A
SS17	LAWSS17	2/22/1989	0.2	1.2	247	N/A
SS18	LAWSS18	2/22/1989	0.2	1.2	2060	N/A
SS31A	SGA011	12/7/1996	0	1	664	0.67
SS31D	SGB058	12/7/1996	0.5	1	205	0.23
SS32B	RHA015	1/18/1997	0	1	678	0.72
SS32D	RHA017	1/18/1997	0	1	766	0.69
SS32E	RHA018	1/18/1997	0	1	119	1.9
SS32F	RHA019	1/18/1997	0	1	105	0.64
SS32G	RHA020	1/18/1997	0	1	1580	0.67
SS32G	RHA021FD1	1/18/1997	0	1	563	0.72
SS33D	SGA028	12/8/1996	0	1	751	0.7
SS33E	SGB068	12/8/1996	0	1	140	0.23
SS33H	MIA334	10/8/1998	0	1	900	0.14
SS33K	MIA325	10/8/1998	0	1	1830	0.58
SS33M	MIA328FD	10/8/1998	0	1	373	0.14
SS33M	MIA327	10/8/1998	0	1	332	0.14
SS45	LAWSS45	10/27/1989	0	1	312	N/A
SS89F	SGA253	12/6/1996	0	1	237	0.67
SS89H	SGA257	12/6/1996	0	1	2470	0.69
SS89J	SGA259	12/6/1996	0	1	2250	0.7
SS89J	SGA260FD1	12/6/1996	0	1	1310	0.71
SS89N	MIA157	10/8/1998	0	1	232	0.14
SS89O	MIA158	10/8/1998	0	1	53	0.14
FU-4 Building 949						
SB83B	SGA401	12/13/1996	0	1	2430	1
SS20	LAWSS20	2/22/1989	0	1	7680	N/A
SS83B	SGB075	12/9/1996	0	1	1720	0.44
SS83C	SGA286	12/9/1996	0	1	2800	0.65
SS83E	MIA236	10/10/1998	0	1	210	0.14
SS83M	MIA244	10/11/1998	0	1	300	0.14
FU-6 Cafeteria						
SS48A	RHA041	1/23/1997	0	1	22.1	0.23

Note:

The sampling locations marked as excavated (approximately to 1 foot) have been identified based on review of the 2000 Main Installation (MI) Remedial Investigation (RI) report and historic removal actions.
FU = Functional unit
mg/kg = milligram per kilogram
N/A = Not available

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

Edit Red Cells

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	142	142	142	142
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.8	0.9	1.2	1.7
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	1.9	1.9	2.9	5.2
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.1%**	**0.0%**	**0.5%**	**5.6%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE L-19
FU-2 USEPA ADULT LEAD MODEL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

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Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	53	53	53	53
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.7	0.8	1.1	1.6
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	1.6	1.7	2.5	4.8
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.0%**	**0.0%**	**0.3%**	**4.5%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

TABLE L-20
FU-3 USEPA ADULT LEAD MODEL
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

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Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	186	186	186	186
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.9	1.0	1.3	1.8
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	2.1	2.1	3.0	5.4
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.1%**	**0.0%**	**0.6%**	**6.1%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

Edit Red Cells

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	84	84	84	84
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.7	0.8	1.1	1.6
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	1.7	1.8	2.7	4.9
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.0%**	**0.0%**	**0.3%**	**4.8%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

Edit Red Cells

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	26	26	26	26
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.6	0.7	1.0	1.5
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	1.5	1.6	2.5	4.7
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.0%**	**0.0%**	**0.2%**	**4.2%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

Calculations of Blood Lead Concentrations (PbBs) and Risk in Nonresidential Areas
U.S. EPA Technical Review Workgroup for Lead

Version date 06/14/2017

Edit Red Cells

Variable	Description of Variable	Units	GSDi and PbBo from Analysis of NHANES 2009-2014	GSDi and PbBo from Analysis of NHANES 2007-2010	GSDi and PbBo from Analysis of NHANES 2004-2007	GSDi and PbBo from Analysis of NHANES III (Phases 1&2)
PbS	Soil lead concentration	µg/g or ppm	38	38	38	38
$R_{fetal/maternal}$	Fetal/maternal PbB ratio	--	0.9	0.9	0.9	0.9
BKSF	Biokinetic Slope Factor	µg/dL per µg/day	0.4	0.4	0.4	0.4
GSD_i	Geometric standard deviation PbB	--	1.8	1.7	1.8	2.1
PbB_0	Baseline PbB	µg/dL	0.6	0.7	1.0	1.5
IR_S	Soil ingestion rate (including soil-derived indoor dust)	g/day	0.050	0.050	0.050	0.050
IR_{S+D}	Total ingestion rate of outdoor soil and indoor dust	g/day	--	--	--	--
W_S	Weighting factor; fraction of IR_{S+D} ingested as outdoor soil	--	--	--	--	--
K_{SD}	Mass fraction of soil in dust	--	--	--	--	--
$AF_{S,D}$	Absorption fraction (same for soil and dust)	--	0.12	0.12	0.12	0.12
$EF_{S,D}$	Exposure frequency (same for soil and dust)	days/yr	219	219	219	219
$AT_{S,D}$	Averaging time (same for soil and dust)	days/yr	365	365	365	365
PbB_{adult}	PbB of adult worker, geometric mean	µg/dL	0.7	0.8	1.1	1.6
$PbB_{fetal,\ 0.95}$	95th percentile PbB among fetuses of adult workers	µg/dL	1.5	1.6	2.5	4.7
PbB_t	Target PbB level of concern (e.g., 2-8 ug/dL)	µg/dL	**5.0**	**5.0**	**5.0**	**5.0**
$P(PbB_{fetal} > PbB_t)$	**Probability that fetal PbB exceeds target PbB, assuming lognormal distribution**	**%**	**0.0%**	**0.0%**	**0.2%**	**4.3%**

Source: U.S. EPA (1996). Recommendations of the Technical Review Workgroup for Lead for an Interim Approach to Assessing Risks Associated with Adult Exposures to Lead in Soil

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Appendix M

Lead Soil Analytical Results Figures



Notes:
1. Sample dates: 1989-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.

Legend

Lead (mg/Kg)
- 0-800
- >800

Location
(Depth Interval, feet) Lead (mg/kg)

- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- Area Available for Unrestricted Use
- 3 Functional Unit Number

Figure M-1

FU-1 Lead Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N
W E
S

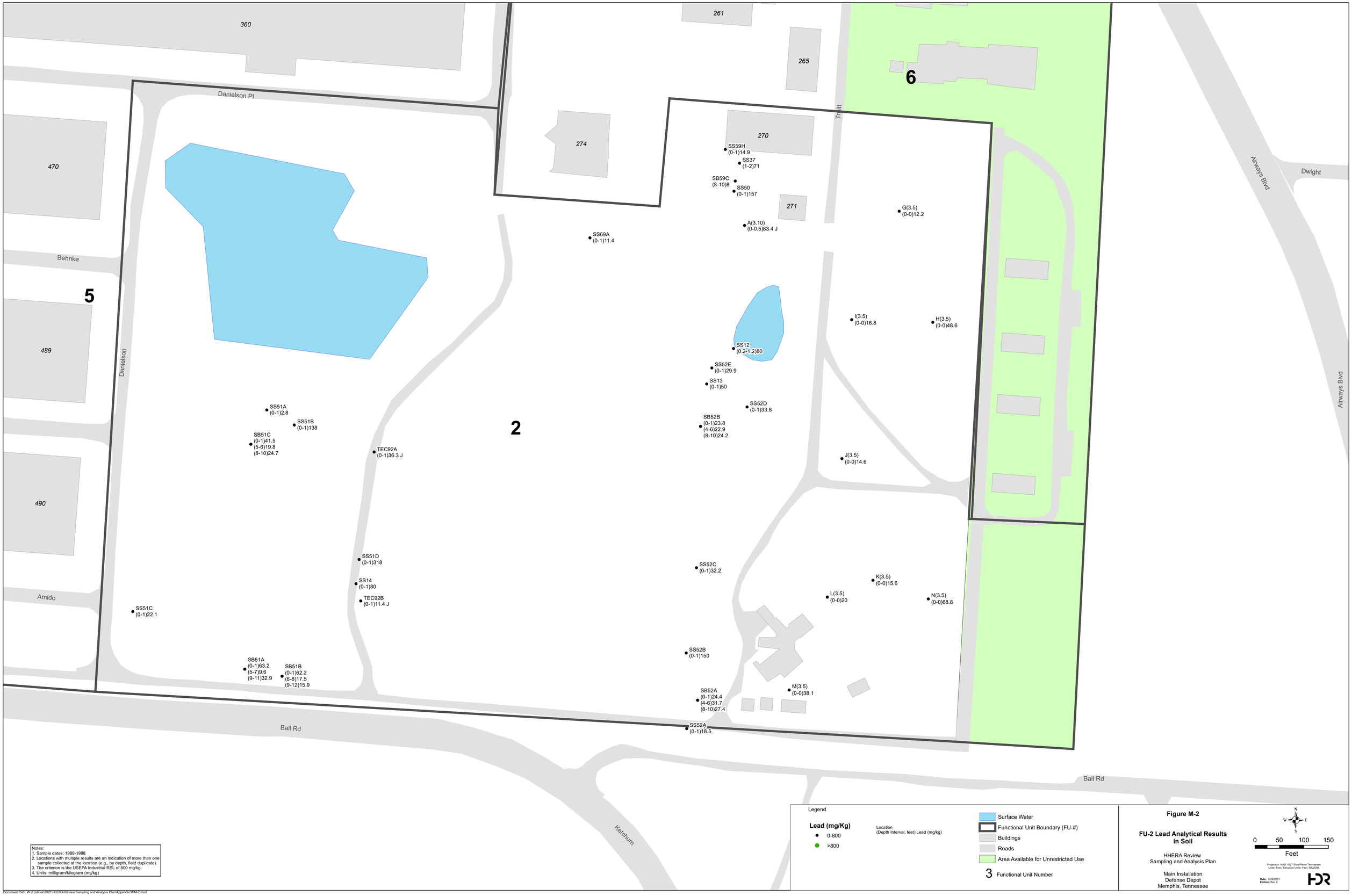
0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

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Notes:
1. Sample dates: 1989-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)

Legend

Lead (mg/Kg)
- 0-800
- >800

Location
(Depth Interval, feet) Lead (mg/kg)

- Surface Water
- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- Area Available for Unrestricted Use

3 Functional Unit Number

Figure M-2

FU-2 Lead Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 50 100 150
Feet

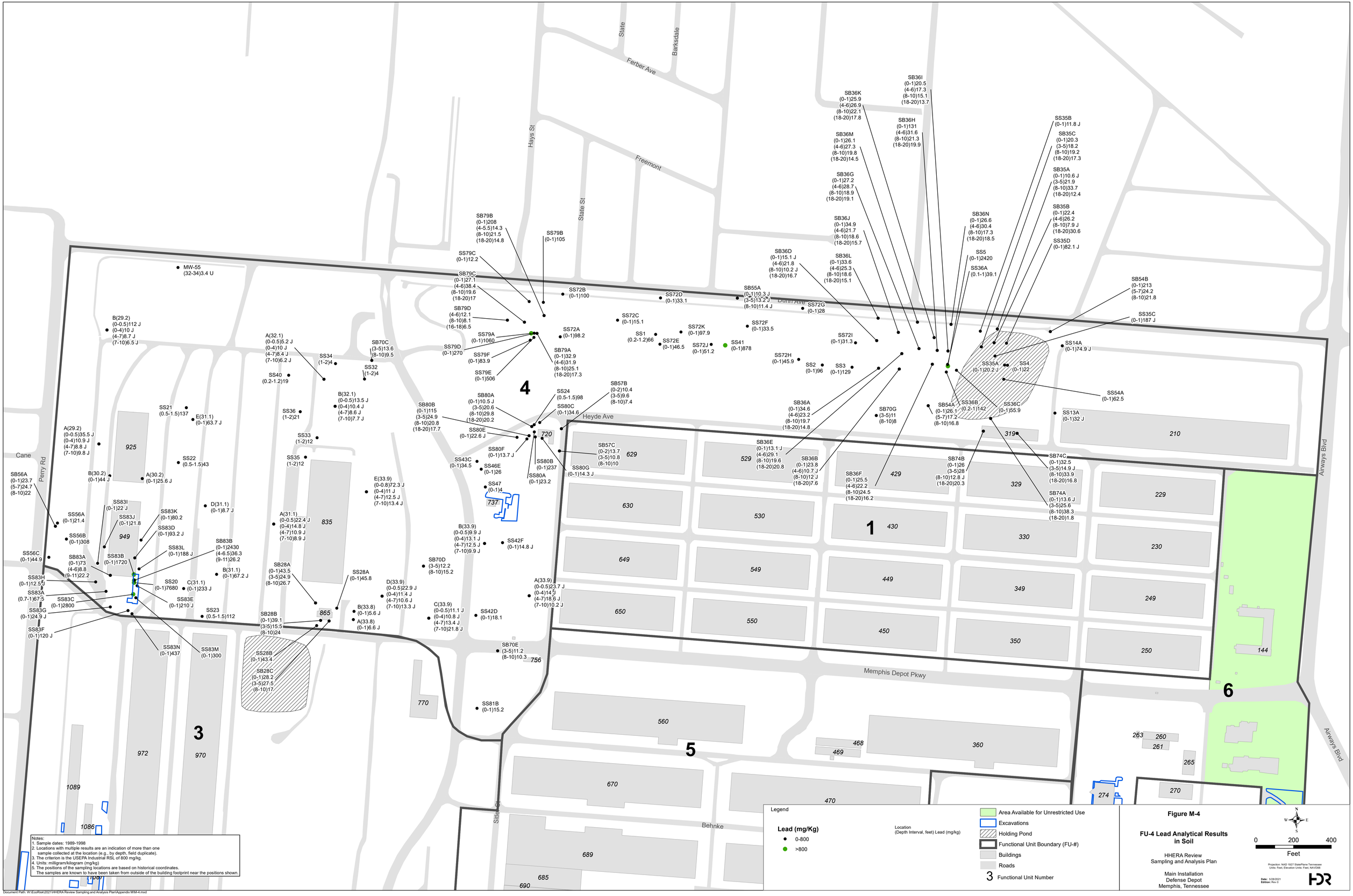
Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

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FU-1
FU-3
FU-4
FU-5
649
650
835
865
949
970
972
1086
1087
1088
1089
1091
995
770
756
560
670
689
685
690
Twenty Seventh
Twenty Third
Twenty First
Twenty Fifth
Sparks
Mallory
Perry Rd
Dempster
Norris
Ball Rd
Amido
Memphis Depot Pkwy
Danielson Pl
W E Freeman
Behnke
Stiller St
Rozelle
Manchester
SS84C (0-1)45.5
SS84H (0.4-1.2)17.7
SS84E (0-1)60.8
SS84F (0-1)31
SS84D (0-1)26.7
SB84C (0-1)104 (4-6)25.5 (8-10)27.1 (18-21)15.3
SB84D (0-1)81 (4-6)282 (8-10)19.3 (18-20)19.3 (38-40)
SB84A (0-1)21.5 (4-6)13.1 (8.5-11)29.5 (18-20)16.1
SS84A (0-1)12.5
SS84B (0-1)12
SB84B (0-1)72.8 (4-6)8.9 (8-10)24.8 (18-20)11.8 (38-40)
B(28.1) (0-0.7)14.3 J (0-4)9.8 J (4-7)10.1 J (7-10)6.2 J
B(26.2) (0-1)42.3 J
A(28.1) (0-0.7)58.8 J (0-4)12.9 J (4-7)8.9 J (7-10)7.6 J
SS89D (0-1)14.9
TEC93A (0-1)15.4
A(25.2) (0-0.5)2.8 J (0-4)15.8 J (4-7)11.9 J (7-10)9.8 J
SB70B (3-5)10.4 (8-10)15.1
SB34B (0-1)702 (3-5)13.7 (8-10)9.2 (13-15)7.9 (18-20)9
SB34C (0-1)93.6 (3-5)13.5 (8-10)10.4 (13-15)6.8 (18-20)7.9
SS49 (0-1)4
SS34F (0-1)145
SB34A (0-1)94.1 (3-5)13 (8-10)9.1 (13-15)7.3 (18-20)8
SS34D (0-1)960
SS39 (0-1)24
SS38 (0-1)48
SS34E (0-1)505
A(24.2) (0-1)47.4 J (0-4)4.6 J (7-10)10.1 J
SS48 (0-1)90
B(24.2) (0-0.5)5 J (0-4)13.8 J (4-7)11.1 J (7-10)8.5 J
SS89K (0-1)39.9
SS89C (0-1)227
SB89B (3-5)25.1 (8-10)20.3
SS89A (0-1)24.6
SS89A (3-5)14.8 (8-10)14.2
SS89B (0-1)139
SB89D (3-5)15.6 (8-10)20.7
SB89E (3-5)8.4 (8-10)11.6 (18-20)4.6 (28-30)3.1 (36-38)1.7
SS89L (0-1)64.7
SS89J (0-1)2250
SS89M (0-1)256
SS89F (0-1)237
SS89I (0-1)30.2
SB89C (3-5)17.2 (8-10)24.7
SS89H (0-1)2470
SS33D (0-1)751
SS45 (0-1)312
SS89N (0-1)232
SS33L (0-1)114
SS33O (0-1)13.2
SS33K (0-1)1830
SB33C (0-1)16.1 (3-5)19.3 (8-10)20 (18-20)12.3 (38-40)28.9
SS33G (0-1)34.6
SS33E (0-1)140
SS33C (0-1)200
SS17 (0.2-1.2)247
SS33B (0.2-1.2)321
SS46 (0-1)166
SS89Q (0-1)53
SS32B (0-1)678
C(35.2) (0-0.5)275 J (0-4)6.9 J (4-7)7.7 J (7-10)11.9 J
B(35.2) (0-0.5)372 J
A(35.2) (0-0.5)201 J
SS33N (0-1)62.3
SS19 (0.2-1.2)10300
SS33M (0-1)373
SS33H (0-1)900
SS32C (0-1)693
SS32D (0-1)766
SS16 (0.2-1.2)17500
SB32A (0-1)4150 (3-5)9.1 (8-10)10.9
SS32E (0-1)119
SS32G (0-1)1580
SS32F (0-1)105
SS31D (0.5-1)205
SB31A (0-1)57.2 (4-6)22.6 (8-10)26.6 (18-20)11.1 (38-40)2
A(26.2) (0-1)15.4 J
SS18 (0.2-1.2)2060
A(23.9) (0-0.5)11.1 J (0-4)8.6 J (4-7)8.4 J (7-10)12.2 J
SS31A (0-1)664
SS33J (0-1)10
SS33I (0-1)22.8
SB31B (0-1)37.3 (4-6)23 (8-10)26.2 (18-20)6.3 (38-40)7.5
SS33F (0-1)79.3
SS15 (0.2-1.2)2670
SB33A (0-1)46.9 (4-6)30 (8-10)28.5 (18-20)10.4 (38-40)1.1
SS33A (0-1)129
SS31C (0-1)84.6
SS31B (0-0.83)85.5
SB70A (3-5)7.5 (8-10)7.5
SB33B (0-1)119 (4-6)20.4 (8-10)30.8 (18-20)7.7 (38-40)3.1
SS27T (0.5-1)24
SS27S (0-1)26.3
SS27R (0.1-1)30.4
SS27Q (0-1)19.4
SS27P (0-1)42.6
SS27 (1-2)13
SS27M (0-1)16.6
SS27H (0-1)40.5 (1-2)10.4
SS27L (0-1)41
SS27K (0-1)58.5
SS29 (1-2)11
SS27A (0-1)11.9 (1-2)12 (3-5)9.7 (8-10)6.9
SB27B (0-1)16.1 (1-2)15.8 (3-5)9.8 (8-10)7.9
SS27G (0-1)60.3 (1-2)10.9
SS26 (1-2)17
SS27F (0-1)156 (1-2)10.5
SB27C (0-1)7.6 (1-2)11.2 (3-5)9.4 (8-10)7.5
SB27D (0-1)9.7 (1-2)9.3 (3-5)9.1 (8-10)7.8
SS28 (1-2)15
SS27J (0-1)27.5 (1-2)9.9
SS27I (0-1)12.6 (1-2)9.9
SB27E (0-1)25 (1-2)9.7 (3-5)8.7 (8-10)7.4
SB82A (0-1)35.9 (4-6)29.3 (9-10.5)17.4 (18-20)15.4
SS82A (0-1)19.2
SS82B (0-1)24.3
SB82B (0-1)22.9 (4-6)31.1 (9-10.5)20.2 (18-20)20.1
TEC90B (6.5-8.5)114 (9-11)10.9
TEC90A (5-7)10.1
SS82C (0-1)50.8
SB82C (0-1)33.5 (5-7)19 (9-10.5)19.7 (18-20)17.3
SB82D (0-1)13.9 (4-6)27.9 (9-11)7.4 (18-20)17.5
SS82D (0-1)11.8
Notes:
1. Sample dates: 1989-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.
Legend
Lead (mg/Kg)
0-800
>800
Location (Depth Interval, feet) Lead (mg/kg)
Excavations
Holding Pond
Functional Unit Boundary (FU-#)
Buildings
Roads
3 Functional Unit Number
Figure M-3
FU-3 Lead Analytical Results in Soil
HHERA Review Sampling and Analysis Plan
Main Installation Defense Depot Memphis, Tennessee
N
W
E
S
0
100
200
Feet
Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88
Date: 5/28/2021
Edition: Rev 0
HDR
Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\Appendix M\M-3.mxd


Slate
Barksdale
Ferber Ave
Hays St
Freemont
State St
Dunn Ave
Heyde Ave
Cane
Perry Rd
Airways Blvd
Sitle St
Behnke
Memphis Depot Pkwy
MW-55 (32-34)3.4 U
SB79B (0-1)208 (4-5.5)14.3 (8-10)21.5 (18-20)14.8
SB79C (0-1)27.1 (4-6)38.4 (8-10)19.6 (18-20)17
SS79C (0-1)12.2
SS79B (0-1)105
SB79D (4-6)12.1 (8-10)8.1 (16-18)6.5
SS79A (0-1)1060
SS79D (0-1)270
SS79F (0-1)83.9
SS79E (0-1)506
SB79A (0-1)32.9 (4-6)31.9 (8-10)25.1 (18-20)17.3
SS72A (0-1)98.2
SS72B (0-1)100
SS72C (0-1)15.1
SS72D (0-1)33.1
SS72E (0-1)46.5
SS72K (0-1)97.9
SS72J (0-1)51.2
SS72F (0-1)33.5
SS72G (0-1)28
SS72I (0-1)31.3
SS1 (0.2-1.2)66
SS41 (0-1)878
SB55A (0-1)10.3 J (3-5)13.2 J (8-10)11.4 J
SB36D (0-1)15.1 J (4-6)21.8 (8-10)10.2 J (18-20)16.7
SB36L (0-1)33.6 (4-6)25.3 (8-10)18.6 (18-20)15.1
SB36K (0-1)25.9 (4-6)26.9 (8-10)22.1 (18-20)17.8
SB36I (0-1)20.5 (4-6)17.3 (8-10)15.1 (18-20)13.7
SB36H (0-1)131 (4-6)31.6 (8-10)21.3 (18-20)19.9
SB36M (0-1)26.1 (4-6)27.3 (8-10)19.8 (18-20)14.5
SB36G (0-1)27.2 (4-6)28.7 (8-10)18.9 (18-20)19.1
SB36J (0-1)34.9 (4-6)21.7 (8-10)18.6 (18-20)15.7
SB36N (0-1)26.6 (4-6)30.4 (8-10)17.3 (18-20)18.5
SS5 (0-1)2420
SS36A (0.1-1)39.1
SS35B (0-1)11.8 J
SS35C (0-1)20.3 (3-5)18.2 (8-10)19.2 (18-20)17.3
SB35A (0-1)10.6 J (3-5)21.9 (8-10)33.7 (18-20)12.4
SB35B (0-1)22.4 (4-6)26.2 (8-10)7.9 J (18-20)30.6
SS35D (0-1)82.1 J
SB54B (0-1)213 (5-7)24.2 (8-10)21.8
SS35C (0-1)87 J
SS14A (0-1)74.9 J
SS35A (0-1)20.2 J
SS4 (0-1)22
SS54A (0-1)62.5
SB54A (0-1)26.1 (5-7)17.2 (8-10)16.8
SS36B (0.2-1)142
SS36C (0-1)55.9
SS13A (0-1)32 J
SB36A (0-1)34.6 (4-6)23.2 (8-10)19.7 (18-20)14.8
SB70G (3-5)11 (8-10)8
SS2 (0-1)96
SS3 (0-1)129
B(29.2) (0-0.5)112 J (0-4)10 J (4-7)8.7 J (7-10)6.5 J
A(32.1) (0-0.5)5.2 J (0-4)10 J (4-7)8.4 J (7-10)6.2 J
SS34 (1-2)4
SB70C (3-5)13.6 (8-10)9.5
SS32 (1-2)4
SS40 (0.2-1.2)19
B(32.1) (0-0.5)13.5 J (0-4)10.4 J (4-7)8.6 J (7-10)7.7 J
SS36 (1-2)21
SS21 (0.5-1.5)137
E(31.1) (0-1)63.7 J
A(29.2) (0-0.5)35.5 J (0-4)10.9 J (4-7)8.8 J (7-10)9.8 J
SS33 (1-2)12
SS35 (1-2)12
SS22 (0.5-1.5)43
B(30.2) (0-1)44 J
A(30.2) (0-1)25.6 J
SB56A (0-1)23.7 (5-7)24.7 (8-10)22
SB80B (0-1)115 (3-5)24.9 (8-10)20.8 (18-20)17.7
SB80A (0-1)10.5 J (3-5)20.6 (8-10)29.8 (18-20)20.2
SS80E (0-1)22.6 J
SS80F (0-1)13.7 J
SS43C (0-1)34.5
SS46E (0-1)26
SS24 (0.5-1.5)98
SS80C (0-1)34.6
SB57B (0-2)10.4 (3-5)9.6 (8-10)7.4
SB57C (0-2)13.7 (3-5)10.8 (8-10)10
SS80B (0-1)237
SS80A (0-1)23.2
SS80G (0-1)14.3 J
SB36E (0-1)13.1 J (4-6)29.1 (8-10)19.6 (18-20)20.8
SB36B (0-1)23.8 (4-6)10.7 J (8-10)12 J (18-20)7.6
SB36F (0-1)25.5 (4-6)22.2 (8-10)24.5 (18-20)16.2
SB74B (0-1)26 (3-5)28 (8-10)12.8 J (18-20)20.3
SB74C (0-1)32.5 (3-5)14.9 J (8-10)33.9 (18-20)16.8
SB74A (0-1)13.6 J (3-5)25.6 (8-10)38.3 (18-20)1.8
E(33.9) (0-0.8)72.3 J (0-4)11 J (4-7)12.5 J (7-10)13.4 J
SS47 (0-1)4
D(31.1) (0-1)8.7 J
SS83I (0-1)22 J
SS83J (0-1)21.8
SS83K (0-1)80.2
SS83D (0-1)93.2 J
SS56A (0-1)21.4
SS56B (0-1)308
SS56C (0-1)44.9
SS83A (0-1)73 (4-6)8.8 (9-11)22.2
SS83B (0-1)1720
SS83L (0-1)188 J
SB83B (0-1)2430 (4-6.5)36.3 (9-11)26.2
SS83H (0-1)12.5
SS83A (0.7-1)67.5
SS83C (0-1)2800
SS83G (0-1)24.9 J
SS83F (0-1)120 J
SS20 (0-1)7680
C(31.1) (0-1)233 J
SS83E (0-1)210 J
B(31.1) (0-1)67.2 J
SS23 (0.5-1.5)112
SS83N (0-1)437
SS83M (0-1)300
A(31.1) (0-0.5)22.4 J (0-4)14.8 J (4-7)10.9 J (7-10)8.9 J
SB28A (0-1)43.5 (3-5)24.9 (8-10)26.7
SS28A (0-1)45.8
SB28B (0-1)39.1 (3-5)15.5 (8-10)24
SS28B (0-1)43.4
SB28C (0-1)28.2 (3-5)27.5 (8-10)17
B(33.8) (0-1)5.6 J
A(33.8) (0-1)6.6 J
D(33.9) (0-0.5)22.9 J (0-4)11.4 J (4-7)10.6 J (7-10)13.3 J
C(33.9) (0-0.5)11.1 J (0-4)10.8 J (4-7)13.4 J (7-10)21.8 J
SS42D (0-1)18.1
B(33.9) (0-0.5)9.9 J (0-4)13.1 J (4-7)12.5 J (7-10)9.9 J
SS42F (0-1)14.8 J
SB70D (3-5)12.2 (8-10)15.2
SS81B (0-1)15.2
SB70E (3-5)11.2 (8-10)10.3
A(33.9) (0-0.5)23.7 J (0-4)14 J (4-7)18.6 J (7-10)10.2 J
4
1
2
3
5
6
720
737
865
756
925
949
835
972
970
1089
1086
1088
629
529
429
329
229
630
530
430
330
230
649
549
449
349
249
650
550
450
350
250
144
770
560
360
670
470
689
685
690
468
469
263
260
261
265
270
274
319
210
Notes:
1. Sample dates: 1989-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)
5. The positions of the sampling locations are based on historical coordinates. The samples are known to have been taken from outside of the building footprint near the positions shown.
Legend
Lead (mg/Kg)
0-800
>800
Location (Depth Interval, feet) Lead (mg/kg)
Area Available for Unrestricted Use
Excavations
Holding Pond
Functional Unit Boundary (FU-#)
Buildings
Roads
3 Functional Unit Number
Figure M-4
FU-4 Lead Analytical Results in Soil
HHERA Review
Sampling and Analysis Plan
Main Installation
Defense Depot
Memphis, Tennessee
N
W
E
S
0
200
400
Feet
Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88
Date: 5/28/2021
Edition: Rev 0
HDR
Document Path: W:\EcoRisk\2021\HHERA Review Sampling and Analysis Plan\Appendix M\M-4.mxd



Notes:
1. Sample dates: 1996-1998
2. Locations with multiple results are an indication of more than one sample collected at the location (e.g., by depth, field duplicate).
3. The criterion is the USEPA Industrial RSL of 800 mg/kg.
4. Units: milligram/kilogram (mg/kg)

Legend

Lead (mg/Kg)
- 0-800
- >800

Location
(Depth Interval, feet) Lead (mg/kg)

- Functional Unit Boundary (FU-#)
- Buildings
- Roads
- 3 Functional Unit Number

Figure M-5

FU-5 Lead Analytical Results in Soil

HHERA Review
Sampling and Analysis Plan

Main Installation
Defense Depot
Memphis, Tennessee

N W E S

0 100 200
Feet

Projection: NAD 1927 StatePlane Tennessee
Units: Feet, Elevation Units: Feet, NAVD88

Date: 5/28/2021
Edition: Rev 0

HDR

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Appendix N

Analytical Results for the Ecological Evaluation, Sediment and Surface Water

TABLE N-1
ECOLOGICAL EXCEEDANCE RESULTS SUMMARY
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

	Functional Unit	2				4			
	Medium	Sediment		Surface Water		Sediment		Surface Water	
Analytical Group	Analytical Method	Exceed Count	Result Count	Exceed Count	Result Count	Exceed Count	Result Count	Exceed Count	Result Count
VOC	SW8260	2	396	0	594	0	264	0	264
VOC	SW8240	--	--	0	14	--	--	0	4
VOC	CV390	1	264	--	--	1	33	--	--
TPH	SW8015 MOD	0	6	--	--	--	--	--	--
TPH	E418.1	--	--	--	--	--	--	--	--
SVOC	SW8270	74	733	2	1,212	69	528	1	530
SVOC	CSV390	94	528	--	--	2	66	--	--
Pest	SW8080	9	105	17	589	26	168	8	169
Pest / PCB	SW8081	23	252	0	252	--	--	--	--
Pest / PCB	CP390	41	222	--	--	0	28	--	--
PAH	SW8100	0	100	0	40	--	--	--	--
Metal	SW9010	0	8	--	--	0	1	--	--
Metal	SW7471	1	22	--	--	0	9	--	--
Metal	SW7470	--	--	0	53	--	--	0	16
Metal	SW6010	55	434	15	890	9	168	10	299
Dioxin / Furan	SW8280	6	156	--	--	0	26	--	--
Dioxin / Furan	CDF991	--	--	--	--	8	144	0	144
TSS	E160.2	--	--	0	17	--	--	--	--
TOC	E415.2	--	--	0	17	--	--	--	--
Total		**306**	**3,226**	**34**	**3,678**	**115**	**1,435**	**19**	**1,426**

Notes:

PAH = Polycyclic aromatic hydrocarbon
Pest/PCB = Pesticide / Polychlorinated biphenyl
SVOC = Semi-volatile organic compound
TOC = Total organic carbon
TPH = Total petroleum hydrocarbon
TSS = Total suspended solids
VOC = Volatile organic compound

TABLE N-2
FU-2 ECOLOGICAL EXCEEDANCE RESULTS IN SEDIMENT AND SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU-2 SEDIMENT EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/kg	2	0.008 - 0.032	0.0078	39
VOC	CV390	CARBON TETRACHLORIDE	56-23-5	mg/kg	1	0.11	0.057	NA
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/kg	1	0.086	0.0202	NA
SVOC	CSV390	ACENAPHTHENE	83-32-9	mg/kg	5	0.027 - 0.26	0.0067	NA
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/kg	4	0.05 - 0.25	0.0067	NA
SVOC	CSV390	ACENAPHTHYLENE	208-96-8	mg/kg	4	0.029 - 0.066	0.0059	NA
SVOC	CSV390	ANTHRACENE	120-12-7	mg/kg	4	0.16 - 0.62	0.057	NA
SVOC	SW8270	ANTHRACENE	120-12-7	mg/kg	4	0.11 - 0.46	0.057	NA
SVOC	CSV390	BENZO(A)ANTHRACENE	56-55-3	mg/kg	6	0.15 - 3.8	0.108	NA
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/kg	5	0.22 - 1.8	0.108	NA
SVOC	CSV390	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.17 - 4.1	0.15	NA
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.23 - 2	0.15	NA
SVOC	CSV390	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	6	0.26 - 4.9	0.19	NA
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	6	0.25 - 2.3	0.19	NA
SVOC	CSV390	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	5	0.44 - 3	0.17	NA
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	5	0.18 - 1.6	0.17	NA
SVOC	CSV390	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	3	0.68 - 4.6	0.24	NA
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	4	0.31 - 2.2	0.24	NA
SVOC	CSV390	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	4	0.19 - 0.3	0.18	NA
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	3	0.22 - 1.5	0.18	NA
SVOC	CSV390	CARBAZOLE	86-74-8	mg/kg	5	0.072 - 0.66	0.069	NA
SVOC	SW8270	CARBAZOLE	86-74-8	mg/kg	4	0.11 - 0.52	0.069	NA
SVOC	CSV390	CHRYSENE	218-01-9	mg/kg	6	0.17 - 4.6	0.166	NA
SVOC	SW8270	CHRYSENE	218-01-9	mg/kg	6	0.27 - 2.6	0.166	NA
SVOC	CSV390	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	5	0.12 - 0.48	0.033	NA
SVOC	CSV390	DIBENZOFURAN	132-64-9	mg/kg	3	0.022 - 0.073	0.51	0.0000025
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/kg	2	0.11 - 0.14	0.51	0.0000025
SVOC	CSV390	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	7	0.019 - 0.045	0.011	NA
SVOC	CSV390	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	1	0.09	0.039	NA
SVOC	CSV390	FLUORANTHENE	206-44-0	mg/kg	5	0.83 - 9.9	0.423	NA
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/kg	4	0.55 - 2.8	0.423	NA
SVOC	CSV390	FLUORENE	86-73-7	mg/kg	4	0.084 - 0.22	0.077	NA
SVOC	SW8270	FLUORENE	86-73-7	mg/kg	2	0.29 - 0.33	0.077	NA
SVOC	CSV390	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	5	0.47 - 3.2	0.2	NA
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	4	0.24 - 1.5	0.2	NA
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/kg	2	0.12 - 0.14	NA	0.01
SVOC	CSV390	PHENANTHRENE	85-01-8	mg/kg	5	0.46 - 4.7	0.204	NA
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/kg	6	0.22 - 3.2	0.204	NA
SVOC	CSV390	PYRENE	129-00-0	mg/kg	5	0.9 - 9.3	0.195	NA
SVOC	SW8270	PYRENE	129-00-0	mg/kg	6	0.47 - 5	0.195	NA

TABLE N-2
FU-2 ECOLOGICAL EXCEEDANCE RESULTS IN SEDIMENT AND SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU-2 SEDIMENT EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018
Pest	CP390	ALPHA-CHLORDANE	5103-71-9	mg/kg	7	0.0043 - 0.026	NA	0.0032
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/kg	3	0.0087 - 0.034	NA	0.0032
Pest	SW8080	DDD	72-54-8	mg/kg	3	0.0044 - 0.077	NA	0.0035
Pest	CP390	DDD	72-54-8	mg/kg	6	0.0058 - 0.23	NA	0.0035
Pest	SW8081	DDD	72-54-8	mg/kg	8	0.0077 - 0.4	NA	0.0035
Pest	SW8080	DDE	72-55-9	mg/kg	2	0.0021 - 0.016	NA	0.0014
Pest	CP390	DDE	72-55-9	mg/kg	7	0.0081 - 0.029	NA	0.0014
Pest	SW8081	DDE	72-55-9	mg/kg	9	0.0091 - 0.79	NA	0.0014
Pest	SW8080	DDT	50-29-3	mg/kg	2	0.0037 - 0.025	NA	0.001
Pest	CP390	DDT	50-29-3	mg/kg	5	0.0047 - 0.093	NA	0.001
Pest	SW8081	DDT	50-29-3	mg/kg	1	0.027	NA	0.001
Pest	SW8080	DIELDRIN	60-57-1	mg/kg	2	0.0028 - 0.024	NA	0.0019
Pest	CP390	DIELDRIN	60-57-1	mg/kg	7	0.0063 - 0.038	NA	0.0019
Pest	SW8081	DIELDRIN	60-57-1	mg/kg	1	0.049	NA	0.0019
Pest	CP390	ENDRIN	72-20-8	mg/kg	6	0.01 - 0.026	NA	0.0022
Pest	CP390	HEPTACHLOR	76-44-8	mg/kg	2	0.0018 - 0.002	NA	0.0006
Pest	CP390	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	1	0.0037	NA	0.0025
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg	1	0.33	NA	0.014
Metal	SW7471	MERCURY	7439-97-6	mg/kg	1	0.53	NA	0.17
Metal	SW6010	ANTIMONY	7440-36-0	mg/kg	2	2.3 - 6.4	NA	2
Metal	SW6010	ARSENIC	7440-38-2	mg/kg	4	10.1 - 14	NA	9.8
Metal	SW6010	BARIUM	7440-39-3	mg/kg	16	24.1 - 142	NA	20
Metal	SW6010	CADMIUM	7440-43-9	mg/kg	3	1.2 - 2.4	NA	1
Metal	SW6010	COBALT	7440-48-4	mg/kg	1	219	NA	50
Metal	SW6010	COPPER	7440-50-8	mg/kg	3	34.7 - 49.4	NA	31.6
Metal	SW6010	LEAD	7439-92-1	mg/kg	5	42.6 - 169	NA	35.8
Metal	SW6010	MANGANESE	7439-96-5	mg/kg	1	697	NA	460
Metal	SW6010	NICKEL	7440-02-0	mg/kg	1	26.2	NA	22.7
Metal	SW6010	SELENIUM	7782-49-2	mg/kg	10	0.73 - 3.8	NA	0.72
Metal	SW6010	SILVER	7440-22-4	mg/kg	1	9.1	NA	1
Metal	SW6010	ZINC	7440-66-6	mg/kg	8	128 - 1170	NA	121
Dioxin/ Furan	SW8280	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g	6	10.45 - 147.2	NA	2.5

TABLE N-2
FU-2 ECOLOGICAL EXCEEDANCE RESULTS IN SEDIMENT AND SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU-2 SURFACE WATER EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Surface Water Acute, 2018	EPA R4 Freshwater Surface Water Chronic, 2018
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	1	0.012	1.1	0.008
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	1	0.002	0.0037	0.0008
Pest	SW8080	DDE	72-55-9	mg/L	2	0.00065 - 0.00088	0.0013	0.0003
Pest	SW8080	DDT	50-29-3	mg/L	7	0.000047 - 0.0022	0.0011	0.000001
Pest	SW8080	DIELDRIN	60-57-1	mg/L	8	0.000066 - 0.00043	0.00024	0.00006
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	6	0.0892 - 0.576	0.75	0.087
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L	4	0.0023 - 0.0313	0.0301	0.00125
Metal	SW6010	SELENIUM	7782-49-2	mg/L	1	0.0058	0.02	0.005
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L	4	0.0763 - 0.406	0.066	0.066

Notes:

FU = Functional Unit
mg/kg = Milligram per kilogram
mg/L = Milligram per liter
NA = Not available
PCB = Polychlorinated biphenyl
Pest = Pesticide
pg/g = Picogram per gram
SVOC = Semi-volatile organic compound
VOC = Volatile organic compound

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

TABLE N-3
FU-4 ECOLOGICAL EXCEEDANCE RESULTS IN SEDIMENT AND SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU-4 SEDIMENT EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018
VOC	CV390	CARBON TETRACHLORIDE	56-23-5	mg/kg	1	0.078	0.057	NA
SVOC	CSV390	2-METHYLNAPHTHALENE	91-57-6	mg/kg	1	0.026	0.0202	NA
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/kg	1	0.17	NA	0.093
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/kg	1	0.061	0.0067	NA
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/kg	1	0.038	0.0059	NA
SVOC	SW8270	ANTHRACENE	120-12-7	mg/kg	3	0.094 - 1.1	0.057	NA
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/kg	7	0.11 - 1.3	0.108	NA
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.23 - 1.7	0.15	NA
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	7	0.22 - 1.6	0.19	NA
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	4	0.18 - 0.32	0.17	NA
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	6	0.28 - 1.6	0.24	NA
SVOC	SW8270	CARBAZOLE	86-74-8	mg/kg	3	0.1 - 0.33	0.069	NA
SVOC	SW8270	CHRYSENE	218-01-9	mg/kg	7	0.19 - 1.8	0.166	NA
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	1	0.09	0.033	NA
SVOC	CSV390	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	1	0.034	0.011	NA
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/kg	5	0.64 - 2.8	0.423	NA
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	4	0.21 - 0.39	0.2	NA
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/kg	2	0.08 - 0.26	NA	0.01
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/kg	5	0.29 - 1.7	0.204	NA
SVOC	SW8270	PYRENE	129-00-0	mg/kg	6	0.41 - 2.3	0.195	NA
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/kg	2	0.032 - 0.53	NA	0.0032
Pest	SW8080	DDD	72-54-8	mg/kg	5	0.03 - 0.99	NA	0.0035
Pest	SW8080	DDE	72-55-9	mg/kg	5	0.015 - 0.25	NA	0.0014
Pest	SW8080	DDT	50-29-3	mg/kg	8	0.022 - 0.27	NA	0.001
Pest	SW8080	DIELDRIN	60-57-1	mg/kg	6	0.038 - 0.29	NA	0.0019
Metal	SW6010	BARIUM	7440-39-3	mg/kg	3	24.6 - 71.2	NA	20
Metal	SW6010	CADMIUM	7440-43-9	mg/kg	2	1.3 - 2.7	NA	1
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/kg	1	68.5	NA	43.4
Metal	SW6010	COPPER	7440-50-8	mg/kg	1	49.9	NA	31.6
Metal	SW6010	LEAD	7439-92-1	mg/kg	2	63.9 - 66.9	NA	35.8

TABLE N-3
FU-4 ECOLOGICAL EXCEEDANCE RESULTS IN SEDIMENT AND SURFACE WATER
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

FU-4 SEDIMENT EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018
Dioxin / Furan	CDF991	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g	8	4.696 - 494.4	NA	2.5

FU-4 SURFACE WATER EXCEEDANCES

Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	Exceed Range	EPA R4 Freshwater Surface Water Acute, 2018	EPA R4 Freshwater Surface Water Chronic, 2018
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	1	0.019	1.1	0.008
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	1	0.00016	0.00022	0.00006
Pest	SW8080	DDT	50-29-3	mg/L	4	0.000066 - 0.00022	0.0011	0.000001
Pest	SW8080	DIELDRIN	60-57-1	mg/L	3	0.00016 - 0.00024	0.00024	0.00006
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	5	0.228 - 1.7	0.75	0.087
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L	1	0.0297	0.007	0.00495
Metal	SW6010	IRON	7439-89-6	mg/L	1	2.52	NA	1
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L	2	0.0028 - 0.0071	0.0301	0.00125
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L	1	0.0023	0.00098	0.00006
Dioxin / Furan	CDF991	TCDD EQUIVALENT	DIOXIN-TEQ	ng/L	8	0.000163 - 0.536	NA	0.0000031

Notes:

FU = Functional Unit
mg/kg = Milligram per kilogram
mg/L = Milligram per liter
NA = Not available
ng/L = Nanogram per liter
PCB = Polychlorinated biphenyl
Pest = Pesticide
pg/g = Picogram per gram
SVOC = Semi-volatile organic compound
VOC = Volatile organic compound

Criteria:

United States Environmental Protection Agency (USEPA), 2018. Region 4 Ecological Risk Assessment Supplemental Guidance. March 2018. Available online: https://www.epa.gov/risk/regional-ecological-risk-assessment-era-supplemental-guidance

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	CV390	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg	0	0.07	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg	0	0.07	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg	0	0.25	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	UJ	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg	0	0.25	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg	0	0.538	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	UJ	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg	0	0.538	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,1-DICHLOROETHANE	75-34-3	mg/kg	0	0.02	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/kg	0	0.02	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,1-DICHLOROETHENE	75-35-4	mg/kg	0	0.1	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/kg	0	0.1	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,2-DICHLOROETHANE	107-06-2	mg/kg	0	0.986	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/kg	0	0.986	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	1,2-DICHLOROPROPANE	78-87-5	mg/kg	0	0.428	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/kg	0	0.428	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	2-BUTANONE	78-93-3	mg/kg	0	7.604	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	2-BUTANONE	78-93-3	mg/kg	0	7.604	NA																									0.12	J	0.11	0.006	J	0.014
VOC	CV390	2-HEXANONE	591-78-6	mg/kg	0	0.045	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	2-HEXANONE	591-78-6	mg/kg	0	0.045	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	4-METHYL-2-PENTANONE	108-10-1	mg/kg	0	0.073	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/kg	0	0.073	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	ACETONE	67-64-1	mg/kg	0	0.065	NA	0.007	J	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.023		0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	ACETONE	67-64-1	mg/kg	0	0.065	NA																									0.88	UJ	0.11	0.03	U	0.014
VOC	CV390	BENZENE	71-43-2	mg/kg	0	0.01	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	BENZENE	71-43-2	mg/kg	0	0.01	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	BROMODICHLOROMETHANE	75-27-4	mg/kg	0	NA	0.21	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/kg	0	NA	0.21																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	BROMOFORM	75-25-2	mg/kg	0	NA	0.142	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	BROMOFORM	75-25-2	mg/kg	0	NA	0.142																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	BROMOMETHANE	74-83-9	mg/kg	0	NA	0.0065	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	BROMOMETHANE	74-83-9	mg/kg	0	NA	0.0065																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CARBON DISULFIDE	75-15-0	mg/kg	0	0.0078	39	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/kg	2	0.0078	39																									**0.032**	J	0.11	0.002	J	0.014
VOC	CV390	CARBON TETRACHLORIDE	56-23-5	mg/kg	1	0.057	NA	0.007	J	0.011	0.011	U	0.011	**0.11**		0.011	0.005	J	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/kg	0	0.057	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CHLOROBENZENE	108-90-7	mg/kg	0	0.03	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/kg	0	0.03	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CHLOROETHANE	75-00-3	mg/kg	0	NA	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CHLOROETHANE	75-00-3	mg/kg	0	NA	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CHLOROFORM	67-66-3	mg/kg	0	0.087	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CHLOROFORM	67-66-3	mg/kg	0	0.087	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CHLOROMETHANE	74-87-3	mg/kg	0	NA	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/kg	0	NA	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg	0	NA	0.0015	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg	0	NA	0.0015																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	DIBROMOCHLOROMETHANE	124-48-1	mg/kg	0	NA	0.198	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/kg	0	NA	0.198																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	ETHYLBENZENE	100-41-4	mg/kg	0	0.29	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/kg	0	0.29	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	METHYLENE CHLORIDE	75-09-2	mg/kg	0	0.018	NA	0.011	U	0.011	0.011	U	0.011	0.001	J	0.011	0.006	J	0.01	0.004	J	0.011	0.015		0.01	0.008	J	0.01	0.012	U	0.012						
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/kg	0	0.018	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	STYRENE	100-42-5	mg/kg	0	0.126	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	STYRENE	100-42-5	mg/kg	0	0.126	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TETRACHLOROETHENE	127-18-4	mg/kg	0	0.002	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/kg	0	0.002	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TOLUENE	108-88-3	mg/kg	0	0.01	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TOLUENE	108-88-3	mg/kg	0	0.01	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg	0	0.2	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg	0	0.2	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TOTAL XYLENES	1330-20-7	mg/kg	0	0.13	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/kg	0	0.13	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg	0	NA	0.0015	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg	0	NA	0.0015																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	TRICHLOROETHENE	79-01-6	mg/kg	0	0.078	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/kg	0	0.078	NA																									0.11	UJ	0.11	0.014	U	0.014
VOC	CV390	VINYL CHLORIDE	75-01-4	mg/kg	0	0.482	NA	0.011	U	0.011	0.011	U	0.011	0.011	U	0.011	0.01	UJ	0.01	0.011	U	0.011	0.01	U	0.01	0.01	U	0.01	0.012	U	0.012						
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/kg	0	0.482	NA																									0.11	UJ	0.11	0.014	U	0.014
TPH	SW8015MOD	THIODIGLYCOL	111-48-8	mg/kg	0	NA	NA	2E-05	U	0.00002	2E-05	U	2E-05	2E-05	U	2E-05	2E-05	U	2E-05	2E-05	U	2E-05	2E-05	U	2E-05												
SVOC	CSV390	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg	0	0.011	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39						
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg	0	0.011	NA																									2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	1,2-DICHLOROBENZENE	95-50-1	mg/kg	0	0.095	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39						

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVISION SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018	Result	Qualifier (Qual)	Reporting Limit (RL)	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/kg	0	0.095	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	1,3-DICHLOROBENZENE	541-73-1	mg/kg	0	0.089	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/kg	0	0.089	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	1,4-DICHLOROBENZENE	106-46-7	mg/kg	0	0.03	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/kg	0	0.03	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/kg	0	NA	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg	0	NA	0.034	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	U	0.84	0.91	U	0.91	4.1	U	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg	0	NA	0.034																										10	U	10	2.4	U	2.4
SVOC	CSV390	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg	0	NA	0.089	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg	0	NA	0.089																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2,4-DICHLOROPHENOL	120-83-2	mg/kg	0	0.057	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/kg	0	0.057	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	0	NA	0.039	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	0	NA	0.039																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2,4-DINITROPHENOL	51-28-5	mg/kg	0	NA	0.223	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	UJ	0.84	0.91	U	0.91	4.1	UJ	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/kg	0	NA	0.223																										10	U	10	2.4	U	2.4
SVOC	CSV390	2,4-DINITROTOLUENE	121-14-2	mg/kg	0	NA	0.29	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/kg	0	NA	0.29																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2,6-DINITROTOLUENE	606-20-2	mg/kg	0	NA	0.296	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/kg	0	NA	0.296																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2-CHLORONAPHTHALENE	91-58-7	mg/kg	0	NA	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/kg	0	NA	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2-CHLOROPHENOL	95-57-8	mg/kg	0	NA	0.055	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/kg	0	NA	0.055																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2-METHYLNAPHTHALENE	91-57-6	mg/kg	0	0.0202	NA	0.018	J	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/kg	1	0.0202	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2-METHYLPHENOL	95-48-7	mg/kg	0	NA	0.119	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/kg	0	NA	0.119																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	2-NITROANILINE	88-74-4	mg/kg	0	NA	NA	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	U	0.84	0.91	U	0.91	4.1	U	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/kg	0	NA	NA																										10	U	10	2.4	U	2.4
SVOC	CSV390	2-NITROPHENOL	88-75-5	mg/kg	0	NA	0.168	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/kg	0	NA	0.168																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg	0	NA	0.031	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg	0	NA	0.031																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	3-NITROANILINE	99-09-2	mg/kg	0	NA	NA	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	U	0.84	0.91	U	0.91	4.1	U	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/kg	0	NA	NA																										10	U	10	2.4	U	2.4
SVOC	CSV390	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg	0	NA	1.477	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	UJ	0.84	0.91	U	0.91	4.1	UJ	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg	0	NA	1.477																										10	U	10	2.4	U	2.4
SVOC	CSV390	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg	0	0.047	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg	0	0.047	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg	0	NA	0.005	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg	0	NA	0.005																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	4-CHLOROANILINE	106-47-8	mg/kg	0	NA	0.0009	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/kg	0	NA	0.0009																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg	0	NA	NA	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg	0	NA	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	4-METHYLPHENOL	106-44-5	mg/kg	0	NA	0.093	0.35	U	0.35	0.35	U	0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/kg	0	NA	0.093																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	4-NITROANILINE	100-01-6	mg/kg	0	NA	NA	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	U	0.84	0.91	U	0.91	4.1	U	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/kg	0	NA	NA																										10	U	10	2.4	U	2.4
SVOC	CSV390	4-NITROPHENOL	100-02-7	mg/kg	0	NA	0.153	0.86	U	0.86	0.86	U	0.86	0.9	U	0.9	0.84	U	0.84	0.91	U	0.91	4.1	U	4.1	0.82	U	0.82	0.94	UJ	0.94								
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/kg	0	NA	0.153																										10	U	10	2.4	U	2.4
SVOC	CSV390	ACENAPHTHENE	83-32-9	mg/kg	5	0.0067	NA	**0.059**	J	0.35	**0.052**	J	0.35	**0.027**	J	0.37	**0.096**	J	0.35	0.38	U	0.38	**0.26**	J	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/kg	4	0.0067	NA																										2.1	U	2.1	**0.05**	J	0.49
SVOC	CSV390	ACENAPHTHYLENE	208-96-8	mg/kg	4	0.0059	NA	**0.058**	J	0.35	**0.062**	J	0.35	**0.066**	J	0.37	**0.029**	J	0.35	0.38	U	0.38	1.7	U	1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/kg	0	0.0059	NA																										2.1	U	2.1	0.49	U	0.49
SVOC	CSV390	ANTHRACENE	120-12-7	mg/kg	4	0.057	NA	**0.2**	J	0.35	**0.2**	J	0.35	0.057	J	0.37	**0.16**	J	0.35	0.38	U	0.38	**0.62**	J	1.7	0.019	J	0.34	0.39	UJ	0.39								
SVOC	SW8270	ANTHRACENE	120-12-7	mg/kg	4	0.057	NA																										2.1	U	2.1	**0.11**	J	0.49
SVOC	CSV390	BAP EQUIVALENTS	BAP	mg/kg	0	NA	NA	1.514		0.35	1.334		0.35	0.9195		0.37	1.16		0.35	0.1444		0.38	5.821		1.7	0.2484		0.34	0.0989		0.39								
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/kg	0	NA	NA																										0.3424		2.1	0.3188		0.49
SVOC	CSV390	BENZO(A)ANTHRACENE	56-55-3	mg/kg	6	0.108	NA	**0.89**		0.35	**0.84**		0.35	**0.67**		0.37	**0.82**		0.35	0.072	J	0.38	**3.8**		1.7	**0.15**	J	0.34	0.39	UJ	0.39								
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/kg	5	0.108	NA																										2.1	U	2.1	**0.28**	J	0.49
SVOC	CSV390	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.15	NA	**0.96**		0.35	**0.81**		0.35	**0.55**		0.37	**0.71**		0.35	0.086	J	0.38	**4.1**		1.7	**0.17**	J	0.34	0.084	J	0.39								
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.15	NA																										**0.28**	J	2.1	**0.24**	J	0.49
SVOC	CSV390	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	6	0.19	NA	**1.3**		0.35	**1.3**		0.35	**1.2**		0.37	**1.4**		0.35	0.15	J	0.38	**4.9**		1.7	**0.26**	J	0.34	0.12	J	0.39								
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	6	0.19	NA																										**0.35**	J	2.1	**0.3**	J	0.49
SVOC	CSV390	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	5	0.17	NA	**0.77**		0.35	**0.54**		0.35	**0.44**		0.37	**0.46**		0.35	0.054	J	0.38	**3**		1.7	0.091	J	0.34	0.39	UJ	0.39								
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	5	0.17	NA																										**0.25**	J	2.1	**0.18**	J	0.49
SVOC	CSV390	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	3	0.24	NA	**0.72**		0.35	**0.68**		0.35	0.37	U	0.37	0.35	U	0.35	0.38	U	0.38	**4.6**		1.7	0.34	U	0.34	0.39	UJ	0.39								
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	4	0.24	NA																										**0.31**	J	2.1	0.24	J	0.49

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	CSV390	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg	0	NA	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg	0	NA	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg	0	NA	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg	0	NA	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	mg/kg	0	NA	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	CSV390	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	4	0.18	NA	0.082	J	*0.35*	0.12	J	*0.35*	**0.29**	J	*0.37*	**0.3**	J	*0.35*	0.051	J	*0.38*	*1.7*	*UJ*	*1.7*	**0.19**	J	*0.34*	**0.21**	J	*0.39*						
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	3	0.18	NA																									**0.22**	J	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg	0	0.1	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	0.084	J	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg	0	0.1	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	CARBAZOLE	86-74-8	mg/kg	5	0.069	NA	**0.17**	J	*0.35*	**0.16**	J	*0.35*	**0.072**	J	*0.37*	**0.19**	J	*0.35*	*0.38*	*U*	*0.38*	**0.66**	J	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	CARBAZOLE	86-74-8	mg/kg	4	0.069	NA																									*2.1*	*U*	*2.1*	**0.11**	J	0.49
SVOC	CSV390	CHRYSENE	218-01-9	mg/kg	6	0.166	NA	**1**		*0.35*	**0.87**		*0.35*	**0.51**		*0.37*	**0.88**		*0.35*	0.059	J	*0.38*	**4.6**		*1.7*	**0.17**	J	*0.34*	0.064	J	*0.39*						
SVOC	SW8270	CHRYSENE	218-01-9	mg/kg	6	0.166	NA																									**0.34**	J	*2.1*	**0.36**	J	0.49
SVOC	CSV390	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	5	0.033	NA	**0.25**	J	*0.35*	**0.24**	J	*0.35*	**0.12**	J	*0.37*	**0.18**	J	*0.35*	0.032	J	*0.38*	**0.48**	J	*1.7*	0.028	J	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	0	0.033	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	DIBENZOFURAN	132-64-9	mg/kg	3	0.51	0.0000025	**0.073**	J	*0.35*	**0.056**	J	*0.35*	*0.37*	*U*	*0.37*	**0.022**	J	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/kg	2	0.51	0.0000025																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	DIETHYLPHTHALATE	84-66-2	mg/kg	0	0.63	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	0.027	J	0.37	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	0.026	J	0.34	0.076	J	0.39						
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/kg	0	0.63	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	DIMETHYLPHTHALATE	131-11-3	mg/kg	0	0.678	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/kg	0	0.678	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	7	0.011	NA	**0.023**	J	*0.35*	**0.019**	J	*0.35*	**0.044**	J	*0.37*	**0.022**	J	*0.35*	**0.022**	J	*0.38*	*1.7*	*U*	*1.7*	**0.02**	J	*0.34*	**0.045**	J	*0.39*						
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	0	0.011	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	1	0.039	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*UJ*	*1.7*	0.021	J	*0.34*	**0.09**	J	*0.39*						
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	0	0.039	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	FLUORANTHENE	206-44-0	mg/kg	5	0.423	NA	**1.8**		0.35	**1.6**		0.35	**0.83**		0.37	**1.2**		0.35	0.037	J	0.38	**9.9**		*1.7*	0.18	J	0.34	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/kg	4	0.423	NA																									**0.58**	J	2.1	**0.82**		0.49
SVOC	CSV390	FLUORENE	86-73-7	mg/kg	4	0.077	NA	**0.1**	J	*0.35*	**0.098**	J	*0.35*	0.039	J	*0.37*	**0.084**	J	*0.35*	*0.38*	*U*	*0.38*	**0.22**	J	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	FLUORENE	86-73-7	mg/kg	2	0.077	NA																									*2.1*	*U*	*2.1*	0.066	J	0.49
SVOC	CSV390	HEXACHLOROBENZENE	118-74-1	mg/kg	0	NA	0.02	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/kg	0	NA	0.02																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	HEXACHLOROBUTADIENE	87-68-3	mg/kg	0	NA	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*UJ*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/kg	0	NA	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg	0	NA	0.0065	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg	0	NA	0.0065																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	HEXACHLOROETHANE	67-72-1	mg/kg	0	0.027	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/kg	0	0.027	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	5	0.2	NA	**0.77**		*0.35*	**0.62**		*0.35*	**0.62**		*0.37*	**0.47**		*0.35*	0.041	J	*0.38*	**3.2**		*1.7*	0.092	J	*0.34*	0.028	J	*0.39*						
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	4	0.2	NA																									**0.24**	J	*2.1*	0.18	J	0.49
SVOC	CSV390	ISOPHORONE	78-59-1	mg/kg	0	0.876	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	ISOPHORONE	78-59-1	mg/kg	0	0.876	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	NAPHTHALENE	91-20-3	mg/kg	0	0.176	NA	0.072	J	*0.35*	0.052	J	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/kg	0	0.176	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	NITROBENZENE	98-95-3	mg/kg	0	0.407	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	NITROBENZENE	98-95-3	mg/kg	0	0.407	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg	0	NA	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*UJ*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*UJ*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg	0	NA	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg	0	0.11	NA	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg	0	0.11	NA																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	PENTACHLOROPHENOL	87-86-5	mg/kg	0	NA	0.01	*0.86*	*U*	*0.86*	*0.86*	*U*	*0.86*	*0.9*	*U*	*0.9*	*0.84*	*UJ*	*0.84*	*0.91*	*U*	*0.91*	*4.1*	*U*	*4.1*	*0.82*	*U*	*0.82*	*0.94*	*UJ*	*0.94*						
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/kg	2	NA	0.01																									*1*	*U*	*1*	*0.24*	*U*	*0.24*
SVOC	CSV390	PHENANTHRENE	85-01-8	mg/kg	5	0.204	NA	**1.5**		*0.35*	**1.3**		*0.35*	**0.46**		*0.37*	**0.61**		*0.35*	*0.38*	*U*	*0.38*	**4.7**		*1.7*	0.063	J	*0.34*	0.029	J	*0.39*						
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/kg	6	0.204	NA																									**0.22**	J	*2.1*	**0.69**		0.49
SVOC	CSV390	PHENOL	108-95-2	mg/kg	0	NA	0.175	*0.35*	*U*	*0.35*	*0.35*	*U*	*0.35*	*0.37*	*U*	*0.37*	*0.35*	*U*	*0.35*	*0.38*	*U*	*0.38*	*1.7*	*U*	*1.7*	*0.34*	*U*	*0.34*	*0.39*	*UJ*	*0.39*						
SVOC	SW8270	PHENOL	108-95-2	mg/kg	0	NA	0.175																									*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
SVOC	CSV390	PYRENE	129-00-0	mg/kg	5	0.195	NA	**2.5**		*0.35*	**2**		*0.35*	**0.9**		*0.37*	**1.2**		*0.35*	0.056	J	*0.38*	**9.3**		*1.7*	0.15	J	*0.34*	0.039	J	*0.39*						
SVOC	SW8270	PYRENE	129-00-0	mg/kg	6	0.195	NA																									**0.61**	J	*2.1*	**0.75**		0.49
SVOC	CSV390	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	0	NA	NA	12.97			11.26			6.489			8.299			0.587	J		53.68			1.373	J		0.364	J							
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	0	NA	NA																									3.18	J		4.266		
Pest	SW8080	ALDRIN	309-00-2	mg/kg	0	NA	0.029																														
Pest	CP390	ALDRIN	309-00-2	mg/kg	0	NA	0.029	*0.002*	*U*	*0.0018*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	0.0092	J	0.002						
Pest	SW8081	ALDRIN	309-00-2	mg/kg	0	NA	0.029																									*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	ALPHA BHC	319-84-6	mg/kg	0	NA	0.0003																														
Pest	CP390	ALPHA BHC	319-84-6	mg/kg	0	NA	0.0003	*0.002*	*U*	*0.0018*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	ALPHA BHC	319-84-6	mg/kg	0	NA	0.0003																									*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/kg	0	NA	NA																														
Pest	CP390	ALPHA ENDOSULFAN	959-98-8	mg/kg	0	NA	NA	*0.002*	*U*	*0.0018*	0.0055	J	0.0018	0.0076	J	0.0019	0.0045	J	0.0018	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	0.0081	J	0.0018	*0.002*	*U*	*0.002*						
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/kg	0	NA	NA																									*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/kg	0	NA	0.0032																														

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVISION SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Pest	CP390	ALPHA-CHLORDANE	5103-71-9	mg/kg	7	NA	0.0032	**0.014**	J	0.0018	**0.026**	J	0.0018	**0.0095**	J	0.0019	**0.0043**	J	0.0018	*0.002*	*U*	*0.002*	**0.0054**	J	0.0018	**0.02**	J	0.0018	**0.0099**	J	0.002						
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/kg	3	NA	0.0032																								*0.053*	*U*	*0.053*	**0.0097**	J	0.013
Pest	SW8080	BETA BHC	319-85-7	mg/kg	0	NA	0.005																														
Pest	CP390	BETA BHC	319-85-7	mg/kg	0	NA	0.005	*0.002*	*U*	*0.0018*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	BETA BHC	319-85-7	mg/kg	0	NA	0.005																								*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/kg	0	NA	0.0009																														
Pest	CP390	BETA ENDOSULFAN	33213-65-9	mg/kg	0	NA	0.0009	*0.004*	*U*	*0.0035*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.003*	*U*	*0.003*	*0.003*	*U*	*0.003*	*0.004*	*U*	*0.004*						
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/kg	0	NA	0.0009																								*0.1*	*U*	*0.1*	*0.024*	*U*	*0.024*
Pest	SW8080	DDD	72-54-8	mg/kg	3	NA	0.0035																														
Pest	CP390	DDD	72-54-8	mg/kg	6	NA	0.0035	**0.011**	J	0.0035	**0.016**	J	0.0035	**0.0058**	J	0.0037	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	**0.006**	J	0.0034	**0.13**		0.034	**0.23**		0.039						
Pest	SW8081	DDD	72-54-8	mg/kg	8	NA	0.0035																								**0.12**		0.1	**0.07**		0.025
Pest	SW8080	DDE	72-55-9	mg/kg	2	NA	0.0014																														
Pest	CP390	DDE	72-55-9	mg/kg	7	NA	0.0014	**0.029**	J	0.0035	**0.026**	J	0.0035	**0.0081**	J	0.0037	*0.004*	*U*	*0.004*	**0.018**		0.0037	**0.015**	J	0.0034	**0.026**	J	0.0034	**0.029**	J	0.0039						
Pest	SW8081	DDE	72-55-9	mg/kg	9	NA	0.0014																								**0.13**		0.1	**0.077**		0.025
Pest	SW8080	DDT	50-29-3	mg/kg	2	NA	0.001																														
Pest	CP390	DDT	50-29-3	mg/kg	5	NA	0.001	**0.093**	J	0.0035							**0.0053**	J	0.0035	*0.004*	*U*	*0.004*	**0.044**	J	0.0034	**0.042**	J	0.0034	**0.0047**	J	0.0039						
Pest	SW8081	DDT	50-29-3	mg/kg	1	NA	0.001																								*0.1*	*U*	*0.1*	**0.027**		0.025
Pest	SW8080	DELTA BHC	319-86-8	mg/kg	0	NA	NA																														
Pest	CP390	DELTA BHC	319-86-8	mg/kg	0	NA	NA	*0.002*	*U*	*0.0018*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	DELTA BHC	319-86-8	mg/kg	0	NA	NA																								*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	DIELDRIN	60-57-1	mg/kg	2	NA	0.0019																														
Pest	CP390	DIELDRIN	60-57-1	mg/kg	7	NA	0.0019	**0.012**	J	0.0035	**0.0081**	J	0.0035	**0.0063**	J	0.0037	**0.014**	J	0.0035	*0.004*	*U*	*0.004*	**0.038**	J	0.0034	**0.031**	J	0.0034	**0.038**	J	0.0039						
Pest	SW8081	DIELDRIN	60-57-1	mg/kg	1	NA	0.0019																								**0.049**	J	0.1	*0.024*	*U*	*0.024*
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0	NA	0.0007																														
Pest	CP390	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0	NA	0.0007	*0.004*	*U*	*0.0035*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.003*	*U*	*0.003*	*0.003*	*U*	*0.003*	*0.004*	*U*	*0.004*						
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0	NA	0.0007																								*0.1*	*U*	*0.1*	*0.024*	*U*	*0.024*
Pest	SW8080	ENDRIN	72-20-8	mg/kg	0	NA	0.0022																														
Pest	CP390	ENDRIN	72-20-8	mg/kg	6	NA	0.0022	**0.014**	J	0.0035	**0.026**	J	0.0035	**0.015**	J	0.0037	**0.01**	J	0.0035	*0.004*	*U*	*0.004*	**0.018**	J	0.0034	**0.014**	J	0.0034	*0.004*	*U*	*0.004*						
Pest	SW8081	ENDRIN	72-20-8	mg/kg	0	NA	0.0022																								*0.1*	*U*	*0.1*	*0.024*	*U*	*0.024*
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0	NA	NA																														
Pest	CP390	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0	NA	NA	*0.004*	*U*	*0.0035*	0.0046	J	0.0035	0.019	J	0.0037	0.0097	J	0.0035	*0.004*	*U*	*0.004*	*0.003*	*U*	*0.003*	0.004	J	0.0034	*0.004*	*U*	*0.004*						
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0	NA	NA																								*0.1*	*U*	*0.1*	*0.024*	*U*	*0.024*
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/kg	0	NA	NA																														
Pest	CP390	ENDRIN KETONE	53494-70-5	mg/kg	0	NA	NA	*0.004*	*U*	*0.0035*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.004*	*U*	*0.004*	*0.003*	*U*	*0.003*	*0.003*	*U*	*0.003*	*0.004*	*U*	*0.004*						
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/kg	0	NA	NA																								*0.1*	*U*	*0.1*	*0.024*	*U*	*0.024*
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0	NA	0.0024																														
Pest	CP390	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0	NA	0.0024	*0.002*	*U*	*0.0018*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0	NA	0.0024																								*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/kg	0	NA	NA																														
Pest	CP390	GAMMA-CHLORDANE	5103-74-2	mg/kg	0	NA	NA	0.018	J	0.0018	0.027	J	0.0018	0.011	J	0.0019	0.0051	J	0.0018	*0.002*	*U*	*0.002*	0.0048	J	0.0018	0.023	J	0.0018	0.0075	J	0.002						
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/kg	0	NA	NA																								*0.053*	*U*	*0.053*	0.025		0.013
Pest	SW8080	HEPTACHLOR	76-44-8	mg/kg	0	NA	0.0006																														
Pest	CP390	HEPTACHLOR	76-44-8	mg/kg	2	NA	0.0006	**0.0018**	J	0.0018	**0.002**	J	0.0018	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	HEPTACHLOR	76-44-8	mg/kg	0	NA	0.0006																								*0.053*	*UJ*	*0.053*	*0.012*	*UJ*	*0.012*
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	0	NA	0.0025																														
Pest	CP390	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	1	NA	0.0025	**0.0037**	J	0.0018	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	0	NA	0.0025																								*0.053*	*U*	*0.053*	*0.012*	*U*	*0.012*
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/kg	0	NA	0.03																														
Pest	CP390	METHOXYCHLOR	72-43-5	mg/kg	0	NA	0.03	*0.018*	*U*	*0.018*	*0.018*	*U*	*0.018*	*0.019*	*U*	*0.019*	*0.018*	*U*	*0.018*	*0.019*	*U*	*0.019*	*0.018*	*U*	*0.018*	*0.018*	*U*	*0.018*	*0.02*	*U*	*0.02*						
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/kg	0	NA	0.03																								*0.53*	*U*	*0.53*	*0.12*	*UJ*	*0.12*
Pest	SW8080	TOXAPHENE	8001-35-2	mg/kg	0	NA	0.0001																														
Pest	CP390	TOXAPHENE	8001-35-2	mg/kg	0	NA	0.0001	*0.18*	*U*	*0.18*	*0.18*	*U*	*0.18*	*0.19*	*U*	*0.19*	*0.18*	*U*	*0.18*	*0.19*	*U*	*0.19*	*0.18*	*U*	*0.18*	*0.18*	*U*	*0.18*	*0.2*	*U*	*0.2*						
Pest	SW8081	TOXAPHENE	8001-35-2	mg/kg	0	NA	0.0001																								*5.3*	*U*	*5.3*	*1.2*	*U*	*1.2*
PCB	CP390	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/kg	0	NA	0.014																								*1*	*U*	*1*	*0.24*	*U*	*0.24*
PCB	CP390	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/kg	0	NA	0.014	*0.072*	*U*	*0.072*	*0.071*	*U*	*0.071*	*0.075*	*U*	*0.075*	*0.07*	*U*	*0.07*	*0.076*	*U*	*0.076*	*0.069*	*U*	*0.069*	*0.069*	*U*	*0.069*	*0.079*	*U*	*0.079*						
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/kg	0	NA	0.014																								*2.1*	*U*	*2.1*	*0.49*	*U*	*0.49*
PCB	CP390	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/kg	0	NA	0.014																								*1*	*U*	*1*	*0.24*	*U*	*0.24*
PCB	CP390	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/kg	0	NA	0.014																								*1*	*U*	*1*	*0.24*	*U*	*0.24*
PCB	CP390	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/kg	0	NA	0.014																								*1*	*U*	*1*	*0.24*	*U*	*0.24*
PCB	CP390	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/kg	0	NA	0.014																								*1*	*U*	*1*	*0.24*	*U*	*0.24*
PCB	CP390	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg	0	NA	0.014	*0.035*	*U*	*0.035*	*0.035*	*U*	*0.035*	*0.037*	*U*	*0.037*	*0.035*	*U*	*0.035*	*0.038*	*U*	*0.038*	*0.034*	*U*	*0.034*	*0.034*	*U*	*0.034*	*0.039*	*U*	*0.039*						
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg	1	NA	0.014																								*1*	*U*	*1*	**0.33**		0.25
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/kg	0	0.141	NA																														
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/kg	0	0.0202	NA																														
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/kg	0	0.0067	NA																														

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/kg	0	0.0059	NA																														
PAH	SW8100	ANTHRACENE	120-12-7	mg/kg	0	0.057	NA																														
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/kg	0	NA	NA																														
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/kg	0	0.108	NA																														
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/kg	0	0.15	NA																														
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg	0	0.19	NA																														
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	0	0.17	NA																														
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	0	0.24	NA																														
PAH	SW8100	CHRYSENE	218-01-9	mg/kg	0	0.166	NA																														
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	0	0.033	NA																														
PAH	SW8100	FLUORANTHENE	206-44-0	mg/kg	0	0.423	NA																														
PAH	SW8100	FLUORENE	86-73-7	mg/kg	0	0.077	NA																														
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	0	0.2	NA																														
PAH	SW8100	NAPHTHALENE	91-20-3	mg/kg	0	0.176	NA																														
PAH	SW8100	PHENANTHRENE	85-01-8	mg/kg	0	0.204	NA																														
PAH	SW8100	PYRENE	129-00-0	mg/kg	0	0.195	NA																														
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	0	NA	NA																														
Metal	SW7471	MERCURY	7439-97-6	mg/kg	1	NA	0.17	*0.11*	*U*	*0.11*	*0.11*	*U*	*0.11*	*0.12*	*U*	*0.12*	*0.11*	*U*	*0.11*	*0.12*	*U*	*0.12*	*0.1*	*U*	*0.1*	*0.1*	*U*	*0.1*	*0.13*	*U*	*0.13*	0.12	J	0.1	0.1		0.024
Metal	SW9010	CYANIDE	57-12-5	mg/kg	0	NA	NA	*0.16*	*U*	*0.16*	0.23	J	0.16	*0.17*	*U*	*0.17*	*0.16*	*U*	*0.16*	*0.17*	*U*	*0.17*	0.34	J	0.16	*0.15*	*U*	*0.15*	*0.19*	*U*	*0.19*						
Metal	SW6010	ALUMINUM	7429-90-5	mg/kg	0	NA	25000	2170		1.7	2810		1.7	6580		1.9	2420		1.7	3500		1.8	6320		1.7	662		1.6	4270		2.1	3860		4.9	9030		1.2
Metal	SW6010	ANTIMONY	7440-36-0	mg/kg	2	NA	2	*0.43*	*U*	*0.43*	*0.43*	*U*	*0.43*	*0.47*	*U*	*0.47*	0.44	J	0.42	*0.46*	*U*	*0.46*	*0.42*	*U*	*0.42*	*0.41*	*U*	*0.41*	*0.52*	*U*	*0.52*	**6.4**	J	1.1	*0.25*	*U*	*0.25*
Metal	SW6010	ARSENIC	7440-38-2	mg/kg	4	NA	9.8	2	J	0.86	1.8	J	0.86	1.7	J	0.93	1.8	J	0.85	2.5		0.92	3.1		0.83	2.1		0.82	6		1	**14**		0.87	4.9		0.21
Metal	SW6010	BARIUM	7440-39-3	mg/kg	16	NA	20	**24.1**	J	0.22	**45.2**		0.21	**142**		0.23	**53**		0.21	**74.9**		0.23	**47.6**		0.21	16.7	J	0.21	**62.8**		0.26	**112**	J	0.3	**91.4**		0.071
Metal	SW6010	BERYLLIUM	7440-41-7	mg/kg	0	NA	NA	0.23	J	0.22	0.29	J	0.21	1.2	J	0.23	0.22	J	0.21	*0.23*	*U*	*0.23*	0.27	J	0.21	*0.21*	*U*	*0.21*	0.4	J	0.26	0.1	J	0.016	0.52	J	0.0037
Metal	SW6010	CADMIUM	7440-43-9	mg/kg	3	NA	1	0.38	J	0.22	0.44	J	0.21	**1.2**		0.23	**2.4**		0.21	*0.23*	*U*	*0.23*	0.4	J	0.21	0.26	J	0.21	0.46	J	0.26	**1.8**	J	0.053	*0.01*	*U*	*0.01*
Metal	SW6010	CALCIUM	7440-70-2	mg/kg	0	NA	NA	19200		1.1	19200		1.1	37900		1.2	148000		2.1	13300		1.2	43100		1	158000		2.1	1820		1.3	20200		14.7	2000		3.5
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/kg	0	NA	43.4	8.4		0.22	6.9		0.21	5.1		0.23	10.7		0.21	14.6		0.23	16.7		0.21	5.6		0.21	7.8		0.26	7.3		0.65	14.2		0.15
Metal	SW6010	COBALT	7440-48-4	mg/kg	1	NA	50	0.76	J	0.22	1	J	0.21	0.8	J	0.23	1.5	J	0.21	**219**		0.23	2.6	J	0.21	1.6	J	0.21	6.8	J	0.26	3.5	J	0.31	5.8	J	0.074
Metal	SW6010	COPPER	7440-50-8	mg/kg	3	NA	31.6	11.9		0.22	4.3	J	0.21	6.9		0.23	15.4		0.21	**34.7**		0.23	7.4		0.21	7.1		0.21	15.3		0.26	**49.4**		0.62	15		0.15
Metal	SW6010	IRON	7439-89-6	mg/kg	0	NA	20000	3470		2.8	2810		2.8	2470		3	4500		2.7	6870		3	4700		2.7	3340		2.7	9090		3.4	12900		2.2	17000		0.53
Metal	SW6010	LEAD	7439-92-1	mg/kg	5	NA	35.8	17.7		0.43	22.4		0.43	19.9		0.47	28.2		0.42	**44**		0.46	**42.6**		0.42	9.3		0.41	**75**		0.52	30.8		0.8	14.8		0.19
Metal	SW6010	MAGNESIUM	7439-95-4	mg/kg	0	NA	NA	884	J	1.7	1210		1.7	5830		1.9	19100		1.7	786	J	1.8	9390		1.7	3930		1.6	1030	J	2.1	2980	J	3.8	1870		0.91
Metal	SW6010	MANGANESE	7439-96-5	mg/kg	1	NA	460	74	J	0.22	115	J	0.21	232	J	0.23	77	J	0.21	160	J	0.23	**697**	J	0.21	112	J	0.21	218	J	0.26	327		0.33	188		0.078
Metal	SW6010	NICKEL	7440-02-0	mg/kg	1	NA	22.7	2.3	J	0.22	2.1	J	0.21	2.2	J	0.23	4.3	J	0.21	**26.2**		0.23	4.8	J	0.21	3.7	J	0.21	9.9	J	0.26	13.1	J	0.2	15.7		0.048
Metal	SW6010	POTASSIUM	7440-09-7	mg/kg	0	NA	NA	180	J	8.8	253	J	8.8	1150	J	9.6	409	J	8.7	271	J	9.4	375	J	8.5	126	J	8.4	498	J	10.6	1170	J	512.1	1950		121.8
Metal	SW6010	SELENIUM	7782-49-2	mg/kg	10	NA	0.72	0.71	J	0.43	**0.73**	J	0.43	**0.79**	J	0.47	*0.42*	*U*	*0.42*	*0.46*	*U*	*0.46*	*0.42*	*U*	*0.42*	*0.41*	*U*	*0.41*	*0.52*	*U*	*0.52*	**3.8**		0.99	**1.5**		0.24
Metal	SW6010	SILVER	7440-22-4	mg/kg	1	NA	1	*0.43*	*U*	*0.43*	*0.43*	*U*	*0.43*	*0.47*	*U*	*0.47*	*0.42*	*U*	*0.42*	**9.1**		0.46	*0.42*	*U*	*0.42*	*0.41*	*U*	*0.41*	*0.52*	*U*	*0.52*	*0.31*	*U*	*0.31*	*0.07*	*U*	*0.07*
Metal	SW6010	SODIUM	7440-23-5	mg/kg	0	NA	NA	57.5	J	2.2	87.7	J	2.1	282	J	2.3	134	J	2.1	45.7	J	2.3	68.8	J	2.1	149	J	2.1	74	J	2.6	201	J	70.9	*112*	*U*	*16.9*
Metal	SW6010	THALLIUM	7440-28-0	mg/kg	0	NA	NA	*0.65*	*U*	*0.65*	*0.64*	*U*	*0.64*	*0.7*	*U*	*0.7*	*0.63*	*U*	*0.63*	*0.69*	*U*	*0.69*	*0.62*	*U*	*0.62*	*0.62*	*U*	*0.62*	*0.77*	*U*	*0.77*	*0.99*	*U*	*0.99*	*0.24*	*U*	*0.24*
Metal	SW6010	VANADIUM	7440-62-2	mg/kg	0	NA	NA	6.9	J	0.22	6.7	J	0.21	4.7	J	0.23	7.1	J	0.21	6.7	J	0.23	12.9		0.21	4.6	J	0.21	13.1		0.26	25.4	J	0.19	26.5		0.045
Metal	SW6010	ZINC	7440-66-6	mg/kg	8	NA	121	33		0.22	40.6		0.21	66.9		0.23	120		0.21	**1170**		0.23	69.6		0.21	66.9		0.21	**135**		0.26	**190**		0.68	46.4		0.16
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	pg/g	0	NA	NA	556		0	427		0	307		307	226	J	0	59.6	J	0	450		450												
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	pg/g	0	NA	NA	6440		0	6080		0	1310	J	0	630	J	0	385	J	0	2100	J	0												
Dioxin/ Furan	SW8280	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	pg/g	0	NA	NA	*130*	*U*	*130*	*91.7*	*U*	*92*	*76.9*	*U*	*77*	*96*	*U*	*96*	*37.9*	*U*	*38*	*420*	*U*	*420*												
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	pg/g	0	NA	NA	*12.8*	*U*	*13*	*8.9*	*U*	*9*	*10.3*	*U*	*10*	*7.9*	*U*	*8*	*2.4*	*U*	*2*	*280*	*U*	*280*												
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	pg/g	0	NA	NA	*4.3*	*U*	*4*	*8.9*	*U*	*9*	*14.8*	*U*	*15*	*11.8*	*U*	*2*	*10.6*	*U*	*11*	*400*	*U*	*400*												
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	pg/g	0	NA	NA	*13.5*	*U*	*14*	*9.4*	*U*	*9*	*10.8*	*U*	*11*	*8.3*	*U*	*8*	*2.5*	*U*	*3*	*500*	*U*	*500*												
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	pg/g	0	NA	NA	92.9	J	0	76.7		0	*6.9*	*U*	*7*	17.5		0	11.6	J	0	*1800*	*U*	*1800*												
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	pg/g	0	NA	NA	*28*	*U*	*28*	*19.5*	*U*	*20*	*22.4*	*U*	*22*	*17.3*	*U*	*173*	*5.3*	*U*	*5*	*200*	*U*	*200*												
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	pg/g	0	NA	NA	146	J	0	78.2		0	*9.6*	*U*	*10*	23.6	J	0	4.3	J	0	*500*	*U*	*500*												
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	pg/g	0	NA	NA	*4.1*	*U*	*4*	*2.3*	*U*	*2*	*4.5*	*U*	*5*	*3.4*	*U*	*3*	*4*	*U*	*4*	*300*	*U*	*300*												
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	pg/g	0	NA	NA	*1.9*	*U*	*2*	*3.1*	*U*	*3*	*4.1*	*U*	*4*	*2.1*	*U*	*2*	*3*	*U*	*3*	*300*	*U*	*300*												
Dioxin/ Furan	SW8280	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	pg/g	0	NA	NA	*22.5*	*U*	*23*	*15.7*	*U*	*16*	*18*	*U*	*18*	*13.9*	*U*	*14*	*4.2*	*U*	*4*	*480*	*U*	*480*												
Dioxin/ Furan	SW8280	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	pg/g	0	NA	NA	*3.9*	*U*	*4*	*2.2*	*U*	*2*	*4.3*	*U*	*4*	*3.3*	*U*	*3*	*3.8*	*U*	*4*	*650*	*U*	*650*												
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	pg/g	0	NA	NA	*2*	*U*	*2*	*2.4*	*U*	*2*	*4.3*	*U*	*4*	*3.8*	*U*	*4*	*4.6*	*U*	*5*	*140*	*U*	*140*												
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	pg/g	0	NA	0.5	*1.4*	*U*	*1*	*2.3*	*U*	*2*	*3.1*	*U*	*3*	*2.2*	*U*	*2*	*3*	*U*	*3*	*160*	*U*	*160*												
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	pg/g	0	NA	NA	1980		0	1670		0	883		307	780		0	166		0	1300	J	0												

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram, SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic compound

								Location	M-SD01			M-SD01			M-SD02			M-SD03			M-SD04			M-SD05			M-SD16			M-SD17			SD25A			SD25B		
								Sample ID	M-SD1-101195			M-SD20-101195			M-SD2-101195			M-SD3-101195			M-SD4-101195			M-SD5-101295			M-SD16-101095			M-SD17-101195			MIA013			MIA014		
								Sample Date	10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/11/1995			10/12/1995			10/10/1995			10/11/1995			9/29/1998			9/29/1998		
								Sample Type	Sample			Field Duplicate (FD)			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	37871-00-4	pg/g	0	NA	NA	12300		0	12600		0	2620		0	1450		0	780		0	4300		0												
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	pg/g	0	NA	NA	495		0	598		0	345		0	289		0	*2.53*	*U*	*3*	*200*	*U*	*200*												
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	34465-46-8	pg/g	0	NA	NA	1030		0	649		0	170		0	178		0	55.9		0	*400*	*U*	*400*												
Dioxin/ Furan	SW8280	OCTACHLORODIBENZOFURAN	39001-02-0	pg/g	0	NA	NA	2360	J	0	1900	J	0	1060	J	0	831	J	0	117	J	0	2400	J	0												
Dioxin/ Furan	SW8280	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	pg/g	0	NA	NA	51000		0	61600		0	15400		0	8440		0	4300	J	0	20000		0												
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	pg/g	0	NA	NA	106		0	82.9		0	34.2		0	43.4		0	*3.79*	*U*	*4*	*300*	*U*	*300*												
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	36088-22-9	pg/g	0	NA	NA	12.8		0	*3.06*	*U*	*3*	*4.05*	*U*	*4*	*2.13*	*U*	*2*	*2.99*	*U*	*3*	*300*	*U*	*300*												
Dioxin/ Furan	SW8280	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g	6	NA	2.5	**147.2**		0	**144.1**		0	**32.63**		0	**21.94**		0	**10.45**		0	**47.9**		0												
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	pg/g	0	NA	NA	12.3		0	8.7		0	*4.29*	*U*	*4*	*3.82*	*U*	*4*	*4.56*	*U*	*5*	*140*	*U*	*140*												
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	41903-57-5	pg/g	0	NA	NA	*1.43*	*U*	*1*	*2.33*	*U*	*2*	*3.09*	*U*	*3*	*2.21*	*U*	*2*	*3*	*U*	*3*	*160*	*U*	*160*												

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

					SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	CV390	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg																																				
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg																																				
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg																																				
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,1-DICHLOROETHANE	75-34-3	mg/kg																																				
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,1-DICHLOROETHENE	75-35-4	mg/kg																																				
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,2-DICHLOROETHANE	107-06-2	mg/kg																																				
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	1,2-DICHLOROPROPANE	78-87-5	mg/kg																																				
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	2-BUTANONE	78-93-3	mg/kg																																				
VOC	SW8260	2-BUTANONE	78-93-3	mg/kg	0.02	J	0.027	*0.012*	*U*	*0.012*	0.004	J	0.013	0.005	J	0.013	0.008	J	0.016	0.003	J	0.012	0.04	J	0.021	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	0.006	J	0.013						
VOC	CV390	2-HEXANONE	591-78-6	mg/kg																																				
VOC	SW8260	2-HEXANONE	591-78-6	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	4-METHYL-2-PENTANONE	108-10-1	mg/kg																																				
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	ACETONE	67-64-1	mg/kg																																				
VOC	SW8260	ACETONE	67-64-1	mg/kg	*0.15*	*U*	*0.027*	*0.013*	*U*	*0.012*	*0.017*	*U*	*0.013*	*0.033*	*U*	*0.013*	*0.045*	*U*	*0.016*	*0.018*	*U*	*0.012*	*0.2*	*UJ*	*0.021*	*0.012*	*UJ*	*0.012*	*0.013*	*UJ*	*0.013*	*0.026*	*UJ*	*0.013*						
VOC	CV390	BENZENE	71-43-2	mg/kg																																				
VOC	SW8260	BENZENE	71-43-2	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	0.004	J	0.021	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	BROMODICHLOROMETHANE	75-27-4	mg/kg																																				
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	BROMOFORM	75-25-2	mg/kg																																				
VOC	SW8260	BROMOFORM	75-25-2	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	BROMOMETHANE	74-83-9	mg/kg																																				
VOC	SW8260	BROMOMETHANE	74-83-9	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*UJ*	*0.012*	*0.013*	*UJ*	*0.013*	*0.013*	*UJ*	*0.013*						
VOC	CV390	CARBON DISULFIDE	75-15-0	mg/kg																																				
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/kg	**0.008**	J	*0.027*	0.002	J	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	0.003	J	0.021	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CARBON TETRACHLORIDE	56-23-5	mg/kg																																				
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CHLOROBENZENE	108-90-7	mg/kg																																				
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CHLOROETHANE	75-00-3	mg/kg																																				
VOC	SW8260	CHLOROETHANE	75-00-3	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CHLOROFORM	67-66-3	mg/kg																																				
VOC	SW8260	CHLOROFORM	67-66-3	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CHLOROMETHANE	74-87-3	mg/kg																																				
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg																																				
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	DIBROMOCHLOROMETHANE	124-48-1	mg/kg																																				
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	ETHYLBENZENE	100-41-4	mg/kg																																				
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	METHYLENE CHLORIDE	75-09-2	mg/kg																																				
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	STYRENE	100-42-5	mg/kg																																				
VOC	SW8260	STYRENE	100-42-5	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TETRACHLOROETHENE	127-18-4	mg/kg																																				
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TOLUENE	108-88-3	mg/kg																																				
VOC	SW8260	TOLUENE	108-88-3	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg																																				
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TOTAL XYLENES	1330-20-7	mg/kg																																				
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg																																				
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	TRICHLOROETHENE	79-01-6	mg/kg																																				
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
VOC	CV390	VINYL CHLORIDE	75-01-4	mg/kg																																				
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/kg	*0.027*	*U*	*0.027*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*	*0.016*	*U*	*0.016*	*0.012*	*U*	*0.012*	*0.021*	*UJ*	*0.021*	*0.012*	*U*	*0.012*	*0.013*	*U*	*0.013*	*0.013*	*U*	*0.013*						
TPH	SW8015MOD	THIODIGLYCOL	111-48-8	mg/kg																																				
SVOC	CSV390	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg																																				
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg	*0.67*	*U*	*0.67*	*0.44*	*U*	*0.44*	*0.44*	*U*	*0.44*	*0.47*	*U*	*0.47*	*0.48*	*U*	*0.48*	*0.43*	*U*	*0.43*	*0.64*	*U*	*0.64*	*0.41*	*U*	*0.41*	*0.42*	*U*	*0.42*	*0.43*	*U*	*0.43*						
SVOC	CSV390	1,2-DICHLOROBENZENE	95-50-1	mg/kg																																				

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

					SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	1,3-DICHLOROBENZENE	541-73-1	mg/kg																																				
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	1,4-DICHLOROBENZENE	106-46-7	mg/kg																																				
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg																																				
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg																																				
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2,4-DICHLOROPHENOL	120-83-2	mg/kg																																				
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2,4-DIMETHYLPHENOL	105-67-9	mg/kg																																				
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2,4-DINITROPHENOL	51-28-5	mg/kg																																				
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	2,4-DINITROTOLUENE	121-14-2	mg/kg																																				
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2,6-DINITROTOLUENE	606-20-2	mg/kg																																				
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2-CHLORONAPHTHALENE	91-58-7	mg/kg																																				
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2-CHLOROPHENOL	95-57-8	mg/kg																																				
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2-METHYLNAPHTHALENE	91-57-6	mg/kg																																				
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.086**	J	0.64																
SVOC	CSV390	2-METHYLPHENOL	95-48-7	mg/kg																																				
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	2-NITROANILINE	88-74-4	mg/kg																																				
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	2-NITROPHENOL	88-75-5	mg/kg																																				
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg																																				
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.81	U	0.81	0.84	U	0.84	0.85	U	0.85						
SVOC	CSV390	3-NITROANILINE	99-09-2	mg/kg																																				
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg																																				
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg																																				
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg																																				
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	4-CHLOROANILINE	106-47-8	mg/kg																																				
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg																																				
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	4-METHYLPHENOL	106-44-5	mg/kg																																				
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	4-NITROANILINE	100-01-6	mg/kg																																				
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	4-NITROPHENOL	100-02-7	mg/kg																																				
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/kg	3.3	U	3.3	2.2	U	2.2	2.2	U	2.2	2.3	U	2.3	2.4	U	2.4	2.1	U	2.1	3.2	U	3.2	2	U	2	2.1	U	2.1	2.1	U	2.1						
SVOC	CSV390	ACENAPHTHENE	83-32-9	mg/kg																																				
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/kg	**0.25**	J	0.67	**0.13**	J	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.25**	J	0.64																
SVOC	CSV390	ACENAPHTHYLENE	208-96-8	mg/kg																																				
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64																
SVOC	CSV390	ANTHRACENE	120-12-7	mg/kg																																				
SVOC	SW8270	ANTHRACENE	120-12-7	mg/kg	**0.46**	J	0.67	**0.2**	J	0.44	0.046	J	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.35**	J	0.64																
SVOC	CSV390	BAP EQUIVALENTS	BAP	mg/kg																																				
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/kg	2.555		0.67	1.438		0.44	0.2964		0.44	0.0861		0.47	0.085		0.48	0.0686		0.43	2.454		0.64																
SVOC	CSV390	BENZO(A)ANTHRACENE	56-55-3	mg/kg																																				
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/kg	**1.8**		0.67	**1.1**		0.44	**0.22**	J	0.44	0.052	J	0.47	0.052	J	0.48	0.046	J	0.43	**1.5**		0.64																
SVOC	CSV390	BENZO(A)PYRENE	50-32-8	mg/kg																																				
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/kg	**2**		0.67	**1.1**		0.44	**0.23**	J	0.44	0.071	J	0.47	0.066	J	0.48	0.058	J	0.43	**1.9**		0.64																
SVOC	CSV390	BENZO(B)FLUORANTHENE	205-99-2	mg/kg																																				
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	**2.1**		0.67	**1.3**		0.44	**0.25**	J	0.44	0.091	J	0.47	0.079	J	0.48	0.053	J	0.43	**2.3**		0.64																
SVOC	CSV390	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg																																				
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	**1.5**		0.67	**0.93**		0.44	0.17	J	0.44	0.056	J	0.47	0.051	J	0.48	0.043	J	0.43	**1.6**		0.64																
SVOC	CSV390	BENZO(K)FLUORANTHENE	207-08-9	mg/kg																																				
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	**2.2**		0.67	**1.1**		0.44	0.21	J	0.44	0.074	J	0.47	0.07	J	0.48	0.06	J	0.43	**2.1**		0.64																

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

					SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	CSV390	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg																																			
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg																																			
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	mg/kg																																			
SVOC	CSV390	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg																																			
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	**1.5**		0.67	0.095	J	0.44	0.066	J	0.44	0.47	U	0.47	0.11	J	0.48	0.43	U	0.43	**0.26**	J	0.64	0.41	U	0.41	2.4	U	0.42	0.43	U	0.43						
SVOC	CSV390	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg																																			
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	CARBAZOLE	86-74-8	mg/kg																																			
SVOC	SW8270	CARBAZOLE	86-74-8	mg/kg	**0.52**	J	0.67	**0.24**	J	0.44	0.048	J	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.45**	J	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	CHRYSENE	218-01-9	mg/kg																																			
SVOC	SW8270	CHRYSENE	218-01-9	mg/kg	**2.5**		0.67	**1.4**		0.44	**0.27**	J	0.44	0.078	J	0.47	0.083	J	0.48	0.062	J	0.43	**2.6**		0.64															
SVOC	CSV390	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg																																			
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64															
SVOC	CSV390	DIBENZOFURAN	132-64-9	mg/kg																																			
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/kg	**0.11**	J	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.14**	J	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	DIETHYLPHTHALATE	84-66-2	mg/kg																																			
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	DIMETHYLPHTHALATE	131-11-3	mg/kg																																			
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg																																			
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg																																			
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	FLUORANTHENE	206-44-0	mg/kg																																			
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/kg				**2.8**		0.44	**0.55**		0.44	0.14	J	0.47	0.17	J	0.48	0.1	J	0.43																		
SVOC	CSV390	FLUORENE	86-73-7	mg/kg																																			
SVOC	SW8270	FLUORENE	86-73-7	mg/kg	**0.29**	J	0.67	0.073	J	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	**0.33**	J	0.64															
SVOC	CSV390	HEXACHLOROBENZENE	118-74-1	mg/kg																																			
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	HEXACHLOROBUTADIENE	87-68-3	mg/kg																																			
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg																																			
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	HEXACHLOROETHANE	67-72-1	mg/kg																																			
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg																																			
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	**1.4**		0.67	**0.86**		0.44	0.17	J	0.44	0.47	U	0.47	0.051	J	0.48	0.43	U	0.43	**1.5**		0.64															
SVOC	CSV390	ISOPHORONE	78-59-1	mg/kg																																			
SVOC	SW8270	ISOPHORONE	78-59-1	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	NAPHTHALENE	91-20-3	mg/kg																																			
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.081	J	0.64															
SVOC	CSV390	NITROBENZENE	98-95-3	mg/kg																																			
SVOC	SW8270	NITROBENZENE	98-95-3	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg																																			
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg																																			
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	PENTACHLOROPHENOL	87-86-5	mg/kg																																			
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/kg	0.33	U	0.33	**0.14**	J	0.22	0.22	U	0.22	0.23	U	0.23	0.24	U	0.24	0.21	U	0.21	**0.12**	J	0.32	0.2	U	0.2	0.21	U	0.21	0.21	U	0.21						
SVOC	CSV390	PHENANTHRENE	85-01-8	mg/kg																																			
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/kg	**3.2**		0.67	**1.4**		0.44	**0.28**	J	0.44	0.078	J	0.47	0.083	J	0.48	0.044	J	0.43	**2.5**		0.64															
SVOC	CSV390	PHENOL	108-95-2	mg/kg																																			
SVOC	SW8270	PHENOL	108-95-2	mg/kg	0.67	U	0.67	0.44	U	0.44	0.44	U	0.44	0.47	U	0.47	0.48	U	0.48	0.43	U	0.43	0.64	U	0.64	0.41	U	0.41	0.42	U	0.42	0.43	U	0.43						
SVOC	CSV390	PYRENE	129-00-0	mg/kg																																			
SVOC	SW8270	PYRENE	129-00-0	mg/kg	**5**		0.67	**2.4**		0.44	**0.47**		0.44	0.12	J	0.47	0.14	J	0.48	0.095	J	0.43	**4.9**		0.64															
SVOC	CSV390	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg																																			
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	22.7			14.79			2.866			0.76	J		0.845	J		0.561	J		22																	
Pest	SW8080	ALDRIN	309-00-2	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.01	J	0.011	0.002	U	0.002
Pest	CP390	ALDRIN	309-00-2	mg/kg																																			
Pest	SW8081	ALDRIN	309-00-2	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	ALPHA BHC	319-84-6	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	ALPHA BHC	319-84-6	mg/kg																																			
Pest	SW8081	ALPHA BHC	319-84-6	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	ALPHA ENDOSULFAN	959-98-8	mg/kg																																			
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

					SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Pest	CP390	ALPHA-CHLORDANE	5103-71-9	mg/kg																																			
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/kg	**0.034**		0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	**0.0087**	J	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	BETA BHC	319-85-7	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	BETA BHC	319-85-7	mg/kg																																			
Pest	SW8081	BETA BHC	319-85-7	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.021	U	0.021	0.004	U	0.004
Pest	CP390	BETA ENDOSULFAN	33213-65-9	mg/kg																																			
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	DDD	72-54-8	mg/kg																					0.004	U	0.004	**0.0044**		0.0042	0.004	U	0.004	**0.077**		0.021	**0.0046**		0.0041
Pest	CP390	DDD	72-54-8	mg/kg																																			
Pest	SW8081	DDD	72-54-8	mg/kg	**0.091**		0.066	0.043	U	0.043	**0.0077**	J	0.022	**0.031**	J	0.046	**0.033**	J	0.048	**0.0092**		0.0042	**0.4**	J	0.63															
Pest	SW8080	DDE	72-55-9	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	**0.016**	J	0.021	**0.0021**	J	0.0041
Pest	CP390	DDE	72-55-9	mg/kg																																			
Pest	SW8081	DDE	72-55-9	mg/kg	**0.3**		0.066	**0.019**	J	0.043	**0.0091**	J	0.022	**0.055**		0.046	**0.07**		0.048	**0.0092**		0.0042	**0.79**		0.63															
Pest	SW8080	DDT	50-29-3	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	**0.025**		0.021	**0.0037**	J	0.0041
Pest	CP390	DDT	50-29-3	mg/kg																																			
Pest	SW8081	DDT	50-29-3	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	DELTA BHC	319-86-8	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	DELTA BHC	319-86-8	mg/kg																																			
Pest	SW8081	DELTA BHC	319-86-8	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	DIELDRIN	60-57-1	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	**0.024**		0.021	**0.0028**	J	0.0041
Pest	CP390	DIELDRIN	60-57-1	mg/kg																																			
Pest	SW8081	DIELDRIN	60-57-1	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.021	U	0.021	0.004	U	0.004
Pest	CP390	ENDOSULFAN SULFATE	1031-07-8	mg/kg																																			
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	ENDRIN	72-20-8	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.021	U	0.021	0.004	U	0.004
Pest	CP390	ENDRIN	72-20-8	mg/kg																																			
Pest	SW8081	ENDRIN	72-20-8	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.021	U	0.021	0.004	U	0.004
Pest	CP390	ENDRIN ALDEHYDE	7421-36-3	mg/kg																																			
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/kg																					0.004	U	0.004	0.004	U	0.004	0.004	U	0.004	0.021	U	0.021	0.004	U	0.004
Pest	CP390	ENDRIN KETONE	53494-70-5	mg/kg																																			
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/kg	0.066	U	0.066	0.043	U	0.043	0.022	U	0.022	0.046	U	0.046	0.048	U	0.048	0.004	U	0.004	0.63	U	0.63															
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	GAMMA BHC (LINDANE)	58-89-9	mg/kg																																			
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	GAMMA-CHLORDANE	5103-74-2	mg/kg																																			
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/kg	0.054		0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.011	J	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	HEPTACHLOR	76-44-8	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	HEPTACHLOR	76-44-8	mg/kg																																			
Pest	SW8081	HEPTACHLOR	76-44-8	mg/kg	0.034	UJ	0.034	0.022	UJ	0.022	0.011	UJ	0.011	0.024	UJ	0.024	0.025	UJ	0.025	0.002	UJ	0.002	0.33	UJ	0.33															
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg																					0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.011	U	0.011	0.002	U	0.002
Pest	CP390	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg																																			
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	0.034	U	0.034	0.022	U	0.022	0.011	U	0.011	0.024	U	0.024	0.025	U	0.025	0.002	U	0.002	0.33	U	0.33															
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/kg																					0.021	U	0.021	0.022	U	0.022	0.022	U	0.022	0.11	U	0.11	0.021	U	0.021
Pest	CP390	METHOXYCHLOR	72-43-5	mg/kg																																			
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/kg	0.34	UJ	0.34	0.22	UJ	0.22	0.11	UJ	0.11	0.24	UJ	0.24	0.25	UJ	0.25	0.022	UJ	0.022	3.3	U	3.3															
Pest	SW8080	TOXAPHENE	8001-35-2	mg/kg																					0.21	U	0.21	0.22	U	0.22	0.22	U	0.22	1.1	U	1.1	0.21	U	0.21
Pest	CP390	TOXAPHENE	8001-35-2	mg/kg																																			
Pest	SW8081	TOXAPHENE	8001-35-2	mg/kg	3.4	U	3.4	2.2	U	2.2	1.1	U	1.1	2.4	U	2.4	2.5	U	2.5	0.22	U	0.22	33	U	33															
PCB	CP390	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/kg																																			
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PCB	CP390	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/kg																																			
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/kg	1.3	U	1.3	0.88	U	0.88	0.44	U	0.44	0.94	U	0.94	0.97	U	0.97	0.086	U	0.086	13	U	13															
PCB	CP390	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/kg																																			
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PCB	CP390	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/kg																																			
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PCB	CP390	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/kg																																			
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PCB	CP390	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/kg																																			
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PCB	CP390	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg																																			
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg	0.66	U	0.66	0.43	U	0.43	0.22	U	0.22	0.46	U	0.46	0.48	U	0.48	0.042	U	0.042	6.3	U	6.3															
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/kg																					0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/kg																					0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/kg																					0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

Analytical Group	Analytical Method	Analyte	CASRN	Unit	SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
					Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	ANTHRACENE	120-12-7	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/kg																								0	U	0.061	0	U	0.063	0	U	0.064	0	U	0.063	0	U	0.12
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	CHRYSENE	218-01-9	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	FLUORANTHENE	206-44-0	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	FLUORENE	86-73-7	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	NAPHTHALENE	91-20-3	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	PHENANTHRENE	85-01-8	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	PYRENE	129-00-0	mg/kg																								0.061	U	0.061	0.063	U	0.063	0.064	U	0.064	0.063	U	0.063	0.12	U	0.12
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg																								0.061	U		0.063	U		0.064	U		0.063	U		0.12	U	
Metal	SW7471	MERCURY	7439-97-6	mg/kg	**0.53**		0.034	0.05	U	0.022	0.02	U	0.02	0.05	U	0.024	0.03	U	0.024	0.03	U	0.021	0.16		0.032	0.03	U	0.007	0.03	U	0.008	0.02	U	0.008	0.03	U	0.008	0.03	U	0.008
Metal	SW9010	CYANIDE	57-12-5	mg/kg																																					
Metal	SW6010	ALUMINUM	7429-90-5	mg/kg	12800		1.6	8640		1	7160		1	10300		1.1	12100		1.1	9900		1	17100		1.5															
Metal	SW6010	ANTIMONY	7440-36-0	mg/kg	0.89	U	0.34	0.22	U	0.22	0.22	U	0.22	0.24	U	0.24	0.26	U	0.25	0.22	U	0.22	**2.3**	J	0.33	1.8	UJ	1.8	1.9	UJ	1.9	1.9	UJ	1.9	2.5	UJ	1.9	2.3	UJ	1.9
Metal	SW6010	ARSENIC	7440-38-2	mg/kg	**13.4**		0.28	5.6		0.18	5.8		0.18	7.2		0.2	8.4		0.2	7.1		0.18	9.1		0.27	6.7		0.2	6.7		0.21	**13.8**		0.21	**10.1**		0.21	9.8		0.2
Metal	SW6010	BARIUM	7440-39-3	mg/kg	**91.3**		0.096	**107**		0.063	**99.9**		0.063	**75.6**		0.068	**88.1**		0.07	**106**		0.062	**130**		0.093															
Metal	SW6010	BERYLLIUM	7440-41-7	mg/kg	0.54	J	0.005	0.55	J	0.0033	0.42	J	0.0033	0.45	J	0.0035	0.52	J	0.0036	0.49	J	0.0032	0.75	J	0.0048	0.32	J	0.016	0.43	J	0.017	0.25	J	0.017	0.29	J	0.016	0.57	J	0.016
Metal	SW6010	CADMIUM	7440-43-9	mg/kg	0.78	J	0.017	0.01	U	0.01	0.01	U	0.01	0.15	J	0.012	0.11	J	0.012	0.72		0.011	0.97		0.016	0.4	U	0.4	0.42	U	0.42	0.42	U	0.42	0.42	U	0.42	0.52	J	0.41
Metal	SW6010	CALCIUM	7440-70-2	mg/kg	2420		4.8	1190		3.1	958		3.1	4030		3.4	3040		3.4	4080		3	1610		4.6															
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/kg	18.8		0.21	11		0.14	10.9		0.14	13.5		0.15	14.9		0.15	12.7		0.13	36.5		0.2	9.8		0.27	17.6		0.28	11.4		0.28	11.2		0.28	14.7		0.27
Metal	SW6010	COBALT	7440-48-4	mg/kg	6.3	J	0.1	5.5	J	0.066	5.4	J	0.066	5.4	J	0.071	5.8	J	0.073	6.1	J	0.064	6.9	J	0.097															
Metal	SW6010	COPPER	7440-50-8	mg/kg	31.4		0.2	14		0.13	11		0.13	15.3		0.14	17.6		0.15	13.9		0.13	**41.2**		0.19	8.8	J	0.15	16.5	J	0.15	13.6	J	0.15	12.8	J	0.15	11.6	J	0.15
Metal	SW6010	IRON	7439-89-6	mg/kg	16500		0.72	18000		0.47	14500		0.47	15100		0.51	17200		0.52	17900		0.46	19200		0.7															
Metal	SW6010	LEAD	7439-92-1	mg/kg	**169**		0.26	9.3		0.17	8.1		0.17	15		0.18	16.2		0.19	9.8		0.17	**121**		0.25	9.9		0.24	10.8		0.25	10.3		0.25	10.4		0.25	15.5		0.24
Metal	SW6010	MAGNESIUM	7439-95-4	mg/kg	2590		1.2	1820		0.81	1620		0.81	2800		0.87	2640		0.9	2880		0.79	2490		1.2															
Metal	SW6010	MANGANESE	7439-96-5	mg/kg	208		0.11	162		0.069	230		0.069	271		0.075	295		0.077	328		0.068	183		0.1															
Metal	SW6010	NICKEL	7440-02-0	mg/kg	17		0.065	14.2		0.042	12.4		0.042	12.8		0.046	14.7		0.047	14.3		0.041	21.2		0.062	11.7	J	0.67	14.5	J	0.7	12.6	J	0.7	11.9	J	0.69	11.1	J	0.69
Metal	SW6010	POTASSIUM	7440-09-7	mg/kg	2630		165.6	2060		108.3	1860		108.5	2050		116.8	2310		119.8	1950		105.8	3240		159.2															
Metal	SW6010	SELENIUM	7782-49-2	mg/kg	**2.8**		0.32	0.54	U	0.21	**1.6**		0.21	**1.2**		0.23	**1.3**		0.23	0.21	U	0.21	**1.9**		0.31	0.38	U	0.17	0.56	U	0.18	0.41	U	0.18	0.29	U	0.18	**0.98**		0.18
Metal	SW6010	SILVER	7440-22-4	mg/kg	0.1	U	0.1	0.07	U	0.07	0.07	U	0.07	0.07	U	0.07	0.07	U	0.07	0.06	U	0.06	0.1	U	0.1	0.27	U	0.27	0.28	U	0.28	0.28	U	0.28	0.28	U	0.28	0.28	J	0.27
Metal	SW6010	SODIUM	7440-23-5	mg/kg	136	U	22.9	99	U	15	132	U	15	16.2	U	16.2	138	U	16.6	51.4	U	14.7	101	U	22															
Metal	SW6010	THALLIUM	7440-28-0	mg/kg	0.32	U	0.32	0.21	U	0.21	0.21	U	0.21	0.23	U	0.23	0.23	U	0.23	0.21	U	0.21	0.31	U	0.31	0.15	U	0.15	0.16	U	0.16	0.16	U	0.16	0.16	U	0.16	0.19	U	0.16
Metal	SW6010	VANADIUM	7440-62-2	mg/kg	27.9		0.061	22.3		0.04	20.9		0.04	25.1		0.043	28.8		0.045	24		0.039	38.9		0.059															
Metal	SW6010	ZINC	7440-66-6	mg/kg	**175**		0.22	50.3		0.14	44.5		0.14	**573**		0.16	**128**		0.16	**142**		0.14	**233**		0.21	39	J	0.12	42.7	J	0.13	46.2	J	0.13	40.1	J	0.13	38.1	J	0.12
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	pg/g																																			
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	pg/g																																			
Dioxin/ Furan	SW8280	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	pg/g																																			
Dioxin/ Furan	SW8280	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	pg/g																																			
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	pg/g																																			
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	pg/g																																			
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	pg/g																																			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-4
FU-2 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available, PAH = Polycyclic aromatic hydroc
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, TPH = Total petroleum hydrocarbon, VOC = Volatile organic

					SD25C			SD26A			SD26B			SD26C			SD26C			SD26D			SD26E			SE51A			SE51B			SE51C			SE52A			SE52B		
					MIA015			MIA023			MIA024			MIA025			MIA026FD			MIA027			MIA028			SGB011			SGB012			SGB013			SGB001			SGB002		
					9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			12/19/1996			12/19/1996			12/19/1996			12/19/1996			12/19/1996		
					Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	37871-00-4	pg/g																																				
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	pg/g																																				
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	34465-46-8	pg/g																																				
Dioxin/ Furan	SW8280	OCTACHLORODIBENZOFURAN	39001-02-0	pg/g																																				
Dioxin/ Furan	SW8280	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	pg/g																																				
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	pg/g																																				
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	36088-22-9	pg/g																																				
Dioxin/ Furan	SW8280	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g																																				
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	pg/g																																				
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	41903-57-5	pg/g																																				

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW10			SW11			SW12			SW13			SW25A1			SW25A1			SW25B1			SW25B1			SW25B1			SW25B1		
								Sample ID	LAWSW10			LAWSW11			LAWSW12			LAWSW13			RHA101			WSRHA101			RHA102			RHA117FD1			WSRHA102			WSRHA117FD1		
								Sample Date	4/5/1989			1/2/1989			1/2/1989			1/2/1989			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freswater Surface Water Acute, 2018**	**EPA R4 Freswater Surface Water Chronic, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	0	0.69	0.076																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	0	0.91	0.2																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	0	3.2	0.73																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	0	3.7	0.41																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	0	1.2	0.13																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	0	8.2	2																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	0	3.3	0.52																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	0	200	22																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	0	1.8	0.099																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	0	2.2	0.17																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8240	ACETONE	67-64-1	mg/L	0	15	1.7	0.001	J		0.004	J		0.004	J																							
VOC	SW8260	ACETONE	67-64-1	mg/L	0	15	1.7																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	BENZENE	71-43-2	mg/L	0	0.7	0.16																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	0	3.1	0.34																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	BROMOFORM	75-25-2	mg/L	0	1.1	0.23																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	0	0.038	0.016																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	0	0.13	0.015																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	0	0.69	0.077																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	0	0.22	0.025																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	0	NA	NA																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	0	1.3	0.14																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	0	NA	NA																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	0	0.015	0.0017																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	0	2.9	0.32																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	0	0.55	0.061																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L	0	8.5	1.5																															
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	0	8.5	1.5																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	STYRENE	100-42-5	mg/L	0	0.29	0.032																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	0	0.43	0.053																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	TOLUENE	108-88-3	mg/L	0	0.56	0.062																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	0	8.8	0.97																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L	0	0.24	0.027				0.001	J																										
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	0	0.24	0.027																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	0	0.015	0.0017																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	0	2	0.22																		0.01	U	0.01	0.01	U	0.01								
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	0	8.4	0.93																		0.01	U	0.01	0.01	U	0.01								
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L	0	NA	NA													94		4				15		4	10		4						
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L	0	NA	NA													14.6		1				2.3		1	2.6		1						
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	0	0.42	0.13																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	0	0.13	0.023																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	0	0.079	0.022																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	0	0.057	0.0094																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	0	NA	NA																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	0	0.017	0.0019																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	0	0.039	0.0049																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	0	0.092	0.011																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	0	0.14	0.015																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	0	0.379	0.071																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	0	0.39	0.044																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	0	0.73	0.081																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	0	NA	NA																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	0	0.16	0.018																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	0	0.042	0.0047																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	0	0.6	0.067																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	0	NA	NA																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	0	0.65	0.073																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	0	0.041	0.0045																		0.02	U	0.02	0.02	U	0.02								
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	0	NA	NA																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	0	NA	NA																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	0	0.012	0.0015																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	0	0.067	0.001																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	0	0.024	0.0008																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	0	NA	NA																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	0	0.48	0.053																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	0	NA	NA																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	0	0.53	0.058																		0.05	U	0.05	0.05	U	0.05								
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	0	0.019	0.015																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	0	0.12	0.013																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	0	0.00018	0.00002																		0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	0	NA	NA																		0	U	0.01	0	U	0.01								
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	0	0.042	0.0047																		0.01	U	0.01	0.01	U	0.01								

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW10			SW11			SW12			SW13			SW25A1			SW25A1			SW25B1			SW25B1			SW25B1			SW25B1		
								Sample ID	LAWSW10			LAWSW11			LAWSW12			LAWSW13			RHA101			WSRHA101			RHA102			RHA117FD1			WSRHA102			WSRHA117FD1		
								Sample Date	4/5/1989			1/2/1989			1/2/1989			1/2/1989			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	EPA R4 Freswater Surface Water Acute, 2018	EPA R4 Freswater Surface Water Chronic, 2018	Result	Qualifier (Qual)	Reporting Limit (RL)	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	0	0.00054	0.00006																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/L	0	0.023	0.0026																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0	0.00019	0.000012																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0	0.0013	0.00006																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BENZOICACID	65-85-0	mg/L	0	0.74	0.042										0.006	J		0.005	J																				
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	0	NA	NA																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	0	NA	NA																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	1	1.1	0.008	0.007	J		0.003	J		0.003	J		0.006	J										0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	0	0.13	0.023				0.003	J																0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	0	NA	NA																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	0	0.042	0.0047																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0	0.00028	0.000012																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	0	0.036	0.004																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	0	0.98	0.22																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	0	3.2	1.1																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	0	0.034	0.019	0.003	J																			0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	0	NA	NA	0.003	J																			0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	1	0.0037	0.0008				**0.002**	J																0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	FLUORENE	86-73-7	mg/L	0	0.11	0.019																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	0	0.0028	0.00015																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	0	0.01	0.001																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	0	0.0045	0.00045																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	0	0.21	0.012																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0	0.00027	0.000012																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	0	7.5	0.92																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	0	0.17	0.021																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	0	1	0.23																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	0	NA	NA																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	0	0.22	0.025	0.002	J								0.007	J										0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	0	0.019	0.015																					0.005	U	0.005	0.005	U	0.005								
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	0	0.031	0.0023																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	PHENOL	108-95-2	mg/L	0	4.7	0.16																					0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	PYRENE	129-00-0	mg/L	0	0.042	0.0046	0.003	J		0.003	J																0.01	U	0.01	0.01	U	0.01								
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	0	NA	NA	0.003	J		0.005	J																0.01	U		0.01	U								
Pest	SW8080	ALDRIN	309-00-2	mg/L	0	0.003	0.00004													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	ALDRIN	309-00-2	mg/L	0	0.003	0.00004																																	
Pest	SW8080	ALPHA BHC	319-84-6	mg/L	0	NA	0.00001													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	ALPHA BHC	319-84-6	mg/L	0	NA	0.00001																																	
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	0	0.00022	0.00006													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L	0	0.00022	0.00006																																	
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L	0	0.0024	0.000004													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L	0	0.0024	0.000004																																	
Pest	SW8080	BETA BHC	319-85-7	mg/L	0	NA	0.00001													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	BETA BHC	319-85-7	mg/L	0	NA	0.00001																																	
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L	0	0.00022	0.00006													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L	0	0.00022	0.00006																																	
Pest	SW8080	DDD	72-54-8	mg/L	0	0.00019	0.00001													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	DDD	72-54-8	mg/L	0	0.00019	0.00001																																	
Pest	SW8080	DDE	72-55-9	mg/L	2	0.0013	0.0003	0.0001			**0.0009**						**0.0007**			2E-04	U	2E-04						1E-04	U	1E-04	3E-05	J	0.0001								
Pest	SW8081	DDE	72-55-9	mg/L	0	0.0013	0.0003																																	
Pest	SW8080	DDT	50-29-3	mg/L	7	0.0011	0.000001	**0.0003**			**0.0019**						**0.0022**			2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	DDT	50-29-3	mg/L	0	0.0011	0.000001																																	
Pest	SW8080	DELTA BHC	319-86-8	mg/L	0	NA	NA													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	DELTA BHC	319-86-8	mg/L	0	NA	NA																																	
Pest	SW8080	DIELDRIN	60-57-1	mg/L	8	0.00024	0.00006													**0.0004**		0.0002						1E-04	U	1E-04	**0.0002**		0.0001								
Pest	SW8081	DIELDRIN	60-57-1	mg/L	0	0.00024	0.00006																																	
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L	0	0.0019	0.00006													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L	0	0.0019	0.00006																																	
Pest	SW8080	ENDRIN	72-20-8	mg/L	0	0.00009	0.00004													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	ENDRIN	72-20-8	mg/L	0	0.00009	0.00004																																	
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L	0	NA	NA													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L	0	NA	NA																																	
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L	0	NA	NA													2E-04	U	2E-04						1E-04	U	1E-04	1E-04	U	1E-04								
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L	0	NA	NA																																	
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L	0	0.00095	0.00011													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L	0	0.00095	0.00011																																	
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L	0	NA	NA													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L	0	NA	NA																																	
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L	0	0.0005	0.000004													1E-04	U	1E-04						5E-05	U	5E-05	5E-05	U	5E-05								

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW10			SW11			SW12			SW13			SW25A1			SW25A1			SW25B1			SW25B1			SW25B1			SW25B1		
								Sample ID	LAWSW10			LAWSW11			LAWSW12			LAWSW13			RHA101			WSRHA101			RHA102			RHA117FD1			WSRHA102			WSRHA117FD1		
								Sample Date	4/5/1989			1/2/1989			1/2/1989			1/2/1989			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	EPA R4 Freswater Surface Water Acute, 2018	EPA R4 Freswater Surface Water Chronic, 2018	Result	Qualifier (Qual)	Reporting Limit (RL)	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L	0	0.0005	0.000004																																
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	0	0.0005	0.000004													1E-04	U	1E-04				5E-05	U	5E-05	5E-05	U	5E-05								
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	0	0.0005	0.000004																																
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L	0	0.0007	0.00003													0.001	U	0.001				5E-04	U	5E-04	5E-04	U	5E-04								
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L	0	0.0007	0.00003																																
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L	0	0.00073	0.0000002													0.01	U	0.01				0.005	U	0.005	0.005	U	0.005								
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L	0	0.00073	0.0000002																																
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L	0	0.000014	0.00000012													0.002	U	0.002				0.002	U	0.002	0.002	U	0.002								
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L	0	0.000014	0.00000012																																
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L	0	0.000014	0.00000012													0.001	U	0.001				0.001	U	0.001	0.001	U	0.001								
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L	0	0.000014	0.00000012																																
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L	0	0.109	0.0061																																
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L	0	0.042	0.0047																																
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L	0	0.019	0.015																																
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L	0	0.12	0.013																																
PAH	SW8100	ANTHRACENE	120-12-7	mg/L	0	0.00018	0.00002																																
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L	0	NA	NA																																
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L	0	0.042	0.0047																																
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L	0	0.00054	0.00006																																
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/L	0	0.023	0.0026																																
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0	0.00019	0.000012																																
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0	0.0013	0.00006																																
PAH	SW8100	CHRYSENE	218-01-9	mg/L	0	0.042	0.0047																																
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0	0.00028	0.000012																																
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L	0	0.0037	0.0008																																
PAH	SW8100	FLUORENE	86-73-7	mg/L	0	0.11	0.019																																
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0	0.00027	0.000012																																
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L	0	0.17	0.021																																
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L	0	0.031	0.0023																																
PAH	SW8100	PYRENE	129-00-0	mg/L	0	0.042	0.0046																																
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	0	NA	NA																																
Metal	SW7470	MERCURY	7439-97-6	mg/L	0	0.0014	0.00077													6E-05	U	1E-05				6E-05	U	1E-05	4E-05	U	1E-05								
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L	0	0.0014	0.00077																4E-05	U	1E-05							8E-05	U	1E-05	5E-05	U	1E-05		
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	6	0.75	0.087																			0.147	U	0.007	0.081	U	0.007								
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L	0	NA	NA																									0.025	U	0.007	0.007	U	0.007		
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	0	0.9	0.19													0.003	U	0.002				0.004	U	0.002	0.002	U	0.002								
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L	0	NA	NA																0.003	U	0.002							0.003	U	0.002	0.002	U	0.002		
Metal	SW6010	ARSENIC	7440-38-2	mg/L	0	0.34	0.15							0.03						0.013		0.0016				0.002	U	0.002	0.002	U	0.002								
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L	0	0.34	0.15																0.0084	J	0.0016							0.002	U	0.002	0.0025	J	0.0016		
Metal	SW6010	BARIUM	7440-39-3	mg/L	0	2	0.22	0.026			0.055			0.098			0.06									0.006	U	2E-04	0.005	U	2E-04								
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L	0	NA	NA																									0.004	U	2E-04	0.004	U	2E-04		
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	0	0.093	0.011													9E-05	U	9E-05				1E-04	U	9E-05	9E-05	U	9E-05								
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L	0	NA	NA																1E-04	U	9E-05							9E-05	U	9E-05	9E-05	U	9E-05		
Metal	SW6010	CADMIUM	7440-43-9	mg/L	0	NA	NA							0.019						4E-04	U	2E-04				4E-04	U	2E-04	2E-04	U	2E-04								
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L	0	0.00094	0.00045																3E-04	U	2E-04							2E-04	U	2E-04	2E-04	U	2E-04		
Metal	SW6010	CALCIUM	7440-70-2	mg/L	0	NA	116																			2.49	J	0.0039	2.44	J	0.0039								
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L	0	NA	NA																									2.29	J	0.0039	2.68	J	0.0039		
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L	0	0.016	0.011																8E-04	U	5E-04							6E-04	U	5E-04	7E-04	U	5E-04		
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	0	NA	NA							0.02						0.003	U	5E-04				0.001	U	5E-04	0.001	U	5E-04								
Metal	SW6010	COBALT	7440-48-4	mg/L	0	0.12	0.019																			0.001	U	3E-04	8E-04	U	3E-04								
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L	0	NA	NA																									1E-03	U	3E-04	0.001	U	3E-04		
Metal	SW6010	COPPER	7440-50-8	mg/L	0	NA	NA	0.025			0.03			0.02						0.007	U	8E-04				0.004	U	8E-04	0.003	U	8E-04								
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L	0	0.007	0.00495																0.003	U	8E-04							0.001	U	8E-04	0.002	U	8E-04		
Metal	SW6010	IRON	7439-89-6	mg/L	0	NA	1																			0.306		0.0017	0.245		0.0017								
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L	0	NA	NA																									0.059	U	0.002	0.089	U	0.002		
Metal	SW6010	LEAD	7439-92-1	mg/L	0	NA	NA				0.05			0.1						0.0169	J	0.002				0.0052	J	0.002	0.0026	J	0.002								
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L	4	0.0301	0.00125																0.002	UJ	0.002							0.002	UJ	0.002	0.002	UJ	0.002		
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	0	NA	82																			0.286	J	0.0019	0.271	J	0.0019								
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L	0	NA	NA																									0.263	J	0.0019	0.418	J	0.0019		

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								SW10			SW11			SW12			SW13			SW25A1			SW25A1			SW25B1			SW25B1			SW25B1			SW25B1		
							Location	LAWSW10			LAWSW11			LAWSW12			LAWSW13			RHA101			WSRHA101			RHA102			RHA117FD1			WSRHA102			WSRHA117FD1		
							Sample ID	4/5/1989			1/2/1989			1/2/1989			1/2/1989			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997			1/15/1997		
							Sample Date	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
							Sample Type																														
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freswater Surface Water Acute, 2018**	**EPA R4 Freswater Surface Water Chronic, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Metal	SW6010	MANGANESE	7439-96-5	mg/L	0	1.68	0.093																		0.0167		0.0002	0.0146	J	0.0002								
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L	0	NA	NA																							0.0103	J	0.0002	0.0097	J	0.0002
Metal	SW6010	NICKEL	7440-02-0	mg/L	0	NA	NA													*0.004*	*U*	*0.001*				*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*						
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L	0	0.26	0.0289																*0.001*	*U*	*0.001*							*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	0	NA	53																		*0.745*	*U*	*0.745*	*0.745*	*U*	*0.745*						
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L	0	NA	NA																							*0.745*	*U*	*0.745*	*0.745*	*U*	*0.745*
Metal	SW6010	SELENIUM	7782-49-2	mg/L	1	0.02	0.005													*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*						
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L	0	NA	NA																*0.001*	*U*	*0.001*							*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*
Metal	SW6010	SILVER	7440-22-4	mg/L	0	NA	NA													*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*	*7E-04*	*U*	*7E-04*						
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L	0	0.00098	0.00006																*7E-04*	*U*	*7E-04*							*7E-04*	*U*	*7E-04*	*7E-04*	*U*	*7E-04*
Metal	SW6010	SODIUM	7440-23-5	mg/L	0	NA	680																		*0.456*	*U*	*0.057*	*0.483*	*U*	*0.057*						
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L	0	NA	NA																							*0.577*	*U*	*0.057*	*0.419*	*U*	*0.057*
Metal	SW6010	THALLIUM	7440-28-0	mg/L	0	0.054	0.006													*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*	*0.001*	*U*	*0.001*						
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L	0	NA	NA																*0.003*	*U*	*0.001*							*0.001*	*U*	*0.001*	*0.002*	*U*	*0.001*
Metal	SW6010	VANADIUM	7440-62-2	mg/L	0	0.079	0.027																		*0.001*	*U*	*4E-04*	*8E-04*	*U*	*4E-04*						
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L	0	NA	NA																							*5E-04*	*U*	*4E-04*	*4E-04*	*U*	*4E-04*
Metal	SW6010	ZINC	7440-66-6	mg/L	0	NA	NA	0.081			0.11			0.15			0.054			*0.049*	*UJ*	*6E-04*				*0.035*	*UJ*	*6E-04*	*0.031*	*UJ*	*6E-04*						
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L	4	0.066	0.066																*0.023*	*UJ*	*6E-04*							*0.025*	*UJ*	*6E-04*	*0.022*	*UJ*	*6E-04*

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW25B2			SW25B2			SW25B2			SW25B2			SW25C1			SW25C1			SW25C2			SW25C2			SW25D1			SW25D1			SW25D2			SW25D2			SW25E
					RHA110			RHA118FD1			WSRHA110			WSRHA118FD1			RHA103			WSRHA103			RHA111			WSRHA111			RHA104			WSRHA104			RHA112			WSRHA112			MIA007
					1/23/1997			1/23/1997			1/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/199
					Sample			FD			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
VOC	SW8240	ACETONE	67-64-1	mg/L																																					
VOC	SW8260	ACETONE	67-64-1	mg/L	0.01	UJ	0.01	0.01	UJ	0.01																														0.01	U
VOC	SW8260	BENZENE	71-43-2	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	BROMOFORM	75-25-2	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	UJ
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L																																					
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	STYRENE	100-42-5	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	TOLUENE	108-88-3	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L																																					
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	0.01	U	0.01	0.005	U	0.01																														0.01	U
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L	4	U	4	4	U	4							4	U	4				4	U	4				21		4				557		4					
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L	5.9		1	6		1							2.8		1				9.5		1				16.8		1				23		1					
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	0.05	U	0.05	0.05	U	0.05																														0.05	U
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	0.01	U	0.01	0.01	U	0.01																														0.01	U
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	0.05	UJ	0.05	0.05	UJ	0.05																														0.05	U
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	0.05	U	0.05	0.05	UJ	0.05																														0.05	U
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	0.02	U	0.02	0.02	UJ	0.02																														0.01	U
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	0.05	U	0.05	0.05	UJ	0.05																														0.05	U
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	0.05	U	0.05	0.05	UJ	0.05																														0.05	U
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	0.05	U	0.05	0.05	UJ	0.05																														0.05	U
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	0.05	U	0.05	0.05	UJ	0.05																														0.05	UJ
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	0	U	0.01	0	U	0.01																														0	U
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																														0.01	U

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW25B2			SW25B2			SW25B2			SW25B2			SW25C1			SW25C1			SW25C2			SW25C2			SW25D1			SW25D1			SW25D2			SW25D2			SW25E
					RHA110			RHA118FD1			WSRHA110			WSRHA118FD1			RHA103			WSRHA103			RHA111			WSRHA111			RHA104			WSRHA104			RHA112			WSRHA112			MIA007
					1/23/1997			1/23/1997			1/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/199
					Sample			FD			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BENZOICACID	65-85-0	mg/L																																						
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	0.01	U	0.01	0.01	U	0.01																															0.01	U
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	FLUORENE	86-73-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	0.005	U	0.005	0.005	UJ	0.005																															0.005	U
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	PHENOL	108-95-2	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	PYRENE	129-00-0	mg/L	0.01	U	0.01	0.01	UJ	0.01																															0.01	U
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	0.01	U		0.01	U																															0.01	U
Pest	SW8080	ALDRIN	309-00-2	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05										5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	ALDRIN	309-00-2	mg/L																																					5E-05	U
Pest	SW8080	ALPHA BHC	319-84-6	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05										5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	ALPHA BHC	319-84-6	mg/L																																					5E-05	U
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05										5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L																																					5E-05	U
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05										5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L																																					5E-05	U
Pest	SW8080	BETA BHC	319-85-7	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05										5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	BETA BHC	319-85-7	mg/L																																					5E-05	U
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L																																					1E-04	U
Pest	SW8080	DDD	72-54-8	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	DDD	72-54-8	mg/L																																					1E-04	U
Pest	SW8080	DDE	72-55-9	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	DDE	72-55-9	mg/L																																					1E-04	U
Pest	SW8080	DDT	50-29-3	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	DDT	50-29-3	mg/L																																					1E-04	U
Pest	SW8080	DELTA BHC	319-86-8	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	DELTA BHC	319-86-8	mg/L																																					5E-05	U
Pest	SW8080	DIELDRIN	60-57-1	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				4E-05	J	0.0001				5E-05	J	0.0001				5E-05	J	0.0001					
Pest	SW8081	DIELDRIN	60-57-1	mg/L																																					1E-04	U
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L																																					1E-04	U
Pest	SW8080	ENDRIN	72-20-8	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	ENDRIN	72-20-8	mg/L																																					1E-04	U
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L																																					1E-04	U
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L	1E-04	U	1E-04	1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04					
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L																																					1E-04	U
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L																																					5E-05	U
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05					
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L																																					5E-05	U
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05					

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW25B2			SW25B2			SW25B2			SW25B2			SW25C1			SW25C1			SW25C2			SW25C2			SW25D1			SW25D1			SW25D2			SW25D2			SW25E
					RHA110			RHA118FD1			WSRHA110			WSRHA118FD1			RHA103			WSRHA103			RHA111			WSRHA111			RHA104			WSRHA104			RHA112			WSRHA112			MIA007
					1/23/1997			1/23/1997			1/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/199
					Sample			FD			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L																																					5E-05	UJ
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	5E-05	U	5E-05	5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L																																			5E-05	U
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L	5E-04	U	5E-04	5E-04	U	5E-04							5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04			
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L																																			5E-04	UJ
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L	0.005	U	0.005	0.005	U	0.005							0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				0.005	U	0.005			
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L																																			0.005	U
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L																																			0.001	U
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L	0.002	U	0.002	0.002	U	0.002							0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002			
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L																																			0.002	U
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L																																			0.001	U
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L																																			0.001	U
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L																																			0.001	U
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L																																			0.001	U
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L	0.001	U	0.001	0.001	U	0.001							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L																																			0.001	U
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L																																						
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L																																						
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L																																						
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L																																						
PAH	SW8100	ANTHRACENE	120-12-7	mg/L																																						
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L																																						
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L																																						
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L																																						
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/L																																						
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L																																						
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L																																						
PAH	SW8100	CHRYSENE	218-01-9	mg/L																																						
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L																																						
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L																																						
PAH	SW8100	FLUORENE	86-73-7	mg/L																																						
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L																																						
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L																																						
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L																																						
PAH	SW8100	PYRENE	129-00-0	mg/L																																						
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L																																						
Metal	SW7470	MERCURY	7439-97-6	mg/L	6E-05	U	6E-05	6E-05	U	6E-05							4E-05	U	1E-05				6E-05	U	6E-05				6E-05	U	1E-05				2E-04	U	6E-05				8E-05	U
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L							6E-05	U	6E-05	6E-05	U	6E-05				4E-05	U	1E-05				6E-05	U	6E-05				5E-05	U	1E-05				6E-05	U	6E-05	
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	0.064	J	0.0066	0.0498	J	0.0066																															**0.351**	
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L							0.014	J	0.0066	0.0147	J	0.0066																										
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	0.002	U	0.002	0.002	U	0.002							0.002	U	0.002				0.003	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L							0.004	U	0.002	0.002	U	0.002				0.003	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002	
Metal	SW6010	ARSENIC	7440-38-2	mg/L	0.002	U	0.002	0.002	U	0.002							0.0026	J	0.0016				0.0038	J	0.0016				0.008	J	0.0016				0.0153		0.0016				0.016	U
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L							0.0018	J	0.0016	0.002	U	0.002				0.002	U	0.002				0.0034	J	0.0016				0.0073	J	0.0016				0.0084	J	0.0016	
Metal	SW6010	BARIUM	7440-39-3	mg/L	0.013	UJ	2E-04	0.012	UJ	2E-04																															0.0177	J
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L							0.008	UJ	2E-04	0.009	UJ	2E-04																										
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	9E-05	U	9E-05	9E-05	U	9E-05							9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				3E-05	U
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L							9E-05	U	9E-05	9E-05	U	9E-05				9E-05	U	9E-05				2E-04	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05	
Metal	SW6010	CADMIUM	7440-43-9	mg/L	2E-04	U	2E-04	2E-04	U	2E-04							7E-04	U	2E-04				5E-04	U	2E-04				3E-04	U	2E-04				5E-04	U	2E-04				1E-04	U
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L							2E-04	U	2E-04	2E-04	U	2E-04				3E-04	U	2E-04				5E-04	U	2E-04				2E-04	U	2E-04				2E-04	U	2E-04	
Metal	SW6010	CALCIUM	7440-70-2	mg/L	8.37		0.0039	8.15		0.0039																															8.92	
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L							7.49		0.0039	8.05		0.0039																										
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L							8E-04	U	5E-04	5E-04	U	5E-04				5E-04	U	5E-04				6E-04	U	5E-04				0.001	U	5E-04				1E-03	U	5E-04	
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	0.001	U	5E-04	0.001	U	5E-04							8E-04	U	5E-04				0.004	U	5E-04				0.002	U	5E-04				0.004	U	5E-04				0.0011	J
Metal	SW6010	COBALT	7440-48-4	mg/L	7E-04	U	3E-04	9E-04	U	3E-04																															6E-04	U
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L							8E-04	U	3E-04	7E-04	U	3E-04																										
Metal	SW6010	COPPER	7440-50-8	mg/L	0.009	U	8E-04	0.007	U	8E-04							0.002	U	8E-04				0.005	U	8E-04				0.006	U	8E-04				0.014	U	8E-04				0.002	U
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L							0.003	U	8E-04	0.003	U	8E-04				1E-03	U	8E-04				0.003	U	8E-04				0.017	U	8E-04				0.01	U	8E-04	
Metal	SW6010	IRON	7439-89-6	mg/L	0.417		0.0017	0.432		0.0017																															0.797	
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L							0.253		0.0017	0.215		0.0017																										
Metal	SW6010	LEAD	7439-92-1	mg/L	0.002	UJ	0.002	0.002	UJ	0.002							0.0023	J	0.002				0.002	UJ	0.002				0.005	J	0.002				0.0162	J	0.002				0.002	U
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L							0.002	UJ	0.002	0.002	UJ	0.002				0.002	UJ	0.002				0.002	UJ	0.002				**0.0023**	J	0.002				0.002	UJ	0.002	
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	1.58	J	0.0019	1.57	J	0.0019																															2.3	J
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L							1.62	J	0.0019	1.57	J	0.0019																										

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW25B2			SW25B2			SW25B2			SW25B2			SW25C1			SW25C1			SW25C2			SW25C2			SW25D1			SW25D1			SW25D2			SW25D2			SW25E
					RHA110			RHA118FD1			WSRHA110			WSRHA118FD1			RHA103			WSRHA103			RHA111			WSRHA111			RHA104			WSRHA104			RHA112			WSRHA112			MIA007
					1/23/1997			1/23/1997			1/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/199
					Sample			FD			Sample			FD			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
Metal	SW6010	MANGANESE	7439-96-5	mg/L	0.0684		0.0002	0.0698		0.0002																														0.0659	
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L							*0.002*	*U*	*2E-04*	*0.003*	*U*	*2E-04*																									
Metal	SW6010	NICKEL	7440-02-0	mg/L	*0.003*	*U*	*0.001*	*0.004*	*U*	*0.001*							*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.005*	*U*	*0.001*				*0.001*	*U*
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L							*0.002*	*U*	*0.001*	*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.004*	*U*	*0.001*		
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	2.73	J	0.7454	2.54	J	0.7454																														3.95	J
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L							2.55	J	0.7454	2.58	J	0.7454																									
Metal	SW6010	SELENIUM	7782-49-2	mg/L	*0.001*	*U*	*0.001*	*0.003*	*U*	*0.001*							*0.002*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.002*	*U*
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L							*0.002*	*U*	*0.001*	*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*		
Metal	SW6010	SILVER	7440-22-4	mg/L	*7E-04*	*U*	*7E-04*	*7E-04*	*U*	*7E-04*							*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*5E-04*	*U*
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L							*7E-04*	*U*	*7E-04*	*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*		
Metal	SW6010	SODIUM	7440-23-5	mg/L	1.08	J	0.0565	0.993	J	0.0565																														*1.14*	*U*
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L							*0.617*	*U*	*0.057*	*0.76*	*U*	*0.057*																									
Metal	SW6010	THALLIUM	7440-28-0	mg/L	*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*							*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L							*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*		
Metal	SW6010	VANADIUM	7440-62-2	mg/L	*8E-04*	*U*	*4E-04*	*7E-04*	*U*	*4E-04*																														0.0043	J
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L							*6E-04*	*U*	*4E-04*	*5E-04*	*U*	*4E-04*																									
Metal	SW6010	ZINC	7440-66-6	mg/L	0.0613	J	0.0006	0.0702	J	0.0006							*0.024*	*UJ*	*6E-04*				0.0862	J	0.0006				*0.052*	*UJ*	*6E-04*				0.0734	J	0.0006				*0.004*	*U*
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L							*0.014*	*UJ*	*6E-04*	*0.026*	*UJ*	*6E-04*				**0.136**	J	0.0006				*0.022*	*UJ*	*6E-04*				*0.054*	*UJ*	*6E-04*				*0.047*	*UJ*	*6E-04*		

Detected Results > Ecological Criteria are shaded blue.
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TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

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						SW25F			SW25G			SW26A1			SW26A1			SW26A2			SW26A2			SW26B1			SW26B1			SW26B2			SW26B2			SW26C1			SW26C1			
						MIA011			MIA012			RHA105			WSRHA105			RHA113			WSRHA113			RHA106			WSRHA106			RHA114			WSRHA114			RHA107			WSRHA107			
						9/29/1998			9/29/1998			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			
						Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8240	ACETONE	67-64-1	mg/L																																						
VOC	SW8260	ACETONE	67-64-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.013	U	0.01				0.017
VOC	SW8260	BENZENE	71-43-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	BROMOFORM	75-25-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L																																						
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	STYRENE	100-42-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	TOLUENE	108-88-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L																																						
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L								106		4				282		4				364		4				14		4				9		4				6
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L								13.5		1				15		1				10.4		1				10		1				7.4		1				3.6
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.02	U	0.02				0.02
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	0.05	0.05	U	0.05	0.05	U	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	0.05	0.05	UJ	0.05	0.05	UJ	0.05																									0.05	U	0.05				0.05
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	0.01	0	U	0.01	0	U	0.01																									0	U	0.01				0
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																									0.01	U	0.01				0.01

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW25F			SW25G			SW26A1			SW26A1			SW26A2			SW26A2			SW26B1			SW26B1			SW26B2			SW26B2			SW26C1			SW26C1			
						MIA011			MIA012			RHA105			WSRHA105			RHA113			WSRHA113			RHA106			WSRHA106			RHA114			WSRHA114			RHA107			WSRHA107			
						9/29/1998			9/29/1998			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			
						Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BENZOICACID	65-85-0	mg/L																																							
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	FLUORENE	86-73-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	0.005	0.005	U	0.005	0.005	U	0.005																											0.005	U	0.005				0.005
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	PHENOL	108-95-2	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	PYRENE	129-00-0	mg/L	0.01	0.01	U	0.01	0.01	U	0.01																											0.01	U	0.01				0.01
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L		0.01	U		0.01	U																											0.01	U					0.01
Pest	SW8080	ALDRIN	309-00-2	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	ALDRIN	309-00-2	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	ALPHA BHC	319-84-6	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	ALPHA BHC	319-84-6	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	BETA BHC	319-85-7	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	BETA BHC	319-85-7	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	DDD	72-54-8	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	DDD	72-54-8	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	DDE	72-55-9	mg/L								3E-05	J	0.0001				1E-04	U	1E-04				3E-05	J	0.0001				1E-04	U	1E-04				6E-05	J	0.0001				1E-04
Pest	SW8081	DDE	72-55-9	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	DDT	50-29-3	mg/L								**5E-05**	J	0.0001				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				**0.0002**		0.0001				1E-04
Pest	SW8081	DDT	50-29-3	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	DELTA BHC	319-86-8	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	DELTA BHC	319-86-8	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	DIELDRIN	60-57-1	mg/L								**9E-05**	J	0.0001				**0.0001**		0.0001				4E-05	J	0.0001				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	DIELDRIN	60-57-1	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	ENDRIN	72-20-8	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	ENDRIN	72-20-8	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L								1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04																																	
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																	
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L								5E-05	U	5E-05				1E-04	U	1E-04				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				1E-04

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW25F			SW25G			SW26A1			SW26A1			SW26A2			SW26A2			SW26B1			SW26B1			SW26B2			SW26B2			SW26C1			SW26C1			
						MIA011			MIA012			RHA105			WSRHA105			RHA113			WSRHA113			RHA106			WSRHA106			RHA114			WSRHA114			RHA107			WSRHA107			
						9/29/1998			9/29/1998			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			
						Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L	5E-05	5E-05	UJ	5E-05	5E-05	UJ	5E-05																																
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L								5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05				5E-05
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	5E-05	5E-05	U	5E-05	5E-05	U	5E-05																																
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L								5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				5E-04				5E-04
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L	5E-04	5E-04	UJ	5E-04	5E-04	UJ	5E-04																																
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L								0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				0.005				0.005
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L	0.005	0.005	U	0.005	0.005	U	0.005																																
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L								0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002				0.002
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L	0.002	0.002	U	0.002	0.002	U	0.002																																
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L								0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001				0.001
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L	0.001	0.001	U	0.001	0.001	U	0.001																																
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L																																						
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L																																						
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L																																						
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L																																						
PAH	SW8100	ANTHRACENE	120-12-7	mg/L																																						
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L																																						
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L																																						
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L																																						
PAH	SW8100	BENZO(B)FLUORANTHENE	205-99-2	mg/L																																						
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L																																						
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L																																						
PAH	SW8100	CHRYSENE	218-01-9	mg/L																																						
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L																																						
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L																																						
PAH	SW8100	FLUORENE	86-73-7	mg/L																																						
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L																																						
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L																																						
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L																																						
PAH	SW8100	PYRENE	129-00-0	mg/L																																						
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L																																						
Metal	SW7470	MERCURY	7439-97-6	mg/L	8E-05	8E-05	U	8E-05	8E-05	U	8E-05	6E-05	U	1E-05				6E-05	U	6E-05				9E-05	U	1E-05				6E-05	U	6E-05				4E-05	U	1E-05				6E-05
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L											5E-05	U	1E-05				6E-05	U	6E-05				4E-05	U	1E-05				6E-05	U	6E-05				5E-05	U	1E-05	
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	0.0079	**0.25**		0.0079	**0.262**		0.0079																										**0.576**		0.0066				**0.118**
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L																																					0.028	U	0.007	
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	0.002	0.004	U	0.002	0.005	U	0.002	0.003	U	0.002				0.003	U	0.002				0.002	U	0.002				0.002	U	0.002				0.003	U	0.002				0.003
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L											0.003	U	0.002				0.003	U	0.002				0.003	U	0.002				0.003	U	0.002				0.003	U	0.002	
Metal	SW6010	ARSENIC	7440-38-2	mg/L	0.001	0.017		0.0014	0.017	U	0.001	0.0123		0.0016				0.0123		0.0016				0.0364		0.0016				0.0223		0.0016				0.002	U	0.002				0.002
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L											0.0078	J	0.0016				0.0099	J	0.0016				0.0096	J	0.0016				0.0193		0.0016				0.0024	J	0.0016	
Metal	SW6010	BARIUM	7440-39-3	mg/L	0.0005	0.0172	J	0.0005	0.0167	J	0.0005																										0.015	U	2E-04				0.015
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L																																					0.006	U	2E-04	
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	3E-05	4E-05	U	3E-05	4E-05	U	3E-05	9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L											1E-04	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05	
Metal	SW6010	CADMIUM	7440-43-9	mg/L	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	5E-04	U	2E-04				3E-04	U	2E-04				0.001	U	2E-04				2E-04	U	2E-04				7E-04	U	2E-04				4E-04
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L											3E-04	U	2E-04				2E-04	U	2E-04				4E-04	U	2E-04				2E-04	U	2E-04				4E-04	U	2E-04	
Metal	SW6010	CALCIUM	7440-70-2	mg/L	0.0237	9.34		0.0237	9.13		0.0237																										4.2	J	0.0039				9.08
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L																																					3.34	J	0.0039	
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L											8E-04	U	5E-04				7E-04	U	5E-04				0.001	U	5E-04				0.001	U	5E-04				5E-04	U	5E-04	
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	0.001	0.001	U	0.001	0.001	U	0.001	0.003	U	5E-04				0.014		0.0005				0.0101		0.0005				0.007	U	5E-04				0.002	U	5E-04				7E-04
Metal	SW6010	COBALT	7440-48-4	mg/L	5E-04	5E-04	U	5E-04	5E-04	U	5E-04																										0.001	U	3E-04				9E-04
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L																																					9E-04	U	3E-04	
Metal	SW6010	COPPER	7440-50-8	mg/L	0.001	0.003	U	0.001	0.002	U	0.001	0.007	U	8E-04				0.01	U	8E-04				0.015	U	8E-04				0.008	U	8E-04				0.009	U	8E-04				0.003
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L											0.004	U	8E-04				0.005	U	8E-04				0.004	U	8E-04				0.006	U	8E-04				0.003	U	8E-04	
Metal	SW6010	IRON	7439-89-6	mg/L	0.0036	0.604		0.0036	0.587		0.0036																										0.835		0.0017				0.077
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L																																					0.035	U	0.002	
Metal	SW6010	LEAD	7439-92-1	mg/L	0.001	0.002	U	0.001	0.002	U	0.001	0.0089	J	0.002				0.0081	J	0.002				0.0188	J	0.002				0.0037	J	0.002				0.011	J	0.002				0.002
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L											0.002	UJ	0.002				0.002	UJ	0.002				0.002	UJ	0.002				0.002	UJ	0.002				0.002	UJ	0.002	
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	0.0062	2.37	J	0.0062	2.33	J	0.0062																										0.388	J	0.0019				1.28
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L																																					0.213	J	0.0019	

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW25F			SW25G			SW26A1			SW26A1			SW26A2			SW26A2			SW26B1			SW26B1			SW26B2			SW26B2			SW26C1			SW26C1			
						MIA011			MIA012			RHA105			WSRHA105			RHA113			WSRHA113			RHA106			WSRHA106			RHA114			WSRHA114			RHA107			WSRHA107			
						9/29/1998			9/29/1998			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			1/15/1997			1/15/1997			
						Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**
Metal	SW6010	MANGANESE	7439-96-5	mg/L	0.0005	0.0562		0.0005	0.0547		0.0005																								0.0461		0.0002						0.0084
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L																																	0.0207		0.0002			
Metal	SW6010	NICKEL	7440-02-0	mg/L	*3E-04*	*0.002*	*U*	*3E-04*	*0.001*	*U*	*3E-04*	*0.004*	*U*	*0.001*				*0.006*	*U*	*0.001*				0.0117	J	0.0012				*0.007*	*U*	*0.001*				*0.002*	*U*	*0.001*						*0.001*
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L											*0.001*	*U*	*0.001*				*0.005*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.004*	*U*	*0.001*				*0.001*	*U*	*0.001*	
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	0.8245	3.11	J	0.8245	3.76	J	0.8245																								*0.745*	*U*	*0.745*						1.91
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L																																	0.751	J	0.7454			
Metal	SW6010	SELENIUM	7782-49-2	mg/L	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.004*	*U*	*0.001*								*0.003*	*U*	*0.001*	*0.002*
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L											*0.002*	*U*	*0.001*				*0.004*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*	
Metal	SW6010	SILVER	7440-22-4	mg/L	*5E-04*	*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*	*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*								*7E-04*	*U*	*7E-04*	*7E-04*
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L											*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*	
Metal	SW6010	SODIUM	7440-23-5	mg/L	*0.114*	*1.29*	*U*	*0.114*	*0.992*	*U*	*0.114*																								0.975	J	0.0565						0.963
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L																																	*0.832*	*U*	*0.057*			
Metal	SW6010	THALLIUM	7440-28-0	mg/L	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*								*0.002*	*U*	*0.001*	*0.001*
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L											*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*	
Metal	SW6010	VANADIUM	7440-62-2	mg/L	0.0003	0.0041	J	0.0003	*0.004*	*U*	*3E-04*																														*0.002*	*U*	*4E-04*	*8E-04*
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L																																	*6E-04*	*U*	*4E-04*			
Metal	SW6010	ZINC	7440-66-6	mg/L	*0.001*	*0.004*	*U*	*0.001*	0.0152	J	0.0011	*0.038*	*UJ*	*6E-04*				*0.033*	*UJ*	*6E-04*				0.0857	J	0.0006				0.0658	J	0.0006				0.184	J	0.0006				0.467
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L											*0.013*	*UJ*	*6E-04*				*0.016*	*UJ*	*6E-04*				*0.026*	*UJ*	*6E-04*				*0.052*	*UJ*	*6E-04*				**0.145**	J	0.0006	

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW26C2			SW26C2			SW26D1			SW26D1			SW26D2			SW26D2			SW26E			SW26F			SW26G			SW26G			SW26H			SW26I			SW3		
					RHA115			WSRHA115			RHA108			WSRHA108			RHA116			WSRHA116			MIA016			MIA017			MIA018			MIA019FD			MIA021			MIA022			LAWSW3		
					/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			4/5/1989		
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8240	ACETONE	67-64-1	mg/L																																			0.003	J	
VOC	SW8260	ACETONE	67-64-1	mg/L	U	0.01																0.01	U	0.01	0.01	UJ	0.01	0.01	U	0.01	0.01	UJ	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	BENZENE	71-43-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	BROMOFORM	75-25-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	UJ	0.01	0.01	U	0.01	0.01	UJ	0.01	0.01	U	0.01			
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L																																			0.001	J	
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	STYRENE	100-42-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	TOLUENE	108-88-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L																																					
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L		4				1180		4				603		4																							
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L		1				12.4		1				9.4		1																							
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	U	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	UJ	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	U	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	U	0.02																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	U	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	U	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	U	0.05																0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05	0.05	U	0.05			
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	U	0.05																0.05	UJ	0.05	0.05	UJ	0.05	0.05	UJ	0.05	0.05	UJ	0.05	0.05	UJ	0.05	0.05	U	0.05			
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	U	0.01																0	U	0.01	0	U	0.01	0	U	0.01	0	U	0.01	0	U	0.01	0	U	0.01			
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW26C2			SW26C2			SW26D1			SW26D1			SW26D2			SW26D2			SW26E			SW26F			SW26G			SW26G			SW26H			SW26I			SW3		
					RHA115			WSRHA115			RHA108			WSRHA108			RHA116			WSRHA116			MIA016			MIA017			MIA018			MIA019FD			MIA021			MIA022			LAWSW3		
					/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			4/5/1989		
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BENZOICACID	65-85-0	mg/L																																					
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.001	J	0.01	0.003	J	
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	FLUORENE	86-73-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	U	0.005																0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	U	0.005			
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	PHENOL	108-95-2	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	PYRENE	129-00-0	mg/L	U	0.01																0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01	0.01	U	0.01			
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	U																	0.01	U		0.01	U		0.01	U		0.01	U		0.01	U		0.01	U				
Pest	SW8080	ALDRIN	309-00-2	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	ALDRIN	309-00-2	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	ALPHA BHC	319-84-6	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	ALPHA BHC	319-84-6	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	BETA BHC	319-85-7	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	BETA BHC	319-85-7	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	DDD	72-54-8	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	DDD	72-54-8	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	DDE	72-55-9	mg/L	U	1E-04				3E-05	J	0.0001				1E-04	U	1E-04																							
Pest	SW8081	DDE	72-55-9	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	DDT	50-29-3	mg/L	U	1E-04				**5E-05**	J	0.0001				1E-04	U	1E-04																							
Pest	SW8081	DDT	50-29-3	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	DELTA BHC	319-86-8	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	DELTA BHC	319-86-8	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	DIELDRIN	60-57-1	mg/L	U	1E-04				1E-04	U	1E-04				**0.0003**		0.0001																							
Pest	SW8081	DIELDRIN	60-57-1	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	ENDRIN	72-20-8	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	ENDRIN	72-20-8	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04																							
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L																		1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	UJ	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L	U	1E-04				5E-05	U	5E-05				5E-05	U	5E-05																							

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW26C2			SW26C2			SW26D1			SW26D1			SW26D2			SW26D2			SW26E			SW26F			SW26G			SW26G			SW26H			SW26I			SW3		
					RHA115			WSRHA115			RHA108			WSRHA108			RHA116			WSRHA116			MIA016			MIA017			MIA018			MIA019FD			MIA021			MIA022			LAWSW3		
					/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			4/5/1989		
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L																		5E-05	UJ	5E-05	5E-05	UJ	5E-05	5E-05	UJ	5E-05	5E-05	UJ	5E-05	5E-05	UJ	5E-05	5E-05	UJ	5E-05			
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05																							
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L																		5E-05	U	5E-05	5E-05	U	5E-05	5E-05	U	5E-05	5E-05	UJ	5E-05	5E-05	U	5E-05	5E-05	U	5E-05			
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04																							
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L																		5E-04	UJ	5E-04	5E-04	UJ	5E-04	5E-04	UJ	5E-04	5E-04	UJ	5E-04	5E-04	UJ	5E-04	5E-04	UJ	5E-04			
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L	U	0.005				0.005	U	0.005				0.005	U	0.005																							
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L																		0.005	U	0.005	0.005	U	0.005	0.005	U	0.005	0.005	UJ	0.005	0.005	U	0.005	0.005	U	0.005			
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L	U	0.002				0.002	U	0.002				0.002	U	0.002																							
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L																		0.002	U	0.002	0.002	U	0.002	0.002	U	0.002	0.002	UJ	0.002	0.002	U	0.002	0.002	U	0.002			
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L	U	0.001				0.001	U	0.001				0.001	U	0.001																							
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L																		0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	UJ	0.001	0.001	U	0.001	0.001	U	0.001			
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L																																			
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L																																			
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L																																			
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L																																			
PAH	SW8100	ANTHRACENE	120-12-7	mg/L																																			
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L																																			
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L																																			
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L																																			
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/L																																			
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L																																			
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L																																			
PAH	SW8100	CHRYSENE	218-01-9	mg/L																																			
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L																																			
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L																																			
PAH	SW8100	FLUORENE	86-73-7	mg/L																																			
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L																																			
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L																																			
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L																																			
PAH	SW8100	PYRENE	129-00-0	mg/L																																			
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L																																			
Metal	SW7470	MERCURY	7439-97-6	mg/L	U	6E-05				8E-05	U	1E-05				6E-05	U	6E-05				8E-05	U	8E-05	8E-05	U	8E-05	8E-05	U	8E-05	9E-05	J	9E-05	8E-05	U	8E-05	8E-05	U	8E-05			
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L			6E-05	U	6E-05				6E-05	U	1E-05				6E-05	U	6E-05																			
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	J	0.0066																**0.0892**	J	0.0079	0.0843	J	0.0079	0.039	U	0.008	0.039	U	0.008	0.052	J	0.0079	0.05	U	0.008			
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L			0.0814	J	0.0066																																	
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	U	0.002				0.002	U	0.002				0.003	U	0.002				0.003	U	0.002	0.004	U	0.002	0.005	U	0.002	0.003	U	0.002	0.005	U	0.002	0.006	U	0.002			
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L			0.002	U	0.002				0.002	U	0.002				0.002	U	0.002																			
Metal	SW6010	ARSENIC	7440-38-2	mg/L	U	0.002				0.0629		0.0016				0.0774		0.0016				0.003	U	0.001	0.003	U	0.001	0.003	U	0.001	0.003	U	0.001	0.003	U	0.001	0.003	U	0.001			
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L			0.002	U	0.002				0.0216		0.0016				0.0405		0.0016																			
Metal	SW6010	BARIUM	7440-39-3	mg/L	UJ	2E-04																0.0131	J	0.0005	0.013	J	0.0005	0.0127	J	0.0005	0.0127	J	0.0005	0.0132	J	0.0005	0.0128	J	0.0005	0.015		
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L			0.015	UJ	2E-04																																	
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05				7E-05	U	3E-05	6E-05	U	3E-05	6E-05	U	3E-05	4E-05	U	3E-05	4E-05	U	3E-05	2E-05	U	2E-05			
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L			9E-05	U	9E-05				9E-05	U	9E-05				9E-05	U	9E-05																			
Metal	SW6010	CADMIUM	7440-43-9	mg/L	U	2E-04				0.001	U	2E-04				0.001	U	2E-04				1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04	1E-04	U	1E-04			
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L			5E-04	U	2E-04				3E-04	U	2E-04				2E-04	U	2E-04																			
Metal	SW6010	CALCIUM	7440-70-2	mg/L		0.0039																6.64		0.0237	6.78		0.0237	6.66		0.0237	6.69		0.0237	6.78		0.0237	6.71		0.0237			
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L			9.62		0.0039																																	
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L			5E-04	U	5E-04				0.001	U	5E-04				0.001	U	5E-04																			
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	U	5E-04				0.0128		0.0005				0.0186		0.0005				0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	U	0.001	0.001	U	0.001			
Metal	SW6010	COBALT	7440-48-4	mg/L	U	3E-04																5E-04	U	5E-04	5E-04	U	5E-04	5E-04	U	5E-04	5E-04	U	5E-04	5E-04	U	5E-04	5E-04	U	5E-04			
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L			0.001	U	3E-04																																	
Metal	SW6010	COPPER	7440-50-8	mg/L	U	8E-04				0.0213	J	0.0008				0.0216	J	0.0008				0.002	U	0.001	0.005	U	0.001	0.004	U	0.001	0.002	U	0.001	0.002	U	0.001	0.002	U	0.001	0.027		
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L			0.003	U	8E-04				0.009	U	8E-04				0.006	U	8E-04																			
Metal	SW6010	IRON	7439-89-6	mg/L	U	0.002																0.269		0.0036	0.219		0.0036	0.149		0.0036	0.156		0.0036	0.189		0.0036	0.166		0.0036			
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L			0.027	U	0.002																																	
Metal	SW6010	LEAD	7439-92-1	mg/L	UJ	0.002				0.0262	J	0.002				0.0224	J	0.002				0.001	U	0.001	0.001	U	0.001	0.002	U	0.001	0.001	U	0.001	0.001	U	0.001	0.003	U	0.001			
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L			0.002	UJ	0.002				**0.0031**	J	0.002				0.002	UJ	0.002																			
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	J	0.0019																0.737	J	0.0062	0.752	J	0.0062	0.714	J	0.0062	0.719	J	0.0062	0.73	J	0.0062	0.71	J	0.0062			
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L			1.4	J	0.0019																																	

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW26C2			SW26C2			SW26D1			SW26D1			SW26D2			SW26D2			SW26E			SW26F			SW26G			SW26G			SW26H			SW26I			SW3		
					RHA115			WSRHA115			RHA108			WSRHA108			RHA116			WSRHA116			MIA016			MIA017			MIA018			MIA019FD			MIA021			MIA022			LAWSW3		
					/23/1997			1/23/1997			1/15/1997			1/15/1997			1/24/1997			1/24/1997			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			9/29/1998			4/5/1989		
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			FD			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Metal	SW6010	MANGANESE	7439-96-5	mg/L	J	0.0002																	0.0203		0.0005	0.0267		0.0005	0.0178		0.0005	0.0179		0.0005	0.0205		0.0005	0.0197		0.0005			
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L			0.0074	J	0.0002																																	
Metal	SW6010	NICKEL	7440-02-0	mg/L	*U*	*0.001*				0.016	J	0.0012				0.0175	J	0.0012				*3E-04*	*U*	*3E-04*	*6E-04*	*U*	*3E-04*	0.0005	J	0.0003	*7E-04*	*U*	*3E-04*	*0.002*	*U*	*3E-04*	*6E-04*	*U*	*3E-04*			
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L			*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.003*	*U*	*0.001*																				
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	J	0.7454																1.25	J	0.8245	1.01	J	0.8245	1.51	J	0.8245	1.4	J	0.8245	1.19	J	0.8245	1.03	J	0.8245			
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L			1.43	J	0.7454																																	
Metal	SW6010	SELENIUM	7782-49-2	mg/L	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*				*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.003*	*U*	*0.002*	*0.005*	*U*	*0.002*	*0.003*	*U*	*0.002*	**0.0058**		0.0016			
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L			*0.003*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*																				
Metal	SW6010	SILVER	7440-22-4	mg/L	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*	*5E-04*	*U*	*5E-04*			
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L			*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*				*7E-04*	*U*	*7E-04*																				
Metal	SW6010	SODIUM	7440-23-5	mg/L	J	0.0565																0.846	*U*	0.114	0.958	*U*	0.114	0.79	*U*	0.114	0.735	*U*	0.114	0.755	*U*	0.114	0.737	*U*	0.114			
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L			0.907	J	0.0565																																	
Metal	SW6010	THALLIUM	7440-28-0	mg/L	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.004*	*U*	*0.002*	*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*			
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L			*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*																				
Metal	SW6010	VANADIUM	7440-62-2	mg/L	*U*	*4E-04*																*6E-04*	*U*	*3E-04*	*3E-04*	*U*	*3E-04*	*7E-04*	*U*	*3E-04*	*4E-04*	*U*	*3E-04*	*3E-04*	*U*	*3E-04*	*5E-04*	*U*	*3E-04*			
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L			*8E-04*	*U*	*4E-04*																																	
Metal	SW6010	ZINC	7440-66-6	mg/L	J	0.0006				0.124	J	0.0006				0.199	J	0.0006				0.0098	J	0.0011	0.0168	J	0.0011	*0.01*	*U*	*0.001*	*0.009*	*U*	*0.001*	0.011	J	0.0011	0.0099	J	0.0011	0.068		
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L			**0.406**	J	0.0006				*0.035*	*UJ*	*6E-04*				*0.031*	*UJ*	*6E-04*																				

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW4			SW5			SW51A			SW51A			SW51B			SW51B			SW51C			SW51C			SW52A			SW52A			SW52B			SW52B			SW6
					LAWSW4			LAWSW5			SGB014			WSSGB014			SGB015			WSSGB015			SGB016			WSSGB016			SGB003			WSSGB003			SGB004			WSSGB004			LAWSW
					4/5/1989			4/5/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			4/5/1989
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	2-BUTANONE	78-93-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	2-HEXANONE	591-78-6	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8240	ACETONE	67-64-1	mg/L	0.002	J		0.002	J																															
VOC	SW8260	ACETONE	67-64-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	BENZENE	71-43-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	BROMOFORM	75-25-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L							0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01																
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CHLOROFORM	67-66-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L																																				
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	STYRENE	100-42-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L							0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01																
VOC	SW8260	TOLUENE	108-88-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L																																				
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L																																				
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L																																				
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L							0.02	U	0.02				0.02	U	0.02				0.02	U	0.02																
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05																
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L							0	U	0.01				0	U	0.01				0	U	0.01																
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW4			SW5			SW51A			SW51A			SW51B			SW51B			SW51C			SW51C			SW52A			SW52A			SW52B			SW52B			SW6
					LAWSW4			LAWSW5			SGB014			WSSGB014			SGB015			WSSGB015			SGB016			WSSGB016			SGB003			WSSGB003			SGB004			WSSGB004			LAWSW
					4/5/1989			4/5/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			4/5/1989
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BENZOICACID	65-85-0	mg/L																																					
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	0.003	J		0.005	J		0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	CHRYSENE	218-01-9	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	FLUORENE	86-73-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L				0.003	J		0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L							0.005	U	0.005				0.005	U	0.005				0.005	U	0.005																
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	PHENOL	108-95-2	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	PYRENE	129-00-0	mg/L							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01																
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L							0.01	U					0.01	U					0.01	U																	
Pest	SW8080	ALDRIN	309-00-2	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	ALDRIN	309-00-2	mg/L																																					
Pest	SW8080	ALPHA BHC	319-84-6	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	ALPHA BHC	319-84-6	mg/L																																					
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L																																					
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L																																					
Pest	SW8080	BETA BHC	319-85-7	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	BETA BHC	319-85-7	mg/L																																					
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L																																					
Pest	SW8080	DDD	72-54-8	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	DDD	72-54-8	mg/L																																					
Pest	SW8080	DDE	72-55-9	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04	0.0002	
Pest	SW8081	DDE	72-55-9	mg/L																																					
Pest	SW8080	DDT	50-29-3	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	DDT	50-29-3	mg/L																																					
Pest	SW8080	DELTA BHC	319-86-8	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	DELTA BHC	319-86-8	mg/L																																					
Pest	SW8080	DIELDRIN	60-57-1	mg/L							**0.0002**		0.0001				1E-04	U	1E-04				**0.0001**		0.0001				**7E-05**	J	0.0001						1E-04	U	1E-04		
Pest	SW8081	DIELDRIN	60-57-1	mg/L																																					
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L																																					
Pest	SW8080	ENDRIN	72-20-8	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	ENDRIN	72-20-8	mg/L																																					
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L																																					
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04						1E-04	U	1E-04		
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L																																					
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L																																					
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L																																					
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05						5E-05	U	5E-05		

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW4			SW5			SW51A			SW51A			SW51B			SW51B			SW51C			SW51C			SW52A			SW52A			SW52B			SW52B			SW6
					LAWSW4			LAWSW5			SGB014			WSSGB014			SGB015			WSSGB015			SGB016			WSSGB016			SGB003			WSSGB003			SGB004			WSSGB004			LAWSW
					4/5/1989			4/5/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			4/5/1989
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L																																						
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L							5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05				
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L																																						
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L							5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04				
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L																																						
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L							0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				0.005	U	0.005				
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L																																						
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L																																						
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L																																						
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L																																						
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L																																						
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L																																						
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L																																						
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L																																						
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L																																						
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L																																						
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L																																						
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L																																						
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L																																						
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L																																						
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L																																						
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	ANTHRACENE	120-12-7	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L																									0	U	0.002				0	U	0.002				
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	BENZO(B)FLUOROANTHENE	205-99-2	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	CHRYSENE	218-01-9	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	FLUORENE	86-73-7	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	PYRENE	129-00-0	mg/L																									0.002	U	0.002				0.002	U	0.002				
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L																									0.002	U					0.002	U					
Metal	SW7470	MERCURY	7439-97-6	mg/L							5E-05	U	1E-05				6E-05	U	1E-05				7E-05	U	1E-05				6E-05	U	1E-05				4E-05	U	1E-05				
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L										1E-05	U	1E-05				1E-05	U	1E-05				1E-05	U	1E-05				1E-05	U	1E-05				1E-05	U	1E-05	
Metal	SW6010	ALUMINUM	7429-90-5	mg/L																																						
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L																																						
Metal	SW6010	ANTIMONY	7440-36-0	mg/L							0.015	U	0.015				0.015	U	0.015				0.015	U	0.015				0.015	U	0.015				0.015	U	0.015				
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L										0.015	U	0.015				0.015	U	0.015				0.015	U	0.015				0.015	U	0.015				0.015	U	0.015	
Metal	SW6010	ARSENIC	7440-38-2	mg/L							0.002	U	0.002				0.002	U	0.002				0.006	J	0.0016				0.0027	J	0.0016				0.0041	J	0.0016				0.048
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L										0.002	U	0.002				0.002	U	0.002				0.0036	J	0.0016				0.0043	J	0.0016				0.0033	J	0.0016	
Metal	SW6010	BARIUM	7440-39-3	mg/L	0.014			0.014																																		0.017
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L																																						
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L							1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L										1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	
Metal	SW6010	CADMIUM	7440-43-9	mg/L							0.003	U	0.003				0.003	U	0.003				0.003	U	0.003				0.003	U	0.003				0.003	U	0.003				
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L										0.003	U	0.003				0.003	U	0.003				0.003	U	0.003				0.003	U	0.003				0.003	U	0.003	
Metal	SW6010	CALCIUM	7440-70-2	mg/L																																						
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L																																						
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L										0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002	
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L							0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				
Metal	SW6010	COBALT	7440-48-4	mg/L																																						
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L																																						
Metal	SW6010	COPPER	7440-50-8	mg/L	0.046			0.03			0.004	U	0.001				0.003	U	0.001				0.008	U	0.001				0.0046	J	0.0012				0.005	U	0.001				0.024
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L										0.006	U	0.001				0.006	U	0.001				0.01	U	0.001				0.003	U	0.001				0.002	U	0.001	
Metal	SW6010	IRON	7439-89-6	mg/L																																						
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L																																						
Metal	SW6010	LEAD	7439-92-1	mg/L							0.0022	J	0.002				0.0168		0.002				0.0594		0.002				0.003	J	0.002				0.0023	J	0.002				
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L										0.002	U	0.002				**0.0064**		0.002				**0.0313**		0.002				0.002	U	0.002				0.002	U	0.002	
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L																																						
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L																																						

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW4			SW5			SW51A			SW51A			SW51B			SW51B			SW51C			SW51C			SW52A			SW52A			SW52B			SW52B			SW6	
					LAWSW4			LAWSW5			SGB014			WSSGB014			SGB015			WSSGB015			SGB016			WSSGB016			SGB003			WSSGB003			SGB004			WSSGB004			LAWSW	
					4/5/1989			4/5/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			4/5/1989	
					Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample	
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**
Metal	SW6010	MANGANESE	7439-96-5	mg/L																																						
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L																																						
Metal	SW6010	NICKEL	7440-02-0	mg/L							0.0061	J	0.0055				*0.006*	*U*	*0.006*				0.007	J	0.0055				*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*						
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L										*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*		
Metal	SW6010	POTASSIUM	7440-09-7	mg/L																																						
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L																																						
Metal	SW6010	SELENIUM	7782-49-2	mg/L							*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*						
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L										*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*		
Metal	SW6010	SILVER	7440-22-4	mg/L							*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*						
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L										*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*		
Metal	SW6010	SODIUM	7440-23-5	mg/L																																						
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L																																						
Metal	SW6010	THALLIUM	7440-28-0	mg/L							*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.003*	*U*	*0.001*						
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L										*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*		
Metal	SW6010	VANADIUM	7440-62-2	mg/L																																						
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L																																						
Metal	SW6010	ZINC	7440-66-6	mg/L	0.022			0.022			0.0648	J	0.001				0.063	J	0.001				0.0908	J	0.001				0.0196	J	0.001				0.0305	J	0.001				0.041	
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L										0.0432		0.001				0.045		0.001				**0.0763**		0.001				0.0271		0.001				*0.014*	*U*	*0.001*		

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW7			SW8			SW9		
						LAWSW7			LAWSW8			LAWSW9		
						4/5/1989			4/5/1989			4/5/1989		
						Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L										
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L										
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L										
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L										
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L										
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L										
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L										
VOC	SW8260	2-BUTANONE	78-93-3	mg/L										
VOC	SW8260	2-HEXANONE	591-78-6	mg/L										
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L										
VOC	SW8240	ACETONE	67-64-1	mg/L		0.002	J		0.002	J		0.018		
VOC	SW8260	ACETONE	67-64-1	mg/L										
VOC	SW8260	BENZENE	71-43-2	mg/L										
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L										
VOC	SW8260	BROMOFORM	75-25-2	mg/L										
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L										
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L										
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L										
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L										
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L										
VOC	SW8260	CHLOROFORM	67-66-3	mg/L										
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L										
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L										
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L										
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L										
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L		0.002	J		0.001	J		0.001	J	
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L										
VOC	SW8260	STYRENE	100-42-5	mg/L										
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L										
VOC	SW8260	TOLUENE	108-88-3	mg/L										
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L										
VOC	SW8240	TOTAL XYLENES	1330-20-7	mg/L										
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L										
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L										
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L										
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L										
TSS	E160.2	SUSPENDED SOLIDS (RESIDUE, NON-FILTERABLE)	SUSSOL	mg/L										
TOC	E415.2	TOTAL ORGANIC CARBON	TOC	mg/L										
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L										
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L										
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L										
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L										
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L										
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L										
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L										
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L										
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L										
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L										
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L										
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L										
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L										
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L										
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L										
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L										
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L										
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L										
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L										
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L										
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L										
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L										
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L										
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L										
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L										
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L										
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L										
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L										
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L										
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L										
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L										
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L										
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L										

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW7			SW8			SW9		
						LAWSW7			LAWSW8			LAWSW9		
						4/5/1989			4/5/1989			4/5/1989		
						Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L										
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/L										
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L										
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L										
SVOC	SW8270	BENZOICACID	65-85-0	mg/L										
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L										
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L										
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L		0.002	J		0.003	J		**0.012**	J	
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L										
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L										
SVOC	SW8270	CHRYSENE	218-01-9	mg/L										
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L										
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L										
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L										
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L										
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L										
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L										
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L										
SVOC	SW8270	FLUORENE	86-73-7	mg/L										
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L										
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L										
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L										
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L										
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L										
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L										
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L										
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L										
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L										
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L		0.003	J							
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L										
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L										
SVOC	SW8270	PHENOL	108-95-2	mg/L										
SVOC	SW8270	PYRENE	129-00-0	mg/L										
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L										
Pest	SW8080	ALDRIN	309-00-2	mg/L										
Pest	SW8081	ALDRIN	309-00-2	mg/L										
Pest	SW8080	ALPHA BHC	319-84-6	mg/L										
Pest	SW8081	ALPHA BHC	319-84-6	mg/L										
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L										
Pest	SW8081	ALPHA ENDOSULFAN	959-98-8	mg/L										
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L										
Pest	SW8081	ALPHA-CHLORDANE	5103-71-9	mg/L										
Pest	SW8080	BETA BHC	319-85-7	mg/L										
Pest	SW8081	BETA BHC	319-85-7	mg/L										
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L										
Pest	SW8081	BETA ENDOSULFAN	33213-65-9	mg/L										
Pest	SW8080	DDD	72-54-8	mg/L										
Pest	SW8081	DDD	72-54-8	mg/L										
Pest	SW8080	DDE	72-55-9	mg/L										
Pest	SW8081	DDE	72-55-9	mg/L										
Pest	SW8080	DDT	50-29-3	mg/L								**0.0002**		
Pest	SW8081	DDT	50-29-3	mg/L										
Pest	SW8080	DELTA BHC	319-86-8	mg/L										
Pest	SW8081	DELTA BHC	319-86-8	mg/L										
Pest	SW8080	DIELDRIN	60-57-1	mg/L										
Pest	SW8081	DIELDRIN	60-57-1	mg/L										
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L										
Pest	SW8081	ENDOSULFAN SULFATE	1031-07-8	mg/L										
Pest	SW8080	ENDRIN	72-20-8	mg/L										
Pest	SW8081	ENDRIN	72-20-8	mg/L										
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L										
Pest	SW8081	ENDRIN ALDEHYDE	7421-36-3	mg/L										
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L										
Pest	SW8081	ENDRIN KETONE	53494-70-5	mg/L										
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L										
Pest	SW8081	GAMMA BHC (LINDANE)	58-89-9	mg/L										
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L										
Pest	SW8081	GAMMA-CHLORDANE	5103-74-2	mg/L										
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L										

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW7			SW8			SW9		
						LAWSW7			LAWSW8			LAWSW9		
						4/5/1989			4/5/1989			4/5/1989		
						Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Pest	SW8081	HEPTACHLOR	76-44-8	mg/L										
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L										
Pest	SW8081	HEPTACHLOR EPOXIDE	1024-57-3	mg/L										
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L										
Pest	SW8081	METHOXYCHLOR	72-43-5	mg/L										
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L										
Pest	SW8081	TOXAPHENE	8001-35-2	mg/L										
PCB	SW8080	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L										
PCB	SW8081	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/L										
PCB	SW8080	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L										
PCB	SW8081	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/L										
PCB	SW8080	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L										
PCB	SW8081	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/L										
PCB	SW8080	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L										
PCB	SW8081	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/L										
PCB	SW8080	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L										
PCB	SW8081	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/L										
PCB	SW8080	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L										
PCB	SW8081	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/L										
PCB	SW8080	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L										
PCB	SW8081	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/L										
PAH	SW8100	1-METHYLNAPHTHALENE	90-12-0	mg/L										
PAH	SW8100	2-METHYLNAPHTHALENE	91-57-6	mg/L										
PAH	SW8100	ACENAPHTHENE	83-32-9	mg/L										
PAH	SW8100	ACENAPHTHYLENE	208-96-8	mg/L										
PAH	SW8100	ANTHRACENE	120-12-7	mg/L										
PAH	SW8100	BAP EQUIVALENTS	BAP	mg/L										
PAH	SW8100	BENZO(A)ANTHRACENE	56-55-3	mg/L										
PAH	SW8100	BENZO(A)PYRENE	50-32-8	mg/L										
PAH	SW8100	BENZO(B)FLUORANTHENE	205-99-2	mg/L										
PAH	SW8100	BENZO(G,H,I)PERYLENE	191-24-2	mg/L										
PAH	SW8100	BENZO(K)FLUORANTHENE	207-08-9	mg/L										
PAH	SW8100	CHRYSENE	218-01-9	mg/L										
PAH	SW8100	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L										
PAH	SW8100	FLUORANTHENE	206-44-0	mg/L										
PAH	SW8100	FLUORENE	86-73-7	mg/L										
PAH	SW8100	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L										
PAH	SW8100	NAPHTHALENE	91-20-3	mg/L										
PAH	SW8100	PHENANTHRENE	85-01-8	mg/L										
PAH	SW8100	PYRENE	129-00-0	mg/L										
PAH	SW8100	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L										
Metal	SW7470	MERCURY	7439-97-6	mg/L										
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L										
Metal	SW6010	ALUMINUM	7429-90-5	mg/L										
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L										
Metal	SW6010	ANTIMONY	7440-36-0	mg/L										
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L										
Metal	SW6010	ARSENIC	7440-38-2	mg/L		0.041			0.037			0.047		
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L										
Metal	SW6010	BARIUM	7440-39-3	mg/L		0.015			0.015			0.06		
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L										
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L										
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L										
Metal	SW6010	CADMIUM	7440-43-9	mg/L								0.005		
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L										
Metal	SW6010	CALCIUM	7440-70-2	mg/L										
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L										
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L										
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L										
Metal	SW6010	COBALT	7440-48-4	mg/L										
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L										
Metal	SW6010	COPPER	7440-50-8	mg/L		0.02			0.019			0.068		
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L										
Metal	SW6010	IRON	7439-89-6	mg/L										
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L										
Metal	SW6010	LEAD	7439-92-1	mg/L								0.295		
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L										
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L										
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L										

Detected Results > Ecological Criteria are shaded blue.
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TABLE N-5
FU-2 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available,
PAH = Polycyclic aromatic hydrocarbon, PCB = Polychlorinated biphenyl, Pest = Pesticide,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

						SW7			SW8			SW9		
						LAWSW7			LAWSW8			LAWSW9		
						4/5/1989			4/5/1989			4/5/1989		
						Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Metal	SW6010	MANGANESE	7439-96-5	mg/L										
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L										
Metal	SW6010	NICKEL	7440-02-0	mg/L										
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L										
Metal	SW6010	POTASSIUM	7440-09-7	mg/L										
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L										
Metal	SW6010	SELENIUM	7782-49-2	mg/L										
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L										
Metal	SW6010	SILVER	7440-22-4	mg/L								0.013		
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L										
Metal	SW6010	SODIUM	7440-23-5	mg/L										
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L										
Metal	SW6010	THALLIUM	7440-28-0	mg/L										
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L										
Metal	SW6010	VANADIUM	7440-62-2	mg/L										
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L										
Metal	SW6010	ZINC	7440-66-6	mg/L		0.032			0.037			0.4		
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L										

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-6
FU-4 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available,
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	M-SD19			SE54A			SE54B			SE54C			SE55A			SE56A			SE56B			SE56C			SE56C		
								Sample ID	M-SD19-101195			SGB008			SGB010			SGB009			SGB017			SGB019			SGB020			SGB021			SGB150FD1		
								Sample Date	10/11/1995			12/20/1996			12/20/1996			12/20/1996			12/22/1996			12/20/1996			12/20/1996			12/20/1996			12/20/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	CV390	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg	0	0.07	NA	0.012	U	0.012																											
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/kg	0	0.07	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg	0	0.25	NA	0.012	U	0.012																											
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/kg	0	0.25	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg	0	0.538	NA	0.012	U	0.012																											
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/kg	0	0.538	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,1-DICHLOROETHANE	75-34-3	mg/kg	0	0.02	NA	0.012	U	0.012																											
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/kg	0	0.02	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,1-DICHLOROETHENE	75-35-4	mg/kg	0	0.1	NA	0.012	U	0.012																											
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/kg	0	0.1	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,2-DICHLOROETHANE	107-06-2	mg/kg	0	0.986	NA	0.012	U	0.012																											
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/kg	0	0.986	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	1,2-DICHLOROPROPANE	78-87-5	mg/kg	0	0.428	NA	0.012	U	0.012																											
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/kg	0	0.428	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	2-BUTANONE	78-93-3	mg/kg	0	7.604	NA	0.012	U	0.012																											
VOC	SW8260	2-BUTANONE	78-93-3	mg/kg	0	7.604	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	J	0.014			
VOC	CV390	2-HEXANONE	591-78-6	mg/kg	0	0.045	NA	0.012	U	0.012																											
VOC	SW8260	2-HEXANONE	591-78-6	mg/kg	0	0.045	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	4-METHYL-2-PENTANONE	108-10-1	mg/kg	0	0.073	NA	0.012	U	0.012																											
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/kg	0	0.073	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	ACETONE	67-64-1	mg/kg	0	0.065	NA	0.012	U	0.012																											
VOC	SW8260	ACETONE	67-64-1	mg/kg	0	0.065	NA				0.011	UJ	0.011	0.011	UJ	0.011	0.012	UJ	0.012	0.014	U	0.014	0.011	UJ	0.011	0.012	UJ	0.012	0.014	UJ	0.014	0.031	UJ	0.014			
VOC	CV390	BENZENE	71-43-2	mg/kg	0	0.01	NA	0.012	U	0.012																											
VOC	SW8260	BENZENE	71-43-2	mg/kg	0	0.01	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	BROMODICHLOROMETHANE	75-27-4	mg/kg	0	NA	0.21	0.012	U	0.012																											
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/kg	0	NA	0.21				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	BROMOFORM	75-25-2	mg/kg	0	NA	0.142	0.012	U	0.012																											
VOC	SW8260	BROMOFORM	75-25-2	mg/kg	0	NA	0.142				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	BROMOMETHANE	74-83-9	mg/kg	0	NA	0.0065	0.012	U	0.012																											
VOC	SW8260	BROMOMETHANE	74-83-9	mg/kg	0	NA	0.0065				0.011	UJ	0.011	0.011	UJ	0.011	0.012	UJ	0.012	0.014	UJ	0.014	0.011	UJ	0.011	0.012	UJ	0.012	0.014	UJ	0.014	0.014	UJ	0.014			
VOC	CV390	CARBON DISULFIDE	75-15-0	mg/kg	0	0.0078	39	0.012	U	0.012																											
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/kg	0	0.0078	39				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CARBON TETRACHLORIDE	56-23-5	mg/kg	1	0.057	NA	**0.078**		0.012																											
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/kg	0	0.057	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CHLOROBENZENE	108-90-7	mg/kg	0	0.03	NA	0.012	U	0.012																											
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/kg	0	0.03	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CHLOROETHANE	75-00-3	mg/kg	0	NA	NA	0.012	U	0.012																											
VOC	SW8260	CHLOROETHANE	75-00-3	mg/kg	0	NA	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CHLOROFORM	67-66-3	mg/kg	0	0.087	NA	0.012	U	0.012																											
VOC	SW8260	CHLOROFORM	67-66-3	mg/kg	0	0.087	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CHLOROMETHANE	74-87-3	mg/kg	0	NA	NA	0.012	U	0.012																											
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/kg	0	NA	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg	0	NA	0.0015	0.012	U	0.012																											
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/kg	0	NA	0.0015				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	DIBROMOCHLOROMETHANE	124-48-1	mg/kg	0	NA	0.198	0.012	U	0.012																											
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/kg	0	NA	0.198				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	ETHYLBENZENE	100-41-4	mg/kg	0	0.29	NA	0.012	U	0.012																											
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/kg	0	0.29	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	METHYLENE CHLORIDE	75-09-2	mg/kg	0	0.018	NA	0.012	U	0.012																											
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/kg	0	0.018	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	STYRENE	100-42-5	mg/kg	0	0.126	NA	0.012	U	0.012																											
VOC	SW8260	STYRENE	100-42-5	mg/kg	0	0.126	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TETRACHLOROETHENE	127-18-4	mg/kg	0	0.002	NA	0.012	U	0.012																											
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/kg	0	0.002	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TOLUENE	108-88-3	mg/kg	0	0.01	NA	0.012	U	0.012																											
VOC	SW8260	TOLUENE	108-88-3	mg/kg	0	0.01	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg	0	0.2	NA	0.012	U	0.012																											
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/kg	0	0.2	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TOTAL XYLENES	1330-20-7	mg/kg	0	0.13	NA	0.012	U	0.012																											
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/kg	0	0.13	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg	0	NA	0.0015	0.012	U	0.012																											
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/kg	0	NA	0.0015				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	TRICHLOROETHENE	79-01-6	mg/kg	0	0.078	NA	0.012	U	0.012																											
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/kg	0	0.078	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
VOC	CV390	VINYL CHLORIDE	75-01-4	mg/kg	0	0.482	NA	0.012	U	0.012																											
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/kg	0	0.482	NA				0.011	U	0.011	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.011	U	0.011	0.012	U	0.012	0.014	U	0.014	0.014	U	0.014			
SVOC	CSV390	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg	0	0.011	NA	0.39	U	0.39																											
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/kg	0	0.011	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	1,2-DICHLOROBENZENE	95-50-1	mg/kg	0	0.095	NA	0.39	U	0.39																											
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/kg	0	0.095	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	1,3-DICHLOROBENZENE	541-73-1	mg/kg	0	0.089	NA	0.39	U	0.39																											
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/kg	0	0.089	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	1,4-DICHLOROBENZENE	106-46-7	mg/kg	0	0.03	NA	0.39	U	0.39																											
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/kg	0	0.03	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/kg	0	NA	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	UJ	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg	0	NA	0.034	0.95	U	0.95																											
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/kg	0	NA	0.034				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg	0	NA	0.089	0.39	U	0.39																											
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/kg	0	NA	0.089				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2,4-DICHLOROPHENOL	120-83-2	mg/kg	0	0.057	NA	0.39	U	0.39																											
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/kg	0	0.057	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	0	NA	0.039	0.39	U	0.39																											
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/kg	0	NA	0.039				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-6
FU-4 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available,
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	M-SD19			SE54A			SE54B			SE54C			SE55A			SE56A			SE56B			SE56C			SE56C		
								Sample ID	M-SD19-101195			SGB008			SGB010			SGB009			SGB017			SGB019			SGB020			SGB021			SGB150FD1		
								Sample Date	10/11/1995			12/20/1996			12/20/1996			12/20/1996			12/22/1996			12/20/1996			12/20/1996			12/20/1996			12/20/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)		
Analytical Group	Analytical Method	Analyte	CASRN	Unit	Exceed Count	EPA R4 Freshwater Sediment Narcotic Mode, 2018	EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018	Result	Qualifier (Qual)	Reporting Limit (RL)	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL	Result	Qual	RL
SVOC	CSV390	2,4-DINITROPHENOL	51-28-5	mg/kg	0	NA	0.223	0.95	U	0.95																										
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/kg	0	NA	0.223				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	2,4-DINITROTOLUENE	121-14-2	mg/kg	0	NA	0.29	0.39	U	0.39																										
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/kg	0	NA	0.29				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2,6-DINITROTOLUENE	606-20-2	mg/kg	0	NA	0.296	0.39	U	0.39																										
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/kg	0	NA	0.296				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2-CHLORONAPHTHALENE	91-58-7	mg/kg	0	NA	NA	0.39	U	0.39																										
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/kg	0	NA	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2-CHLOROPHENOL	95-57-8	mg/kg	0	NA	0.055	0.39	U	0.39																										
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/kg	0	NA	0.055				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2-METHYLNAPHTHALENE	91-57-6	mg/kg	1	0.0202	NA	**0.026**	J	0.39																										
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/kg	0	0.0202	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2-METHYLPHENOL	95-48-7	mg/kg	0	NA	0.119	0.39	U	0.39																										
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/kg	0	NA	0.119				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	2-NITROANILINE	88-74-4	mg/kg	0	NA	NA	0.95	U	0.95																										
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/kg	0	NA	NA				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	2-NITROPHENOL	88-75-5	mg/kg	0	NA	0.168	0.39	U	0.39																										
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/kg	0	NA	0.168				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg	0	NA	0.031	0.39	U	0.39																										
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/kg	0	NA	0.031				0.74	U	0.74	0.72	U	0.72	0.78	U	0.78	0.9	U	0.9	0.72	U	0.72	4.1	U	4.1	4.6	U	4.6	19	U	19			
SVOC	CSV390	3-NITROANILINE	99-09-2	mg/kg	0	NA	NA	0.95	U	0.95																										
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/kg	0	NA	NA				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg	0	NA	1.477	0.95	U	0.95																										
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/kg	0	NA	1.477				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg	0	0.047	NA	0.39	U	0.39																										
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/kg	0	0.047	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg	0	NA	0.005	0.39	U	0.39																										
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/kg	0	NA	0.005				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	4-CHLOROANILINE	106-47-8	mg/kg	0	NA	0.0009	0.39	U	0.39																										
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/kg	0	NA	0.0009				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg	0	NA	NA	0.39	U	0.39																										
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/kg	0	NA	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	4-METHYLPHENOL	106-44-5	mg/kg	0	NA	0.093	0.39	U	0.39																										
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/kg	1	NA	0.093				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	**0.17**	J	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	4-NITROANILINE	100-01-6	mg/kg	0	NA	NA	0.95	U	0.95																										
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/kg	0	NA	NA				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	U	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	4-NITROPHENOL	100-02-7	mg/kg	0	NA	0.153	0.95	U	0.95																										
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/kg	0	NA	0.153				1.8	U	1.8	1.8	U	1.8	2	U	2	2.2	UJ	2.2	1.8	U	1.8	10	U	10	11	U	11	48	U	48			
SVOC	CSV390	ACENAPHTHENE	83-32-9	mg/kg	0	0.0067	NA	0.39	U	0.39																										
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/kg	1	0.0067	NA				0.37	U	0.37	**0.061**	J	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	ACENAPHTHYLENE	208-96-8	mg/kg	0	0.0059	NA	0.39	U	0.39																										
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/kg	1	0.0059	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	**0.038**	J	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	ANTHRACENE	120-12-7	mg/kg	0	0.057	NA	0.39	U	0.39																										
SVOC	SW8270	ANTHRACENE	120-12-7	mg/kg	3	0.057	NA				0.37	U	0.37	**0.13**	J	0.36	0.39	U	0.39	0.45	U	0.45	**0.094**	J	0.36	2	U	2	**1.1**	J	2.3	9.5	U	9.5			
SVOC	CSV390	BAP EQUIVALENTS	BAP	mg/kg	0	NA	NA	0	U	0.39																										
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/kg	0	NA	NA				0.1204		0.37	0.5473		0.36	0.2921		0.39	0.1762		0.45	0.4844		0.36	0.5302		2	0.97		2.3	2.008		9.5			
SVOC	CSV390	BENZO(A)ANTHRACENE	56-55-3	mg/kg	0	0.108	NA	0.39	U	0.39																										
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/kg	7	0.108	NA				0.06	J	0.37	**0.33**	J	0.36	**0.14**	J	0.39	**0.11**	J	0.45	**0.53**		0.36	**0.44**	J	2	**0.9**	J	2.3	**1.3**	J	9.5			
SVOC	CSV390	BENZO(A)PYRENE	50-32-8	mg/kg	0	0.15	NA	0.39	U	0.39																										
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/kg	6	0.15	NA				0.085	J	0.37	**0.35**	J	0.36	**0.23**	J	0.39	0.13	J	0.45	**0.32**	J	0.36	**0.4**	J	2	**0.72**	J	2.3	**1.7**	J	9.5			
SVOC	CSV390	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	0	0.19	NA	0.39	U	0.39																										
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/kg	7	0.19	NA				0.18	J	0.37	**0.46**		0.36	**0.34**	J	0.39	**0.22**	J	0.45	**0.83**		0.36	**0.5**	J	2	**1.1**	J	2.3	**1.6**	J	9.5			
SVOC	CSV390	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	0	0.17	NA	0.39	U	0.39																										
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/kg	4	0.17	NA				0.11	J	0.37	**0.25**	J	0.36	0.095	J	0.39	0.11	J	0.45	**0.18**	J	0.36	**0.27**	J	2	**0.32**	J	2.3	9.5	U	9.5			
SVOC	CSV390	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	0	0.24	NA	0.39	U	0.39																										
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/kg	6	0.24	NA				0.12	J	0.37	**0.38**		0.36	**0.28**	J	0.39	0.2	J	0.45	**0.64**		0.36	**0.45**	J	2	**0.94**	J	2.3	**1.6**	J	9.5			
SVOC	CSV390	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg	0	NA	NA	0.39	U	0.39																										
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/kg	0	NA	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg	0	NA	NA	0.39	U	0.39																										
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/kg	0	NA	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	mg/kg	0	NA	NA	0.39	U	0.39																										
SVOC	CSV390	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	0	0.18	NA	0.074	J	0.39																										
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/kg	0	0.18	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg	0	0.1	NA	0.39	U	0.39																										
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/kg	0	0.1	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	CARBAZOLE	86-74-8	mg/kg	0	0.069	NA	0.39	U	0.39																										
SVOC	SW8270	CARBAZOLE	86-74-8	mg/kg	3	0.069	NA				0.37	U	0.37	**0.1**	J	0.36	0.39	U	0.39	0.45	U	0.45	**0.18**	J	0.36	2	U	2	**0.33**	J	2.3	9.5	U	9.5			
SVOC	CSV390	CHRYSENE	218-01-9	mg/kg	0	0.166	NA	0.39	U	0.39																										
SVOC	SW8270	CHRYSENE	218-01-9	mg/kg	7	0.166	NA				0.16	J	0.37	**0.47**		0.36	**0.35**	J	0.39	**0.19**	J	0.45	**1**		0.36	**0.72**	J	2	**1.6**	J	2.3	**1.8**	J	9.5			
SVOC	CSV390	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	0	0.033	NA	0.39	U	0.39																										
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/kg	1	0.033	NA				0.37	U	0.37	**0.09**	J	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	DIBENZOFURAN	132-64-9	mg/kg	0	0.51	0.0000025	0.39	U	0.39																										
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/kg	0	0.51	0.0000025				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	DIETHYLPHTHALATE	84-66-2	mg/kg	0	0.63	NA	0.39	U	0.39																										
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/kg	0	0.63	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	DIMETHYLPHTHALATE	131-11-3	mg/kg	0	0.678	NA	0.39	U	0.39																										
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/kg	0	0.678	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	1	0.011	NA	**0.034**	J	0.39																										
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/kg	0	0.011	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			
SVOC	CSV390	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	0	0.039	NA	0.39	U	0.39																										
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/kg	0	0.039	NA				0.37	U	0.37	0.36	U	0.36	0.39	U	0.39	0.45	U	0.45	0.36	U	0.36	2	U	2	2.3	U	2.3	9.5	U	9.5			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-6
FU-4 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available,
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	M-SD19			SE54A			SE54B			SE54C			SE55A			SE56A			SE56B			SE56C			SE56C		
								Sample ID	M-SD19-101195			SGB008			SGB010			SGB009			SGB017			SGB019			SGB020			SGB021			SGB150FD1		
								Sample Date	10/11/1995			12/20/1996			12/20/1996			12/20/1996			12/22/1996			12/20/1996			12/20/1996			12/20/1996			12/20/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	CSV390	FLUORANTHENE	206-44-0	mg/kg	0	0.423	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/kg	5	0.423	NA				0.16	J	0.37	**0.64**		0.36	0.2	J	0.39	0.21	J	0.45	**1.2**		0.36	**1**	J	2	**2.2**	J	2.3	**2.8**	J	9.5		
SVOC	CSV390	FLUORENE	86-73-7	mg/kg	0	0.077	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	FLUORENE	86-73-7	mg/kg	0	0.077	NA				*0.37*	*U*	*0.37*	0.066	J	0.36	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	HEXACHLOROBENZENE	118-74-1	mg/kg	0	NA	0.02	*0.39*	*U*	*0.39*																												
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/kg	0	NA	0.02				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	HEXACHLOROBUTADIENE	87-68-3	mg/kg	0	NA	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/kg	0	NA	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg	0	NA	0.0065	*0.39*	*U*	*0.39*																												
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/kg	0	NA	0.0065				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	HEXACHLOROETHANE	67-72-1	mg/kg	0	0.027	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/kg	0	0.027	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	0	0.2	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/kg	4	0.2	NA				0.1	J	0.37	**0.24**	J	0.36	0.11	J	0.39	0.11	J	0.45	**0.21**	J	0.36	**0.31**	J	2	**0.39**	J	2.3	*9.5*	*U*	*9.5*		
SVOC	CSV390	ISOPHORONE	78-59-1	mg/kg	0	0.876	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	ISOPHORONE	78-59-1	mg/kg	0	0.876	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	NAPHTHALENE	91-20-3	mg/kg	0	0.176	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/kg	0	0.176	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	NITROBENZENE	98-95-3	mg/kg	0	0.407	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	NITROBENZENE	98-95-3	mg/kg	0	0.407	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg	0	NA	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/kg	0	NA	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg	0	0.11	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/kg	0	0.11	NA				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	PENTACHLOROPHENOL	87-86-5	mg/kg	0	NA	0.01	*0.95*	*U*	*0.95*																												
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/kg	2	NA	0.01				*0.18*	*U*	*0.18*	**0.26**		0.18	*0.2*	*U*	*0.2*	*0.22*	*U*	*0.22*	**0.08**	J	0.18	*1*	*U*	*1*	*1.1*	*U*	*1.1*	*4.8*	*U*	*4.8*		
SVOC	CSV390	PHENANTHRENE	85-01-8	mg/kg	0	0.204	NA	0.02	J	0.39																												
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/kg	5	0.204	NA				0.068	J	0.37	**0.5**		0.36	*0.39*	*U*	*0.39*	0.063	J	0.45	**0.29**	J	0.36	**0.57**	J	2	**1**	J	2.3	**1.7**	J	9.5		
SVOC	CSV390	PHENOL	108-95-2	mg/kg	0	NA	0.175	*0.39*	*U*	*0.39*																												
SVOC	SW8270	PHENOL	108-95-2	mg/kg	0	NA	0.175				*0.37*	*U*	*0.37*	*0.36*	*U*	*0.36*	*0.39*	*U*	*0.39*	*0.45*	*U*	*0.45*	*0.36*	*U*	*0.36*	*2*	*U*	*2*	*2.3*	*U*	*2.3*	*9.5*	*U*	*9.5*		
SVOC	CSV390	PYRENE	129-00-0	mg/kg	0	0.195	NA	*0.39*	*U*	*0.39*																												
SVOC	SW8270	PYRENE	129-00-0	mg/kg	6	0.195	NA				0.13	J	0.37	**0.72**		0.36	**0.41**		0.39	0.18	J	0.45	**1.2**		0.36	**0.89**	J	2	**2**	J	2.3	**2.3**	J	9.5		
SVOC	CSV390	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	0	NA	NA	0.046	J																												
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/kg	0	NA	NA				1.173	J		4.687			2.155			1.523	J		6.532			5.55	J		12.27	J		14.8	J			
Pest	CP390	ALDRIN	309-00-2	mg/kg	0	NA	0.029	*0.002*	*U*	*0.002*																												
Pest	SW8080	ALDRIN	309-00-2	mg/kg	0	NA	0.029				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	ALPHA BHC	319-84-6	mg/kg	0	NA	0.0003	*0.002*	*U*	*0.002*																												
Pest	SW8080	ALPHA BHC	319-84-6	mg/kg	0	NA	0.0003				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	ALPHA ENDOSULFAN	959-98-8	mg/kg	0	NA	NA	*0.002*	*U*	*0.002*																												
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/kg	0	NA	NA				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	ALPHA-CHLORDANE	5103-71-9	mg/kg	0	NA	0.0032	*0.002*	*U*	*0.002*																												
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/kg	2	NA	0.0032				*0.009*	*U*	*0.009*	**0.53**	J	0.18	*0.06*	*UJ*	*0.06*	0.0032	J	0.0046	*0.036*	*UJ*	*0.036*	**0.032**	J	0.041	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	BETA BHC	319-85-7	mg/kg	0	NA	0.005	*0.002*	*U*	*0.002*																												
Pest	SW8080	BETA BHC	319-85-7	mg/kg	0	NA	0.005				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	BETA ENDOSULFAN	33213-65-9	mg/kg	0	NA	0.0009	*0.004*	*U*	*0.0039*																												
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/kg	0	NA	0.0009				*0.018*	*U*	*0.018*	*0.36*	*UJ*	*0.36*	*0.12*	*UJ*	*0.12*	*0.009*	*U*	*0.009*	*0.071*	*UJ*	*0.071*	*0.08*	*UJ*	*0.08*	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	DDD	72-54-8	mg/kg	0	NA	0.0035	*0.004*	*U*	*0.0039*																												
Pest	SW8080	DDD	72-54-8	mg/kg	5	NA	0.0035				*0.018*	*U*	*0.018*	**0.99**	J	0.36	**0.089**	J	0.12	**0.03**		0.0089	*0.071*	*UJ*	*0.071*	**0.061**	J	0.08	*0.09*	*UJ*	*0.09*	**0.04**	J	0.094		
Pest	CP390	DDE	72-55-9	mg/kg	0	NA	0.0014	*0.004*	*U*	*0.0039*																												
Pest	SW8080	DDE	72-55-9	mg/kg	5	NA	0.0014				**0.015**	J	0.018	**0.12**	J	0.36	**0.25**	J	0.12	**0.032**		0.0089	*0.071*	*UJ*	*0.071*	**0.047**	J	0.08	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	DDT	50-29-3	mg/kg	0	NA	0.001	*0.004*	*U*	*0.0039*																												
Pest	SW8080	DDT	50-29-3	mg/kg	8	NA	0.001				**0.022**		0.018	**0.21**	J	0.36	**0.27**	J	0.12	**0.068**		0.0089	**0.034**	J	0.071	**0.16**	J	0.08	**0.071**	J	0.09	**0.11**	J	0.094		
Pest	CP390	DELTA BHC	319-86-8	mg/kg	0	NA	NA	*0.002*	*U*	*0.002*																												
Pest	SW8080	DELTA BHC	319-86-8	mg/kg	0	NA	NA				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	DIELDRIN	60-57-1	mg/kg	0	NA	0.0019	*0.004*	*U*	*0.0039*																												
Pest	SW8080	DIELDRIN	60-57-1	mg/kg	6	NA	0.0019				**0.04**		0.018	**0.29**	J	0.36	**0.11**	J	0.12	*0.009*	*U*	*0.009*	**0.077**	J	0.071	*0.08*	*UJ*	*0.08*	**0.038**	J	0.09	**0.064**	J	0.094		
Pest	CP390	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0	NA	0.0007	*0.004*	*U*	*0.0039*																												
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/kg	0	NA	0.0007				*0.018*	*U*	*0.018*	*0.36*	*UJ*	*0.36*	*0.12*	*UJ*	*0.12*	*0.009*	*U*	*0.009*	*0.071*	*UJ*	*0.071*	*0.08*	*U*	*0.08*	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	ENDRIN	72-20-8	mg/kg	0	NA	0.0022	*0.004*	*U*	*0.0039*																												
Pest	SW8080	ENDRIN	72-20-8	mg/kg	0	NA	0.0022				*0.018*	*U*	*0.018*	*0.36*	*UJ*	*0.36*	*0.12*	*UJ*	*0.12*	*0.009*	*U*	*0.009*	*0.071*	*UJ*	*0.071*	*0.08*	*UJ*	*0.08*	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0	NA	NA	*0.004*	*U*	*0.0039*																												
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/kg	0	NA	NA				*0.018*	*U*	*0.018*	*0.36*	*UJ*	*0.36*	*0.12*	*UJ*	*0.12*	*0.009*	*U*	*0.009*	*0.071*	*UJ*	*0.071*	*0.08*	*UJ*	*0.08*	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	ENDRIN KETONE	53494-70-5	mg/kg	0	NA	NA	*0.004*	*U*	*0.0039*																												
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/kg	0	NA	NA				*0.018*	*U*	*0.018*	*0.36*	*UJ*	*0.36*	*0.12*	*UJ*	*0.12*	*0.009*	*U*	*0.009*	*0.071*	*UJ*	*0.071*	*0.08*	*UJ*	*0.08*	*0.09*	*UJ*	*0.09*	*0.094*	*UJ*	*0.094*		
Pest	CP390	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0	NA	0.0024	*0.002*	*U*	*0.002*																												
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/kg	0	NA	0.0024				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	GAMMA-CHLORDANE	5103-74-2	mg/kg	0	NA	NA	*0.002*	*U*	*0.002*																												
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/kg	0	NA	NA				*0.009*	*U*	*0.009*	0.65	J	0.18	*0.06*	*UJ*	*0.06*	0.0038	J	0.0046	*0.036*	*UJ*	*0.036*	0.048	J	0.041	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	HEPTACHLOR	76-44-8	mg/kg	0	NA	0.0006	*0.002*	*U*	*0.002*																												
Pest	SW8080	HEPTACHLOR	76-44-8	mg/kg	0	NA	0.0006				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	0	NA	0.0025	*0.002*	*U*	*0.002*																												
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/kg	0	NA	0.0025				*0.009*	*U*	*0.009*	*0.18*	*UJ*	*0.18*	*0.06*	*UJ*	*0.06*	*0.005*	*U*	*0.005*	*0.036*	*UJ*	*0.036*	*0.041*	*UJ*	*0.041*	*0.046*	*UJ*	*0.046*	*0.048*	*UJ*	*0.048*		
Pest	CP390	METHOXYCHLOR	72-43-5	mg/kg	0	NA	0.03	*0.02*	*U*	*0.02*																												
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/kg	0	NA	0.03				*0.094*	*U*	*0.094*	*1.8*	*UJ*	*1.8*	*0.6*	*UJ*	*0.6*	*0.046*	*U*	*0.046*	*0.36*	*UJ*	*0.36*	*0.41*	*UJ*	*0.41*	*0.46*	*UJ*	*0.46*	*0.48*	*UJ*	*0.48*		
Pest	CP390	TOXAPHENE	8001-35-2	mg/kg	0	NA	0.0001	*0.2*	*U*	*0.2*																												
Pest	SW8080	TOXAPHENE	8001-35-2	mg/kg	0	NA	0.0001				*0.94*	*U*	*0.94*	*18*	*UJ*	*18*	*6*	*UJ*	*6*	*0.46*	*U*	*0.46*	*3.6*	*UJ*	*3.6*	*4.1*	*UJ*	*4.1*	*4.6*	*UJ*	*4.6*	*4.8*	*UJ*	*4.8*		
PCB	CP390	PCB-1016 (AROCHLOR 1016)	12674-11-2	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																												
PCB	CP390	PCB-1221 (AROCHLOR 1221)	11104-28-2	mg/kg	0	NA	0.014	*0.08*	*U*	*0.08*																												
PCB	CP390	PCB-1232 (AROCHLOR 1232)	11141-16-5	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																												

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-6
FU-4 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available,
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	M-SD19			SE54A			SE54B			SE54C			SE55A			SE56A			SE56B			SE56C			SE56C		
								Sample ID	M-SD19-101195			SGB008			SGB010			SGB009			SGB017			SGB019			SGB020			SGB021			SGB150FD1		
								Sample Date	10/11/1995			12/20/1996			12/20/1996			12/20/1996			12/22/1996			12/20/1996			12/20/1996			12/20/1996			12/20/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
PCB	CP390	PCB-1242 (AROCHLOR 1242)	53469-21-9	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																											
PCB	CP390	PCB-1248 (AROCHLOR 1248)	12672-29-6	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																											
PCB	CP390	PCB-1254 (AROCHLOR 1254)	11097-69-1	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																											
PCB	CP390	PCB-1260 (AROCHLOR 1260)	11096-82-5	mg/kg	0	NA	0.014	*0.039*	*U*	*0.039*																											
Metal	SW7471	MERCURY	7439-97-6	mg/kg	0	NA	0.17	*0.12*	*U*	*0.12*	*0.06*	*U*	*0.007*	0.1		0.0067	*0.02*	*U*	*0.008*	*0.03*	*U*	*0.009*	*0.02*	*U*	*0.007*	0.12		0.0075	*0.04*	*U*	*0.008*	*0.04*	*U*	*0.009*			
Metal	SW9010	CYANIDE	57-12-5	mg/kg	0	NA	NA	*0.18*	*U*	*0.18*																											
Metal	SW6010	ALUMINUM	7429-90-5	mg/kg	0	NA	25000	203		1.9										1200		2.5	1960		1.9	2180		2.2	1630		2.5	2700		2.6			
Metal	SW6010	ANTIMONY	7440-36-0	mg/kg	0	NA	2	*0.47*	*U*	*0.47*	*1.7*	*U*	*1.7*	*1.6*	*U*	*1.6*	*2.3*	*U*	*1.8*	*2*	*U*	*2*	*2*	*U*	*1.8*	*2.3*	*U*	*1.8*	*2.1*	*U*	*2.1*	*3*	*U*	*2.2*			
Metal	SW6010	ARSENIC	7440-38-2	mg/kg	0	NA	9.8	*0.94*	*U*	*0.94*	4	J	1.8	7.6	J	1.8	7.3		0.19	0.26	J	0.22	3.9		0.18	3.1	J	2	2		0.22	4.5		0.24			
Metal	SW6010	BARIUM	7440-39-3	mg/kg	3	NA	20	5.8	J	0.23										8.8	J	0.048	**24.6**		0.037	**71.2**		0.043	17	J	0.048	**48.6**		0.05			
Metal	SW6010	BERYLLIUM	7440-41-7	mg/kg	0	NA	NA	*0.23*	*U*	*0.23*	0.09	J	0.014	0.09	J	0.014	*0.02*	*U*	*0.02*	*0.02*	*U*	*0.02*	0.07	J	0.014	0.05	J	0.016	*0.02*	*U*	*0.02*	0.04	J	0.019			
Metal	SW6010	CADMIUM	7440-43-9	mg/kg	2	NA	1	*0.23*	*U*	*0.23*	*0.37*	*U*	*0.37*	**1.3**		0.36	*0.39*	*U*	*0.39*	**2.7**		0.45	*0.35*	*U*	*0.35*	*1.1*	*U*	*0.4*	*0.45*	*U*	*0.45*	*0.55*	*U*	*0.47*			
Metal	SW6010	CALCIUM	7440-70-2	mg/kg	0	NA	NA	134000		2.3										232000		15.5	25900		0.61	243000		13.9	51400		0.78	39300		0.82			
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/kg	1	NA	43.4	3.7		0.23	**68.5**	J	0.24	16.5	J	0.24	6.6	J	0.26	13.5		0.3	12.1	J	0.24	26.5	J	0.27	16.7	J	0.3	28.1	J	0.32			
Metal	SW6010	COBALT	7440-48-4	mg/kg	0	NA	50	10.8	J	0.23										1.5	J	0.34	2.1	J	0.27	2.3	J	0.3	3.3	J	0.34	3.6	J	0.36			
Metal	SW6010	COPPER	7440-50-8	mg/kg	1	NA	31.6	4.5	J	0.23	4.5	J	0.13	**49.9**	J	0.13	2.9	J	0.14	27.3	J	0.16	6.8	J	0.13	22.8	J	0.15	5	J	0.16	11.1	J	0.17			
Metal	SW6010	IRON	7439-89-6	mg/kg	0	NA	20000	3490		3										2960		0.27	6080		0.21	9770		0.24	4880		0.27	8510		0.29			
Metal	SW6010	LEAD	7439-92-1	mg/kg	2	NA	35.8	1.8		0.47	13.8	J	2.2	**63.9**	J	2.1	7.2	J	0.23	11.6	J	0.27	25.6	J	0.21	33.3	J	2.4	23.6	J	0.27	**66.9**	J	0.28			
Metal	SW6010	MAGNESIUM	7439-95-4	mg/kg	0	NA	NA	3020		1.9										5170		2.5	1620		1.9	7780		2.2	1930		2.5	1990		2.6			
Metal	SW6010	MANGANESE	7439-96-5	mg/kg	0	NA	460	37.3	J	0.23										53.2	J	0.046	72.5	J	0.036	160	J	0.041	64.9	J	0.047	177	J	0.049			
Metal	SW6010	NICKEL	7440-02-0	mg/kg	0	NA	22.7	3.9	J	0.23	4.8		0.61	4.6		0.6	3	J	0.65	*4.9*	*U*	*0.75*	4.4		0.59	19.1		0.67	3.6	J	0.75	7.5		0.79			
Metal	SW6010	POTASSIUM	7440-09-7	mg/kg	0	NA	NA	76	J	9.6										222	J	101.2	257	J	79.7	419	J	90.5	194	J	101.9	350	J	107.2			
Metal	SW6010	SELENIUM	7782-49-2	mg/kg	0	NA	0.72	*0.47*	*U*	*0.47*	*1.6*	*U*	*1.6*	*1.5*	*U*	*1.5*	*0.18*	*U*	*0.17*	*0.19*	*U*	*0.19*	*0.21*	*U*	*0.15*	*1.7*	*U*	*1.7*	*0.19*	*U*	*0.19*	*0.48*	*U*	*0.2*			
Metal	SW6010	SILVER	7440-22-4	mg/kg	0	NA	1	*0.47*	*U*	*0.47*	*0.24*	*U*	*0.24*	*0.24*	*U*	*0.24*	*0.26*	*U*	*0.26*	*0.3*	*U*	*0.3*	*0.24*	*U*	*0.24*	*0.27*	*U*	*0.27*	*0.3*	*U*	*0.3*	*0.32*	*U*	*0.32*			
Metal	SW6010	SODIUM	7440-23-5	mg/kg	0	NA	NA	107	J	2.3										158	J	1.2	136	J	0.94	149	J	1.1	*83.2*	*UJ*	*1.2*	*77.9*	*UJ*	*1.3*			
Metal	SW6010	THALLIUM	7440-28-0	mg/kg	0	NA	NA	*0.7*	*U*	*0.7*	*1.4*	*U*	*1.4*	*1.4*	*U*	*1.4*	*0.15*	*U*	*0.15*	*0.17*	*U*	*0.17*	*0.14*	*U*	*0.14*	*1.5*	*U*	*1.5*	*0.17*	*U*	*0.17*	*0.18*	*U*	*0.18*			
Metal	SW6010	VANADIUM	7440-62-2	mg/kg	0	NA	NA	2.1	J	0.23										4.5	J	0.23	8.2		0.18	17.5		0.21	7.4		0.23	13.1		0.24			
Metal	SW6010	ZINC	7440-66-6	mg/kg	0	NA	121	17		0.23	36.5	J	0.11	68.4	J	0.11	16.2	J	0.12	47.6	J	0.14	37.1	J	0.11	117	J	0.12	53.8	J	0.14	115	J	0.14			
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	pg/g	0	NA	NA				293	J	2500	6989		2500	506	J	2500	468	J	2500	1400	J	2500	92	J	2500	*2500*	*U*	*2500*	480	J	2500			
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	pg/g	0	NA	NA	6.9	J	0																											
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	pg/g	0	NA	NA				1253	J	2500	23800		2500	*2500*	*U*	*2500*	2523		2500	7862		2500	384	J	2500	180	J	2500	*2205*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	pg/g	0	NA	NA	*23.7*	*U*	*24*																											
Dioxin/ Furan	CDF991	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	pg/g	0	NA	NA				*2500*	*U*	*2500*	110	J	2500	57	J	2500	*2500*	*UJ*	*2500*	21	J	2500	*2500*	*UJ*	*2500*	*2500*	*UJ*	*2500*	*2500*	*UJ*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	pg/g	0	NA	NA	*7*	*U*	*7*																											
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	pg/g	0	NA	NA				10	J	2500	74	J	2500	42	J	2500	*2500*	*U*	*2500*	18	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	pg/g	0	NA	NA	*2.1*	*U*	*2*																											
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	pg/g	0	NA	NA				8	J	2500	*48*	*UJ*	*2500*	13	J	2500	*2500*	*U*	*2500*	14	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	pg/g	0	NA	NA	*8.3*	*U*	*8*																											
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	pg/g	0	NA	NA				4	J	2500	79	J	2500	14	J	2500	*2500*	*U*	*2500*	12	J	2500	*2500*	*UJ*	*2500*	*2500*	*UJ*	*2500*	8	J	2500			
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	pg/g	0	NA	NA	*2.2*	*U*	*2*																											
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	pg/g	0	NA	NA				20	J	2500	260	J	2500	44	J	2500	*2500*	*U*	*2500*	7	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	25	J	2500			
Dioxin/ Furan	SW8280	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	pg/g	0	NA	NA	*3.9*	*U*	*4*																											
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	pg/g	0	NA	NA				*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*UJ*	*2500*	*2500*	*UJ*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	pg/g	0	NA	NA	*4.5*	*U*	*5*																											
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	pg/g	0	NA	NA				15	J	2500	150	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	25	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	18	J	2500			
Dioxin/ Furan	SW8280	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	pg/g	0	NA	NA	*5.4*	*U*	*5*																											
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	pg/g	0	NA	NA				*2500*	*UJ*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	pg/g	0	NA	NA	*2.4*	*U*	*2*																											
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	pg/g	0	NA	NA				*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	pg/g	0	NA	NA	*2.9*	*U*	*3*																											
Dioxin/ Furan	CDF991	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	pg/g	0	NA	NA				*2500*	*U*	*2500*	*2500*	*U*	*2500*	22	J	2500	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	pg/g	0	NA	NA	*3.6*	*U*	*4*																											
Dioxin/ Furan	CDF991	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	pg/g	0	NA	NA				*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*UJ*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*	*2500*	*U*	*2500*			
Dioxin/ Furan	SW8280	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	pg/g	0	NA	NA	*2.3*	*U*	*2*																											
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	pg/g	0	NA	NA				*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-6
FU-4 ECOLOGICAL EVALUATION OF SEDIMENT ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/kg = Milligram per kilogram, NA = Not available,
PCB = Polychlorinated biphenyl, Pest = Pesticide, pg/g = Picogram per gram,
SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	M-SD19			SE54A			SE54B			SE54C			SE55A			SE56A			SE56B			SE56C			SE56C		
								Sample ID	M-SD19-101195			SGB008			SGB010			SGB009			SGB017			SGB019			SGB020			SGB021			SGB150FD1		
								Sample Date	10/11/1995			12/20/1996			12/20/1996			12/20/1996			12/22/1996			12/20/1996			12/20/1996			12/20/1996			12/20/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freshwater Sediment Narcotic Mode, 2018**	**EPA R4 Freshwater Sediment Non-Narcotic Mode, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	pg/g	0	NA	NA	*1.9*	*U*	*2*																										
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	pg/g	0	NA	0.5				*1000*	*UJ*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*	*1000*	*U*	*1000*
Dioxin/ Furan	SW8280	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	pg/g	0	NA	0.5	*1.8*	*U*	*2*																										
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZOFURANS, (TOTAL)	38998-75-3	pg/g	0	NA	NA	6.9		0																										
Dioxin/ Furan	SW8280	HEPTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	37871-00-4	pg/g	0	NA	NA	*23.7*	*U*	*24*																										
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZOFURANS, (TOTAL)	55684-94-1	pg/g	0	NA	NA	*2.16*	*U*	*2*																										
Dioxin/ Furan	SW8280	HEXACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	34465-46-8	pg/g	0	NA	NA	*3.92*	*U*	*4*																										
Dioxin/ Furan	CDF991	OCTACHLORODIBENZOFURAN	39001-02-0	pg/g	0	NA	NA				707	J	5000	14860	J	5000	2252	J	5000	1063	J	5000	2989	J	5000	153	J	5000	*46*	*UJ*	*5000*	1085	J	5000
Dioxin/ Furan	SW8280	OCTACHLORODIBENZOFURAN	39001-02-0	pg/g	0	NA	NA	24.3	J	0																										
Dioxin/ Furan	CDF991	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	pg/g	0	NA	NA				7954		5000	114300	J	5000	16840		5000	17690		5000	66770		5000	5248		5000	2896	J	5000	29300		5000
Dioxin/ Furan	SW8280	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	pg/g	0	NA	NA	207	J	7																										
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZOFURANS, (TOTAL)	30402-15-4	pg/g	0	NA	NA	*2.29*	*U*	*2*																										
Dioxin/ Furan	SW8280	PENTACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	36088-22-9	pg/g	0	NA	NA	*2.9*	*U*	*3*																										
Dioxin/ Furan	CDF991	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g	8	NA	2.5				**29.82**		1000	**494.4**		1000	**38.22**		1000	**48.67**		1000	**170.2**		1000	**10.16**		1000	**4.696**		1000	**40.29**		1000
Dioxin/ Furan	SW8280	TCDD EQUIVALENT	DIOXIN-TEQ	pg/g	0	NA	2.5	0.3003		0																										
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZOFURANS, (TOTAL)	55722-27-5	pg/g	0	NA	NA	*1.85*	*U*	*2*																										
Dioxin/ Furan	SW8280	TETRACHLORINATED DIBENZO-P-DIOXINS, (TOTAL)	41903-57-5	pg/g	0	NA	NA	*1.84*	*U*	*2*																										

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW14			SW2			SW54A			SW54A			SW54B			SW54B			SW54C			SW54C			SW55A			SW55A		
								Sample ID	LAWSW14			LAWSW2			SGB005			WSSGB005			SGB006			WSSGB006			SGB007			WSSGB007			SGB018			WSSGB018		
								Sample Date	1/2/1989			4/6/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freswater Surface Water Acute, 2018**	**EPA R4 Freswater Surface Water Chronic, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	0	0.69	0.076							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	0	0.91	0.2							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	0	3.2	0.73							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	0	3.7	0.41							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	0	1.2	0.13							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	0	8.2	2							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	0	3.3	0.52							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8240	2-BUTANONE	78-93-3	mg/L	0	200	22	0.004	J																												
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	0	200	22							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	0	1.8	0.099							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	0	2.2	0.17							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8240	ACETONE	67-64-1	mg/L	0	15	1.7	0.11			0.005	J																									
VOC	SW8260	ACETONE	67-64-1	mg/L	0	15	1.7							0.01	U	0.01				0.01	U	0.01				0.01	UJ	0.01				0.01	UJ	0.01			
VOC	SW8260	BENZENE	71-43-2	mg/L	0	0.7	0.16							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	0	3.1	0.34							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	BROMOFORM	75-25-2	mg/L	0	1.1	0.23							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	0	0.038	0.016							0.01	UJ	0.01				0.01	UJ	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	0	0.13	0.015							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	0	0.69	0.077							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	0	0.22	0.025							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	0	1.3	0.14							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	0	0.015	0.0017							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	0	2.9	0.32							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	0	0.55	0.061							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L	0	8.5	1.5				0.001	J																									
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	0	8.5	1.5							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	STYRENE	100-42-5	mg/L	0	0.29	0.032							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	0	0.43	0.053							0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01			
VOC	SW8260	TOLUENE	108-88-3	mg/L	0	0.56	0.062							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	0	8.8	0.97							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	0	0.24	0.027							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	0	0.015	0.0017							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	0	2	0.22							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	0	8.4	0.93							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	0	0.42	0.13							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	0	0.13	0.023							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	0	0.079	0.022							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	0	0.057	0.0094							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	0	0.017	0.0019							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	0	0.039	0.0049							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	0	0.092	0.011							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	0	0.14	0.015							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	0	0.379	0.071							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	0	0.39	0.044							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	0	0.73	0.081							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	0	0.16	0.018							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	0	0.042	0.0047							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	0	0.6	0.067							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	0	NA	NA							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	0	0.65	0.073							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	0	0.041	0.0045							0.02	U	0.02				0.02	U	0.02				0.02	U	0.02				0.02	U	0.02			
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	0	NA	NA							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	0	NA	NA							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	0	0.012	0.0015							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	0	0.067	0.001							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	0	0.024	0.0008							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	0	0.48	0.053							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	0	NA	NA							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	0	0.53	0.058							0.05	U	0.05				0.05	U	0.05				0.05	U	0.05				0.05	U	0.05			
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	0	0.019	0.015							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	0	0.12	0.013							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	0	0.00018	0.00002							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	0	NA	NA							0	U	0.01				0	U	0.01				0	U	0.01				0	U	0.01			
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	0	0.042	0.0047							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	0	0.00054	0.00006							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BENZO(B)FLUOROANTHENE	205-99-2	mg/L	0	0.023	0.0026							0.01	U	0.01				0.01	U	0.01				0.01	U	0.01				0.01	U	0.01			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW14			SW2			SW54A			SW54A			SW54B			SW54B			SW54C			SW54C			SW55A			SW55A		
								Sample ID	LAWSW14			LAWSW2			SGB005			WSSGB005			SGB006			WSSGB006			SGB007			WSSGB007			SGB018			WSSGB018		
								Sample Date	1/2/1989			4/6/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freswater Surface Water Acute, 2018**	**EPA R4 Freswater Surface Water Chronic, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0	0.00019	0.000012							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0	0.0013	0.00006							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BENZOICACID	65-85-0	mg/L	0	0.74	0.042	0.003	J																														
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	1	1.1	0.008	0.003	J					0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	0	0.13	0.023							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	0	0.042	0.0047							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0	0.00028	0.000012							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	0	0.036	0.004							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	0	0.98	0.22							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	0	3.2	1.1							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	0	0.034	0.019							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	0	0.0037	0.0008							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	FLUORENE	86-73-7	mg/L	0	0.11	0.019							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	0	0.0028	0.00015							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	0	0.01	0.001							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	0	0.0045	0.00045							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	0	0.21	0.012							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0	0.00027	0.000012							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	0	7.5	0.92							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	0	0.17	0.021							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	0	1	0.23							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	0	NA	NA							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	0	0.22	0.025							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	0	0.019	0.015							0.007		0.005				0.006		0.005							0.005	U	0.005				0.013		0.005			
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	0	0.031	0.0023							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	PHENOL	108-95-2	mg/L	0	4.7	0.16							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	PYRENE	129-00-0	mg/L	0	0.042	0.0046							0.01	U	0.01				0.01	U	0.01							0.01	U	0.01				0.01	U	0.01			
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	0	NA	NA							0.01	U					0.01	U								0.01	U					0.01	U				
Pest	SW8080	ALDRIN	309-00-2	mg/L	0	0.003	0.00004							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	ALPHA BHC	319-84-6	mg/L	0	NA	0.00001							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	1	0.00022	0.00006				**0.0002**			5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L	0	0.0024	0.000004							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	BETA BHC	319-85-7	mg/L	0	NA	0.00001							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L	0	0.00022	0.00006							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	DDD	72-54-8	mg/L	0	0.00019	0.00001							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	DDE	72-55-9	mg/L	0	0.0013	0.0003							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	DDT	50-29-3	mg/L	4	0.0011	0.000001							**7E-05**	J	0.0001				**7E-05**	J	0.0001							**9E-05**	J	0.0001				**0.0002**		0.0001			
Pest	SW8080	DELTA BHC	319-86-8	mg/L	0	NA	NA							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	DIELDRIN	60-57-1	mg/L	3	0.00024	0.00006							**0.0002**		0.0001				**0.0002**		0.0001							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L	0	0.0019	0.00006							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	ENDRIN	72-20-8	mg/L	0	0.00009	0.00004							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L	0	NA	NA							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L	0	NA	NA							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L	0	0.00095	0.00011							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L	0	NA	NA							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L	0	0.0005	0.000004							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	0	0.0005	0.000004							5E-05	U	5E-05				5E-05	U	5E-05							5E-05	U	5E-05				5E-05	U	5E-05			
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L	0	0.0007	0.00003							5E-04	U	5E-04				5E-04	U	5E-04							5E-04	U	5E-04				5E-04	U	5E-04			
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L	0	0.00073	0.0000002							0.005	U	0.005				0.005	U	0.005							0.005	U	0.005				0.005	U	0.005			
Metal	SW7470	MERCURY	7439-97-6	mg/L	0	0.0014	0.00077							6E-05	U	1E-05				8E-05	U	1E-05							6E-05	U	1E-05				8E-05	U	1E-05			
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L	0	0.0014	0.00077										1E-05	U	1E-05				1E-05	U	1E-05							1E-05	U	1E-05				1E-05	U	1E-05
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	5	0.75	0.087																												**1.7**		0.0182			
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L	0	NA	NA																															0.32		0.0182
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	0	0.9	0.19							0.015	U	0.015				0.015	U	0.015							0.015	U	0.015				0.015	U	0.015			
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L	0	NA	NA										0.015	U	0.015				0.015	U	0.015							0.015	U	0.015				0.015	U	0.015
Metal	SW6010	ARSENIC	7440-38-2	mg/L	0	0.34	0.15							0.0046	J	0.0016				0.0058	J	0.0016							0.0125		0.0016				0.002	U	0.002			
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L	0	0.34	0.15										0.0042	J	0.0016				0.0058	J	0.0016				0.0121		0.0016							0.002	U	0.002
Metal	SW6010	BARIUM	7440-39-3	mg/L	0	2	0.22	0.042			0.076																								0.0339	J	0.0004			
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L	0	NA	NA																															0.0235	J	0.0004
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	0	0.093	0.011							1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04				1E-04	U	1E-04			
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L	0	NA	NA										1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04
Metal	SW6010	CADMIUM	7440-43-9	mg/L	0	NA	NA							0.003	U	0.003				0.003	U	0.003							0.003	U	0.003				0.003	U	0.003			
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L	0	0.00094	0.00045										0.003	U	0.003				0.003	U	0.003				0.003	U	0.003							0.003	U	0.003
Metal	SW6010	CALCIUM	7440-70-2	mg/L	0	NA	116																												30.3		0.0057			
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L	0	NA	NA																															24.4		0.0057

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

								Location	SW14			SW2			SW54A			SW54A			SW54B			SW54B			SW54C			SW54C			SW55A			SW55A		
								Sample ID	LAWSW14			LAWSW2			SGB005			WSSGB005			SGB006			WSSGB006			SGB007			WSSGB007			SGB018			WSSGB018		
								Sample Date	1/2/1989			4/6/1989			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
								Sample Type	Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample			Sample		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Exceed Count**	**EPA R4 Freswater Surface Water Acute, 2018**	**EPA R4 Freswater Surface Water Chronic, 2018**	**Result**	**Qualifier (Qual)**	**Reporting Limit (RL)**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L	0	0.016	0.011										0.002	U	0.002				0.002	U	0.002				0.002	U	0.002							0.0022	J	0.0022
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	0	NA	NA	0.01			0.02			0.0031	J	0.0022				0.0029	J	0.0022										0.0082	J	0.0022			
Metal	SW6010	COBALT	7440-48-4	mg/L	0	0.12	0.019																									0.003	U	0.003			
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L	0	NA	NA																												0.003	U	0.003
Metal	SW6010	COPPER	7440-50-8	mg/L	0	NA	NA				0.023			0.011	U	0.001				0.008	U	0.001				0.005	U	0.001				0.0593		0.0012			
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L	1	0.007	0.00495										0.007	U	0.001				0.009	U	0.001				0.001	U	0.001				0.0297		0.0012
Metal	SW6010	IRON	7439-89-6	mg/L	1	NA	1																									2.52		0.002			
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L	0	NA	NA																												0.445	J	0.002
Metal	SW6010	LEAD	7439-92-1	mg/L	0	NA	NA							0.0114		0.002				0.0082		0.002				0.002	U	0.002				0.0387		0.002			
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L	2	0.0301	0.00125										0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.0071		0.002
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	0	NA	82																									2.41	J	0.0181			
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L	0	NA	NA																												1.84	J	0.0181
Metal	SW6010	MANGANESE	7439-96-5	mg/L	0	1.68	0.093																									0.0492		0.0003			
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L	0	NA	NA																												0.0102	J	0.0003
Metal	SW6010	NICKEL	7440-02-0	mg/L	0	NA	NA							0.0094	J	0.0055				0.0062	J	0.0055				0.006	U	0.006				0.006	J	0.0055			
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L	0	0.26	0.0289										0.006	U	0.006				0.006	U	0.006				0.006	U	0.006							0.006	U	0.006
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	0	NA	53																									3.02	J	0.745			
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L	0	NA	NA																												2.8	J	0.745
Metal	SW6010	SELENIUM	7782-49-2	mg/L	0	0.02	0.005							0.002	U	0.001				0.001	U	0.001				0.001	U	0.001				0.002	U	0.001			
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L	0	NA	NA										0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001
Metal	SW6010	SILVER	7440-22-4	mg/L	0	NA	NA							0.002	U	0.002				0.002	U	0.002				0.002	U	0.002				0.002	U	0.002			
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L	1	0.00098	0.00006										0.002	U	0.002				0.002	U	0.002				0.002	U	0.002							0.002	U	0.002
Metal	SW6010	SODIUM	7440-23-5	mg/L	0	NA	680																									2.07	J	0.0088			
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L	0	NA	NA																												2.11	J	0.0088
Metal	SW6010	THALLIUM	7440-28-0	mg/L	0	0.054	0.006							0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001			
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L	0	NA	NA										0.001	U	0.001				0.001	U	0.001				0.001	U	0.001				0.001	U	0.001
Metal	SW6010	VANADIUM	7440-62-2	mg/L	0	0.079	0.027																									0.004	J	0.0017			
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L	0	NA	NA																												0.0018	J	0.0017
Metal	SW6010	ZINC	7440-66-6	mg/L	0	NA	NA	0.036			0.029			0.0475	J	0.001				0.0286	J	0.001				0.0353	J	0.001				0.0536	J	0.001			
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L	0	0.066	0.066										0.007	U	0.001				0.006	U	0.001				0.015	U	0.001				0.0188	J	0.001
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	ng/L	0	NA	NA							0.104	J	25				25	UJ	25				25	U	25				0.707	J	25			
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	ng/L	0	NA	NA							0.225	UJ	25				0.298	UJ	25				0.115	UJ	25				2.309	UJ	25			
Dioxin/ Furan	CDF991	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	ng/L	0	NA	NA							0.17	UJ	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	ng/L	0	NA	NA							25	U	25				25	UJ	25				0.06	J	25				0.075	J	25			
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	ng/L	0	NA	NA							25	U	25				0.733	UJ	25				1.931	J	25				1.532	J	25			
Dioxin/ Furan	CDF991	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	ng/L	0	NA	NA							25	U	25				25	UJ	25				25	U	25				25	U	25			
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	ng/L	0	NA	NA							10	U	10				10	UJ	10				10	U	10				10	U	10			
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	ng/L	0	NA	0.0000031							10	U	10				10	UJ	10				10	U	10				10	U	10			
Dioxin/ Furan	CDF991	OCTACHLORODIBENZOFURAN	39001-02-0	ng/L	0	NA	NA							0.133	J	50				0.221	J	50				0.081	J	50				1.301	J	50			
Dioxin/ Furan	CDF991	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	ng/L	0	NA	NA							3.176	J	50				3.865	J	50				2.019	J	50				27.15	J	50			
Dioxin/ Furan	CDF991	TCDD EQUIVALENT	DIOXIN-TEQ	ng/L	8	NA	0.0000031							0.0043		10				0.0041		10				0.2012		10				0.1962		10			

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW56A			SW56A			SW56B			SW56B			SW56C			SW56C			SW56C			SW56C		
					SGB022			WSSGB022			SGB023			WSSGB023			SGB024			SGB091FD1			WSSGB024			WSSGB091FD1		
					12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
					Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
VOC	SW8260	1,1,1-TRICHLOROETHANE	71-55-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,1,2,2-TETRACHLOROETHANE	79-34-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,1,2-TRICHLOROETHANE	79-00-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,1-DICHLOROETHANE	75-34-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,1-DICHLOROETHENE	75-35-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,2-DICHLOROETHANE	107-06-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	1,2-DICHLOROPROPANE	78-87-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8240	2-BUTANONE	78-93-3	mg/L																								
VOC	SW8260	2-BUTANONE	78-93-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	2-HEXANONE	591-78-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	4-METHYL-2-PENTANONE	108-10-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8240	ACETONE	67-64-1	mg/L																								
VOC	SW8260	ACETONE	67-64-1	mg/L	0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01	0.01	UJ	0.01						
VOC	SW8260	BENZENE	71-43-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	BROMODICHLOROMETHANE	75-27-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	BROMOFORM	75-25-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	BROMOMETHANE	74-83-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CARBON DISULFIDE	75-15-0	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CARBON TETRACHLORIDE	56-23-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CHLOROBENZENE	108-90-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CHLOROETHANE	75-00-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CHLOROFORM	67-66-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CHLOROMETHANE	74-87-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	CIS-1,3-DICHLOROPROPENE	10061-01-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	DIBROMOCHLOROMETHANE	124-48-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	ETHYLBENZENE	100-41-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8240	METHYLENE CHLORIDE	75-09-2	mg/L																								
VOC	SW8260	METHYLENE CHLORIDE	75-09-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	STYRENE	100-42-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	TETRACHLOROETHENE	127-18-4	mg/L	0.01	UJ	0.01				0.01	UJ	0.01				0.01	UJ	0.01	0.01	UJ	0.01						
VOC	SW8260	TOLUENE	108-88-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	TOTAL 1,2-DICHLOROETHENE	540-59-0	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	TOTAL XYLENES	1330-20-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	TRANS-1,3-DICHLOROPROPENE	10061-02-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	TRICHLOROETHENE	79-01-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
VOC	SW8260	VINYL CHLORIDE	75-01-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	1,2,4-TRICHLOROBENZENE	120-82-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	1,2-DICHLOROBENZENE	95-50-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	1,3-DICHLOROBENZENE	541-73-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	1,4-DICHLOROBENZENE	106-46-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,2'-OXYBIS(1-CHLOROPROPANE)	108-60-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,4,5-TRICHLOROPHENOL	95-95-4	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	2,4,6-TRICHLOROPHENOL	88-06-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,4-DICHLOROPHENOL	120-83-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,4-DIMETHYLPHENOL	105-67-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,4-DINITROPHENOL	51-28-5	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	2,4-DINITROTOLUENE	121-14-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2,6-DINITROTOLUENE	606-20-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2-CHLORONAPHTHALENE	91-58-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2-CHLOROPHENOL	95-57-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2-METHYLNAPHTHALENE	91-57-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2-METHYLPHENOL	95-48-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	2-NITROANILINE	88-74-4	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	2-NITROPHENOL	88-75-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	3,3'-DICHLOROBENZIDINE	91-94-1	mg/L	0.02	U	0.02				0.02	U	0.02				0.02	U	0.02	0.02	U	0.02						
SVOC	SW8270	3-NITROANILINE	99-09-2	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	4,6-DINITRO-2-METHYLPHENOL	534-52-1	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	4-BROMOPHENYL-PHENYLETHER	101-55-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	4-CHLORO-3-METHYLPHENOL	59-50-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	4-CHLOROANILINE	106-47-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	4-CHLOROPHENYL-PHENYLETHER	7005-72-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	4-METHYLPHENOL	106-44-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	4-NITROANILINE	100-01-6	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	4-NITROPHENOL	100-02-7	mg/L	0.05	U	0.05				0.05	U	0.05				0.05	U	0.05	0.05	U	0.05						
SVOC	SW8270	ACENAPHTHENE	83-32-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	ACENAPHTHYLENE	208-96-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	ANTHRACENE	120-12-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BAP EQUIVALENTS	BAP	mg/L	0	U	0.01				0	U	0.01				0	U	0.01	0	U	0.01						
SVOC	SW8270	BENZO(A)ANTHRACENE	56-55-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BENZO(A)PYRENE	50-32-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BENZO(B)FLUORANTHENE	205-99-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW56A			SW56A			SW56B			SW56B			SW56C			SW56C			SW56C			SW56C		
					SGB022			WSSGB022			SGB023			WSSGB023			SGB024			SGB091FD1			WSSGB024			WSSGB091FD1		
					12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
					Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
SVOC	SW8270	BENZO(G,H,I)PERYLENE	191-24-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BENZO(K)FLUORANTHENE	207-08-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BENZOICACID	65-85-0	mg/L																								
SVOC	SW8270	BIS(2-CHLOROETHOXY)METHANE	111-91-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BIS(2-CHLOROETHYL)ETHER	111-44-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	mg/L	0.01	U	0.01				0.01	U	0.01				**0.019**		0.01	0.01	U	0.01						
SVOC	SW8270	BUTYLBENZYLPHTHALATE	85-68-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	CARBAZOLE	86-74-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	CHRYSENE	218-01-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DIBENZO(A,H)ANTHRACENE	53-70-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DIBENZOFURAN	132-64-9	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DIETHYLPHTHALATE	84-66-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DIMETHYLPHTHALATE	131-11-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DI-N-BUTYLPHTHALATE	84-74-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	DI-N-OCTYLPHTHALATE	117-84-0	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	FLUORANTHENE	206-44-0	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	FLUORENE	86-73-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	HEXACHLOROBENZENE	118-74-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	HEXACHLOROBUTADIENE	87-68-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	HEXACHLOROCYCLOPENTADIENE	77-47-4	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	HEXACHLOROETHANE	67-72-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	INDENO(1,2,3-CD)PYRENE	193-39-5	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	ISOPHORONE	78-59-1	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	NAPHTHALENE	91-20-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	NITROBENZENE	98-95-3	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	N-NITROSO-DI-N-PROPYLAMINE	621-64-7	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	N-NITROSODIPHENYLAMINE	86-30-6	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	PENTACHLOROPHENOL	87-86-5	mg/L	0.005	U	0.005				0.005	U	0.005				0.005	U	0.005	0.005	U	0.005						
SVOC	SW8270	PHENANTHRENE	85-01-8	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	PHENOL	108-95-2	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	PYRENE	129-00-0	mg/L	0.01	U	0.01				0.01	U	0.01				0.01	U	0.01	0.01	U	0.01						
SVOC	SW8270	TOTAL POLYNUCLEAR AROMATIC HYDROCARBONS	TOTAL_PAH	mg/L	0.01	U					0.01	U					0.01	U		0.01	U							
Pest	SW8080	ALDRIN	309-00-2	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	ALPHA BHC	319-84-6	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	ALPHA ENDOSULFAN	959-98-8	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	ALPHA-CHLORDANE	5103-71-9	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	BETA BHC	319-85-7	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	BETA ENDOSULFAN	33213-65-9	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	DDD	72-54-8	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	DDE	72-55-9	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	DDT	50-29-3	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	DELTA BHC	319-86-8	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	DIELDRIN	60-57-1	mg/L	**0.0002**		0.0001				6E-05	J	0.0001				3E-05	J	0.0001	1E-04	U	1E-04						
Pest	SW8080	ENDOSULFAN SULFATE	1031-07-8	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	ENDRIN	72-20-8	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	ENDRIN ALDEHYDE	7421-36-3	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	ENDRIN KETONE	53494-70-5	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Pest	SW8080	GAMMA BHC (LINDANE)	58-89-9	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	GAMMA-CHLORDANE	5103-74-2	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	HEPTACHLOR	76-44-8	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	U	U	5E-05						
Pest	SW8080	HEPTACHLOR EPOXIDE	1024-57-3	mg/L	5E-05	U	5E-05				5E-05	U	5E-05				5E-05	U	5E-05	5E-05	U	5E-05						
Pest	SW8080	METHOXYCHLOR	72-43-5	mg/L	5E-04	U	5E-04				5E-04	U	5E-04				5E-04	U	5E-04	5E-04	U	5E-04						
Pest	SW8080	TOXAPHENE	8001-35-2	mg/L	0.005	U	0.005				0.005	U	0.005				0.005	U	0.005	0.005	U	0.005						
Metal	SW7470	MERCURY	7439-97-6	mg/L	6E-05	U	1E-05				7E-05	U	1E-05				7E-05	U	1E-05	6E-05	U	1E-05						
Metal	SW7470	MERCURY, DISSOLVED	7439-97-6	mg/L				1E-05	U	1E-05				1E-05	U	1E-05							1E-05	U	1E-05	1E-05	U	1E-05
Metal	SW6010	ALUMINUM	7429-90-5	mg/L	**0.602**		0.0182				**0.302**		0.0182				**0.228**		0.0182	**0.319**		0.0182						
Metal	SW6010	ALUMINUM, DISSOLVED	7429-90-5	mg/L				0.047	U	0.018				0.044	U	0.018							0.126	U	0.018	0.114	U	0.018
Metal	SW6010	ANTIMONY	7440-36-0	mg/L	0.015	U	0.015				0.015	U	0.015				0.015	U	0.015	0.015	U	0.015						
Metal	SW6010	ANTIMONY, DISSOLVED	7440-36-0	mg/L				0.015	U	0.015				0.015	U	0.015							0.015	U	0.015	0.015	U	0.015
Metal	SW6010	ARSENIC	7440-38-2	mg/L	0.0068	J	0.0016				0.0051	J	0.0016				0.002	U	0.002	0.002	U	0.002						
Metal	SW6010	ARSENIC, DISSOLVED	7440-38-2	mg/L				0.006	J	0.0016				0.0892		0.0016							0.002	U	0.002	0.002	U	0.002
Metal	SW6010	BARIUM	7440-39-3	mg/L	0.0229	J	0.0004				0.0203	J	0.0004				0.0282	J	0.0004	0.0309	J	0.0004						
Metal	SW6010	BARIUM, DISSOLVED	7440-39-3	mg/L				0.0195	J	0.0004				0.0189	J	0.0004							0.0286	J	0.0004	0.0288	J	0.0004
Metal	SW6010	BERYLLIUM	7440-41-7	mg/L	1E-04	U	1E-04				1E-04	U	1E-04				1E-04	U	1E-04	1E-04	U	1E-04						
Metal	SW6010	BERYLLIUM, DISSOLVED	7440-41-7	mg/L				1E-04	U	1E-04				1E-04	U	1E-04							1E-04	U	1E-04	1E-04	U	1E-04
Metal	SW6010	CADMIUM	7440-43-9	mg/L	0.003	U	0.003				0.003	U	0.003				0.003	U	0.003	0.003	U	0.003						
Metal	SW6010	CADMIUM, DISSOLVED	7440-43-9	mg/L				0.003	U	0.003				0.003	U	0.003							0.003	U	0.003	0.003	U	0.003
Metal	SW6010	CALCIUM	7440-70-2	mg/L	17		0.0057				17.5		0.0057				6.19		0.0057	7.13		0.0057						
Metal	SW6010	CALCIUM, DISSOLVED	7440-70-2	mg/L				18.5		0.0057				18.1		0.0057							7.33		0.0057	7.28		0.0057

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

TABLE N-7
FU-4 ECOLOGICAL EVALUATION OF SURFACE WATER ANALYTICAL RESULTS
HHERA REVIEW SAMPLING AND ANALYSIS PLAN
MAIN INSTALLATION - DEFENSE DEPOT MEMPHIS, TENNESSEE

Abbreviations: mg/L = Milligram per liter, NA = Not available, ng/L = Nanogram per liter
Pest = Pesticide, SVOC = Semivolatile organic compound, VOC = Volatile organic compound

					SW56A			SW56A			SW56B			SW56B			SW56C			SW56C			SW56C			SW56C		
					SGB022			WSSGB022			SGB023			WSSGB023			SGB024			SGB091FD1			WSSGB024			WSSGB091FD1		
					12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996			12/12/1996		
					Sample			Sample			Sample			Sample			Sample			Field Duplicate (FD)			Sample			FD		
Analytical Group	**Analytical Method**	**Analyte**	**CASRN**	**Unit**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**	**Result**	**Qual**	**RL**
Metal	SW6010	CHROMIUM, DISSOLVED	7440-47-3	mg/L				*0.002*	*U*	*0.002*				0.004	J	0.0022							*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*
Metal	SW6010	CHROMIUM, TOTAL	7440-47-3	mg/L	*0.002*	*U*	*0.002*				0.0042	J	0.0022				*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Metal	SW6010	COBALT	7440-48-4	mg/L	*0.003*	*U*	*0.003*				*0.003*	*U*	*0.003*				*0.003*	*U*	*0.003*	*0.003*	*U*	*0.003*						
Metal	SW6010	COBALT, DISSOLVED	7440-48-4	mg/L				*0.003*	*U*	*0.003*				*0.003*	*U*	*0.003*							*0.003*	*U*	*0.003*	*0.003*	*U*	*0.003*
Metal	SW6010	COPPER	7440-50-8	mg/L	*0.007*	*U*	*0.001*				*0.007*	*U*	*0.001*				*0.004*	*U*	*0.001*	*0.007*	*U*	*0.001*						
Metal	SW6010	COPPER, DISSOLVED	7440-50-8	mg/L				*0.006*	*U*	*0.001*				*0.007*	*U*	*0.001*							*0.009*	*U*	*0.001*	*0.006*	*U*	*0.001*
Metal	SW6010	IRON	7439-89-6	mg/L	0.531		0.002				0.312		0.002				0.329		0.002	0.458		0.002						
Metal	SW6010	IRON, DISSOLVED	7439-89-6	mg/L				0.0719	J	0.002				0.108	J	0.002							0.223	J	0.002	0.207	J	0.002
Metal	SW6010	LEAD	7439-92-1	mg/L	0.0045		0.002				0.0026	J	0.002				0.0036		0.002	0.0029	J	0.002						
Metal	SW6010	LEAD, DISSOLVED	7439-92-1	mg/L				*0.002*	*U*	*0.002*				**0.0028**	J	0.002							*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*
Metal	SW6010	MAGNESIUM	7439-95-4	mg/L	1.82	J	0.0181				2.14	J	0.0181				1.46	J	0.0181	1.6	J	0.0181						
Metal	SW6010	MAGNESIUM, DISSOLVED	7439-95-4	mg/L				1.91	J	0.0181				2.2	J	0.0181							1.65	J	0.0181	1.63	J	0.0181
Metal	SW6010	MANGANESE	7439-96-5	mg/L	0.0147	J	0.0003				0.0151		0.0003				0.0108	J	0.0003	0.0131	J	0.0003						
Metal	SW6010	MANGANESE, DISSOLVED	7439-96-5	mg/L				0.0031	J	0.0003				0.0068	J	0.0003							0.007	J	0.0003	0.007	J	0.0003
Metal	SW6010	NICKEL	7440-02-0	mg/L	0.0071	J	0.0055				0.0109	J	0.0055				0.0121	J	0.0055	*0.006*	*U*	*0.006*						
Metal	SW6010	NICKEL, DISSOLVED	7440-02-0	mg/L				*0.006*	*U*	*0.006*				*0.006*	*U*	*0.006*							*0.006*	*U*	*0.006*	*0.006*	*U*	*0.006*
Metal	SW6010	POTASSIUM	7440-09-7	mg/L	2.59	J	0.745				1.79	J	0.745				1.7	J	0.745	1.53	J	0.745						
Metal	SW6010	POTASSIUM, DISSOLVED	7440-09-7	mg/L				2.45	J	0.745				1.53	J	0.745							1.59	J	0.745	2.5	J	0.745
Metal	SW6010	SELENIUM	7782-49-2	mg/L	*0.001*	*U*	*0.001*				*0.002*	*U*	*0.001*				*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*						
Metal	SW6010	SELENIUM, DISSOLVED	7782-49-2	mg/L				*0.001*	*U*	*0.001*				0.0101		0.0014							*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*
Metal	SW6010	SILVER	7440-22-4	mg/L	*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Metal	SW6010	SILVER, DISSOLVED	7440-22-4	mg/L				*0.002*	*U*	*0.002*				*0.002*	*U*	*0.002*							*0.002*	*U*	*0.002*	**0.0023**	J	0.0022
Metal	SW6010	SODIUM	7440-23-5	mg/L	0.74	J	0.0088				0.859	J	0.0088				0.584	J	0.0088	0.692	J	0.0088						
Metal	SW6010	SODIUM, DISSOLVED	7440-23-5	mg/L				0.57	J	0.0088				0.777	J	0.0088							0.661	J	0.0088	0.598	J	0.0088
Metal	SW6010	THALLIUM	7440-28-0	mg/L	*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*						
Metal	SW6010	THALLIUM, DISSOLVED	7440-28-0	mg/L				*0.001*	*U*	*0.001*				*0.001*	*U*	*0.001*							*0.001*	*U*	*0.001*	*0.001*	*U*	*0.001*
Metal	SW6010	VANADIUM	7440-62-2	mg/L	*0.002*	*U*	*0.002*				0.0032	J	0.0017				*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*						
Metal	SW6010	VANADIUM, DISSOLVED	7440-62-2	mg/L				*0.002*	*U*	*0.002*				0.0093	J	0.0017							*0.002*	*U*	*0.002*	*0.002*	*U*	*0.002*
Metal	SW6010	ZINC	7440-66-6	mg/L	0.03	J	0.001				0.0251	J	0.001				0.0634	J	0.001	0.0702	J	0.001						
Metal	SW6010	ZINC, DISSOLVED	7440-66-6	mg/L				*0.011*	*U*	*0.001*				*0.015*	*U*	*0.001*							0.0588		0.001	0.064		0.001
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZOFURAN	67562-39-4	ng/L	0.116	J	25				0.071	J	25				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	35822-39-4	ng/L	*0.378*	*UJ*	*25*				*0.282*	*UJ*	*25*				*25*	*UJ*	*25*	*25*	*UJ*	*25*						
Dioxin/ Furan	CDF991	1,2,3,4,7,8,9-HEPTACHLORODIBENZOFURAN	55673-89-7	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZOFURAN	70648-26-9	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,4,7,8-HEXACHLORODIBENZO-P-DIOXIN	39227-28-6	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZOFURAN	57117-44-9	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,6,7,8-HEXACHLORODIBENZO-P-DIOXIN	57653-85-7	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZOFURAN	72918-21-9	ng/L	*25*	*U*	*25*				0.225	J	25				*25*	*U*	*25*	0.26	J	25						
Dioxin/ Furan	CDF991	1,2,3,7,8,9-HEXACHLORODIBENZO-P-DIOXIN	19408-74-3	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZOFURAN	57117-41-6	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	1,2,3,7,8-PENTACHLORODIBENZO-P-DIOXIN	109333-34-8	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	2,3,4,6,7,8-HEXACHLORODIBENZOFURAN	60851-34-5	ng/L	2.286	J	25				5.065	J	25				*25*	*U*	*25*	4.822	J	25						
Dioxin/ Furan	CDF991	2,3,4,7,8-PENTACHLORODIBENZOFURAN	57117-31-4	ng/L	*25*	*U*	*25*				*25*	*U*	*25*				*25*	*U*	*25*	*25*	*U*	*25*						
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZOFURAN	51207-31-9	ng/L	*10*	*U*	*10*				*10*	*U*	*10*				*10*	*U*	*10*	*10*	*U*	*10*						
Dioxin/ Furan	CDF991	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	1746-01-6	ng/L	*10*	*U*	*10*				*10*	*U*	*10*				*10*	*U*	*10*	*10*	*U*	*10*						
Dioxin/ Furan	CDF991	OCTACHLORODIBENZOFURAN	39001-02-0	ng/L	0.224	J	50				0.179	J	50				*50*	*U*	*50*	*50*	*U*	*50*						
Dioxin/ Furan	CDF991	OCTACHLORODIBENZO-P-DIOXIN	3268-87-9	ng/L	7.035	J	50				6.413	J	50				0.163	J	50	0.236	J	50						
Dioxin/ Furan	CDF991	TCDD EQUIVALENT	DIOXIN-TEQ	ng/L	**0.237**		10				**0.5363**		10				**0.0002**		10	**0.5084**		10						

Detected Results > Ecological Criteria are shaded blue.
Reporting limits > Ecological Criteria are in red font.

O

Appendix O

Field SOPs

STANDARD OPERATING PROCEDURE 1 - GENERAL PROCEDURES FOR FIELD PERSONNEL

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose

This Standard Operating Procedure (SOP) provides guidance for the general field practices to be followed during field activities at Defense Depot Memphis, Tennessee (DDMT); review is mandatory prior to the start of each field event. This SOP provides general guidance; the project-specific work plan must be reviewed for specific project requirements.

2 Health and Safety

Each individual assigned to field work must participate in the HDR Medical Monitoring Program, must have taken the Occupational Safety and Health Administration (OSHA) 40-Hour course (updated with the 8-Hour OSHA Refresher, when necessary), and must be certified as able to wear respiratory protection.

Each individual is required to have read and understood the project Site Safety and Health Plan (SSHP) for the specific project activity. Upon arrival at the site, each person shall sign the acknowledgement sheet confirming their review of the SSHP. Personal protective equipment (PPE) and other provisions for site safety requirements are discussed in the project specific Health and Safety plan.

All equipment will only be used by properly trained personnel. Only personnel that have received forklift operator safety training are permitted to use the forklift. Proper tools will be made available to each employee as necessary. Any questions should be addressed to the Field Team Leader (FTL).

3 Personnel Qualifications and Responsibilities

Field activities will be directed by the FTL, an environmental professional (engineer, geologist or scientist) with experience in performing and directing the planned activities. Field staff will be junior to mid-level environmental professionals or environmental technicians. Field work will be conducted by persons with experience in performing the planned activities. At least one person on each team will have a current certification in first aid and CPR.

The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents (Quality Assurance Project Plan [QAPP], project work plan and SOPs). The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

4 Equipment and Supplies

The required equipment and supplies will be identified in the SOPs for the specific field activities to be performed and in the project work plan. Field activities should not proceed until the proper tools and equipment are available and in good working order.

Each team will have use of a truck/van during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance. For each HDR owned vehicle, mileage will be recorded on the vehicle mileage log at the start and end of each field event.

5 Procedure

5.1 Start-Up Activities

5.1.1 Office

Prior to leaving the office for field work, personnel will perform the following actions:

1. The Project Manager (PM) will assign an FTL to direct field activities and coordinate with project personnel. Task specific responsibilities of the FTL will be addressed in the appropriate SOP; general responsibilities include:
    a. Review project work plan, SSHP, and QAPP.
    b. Work with PM to properly staff the field activity.
    c. Coordinate sampling activities with the project chemist and analytical laboratory.
    d. Confirm availability and condition of DDMT-owned equipment and order additional equipment/supplies for delivery prior to the start of each event.
    e. Prepare field forms and other documentation for the planned event.
    f. If work is to be subcontracted, review the subcontract agreement, work plan, and SSHP.
    g. Confirm that field staff have Driver's License (or other picture identification) and current OSHA Certification in their possession prior to leaving the office.

5.1.2 Field

After arrival on site, but prior to commencement of operations, the following activities will be performed:

- Complete equipment and supply checklists and verify that required documentation and equipment for field activities are on site.
- Review condition of DDMT-owned and rental equipment; inventory field supplies and laboratory-provided sampling supplies.

- Review locations for planned field activities for hazards, determine requirements for site preparation and clearance, and select location for the storage of purge and decontamination waters.
- Conduct team safety meetings as required by the SSHP.
- Conduct team review of the project documents including SOPs to be utilized.
- Complete the Field Event Startup Report and submit to PM (Attachment 1-1).

5.2 Field Operations

Field staff responsibilities are project-specific. At a minimum, field personnel will perform the following activities:

1. Document field activities in a log book for each team and/or field records as required by the work plan or SOPs.
2. Record the following additional information for field measurements:
    a. The identification number and calibration results for each field instrument
    b. The numerical value and units of each measurement
    c. A description of any unexpected delays or problems observed during purging or sampling activities
3. Complete required data collection/sample control forms (e.g., Chain-of-Custody, Field Sampling Report, etc.).
4. Communicate with the PM regarding site conditions and out of scope work to be performed.
5. Perform following activities daily before leaving the site:
    a. Decontaminate and check condition of field equipment.
    b. Provide log books and other field documentation to FTL for review and scanning.
    c. Properly dispose of trash, debris and used PPE.
    d. Safely store purge and decontamination water, or transfer to large storage tanks at Dunn Field.
    e. Make arrangements for shipment of samples (if applicable) and follow-up with the analytical laboratory to confirm samples arrived in good condition.
    f. Complete activity-specific field reports as required by applicable SOPs.
    g. Complete the Daily Field Report and submit to PM (Attachment 1-2).

5.3 Field Log Books and Documentation

Dedicated log books will be used by each field team in addition to documentation required by activity-specific SOPs.

- The first page of each log book will list the following information:
    - Site Name: Former Defense Depot Memphis Tennessee

  - EPA ID (TN4210020570)
  - Project Location: 2241 Truitt Street, Memphis, TN 38114
- The first entry for each field event will list the following information: log books:
  - Project Name and Number
  - FTL (full name) and initials
  - Sample team leader and members (full names) and initials
- At minimum, the log book will describe general activities performed, date and time, personnel and weather conditions. All field equipment calibration and maintenance records will be documented in the logbook. Communications with the FTL, PM or project chemist regarding field activities will be documented. Additional field data will be recorded in the log book if other field records are not used.
- Any deviations from the QAPP or work plan will be noted in the log books.
- Errors will be crossed out with a single line, the correction added and the entry initialed.
- Each page will be numbered and dated. A diagonal line will be drawn through any unused portion of a page containing an entry. To indicate the end of an entry, personnel are required to initial and date the page at the conclusion of each day.

5.4 Closeout

Upon the completion of field activities, the FTL will view each site to verify the area has been cleared and restored as closely as possible to its prior condition. Trash will be removed from the site, and surface damage, including ruts caused by vehicles, will be repaired.

Confirm all equipment is accounted for and properly decontaminated and in good working condition. Notify PM if repairs are needed. Properly package and ship all rental equipment to the vendor. When shipping equipment, use the proper HDR FedEx number and insure the package for the cost of the equipment. Follow manufacturer's instructions on long and short term storage when storing government and/or HDR equipment.

Rental trucks should be fueled and returned to the rental company as soon as possible. HDR leased trucks should also be fueled and cleaned prior to storing at the shop.

Work areas should be cleaned with tools and equipment properly stored.

The FTL will make a final check of all logbooks and other field records to ensure there are no blanks or missing data and the entries are legible. FTL will organize scanned forms in proper order and transmit to PM.

The FTL will complete Field Event Closeout Report and submit to PM (Attachment 1-3).

6 Data and Records Management

All field forms and log book entries will be scanned and copied to the project folder on the HDR network file share drive within one week of the field event completion. All photographs taken during the field event will be uploaded along with a typed photograph log (date, project and subject) to the HDR network file share drive. The photographs will then be erased from the camera. All original forms will be stored on site in Memphis in the filing cabinet in the proper folder labeled for the project. The PM, project chemist and project administrator will be sent a link for the data.

7 Quality Control and Quality Assurance

All work will be performed in accordance with the QAPP, the specific work plan, and applicable SOPs. All field activities will be recorded in the log books in sufficient detail to reconstruct the events. No erasures or mark outs will be made on field forms or log books. A single line will be used to strike out errors and will be annotated with the initials and date of the editor.

8 References

HDR, 2017a. *2017 Uniform Federal Policy-Quality Assurance Project Plan, Environmental Restoration Support at Former Defense Depot Memphis, Tennessee, Revision 0*. Prepared for the U.S. Army Corps of Engineers, Mobile District. May 2017.

USEPA Region 4 SESD Guidance, *Soil Sampling* (SESDPROC-010-4). October, 2010.

Field Event Startup Report

Prepared by: Date:

Event Name:

Project-Activity Number:

Summary of Planned Event:

Planned Performance Period: _____to_____

Project Documents - Title, Date

Work Plan:

Health and Safety Plan:

Other SOPs – List number/revision and title:

Field Event Staffing

Position	Name	OSHA Cert. (Y/N)	First Aid/ CPR (Y/N)	Driver's License (Y/N)	Proj. Plans reviewed (Y/N)	Experience (Hi-Med-Low-None)
Field Team Leader						

DDMT Field Equipment

Name/Use	Mfr./Model No.	Condition	Calibration Req'd.(Y/N)	Calibration supplies	Other supplies (batteries, etc.)

Rental Equipment

Name/Use	Mfr./Model No.	Condition	Calibration Req'd.(Y/N)	Calibration supplies	Other supplies (batteries, etc.)

Lab-provided Sampling Supplies

Sample Type	Number	Supplies

Additional Tools/Supplies

Camera
Field forms (list):
Sample supplies (list):
Water/Ice cooler
Sample cooler

Final Check

1. All required equipment/tools received and condition checked

Yes ___ No ___ Comment:

2. Initial equipment calibration completed

Yes ___ No ___ Comment:

3. Vehicles inspected

Yes ___ No ___ Comment:

4. Field locations reviewed

Yes ___ No ___ Comment:

5. Weather forecast checked

Yes ___ No ___ Comment:

6. Staff documents (OSHA, DL) checked

Yes ___ No ___ Comment:

7. Review of project plans confirmed and activities discussed

Yes ___ No ___ Comment:

8. Initial Safety Meeting held and SSHP signed

Yes ___ No ___ Comment:

Daily Field Report

Project Number/Activity:	**Date:**
Project Name:	**Field Team Leader:**
Brief Work Description:	

Weather:	**Temp:**

Previous Day's Samples received at laboratory – Y / N Comment:

Time	Description

Name/Organization of Field Staff, Subcontractors and Site Visitors	

Samples Collected

Problems or Deviations from Work Plan

Tasks to be completed next workday

_____ _____ _____

Name **Signature** **Date**

Field Event Close-Out Report

Prepared by: Date:

Event Name:

Project-Activity Number:

Performance Period: _____to_____

Field Team Leader:

Field Staff:

Summary of Completed Event:

Field problems and/or changes from planned activities:

Change in number/type of samples collected:

Health and Safety problems/Injuries:

Close-out Checklist

1. Log book and field forms scanned and originals placed in project file

Yes ___ No ___ Comment:

2. Equipment/tools decontaminated

Yes ___ No ___ Comment:

3. Rental equipment shipped to supplier

Yes ___ No ___ Comment:

4. Rental vehicles returned

Yes ___ No ___ Comment:

5. DDMT equipment and tools properly stored

Yes ___ No ___ Comment:

6. List damaged equipment

Yes ___ No ___ Comment:

7. Replacement supplies ordered

Yes ___ No ___ Comment:

8. Field locations inspected and trash/debris removed

Yes ___ No ___ Comment:

9. Field shop/office cleaned

Yes ___ No ___ Comment:

STANDARD OPERATING PROCEDURE 7 – SAMPLE CONTROL AND DOCUMENTATION

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

This Standard Operating Procedure (SOP) provides guidance for sample control and identification, data recording, and proper completion of Chain-of-Custody (COC) forms.

2 Health and Safety

General Information on health and safety requirements are provided in SOP 1. Each individual is required to have read and understood the Site Safety and Health Plan for the specific project activity and signed the acknowledgement sheet confirming their review.

Health and safety concerns for sample handling include potential for exposure to contaminants, sample container preservatives, and injury from breakage of sample containers. Contamination levels at Defense Depot Memphis, Tennessee (DDMT) are relatively low but care should be taken to avoid exposure. Sample containers should be handled carefully; nitrile gloves and safety glasses should be used.

3 Personnel Qualifications and Responsibilities

Sample control activities will be directed by the Field Team Leader (FTL), an environmental professional (engineer, geologist or scientist) with experience in sampling activities. The field staff, environmental professionals or technicians, are responsible for proper sample handling and documentation of the sample collection.

4 Equipment and Supplies

The field staff will use a pen with blue or black waterproof ink to record field activities and document sample handling in a field logbook and on field data sheets. A laptop computer with laboratory-provided software may also be used for sample documentation.

5 Procedure

Proper field sampling and documentation help ensure sample authenticity and data integrity. These procedures describe sample collection documentation and sample handling, tracking, and custody procedures to ensure that sample integrity and custody are maintained.

If the computer is being used to scan the samples as they are collected the data recorded by the computer should be checked for correctness. The date and time on the computer should be checked prior to scanning of any samples. The sample label should be completed when the sample is collected. If a hand written COC will be used, all information should be recorded in a log book as to the type of sample, date and time collected and number of sample containers. The COC can then be filled out back at the field office in a quiet environment without disturbances to avoid errors.

Corrections to the COC, field logbook or field data forms will be made by a single line to strike out errors annotated with the initials and date of the editor; the correct information will be inserted as appropriate.

The number of sample containers on the COC should be physically checked against the number of containers collected. Once this is confirmed the sample crew can properly store the samples for shipment.

5.1 Start-Up Activities

5.1.1 Office

The FTL will work with the project chemist (PC) to:

- Prepare the sampling plan detail (Attachment 7-1).
- Coordinate with the analytical laboratory and ensure that sample forms including chain of custody forms and custody seals are shipped to the site.

5.1.2 Field

After arrival on site, but prior to commencement of operations, the FTL will confirm that required documentation and equipment for field activities are on site.

5.2 Field Operations

5.2.1 Sample Identification

Individual samples will be identified by a unique alphanumeric code (also referred to as a sample ID number or field number) which will be written on the sample label and recorded on the COC form. The sample ID will include the location and sampling event as described in Worksheet #17 of the Quality Assurance Project Plan (QAPP). Additional information to be written on the label includes sample ID, time and date of sample, sampler's initials, and the analytical methods to be performed, as described in Section 5.2.3 of this SOP.

Field Quality Control (QC) samples to be collected at DDMT include trip blanks, rinsate blanks, field (ambient) blanks, and field duplicates. The ID for trip blanks, rinsate blanks and field blanks will consist of the prefix TB, RB or FB, respectively, followed by a number, followed by the sampling event, as shown below:

TB-1-ODPM-9	first Trip Blank for event ODPM-9
TB-2-ODPM-9	second Trip Blank for event ODPM-9
RB-1-ODPM-9	Rinsate Blank for event ODPM-9
FB-1-ODPM-9	Field Blank for event ODPM-9

Matrix spike and matrix spike duplicate samples will also be collected. The ID for these samples will consist of the location ID, followed by the sampling event, followed by the suffix matrix spike (MS) or matrix spike duplicate (MSD), as shown below:

MW-315-ODPM-9-MS	Matrix Spike sample for well MW-315
MW-315-ODPM-9-MSD	Matrix Spike Duplicate sample for well MW-315

The identity of field duplicate samples will be concealed from the laboratory by using a consecutively numbered duplicate identifier, followed by the sampling event, as shown below:

DUP-1-ODPM-9	first field duplicate for event ODPM-9
DUP-2-ODPM-9	second field duplicate for event ODPM-9

The location of field duplicates will be recorded on the sampling plan detail (SPD) and field notebook. The final SPDs will be maintained in the project file and copies will be kept at the on-site field office. At the end of the sampling event, the FTL will send the PM and PC the final SPD with changes to field duplicate or MS/MSD sample IDs, additional blanks collected, and any other changes.

5.2.2 Field Documentation

5.2.2.1 Logbook

The logbook is a written record of sampling activities to be completed in the field during sampling. The purpose is to document field conditions or procedural exceptions that may aid in the analysis of data generated from sampling activities. The log book will have with sequentially numbered pages and information will be recorded in blue or black waterproof ink. The recorder will sign and date each entry.

Information pertaining to environmental conditions at the site during the field investigation will be noted in the field log book for each day. The following information will be recorded for each activity:

1. Activity
2. Location
3. Date and time
4. Weather conditions

For field sampling activities, the following information will be recorded, if a sampling form is not used:

1. Sample type and sampling method

2. The identity of each sample and the depth(s) from which it was collected
3. Sample description (e.g., color, odor, clarity)
4. Identification of sampling devices used
5. Identification of sampling conditions that might affect the representativeness of a sample (i.e., refueling operations, damaged casings)

5.2.2.2 Daily Field Reports

Each day the FTL will prepare a Daily Field Report (SOP 1, Attachment 1-2). The report will include daily weather, time and description of field activities, samples collected, and any problems or changes in scope that occurred that day. The report also lists field staff, subcontractors and site visitors.

5.2.2.3 Photographs

Photographs taken for the purpose of project documentation will be noted in the field logbook. The sequential number of the photograph, photographer, date, time, location, description, and orientation of the photograph will be recorded in the logbook as the photographs are taken. The photographs and documentation will be loaded on the HDR network project file.

5.2.3 Sample Labels/Tags

Sample labels will be filled out for each sample with an indelible pen. The label will be protected from water and solvents with clear label protection tape. Any change in the pre-prepared label information will be initialed by the sampler.

5.2.3.1 Labels for Groundwater Samples

Pre-printed labels from the laboratory for groundwater sampling events contain the following information:

- Sample ID
- Preservative
- Date the bottle was prepared
- Matrix
- Tests
- Laboratory name
- Bar code

The sample collector will write in the following information:

- Date of collection
- Time of collection
- Name or initials of collector

5.2.3.2 Sample Tags for Air Samples

Sample tags from the laboratory for air sampling events contain the following information:

- Laboratory name, address, phone number and fax number

The sample collector will write in the following information:

- Client name (HDR)
- Sample ID
- Analysis (TO-15)
- Date and time of sample collection
- Sampler's initials
- Comments

5.2.4 Sample Custody

Sample custody is a part of a quality field or laboratory operation. Custody of a sample is defined as:

1. Having physical possession
2. Being in view, after being in possession
3. Having possession, then being placed in a secure area
4. Being maintained in a secure area by the person who had possession last

These custody practices will be observed in the field. They will be performed according to the procedures described in the following subsections.

5.2.4.1 COC Records

A hand-written three-part COC will be fully completed, in triplicate. The first two pages will accompany the cooler to the laboratory, and the bottom copy will be retained in the files at the field office after it is scanned into the computer file.

A computer-generated COC will have one copy printed that will accompany the cooler to the laboratory. The data used to generate the COC will be transmitted via E-mail to the laboratory and a PDF copy of the COC will be saved on the computer in the sampling file.

The information specified on the COC record will contain the same level of detail found in the site log book, with the exception that on-site measurement data will not be recorded. The custody record will include at least the following information:

- Name of person collecting the samples
- Date samples were collected
- Type of sampling conducted (composite/grab)
- Location of sampling station (including the site location)
- Number and type of containers used

- Signature of the HDR person relinquishing samples to a non-HDR person (such as a FedEx agent), with the date and time of transfer noted, and the cooler designation
- Airbill Number

If samples will require rapid turnaround in the laboratory because of project time constraints or analytical concerns such as extraction time or sample retention period limitations, these constraints will be noted in the remarks section of the custody record. The FTL or designee will contact the laboratory to confirm the turnaround time can be achieved. The computer generated COC is for use with Microbac Laboratories only. Other laboratories will provide COCs for use.

It is not practicable to seal the sample coolers or cartons at a FedEx office; they will be sealed beforehand. The custody record will, therefore, have the signature of the relinquishing field technician with the date and time, but the “relinquished to” box will not be completed.

The duplicate custody record will then be placed in a plastic bag, taped to the underside of the cooler lid, and the cooler closed. COCs for air samples will be included in the carton. The container will be tightly bound with filament tape. Finally, custody seals will be signed by the individual relinquishing custody and affixed in such a way that the cooler or carton cannot be opened without breaking the seals.

The original and duplicate custody records and the airway bill or delivery note together constitute a complete record. The FTL will email a copy of the airbill and the COC to the PC, who will maintain the custody records as part of the analytical data file.

Custody Seals: Custody seals will be preprinted, adhesive-backed seals designed to break if disturbed. For groundwater samples, affix custody seals on the sample shipping containers (coolers) in as many places as necessary to ensure security. For vapor samples affix a custody seal across the top, taped seam of the canister shipping carton and additional locations as necessary. Seals will be signed and dated before application.

Laboratory custody procedures are described in the laboratory sample handling and storage SOPs, included in Appendix C of this QAPP.

5.3 Closeout

Before leaving the site daily, the following procedures will be performed by on-site personnel:

- Maintain custody of samples, maintaining them as specified for the analyses to be performed.
- Prepare samples for shipment to the laboratory.
- Complete the COC forms.
- Contact the laboratory to inform them that samples will be shipped and also remind them of any special requirements for the sample analyses.
- Verify completion of logbook, ensuring that required information has been recorded.

Upon the completion of sample collection and shipment, copies of the COCs will be scanned and sent to interested parties to include the PM and PC. The FedEx tracking numbers will be checked

each day to confirm the samples were delivered and the laboratory will be contacted to check on problems with the samples or COCs.

6 Data and Records Management

All field forms, COCs, and log book entries will be scanned and copied project folder on the HDR network project file within one week of the field event completion. All original forms will be stored on site in Memphis in the filing cabinet in the proper folder labeled for the project. The PM and PC will be sent a link for the data.

7 Quality Control and Quality Assurance

Work will be performed in accordance with the QAPP, the specific work plan, and applicable SOPs. Field activities will be recorded in the log books in sufficient detail to reconstruct the events and forms provided with the SOP will be completed. No erasures or mark outs will be made on field forms or log books. A single line will be used to strike out errors and will be annotated with the initials and date of the editor; the correct information will be inserted as appropriate.

8 References

HDR, 2018. DDMT Uniform Federal Policy-Quality Assurance Project Plan, Environmental Restoration Support at Former Defense Depot Memphis, Tennessee, Revision 1. Prepared for the U.S. Army Corps of Engineers, Mobile District. March 2018.

USEPA Region 4 Science and Ecosystem Support Division (SESD) 2011. SESDPROC-209-R2, *Operating Procedure: Packing, Marking, Labeling and Shipping of Environmental and Waste Samples*. April 2011.

Attachment 7-1

EXAMPLE: Sample Plan Detail

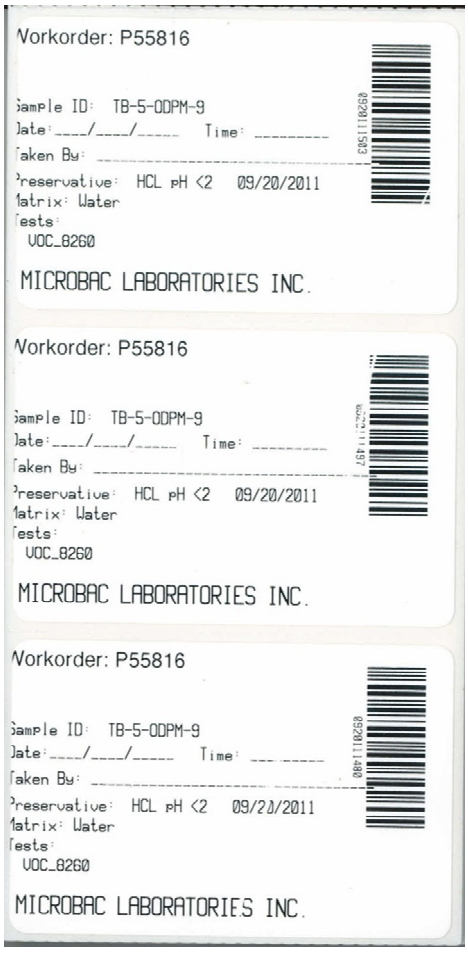
SAMPLING PLAN DETAIL (OFF DEPOT PM WELLS September 2011) - ODPM-9

Parameter	**VOCs**
Method	**8260B**
Container	**40 mL VOA**
Preservative	**HCl to pH<2**
	Cool to 4°C

#	Well ID	Sample ID	Additional	No. of Containers
1	MW-54	MW-54-ODPM-9		3
2	MW-70	MW-70-ODPM-9		3
3	MW-76	MW-76-ODPM-9		3
4	MW-77	MW-77-ODPM-9		3
5	MW-79	MW-79-ODPM-9	DUP-1	3
6	MW-148	MW-148-ODPM-9		3
7	MW-149	MW-149-ODPM-9		3
8	MW-150	MW-150-ODPM-9		3
9	MW-151	MW-151-ODPM-9		3
10	MW-152	MW-152-ODPM-9		3
11	MW-155	MW-155-ODPM-9		3
12	MW-157	MW-157-ODPM-9		3
13	MW-158	MW-158-ODPM-9		3
14	MW-158A	MW-158A-ODPM-9		3
15	MW-159	MW-159-ODPM-9	DUP-2	3
16	MW-160	MW-160-ODPM-9		3
17	MW-161	MW-161-ODPM-9		3
18	MW-162	MW-162-ODPM-9		3
19	MW-163	MW-163-ODPM-9		3
20	MW-164	MW-164-ODPM-9		3
20	MW-164	MW-164-ODPM-9-MS	MS	3
20	MW-164	MW-164-ODPM-9-MSD	MSD	3
21	MW-165	MW-165-ODPM-9		3
22	MW-165A	MW-165A-ODPM-9		3
23	MW-166	MW-166-ODPM-9		3
24	MW-166A	MW-166A-ODPM-9		3
25	MW-241	MW-241-ODPM-9		3
26	MW-242	MW-242-ODPM-9		3
27	MW-243	MW-243-ODPM-9		3
28	MW-244	MW-244-ODPM-9		3
29	MW-245	MW-245-ODPM-9		3
30	MW-246	MW-246-ODPM-9		3
31	RB	RB-ODPM-9		3
32	DUP-1	DUP-1-ODPM-9		3
33	DUP-2	DUP-2-ODPM-9		3
34	TB-1	TB-1-ODPM-9		3
35	TB-2	TB-2-ODPM-9		3

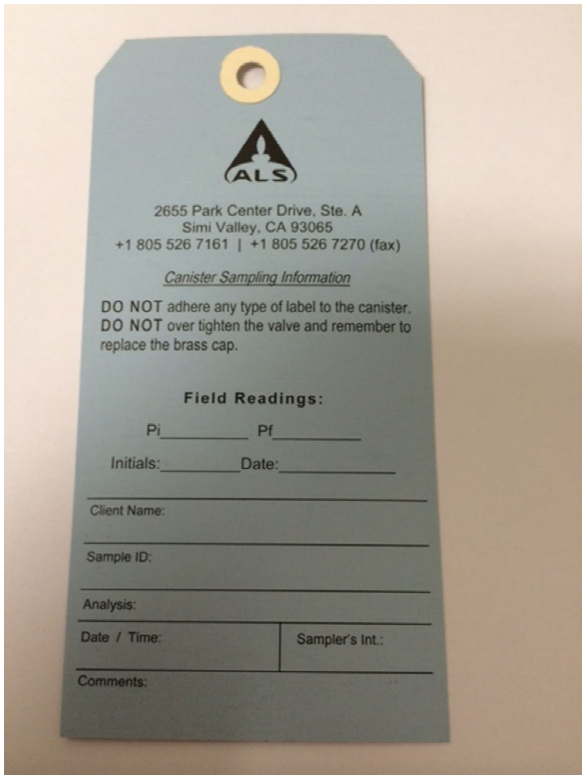
Attachment 7-2

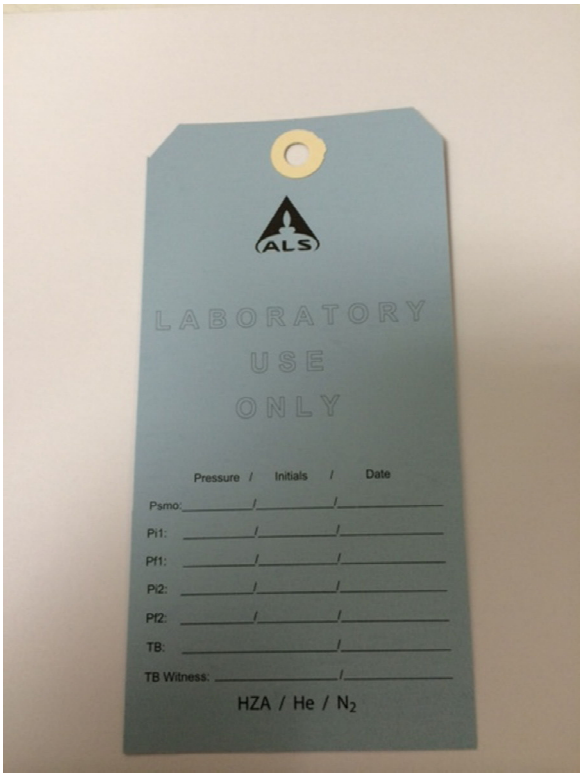
EXAMPLE: Sample Labels for Groundwater Samples



Attachment 7-3

EXAMPLE: Sample Labels for Air Samples





Attachment 7-4

EXAMPLE: Microbac Chain-of-Custody Form (Computer)

Microbac

Chain of Custody
Chain #: 1001
Printed at : 04/26/2011 08:46

Barcode	Client ID	Tests	Collect Date	Beg. Depth	End. Depth	Notes
~~0420111~~	~~MW-91-ODLB-3~~	~~VOC_8260~~	~~04/25/2011 10:09~~			
~~0420112~~	~~MW-91-ODLB-3~~	~~VOC_8260~~	~~04/25/2011 10:09~~			
~~0420113~~	~~MW-91-ODLB-3~~	~~VOC_8260~~	~~04/25/2011 10:09~~			
0420111	04/25/11-TB-1-ODPM-8	VOC_8260	04/25/2011 10:09			
0420112	04/25/11-TB-1-ODPM-8	VOC_8260	04/25/2011 10:09			
0420113	04/25/11-TB-1-ODPM-8	VOC_8260	04/25/2011 10:09			
0420114	DUP-1-ODPM-8	VOC_8260	04/25/2011 11:32			
0420115	DUP-1-ODPM-8	VOC_8260	04/25/2011 11:32			
0420116	DUP-1-ODPM-8	VOC_8260	04/25/2011 11:32			
0420117	MW-250-ODPM-8	VOC_8260	04/25/2011 10:30			
0420118	MW-250-ODPM-8	VOC_8260	04/25/2011 10:30			
0420119	MW-250-ODPM-8	VOC_8260	04/25/2011 10:30			
04201110	MW-251-ODPM-8	VOC_8260	04/25/2011 10:42			
04201111	MW-251-ODPM-8	VOC_8260	04/25/2011 10:42			
04201112	MW-251-ODPM-8	VOC_8260	04/25/2011 10:42			
04201113	MW-54-ODPM-8	VOC_8260	04/25/2011 11:32			
04201114	MW-54-ODPM-8	VOC_8260	04/25/2011 11:32			
04201115	MW-54-ODPM-8	VOC_8260	04/25/2011 11:32			
04201116	MW-70-ODPM-8	VOC_8260	04/25/2011 13:23			
04201117	MW-70-ODPM-8	VOC_8260	04/25/2011 13:23			
04201119	MW-70-ODPM-8-MS	VOC_8260	04/25/2011 13:23			
04201120	MW-70-ODPM-8-MS	VOC_8260	04/25/2011 13:23			
04201122	MW-70-ODPM-8-MSD	VOC_8260	04/25/2011 13:23			
~~04201123~~	~~MW-70-ODPM-8-MSD~~	~~VOC_8260~~	~~04/25/2011 13:23~~			
04201125	MW-76-ODPM-8	VOC_8260	04/25/2011 13:07			
04201126	MW-76-ODPM-8	VOC_8260	04/25/2011 13:07			
04201127	MW-76-ODPM-8	VOC_8260	04/25/2011 13:07			
04201128	MW-77-ODPM-8	VOC_8260	04/25/2011 13:14			
04201129	MW-77-ODPM-8	VOC_8260	04/25/2011 13:14			
04201130	MW-77-ODPM-8	VOC_8260	04/25/2011 13:14			
04201131	MW-79-ODPM-8	VOC_8260	04/25/2011 11:17			
04201132	MW-79-ODPM-8	VOC_8260	04/25/2011 11:17			

Microbac OVD 221000014398
Received: 04/27/2011 12:56
By: BRENDA GREENWALT
(signed)

Barcode	Client ID	Tests	Collect Date	Beg. Depth	End. Depth	Notes
04201133	MW-79-ODPM-8	VOC_8260	04/25/2011 11:17			

Samples Collected on: 04/25/2011 by jbsperry
(signed)

Attachment 7-4

EXAMPLE: Microbac Chain-of-Custody Form (Hand)

COC No. A 23953

158 Starlite Drive
Marietta, OH 45750

Microbac

CHAIN-OF-CUSTODY RECORD

Phone: 740-373-4071
Fax: 740-373-4835

Company Name:

Project Contact: | Contact Phone #:

Turn Around Requirements: | Location:

Project ID:

Sampler (print): | Signature:

Program
☐ CWA
☐ RCRA
☐ DOD
☐ AFCEE
☐ Other ______

ADDITIONAL REQUIREMENTS

Sample I.D. No.	Comp	Grab	Date	Time	Matrix*	NUMBER OF CONTAINERS	Hold															TOTAL # (LAB USE)	ADDITIONAL REQUIREMENTS

Relinquished by: (Signature)	Date	Time	Received by: (Signature)	Relinquished by: (Signature)	Date	Time	Received by: (Signature)

Relinquished by: (Signature)	Date	Time	Received for Laboratory by: (Signature)	Date	Time	Remarks:

*Water (W), Soil (S), Solid Waste (SD), Unknown (X)

Page ________ of ________

Attachment 7-5

EXAMPLE: ALS Chain-of-Custody Form

Air - Chain of Custody Record & Analytical Service Request

Page _____ of _____

2655 Park Center Drive, Suite A
Simi Valley, California 93065
Phone (805) 526-7161
Fax (805) 526-7270

Requested Turnaround Time in Business Days (Surcharges) please circle
1 Day (100%) 2 Day (75%) 3 Day (50%) 4 Day (35%) 5 Day (25%) 10 Day-Standard

ALS Project No.

Company Name & Address (Reporting Information)

Project Name

Project Number

ALS Contact:

Analysis Method

Project Manager

P.O. # / Billing Information

Phone | Fax

Email Address for Result Reporting

Sampler (Print & Sign)

Comments
e.g. Actual Preservative or specific instructions

Client Sample ID	Laboratory ID Number	Date Collected	Time Collected	Canister ID (Bar code # - AC, SC, etc.)	Flow Controller ID (Bar code # - FC #)	Canister Start Pressure "Hg	Canister End Pressure "Hg/psig	Sample Volume			

Report Tier Levels - please select

Tier I - Results (Default if not specified) ____ Tier III (Results + QC & Calibration Summaries) ____
Tier II (Results + QC Summaries) ____ Tier IV (Data Validation Package) 10% Surcharge ____

EDD required Yes / No
Type: _____ Units: _____

Chain of Custody Seal: (Circle)
INTACT BROKEN ABSENT

Project Requirements (MRLs, QAPP)

Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Date:	Time:	Received by: (Signature)	Date:	Time:

Cooler / Blank Temperature ____ °C

STANDARD OPERATING PROCEDURE 8 – SAMPLE PACKING AND SHIPPING

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

The purpose of this Standard Operating Procedure (SOP) is to provide guidance for packing and shipping environmental samples to the laboratory for analysis. The goals for sample packing and shipping are that: 1) the integrity of the sample is maintained, and 2) no exposure to the sample contents occurs during transit. These goals should be met regardless of the method by which the samples were shipped.

Samples will usually be shipped as either environmental samples or as hazardous materials based on the expected contaminant concentrations. While the concentration of constituents in the sample is not generally known prior to shipment of the sample, inferences can be made based on the site location and knowledge of past activities, observations during collection, and past sample results. Hazardous materials are generally considered to be samples of highly contaminated media collected at or near an observed release and can consist of pure product or a mixture. Environmental samples are generally media with low-level contamination.

Relevant regulations include Department of Transportation (DOT) regulations for ground transportation (49 Code of Federal Regulations [CFR]) and the International Air Transport Association (IATA) regulations for air transportation. Common carriers (e.g., FedEx, and UPS etc.) must abide by these regulations. This SOP provides specific guidance on how to package and ship samples to achieve the stated objectives and remain in compliance with shipping regulations. If field personnel are unsure regarding current shipping regulations, they will immediately contact the selected carrier (e.g., FedEx, UPS, etc.) for guidance.

2 Health and Safety

General Information on Health and Safety requirements are provided in SOP 1. Each individual is required to have read and understood the Health and Safety Plan (HASP) for the specific project activity and signed the acknowledgement sheet confirming their review.

Health and safety concerns for sample shipment include potential for exposure to contaminants, sample container preservatives, and injury from breakage of sample containers. Contamination levels at Defense Depot Memphis, Tennessee (DDMT) are relatively low but care should be taken to avoid exposure. Sample containers should be handled carefully; nitrile gloves and safety glasses should be used.

3 Personnel Qualifications and Responsibilities

Sample packing and shipping activities will be directed by the Field Team Leader (FTL), a mid- or senior level environmental professional (engineer, geologist or scientist) with experience in sampling activities. Field staff, environmental professionals or technicians, are responsible for proper sample handling and compliance with these guidelines.

4 Equipment and Supplies

The required equipment and supplies will consist of ice chests from the laboratory, clear tape, filament tape, gallon size Ziploc bags, trash bags, custody seals, bubble bags, cushion for bottom of cooler, and FedEx handle label hangers.

5 Procedure

5.1 Start-Up Activities

5.1.1 Office

The FTL will work with the project chemist (PC) to:

- Ensure that sufficient sample containers, shipping containers/coolers and packing material are shipped to the site based on the analytical parameters, total number of samples and average number of samples to be collected per day.
- Develop guidelines on the number/type of samples per shipper based on sample type and past analytical results (i.e. volatile organic compounds [VOCs] in one cooler to limit the number of trip blanks needed and samples from high concentration wells packed in separate cooler to prevent cross contamination)
- Coordinate sample shipments to ensure laboratory personnel will be available to receive the samples if weekend or holiday shipments are planned.

5.1.2 Field

After arrival on site, but prior to commencement of operations, the FTL will confirm that the required sample containers, sample coolers, packing material and ice are available on-site.

5.2 Field Operations

On specific projects, protocols for sample shipment will be specified in the work plan. This SOP provides general guidelines for sample packing and shipping.

- Samples will be shipped to the laboratory by an overnight courier service.
- Samples will not remain on site for more than 24 hours after collection, unless samples were collected on a weekend or there were not enough samples to make a shipment. These

samples will be stored in the refrigerator at 4 degrees Celsius (°C) in a locked office until the next shipment.

- Glass sample containers will be placed inside sealed plastic bubble wrap bags or wrapped in bubble wrap and placed in plastic bags as a precaution against cross-contamination due to leakage or breakage.
- Sample bottles will be placed in coolers in a manner to limit the breakage and/or leakage during shipment. All coolers will have a bottom cushion/absorbent placed in prior to placing the samples in the cooler.
- Coolers will be lined with a heavy duty plastic garbage bag.
- Segregate highly contaminated samples, if known, by placement in a separate cooler or in separate plastic zip-lock bags.
- All coolers will have the drain plug taped closed, if present.
- Sufficient ice in plastic bags (double-bagged) will be placed in the coolers to keep the samples at 4°C throughout shipment.
- The top of the garbage bag, lining the cooler and containing the samples and ice, will be tied or adequately sealed as to prevent leakage.
- Chain-of-Custody (COC) documents will be placed in zip-lock bags and taped to the inside lid of each cooler.
- Cooler lids will be secured by wrapping with filament tape.
- The air bill will be secured to the handle of the cooler for the shipment label.
- Place Fragile and perishable stickers on all coolers. If shipping for Saturday delivery, place multiple Saturday Delivery stickers on each cooler and contact the laboratory to confirm receiving staff will be present.
- Confirm arrangements with the laboratory point-of-contact for Saturday delivery samples so that hold times and/or sample preservation are not compromised.

Custody seals will be used for sample shipments in accordance with SOP 7, Sample Control and Documentation. Custody seals are adhesive labels that are placed in such a manner that they will be visibly disturbed upon opening the shipping container or cooler. The seals will be initialed and dated upon placement. Upon receipt at the laboratory, the sample custodian will note the condition of custody seals and will also check the sample temperature, recording these items on the laboratory receipt form.

5.3 Closeout

Before leaving the site daily, the following procedures will be performed by the FTL or designated field staff:

- Ensure that the sample transport containers are properly packed and are in compliance with DOT and IATA regulations.
- Complete the Sample Handling, Packing & Shipping Checklist (Attachment 8-1).

6 Data and Records Management

All field forms and log book entries will be scanned and copied project folder on the “Z” drive within one week of the field event completion.

7 Quality Control and Quality Assurance

Work will be performed in accordance with the Quality Assurance Project Plan (QAPP), the specific work plan, and applicable SOPs. The Sample Handling, Packing & Shipping Checklist will be completed each day that samples are shipped. No erasures or mark outs will be made on the checklist. A single line will be used to strike out errors and will be annotated with the initials and date of the editor.

8 References

HDR, 2018a. DDMT Uniform Federal Policy-Quality Assurance Project Plan, Environmental Restoration Support at Former Defense Depot Memphis, Tennessee, Revision 1. Prepared for the U.S. Army Corps of Engineers, Mobile District. March 2018.

SESDPROC-209-R2, *Operating Procedure: Packing, Marking, Labeling and Shipping of Environmental and Waste Samples,* 2011.

Attachment 8-1

Sample Handling, Packing & Shipping Checklist

When preparing samples for shipment to the laboratory, complete this checklist to ensure that samples, documents, and materials are properly packed in the sample shipper.

Sample Event: _____

Date: _____

PROJECT SAMPLES

□ All samples, duplicates, MS/MSDs, equipment blanks, ambient blanks, and trip blanks should be included in the cooler that are listed on the COC.

□ Verify that the proper number of bottles with appropriate preservative(s) were collected for each sample

□ Verify that samples were checked for pH (except volatile samples)

DOCUMENTS

□ **Chain-of-Custody (COC)** generated for *each* cooler

□ COC reviewed for completeness, including appropriate signature(s) and date(s), and include the **courier tracking/shipping number** on the COC

□ **COC** placed in a Ziploc bag and taped to the underside of the cooler lid

□ **Custody seals** placed on the front and back of each cooler, or across the sealing tape for Summa canister cartons.

□ Coolers for Saturday delivery have “Saturday Delivery” stickers and “Saturday Delivery” box checked on the airbill

□ Shipments are insured

PACKING MATERIALS

□ Ice is “double-bagged” and is sufficient to maintain a temperature of 4°C

□ Glass bottles placed in a bubble bag to prevent breakage and leakage

□ All coolers have a bottom cushion in place prior to placing samples in the cooler.

□ Highly contaminated samples (if known) placed together

□ **Trip blank** placed in each cooler that contains samples for VOC analyses at beginning of day

□ All VOC samples placed in same cooler to minimize the number of trip blanks,

□ Each cooler contains a **temperature blank**

Comments: (special handling or delivery requirements, highly contaminated samples, etc.)

_____

_____

Number of coolers shipped: _____

Checklist Completed By: _____ Date: _____

Note: Place the completed checklist in the project file with the associated COCs and airbill.

STANDARD OPERATING PROCEDURE 9 – EQUIPMENT DECONTAMINATION

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

This Standard Operation Procedure (SOP) provides guidance for proper decontamination of equipment used in sampling and collection of equipment rinsates to evaluate effectiveness of decontamination procedures.

2 Health and Safety

General Information on Health and Safety requirements is provided in SOP 1. Each individual is required to have read and understood the Site Safety and Health Plan for the project and signed the acknowledgement sheet confirming their review.

Health and safety concerns for equipment decontamination include exposure to contaminants from sampling equipment. Nitrile gloves and safety glasses should be used during decontamination.

3 Personnel Qualifications and Responsibilities

Sampling equipment decontamination and rinsate sample collection will be directed by the Field Team Leader (FTL), an environmental professional (engineer, geologist or scientist) with experience in equipment decontamination and sampling activities. The field staff, environmental professionals or technicians, are responsible for following these procedures and seeking direction from the FTL when questions or problems arise.

4 Equipment and Supplies

The required equipment and supplies will consist of Alconox soap, deionized water (DI), tap water, paper towels, foil, and sample containers.

5 Procedure

Proper equipment decontamination will prevent cross-contamination of samples due to residual contamination from previous sample locations and spread of contamination via sampling equipment. Proper decontamination also supports the legal defensibility of data generated during site activities.

Decontamination procedures will be evaluated by the collection of equipment rinsate samples. These samples consist of reagent water collected from final rinse of sampling equipment after the decontamination procedure has been performed. The samples are analyzed with the environmental sample to assess the adequacy of the decontamination performed.

5.1 Start-Up Activities

5.1.1 Office

The FTL will confirm that sufficient equipment and supplies are available at the site based on the number of samples and estimated field days.

5.1.2 Field

After arrival on site, but prior to commencement of operations, the FTL will confirm that decontamination supplies and equipment are available on site and review procedures with field staff.

5.2 Field Operations

5.2.1 Decontamination Area

The location of the decontamination area, used primarily for larger pieces of equipment, will be determined in consultation with subcontractor personnel. The decontamination pad will include a sump lined with 6-mil polyethylene sheeting to collect the decontamination water. The sump will be constructed by either excavating a small area to create a depression or by elevating the edges of the sheeting. Existing concrete pads with containment areas can be used for large equipment like drill rigs. Small handheld equipment will be decontaminated in 5-gallon buckets in order to contain the water.

5.2.2 Decontamination Water Source

Potable water from the municipal water system will be used as a rinse in the decontamination procedure. The FTL will be responsible for coordinating with the subcontractor personnel to secure an adequate supply of potable water for decontamination procedures. If large quantities of water are to be used, the subcontractor will rent a water meter from Memphis Light Gas and Water (MLGW). For smaller amounts, the field office water supply can be used.

5.2.3 Decontamination Procedures

The required decontamination procedure for large pieces of equipment such as drill rigs, auger flights, and drilling and well casing is:

1. Wash the external surface of equipment or materials with high pressure hot water and Alconox or equivalent, and scrub with brushes if necessary until all visible dirt, grime, grease, oil, loose paint, rust flakes, etc., have been removed from the equipment.
2. Air dry.
3. Decontamination waste water will be stored at the site and analyzed prior to disposal.

The required decontamination procedure for sampling equipment except the water level indicator probe is:

1. Wash and scrub with Alconox solution (or equivalent) and nylon brushes.
2. Double tap water rinse.
3. Rinse with American Society for Testing and Materials (ASTM) Type II Reagent - Grade Water
4. Wrap in oil free aluminum foil for transport.
5. Collect all decontamination rinse water in 5 gallon buckets. Rinse water will be combined with other wastewater generated during sampling activities and disposed of according to the work plan.

During water level sweeps and measurements in low-flow sampling, the water level tape and indicator in contact with groundwater will be decontaminated before initial use and before moving to a new location. The decontamination procedure for the water level indicator is:

1. Hand wash the calibrated tape and probe with Alconox solution (or equivalent).
2. Rinse with deionized (Reagent Grade II) water.

5.2.4 Equipment Rinsate Collection

When non-dedicated sampling equipment is used, the equipment will be decontaminated before initial use and after each sample is collected. An equipment rinsate sample will be collected for equipment type (bladder pump or bailer). At least one equipment rinsate will be collected for each sampling protocol (i.e. soil sampling, bladder pumps used for groundwater sampling) during each week of sampling. Equipment rinsate samples will be collected to be representative of field decontamination procedures.

Sampling Equipment: Equipment rinsate samples will be obtained from decontaminated bladder pumps, bailers, stainless steel split-spoons, hand augers, and stainless steel bowls with ASTM Type II water or better.

The equipment rinsate protocol will be as follows:

a. Label Sample Container - Label the sample container as outlined in SOP 7 – Sample Control and Documentation.

b. Collect Sample - After sample collection and equipment has been decontaminated as described above, an equipment rinsate will be collected. ASTM Type II water (or better) will be poured over and through the sampling equipment into a cleaned stainless steel bowl (preferably the equipment and bowl to be used on a specifically identifiable sample location). The collected water will be poured into the appropriate sample container. Repeat the process as necessary to fill each container to the required volume. Vials for volatile analysis and bottles for total organic carbon (TOC) analysis will be completely filled, leaving no air space above the liquid portion (to minimize volatilization). Check that the Teflon on the Teflon- lined silicone septum is toward the sample in the caps and secure the cap tightly. If semi-volatile compounds are to be sampled for, collect these samples next. Proceed to the collection of

samples for the remaining analyses. Be careful of all pre-preserved bottles. If acids are present, open the bottle downwind and away from the body.

c. Custody, Handling and Shipping - Complete the procedures as outlined in SOP 7 – Sample Control and Documentation and SOP 8 - Sample Packing and Shipping.

5.3 Closeout

Before leaving the site daily, the following procedures will be performed by the FTL or designated field staff:

- Confirm all equipment is decontaminated and properly stored all equipment.
- Add decontamination rinse water to the wastewater storage tank
- Note equipment decontamination activities and rinsate sample collection on the Daily Field Report (SOP 1, Attachment 1-2).

6 Data and Records Management

All field forms and log book entries will be scanned and copied project folder on the “Z” drive within one week of the field event completion.

7 Quality Control and Quality Assurance

Work will be performed in accordance with the Quality Assurance Project Plan (QAPP), the specific work plan, and applicable SOPs.

8 References

HDR, 2018. DDMT Uniform Federal Policy-Quality Assurance Project Plan, Environmental Restoration Support at Former Defense Depot Memphis, Tennessee, Revision 1. Prepared for the U.S. Army Corps of Engineers, Mobile District. March 2018.

SESDPROC-205-R2, *Operating Procedure Field Equipment Cleaning and Decontamination,* 2011.

STANDARD OPERATING PROCEDURE 10 – DATA VERIFICATION, VALIDATION, QUALIFICATION AND USABILITY ASSESSMENT

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Project Chemist: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

This Standard Operating Procedure (SOP) provides guidance for the data verification, validation and usability assessment (hereafter called "data review" to denote all three stages) performed for analytical data generated for groundwater and vapor samples collected at Defense Depot Memphis, Tennessee (DDMT).

2 Health and Safety

There are no health and safety issues associated with the activities described in this SOP.

3 Personnel Qualifications and Responsibilities

Data review will be performed by the DDMT Project Chemist (PC), who will be familiar with the sampling areas and data requirements at DDMT and experienced in data review.

4 Equipment and Supplies

A computer loaded with Microsoft Excel, Microsoft Word and Adobe Acrobat (reader level or higher) is required.

5 Procedure

This section describes the data qualifiers that will be applied to the data during the verification and validation steps of the data review, and how the determination of usability will be performed. General guidelines for final qualification are provided; individual circumstances for data packages or specific samples may result in different qualification.

To maintain comparability among data sets for the entire DDMT project, the data validation guidelines from these documents have been incorporated:

- Appendix E, Data Quality Evaluation SOPs, of the previous version of the DDMT Quality Assurance Project Plan (QAPP) (MACTEC, 2005);

- Project Quality Assurance Project Plan (QAPP) (*DDMT Uniform Federal Policy – Quality Assurance Project Plan, Environmental Restoration Support at Former Defense Depot Memphis, Tennessee, Revision 1* [HDR, March 2018])
- *General Data Validation Guidelines* (United States Department of Defense [DoD] Environmental Data Quality Workgroup [EDQW], February 09, 2018);
- *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual* (Intergovernmental Data Quality Task Force, 2005);
- United States Environmental Protection Agency (USEPA) National Functional Guidelines (USEPA, 2017); and
- Quality Systems Manual (QSM) 5.1.

Refer to Sections 1 and 2 and Worksheets #12, #19, #24 and #28 of the QAPP for the quality control limits to be used for data validation.

Final qualifiers will be:

- No qualification
- Non-detect (U)
- Detected and estimated (J)
- Detected and estimated with possible low bias (J-)
- Detected and estimated with possible high bias (J+)
- Non-detect and estimated (UJ)
- Rejected (R)

5.1 Chain-of-Custody

If the chain-of-custody (COC) form was not received by the laboratory with the sample, was not signed with date and time by the sampler in the “relinquished by” box, and/or was not signed with date and time by the lab’s sample receipt personnel in the “received by” box, the legal trail of custody may be compromised. A copy of the COC will be sent to the lab and the PC by the Field Team Leader (FTL) following sample shipment. The PC will examine sample receipt documentation and call or email the lab when discrepancies are identified. Custody seals should be noted as unbroken.

5.2 Sample Receipt

5.2.1 Water Samples

Water samples should arrive at the lab between 0 degrees Celsius (ºC) and 6ºC. If water samples were received warm, the lab will contact the PC immediately. The PC and Project Manager (PM) will determine whether samples should be analyzed or re-collected. If samples are analyzed and reported, generally all results will be qualified as estimated (J), estimated with possible low bias (J-), or non-detect estimated (UJ).

5.2.2 Air Samples

Air samples have no temperature requirements.

5.3 Holding Times and Preservation

For samples analyzed past their holding time, generally all results will be qualified as estimated with possible low bias (J-) or non-detect estimated (UJ) unless holding times are grossly exceeded.

5.4 Method Identification, Analyte List, and RLs/MDLs

The correct methods used for analysis must be identified on the sample result pages. If an incorrect method was used, the lab may be instructed to reanalyze samples using the correct method.

If the list of reported analytes is incorrect, or incorrect limits of quantitation (LOQ), limits of detection (LOD), or detection limits (DL) are reported, the lab will be requested to report the correct analyte list or the correct LOQs, LODs, and DLs.

5.5 Gas Chromatography/Mass Spectrometry Tuning and Analytical Sequence

If tuning requirements were not met, the lab should not have proceeded with sample analysis. If samples were analyzed and reported after an unacceptable tune with 4-bromofluorobenzene (BFB), this will be brought to the attention of the lab PM, and it should have been mentioned in the Case Narrative.

For volatile organic compounds (VOCs) in water and air the critical ion abundance criteria for BFB are the m/z 95/96, 174/175, 174/176, and 176/177 ratios. The relative abundances of m/z 50 and 75 are of lower importance. Samples reported after an unacceptable tune may be rejected (R), or qualified as estimated (J) and non-detect estimated (UJ), according to the reviewer's judgment.

Analysis of all field and QC samples must begin within 12 hours (for waters) or within 24 hours (for air samples) of a valid BFB tune. If sample analysis began later than required, sample results will be qualified as estimated (J) or non-detect estimated (UJ). If analysis began only a short time (within 15 minutes) after the required interval, the results need not be qualified.

5.6 Initial Calibration

Initial calibration Relative Response Factors (RRFs) and % Relative Standard Deviations (RSDs) will be examined to determine whether they met required control limits.

5.6.1 Water Samples

VOC analytes with a %RSD greater than 15% should have had a linear curve fit with an r value of at least 0.995 or a quadratic curve fit with an r^2 value of at least 0.990, or the average %RSD of all analytes in the calibration curve must be 15% or less. Calibration check compounds (CCCs) must have %RSDs less than or equal to 30%. Analytes outside these limits will be qualified as estimated (J) or non-detect estimated (UJ).

A number of VOC analytes (shown below) are considered poor responders and have less stringent requirements for minimum RRF.

Poor Responders		
Acetone	Chloroethane	1,2-Dibromoethane (EDB)
2-Butanone	Chloromethane	1,2-Dibromo-3-chloropropane
2-Hexanone	Dichlorodifluoromethane	cis-1,2-Dichloroethene
4-Methyl-2-pentanone	Trichlorofluoromethane	trans-1,2-Dichloroethene
Carbon disulfide	Methyl tert-butyl ether (MTBE)	1,2-Dichloropropane
	Isopropylbenzene	Methylene chloride

All VOC analytes except the poor responders should have an RRF of at least 0.05. The poor responders should have an RRF of at least 0.01. System performance check compounds (SPCCs) must have RRFs of at least 0.1 or 0.3 as required by the method. Analytes outside these limits will be qualified as estimated (J) or non-detect estimated (UJ).

Initial calibrations for other analytes that do not meet requirements will be qualified in a similar manner as VOCs.

5.6.2 Air Samples

Analytes with a %RSD greater than 30% will be qualified as estimated (J) or non-detect estimated (UJ).

5.7 Initial Calibration Verification (Second Source Standard)

A second source standard must be analyzed after every initial calibration. An LCS can serve as a second source standard for VOCs or dissolved gases as long as it can be determined from the standard prep sheets of instrument run logs that a different standard than those used for the calibration curve was used.

5.7.1 Water Samples

Any analyte with a %D (difference or drift) greater than the control limit compared to the initial calibration will be qualified as estimated (J) or non-detect estimated (UJ).

5.7.2 Air Samples

Any analyte with a %D (difference or drift) greater than 30% compared to the initial calibration will be qualified as estimated (J) or non-detect estimated (UJ).

5.8 Continuing Calibrations

5.8.1 Water Samples

VOC CCCs must have %D values less than or equal to 20%. Other analytes should have %D values less than or equal to 20%. Analytes outside these limits with lower responses than the initial calibration will be qualified as estimated with possible low bias (J-) or non-detect estimated (UJ).

Detected analytes outside these limits with higher responses than the initial calibration will be qualified as estimated with possible high bias (J+).

All VOC analytes except the poor responders should have an RRF of at least 0.05. The poor responders should have an RRF of at least 0.01. SPCCs must have RRFs of at least 0.1 or 0.3 as required by the method. Analytes outside these limits will be qualified as estimated (J) or non-detect estimated (UJ).

Any other analyte with a %D (difference or drift) greater than the control limit compared to the initial calibration will be qualified as estimated with possible low bias (J-) , estimated with possible high bias (J+), or non-detect estimated (UJ), as in Section 5.8.1 above.

5.8.2 Air Samples

All analytes must have %D values less than or equal to 30%. Analytes outside these limits with lower responses than the initial calibration will be qualified as estimated with possible low bias (J-) or non-detect estimated (UJ). Detected analytes outside these limits with higher responses than the initial calibration will be qualified as estimated with possible high bias (J+).

5.9 Blanks

5.9.1 Method Blank

There must be a method blank associated with each sample. Method blanks should contain no COCs above one-half the LOQ. Analytes detected above the LOQ should be discussed in the Case Narrative.

Analytes detected in the samples as well as the method blank will be qualified as non-detect (U) or will not be qualified, in accordance with the qualification as discussed in the applicable National Functional Guidelines (USEPA, 2017).

5.9.2 Trip Blank

A trip blank must accompany all VOC water samples during sampling and shipment, in the same cooler. Trip blanks are not required for air samples.

Analytes detected in the samples as well as the trip blank will be qualified as for a method blank.

5.9.3 Rinsate Blank

A rinsate blank must be collected periodically when non-dedicated sampling equipment is used to collect water samples. Rinsate blanks are not required for air samples.

Analytes detected in the associated samples as well as the rinsate blank will be qualified as for a method blank.

5.10 Laboratory Control Sample and Duplicate

There must be a laboratory control sample (LCS) associated with each sample. There may also be a laboratory control sample duplicate (LCSD), although this is not required. LCSs must be spiked with all COCs.

Analytes with recoveries above the control limits may be biased high and will be qualified as estimated with possible high bias (J+) when detected; non-detect results will not be qualified. Analytes with recoveries below the control limits may be biased low and will be qualified as estimated with possible low bias (J-) or non-detect estimated (UJ). If an LCSD is also analyzed, analytes with relative percent difference (RPD) values greater than 20% (30% for VOCs in air) will be qualified as estimated (J) when detected; non-detect results will not be qualified. All samples associated with the LCS will be qualified.

5.11 Matrix Spike and Matrix Spike Duplicate

MS/MSD samples will be indicated on the COC. Matrix spike/matrix spike duplicate (MS/MSD) samples must be spiked with all COCs.

5.11.1 Water Samples

One set of MS/MSD samples will be collected for every 20 field samples. Recovery limits are the lab's in-house control limits. Analytes with higher recoveries may be biased high and will be qualified as estimated (J) when detected; non-detect results will not be qualified. Analytes with lower recoveries may be biased low and will be qualified as estimated with possible high bias (J+) or non-detect estimated (UJ). Analytes with RPD values greater than 20% will be qualified as estimated (J) when detected; non-detect results will not be qualified. Only the parent sample will be qualified.

5.11.2 Air Samples

MS/MSD samples are not collected for air samples.

5.12 Field Duplicates

Field duplicate samples will be sent blind to the laboratory. They will be designated on the COC but not identified with a specific sample location. One field duplicate sample will be collected for every 10 field samples.

Analytes detected above the LOQ should agree within the RPD control limit. Sample results outside this control limit will be qualified as estimated (J). Results detected below the LOQ will not be assessed. If one result is above the LOQ and the other result is below the LOQ, both results will be qualified as estimated (J). If one result is above the LOQ and the other result is non-detect, the detected result will be qualified as estimated (J) and the non-detect result will be qualified as non-detect estimated (UJ).

5.13 Laboratory Duplicates

5.13.1 Water Samples

Laboratory duplicates may be analyzed for metals in water samples. Control limits and qualification are the same as for a field duplicate.

5.13.2 Air Samples

A laboratory duplicate of an air sample must be analyzed daily. Laboratory duplicate results are assessed only if the duplicate was on a DDMT sample. Control limits and qualification are the same as for a field duplicate.

5.14 Surrogates

Surrogates are spiked into every field sample, quality control (QC) sample, and standard for VOCs in water and air.

Surrogates with recoveries above the control limits may indicate a high bias in detected sample results; all detected analytes in the sample will be qualified as estimated with possible high bias (J+). Surrogates with recoveries below control limits may indicate a low bias in sample results; all analytes in the sample will be qualified as estimated with possible low bias (J-) or non-detect estimated (UJ). Samples will not be qualified if only one surrogate out of three or four has a high or low recovery.

5.15 Internal Standards

Internal Standards are spiked into every field sample, QC sample, and standard for VOCs in water and air.

Internal standards with recoveries or retention times outside control limits may indicate interferences in the sample matrix or poor purging.

All analytes associated with an internal standard that has an area outside control limits will be qualified as estimated (J) or non-detect estimated (UJ).

If an internal standard has a retention time outside control limits, the chromatogram and quantitation report will be examined to determine possible impact on the detected or non-detected sample results. Retention times outside control limits may lead to false positive or false negative results for other analytes.

5.16 Usability Assessment

The HDR PC will assess the Precision, Accuracy/bias, Representativeness, Comparability, Completeness, and Sensitivity (PARCCS) parameters and determine overall usability of the data. In general, non-rejected data will be considered usable. Measurement error will be deemed within acceptable limits when project data quality objectives (DQOs) as assessed by PARCCS parameters are met. The PC will write a brief assessment of data usability for each data package.

6 Data and Records Management

This section details the distribution of data files from the laboratories to HDR and the project files.

6.1 Data Files from Laboratories

The laboratories will email to the HDR PC the Level IV data package in PDF format and an electronic data deliverable (EDD) file in Excel to the PC. The PC will save these files to the appropriate folders on the HDR network drive, to be retained in perpetuity.

Hardcopy (paper) data files are not required for this project.

6.2 Data Files from HDR

The HDR PC will email the PDF Level IV data package and the Excel EDD to the HDR Project Manager (PM) and the EDD to the project database manager. The database manager will prepare preliminary tables of results to be used in reports.

6.3 Data Files at HDR

The PC will save the report and EDD file to the appropriate folders on the HDR network drive. The PC will make a copy of the EDD file, with the same name plus “-final”.

The PC will prepare a final validation report and note any qualifiers.

The PC will open the “final” file and add a column before the analytes column, called “Report?”; all entries will default to “Y(es)”, and will be changed to “N(o)” in the event of multiple runs and/or dilution runs of a sample, so that there is only one reportable result per analyte in all samples. The PC will also add a field named “Final Qualifier” at the end of the fields and record final qualifiers as described in Section 5.6.1 of this SOP.

When all the EDDs have been completed for a sampling event, the PC will email the PM and the database manager the files, to create final result tables to be used in reports.

7 Quality Control and Quality Assurance

All work will be performed in accordance with the QAPP, the specific work plan, the specific sampling plan details (SPD) and applicable SOPs.

8 References

Intergovernmental Data Quality Task Force, 2005. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1: UFP-QAPP Manual* (2005).

MACTEC Engineering and Consulting, Inc. (MACTEC), 2005. *Remedial Action Sampling and Analysis Plan, Volume II: Quality Assurance Project Plan, Defense Depot Memphis, Tennessee, Revision 1*. November 2005.

United States Department of Defense (DoD), 2018. *General Data Validation Guidelines* (Environmental Data Quality Workgroup [EDQW]. February 09, 2018).

United States Environmental Protection Agency (USEPA), 2017a. *National Functional Guidelines for Organic Superfund Methods Data Review (EPA-540-R-2017-002).* January 2017.

USEPA, 2017b. *National Functional Guidelines for Inorganic Superfund Methods Data Review (EPA-540-R-2017-001).* January 2017.

STANDARD OPERATING PROCEDURE 11 – SURFACE AND SUBSURFACE SOIL SAMPLING

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative soil samples for geotechnical or chemical analyses. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push technology, or other mechanized equipment (except for power auger). Sample depths may extend up to six feet below ground surface.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the procedures employed should be documented in the final report.

2 Health and Safety

Proper safety precautions must be observed during activities and when collecting samples in accordance with the site-specific health and safety plan (SSHP). Each individual assigned to field work must: (1) participate in the HDR Medical Monitoring Program, or subcontractor medical surveillance program, as applicable, (2) must have taken the Occupational Safety and Health Administration (OSHA) 40-Hour course (updated with the 8-Hour OSHA Refresher, when necessary), and (3) must be certified as able to wear respiratory protection.

All field personnel are required to have read and understood the SSHP for the specific project activity. Upon arrival at the site, each person shall sign the acknowledgement sheet confirming their review of the SSHP. Personal protective equipment (PPE) and other provisions for site safety requirements are discussed in the SSHP. At minimum, personnel will wear steel toe shoes and a high visibility outer garment. Additional PPE such as safety glasses, hearing protection and hard hat may be necessary when operating power tools or where overhead hazards exist.

Equipment will only be used by properly trained personnel. In particular, the use of a photoionization detector (PID) will only be performed by personnel familiar with the equipment. Proper tools will be made available to each employee as necessary. Questions should be addressed to the FTL.

Boring locations will be cleared for underground and above ground utilities. Documentation for clearance will be confirmed by the FTL prior to beginning drilling activities. The FTL will also confirm the location has been cleared with the property owner/tenant. Locations will be offset if aboveground

or subsurface obstructions are identified prior to drilling or encountered after drilling has begun. The new locations will be as close as possible to the originally proposed locations; utility clearance will be repeated as necessary.

The team will have use of a vehicle during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance.

3 Personnel Qualifications and Responsibilities

Field activities will be conducted by the Field Team Leader (FTL) and qualified junior to mid-level environmental professionals or environmental technicians. The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents including Work Plan (WP), SSHP, and SOPs. The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

4 Equipment and Supplies

Field activities should not proceed until the proper tools and equipment are available and in good working order. Usual equipment/supplies for soil sampling will include: site maps, safety equipment, power auger and fuel, stainless steel bowl, stainless steel scoop, tape measure, GPS, survey stakes/flags, camera, ziptop bags, labels, sample containers, cooler, ice, chain of custody, tape measure, hand auger, shovel/trowel, slide hammer, and decontamination supplies.

5 Procedure

Procedures for conducting a surface or subsurface soil sampling event are below.

5.1 Pre-Mobilization Planning and Preparation

1. Determine the extent of the sampling effort, constituents for analysis, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.
2. Obtain the necessary sampling equipment.
3. Prepare schedules and coordinate with staff, laboratory, client, and regulatory agencies, as appropriate.
4. Notify Tennessee One Call so that buried utilities can be located and marked.

5.2 Surface and Subsurface Soil Sampling

Methods for surface and subsurface soil sampling are listed below.

1. Don gloves and other PPE as necessary based on field conditions.
2. Clear debris (e.g. rocks, glass, debris) from the surface at sample location(s).
3. Thoroughly decontaminate reusable sample collection equipment in accordance with SOP 9.
4. Install new brass or stainless-steel tube (Tube) into the core barrel and use the slide hammer to advance the Tube to 6-inches below ground surface (bgs). If refusal occurs, a decontaminated hand auger may be used to excavate the soil sample.
5. If sample analyses include VOCs, use a Terracore sampler to collect soil samples from the bottom of the Tube or from the deeper auger soil cuttings in accordance with SOP 2.
6. Place the remainder of the Tube contents and/or auger cuttings into stainless steel bowl and thoroughly mixed.
7. Remove debris as necessary and place the homogenized soil sample into laboratory-supplied containers, label containers and secure the caps tightly. Place the samples into a new zip top bag and place bag in ice chest cooled with bagged ice.
8. Advance the boring by hand auger to 12 inches bgs.
9. Decontaminate the slide hammer core barrel in accordance with SOP 9 and install a new Tube.
10. Advance the Tube to 18-inches bgs. If refusal occurs, a decontaminated hand auger may be used to excavate the soil sample.
11. Repeat steps 5 through 7.
12. Advance the boring by hand auger to 60-inches bgs. If refusal occurs, a power auger may be used to advance the boring.
13. Decontaminate the slide hammer core barrel in accordance with SOP 9 and install a new Tube.
14. Advance the Tube to 66-inches bgs. If refusal occurs, a decontaminated hand auger may be used to excavate the soil sample.
15. Repeat steps 5 through 7.
16. Once all samples have been collected, thoroughly decontaminate the sampling equipment, fill the boring with excavated soil and compact.
17. Photograph sample location with nearby landmarks visible.
18. Move to next sample location and repeat the sampling procedure.

6 Field Documentation

Field activities will be documented in a bound logbook for each team and in field records as required by the project-specific work plan or SOPs. At minimum, the logbook will describe general activities performed, date and time, personnel performing the activity, and weather conditions.

For field measurements, the following additional information will be required:

- The numerical value and units of each measurement

- The identity and calibration results for each field instrument

For sampling activities, the following additional information will be required:

- Sampling type and method
- The identity of each sample and the depth(s) from which it was obtained
- The amount of each sample
- Sample description (e.g., color, odor, clarity)
- Identification of sampling devices
- Identification of conditions that might reflect representativeness of a sample (e.g., refueling operations)

Field personnel will complete required data collection/sample control forms (e.g., Chain-of-Custody [COC], Field Sampling Report, etc.).

7 Data and Records Management

All field forms and logbook entries will be scanned and copied to the project folder on the network file share drive within one week of the field event completion. All photographs taken during the field event will also be uploaded along with a typed photograph log (date, project and subject) to the network file share. All uploaded photographs will then be erased from the camera. All original forms will be stored on site at the field office in Memphis in the appropriate project-specific filing cabinet and task-specific labeled folder.

8 Quality Control and Quality Assurance

Data must be documented in site logbooks or on field data sheets. The following data is typically recorded: Sampler's name, sample number, sample location, sample depth, type of analyses to be performed, sample description, date and time of sample collection, weather conditions at time of sampling, method of sample collection, sketch of sample location.

9 References

USEPA Region 4 SESD Guidance, 2011, *Soil Sampling,* (SESDPROC-300-R2). December

STANDARD OPERATING PROCEDURE 12 – SEDIMENT AND SURFACE WATER SAMPLING

Lead Organization: Department of the Army (DA)
Preparing Organization: HDR
SOP Approved by: Field Team Leader: Clayton Mokri
Project QA Officer: Lynn Lutz
Project Manager: Tom Holmes

1 Purpose and Summary

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative sediment and surface water samples that may be used to determine toxicity, contaminant migration pathways, biological availability, and fate of contaminants. This SOP assumes that samples can be safely collected from the shoreline, without use of boats, waders, or personal flotation devices, and that confined space entry will not be required.

Surface water sampling methods listed below were adopted from the United States Environmental Protection Agency (USEPA) *Surface Water Sampling Operating Procedure* (USEPA, 2013) and modified where necessary based on site conditions and constituents of concern at Defense Depot, Memphis, Tennessee

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with a final report.

2 Health and Safety

Proper safety precautions must be observed during activities and when collecting samples in accordance with the site-specific health and safety plan (SSHP). Each individual assigned to field work must: (1) participate in the HDR Medical Monitoring Program, or subcontractor medical surveillance program, as applicable, (2) must have taken the Occupational Safety and Health Administration (OSHA) 40-Hour course (updated with the 8-Hour OSHA Refresher, when necessary), and (3) must be certified as able to wear respiratory protection.

All field personnel are required to have read and understood the SSHP for the specific project activity. Upon arrival at the site, each person shall sign the acknowledgement sheet confirming their review of the SSHP. Personal protective equipment (PPE) and other provisions for site safety requirements are discussed in the SSHP. At minimum, personnel will wear steel toe shoes and a high visibility outer garment.

The team will have use of a vehicle during field activities. An initial safety check should be performed at the start of each shift to confirm the vehicle is in good working condition. The vehicle should then be checked daily for damage or required maintenance.

3 Personnel Qualifications and Responsibilities

Field activities will be conducted by the Field Team Leader (FTL) and a qualified junior to mid-level environmental professionals or environmental technicians. The FTL will provide direction to field staff to ensure work is performed in accordance with the project documents including Work Plan (WP), SSHP, and SOPs. The field staff will carefully review the project documents, conduct the work as planned, seek direction from the FTL when questions or problems arise, and carefully complete field documentation.

4 Equipment and Supplies

Field activities should not proceed until the proper tools and equipment are available and in good working order. Typical equipment/supplies for sampling may include: site maps, safety equipment, GPS, camera, zip top bags, labels, sample containers, cooler, ice, chain of custody, sample scoop, pump, bailer, syringe, 0.45 micron (µm) filter, twine, and decontamination supplies. A description of sediment and surface water sampling equipment referenced in this SOP are listed below:

4.1 Scoops

Stainless steel scoops provide a means of collecting samples from sediment or surface water bodies that may be inaccessible by hand. The scoop may be used directly to collect and transfer a surface water sample to the sample container, or it may be attached to an extension to access the selected sampling location.

4.2 Peristaltic Pump

The peristaltic pump can be used to collect a water sample from depth or from an area that is inaccessible to reach by hand or with a scoop. The tubing is attached to the pump and placed into the surface water at the desired depth and location. The pump is operated, and the water is discharged from the pump into sample containers.

Samples for volatile organic compound (VOC) analysis cannot be collected directly from the peristaltic pump discharge. If a peristaltic pump is used for sample collection and VOC analysis is required, the VOC sample must be collected using one of the “soda straw” variations. Ideally, the tubing intake will be placed at the depth from which the sample is to be collected and the pump will be run for several minutes to fill the tubing with water representative of that interval. After several minutes, the pump is turned off and the tubing string is retrieved. The pump speed is then reduced to a slow pumping rate and the pump direction is reversed. After turning the pump back on, the sample stream is collected into the VOC vials as it is pushed from the tubing by the pump. Care must be taken to prevent any water that was in contact with the elastic pump head tubing from being incorporated into the sample.

4.3 Bailers

An open top Teflon bailer with a bottom check-valve may be used for surface water sampling. As the bailer is lowered through the water column, water is continually displaced through the bailer until full at which point the bailer is retrieved and water is decanted from the bailer into sample containers.

4.4 Automatic Sampler

Where unattended sampling is required (e.g., storm-event sampling, time-of-travel studies) an automatic sampler may be used. The automatic sampling device may be used to collect grab samples based on time, in-stream flow or water level or used to collect composite samples as dictated by the study data needs. The automatic sampling device should be calibrated prior to deployment to ensure the proper volume is collected. The manufacturer's instruction manual should be consulted for automatic sampler operation.

5 Sampling Procedure

Procedures for conducting sediment and surface water sampling event are listed below.

5.1 Pre-Mobilization Planning and Preparation

1. Determine the extent of the sampling effort, sample locations, constituents for analysis, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.
2. Obtain the necessary sampling equipment.
3. Prepare schedules and coordinate with staff, laboratory, client, and regulatory agencies, as appropriate.

5.2 Sediment Sampling

Sediment sampling procedures are listed below:

1. Inspect the sampling area from a safely accessible area to identify potential risks that may include, but not limited to: confined space, unstable shoreline, rushing water, traffic, or biological hazards. If hazards are identified, notify the FTL.
2. If the sampling area can be safely accessed, field personnel will start downstream and work upstream to prevent contamination of unsampled areas.
3. Collect the sediment samples using a gloved hand, disposable scoop or decontaminated stainless-steel scoop. Remove any large particles and then homogenize the sample by rolling the sample from corner to corner on a plastic sheet a minimum of 20 times. Be especially careful to avoid the loss of the very fine clay/silt particles when collecting the sample. The fine particles have a higher adsorption capacity than larger particles.

Minimize the amount of water that is collected within the sample matrix. Decant the water off the sample slowly and carefully to maximize retention of the very fine particles.
4. Place the sample into laboratory-supplied containers, label containers and secure the caps tightly. Place the samples into a new zip top bag and ice chest cooled with bagged ice.
5. Decontaminate reusable equipment in accordance with SOP 9 and repeat steps as necessary to collect additional samples.

5.3 Surface Water Sampling

Surface water sampling procedures are listed below:

1. Inspect the sampling area from a safely accessible area to identify potential risks that may include, but not limited to: confined space, unstable shoreline, rushing water, traffic, or biological hazards. If hazards are identified, notify the FTL.
2. If the sampling area can be safely accessed, field personnel will start downstream and work upstream to prevent contamination of unsampled areas.
3. Where accessible by hand, the sample bottle is gently submerged with the mouth pointed upstream and the bottle tilted slightly downstream. Bubbles and floating materials should be prevented from entering the bottle. Care should be taken so that sample preservative is not washed from the sample container.
4. If using a Peristaltic pump, lower the tubing into the water to the desired depth and if using a scoop, scoop an aliquot of water from the desired location. Pump or decant the water into the laboratory-supplied containers, label containers and secure the caps tightly.
5. For dissolved metals analysis, fill a new or decontaminated syringe with water from the sample scoop. Attach a new 0.45 µm filter to the end of the syringe and slowly depress the syringe plunger so that the sample is forced through the filter and into the laboratory supplied containers, label containers and secure the caps tightly. If a peristaltic pump is used, a 0.45 µm filter can be attached to the pump discharge and the pump slowly operated so that the sample is pumped through the filter and into the laboratory supplied containers, label containers and secure the caps tightly. Dispose the filter after the sample is collected.
6. Place the samples into a new zip top bag and ice chest cooled with bagged ice.
7. Decontaminate reusable equipment in accordance with SOP 9 and replate peristaltic pump tubing prior to the next sample location.

6 Field Documentation

Field activities will be documented in a bound logbook for each team and in field records as required by the project-specific work plan or SOPs. At minimum, the logbook will describe general activities performed, date and time, personnel performing the activity, and weather conditions.

For field measurements, the following additional information will be required:

- The numerical value and units of each measurement
- The identity of and calibration results for each field instrument

For sampling activities, the following additional information will be required:

- Sampling type and method
- The identity of each sample and the depth(s) from which it was obtained
- The amount of each sample
- Sample description (e.g., color, odor, clarity)
- Identification of sampling devices
- Identification of conditions that might reflect representativeness of a sample (e.g., refueling operations)

Field personnel will complete required data collection/sample control forms (e.g., Chain-of-Custody [COC], Field Sampling Report, etc.).

7 Data and Records Management

All field forms and logbook entries will be scanned and copied to the project folder on the network file share drive within one week of the field event completion. All photographs taken during the field event will also be uploaded along with a typed photograph log (date, project and subject) to the network file share. All uploaded photographs will then be erased from the camera. All original forms will be stored on site at the field office in Memphis in the appropriate project-specific filing cabinet and task-specific labeled folder.

8 Quality Control and Quality Assurance

Data must be documented in site logbooks or on field data sheets. The following data is typically recorded: Sampler's name, sample number, sample location, sample depth, type of analyses to be performed, sample description, date and time of sample collection, weather conditions at time of sampling, method of sample collection, sketch of sample location.

9 References

USEPA Region 4 SESD Guidance, *Surface Water Sampling Operating Procedure* (SESDPROC-201-R3), February, 2013.

P

Appendix P

Analytical SOPs

Standard Operating Procedure

RECEIVING SAMPLES

STATEMENT OF PURPOSE

This procedure describes the proper way for the sample custodian or his/her designee to receive samples at APPL, Inc.

INSTRUCTIONS

1.0 Scope and Application

This SOP describes APPL's sample acceptance policy, checking incoming samples for the presence of ionizing radiation, cooler temperature determination, logging in samples, completion of the cooler receipt form, completion of a Sample Receiving Quality Control Sign-off Sheet, amending an Analysis Request Form (ARF), scanning and distributing an ARF and re-receiving samples. This process also addresses the steps to take when analyses are cancelled.

Method Summary - NA

3.0 Detection Limits - NA

4.0 Definitions

Analysis Request Form (ARF): A computer generated form, which includes: Client name and address, job number, client and APPL sample IDs, date and time of sampling, analyses requested, and any associated comments.

Chain of Custody (COC): A record that documents the possession of the samples from the time of collection to receipt in the laboratory. This record generally includes the number and types of containers; the mode of collection; the collector; time of collection; preservation; and requested analyses.

Radiation (RAD): The emission of energy as electromagnetic waves or as moving subatomic particles, especially high-energy particles that cause ionization.

Sample Receiving Quality Control Sign-off worksheet (SRQCS): A questionnaire that verifies the ARF and cooler receipt forms are correct. The physical checks of samples and the distribution of the ARF have been completed.

Cooler Receipt Form (CRF): A form that documents the condition of the cooler(s) and samples upon arrival at the laboratory.

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5.0 Interferences and Potential Problems - NA

6.0 Health and Safety

Wear gloves and lab coat whenever handling samples or preserved containers. Wear a respirator for samples suspected to be highly contaminated.

7.0 Sample Preservation, Containers, Handling and Storage

See SHR004 for a list of containers, preservatives, and hold times.

8.0 Quality Control - NA

9.0 Equipment/Apparatus

9.1 Ludlum Model 2 Survey Meter and Model 44-9 Wand
9.2 Gloves
9.3 Respirator
9.4 Thermometer
9.5 Baker (or equivalent) pH indicator strips
9.6 Scanner
9.7 Pool test strips
9.8 Disposable cups
9.9 Stickers, Blue, Yellow, Hold, Composite, etc.

10.0 Reagents and Standards - NA

11.0 Calibration and Standardization - NA

12.0 Procedure

12.1 The sample(s) are delivered to the personnel in the laboratory responsible for receiving samples, the sample custodian or his/her designee, referred to hereafter as "Receiving".

12.2 Upon receipt, Receiving will validate that the COC has appropriate signatures from the shipper and courier(s). The COC is signed at the last available space for a lab signature, received by date and the time entered by the Receiving personnel.

12.3 Sample(s) that do not meet sample acceptance criteria are not received into the laboratory. (See Table 2 for Sample Acceptance Policy) The project manager is notified immediately, who then notifies the client. All pertinent information regarding the rejection is conveyed to the client. The client and APPL, Inc. will determine if the client will remove the samples from the laboratory.

12.4 Samples are assigned unique APPL ID numbers and analyses codes and are stored according to the appropriate method's guidelines until analyzed.

Samples Delivered by Hand

12.5 The following must be checked before the client leaves

12.6 **Check correct containers / Preservatives BEFORE the client leaves**

- Compare containers to the posted Container List in Receiving

12.7 **COC filled out completely and correctly BEFORE the client leaves**

- Take the temp and notify the client if outside the criteria
- *** If the samples were not both sampled the same day of delivery and on ice then the client must make a note on the COC "OK to proceed with the analysis" with their initials and the date.
- Collection Date / Time listed?
- Client contact information listed?
- Is the TAT listed?
- Are any of the samples out of hold time?
- Matrix listed correctly?
- Containers count correct?
- The test method listed for all samples?
- Make sure any comments on the COC are clear and concise and if not ask for further explanation.
- Ensure both yourself and the client sign with the correct Date / Time for Relinquished and Received.
- Sign ALWAYS on the last most available Received by line.

Sample Acceptability

12.8 The following outlines the circumstances under which samples will be accepted. Data generated from any samples, which do not meet the following criteria, will be flagged. The nature and substance of the variation will be clearly defined in the case narrative. The following documentation will be noted on the COC: If any of the following is not noted on the COC, the Project Manager must be notified via email.

- Client Sample identification
  - the location, date and time of collection
  - collector's signature and date

- preservation added
- matrix type
- client contact info
- client's relinquished signature date/time
- Requested test methods

.

NOTE: All discrepancies should be resolved before the samples are assigned for analysis. This includes the following:

- Sample IDs
- Sample date and times
- Temperature
- Preservation
- Air bubbles larger than a pea (VOA)
- Inappropriate sample containers
- Insufficient sample volume
- Leakage
- Broken or cracked sample containers
- Expired holding times

12.8.1 If any soil or plant materials are received from outside of California and a green/white USDA sticker is not on the outside of the cooler, the Receiving Custodian will call the Office of USDA at 559-600-7510 and tell the agent what type of sample and its point of origin. Let them know that we have received soils or plant materials that do not have a USDA green/white sticker on the outside of the cooler. The USDA will either clear the shipment by phone or come in person to clear the cooler. If there are short hold or expedited TAT, let the USDA official know that we must analyze the sample ASAP and need to unpack the cooler right away. Notify the project manager that you have informed the USDA.

12.8.2 All discrepancies are to be discussed with the project manager, who will call the client for further instructions.

Screening Cooler and Contents for Radiation

12.9 Prior to the acceptance of samples by APPL, Inc., all sample coolers or samples will be screened for the presence of ionizing radiation.

12.10 **Daily Geiger Counter Check** (Geiger counter "Ludlum Model 2 Survey Meter" and "Model 44-9 Wand) is performed each day prior to use, and documented in T:\Equipment Calibrations.

12.10.1 **Battery Check:** Turn the black knob to "BAT", and the gauge needle should read between 3-5K in the zone labeled "BAT TEST". If the needle does not read within these parameters, then notify the lab director and use the backup Geiger Counter until the other one can be repaired.

12.10.2 **Background Radiation Test**: Turn on the Geiger counter using the silver toggle, and turn the black knob to X0.1 (which is the most sensitive reading).

- At the X10 setting, 1K = 10,000 counts/min
- At the X1 setting, 1K = 1000 counts/ min

- At the X0.1 setting, 1K = 100 counts/ min (this is the setting for reading coolers)

12.10.3 Leave the wand in the wand holder, and observe the background reading. The acceptable background range for this instrument is between 50-100 counts/min. (at the X0.1 setting, the needle will read below 1K)

12.10.4 **Operations Test**: Take the wand and place it on top of the yellow-sticker radiation source Cs137 (0.25uCi) on the side of the Geiger Counter. This should give a gauge needle reading of 5K at the X0.1 setting (500 counts / min). If the needle does not read at 5K, then notify the lab director and use the backup Geiger counter until the other one can be repaired.

12.10.5 The technician will then screen the cooler before opening the cooler. To do this, turn the black knob to X0.1, take the plastic cover off of the scanning wand and pass the wand about 6" around the cooler. If the clicks per minute exceed 100 (which is the background radiation) then the sample custodian or technician will call the project manager or lab director for further instructions on how to proceed. The client will be contacted and arrangements will be made to return the ice chest back to the client, since APPL is not equipped to handle radioactive material. The cooler will remain un-opened in the Hazardous Waste Storage Room at APPL until it can be removed to the proper facility, as per the client's instructions.

12.10.6 The scanner and wand must be calibrated once per year. To do this, call Ludlum Measurements, Inc., 501 Oak Street, Sweetwater, TX. 79556 @ 1-915-235-5494 and obtain a Return Authorization Number. Send out on a Friday with same day service. You will need to use a PO number. You can request a PO number from the Purchasing officer or the lab director.

12.10.6.1 The lab is required to maintain a calibrated backup Geiger Counter on site at all times. The backup device is verified weekly.

Opening the Coolers

12.11 Grab a stack of Cooler Notation Forms (See Table 8), or CNF's, as one must be filled out per ARF as soon as the coolers are opened. The purpose of the CNF is to have a place to notate any information or deficiencies that will need to be recorded later on the CRF, Cooler Receipt Form, that is filled out in ARF Summary. **All information notated on this form will be transferred to the CRF when the paperwork is being completed and the CNF will be kept with the ARF.

12.12 If the cooler passes the RAD screening, it can be opened and the contents scanned with the Geiger criteria in 12.10.5.

12.13 Check to see if there are custody seals and count how many, then write down that information on your CNF. Try to save one of the custody seals because one will be attached to the finished CRF at the end. Cut the custody seal off and place it on top of the cooler until it is ready to be added to the CRF. (See Table 1) Note: If one of the coolers out of the group does not have a custody seal, make a note of which cooler and what sample bottles are affected on the CNF. Inform the project manager immediately so they can let the client know.

12.14 All coolers are opened under a hood.

12.15 Remove the COC and sign it at the last available space for a lab signature or received signature, put the date and time that the shipment arrived at the lab.

12.15.1 If a cooler has no COC provided, take a CNF and notate the necessary information. Then immediately email the Project manager (if you are unsure

of whose project it is email all the PMs) with the name of the client, via shipping label, and state that it has arrived with no COC, the condition of the cooler and ask how to proceed.

12.16 If the client has provided a temperature blank the thermometer will be placed directly into the bottle to record the temperature. You will record both the read temperature and the final temperature after the correction factor is added, as well as which Thermometer was used for each cooler (Ex. **Which Thermometer used @ The temp you read/The corrected temp**; so if you used the R3 NIST Thermometer which had a correction factor of +0.3°C and read the temperature as 4.0°C then you would write **R3 @ 4.0/4.3°** on the COC.) ***If the Temperature Blank is reading out of temperature by a small margin, a secondary temperature can be taken using the IR gun, **however both temperatures must be recorded** (using the CNF) and its is up to the client and project manager which temperature is used for that cooler.

12.17 **If a temperature blank has not been provided**, use the infrared (IR) gun to take the temperature for DoD projects. Do this by placing a white paper on your tabletop and place one container on the paper. Use the IR gun to scan the container near the bottom half so the beam will hit the white paper. Record the temperature on your CRF in the same manner noted above just replace the NIST Thermometer name with IR and use the correct correction factor for the IR Gun. Note: The IR gun has two Correction Factors, one for samples between 0.0-10.0°C and one for samples that come in at or greater than 10.1°C (Ex. If the IR gun has a correction factor of –0.3°C for samples below 10.0° and you read the temp as 4.0°C then you would write **IR @ 4.0/3.7°**on the COC.)

12.17.1 Record the temperatures of each cooler sent per project on the CNF and on the APPL COC under “shuttle temperature”. (E.g. If the client sent 3 coolers for project #XXX then there should be three temperatures noted each noted with both the read temp and the corrected temp.) If the client uses a non-APPL COC that doesn’t have a space for recording the cooler temperature upon arrival, then record the temperature in the top right hand corner of the COC, ensure you leave room for the ARF number to be added to the upper right corner as well. The CNF has numbered lines for the temperatures of each cooler, write the coordinating numbers on the coolers with a sharpie. This way you know which temperature belongs to which cooler.

12.17.2 If the temperature exceeds the Maximum Allowable Temperature (0.0 to ≤ 6.0°C) notify the Project Manager **immediately** by email with an attached COC, notate in the email that a follow up email will be sent specifying which containers were received in the out of temperature cooler/s. Place the large “Received Out of Temperature” warning sticker on the top of the cooler/s that were out of allowable temperature ranges, and make sure to write the temperature on the sticker. Then place one “Out of Temperature” seals over the cooler lid, to keep the cooler from being accidentally unpacked until all the containers can be properly notated on the CNF. See section 12.51 for details on unpacking out of temperature coolers and how to notate the sample containers affected.

12.17.3 Other Temperature related issues that must be notated and emailed to the PM: If you received a set of coolers from one client and some have Temperature Blanks and some do not, If you receive any coolers with

Frozen temperature blanks, and If you receive Temperature Blanks and they have an out of temperature reading but the IR gun is reading the samples within temperature.

12.17.4 If the samples are delivered to the laboratory on the same day they are collected they may not meet the temperature requirements. In these cases, the samples shall be considered acceptable if the samples were received on ice.

12.17.5 **For samples coming from the State of Alaska, two temperatures must be recorded for every cooler received.** One temperature will be recorded using the NIST thermometer in the temperature blank and the other will be from the IR Gun on a sample. Some clients also have client specific cooler receipt forms that must be filled out for each cooler, if you have questions about this or are unsure if a project needs two temperatures speak to the Receiving Supervisor, a Project Manager, or the Lab Director.

Priority of Samples and Assigning ARF Numbers

12.18 **Samples with RUSH TAT, short holding times (or samples received with little holding time remaining), or time sensitive pH requirements are given first priority**. Check the Holding Times Sheet posted in Sample Receiving for analyses with short hold times. Receiving will notify the applicable section managers and project managers via email about rushes or short hold times. A copy of the COC attached to the email, after the COC's have been assigned ARF numbers.

12.19 **Time sensitive pH instructions:** If a COC has Ammonia, Cyanide, Hexachrom, Phosphorus, Sulfide, TKN, or TOXN water sample/s on it, it gets **first priority** for log in and labeling.

12.19.1 If the containers for these analyses are unpreserved, then an email will go out to Wetlab stating either "Unpreserved Hexachrom samples received, preserve within **24 hours** of being sampled." Or "Unpreserved Ammonia, Cyanide, Phosphorus, Sulfide, TKN, or TOXN samples received, preserve within **48 hours** of being sampled."

12.19.2 Note: if the samples are already out of holding time, make note of this in the email.

12.19.3 If the Ammonia, Cyanide, Hexachrom, Phosphorus, Sulfide, TKN, or TOXN containers are preserved, then the technician must take all of the sample containers out of the cooler/s and pH them to ensure the preservation is at the correct pH according to the following table:

Test	Preservative	PH
Ammonia	H2SO4	<2
Cyanide	NaOH	>12
Hexachrom	NaOH/(NH4)2SO4	>9
Phosphorus	H2SO4	<2
Sulfide	NaOH, Zinc Acetate	>10
TKN	H2SO4	<2
TOXN	H2SO4	<2

12.19.4 Once all the Ammonia, Cyanide, Hexachrom, Phosphorus, Sulfide, TKN, or TOXN samples have been pulled from the coolers and are lined out on the

receiving table in order of the sample ID's on the COC. The technician will take the pH of each container and record the value on the COC or Sample Receipt Form and then the container. Check the pH according to the section entitled "Checking the pH of Samples".

12.19.4.1 For recording the values on the COC, take a blue or black pen and write "Ammonia, Cyanide, HexaCr, Phosphorus, Sulfide, TKN, or TOXN Lab pH" on the line just above the "comments section" with date and your initials.

12.19.4.2 Then as the pH is measured, write the actual "pH *value*" in the "comments section" for each sample line item. If the client has already recorded information in the comments section, then write the pH to the side of the comments.

12.19.4.3 Then using a sharpie record the pH on the container. These values will be inputted into the LIMs system at the login or labeling stage. If any of the samples are not within the acceptable pH range, an email must be sent to Wetlab, stating "Ammonia, Cyanide, Hexachrom, Phosphorus, Sulfide, TKN, or TOXN to further preserve, see COC for pH values". (*Note: all emails to wetlab will be sent after the COC receives an ARF number and gets scanned into the COC folder of the T:drive, the PM and Lab Director must be CC'd on these emails.)

12.20 **Note:** If TOC/DOC arrives unpreserved, notify Wetlab of 48 hour HT

12.21 Use the sheet with ARF numbers printed on it. (These are periodically printed sheets with consecutive numbers to be used to assign the ARF number.)

12.22 On the next available number write in the client's name in the box to show that it has been used and cross out the number.

12.23 Assign an ARF number and write the ARF number directly on the upper right-hand corner of the COC. Scan the COC into the database. Upon request, COCs will be emailed to the project managers**.**

12.23.1 If a COC is not received or is incomplete to the point that analysis cannot proceed without further instruction, the project manager is notified. A CoC arriving from the client is considered incomplete if any one of the following minimum information is missing: client contact info, sampler name/signature, client relinquished signature/date, client sample IDs, collection date/time, test methods requested, TAT. The project manager will notify the client by phone, email or by fax, stating that the COC was not received or is incomplete. The samples are then placed in the refrigerator (or if they are volatile soils in jars/sleeves/encores or un-preserved TerraCores they need to go in the Freezer) until the client is able to respond to the information. Once the client has responded, the samples are then logged into Labworks and the rest of the process is completed.

12.23.2 When a COC is received without a COC number or name, receiving personnel will hand write an APPL designated COC number, based on the client's "relinquished date." If there is more than one COC page, then letters A, B, C, etc. will be used for each page. Example: 131018A, 131018B, etc.

Scanning the COC

12.24 Scan every COC into the COC database using the copy machine in Receiving by selecting:

12.25 Template → COC → Portrait **or** Landscape → File/USB → in the "file name" field, add the ARF number then a space then COC (Ex. 90865 COC)_ → OK → OK → Scan.

(Note: the "→" indicates to press that function)

Sample Log-in: Generating the ARF, Labels and Inventory Sheet

- Open Labworks. Enter your username and password.
- Select Login
- Select Multi-Sample Login
- Select RECV1.MLT, double click

12.26 Log-in sample IDs in the order it is listed on the COC.

12.27 A **maximum number of 40 samples** is allowed for each ARF, in order to properly manage the labeling of containers and the review ARF with COC.

12.28 Samples with a quick turn are placed on a separate ARF and are logged in first.

12.29 Fill in the following information by placing your cursor under the header and complete the cells:

(Note: The client's information, turn around time, matrix, delivered, will appear in all CAPS no matter what setting your keyboard is on)

- Client Code, right click. (The client's information will appear in all CAPS no matter what setting your keyboard is on) Choose Select Client Name. Type in the first few letters of the client's name and highlight the name you have selected; double click. The Client's name, address, etc. will show up on line one (1) of the Labworks MultiSample Login spreadsheet. Check the default info in the client code against the COC or an old ARF from the same project and client (Note: Not all client codes are set up to match the clients COC's perfectly, there may be some variation between the two. If you are unsure of which has the correct information, either use an old ARF or contact the PM. Always defer to the client code unless told otherwise, and always double check before making changes).
    - Short client name
    - Full client name
    - Street
    - City and Zip
    - Contact
    - Phone
    - Fax
- TurnAround Time: Determine the turn around time from the COC (e.g., Std)
- Matrix: Water, Soil, or Misc. These words must be typed in exactly as they are written here or they will not be accepted by Labworks.
- Delivered: Enter the name of the courier delivering the samples or if they were picked up, etc. (Ex. FedEx, UPS, GSO, Hand, or Appl Courier)
- Sample Date: This should be on the COC and on the bottles. If there is no date listed on the COC or label, the date which the sample was received will be used as default. If there are multiple dates, the earliest date will be used.

- Collection Time: This should be on the COC and on the bottles. This must be entered in military time. If there is no time listed on the COC or label, the default time 00:01 will be used.
- Client Sample ID: Each line is for each individual sample on the COC. Enter the 1st sample listed on the COC using **CAPS LOCK**.
- The headers IRPMS LOCID (Location), IRPMS SBD (Beginning Depth) and IRPMS SED (Ending Depth) are used only for those clients that note these on the COC.
- MS/MSD: Add MS/MSD, COMP (composite), LCSD, X-SPIKE, LTDVOL (limited volume) as needed.
- Under the header Additional Tests, you would type in special requested analytes, special instructions, etc.
- Chain of Custody: Type in the COC number. If there is no number listed, use the relinquished date on the COC with the letter A, B, C, etc. (See 12.16.2)
- Client Job: This is usually located on the top portion of the COC. The client job description may include a project name, project number or a job name. If a project description is not found then ask the project manager, refer to an older ARF or use NA.
- Make sure the PO Number matches what is on the COC. If there is no PO number, then ask the project manager, refer to an older ARF, or put NA in the cell.
- Under the header Project Manager, verify the project manager's name is entered correctly.
- Verify that the Date Received is entered correctly.
- Enter Time Received as the time the samples were received by the lab.
- Type in the color of all of the Refrigerator(s) where you are placing the samples. You will often have containers going into multiple locations, they must be in the order of VOA first then Walk-in Fridge then Metals Cabinet and lastly Sub Out containers with slashes in between each. For VOA samples, use the designation VOA_Frig or VOA_Freezer. If there is limited room in the field, then use VFRG (for VOA Frig) and VFRZ (for VOA Freezer). For the Fridge locations you will put the capitalized letter of the shelf **dash** the abbreviated the color name, capital letters for the First letter of the color or colors. You will do the same for the Metals cabinet. For the sub outs you can just put SUB. If you have a container for each location there should be slashes in-between. (EX. VFRG/A-Grn/GS-BluYel/SUB.) You may need to rearrange your abbreviations to make this fit in the field provided.
- *** *In the case of receiving a soil that has only one container and it needs to go to both VOA and other departments*, ***VOA must always get the container first***, then it gets moved to the walk in Fridge after. In the Fridge category field type the VOA Freezer first (as it will most likely be a un-preserved jar) then a dash and greater than symbol then your Fridge color, **Ex. VFRZ->A-Green**. This container will need to be put into the Fridge color (A-Green) once the custody tracking window pops up after login (see 12.3 for details on custody tracking), then after the labels are printed, the person logging in will go back to the custody tracking window and put the container into the VOA freezer. This way the label is correct for when it makes its transition into the Fridge from VOA and the COC location is correct. VOA personnel will be responsible for scanning it

from their Freezer and placing it the properly labeled jar into the correct fridge color. Under the Metals, Metals2 and Wetlab2 headers, enter the individual metals or individual wetlab analytes [Specifically on for Anions (300 & 9056) and Alkalinity lists) (. If the metals and/or Wetlab lists are too long or complex, you can add them to the "addtest" or comments fields.

12.30 To list the analyses requested for the samples on the COC, right click any cell on line one (1) and choose Edit Analysis List. Choose the tests to be performed for the(all) sample(s) on the COC. In the right column double click on the tests you do **NOT** need for this set of samples. If analyses are not shown in the right column, find them in the left column and move them to the right column by typing in a test code in the small window below the left column (Speed Search). Once you have found the test code, which you need to move, double click in the left column to move it to the right column. If you remove a code from the right column that you needed, go back to the left and scroll to the very bottom to find recently removed codes, double click to read it back to the right column. To designate containers type @W or @M or @S in the speed search window below the left column; double click to move the common number of containers you need to the right column. (you want to select whatever container amount is majority on your COC, to save time later when editing each individual sample. So if there are 9 samples with 4 containers, and 1 sample with 2 containers, you want to place 4 containers in for this initial sample, as now you only have to edit the 1.) Select Save.

12.31 Go back to line 1, right click and choose Enter Special Info. Make sure that every cell except for "Invoice Attention To" is filled in correctly, change as needed and be sure to add in the final temperature for your cooler/s (just use the corrected temperatures for this field). Choose Save. For entering the ice chest temperature degree sign, hold down the ALT key and type 248. Enter the time zone where the sample was collected in the Time Zone cell. You can go to www.timetemperature.com/tzus/time_zone_codes_us.shtml for the UTC (Universal Time Coordinates) offset table, in which a positive or negative numerical value is given relative to Greenwich Mean Time. Enter this value into the Time Zone cell in Labworks, and the software will properly calculate the time zone relative to Clovis, CA.

12.32 If there is more than one sample, highlight the first line, copy and paste (right click the mouse) onto the next line and every line after that as needed for the number of samples, as per the COC. Enter the correct matrix, collection date and time for each sample. Enter the correct Client ID exactly as it is written on the COC, with the exception of lower-case letters. [All Client ID's need to be logged in with Capital Letters into APPL's LIM System (LabWorks).] If there are different tests for each sample, then right click and choose Edit Analysis List and choose the tests requested on the COC for that particular sample. Delete tests not required by double clicking on that test in the right column. Follow the same procedure to add or remove containers. (see 12.22) If there is a special analyte requested, type under Additional Tests the analyte. You can view a summary of the test codes and containers below the log in spreadsheet. It's a quick way to check that each sample has the test codes and containers needed.

12.33 Select Login on the lower right hand corner.

12.34 Type in the ARF number that you've assigned from the ARF number page and select OK.

12.35 If the "Samples Logged Successfully" window comes up. Click on ok, then go to Results/Custody tracking in Labworks and choose your ARF number. Click on Track Samples and follow the instructions in the next step.

12.36 The Labworks Sample Container Location and Sample Tracking window comes up. Click ARFNumber and select from the list or type in the ARF number. Select Track Samples. This is a list of the samples you entered along with the bottle designations running across the top (@W01, etc.). Change the white cells to black for all the samples that will go into the refrigerator by clicking on the cell or in the column header to highlight all containers in the column. Click on Move Samples and choose the location, click Save Move. The refrigerator you have chosen will replace the cells you highlighted previously. Highlight any other cells that are white, such as all the VOA containers and assign them to the VOA frig or VOA Freezer in the same way. Click Save Changes. Click Exit.

12.36.1 **VOA Department has special storage requirements as follows:**

- Encores – VOA_Freezer
- Preserved TerraCores – VOA_Frig
- Methanol TerraCores- VOA_Frig
- Un-preserved TerraCores – VOA_Freezer within 48 hours of collection
- Soil in jars or sleeves – VOA_Freezer within 48 hours of collection

12.37 A Print Setup window may appear. Click Cancel.

12.38 The Labworks Desktop Sample Login window shows up and tells you how many samples are associated with your ARF number. Verify them and click OK.

12.39 Minimize the Multi-Login window. Click Utilities then Refresh Rollup.

12.40 Open up Modify (during the login process the comments get scrambled and this must be fixed before the ARF is printed), to do this click maintenance then Modify/Delete Samples. Once this window opens click ARF Number and select your ARF (if it doesn't pop up you may not have Refreshed your rollups but you can use cross reference instead, this is also helpful when comparing old ARFs to your current ARF as you can bring up two ARFs and compare them with this feature. Select the box with the three dots, then select ARF and OK, type in your ARF number select OK, and then you have your ARF selected) then select Modify Samples, then Multisample Spreadsheet. Double check all your information is correct and then you will need to fix the comments, select Sample comments at the bottom, select the first sample, then copy the comments from the client code into this space. (*If you do not have the client code open, select Maintenance, Location List, then select Create/Modify Entry, once the window opens, select load and type in the Client code name then select OK, this will open the client code. Select comments and you can copy these into your current ARF) Also be sure to check past ARFs to ensure your comments are as correct as possible (some changes may differ between the client code and the different projects).

12.41 On the Labworks desktop click on Zip Report. Double click on ARFPrint.cef.

12.42 In the bottom left corner select ARFnumber. Select Load.

12.43 Typically the most recently created ARF appears at or near the top of the list. Double click on desired ARF or type in an ARF number then double click or choose OK.

12.44 All the AZ numbers associated with the ARF should show up on the window. Verify the number of samples and choose Done.

12.44.1 **NOTE: During sample log in, If a sample on the client's COC was inadvertently missed, then the next available APPL ID will be assigned**

to that sample and added AFTER the last sample on the ARF (not in the middle of the ARF APPL ID numbers).

12.45 On the next screen click on "Print Labels" and a window will have all the containers received listed on the left side. (All container labels are printed with indelible ink on water resistant labels.) On the right side will be listed the refrigerator color. To complete the containers inventory sheet, highlight the assigned containers (i.e. W01, etc.) and select the pull down menu at the top left corner. Select the appropriate container description. Select Change Container Type. Continue in this manner until all the containers have a description, ensure you assign the containers in the following order:

- Encore or VOA vials are placed first (unless they are being subbed out) (if you have Terracores the MeOH vials always go last.)
- Plastic - Unpreserved Small containers then large
- Plastic - Preserved Small containers then large
- Glass - Unpreserved Small containers then large
- Glass - Preserved Small containers then large
- Metals with HNO_3 or unpreserved containers that will later have HNO3 added
- Sub-out work

12.46 Assign NA for all vials, unpreserved and subcontracted containers, leave the pH space blank for all containers with Acid or Base (VOA being the only exception) as they need to be tested and the true number written on the container sheet, to be input into the system at a later point.

12.47 Choose Print Sample Receipt Form. Print the APPL Sample Receipt Form on the screen.

12.48 Choose Print Labels, then select Print Labels for Every Sample in ARFPrint. Exit the window.

12.49 Back at the Welcome window, select Print an ARF. If you wish you could modify the metals list, which will print by individual sample and test code: Do you wish to modify the ARF metals list? Choose Yes or No or Cancel. "Yes" takes you to a table to modify metals lists by sample and test code. If you choose yes, make changes to lists, then close the window. "No" takes you to ARF: report. "Cancel" takes you to the Welcome window.

12.50 Print the ARF.

12.51 Once the ARF is printed, the person logging in will then split the ARF apart and compare it against the COC, Client Code, and old ARF's from the same project to ensure all information is accurate as possible. The person will take a blue or black pen and make physical check marks next to all the information on the ARF as the check if its correct. (Checking Client code, Client name/Information, Address, Project Name, Fridge colors, Sample Matrixes, Sample IDs, Dates/Times, Analysis Codes, etc.) If they come across a mistake they will strike one line through it and write in the correction next to it, then go to Modify immediately and fix the error. When finished they will write on the right side of the ARF comments the word Reviewed with their Initials and the Date.

12.52 If the receiving supervisor is not the technician logging in the ARF, then after the ARF is checked by the technician logging in they must pass it on to the receiving supervisor to review it before it can be labeled. If an ARF must be labeled before the supervisor can review it, the receiving technicians labeling will leave the written

on original white copy of the ARF on top for the receiving supervisor to review before a fresh copy is printed and the ARF is taken to the front.

Sample Layout, Labeling and Storage

12.53 Before pulling samples out to label, the technician will take a red pen and make physical check marks next to all the information on the ARF as the check if its correct. (Checking Client code, Client name/Information, Address, Project Name, Fridge colors, Sample Matrixes, Sample IDs, Dates/Times, Analysis Codes, etc.) If they come across a mistake they will strike one line through it and write in the correction next to it, then go to Modify immediately and fix the error. They will also pull out the CNF to ensure there isn't anything they need to know before opening the coolers. When finished they will write on the right side of the ARF comments the word Reviewed with their Initials and the Date underneath the initials of whoever logged in the samples.

12.54 Now after having reviewed the ARF and CNF**, if one or more of the coolers that are about to be unpacked are out of temperature, the receiving tech will find those coolers first.** They will then proceed to unpack and notate all the ID's and container types that reside in the out of temperature cooler/s on the CNF. They will also place a sticker that says "Out of temperature _____℃. Check with a PM before proceeding." on all the containers within that cooler. Then email that information to the PM immediately before opening the rest of the coolers for that ARF.

12.55 When pulling out samples from coolers the samples are placed on the counter in rows and in the order in which they are listed on the COC supplied by the customer. Place the bottles in the following order:

- Encore or VOA vials are placed first (unless they are being subbed out)
- Small containers then large
- Unpreserved containers then preserved
- Metals with HNO_3
- Sub-out work

12.56 Refer to client labels on containers to determine what analyses to run. If none listed, view "APPL Container List".

12.57 If the samples have short hold times and need to be taken before the containers are labeled (for example, wetlab needs ferrous iron) the analyst/technician must follow the unlabeled sample checkout procedure listed below.

12.57.1 The analyst/technician must bring a copy of the COC, and the backlog if the ARF is already logged in.

12.57.2 They need to locate the coolers that correspond to the COC.

12.57.2.1 If a receiving technician is already in the process of labeling the samples you are looking for, you can work together to finish pulling out all the samples before taking the containers that you need so that the receiving technician can note any deficiencies immediately.

12.57.3 Once all samples have been gathered, the **sample COC logbook** must be filled out by the analyst/technician and a receiving technician/supervisor must check the sample ID's on the labels vs. analyses requested on the COC.

12.57.3.1 **Any deficiencies or discrepancies must be noted on the copy of the COC. If clarification is needed from the Project Manager, Lab Director, QAU Director, or a department supervisor, the**

analyst/technician must wait for further instructions before taking the samples.

12.57.4 Once samples and the COC log book have been verified by receiving personnel, they will sign and date the copy of the COC.

12.57.5 A copy must be made of the signed COC and placed on the receiving supervisor's desk.

12.57.5.1 In the event that receiving personnel are not available to check and sign off on the COC, all other steps will be taken and the analyst/technician will be the one to sign the COC before placing it on the supervisor's desk.

12.58 Once the department has taken the appropriate amount of sample, the container is returned to Sample Receiving, logged back in with the Sample Receiving COC Log Book and the labels are placed on the container.

12.59 Suggestions for sample Layout:

- Take containers out of cooler and check name, time, and date against COC and ARF (for second review process). Lay the containers out in the same order as the COC/ARF, place all containers with the same IDs together as they are all part of the same sample. Put the containers in the same order as they are logged in. (see 12.40, ex. VOA first, smallest to largest, plastic before glass, etc.)
- Pull the containers from the cooler and line them up in chronological order, place the earliest time on one end of the table and the latest on the other. Checking times and IDs as you go to ensure all containers for each sample are together. (if done this way you will need to use caution when placing the label on as the samples as they wont be in order of the COC/ARF)
  - If the COC does not have the time of sampling written down and the bottles do, transfer the time from the bottle to Labworks.

12.60 When samples for volatile analysis are received, the samples can only be at room temperature 5-10 minutes. If there is a time delay in receiving samples, the samples must be placed in a ≤ 6°C environment until the log-in process can be completed.

12.60.1 All VOA vials waiting for responses from the client regarding labeling are placed in a box, labeled with the ARF number and placed on the sample unlabeled cart in the walk-in fridge.

12.61 Before the APPL ID is placed on the container, receiving personnel will double check the APPL IDs against the Client IDs, and initial the label on the W01, S01 or M01 before it is stored (including VOA vials). If the APPL ID does not match the Client ID, then refer to the COC for the correct sample ID and have a second Receiving staff member double check your observation of the discrepancy. Once the discrepancy has been verified by two people, then decide whether or not the error requires LabWorks revision or if the error was a client mistake between the Client's ID and the Client's COC. The Client Sample ID should be **exactly** the same as listed on the COC. If it does not match, then the Lab Director and Project Manager are notified. Make a note on the ARF stating "Container Says…" **Always notate any and all differences** and place your initials and the date next to your note. If the APPL ID matches the COC but not the Container, no changes to the ID, Date, or Time should be made unless the PM or Lab Director states to do so. Photos are required of any discrepancy found on the containers (incorrect IDs, incorrect times/dates, broken containers/lids, missing labels, etc.) Take a photo

using the Standing computer in receiving and send a clear concise email with the photo attached about the issue. (Ex. Email: The COC states the ID as … however the Sample ID states … See photo attached above.)

12.62 Lay the labels out and then colored line(s) are drawn above the number on the label with a marker corresponding to the color of the refrigerator or freezer where the sample(s) will be stored.

12.63 Place the labels on the containers in a vertical direction without covering the Client ID or the sample weights on the VOA sample containers. For odd shaped containers the label may be folded around the container. However, the section of the label containing the bar code must be kept flat.

12.63.1 Some clients write specific analyses on their containers, so ensure they are labeled accordingly. (For Example: If 2 250mL unpreserved plastic containers are received, one being for metals and the other for wetlab, you must check the client label for a notation of which analysis is requested of which 250mL container, then label accordingly.) ***Pay extreme attention to containers that contain preservatives or may need to be preserved, so that they end up in the correct location. If there are no notations for specific analyses and clarity is needed on how to move forward with labeling, ask the receiving supervisor for assistance.

12.63.2 If one of the VOA vials has an air bubble, then do not label that one as W01. Instead, make it the W03 container, or whatever the last VOA container number is, make any VOA with no bubbles the first VOA containers. When labeling you can tap the containers for air bubbles to shake up any air that might be present, place these containers upside down on the table in order of no bubbles to bubbles, this makes it easier when labeling them.

12.63.2.1

12.63.3 Some clients assign a unique number to each container. In these cases arrange the containers in sequential order and then attach the labels.

12.64 APPL sample numbers are placed on the top of all containers except for VOA vials.

12.64.1 All samples received for volatile analysis are labeled and taken directly to the VOA department, along with a copy of the ARF as soon as possible. Un-preserved TerraCores, soil jars, and encores go in the VOA Freezer.

12.64.1.1 If more than one analysis is required of a single container and volatile analysis is one of them, VOA always gets the container first.

12.64.2 For client errors, the discrepancy is noted on the CRF and may not require LabWorks revisions (Labworks revisions are only for login errors or client requested changes).

12.64.3 If LabWorks revisions are required, then make the necessary changes **immediately after noticing the lab's login error**.

12.65 **A new sticker is required** whenever a discrepancy has been noted and changed between the APPL and Client ID's or when samples are moved from one ARF to another**. It is not acceptable to hand-correct a sticker label.** All corrections must be done electronically in LIMS and then new stickers re-printed.

12.66 Take the pH of all preserved aqueous samples according to the Checking the pH of Samples section and note on the Sample Inventory Sheet the sample pH, these values will be added into Labworks later.

12.67 If there are jars or bags that contain 90% rocks with very little soil the Lab Manager must be notified.

12.68 Other stickers may be placed on the containers when necessary. See the Special Labeling Section below.

12.69 The samples are placed in the assigned refrigerator.

12.69.1 For Metals containers stored in the cabinets: Be sure to put them in the correct lettered and colored cabinet (NM-BlackTeal for example).

12.70 Fill out the Cooler Receipt Form and the SRQCS including the communication section before moving onto the next set of samples.

Checking the pH of Samples

12.71 The pH is checked immediately after labeling on all preserved aqueous samples except VOA vials and sub outs. VOA personnel check VOA vial preservation after analysis is complete. For weekend and holiday sample arrivals, see section 12.112 of this SOP.

12.72 When a sample is acidified below pH 4 use Baker (or equivalent) pH indicator strips that are in the range of 0-2.5. The normal pH level for a preserved acid sample is less than 2. If it is higher than 2 it is noted on the CRF form and the project manager is notified.

12.73 For basic samples above a pH of 8, use EMD (or equivalent) pH indicator strips that are in the range of 0-14. The normal pH level for a preserved basic sample is greater than 12. If it is less than 12 it is noted on the CRF and the project manager is notified.

12.74 The container is vigorously shaken and inverted at least three times to mix the sample.

12.75 The sample container lid is removed a small amount of sample is poured into the cap. A pH strip is used to test the sample from the cap. The pH strip is **NOT** inserted into the sample container.

12.76 If the pH does not meet the preservation requirements and needs to be adjusted, notify the project manager who will notify the client, In addition, the appropriate department supervisor will be notified via email from the Receiving Department.

12.77 The appropriate department personnel will make the pH adjustments as needed per the method of analysis for containers that do not meet their preservation requirements.

12.78 The pH of the sample is noted on the top or side of the sample bottle and also on the initial draft Sample Inventory Sheet. The initial inventory sheet is then used to enter the pH values electronically into LabWorks, and a final copy of the sheet is printed. A copy of BOTH the initial and final Inventory Sheets must be retained and kept together with the original hard copy ARF.

12.79 The containers will then be placed on the Receiving Preserve Cart until the department technician preserves the container. Once the containers are preserved, the department technician moves the containers to the appropriate storage location as designated on the APPL label.

12.80 The Receiving personnel will check the Receiving Preserve Cart at the end of the day to make sure the preservation has been done. If it has not been done yet, the Receiving Dept will remind the Lab Department or the PM (via email) that the preservation needs to be done immediately and the sample container moved to the storage location listed on the APPL label.

Special Stickers and Labeling

12.81 Blue Dot:

12.81.1 All samples containers suspected to be highly contaminated are labeled with a “blue dot” sticker. This “blue dot” tells the laboratory personnel that this is a suspect sample and to take the proper precautions. (See section below titled “**Handling Samples Suspected to be Highly Contaminated”**)

12.82 Red Dot:

12.82.1 When samples need to be filtered or preserved by the laboratory, the appropriate section is notified and the containers are labeled with a “red dot” sticker.

12.82.2 When the lab filters and preserves samples, it is noted on the cooler receipt form.

12.83 Limited Volume:

12.83.1 When a limited amount of sample is received a “limited volume” sticker is placed on the container and a notation is made on the CRF.

12.84 Composite:

12.84.1 If samples are to be compositied, then a “composite” sticker is placed on each container and the number in the sequence is indicated. For example: “composite 1 of 3,””composite 2 of 3” and so on.

12.85 Hold:

12.85.1 When samples are put on hold by the client, the containers are labeled with a “hold” sticker

12.86 Extract and Hold:

12.86.1 When client’s request that samples be extracted and held, the containers are labeled with an “extract and hold” sticker.

Completion of the Cooler Receipt Form

12.87 A Cooler Receipt Form (CRF, See Table 1) is completed for every group of samples received. This form documents the condition of the cooler(s) and samples upon arrival at the laboratory.

12.88 You must note **any and all** abnormalities or departures from the acceptance policy, on the CRF as clearly as you are able to. This paperwork gets stored with the final ARF and allows everyone access to see any deficiencies that the ARF may have had. Ensure you are using the Client IDs when referring to the samples and their deficiencies.

12.89 The project manager is notified by email of **any and all** abnormalities or departures from the acceptance policy.

12.89.1 Email the project manager any deficiencies. In the subject line write ARF XXX and the Client Name. In the email write:

- Attach the COC to the email
- Write in and all deficiencies as clearly as you can, use the Client IDs when referring to the samples as these emails will be forwarded to clients and they do not yet have access to APPL IDs.

12.89.2 Print the email and attach it to the ARF.

12.89.3 The project manger will inform the client of deviations from the relevant test method. All communication is documented on the form.

Completion of the Sample Receiving Quality Control Sign off Sheet

12.90 After labels have been placed on the sample containers and the CRF and inventory sheet have been completed, the technician will then proceed to documenting their review of the ARF on the Sample Receiving Quality Control Sign Off sheet

(SRQCS, See Table 4). This form is only needed for reports that require DVP type reports.

12.91 The person who applied the labels completes the electronic portion of the SRQC. The physical checks are made by the PM at a later point in time.

12.92 The communication section of the SRQCS is completed if any of the following occur:

12.92.1 When samples need to be filtered or preserved by the laboratory, the appropriate section is notified via email. The sample containers are flagged with a red filter and preserve sticker. (See 12.68.)

12.92.2 If the pH of a preserved sample is not acceptable, the appropriate section is notified. (See 12.63.)

12.92.3 The appropriate section should be notified for all RUSH samples (less than 2 weeks), IS samples and all samples that have less than 4 working days of holding time left.

12.92.3.1 Refer to the Holding Times paper located at these locations, the supervisor's desk, the bottle order station, or the standing computer.

12.93 Double-check all client requests on their COC to verify that MS/MSDs are designated on the ARF. On the SRQCS place your initials next to "MS/MSD requests indicated".

12.94 After the paperwork is complete, any log in errors found are noted on the white copy of the ARF. All discrepancies are noted in the comment section, corrections are made and the ARF is amended.

12.95 All paperwork that has been written on is kept with the original white copy of the ARF.

Assembling the Final ARF

12.96 The final ARF and corresponding paperwork is assembled in the following order:

- ARF reprinted (If the receiving supervisor has not checked the ARF yet leave the copy with notes on it until it gets reviewed)
- Container Inventory Sheet
- Incoming Sample Notice and/or Client Compound List and/or FAX/email from client.
- Chain of Custody
- Purchase order form
- Cooler Receipt Form
- Sample Receiving Quality Control Sign Off Sheet (SRQCSO) (Table 4)
- Copies of COCs
- Copies of ARFs where revisions are noted
- Emails related to the ARFs
- CNF
- The PM reviews and completes the ARF, which is then scanned into T:\ARFs Final

Amending the ARF

In Labworks:

12.97 Choose Modify

12.98 Choose ARF number and highlight the ARF to be modified, then OK.

12.99 Choose Modify Sample, Multi-Sample Spreadsheet.

12.100 There are five tabs in the following order: Sample Header Info, Sample Comments, Sample Special Info, Analysis Order, and Setup Header Editing.

12.101 Go to the following tab or window for editing: Sample Header Info:

- sample info
- client information
- job information
- chain of custody number
- turn around time
- submittal information
- refrigerator color
- name of project manager
- invoicing info (in Invoice Address lines 4 & 5 and Report Address line 4)
- sample information
- MS/MSD,LCSD, X-SPK, LTDVOL, Comp, etc (in Report Address Line 5)
- add test
- metals list
- Wetlab list*

*if the info you need to change does not appear in the columns, refer to 12.91 Setup Header Editing.

12.102 Sample Comments: When you choose Sample Comments a window will come up showing the list of samples. Choose the first sample in the list. Add any comment needed and enter your initials and the date. No more than nine lines can be entered. Choose Save.

12.103 Sample Special Info: When you choose sample special info a window will come up showing the list of samples. Choose the first sample in the list. When you fix the first sample's info in Sample Special Info, it fixes the info for the whole ARF.

- COC (Y or N)
- RAD screen
- pH
- Custody seals
- Chest temp
- QC report type
- Invoice (first line)
- Time Zone

12.104 Analysis Order:

12.104.1 To delete one or more of the analyses, perform the following step: Under the sample number and to the right of the code you wish to change, right click on pending. Click on Remove analysis. When removing a dollar code, be sure to remove any prep codes (underscore codes) that go with that dollar code.

12.104.2 To add an analysis, click the first available line under Analysis Ordered. The analysis selection window opens. Either type in the analysis you want to add or scroll down and highlight it. Click OK.[When adding codes always use the pound code and not the dollar code, this way you will not miss any prep codes that go with the dollar code you were looking for. (Pound codes include the dollar code and the prep code for one analysis)]

12.104.3 The code will be transferred to your analysis ordered window.

12.104.4 In order to add an analysis to a sample, click on the cell directly across the added code, under the sample number. Test added will show up as "newtest."

12.105 Setup Header Editing: Remove, add and rearrange headers (columns) as displayed in the Sample Header Info window. Click Save. Changes made under this tab are global, i.e.; not specific to the ARF you are modifying. The next time you enter modify the headers will be arranged as you set them up previously.

12.106 When all changes are completed, click on Sample Header Info tab located on the bottom left-hand corner. Click Save; enter "edit ARF" as reason for change.

12.107 The ARFs are given to reporting department for approval. Any errors or omissions are noted directly on the ARF. If there are changes that need to be made, then amend the ARF as above. A Project Manager will print the final ARF on colored paper and scan them into the ARFs Final folder on the T: drive.

Second Reviewing the ARF

12.108 Once the ARF has been reprinted and assembled in the proper order the labeling technician will put the ARF in the basket labeled "ARF's to be reviewed". From that basket the supervisor or a trained technician can the second review the ARF.

12.108.1 If the Receiving supervisor has not checked the ARF to the COC at this stage they need to before it can be second reviewed and taken to the PM.

12.109 To second review the technician or supervisor will do the following:

12.109.1 Check the ARF to the COC by making physical check marks, if the second reviewer already has done that, they may proceed to the next step.

12.109.2 Check the re-printed ARF to the ARF with notations to ensure all edits have been made correctly.

12.109.3 Check the CRF and ensure the information matches up for that ARF and the samples that were received. They will ensure any deficiencies were noted properly and emailed to the appropriate PM's and departments.

12.109.4 Determine whether or not an SRQC was needed dependent on the report type, and if it was, review that to ensure all the questions were answered correctly and sheet is true to the state of the ARF and samples.

12.109.5 Check to ensure all emails for that ARF were printed out and have been placed with the ARF.

12.109.6 Ensure the ARF is assembled in the correct order and that nothing is missing.

12.109.7 Lastly they will sign their initials on the CRF in the space marked as second reviewer.

Making Changes to a Final ARF (for PMs)

12.110 Changes to a Final ARF are made for various reasons and should be made by the Project manager, which may include:

- Adding or deleting analysis as per client or project manager
- Change in turn around time by client or project manager
- Errors in the log-in process
- Canceling all analyses by client or project manager

12.111 You must have the original ARF to make any changes.

12.112 When all analyses are canceled, obtain the printed ARF from the shelf organizer and write, “cancel” and initial and date. (See the Canceling an Analysis section.)

12.113 To make changes to an ARF, open LabWorks, go into modify and make the appropriate changes. All changes are noted in the comment section of the ARF with your initial and date. (See Amending the ARF section.)

12.114 Any changes that are requested by the client must be documented and the documentation must be attached to the ARF. The documentation may be an amended COC, and email approving changes to the COC or a telephone request to the project manager who makes the changes on the COC, initials, dates and notes the client's name who authorized the change. A copy of the amended COC is sent to the client with the final report.

12.115 The ARF is printed on blue paper, signed off by the project manager, then initialed and dated by the appropriate section managers.

12.116 The revised ARF is scanned and saved in the T:\ARFs Final folder. The pdf is named in the following manner: 5-digits of ARF #-rev (space) client code.

Re-receiving Samples

12.117 When a request for additional analyses or re-analyses is requested, the information is given to the sample custodian or designee in writing. The samples are re-received as follows:

12.118 The container is pulled and checked to see if there is sufficient and appropriate (i.e., correct preservation) volume remaining for the additional analyses being requested.

12.119 The original ARF is pulled and copies are made of the Chain of Custody, Cooler Receipt Form, and Incoming Sample Notice, Client Compound List and any other information the chemist should have.

12.120 The samples are logged into the LIMS system as described in the Sample Log-in portion above. In the delivered by section, enter “in-house.” In the comments section write, “These are the in-house samples from ARF XXX.”

12.121 The original APPL labels are covered or removed so only the new label is visible.

12.122 In the COC Database, the old samples are moved to reanalysis.

12.123 After new labels have been placed, the ARF is peer reviewed and the samples are put back into the assigned refrigerator.

Canceling an Analysis

12.124 If a client requests the cancellation of all analysis before the ARF has been generated, write “Cancel” on the COC with your initials and date. File the COC inin the COC folder in the T:Drive, rescan the COC with the “Cancel” written on it. When Scanning it amend the file name to be ARF # COC Canceled. The samples are placed on the disposal cart, or sent back to the client, if requested

12.125 If a client requests the cancellation of all analysis after the ARF has been generated, the ARF is modified as described in amending the ARF. After deleting all of the analysis codes, replace them with the analysis code “cancel”.

12.126 Print the revised ARF on a blue paper, have the project manager sign off then scan and save the revised ARF in the T:\ARFs Final folder. The PDF is named in the following manner: 5-digits of ARF #-rev# (space) client code.

Samples Arriving on Weekends and Holidays

12.127 During non-business days, weekends, and holidays, a trained laboratory employee will be present to verify cooler temperatures and continue the chilling process in the laboratory's walk-in refrigerator, until the next business day when Receiving Department personnel are able to officially receive the samples. The temperature of the coolers is checked and documented on COC. The entire cooler is kept in tact and temporarily stored in the walk-in fridge to ensure that samples are kept at the accepted temperature of ≤ 6℃.The chemical preservation is verified by receiving personnel on the next business day during the official sample receipt process.

12.128 The status of coolers being delivered by Fed Ex to APPL are to be checked as soon as the technician arrives at the lab in the morning of a weekend or holiday, as follows:

12.128.1 Use the Fed Ex computer located on in the Receiving department to perform the following:

- Use the Chrome web browser to select the book-marked FedEx Insight website. Username: applinc Password: Appl2175

https://www.fedex.com/fcl/;IVSESSIONID=9gwUHyHirvsih68RMU2kXSLVMa_0WRMNahR6VP8Kp1MWEvZi_-xB!140644327?appName=fclinsight&locale=us_en&step3URL=https%3A%2F%2Fwww.fedex.com%2Finsight%2Fentrance%2Ffcl_registration_landing_post.jsp&returnurl=https%3A%2F%2Fwww.fedex.com%2Finsight%2Fentrance%2Fpre_entrance_post.jsp%3FprogramIndicator=

- Check to see how many coolers are arriving that day and their delivery status. Print out a copy from FedEx insight of what is to arrive, make check marks next to each one when the coolers arrive, sign and date the page. This printed copy must be kept with this checklist (for printing log into insight on Chrome as the email is not always reliable)
- Also check the satreceiving@applinc.com email for the following:
  - **"FedEx Tracking: Delivery Exception Reports".** This email would list any coolers that are supposed to be delivered, but are delayed for a certain reason. If a cooler is delayed, notify one of the following managers in this priority order: Receiving Supervisor, QAU, Lab Director. FedEx must be contacted 800-GOFEDEX (800-463-3339), and the cooler tracked in order to determine whether or not it can be delivered to the lab on that day or picked up by lab personnel at the nearest FedEx office. All coolers must arrive on the day they are scheduled, in order to maintain their temperature compliance.
  - Check the satreceiving@applinc.com for any **client emails** forwarded by the lab director or project managers regarding coolers expected to arrive on Saturdays / Holidays. You may also refer to the COCs attached to these emails. When the coolers arrive, verify that all the coolers from client emails actually did arrive. If there are any missing coolers, then notify one of the following managers in this priority order: Receiving Supervisor, QAU, Lab Director. FedEx must be contacted 800-GOFEDEX (800-463-3339) to determine delivery status.
  - Check the satreceiving@applinc.com email for the **"FedEx Tracking: Consolidated PreAlert".** This email lists the coolers scheduled for delivery including their tracking numbers, however it is not as accurate as the FedEx Insight website. This PreAlert email is a helpful tool, but should not be relied upon without checking Insight. Click on the tracking numbers in the email, which will take you to the FedEx

Tracking website to make sure they are all scheduled for delivery that day.

12.128.2 Remove the coolers from the Lockout Room.

12.128.3 Scan the cooler for the presence of ionizing radiation by using the Geiger counter "Ludlum Model 2 Survey Meter" and "Model 44-9 Wand." To do this, turn the black knob to X0.1, take the plastic cover off of the scanning wand and pass the wand about 6" around the cooler. The background for this instrument is between 50-100 clicks per minute. As a general rule anything above 100 clicks per minute (1K on the needle gauge) will be the cut off acceptance level. If the clicks per minute exceed 100 (1K on the needle gauge) then the weekend receiver should call the lab director for further instructions on how to proceed.

12.128.4 If there are custody seals, then cut the bottom end of the tape below the custody seal. Lift up the cut end of the seal (like a hinged door) and open the cooler lid without taking the seal completely off from the cooler (if possible). Place the custody seal on the top of the cooler.

12.128.5 Coolers are to be opened under a hood.

12.128.6 Remove the COC from each cooler. Sign the COC at the first available space or in received by lab signature space at the bottom of the form. The time the cooler was removed from the Lockout Room (not the time the cooler was opened) is documented on the COC next to your signature.

12.128.7 The temperature of the cooler is taken using the temp blank if provided by the client, or thermometer placed inside the cooler for at least 5-10 min (if temp blank is not provided). **See section 12.13 & 12.14 for instructions on how to take temperatures in detail.** Record the temperature on the upper right hand corner of the COC. **If the temperature is outside 2℃ – 6℃, then notify the Lab Director or QAU immediately**. Send an email to the Lab Director and CC the Project Manager in charge and the Receiving Supervisor. Put the name of the client and the project in the email and say what the temperature was at. (if the PM is unknown then CC all the PMs.) Their contact information is located on the Saturday Sample Receiving Checklist in the appendix of this SOP.

12.128.8 The signed COC is puton the Receiving Supervisors desk on the Clipboard with ARF numbers.

12.128.9 The pH of preserved containers will be recorded by Receiving personnel on the next business day, after the samples are logged into the LIM System (LabWorks).

12.128.10 Any broken aqueous samples should be left in the coolers so that the labels can be retrieved later. If soil samples are received cracked or broken, the sample may be placed into a larger jar or Ziplock bag, as long as the sample has not been compromised, until the client has been notified and approves analysis to be performed on the broken sample. Please leave a note on the COC, telling Sample Receiving that there were broken samples enclosed. **Notify the QAU or Lab Director immediately if breakage has occurred.**

- Once the client approves a broken soil sample for analysis, the contents of the jar are transferred into a clean, labeled glass jar using gloved hands and a clean spatula.
- Do not transfer broken pieces of glass into the new container.

- Only transfer the portions of the sample that did NOT come into contact with laboratory surfaces that may potentially contaminate the sample.
- Consult the QAU or Lab Director or project manager when transferring any client's sample into another jar.
- This procedure also applies to sample jars that are inadvertently broken by laboratory personnel.

12.128.11 When Encore® samples are received, first see if there is any VOA personnel working and let them know Encores® have arrived. If there is no one in the VOA department then call the Lab Director or QAU. The Lab Director / QAU will contact the proper personnel in the VOA department to have the samples extruded. Using the Saturday Receipt email and hard copies provided by the lab director, check to make sure all coolers have arrived as expected. Look at the client name and project name on the COC to verify the correct coolers have arrived.

12.128.12 When unpreserved TerraCores arrive, they must be placed in the VOA FREEZER (not the refrigerator). Make sure the 2 unpreserved TerraCores go in the freezer, and the methanol TerraCore goes in the refrigerator.

12.128.13 If all expected coolers have been arrived and have been properly received on Saturdays or holidays, the receiving technician will notify the lab manager or QAU via text that samples have been received.

12.128.14 **If a Fed Ex shipment has not been delivered within the scheduled time frame, then the technician will contact following mangers in this priority order: Receiving Supervisor, QAU, or Lab Director <u>before leaving the lab</u>, so that an employee can go to the lab later in the day and verify whether or not a shipment was received.**

12.128.15 In certain situations, it may be necessary for the Lab Director / QAU to contact the Fed Ex Clovis office and coordinate for any missing coolers. The APPL technician may need to pick up the missing cooler(s) later that day at the Clovis Fed Ex office:

Clovis Fed Ex office
3225 Villa Ave, Clovis, CA 93612 · (800) 463-3339

12.128.16 On Saturdays before the technician leaves the laboratory, they will fill out the "Saturday / Holiday Sample Receiving Checklist" and place it on the Receiving Supervisor's desk, to be scanned into the server for electronic filing. See Table 7 at the end of this SOP.

Receiving Samples After Hours

12.129 For special circumstances in which the client requests to deliver samples before or after business hours M - F (8am - 5pm), the project manager will notify the lab director so that special arrangements can be made for APPL staff to meet the client at the laboratory. APPL personnel will sign the COC, document the temperature of the cooler on the COC, take and document the pH of the samples on the container (where applicable) upon receipt. The samples will then be stored in the walk-in refrigerator and completion of the login process with ARF generation will take place during the next normal business hours.

Courier Transportation

12.130 APPL provides local courier service, which is scheduled by project managers through the Courier Calendar in ARF Summary. APPL couriers are responsible for picking up samples that have been properly packaged and preserved by the client before the courier's arrival on site. See SHR027 Courier Duties for more information.

Receiving Biohazard Samples

12.131 Biohazard samples are not accepted at the lab. Biohazard samples are samples that come from warm-blooded animals (tissues, blood, etc). If any sample is suspected to be a biohazard, the lab director will be notified and asked how to proceed. Suspected biohazard samples may be sent to another lab to be tested for biohazard material. If the samples are found to be biohazard free, they can be shipped back to APPL if requested by either the client or the Lab Director.

Handling Samples Suspected to be Highly Contaminated

12.132 All coolers are RAD screened and opened under a hood.

12.133 Wear gloves and lab coat whenever handling samples. Wear a respirator if needed.

12.134 All samples containers suspected to be highly contaminated are labeled with a "blue dot." This "blue dot" tells the laboratory personnel that this is a suspect sample and to take the proper precautions.

12.135 Once the samples have been labeled, the project manager will instruct the receiving on where to store the samples away from other client samples.

Removing Broken Containers

12.136 The following steps are taken if there are samples with broken containers in the cooler:

12.137 Remove all of the unbroken sample containers from the cooler.

12.138 Notify the Project Manager to determine if the contents are known to contain contaminated samples.

12.139 If the cooler is known to contain samples from a hazardous waste site as per the Project Manager, the cooler is put aside until further steps are determined as to when the client will pick up the cooler.

12.140 If it has been determined that the cooler has not come from a waste treatment facility or a hazardous waste side it can be removed to the back of the building by the dumpster.

12.141 A picture of the broken container(s) is taken before disposal. The photo is emailed, along with the COC to the appropriate project manager, who will notify the client.

12.142 Check the pH of the water in the cooler. If the water is acidic (pH <5), then neutralize with sodium hydroxide as needed before disposing of the water. If the water is alkaline (or basic pH>8), then neutralize with small amounts of dilute acid prior to disposing of the water. Check with the department supervisor or lab manager for appropriate acid to be used for neutralizing specific preservatives from broken containers.

12.143 Spill the contents onto the ground to let the water and ice separate from the broken glass.

12.144 Sweep the glass up with a dustpan and broom and put it in the dumpster.

12.145 Rinse out the cooler with a bucket of water and let dry outside.
12.146 Broken containers are noted on the cooler receipt form.
12.147 When breakage occurs and causes insufficient volume for the analyses requested, the breakage is noted on the cooler receipt form and the project manager is notified. If the Project Manager is unavailable, the Lab Director is notified and the COC is emailed to the client or the client is notified by phone.

Coolers with Missing, Incorrect or Extra Samples

12.148 If samples are missing, Receiving will notify the Project Manager and/or the Lab Director immediately and will have them search for the sample containers. A second person other then the person unpacking the cooler in receiving is to check the following places for the missing samples: the cooler, the sample log out book, and the unlabeled sample cart. The packing materials and ice will not be put into the dumpster until the Project Manager and/or the Lab Director have signed the SRQCS.
12.149 If extra samples are received, Receiving will notify the Project Manager and/or the Lab Director. The extra samples are noted on the cooler receipt form and signed off by the Project Manager and/or the Lab Director. If extra containers for a sample listed on the COC are received then they may be added to the volume, but if a sample is received not listed on the COC wait for PM instructions on how to proceed.
12.150 When a client supplies us with the incorrect sample container notify the Project Manager for further instruction.

13.0 Data Analysis and Calculations - NA
14.0 Data Assessment and Acceptance Criteria for QC - NA
15.0 Corrective Actions & Contingencies for Out of Control Data Unacceptable Data - NA
16.0 Method deviations – NA
17.0 Pollution Prevention

All hazardous materials generated during the testing of samples are properly collected and stored. Drums are available in the storage room for the following types of wastes: acidic, basic and solvents. For more information on pollution prevention refer to APPL SOP # SHR012.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and lands disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations. For more information on waste disposal refer to APPL SOP # SHR012.

19.0 Method Performance - NA
20.0 Equipment/Instrument Maintenance and Troubleshooting - NA
21.0 Computer hardware and software Perkin Elmer Labworks ES LIMS, version 5.7
22.0 References DoD QSM version 5.3, May 2019
23.0 Any tables, diagrams, flowcharts, validation data

Table 1: Cooler Receipt Form (Example)
Table 2: Sample Acceptance Policy (Example)
Table 3: Inventory Sheet (Example)
Table 4: Sample Receiving Quality Control Sign-off (SRQCS) (Example)
Table 5: Analysis Request Form (ARF) (Example)
Table 6: Chain of Custody (Example)
Table 7: Saturday Receiving Duties

Table 8: Cooler Notation Form (CNF)

Section Manager Name: Megan Salata

Section Manager Signature: _____ Date: 02/22/22

QAU Director Name: Paula McCartney

QAU Director Signature _____ Date: 02/22/22

Table 1

COOLER RECEIPT FORM

1) Project: _____ Date Received: _____
2) Coolers: Number of Coolers:_____
3) YES NO Were coolers and samples screened for radioactivity?
4) YES NO Were custody seals on outside of cooler? How many?____Date on seal? _____
5) Name on seal?_____
6) YES NO NA Were custody seals unbroken and intact at the time of arrival?
7) YES NO Did the cooler come with a shipping slip (air bill, etc.)? Carrier name:_____
8) Shipping slip numbers:1)_____2)_____3)_____
9) YES NO NA Was the shipping slip scanned into the database?
10) YES NO NA If cooler belongs to APPL, has it been logged into the ice chest database?
11) Describe type of packing in cooler (bubble wrap, popcorn, type of ice, etc.):_____
12) YES NO NA For hand delivered samples was sufficient ice present to start the cooling process?
13) YES NO Was a temperature blank included in the cooler?
14) Serial number of certified NIST thermometer used:_____Correction factor: _____
15) Cooler temp(s): 1)_____2)_____3)_____4)_____5) _____6)_____7)_____8)___

Chain of custody:

16) YES NO Was a chain of custody received?
17) YES NO Were the custody papers signed in the appropriate places?
18) YES NO Was the project identifiable from custody papers?
19) YES NO Did the chain of custody include date and time of sampling?
20) YES NO Is location where sample was taken listed on the chain of custody?

Sample Labels:

21) YES NO Were container labels in good condition?
22) YES NO Was the client ID on the label?
23) YES NO Was the date of sampling on the label?
24) YES NO Was the time of sampling on the label?
25) YES NO Did all container labels agree with custody papers?

Sample Containers:

26) YES NO Were all containers sealed in separate bags?
27) YES NO Did all containers arrive unbroken?
28) YES NO Was there any leakage from samples?
29) YES NO Were any of the lids cracked or broken?
30) YES NO Were correct containers used for the tests indicated?
31) YES NO Was a sufficient amount of sample sent for tests indicated?
32) YES NO NA Were bubbles present in volatile samples? If yes, the following were received with air bubbles:
Larger than a pea: _____
Smaller than a pea: _____

Preservation & Hold time:

33) YES NO NA Was a sufficient amount of holding time remaining to analyze the samples?
34) YES NO NA Do the sample containers contain the same preservative as what is stated on the COC?
35) YES NO NA Was the pH taken of all non-VOA preserved samples and written on the sample container?
36) YES NO NA Was the pH of acid preserved non-VOA samples < 2?
37) YES NO NA Was the pH of sodium hydroxide preserved samples for Cyanide > 12 and Sulfide >9?
38) YES NO NA Unpreserved VOA Vials received? _____
39) YES NO NA Are unpreserved VOA vials noted in the ADD TEST FIELD on the ARF? _____
Lab notified if pH was not adequate:_____
Deficiencies:_____
_____
_____
_____
_____
_____
_____
_____

Signature of personnel receiving samples: _____Second reviewer: _____
Signature of project manager notified:_____Date and Time of notification:_

Name of client notified:_____Date and Time of notification:_
Information given to client: _____
_____ by whom
(Initials): _____

Table 2

Sample Acceptance Policy

Please be aware APPL, Inc. has adopted a new sample acceptance policy to insure the integrity of our project and to uphold regulatory requirements. All incoming work will be evaluated against the criteria listed below. Where applicable, data from any samples that do not meet the criteria will be noted in the laboratory report defining the nature and substance of the variation.

- Samples must arrive with labels intact and with a Chain of Custody filled out completely and legibly. The following information must be recorded:
  - Client name, address, phone number and fax number (if available)
  - ***Project name and/or number***
  - The sample identification
  - Date, time and location of sampling
  - The collectors name
  - The matrix description
  - ***The container description***
  - ***The total number of each type of container***
  - Preservatives used
  - Analysis requested
  - Requested turnaround time (TAT)
  - Any special instructions
  - Purchase Order number or billing information (e.g. quote number) if available.
  - The date and time that each person received or relinquished the sample(s), including their signed name as well as the date and time of receipt of when the APPL technician who received the samples in the lab.
  - **Information must be legible**

- Samples must be properly labeled.
  - Use durable labels (labels provided by APPL, Inc. are preferred)
  - Include a unique identification number
  - Include sampling date and time and sampler ID
  - Include preservative used

- ***Use indelible ink***
- **Information musts be legible**

❖ Proper sample containers must be used that provide adequate volume for the analysis and necessary QC that are required for each analysis requested. APPL, Inc. will provide containers when requested.

❖ Samples must be preserved according to the requirements of the requested analytical method or per client QAPP. This includes samples (other than water samples for metals analysis) begin chilling to bellow 6℃. Note: Samples that are hand delivered to the laboratory immediately after collection may not have had time to cool sufficiently. In this case the samples will be considered acceptable as long as there is evidence that the chilling process has begun (arrival on ice). A temperature blank must be included in each cooler.

Chemical preservation (pH) will be verified prior to analysis during login and the project manager will be notified immediately if there is a discrepancy. If analyses will still be performed, all affected results will be flagged to indicate improper preservation. In the case of volatile analysis, the pH will be taken after analysis.

❖ Sample Holding Times
APPL, Inc. will make every effort to analyze samples within the regulatory holding time. Samples must be received in the laboratory with enough time to perform the sample analysis. Except for samples with short holding time (<48hr HT) samples must be received with at least 60 hrs (2.5 working days) remaining on the holding time for us to ensure analysis.

Analyses that are “field” analyses (e.g. pH, DO, residual chlorine) will be analyzed within 24 hours from receipt of the samples in the laboratory. Field analyses samples received after 4:00pm on Friday or on the weekend will be analyzed no later than the next business day after receipt (Monday unless a holiday).

❖ The project manager will be notified if any sample is received in damaged condition. APPL, Inc. will request that a sample be resubmitted for analysis.

❖ Recommended for packing samples for shipment:

- Pack samples in ice rather than “Gel” ice packs.
- Place ice in zip lock bags to avoid leakage.
- Soil sample should be placed in plastic zip-lock bags. The containers often have dirt around the top and do not seal very well and are prone to intrusion from the water from melted ice.
- Water samples would be best if wrapped with bubble-wrap or paper (newspaper or paper towels work) and then placed in plastic zip-lock bags.
- Fill extra cooler space with bubble wrap and popcorn.
- Always include a temperature blank in each cooler.

I have read and understand the above requirements regarding the sample acceptance policy at APPL, Inc.

_____

Signature **Date**

Table 3

INVENTORY SHEET (APPL Sample Receipt Form)

Initials _____ Date _____ APPL Sample Receipt Form ARF# **58262**

Sample	Container Type	Count	pH	Sample	Container Type	Count	pH
AX91850	[1] PL Liter	1					
	[6] PL 500mL - HNO3	1	1.7				
	[13] VOAs - HCL	3					
AX91851	[13] VOAs - HCL	3					

ARF Number: _____

Table 4 - Sample Receiving Quality Control Sign Off

Analysis Request Form	Reviewers Initials/Date		
Is the chain of custody attached?	Yes	No	NA
Is the COC number entered correctly?	Yes	No	NA
Is RAD screen performed entered correctly?	Yes	No	NA
Is pH check performed entered correctly?	Yes	No	NA
Turn around time entered correctly?	Yes	No	NA
Date received entered correctly?	Yes	No	NA
Time received entered correctly?	Yes	No	NA
Delivered by name entered correctly?	Yes	No	NA
Is shuttle custody seals entered correctly?	Yes	No	NA
Is Time Zone entered correctly?	Yes	No	NA
Ice chest temp.entered correctly?	Yes	No	NA
Project manager entered correctly?	Yes	No	NA
Client ID's from chain entered correctly?	Yes	No	NA
APPL ID's have correct matrix designation?	Yes	No	NA
Sample date entered correctly?	Yes	No	NA
Sample time entered correctly?	Yes	No	NA
MS/MSD requests indicated? (Initial)_____	Yes	No	NA
% moisture indicated?	Yes	No	NA
Limited volume indicated?	Yes	No	NA
Are samples on hold labeled correctly?	Yes	No	NA
Are subcontract COCs attached?	Yes	No	NA
COC scanned to pdf?	Yes	No	NA

	Project Manager Intials/Date		
Client name correct?	Yes	No	NA
Client address correct?	Yes	No	NA
Attention name correct?	Yes	No	NA
Client phone number and fax number correct?	Yes	No	NA
Project name or number correct?	Yes	No	NA
PO number correct?	Yes	No	NA
Correct analyses requested entered on ARF?	Yes	No	NA
Correct Labworks codes used for each matrix?	Yes	No	NA
Correct codes used for client/project?	Yes	No	NA
Correct metals listed?	Yes	No	NA
Subcontract COCs correct?	Yes	No	NA
QC report type entered correctly?	Yes	No	NA
Comments entered correctly?	Yes	No	NA
Invoicing information entered from chain?	Yes	No	NA
A special spike, if needed, is entered?	Yes	No	NA
Are samples on hold labeled correctly?	Yes	No	NA
Limited volume indicated, if needed?	Yes	No	NA

Physical Check of Samples	Reviewers Initials/Date		
APPL ID numbers placed on correct samples?	Yes	No	NA
Color of refrigerator/freezer correct on labels?	Yes	No	NA
Has inventory sheet been completed correctly?	Yes	No	NA
pH's recorded on samples?	Yes	No	NA
pH acceptable?	Yes	No	NA
Stickers placed on samples for VOA,GC,& GC/MS?	Yes	No	NA
Were 'hold', 'composite', or 'limited volume' stickers affixed?	Yes	No	NA
Were there missing samples? Checked by: _____, _____	Yes	No	NA

Communication

See attached email for lab notification of: RUSH, Short HTs, Filtering, pH Adjust

Distribution of ARF

Scanned (Initials / Date) _____

Comments:

Table 5

Analysis Request Form (ARF) (Example)

APPL - Analysis Request Form 00000

Client: APPL
Address: 908 N. TEMPERANCE AVE
CLOVIS, CA 93611
Attn: Diane Anderson
Phone: 209-275-2175 Fax: 209-275-4422
Job: EXAMPLE PROJECT
PO #:
Chain of Custody (Y/N): Y # #
RAD Screen (Y/N): Y pH (Y/N): N
Turn Around Type: STD

Received by: TBV
Date Received: 04/06/09 Time: 16:15
Delivered by:
Shuttle Custody Seals (Y/N): N
Chest Temp(s): 20°C
Color: A-GREEN
Samples Chilled until Placed in Refrig/Freezer: Y
Project Manager: DIANE ANDERSON
QC Report Type: STD
Due Date: 04/18/09

Comments:

Sample Distribution:
VOA: 1-$821L

Charges:

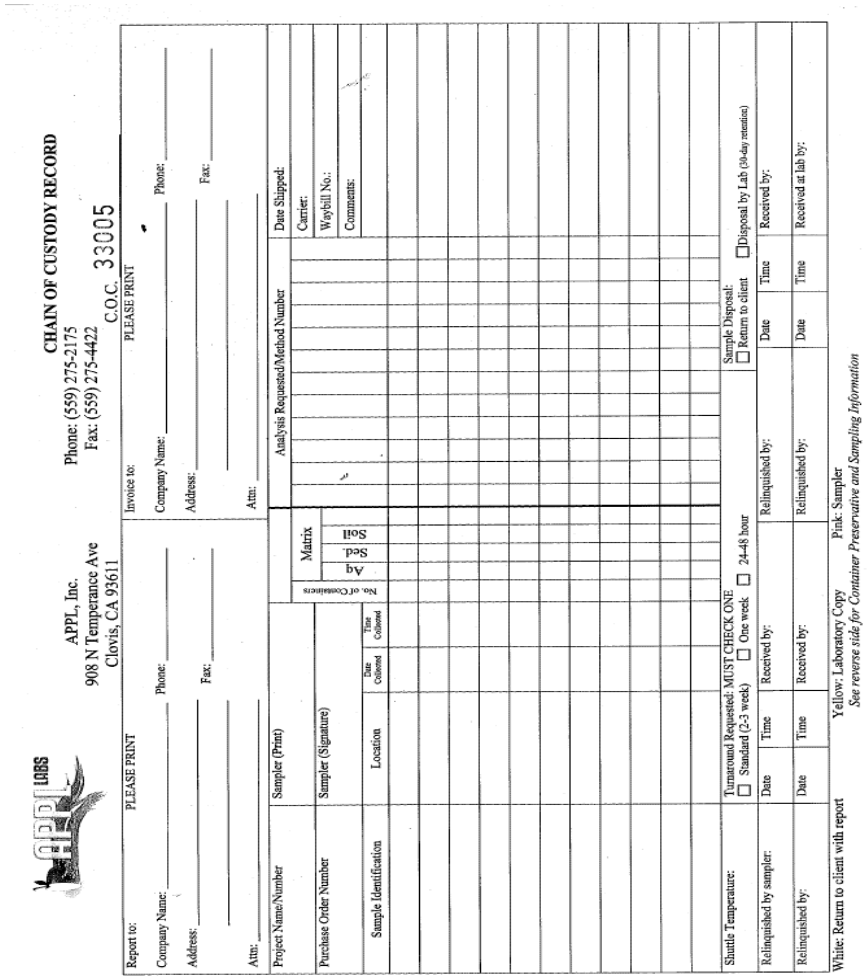
Invoice To:

Client ID	APPL ID	Sampled	Analyses Requested
1. TEMPLATE EXAMPLE	AX94186	04/06/09 00:00	$821L

Page 1 Client Code: APPL *Printed 04/06/09 4:23:03 PM* Computer: APPL-04 # 00000

Table 6

Chain of Custody (Example)



CHAIN OF CUSTODY RECORD

APPL, Inc.
908 N Temperance Ave
Clovis, CA 93611

Phone: (559) 275-2175
Fax: (559) 275-4422

C.O.C. 33005

Report to: PLEASE PRINT
Company Name: Phone:
Address: Fax:
Attn:

Invoice to: PLEASE PRINT
Company Name: Phone:
Address: Fax:
Attn:

Project Name/Number | Sampler (Print)
Purchase Order Number | Sampler (Signature)

Sample Identification | Location | Date Collected | Time Collected | No. of Containers | Matrix: Aq, Sed., Soil | Analysis Requested/Method Number

Date Shipped:
Carrier:
Waybill No.:
Comments:

Shuttle Temperature:
Turnaround Requested: MUST CHECK ONE
☐ Standard (2-3 week) ☐ One week ☐ 24-48 hour

Sample Disposal:
☐ Return to client ☐ Disposal by Lab (30-day retention)

Relinquished by sampler: Date | Time | Received by:
Relinquished by: Date | Time | Received by:
Relinquished by: Date | Time | Received by:
Relinquished by: Date | Time | Received at lab by:

White: Return to client with report
Yellow: Laboratory Copy
Pink: Sampler
See reverse side for Container Preservative and Sampling Information

Table 7

Saturday / Holiday Sample Receiving Checklist

1. Receive Fed Ex coolers and put in walk-in frig
2. Label Samples **(Receiving Personnel ONLY)**
3. Purge and organize the walk-in frig AND metals cabinets.
4. Cleanup Receiving room (pick up trash and sweep or clean out coolers).
5. Sample disposal / draining
6. _____ **Check Lab Refrig/Freezer temps** in book-marked link (Manager's Computer) http://hurley/TempDatabase.php?days=1

7. _____ Use **Fed Ex Computer** to check these 3 resources for in-coming coolers, and make sure **all** coolers have arrived at the lab before going home.
   - Fed Ex Insight. Username: applinc Password: Appl2175 Print a hard copy, and make checkmarks/notes for coolers that arrived. Date/Sign the page.
   - satreceiving@applinc.com email: Check the FedEx "PreAlert" email AND check for any APPL proj manager emails for in-coming coolers. Print the "PreAlert" email, and make checkmarks/notes for coolers that arrived.
   - If ANY of the coolers listed on (FedEx Insight, FedEx PreAlert, or APPL PM emails) did not arrive, then follow step number 7 below.

8. _____ Text or call the Receiving Supervisor, QAU, or Lab Director immediately if there are **ANY issues with temp, breakage, or missing coolers** (Ph # posted on wall). **Also** contact FedEx to find the missing items (customer service line 800 463-3339) have tracking number ready. A plan should be made, and noted below, on how to proceed before leaving the lab.

   Missing Cooler Plan:_____

9. _____ Custody Seals intact & CoC signed with date / time.

10. _____ Temperature documented on CoC for EACH Cooler. Use thermometer to take temp blank inside cooler. If there is no temp blank from client, then use IR Gun on a liquid sample bottle. **FOR CLIENT PROJECT SAMPLES COMING FROM THE STATE OF ALASKA, BOTH TEMPERATURES ARE RECORDED.** *(If no space is provided to record the temperature, please put them in the top right corner of the chain, leave room for the ARF # to be written in later.)*

11. _____ Write the Client name and Temperatures on the top of the coolers tape. If a cooler is out temperature ensure it gets the proper Out of Temperature label per SOP001

12. _____ If all coolers arrived within temp and there were no issues, text the Receiving supervisor that the Saturday receipt was completed.

13. _____ If VOA's TerraCore Soil containers received un-preserved must be placed into the Freezer immediately.

14. _____ Coolers put in Receiving walk-in fridge, locked, key put back on bulletin board hook.

15. _____ Give COC's ARF numbers and send out emails for all Quick TAT's, Short hold times, Out of temp coolers and/or Breakage. Send emails from receiving email and always CC the lab director on all emails. If you are unsure if a COC needs an email contact Receiving Supervisor (CC all PM's if unsure of who is the project manager for a COC). **(Receiving Personnel ONLY)**

16. _____ Clean up and wipe dry the space used.

17. _____ Put this check list along with the copy of the Insight printed page under the Receiving Supervisors keyboard for review.

Signature and date: _____

T:\Receiving\Saturday Receiving Duties

Table 8

Cooler Notation Form – Notes / Deficiencies upon Arrival

Client**:** _____ ARF**:** _____

Project: _____

How many Custody Seals were present? _____
Were they intact? If no write why. **Yes** / **No** _____
Is there a COC? **Yes** / **No**
If no please list the name on the shipper slip in Client name section above and ensure you note the time of arrival
_____

How many coolers were received: _____
Were there temperature blanks in all? **Yes** / **No**
If No, please list how many coolers contained temperature blanks: _____
Were any of the temperature blanks Frozen? **Yes** / **No**
Notes:
_____
_____

Cooler Temperatures

Serial Number for Thermometer: _____
1._____ 2._____ 3._____ 4._____ 5._____ 6._____ 7._____ 8._____ 9._____ 10._____ 11._____ 12._____ 13._____
14._____ 15._____ 16._____ 17._____ 18._____ 19._____ 20._____
*If any issues with temperatures, or how a cooler was packaged notate below.

Type of Packaging in Cooler

___ Bubble Wrap ___ Popcorn ___ Foam ___ Plastic Bags ___ Other
___ Wet Ice ___ Dry Ice ___ No Ice ___ Gel Ice

Notes / **Deficiencies:**
_____
_____
_____
_____
_____
_____

Personnel Receiving Cooler _____
Date _____

Standard Operating Procedure

INDUCTIVELY COUPLED PLASMA-ATOMIC EMISSION SPECTROSCOPY BY EPA METHOD 6010B, 6010C and 6010D

STATEMENT OF PURPOSE

This procedure is used to determine total metals by ICP (inductively coupled argon plasma spectroscopy). This SOP is applicable to EPA methods 6010B ,6010C and 6010D.

INSTRUCTIONS

1.0 Scope and Application

1.1 Inductively coupled plasma-atomic emission spectroscopy (ICP) determines trace elements, including metals, in solution. All matrices, including ground water, aqueous samples, TCLP and EP extracts, industrial wastes, soil, sludge, sediment, and other solid wastes, require digestion prior to analysis.

1.2 Use of this method is restricted to analysts who are knowledgeable in the correction of spectral, chemical, and physical interferences. This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.3 If an individual project has its own QAPP with client specific requirements that are different than the SOP, the QAPP overrides the SOP. This information will be specified in the comment section of the work order.

2.0 Method Summary

2.1 Prior to analysis, samples must be solubilized or digested using appropriate sample preparation methods (3010A and 3050B).

2.2 Method 6010 describes the simultaneous, multi-elemental determination of elements by ICAP. The method measures element-emitted light by optical spectrometry. Samples are nebulized and the resulting aerosol is transported to the plasma torch. Element-specific atomic-line emission spectra are produced by a radio-frequency inductively coupled plasma. The spectra are dispersed by a grating spectrometer, and photomultiplier tubes monitor the intensities of the lines. Background correction is required for trace element determination. Background must be measured adjacent to analyte lines on samples during analysis. The position selected for the background-intensity measurement, on either or both sides of the analytical line, will be determined by the complexity of the spectrum adjacent to the analyte line. The position used must be free of spectral interference and reflect the same change in background intensity as occurs at the analyte wavelength measured. Background correction is not required in cases of line broadening where a background correction measurement would actually degrade the analytical result. The possibility of additional interferences should also be recognized and appropriate corrections made; tests for their presence are described in the QC section.

2.3 The SOP applies to EPA methods 6010B, 6010C and 6010D. EPA 6010C/D have the same method and QC requirements as 6010B except that 6010C/D requires a Lower limit of Quantitation Check (LLQC) (Both LLQC, LLOQ and LLCCV are

interchangeable in our analytical sequences). In addition, EPA 6010D requires single element interference checks every six months at a minimum.

3.0 Detection Limits

Table 1 lists the quantitation limits (LOQ for DoD QSM) for all target analytes. If an individual project has its own QAPP with client specific requirements different from those in Table 1, the client QAPP limits are used.

4.0 Definitions

See SOP# DOC019, Definitions.

5.0 Interferences and Potential Problems

5.1 Spectral interferences are caused by:

- 5.1.1 Overlap of a spectral line from another element at the analytical or background measurement wavelengths
- 5.1.2 Unresolved overlap of molecular band spectra
- 5.1.3 Background contribution from continuum or recombination phenomena
- 5.1.4 Stray light from the line emission of high-concentration elements

5.2 Computer-correcting the raw data after monitoring and measuring the interfering element can compensate for spectral overlap. Unresolved overlap requires selection of an alternate wavelength. Background contribution and stray light can usually be compensated for by a background correction adjacent to the analyte line. The absence of spectral interference from an element in a sample for which there is no instrument detection channel must be verified.

- 5.2.1 Element-specific interference is expressed as analyte concentration equivalents (i.e. false analyte concentrations) arising from 100mg/L of the interference element. For example, assume that As is to be determined (at 193.696nm) in a sample containing approximately 10mg/L of Al. If 100mg/L of Al would yield a false signal for As equivalent to approximately 1.3mg/L. Therefore, the presence of 10mg/L of Al would result in a false signal for As equivalent to approximately 0.13mg/L. The analyst should be aware of the possibility of other interferences when conducting analyses.
- 5.2.2 Generally, interferences are discernible if they produce peaks, or background shifts, corresponding to 2 to 5% of the peaks generated by the analyte concentrations.
- 5.2.3 When creating correction models to computer-correct raw data. Files cannot be saved over and must be given a unique name. The following naming structure is recommended: method-year, month, day and example would be 6010C-060731 for 6010C method-7/31/2006.
- 5.2.4 Every time a new correction model is loaded (either IEC or MSF) the method's file name must be saved under a unique name. Method file names cannot be saved over. Creating a new method file name allows ease of reprocess because each method file saves the corresponding IEC and MSF models that were used for analyses. This procedure also ensures that where calibrations give rise to a set of correction factors that any copies are correctly updated.
- 5.2.5 See section 11.5.2-11.5.3 on how to make an IEC and MSF model.

5.3 Physical interferences are effects associated with the sample nebulization and transport processes. Changes in viscosity and surface tension can cause significant inaccuracies, especially in samples containing high dissolved solids or

high acid concentrations. Differences in solution volatility can also cause inaccuracies when organic solvents are involved. If physical interferences are present, they are reduced by diluting the sample or by the peristaltic pump. Another problem that can occur with high dissolved solids is salt buildup at the tip of the nebulizer, which affects aerosol flow rate and causes instrumental drift. Diluting the sample, changing the nebulizer and removing salt buildup from the tip of the torch can control the problem. The torch and torch tip are cleaned with Aqua Regia. A mass flow controller is used to control the argon flow rate. This improves instrument performance by regulating gas flow with greater accuracy.

5.4 Chemical interferences include molecular compound formation, ionization effects, and solute vaporization effects. Normally, these effects are not ICAP technique. These effects are minimized by careful selection of operating conditions (RF power, argon flow rate, and so forth), and by matrix matching, and by post spike procedures. Chemical interferences are highly dependent on matrix type and the specific analyte element.

5.5 High mineral content may interfere with the instrument's ability to accurately detect specific metal elements in the samples, causing the concentration to be calculated as a negative value. When the sample contains minerals at concentrations above the correction factor set up in the model, then negative intensities and concentrations may be observed for elements in which the minerals interfere, for example Tl may have negative intensities when Ca is detected above the model's interference maximum. For analytes that exhibit negative concentrations, in which the absolute value is greater than the PQL/LOQ, the sample requires either dilution or analysis by ICP-MS. Diluting the sample will decrease the affects of the interfering minerals, and help reduce the negative concentration values to at or below the PQL/LOQ levels. For projects in which the majority of the samples exhibit negative values above the PQL/LOQ, the project manager, lab director, and technical director should be notified in order to consult with the client on a course of action for dilution or analysis by ICP-MS. The analyst should be aware that in certain matrices the concentration may be quantitated as a positive number, where the intensity is negative. Both the intensity and concentration should be reviewed by the analyst and data reviewer for negative values, and appropriate dilutions or model adjustments should be made depending on the type of sample.

6.0 Health and Safety

6.1 Lab coats, gloves, and safety glasses are used at all times. Some samples require the use of respirators. This is on a case by case basis.

6.2 Concentrated nitric and hydrochloric acids are moderately toxic and extremely irritating to skin and mucus membranes. Use these reagents in a hood and if eye or skin contact occurs, flush with large volumes of water. Always wear safety glasses or a shield for eye protection when working with these reagents. Hydrofluoric acid is mentioned in the method, however, because of its toxicity we do not use it.

6.3 Many metal salts are extremely toxic if inhaled or swallowed. Extreme care must be taken to ensure that samples and standards are handled properly and that all exhaust gases are properly vented. Wash hands thoroughly after handling.
The acidification of samples containing reactive materials may result in the release of toxic gases, such as cyanides or sulfides. For this reason, the acidification and digestion of samples should be performed in an approved fume hood.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 Samples are to arrive in plastic or glass containers.

7.2 Aqueous samples must be acidified to a pH of <2 with HNO_3.

7.3 If properly preserved, the sample can be held up to 6 months before analysis In the determination of trace metals, containers can introduce either positive or negative errors in the measurement of trace metals by (a) contributing contaminants through leaching or surface desorption, and (b) depleting concentrations through adsorption. Thus the collection and treatment of the sample prior to analysis require particular attention. To minimize contamination from the sample bottles certified clean bottles are used during sampling. For laboratory glassware and containers, the following cleaning treatment sequence has been determined to be adequate to minimize contamination: detergent, tap water, 1:1 nitric acid, tap water, 1:1 hydrochloric acid, tap water and reagent water.

8.0 Quality Control

8.1 Quality control data should be maintained and available for easy reference or inspection. Refer to Chapter One for additional quality control procedures.

8.2 Whenever there is an out of control situation that cannot be resolved, notify the supervisor and the Project Manager.

8.3 Prior to the analysis of samples, refer to the client QAPP to ensure proper QC was prepared. If there is no client QAPP available, ask the supervisor who will ask the Project Manager.

8.4 Method Detection Limits: Establish the LOD/PQL, LOQ, DL and MDL according to SOP# QC018.

8.5 A Demonstration of Capability (DOC) must be performed for each analyst who prepares or analyzes samples. Prior to working with samples and renewed each year, a DOC must be performed according to SOP# ROU029.

8.6 After setting up the instrument and after significant change an Instrument Detection Limit (IDL) must be determined. Instrument detection limits (IDLs) are useful means to evaluate the instrument noise level and response changes over time for each analyte from a series of reagent blank analyses to obtain a calculated concentration. They are not to be confused with the lower limit of quantitation, nor should they be used in establishing this limit.

8.7 IDLs in µg/L can be estimated as the mean of the blank results plus three times the standard of ten replicates of the reagent blank solution. (Use zero for the mean if the mean is negative). . Each measurement should be performed as though it were a separate analytical sample (i.e., each measurement must be followed by a rinse and/or any other procedure normally performed between the analysis of separate samples). IDLs should be determined at least once using new equipment, after major instrument maintenance such as changing the detector, and/or at a frequency designated by the project. The results are placed into the IDL table The calculated IDLs shall be ≤ PQL (reporting limit). This indicates that the reporting limit is 3 times the noise level of the instrument. Employ one method reagent blank per sample batch to determine if contamination or any memory effects are occurring. A method reagent blank is a volume of reagent water taken through the entire process of sample preparation and analysis.

8.8 At least one laboratory control sample (LCS) must be carried throughout the entire sample preparation and analytical process.

8.9 Analyze a matrix spike (MS) and a matrix spike duplicate (MSD) for every twenty samples or per analytical batch, whichever is more frequent. Some clients require a Matrix spike and an unspiked duplicate (MS/DUP) in lieu of a MS/MSD. The MS/MSD or MS/DUP must be carried throughout the entire sample preparation and analytical process. MS/MSD samples should be spiked at the same level, and with the same spiking material, as the corresponding laboratory control sample that is at the project-specific action level or, when lacking project-specific action levels, at approximately mid-point of the linear dynamic range. For DoD projects, an LCSD is required, if there is insufficient volume for MS/MSD. The relative percent difference between spiked matrix duplicate or unspiked duplicate determinations is to be calculated as follows:

$$RPD = \frac{D1 - D2}{(D1 + D2)/2} \times 100$$

Where:
RPD = relative percent difference.
D1 = first sample value.
D2 = second sample value (spiked or unspiked duplicate).

8.10 It is recommended that whenever a new or unusual sample matrix is encountered, a series of tests be performed prior to reporting concentration data for analyte elements. These tests will ensure the analyst that neither positive nor negative interferences are operating on any of the analyte elements to distort the accuracy of the reported values.

8.11 Dilution Test: If the analyte concentration is sufficiently high (minimally, a factor of 10 above the instrumental detection limit after dilution), an analysis of a 1:5 dilution should agree within ± 10% of the original determination. If not, a chemical or physical interference effect should be suspected. For DoD samples, the dilution test is applicable to analytes with concentrations greater than 50 times the DL.

8.12 Post digestion spike addition: An analyte spike added to a portion of a prepared sample, or its dilution, should be recovered to within 80% to 120% for method 6010C and DoD QSM 5.3 of the known value or 75% to 125% for 6010B/D. The spike addition should produce a minimum level of 10 times and a maximum of 100 times the instrumental detection limit. If this spike fails, then the dilution test should be run on this sample. If both the MS/MSD and the post digestion spike fail, then matrix effects are confirmed.

8.11.1 For DoD samples, a PDS should be analyzed when the dilution test fails or the analytes concentrations in the parent sample are less than 50 times the DL.

CAUTION**:** If spectral overlap is suspected, use of computerized compensation, an alternate wavelength, or comparison with an alternate method is recommended.

8.13 Determined analyte concentrations that are above the upper range limit must be diluted and reanalyzed. The analyst should also be aware that if an Interelement correction from an analyte above the linear range exists, a second analyte where the Interelement correction has been applied might be inaccurately reported. New dynamic ranges should be determined whenever there is a significant change in instrument response. For those analytes that periodically approach the upper limit,

the range should be checked every six months. For those analytes that are known interferences, and are present at above the linear range, the analyst should ensure that the Interelement correction has not been inaccurately applied.

8.14 Mixed calibration standard solutions (CAL): Prepare mixed calibration standard solutions by combining appropriate volumes of the stock solutions in volumetric flasks. Match the matrix with the appropriate acids and dilute to approximate volume with water. Prior to preparing the mixed standards, each stock solution should be analyzed separately to determine possible spectral interference or the presence of impurities. Care should be taken when preparing the mixed standards to ensure that the elements are compatible and stable together. Transfer the mixed standard solutions to unused polyethylene bottles for storage. Fresh mixed standards should be prepared, as needed, with the realization that concentration can change on aging. Calibration standards must be initially verified using a second source quality control sample and monitored for stability each day the calibration standards are used (ICV - Initial Calibration Verification Sample). All mixtures should then be scanned using a simultaneous spectrometer to verify the absence of Interelement spectral interference in the recommended mixed standard solutions.

8.15 The interference check solution is prepared to contain known concentrations of interfering elements that will provide an adequate test of the correction factors. Interference Check Solution A (ICSA) contains 100ppm Al, Ca, Mg, and Fe. This is used to check interference on elements with zero concentration in solution. ICSAB has the same concentration of Al, Ca, Mg and Fe, in addition it contains the other metals at varying higher concentrations. The ICSAB checks interference on elements at greater concentrations. A 0.25ppm stock of each metal (with the following exceptions: 100ppm Al, Ca, Mg, and Fe, 0.5ppm Ag, Cd, Ni, Pb, and Zn,) is used to check for interference on other metals. In the absence of measurable analyte, over-correction could go undetected because a negative value could be reported as zero. If the particular instrument will display over-correction as a negative number, this spiking procedure will not be necessary.

9.0 Equipment/Apparatus

9.1 Agilent 5800 Inductively coupled argon plasma emission spectrometer:
- 9.1.1 Computer-controlled emission spectrometer with background correction.
- 9.1.2 Radio frequency generator compliant with FCC regulations.
- 9.1.3 Argon gas supply - Welding grade or better.

9.2 Operating conditions - The analyst should follow the instructions provided by the instrument manufacturer. Sensitivity, instrumental detection limit, precision, linear dynamic range, and interference effects must be established for each individual analyte line. All measurements must be within the instrument linear range where spectral interference correction factors are valid. The department must verify that the instrument configuration and operating conditions satisfy the analytical requirements and maintain quality control data confirming instrument performance and analytical results.

9.3 Class A volumetric flasks

9.4 Class A volumetric pipettes

9.5 Adjustable pipettes, Eppendorf: See SOP ROU006 for calibration instructions.

9.6 Analytical balance - capable of accurate measurement to 4 significant figures.

10.0 Reagents and Standards

10.1 Reagent Water. All references to water in the method refer to reagent water unless otherwise specified. Reagent water will be interference free. Refer to Chapter One for a definition of reagent water.

10.2 Reagent grade chemicals shall be used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. All reagents used will be traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.3 The expiration date for analytical standards may be extended by following re-certification procedures below:

10.3.1 Contact the standard supplier and request an expiration date extension. If the supplier is not able to extend the date, then in-house re-certification may be performed as follows:

10.3.1.1 Analyze the expired standard and quantitate it against an unexpired standard from a different supplier or different lot # from same supplier.

10.3.1.2 For inorganic standards, the acceptance criteria is 10%D.

10.3.1.3 If the expired standard meets the above acceptance criteria, then extend the date by 6 months for inorganics.

10.3.1.4 The re-certification with extended expiration date is documented in the standard prep log book, along with the analysis date, instrument name, data file ID, and name of standard supplier with current unexpired lot number that was used to re-certify the expired standard.

10.3.2 Email this information to QAU.

10.4 The following acids are analyzed prior to use. See SOP# ROU016.

10.4.1 Hydrochloric acid (conc.), HCl

10.4.2 Nitric acid (conc.), HNO_3

10.5 The following Table summarizes the procedure for preparing the reagents and standards. The procedure is subject to change depending on shifts in instrument sensitivity and adjustments in volume. Suppliers/Part numbers may be changed if equivalent.

1% HNO3 / 5% HCl							
Prepared:				**Prepared By (Initials):**			
Expires:							
Initial Standard Information				Final Standard Information			
Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc.	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. Range
Nitric acid	**BDH**	**87003-261**	100%	20mL	2L	DI Water	1-5% v/v
Hydrochloric acid	**BDH**	**87003-253**	100%	100mL			

ICP-OES Calibration Standard Prep							
Prepared:							

Expires:							
1% HNO3 / 5% HCl Prep:					**Prepared By (Initials):**		
Calibration Standard 3							
Initial Standard Information				Final Standard Information			
Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc. Range (ug/mL)	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. Range (ug/L)
Solution A	Texas Scientific	HP1810-250	200 - 5,000	500uL	100mL	1% HNO3 / 5% HCl	1000 - 25,000
Solution B	Texas Scientific	HP1810-250	4000 - 10,000	500uL			2000 - 50,000
Solution C	Texas Scientific	HP1810-250	100 - 200	500uL			500 - 1000
Calibration Standard 2							
ICP-OES Calib Standard 3	Texas Scientific	Standard 2/CCV1	0.5 - 50	25mL	50mL	1% HNO3 / 5% HCl	250 - 25,000
Calibration Standard 1							
200.7 LDL	O2SI	160634-01-01	0.05 - 100	250uL	50mL	1% HNO3 / 5% HCl	0.25 - 200
ICP-OES ICV (SS)							
Prepared:							
Expires:							
1% HNO3 / 5% HCl Prep:					**Prepared By (Initials):**		
ICP-OES ICV 1							
Initial Standard Information				Final Standard Information			
Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc. Range (ug/mL)	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. Range (ug/mL)
QCS ICV Soln A	CPI	4400-070615RH01	50 - 500 ug/mL	250uL	50mL	1% HNO3 / 5% HCl	0.25 - 2.5
QCS ICV Soln B	CPI	4400-070615RH01	2,500 ug/mL	250uL			12.5
ICP-OES CCV2							
Initial Standard Information				Final Standard Information			

Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc. Range (ug/mL)	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. Range (ug/mL)
ICP-OES Calib Standard 3	Texas Scientific	CCV2	0.5 - 50	15mL	50mL	1% HNO3 / 5% HCl	0.15 - 15
ICP-OES Interference Check Solution A							
Prepared:							
Expires:							
1% HNO3 / 5% HCl Prep:						**Prepared By (Initials):**	
Initial Standard Information				Final Standard Information			
Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc. (ug/mL)	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. (ug/mL)
Aluminum	Inorganic Ventures	35-APPLTSP-6010ICSA	10,000	500uL	50mL	1% HNO3 / 5% HCl	100
Calcium			10,000				100
Magnesium			10,000				100
Iron			10,000				100
ICP-OES Interference Check Solution AB							
Aluminum	Inorganic Ventures	35-APPLTSP-6010ICSA	10,000	500uL	50mL	1% HNO3 / 5% HCl	100
Calcium			10,000				100
Magnesium			10,000				100
Iron			10,000				100
Special Mix (Interference)	O2SI	160495-01-01	100	250uL			0.5
ICP-OES Internal Standards							
Prepared:							
Expires:							
1% HNO3 / 5% HCl Prep:						**Prepared By (Initials):**	
Initial Standard Information				Final Standard Information			
Name of Initial Standard (QAU Label)	Supplier	Supplier P/N#	Conc. (mg/L)	Aliquot From Stock	Final Volume	Solvent	Final Standard Conc. (mg/L)

Yttrium	O2SI	060039-04-03	1000	4mL	2L	1% HNO3 / 5% HCl	2

11.0 Calibration and Standardization

11.1 Set up the instrument with proper operating parameters. The instrument should be allowed to become thermally stable before beginning (usually requiring at least 30 minutes of operation prior to calibration). For operating conditions, the analyst should follow the instructions provided by the instrument manufacturer.

11.2 Instrument wavelength calibration is performed when:

11.2.1 The instrument or software is first installed.

11.2.2 If analyte peaks in the Examine Spectra window are significantly offset from the central line for the wavelength on a consistent basis. If analyte peaks are slightly offset, a system wavelength calibration is usually not necessary. Instead, fine adjustments to wavelengths can be made using the Examine Spectra window. Wavelength calibration is performed according to manufacturer direction and includes Hg realignment, visible wavelength calibration, and UV wavelength calibration.

11.2.3 A torch alignment is performed as needed with a 1ppm Mn solution; the software aligns the torch. Click on “Tools”, “Spectrometer control”, and then click on “align view” for both axial and radial to have the torch aligned.

11.3 The lower limits of quantitation should be established for all wavelengths utilized for each type of matrix analyzed and for each preparation method used and for each instrument. These limits are considered the lowest reliable laboratory reporting concentrations and should be established from the lower limit of quantitation check sample and then confirmed using either the lowest calibration point or from a low-level calibration check standard.

Calibrate the instrument in the following sequence – Run the calibration blank, then the standards (Standard 1, 2, and 3).

11.4 Check the instrument standardization by analyzing appropriate check standards as follows.

11.4.1 Verify the calibration by analyzing an initial calibration verification standard (ICV/second source) immediately after the ICAL.

11.4.2 Verify the calibration by analyzing an initial calibration blank (ICB) immediately after the ICAL.

11.4.3 Verify the LOQ by analyzing a LLOQ/LLCCV at or below the LOQ. The LLOQ/LLCCV is from the same source as the ICAL. All reported analytes will be within ±20% of the true value.

11.4.4 Verify the calibration every 10 samples and at the end of the analytical run, using the CCB and a CCV.

11.4.5 Verify the Interelement and background correction factors at the beginning of an analytical run. Do this by analyzing the interference check solutions. ICSA and ICSAB.

11.5 To create a new correction model:

11.5.1 Make your individual spikes as listed in Table 2. Load the newest method file and save as a new method using a unique name. Perform axial/radial/Hg realignment. Calibrate instrument and then examine spectra and optimize wavelengths for individual analytes as necessary. Update and save method each time you change wavelength settings. Recalibrate instrument and

analyze spike amounts using an uncorrected method. Analyst does not need to run QC when analyzing spikes only. Spike sample must recover within 10% of spike value. If they do not, a HDL study should be performed and spike amounts should be adjusted.

11.5.2 To create an IEC model- use IEC model builder (computer software) load the correct data file. Load interferent analytes for each analyte chosen (e.g. aluminum to aluminum.) Save IEC model using a unique name.

11.5.3 To create a MSF model- open an old MSF model. Load data file that contains your spiked analytes (i.e. same file you used for IEC model.) Assign a global blank, and a global analyte. Save MSF model using a unique name.

11.5.4 Load MSF model and IEC model in your method, then choose how each analyte should be corrected (MSF or IEC). Save method. Run the ICSA/ICSAB to verify that the correction model is correct. If the ICSA/ICSAB does not recover within control limits, modify your correction models appropriately and reanalyze.

11.6 Linear Dynamic Range

Minimum frequency is every 6 months. Acceptance criteria – Within ± 10% of expected value. The upper limit of the linear dynamic range must be established for each wavelength utilized by determining the signal responses from a minimum for three, preferably five, different concentration standards across the range. One of these should be near the upper limit of the range. The data and calculations should be documented and kept on file. The upper range limit should be an observed signal no more than 10% below the level extrapolated from lower standards.

12.0 Procedure

12.1 Preliminary treatment of most matrices is necessary because of the complexity and variability of sample matrices. Water samples, which have been pre-filtered and acidified, will not need acid digestion. However, all associated QC samples (i.e. method blank, LCS, and MS/MSD) must undergo the same filtration and acidification procedures. Samples, which are not digested, must either use an internal standard or be matrix-matched with the standards. Digestion procedures are presented in Sample Preparation Methods (Methods: 3010A or 3050B). Obtain digestates from digestion employee and place initials, date, and time in the appropriate transfer area as per SOP# ROU030.

12.2 Check that the waste container is not full, or liable to overflow during analysis. If the container is full, neutralize the waste with baking soda (to pH 7), then pour down the sink with plenty of water.

12.3 Before starting the instrument each day, refer to section 20.0 and perform any needed maintenance.

12.4 Profile and calibrate the instrument according to the instrument manufacturer's recommended procedures, using the typical mixed calibration standard solutions described in Sec. 11.5. Flush the system with the calibration blank between each standard or as the manufacturer recommends. The calibration curve should be prepared as detailed in Section 10.

12.5 Regardless of whether the initial calibration is performed using a single high standard and the calibration blank or the multi-point option, the laboratory should analyze an LLOQ/LLCCV. For all analytes and determinations, the laboratory must analyze an ICV and LLOQ/LLCCV immediately following daily calibration. It is recommended that a CCV, LLOQ/LLCCV, and CCB be analyzed after every ten

samples and at the end of the analysis batch. The LLOQ/LLCCV is a 6010C/D requirement.

12.6 Rinse the system with the calibration blank solution before the analysis of each sample. The rinse time will be one minute. Each laboratory may establish a reduction in this rinse time through a suitable demonstration. Analyze the samples and record the results.

13.0 Data Analysis and Calculations

13.1 The conversion from µg/L to mg/kg is shown below:

1mL=1g. i.e. (1000µg/L Arsenic)(1L/1kg) (1mg/1000µg)= 1mg/kg

13.2 The Agilent ICP Expert software will determine the linear regression and the correlation coefficient once the calibration is complete. Concentration of a sample can be determined using the following equation:

$$\text{Concentration } (\mu g/L) = \frac{(\text{absorbance} - \text{intercept})}{\text{Slope}}$$

13.3 The quantitative values must be reported in appropriate units, such as micrograms per liter (µg/L) for aqueous samples and milligrams per kilogram (mg/kg) for solid samples. If dilutions were performed, the appropriate corrections must be applied to the sample values. All results should be reported with up to three significant figures.

13.4 If appropriate, or required, calculate results for solids on a dry-weight basis as follows:

13.4.1 A separate determination of percent solids must be performed.

13.4.2 The concentrations determined in the digest are to be reported on the basis of the dry weight of the sample.

$$\text{Concentration (dry weight)(mg/kg)} = \frac{C \times V}{W \times S}$$

Where:
C = Digest Concentration (mg/L)
V = Final volume in liters after sample preparation
W = Weight in kg of wet sample
S = $\frac{\%\ \text{Solids}}{100}$

13.5 Calculations must include appropriate interference corrections (see Sec. 4.0 for examples), internal-standard normalization, and the summation of signals at 206, 207, and 208m/z for lead (to compensate for any differences in the abundances of these isotopes between samples and standards).

13.6 See section 5.5 regarding samples with high mineral content.

13.7 See SOP# DOC014 for formulas and calculations used to obtain and utilize the calibration curves.

13.8 To calculate the percent recovery for spikes, divide the concentration (ppb) of the sample by the spike value and then multiply by 100 for a percent.

Laboratory control spike calculation:

Spike concentration (□g/L) = (Spike volume)(Concentration of spiking standard) / 0.1L

% Recovery of element = (LCS result / Spiking concentration) *100

Matrix spike calculation:

(Spike volume)(Concentration of spiking standard) / 0.1L = Spike concentration (□g/L)

$$\%\text{Recovery} = \frac{(SSR - SR)}{SA} * 100$$

Where:
SSR = Spiked sample result
SR = Unspiked Sample result
SA = Spike amount added

13.9 To calculate the RPD between two values (e.g. MS/MSD):

$$\text{RPD} = \left(\frac{MS - MSD}{MS + MSD/2} \right) \text{ x } 100$$

13.10 If dilution of sample was required:

$$\mu\text{g/L metal in sample} = \frac{A\,(C+B)}{C}$$

Where:
A = µg/L of metal in diluted aliquot from calibration curve
B = Acid blank matrix used for dilution, mL
C = Sample aliquot, mL

13.11 To calculate Calcium and Total Hardness: Refer to APPL SOP ANA2340B.

14.0 Data Assessment and Acceptance Criteria for QC

14.1 The analyst who completes the work first reviews data. The initial calibration curve is reviewed, the continuing calibration %D is reviewed and the spike recovery and precision are reviewed. If at any point the review shows an out of control situation the section manager is notified verbally and the problem is investigated. The correction may be one of several points considered: standard preparation, digestion technique, etc. The problem is potentially solved and reanalysis or re-digestion and reanalysis are completed.

14.2 The second level of review is either by a peer in the same section or the section manager. There is a Multilevel Quality Control Sign Off worksheet that is filled out in its entirety by the review person.

14.3 If the data quality is impacted, the client shall be notified immediately after assessment.

Acceptance criteria for QC

14.4 To be considered acceptable, the calibration curve should have a correlation coefficient greater than or equal to 0.995 ($r^2 \geq 0.990$) for 6010B and 6010D, but **0.998 for 6010C**. When using a multipoint calibration curve approach, every effort should be made to attain an acceptable correlation coefficient based on a linear response for each desired target analyte. If the recommended linear response cannot be attained using a minimum of three non-zero calibration standards, consideration should be given to adding more standards, particularly at the lower concentrations, in order to better define the linear range and the lower limit of quantitation. Conversely, the extreme upper and lower calibration points may be removed from the multi-point curve along as three non-zero points remain such that the linear range is narrowed and the non-linear upper and/or lower portions are removed.

14.4.1 Many instrument software packages allow multi-point calibration curves to be "forced" through zero. It is acceptable to use this feature provided that the resulting calibration meets the acceptance criteria, and can be verified by acceptable QC results. Forcing a regression through zero should NOT be used as a rationale for reporting results below the calibration range defined by the lowest standard in the calibration curve.

14.4.2 If Calibration does not meet acceptance criteria, recalibrate. If it still does not meet acceptance criteria examine the problem, remake standards if necessary, and recalibrate.

14.5 ICV must pass within ± 10% of true value.

14.5.1 If the ICV does not meet acceptance criteria reanalyze once. If it still does not meet acceptance criteria determine the problem, correct and recalibrate.

14.6 ICB must have all analytes less than the PQL for 6010B/C and <½ the PQL/LOQ for 6010D and DoD QSM 5.3. Corrective Action: The problem shall be corrected, then the blanks shall be re-prepared and reanalyzed.

14.7 LLOQ/LLCCV (6010 D and DoD QSM 5.3 only) are to agree within 20% of the true value. Minimum frequency-- At the beginning of an analytical run.

14.7.1 For 6010C samples, the low-level calibration check standard (LLOQ/LLCCV) is only applicable for one point ICAL. We use a multipoint calibration for our ICP-OES.

14.7.2 If the LLOQ/LLCCV recovers above the 120% upper control limit and the samples are ND the samples do not need to be reanalyzed.

14.7.3 A LLOQ/LLCCV can be made at different concentration so long as it is at or below the reporting limit of the sample.

14.7.4 If the LLOQ/LLCCV does not meet acceptance criteria terminate the analysis, correct the problem, and reanalyze the samples bracketed by the failing LLOQ/LLCCV.

14.8 ICSA. Ca, Mg, Al, Fe must pass within ± 20% of true value. For 6010B/C, all other elements are passing at < PQL. For 6010D, all other elements are passing if the absolute value is < PQL. For DoD QSM 5.3, all other elements are passing if the absolute value is <1/2 LOQ.

14.9 ICSAB. Must pass within ± 20% of true values.

14.9.1 If the ICSA and/or ICSAB do not recover within required limits the analyst may need to create new correction models or change the type of correction used for a specified analyte. See the calibration section on how to make and IEC/MSF correction model.

14.10 Continuing Calibration Verification. The analytes of interest need to recover within ± 10% of the true value.

14.10.1 If the CCV recovers above the upper limit, and the sample is ND the sample does not need to be reinjected.

14.10.2 For DoD QSM 5.3 projects, if a CCV fails, the laboratory can immediately analyze two additional consecutive CCVs (immediately is defined as starting a consecutive pair within one hour; no samples can be run between the failed CCV and the two additional CCVs). This approach allows for spurious failures of analytes to be reported without reanalysis of samples. Any corrective actions that change the dynamics of the system (e.g., clip column, clean injection port, run blanks) requires that all samples since the last acceptable CCV be reanalyzed. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without reanalysis. If either of these two CCVs fail or if the laboratory cannot immediately analyze two CCVs, the associated samples cannot be reported and must be reanalyzed. Flagging of data for a failed CCV is only appropriate when the affected samples cannot be reanalyzed. The lab must notify the client prior to reporting data associated with a failed CCV.

14.11 CCB must have all analytes < PQL for 6010B/C and <½ the PQL/LOQ for 6010D and DoD QSM 5.3. Corrective Action: The problem shall be corrected, then all samples following the last acceptable CCB will be re-prepared and reanalyzed.

14.12 Method Blank: Acceptance criteria: All target analytes in the method blank must be < RL for 6010B/C and < 1/2 the PQL/LOQ for 6010D and DoD QSM 5.3. Many of our clients follow QAPPs with more stringent requirements. Please refer to the ARF comments to determine what criteria apply to the method blank of interest.

14.12.1 In the absence of project-specific DQOs, if the blank is less than 10% of the lower limit of quantitation check sample concentration, less than 10% of the regulatory limit, or less than 10% of the lowest sample concentration for each analyte in a given preparation batch, whichever is greater, then the method blank is considered acceptable. If the method blank exceeds the criteria, but the samples are all either below the reporting level or below the applicable action level or other DQOs, then the sample data may be used despite the contamination of the method blank.

14.12.2 If the method blank cannot be considered acceptable, the method blank should be re-run once, and if still unacceptable, t the analytical batch should be re-prepared and reanalyzed along with the appropriate batch QC samples.

14.13 LCS acceptance limits for 6010 B are at ± 25% (6010C/D ± 20%) of the spiked value with a relative percent difference (RPD) between the LCS and LCSD at 20% RPD. If the LCS does not meet acceptance criteria reanalyze once.

14.13.1 For DOD Clients see Table C-4 and C-5 for the acceptance limits in the QSM.

14.13.2 If the LCS recovers above the acceptance limits and the samples are ND the samples can be reported as the method has increased sensitivity.

14.13.3 If the LCS cannot be considered acceptable the analytical batch should be re-prepared and reanalyzed along with the appropriate batch QC samples.

14.14 DUP/MS/MSD -In the absence of project-specific or historical data generated criteria, the acceptance limits should be set at ± 25% of the spiked value and with a relative percent difference (RPD) between the MS and MSD and sample and DUP at 20% RPD.
For DoD clients the acceptance limits are at ± 20% of the spiked value and with a relative percent difference (RPD) between the MS and MSD, and sample and DUP at 20% RPD.
14.14.1 If the DUP/MS/MSD do not meet acceptance criteria examine the project specific DQOs and notify the project manager. The project manager will contact the client as to additional quality measures to be taken.
14.14.2 Apply J flag to the parent sample for the analytes that fail criteria.
14.15 Internal standards (Yttrium or Scandium) must recover within 50% - 150%. If they do not recover within control limits, terminate the analysis, correct the problem, recalibrate, verify the new calibration, and reanalyze the affected samples. If only specific samples demonstrated exceedances in internal standard recovery, dilute 1:5 and reanalyze. The use of internal standards is performed for laboratory data assessment. The results for the internal standards recoveries are provided on the sample raw data. They are only reported if specifically requested for a project.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

15.1 The following steps are to be followed whenever the results of your work did not conform to our SOPs or your work did not conform to the agreed requirements of our clients.
15.2 It is the responsibility of the analyst to immediately inform his/her Supervisor of any problems that may have occurred during the extraction and/or analysis of client's samples. The supervisor immediately informs the Project Manager.
15.3 The Supervisor, analyst and Project Manager evaluates the significance of the non-conforming work and determine what impact it may have on results and what actions must immediately be taken to correct the situation.
15.4 If the data quality is impacted, the client shall be notified immediately after assessment.
15.5 A Non-conforming Work Report (NWR) is initiated when:
15.5.1 An out of control situation has significant impact on the outcome of finalized data. Such as (LCS, Internal standard, Calibration, RPD, CCV, ICV failure), hold time expired, blank contamination, or other situations t that affected the results.
15.5.2 The NWR form is located in ARF Summary on your desktop.
15.5.3 Refer to APPL SOP # QC033 for more information on nonconforming work.
15.6 In the event that an out of control situation occurs, the project manager is notified immediately. The affect of the out of control situation is assessed according to the project DQO. If sufficient sample remains, and the situation significantly affects the quality of the results, the analysis is repeated. If the situation does not significantly affect the quality of the data, the project manager notifies the client and instructions from the client will be are followed. In the event no sample remains, the client is notified immediately. All situations are documented on the multi level review sheet and initialed by the project manager. All out of control situations are brought to the attention of the QAU in the form of a NWR. The QAU has the final authority to approve any actions taken.

16.0 Method deviations

This SOP is written to address method 6010B, 6010C, 6010D and DoD QSM Version 5.3 requirements.

- The method ICP-OES parameters are customized for the instrumentation to perform to method specifications.
- The EPA 6010D Single Element Interference Checks every six months will not be performed by APPL, unless a client requires this method for a South Carolina Project.
    - Technical Justification for non-South Carolina projects: The instrument interference models are set at method start up and major instrument maintenance with single-element interference checks. The multi-element interference check is used on a daily basis to optimize the instrument models as needed for that particular day.
- EPA method 6010B requires that the ICB/CCB have no analytes greater than 3X the MDL and 6010C no analytes greater than 2-3X the MDL. For 6010B and 6010C, APPL will screen to below the reporting limit for method blanks/ICBs/CCBs.
- EPA method 6010C does not list requirements for the ICSA and EPA method 6010D does not list requirements for the ICSAB. For consistency, APPL requires that no analytes are detected above the RL in the ICSA and all spiked analyte must recover within ±20% in the ICSAB.
- EPA method 6010D allows for a 20% deviation between a sample and a serial dilution. APPL uses a more stringent requirement of 10% which follows DoD guidelines.
- The IDL study results are to be kept on the server rather than in the instrument logbook. This allows for easy accessibility for all APPL personnel.

17.0 Pollution Prevention

All hazardous materials generated during the testing of samples are properly collected and stored. Drums are available in the storage room for the following types of wastes: acidic, basic and solvents. For more information on pollution prevention refer to APPL SOP # SHR012.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and lands disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations. For more information on waste disposal refer to APPL SOP # SHR012.

19.0 Method Performance

19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.

19.2 A method detection Limit (MDL) study is run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. An MDL study and LOD determination/verification is performed according to SOP # QC018. The laboratory maintains documentation for all detection limit determinations and LOD verifications.

19.3 Instrument detection limits (IDLs) are used to evaluate the instrument noise level and response change over time. The IDLs are determined at least once using new equipment, after major instrument maintenance such as changing the detector, and/or at the frequency designated by the project.

19.4 The method is not to be performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study. (See section 8.1)

20.0 Equipment/Instrument Maintenance and Troubleshooting

20.1 Each day, check the sample tubing (black-black) and waste tubing (red-red) for stretching. If the tubing is not tight on the pump, it should be replaced.

20.2 Each day clean the torch by rotating the dial to the "XX" position and pulling the torch out. Then, with cotton-tipped applicators, wipe off any build-up on the torch. If necessary, use applicators dipped in 10% HNO_3.

20.3 Each day, remove nebulizer from spray chamber and flush it out by running water through the nebulizer in reverse under a faucet.

20.4 Each day, injector should be inspected for any buildup within it. The injector can be flushed out by running water through it under a faucet.

20.5 Periodically check the radial and axial window. Clean with soap and DI water if necessary. Dry with compress air or a Chem Wipe.

20.6 Each day, check the DI level on the argon humidifier. If the humidifier is less than a quarter full, add more DI water.

20.7 The above maintenance items are to be performed regularly as a part of the procedure and do not require documentation. Any other maintenance exceeding the items above but not limited to the items listed below are to documented in the instrument log book.

20.8 If sample probe is clogged, use a cleaning wire supplied by manufacturer to push out any foreign particles that may be trapped in the line.

20.9 If autosampler is stuck, apply lubricant along the metal columns within the autosampler arm.

20.10 Spray chamber should only be cleaned by rinsing with DI water or dilute acid (1% HNO_3). Do not use high concentration of acid solutions. They can damage the wetting properties of the spray chamber.

20.11 Once a month, check and clean both filters on the instrument and the chiller's filter. Use compress air or water to remove the dust trapped in the filters.

<u>Troubleshooting</u>

20.12 The majority of the issues encountered by the analyst can be linked to the instrument's sample introduction. If a loss in sensitivity occurs, check the nebulizer and the tubing's flow. If that doesn't work clean the injector and check the axial and radial lenses. For everything the analyst can not fix, the instrument is under service contract with Full Spectrum

21.0 Computer hardware and software

21.1 ICP OES Agilent 5800

21.2 ICP Expert Software

22.0 References

22.1 DoD QSM version 5.3, 2019

22.2 EPA Method 6010D, USEPA SW846, Third Edition, Revision 4 July 2014

22.3 EPA Method 6010C, USEPA SW846, Third Edition, Revision 3 February 2007

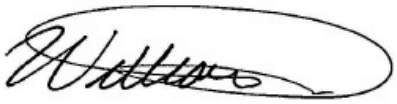
22.4 EPA Method 6010B, USEPA SW846, Third Edition, Revision 2 December 1996

22.5 EPA Method 3010A, USEPA SW8461, Third Edition, Revision 1 July 1992
22.6 EPA Method 3050B, USEPA SW8461, Third Edition, Revision 2 December 1996
22.7 Chapter One USEPA SW-846, Third Edition, Revision 1, September 1994

23.0 Any tables, diagrams, flowcharts, validation data

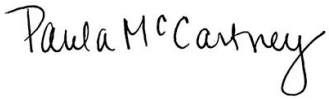
Table 1: Analyte Reporting Limits for Soil and Water
Table 2: Initial Calibration Standard Concentrations
Table 3: ICSA Concentrations
Table 4: ICSAB Concentrations
Table 5: ICV Concentrations
Table 6: LCS/MS Concentrations
Table 7: IEC/MSF concentrations
Table 8: DoD QSM 5.3 Table B-8

Section Manager Name: William Diaz



Section Manager Signature: _____ Date: 06/21/21

QAU Director Name: Paula McCartney



QAU Director Signature: _____ Date: 06/21/21

TABLE 1

General EPA Method 6010B/C/D Analyte Reporting Limits for Soil and Water
(See client QAPPs for specific limits)

Analyte	Reporting Limit (mg/Kg)	Reporting Limit (µg/L)
Aluminum (Al)	10	100
Antimony (Sb)	0.5	5
Arsenic (As)	0.5	5
Barium (Ba)	0.5	5
Beryllium (Be)	0.2	2
Boron (B)	5	50
Cadmium (Cd)	0.5	5
Calcium (Ca)	10	100
Chromium (Cr)	0.5	5
Cobalt (Co)	0.5	5
Copper (Cu)	0.5	5
Iron (Fe)	5	50
Lead (Pb)	0.5	3
Magnesium (Mg)	5	50
Manganese (Mn)	0.5	5
Molybdenum (Mo)	0.5	5
Nickel (Ni)	0.5	5
Phosphorus (P)	2.5	25
Potassium (K)	100	1000
Selenium (Se)	0.5	5
Silver (Ag)	0.1	1
Sodium (Na)	100	1000
Strontium (Sr)	0.5	5
Thallium (Tl)	0.5	5
Tin (Sn)	0.5	5
Titanium (Ti)	0.5	5
Vanadium (V)	0.5	5
Zinc (Zn)	5	50

TABLE 2
Calibration Standard 1, 5 and 6
Concentrations

Analyte	Low Point -Standard 1 & 2 (µg/L)	Standard 5 (µg/L)	Standard 6 (µg/L)
Silver (Ag)	1	500	1000
Aluminum (Al)	50	20000	40000
Arsenic (As)	4	1000	2000
Boron (B)	25	1000	2000
Barium (Ba)	1.5	1000	2000
Beryllium (Be)	1	1000	2000
Calcium (Ca)	50	50000	100000
Cadmium (Cd)	0.5	1000	2000
Cobalt (Co)	5	1000	2000
Chromium (Cr)	1	1000	2000
Copper (Cu)	5	1000	2000
Iron (Fe)	25	20000	40000
Potassium (K)	500	20000	40000
Magnesium (Mg)	25	50000	100000
Manganese (Mn)	1	1000	2000
Molybdenum (Mo)	2	1000	2000
Sodium (Na)	500	25000	50000
Nickel (Ni)	2	1000	2000
Phosphorus (P)	12.5	5000	10000
Lead (Pb)	3	1000	2000
Antimony (Sb)	4	1000	2000
Selenium (Se)	4	1000	2000
Tin (Sn)	6	1000	2000
Strontium (Sr)	1	1000	2000
Titanium (Ti)	5	1000	2000
Thallium (Tl)	10	1000	2000
Vanadium (V)	1	1000	2000
Zinc (Zn)	25	1000	2000

TABLE 3

ICSA Concentrations

Metal	Final Concentration (µg/L)
Aluminum (Al)	100000
Calcium (Ca)	100000
Iron (Fe)	100000
Magnesium (Mg)	100000

TABLE 4

ICSAB Concentrations

Metal	Final Concentration (µg/L)
Silver (Ag)	500
Aluminum (Al)	100000
Arsenic (As)	250
Barium (Ba)	250
Beryllium (Be)	250
Calcium (Ca)	100000
Cadmium (Cd)	500
Cobalt (Co)	250
Chromium (Cr)	250
Copper (Cu)	250
Iron (Fe)	100000
Magnesium (Mg)	100000
Manganese (Mn)	250
Molybdenum (Mo)	250
Nickel (Ni)	500
Lead (Pb)	500
Antimony (Sb)	250
Selenium (Se)	250
Thallium (Tl)	250
Vanadium (V)	250
Zinc (Zn)	500

TABLE 5

ICV (Second Source) Concentrations

Metal	Final Concentration (µg/L)
Silver (Ag)	250
Aluminum (Al)	12500
Arsenic (As)	500
Boron (B)	500
Barium (Ba)	500
Beryllium (Be)	500
Calcium (Ca)	12500
Cadmium (Cd)	500
Cobalt (Co)	500
Chromium (Cr)	500
Copper (Cu)	500
Iron (Fe)	12500
Potassium (K)	12500
Magnesium (Mg)	12500
Manganese (Mn)	500
Molybdenum (Mo)	500
Sodium (Na)	1250
Nickel (Ni)	500
Phosphorus (P)	2500
Lead (Pb)	500
Antimony (Sb)	500
Selenium (Se)	500
Tin (Sn)	250
Strontium (Sr)	500
Titanium (Ti)	500
Thallium (Tl)	500
Vanadium (V)	500
Zinc (Zn)	500

TABLE 6

LCS & MS/MSD Concentrations

3010A digestates spiked with 500uL ea. of Spike A & B, initial volume of 50mL to a final volume of 50mL
3050 digestates spiked with 1mL ea. Of Spike Spike A & B, initial volume of 1.00g to a final volume of 100mL

Analyte	Final Conc. 3010A LCS/MS (µg/L)	Final Conc. 3050B LCS (mg/Kg)	Final Conc. 3050B MS (mg/Kg)
Silver (Ag)	100	10	20
Aluminum (Al)	2000	200	400
Arsenic (As)	250	25	50
Boron (B)	250	25	50
Barium (Ba)	250	25	50
Beryllium (Be)	50	5	10
Calcium (Ca)	25000	2500	5000
Cadmium (Cd)	50	5	10
Cobalt (Co)	250	25	50
Chromium (Cr)	250	25	50
Copper (Cu)	250	25	50
Iron (Fe)	1000	100	200
Potassium (K)	5000	500	1000
Magnesium (Mg)	25000	2500	5000
Manganese (Mn)	250	25	50
Molybdenum (Mo)	250	25	50
Sodium (Na)	25000	2500	5000
Nickel (Ni)	250	25	50
Phosphorus (P)	2000	200	400
Lead (Pb)	250	25	50
Antimony (Sb)	250	25	50
Selenium (Se)	250	25	50
Tin (Sn)	250	25	50
Strontium (Sr)	250	25	50
Titanium (Ti)	250	25	50
Thallium (Tl)	250	25	50
Vanadium (V)	250	25	50
Zinc (Zn)	500	50	100

TABLE 7

IEC/MSF Concentrations (prepared separately)

Volume (mL)	Analyte	Final Conc. (µg/L)
0.200	Ca	100000
0.200	Mg	100000
0.200	Al	100000
0.200	Fe	100000
1	Cr	20000
1	Co	20000
1	Cu	20000
1	Mn	50000
1	Mo	10000
1	Ni	20000
1	Ti	20000
1	Ba	50000
1	Sn	20000
1	V	20000

Standard Operating Procedure

TABLE 8

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Linear Dynamic Range (LDR) or high-level check standard	At initial set up and checked every 6 months with a high standard at the upper limit of the range.	Within ± 10% of true value.	Dilute samples within the calibration range or re-establish/ verify the LDR.	Flagging is not appropriate.	Data cannot be reported above the high calibration range without an established/passing high-level check standard.
Initial Calibration (ICAL) for all analytes	Daily ICAL prior to sample analysis.	If more than one calibration standard is used, $r^2 \geq 0.99$.	Correct problem, then repeat ICAL.	Flagging is not appropriate.	Minimum one high standard and a Calibration Blank. No samples shall be analyzed until ICAL has passed.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within ± 10% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Continuing Calibration Verification (CCV)	After every 10 field samples and at the end of the analysis sequence.	All reported analytes within ± 10% of the true value.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails or if two consecutive CCVs cannot be run, perform corrective action(s) and repeat CCV and all associated samples since last successful CCV. Alternately, recalibrate if necessary; then reanalyze all associated samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative. Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable calibration verification.	Results may not be reported without valid CCVs. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Low-Level Calibration Check Standard (LLCCV)	Daily.	All reported analytes within ± 20% of true value.	Correct problem and repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed without a valid Low-Level Calibration Check Standard (LLCCV). LLCCV should be less than or equal to the LOQ. If the concentration of the lowest calibration standard is less than or equal to the LOQ, the lowest standard may be re-quantified against the calibration curve as a LLCCV. Otherwise, a separate standard must be analyzed as LLCCV prior to the analysis of any samples.

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Method Blank (MB)	One per preparatory batch.	The absolute values of all analytes must be < ½ LOQ or < 1/10th the amount measured in any sample or 1/10th the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze MB and all QC samples and field samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid Method Blank. Non-detects associated with positive blank infractions may be reported. Sample results >10X the LOQ associated with negative blanks may be reported. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Initial and Continuing Calibration Blank (ICB/CCB)	Immediately after the ICV and immediately after every CCV.	The absolute values of all analytes must be < ½ LOQ or < 1/10th the amount measured in any sample.	ICB: Correct problem and repeat ICV/ICB analysis. If that fails, rerun ICAL. All samples following the last acceptable Calibration Blank must be reanalyzed. CCBs may not be re-analyzed without re-analysis of the associated samples and CCV(s).	Flagging is not appropriate.	Results may not be reported without valid Calibration Blanks. Non-detects associated with positive blank infractions may be reported. Sample results >10X the LOQ associated with negative blanks may be reported. For CCB, failures due to carryover may not require an ICAL.
Interference Check Solutions (ICS) (also called Spectral Interference Checks)	After ICAL and prior to sample analysis.	ICS-A: Absolute value of concentration for all non-spiked project analytes <1/2 LOQ (unless they are a verified trace impurity from one of the spiked analytes); ICS-AB: Within ± 20% of true value.	Terminate analysis; locate and correct problem; reanalyze ICS, reanalyze all samples.	If corrective action fails, apply Q-flag to all results for specific analyte(s) in all samples associated with the failed ICS.	All analytes must be within the LDR. ICS-AB is not needed if instrument can read negative responses.

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the DoD/DOE QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then reprep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the Case Narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Must contain all reported analytes. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the DoD/DOE QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the Case Narrative.	For matrix evaluation only. If MS results are outside the limits, the data shall be evaluated to the source(s) of difference (i.e., matrix effect or analytical error).

Standard Operating Procedure

TABLE 8, continued

DoD/DOE QSM 5.3
Appendix B
2019

Table B-8. Inorganic Analysis by Inductively Coupled Plasma Atomic Emission Spectrometry (ICP/AES)

QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the DoD/DOE QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the Case Narrative.	The data shall be evaluated to determine the source of difference. For Sample/MD: RPD criteria only apply to analytes whose concentration in the sample is greater than or equal to the LOQ.
Dilution Test	One per preparatory batch if MS or MSD fails.	Five-fold dilution must agree within ± 10% of the original measurement.	No specific CA unless required by the project.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the Case Narrative.	Only applicable for samples with concentrations > 50 x LOQ (prior to dilution). Use along with MS/MSD and PDS data to confirm matrix effects.
Post-Digestion Spike (PDS) Addition (ICP only)	Perform if MS/MSD fails. One per preparatory batch (using the same sample as used for the MS/MSD if possible).	Recovery within 80-120%.	No specific CA unless required by the project.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the Case Narrative.	Criteria applies for samples with concentrations < 50 X LOQ prior to dilution.
Method of Standard Additions (MSA)	When dilution test or post digestion spike fails and if required by project.	NA.	NA.	NA.	Document use of MSA in the Case Narrative.

Standard Operating Procedure

Alkaline Digestion for Hexavalent Chromium
Method 3060A

STATEMENT OF PURPOSE

This procedure defines the EPA method for the alkaline digestion and determination of Hexavalent Chromium (Cr^{+6}) from soluble, adsorbed, and precipitated forms of Chromium compounds in soils, sludges, sediments, and similar waste materials. Dissolved Hexavalent Chromium (Cr^{+6}) can be determined in EP/TCLP characteristic extracts, ground waters and domestic and industrial wastes without alkaline digestion. Samples containing Molybdenum, Vanadium, and/or Mercury may interfere with the reaction of Chromium and Diphenylcarbazide giving inaccurate results.

INSTRUCTIONS

1.0 Scope and Application

1.1 This method is used to determine the concentration of soluble and insoluble (with the exception of partial solubility of barium chromate in some soil matrices) Hexavalent Chromium in solid waste samples using an alkaline digestion. This method may be used to digest samples containing from 0.6 to 1.0mg/kg or (0.1 to 1.0mg/kg for low-level analysis), followed by analysis by an appropriate method.

1.2 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.3 If an individual project has its own QAPP with client specific requirements that are different than the SOP, the QAPP overrides the SOP. This information will be specified in the comment section of the ARF.

2.0 Method Summary

2.1 This method uses an alkaline digestion to solubilize both water-insoluble and water soluble Hexavalent Chromium in solid waste samples. The pH of the digestate must be carefully adjusted during the digestion procedure. Failure to meet the pH specifications will necessitate redigestion of the samples.

2.2 The sample is digested using 0.28M Na_sCO_3/0.5M NaOH solution and heating at 90-95°C for 60 minutes to dissolve the Cr (VI) and stabilize it against reduction to Cr (III).

2.3 The Cr (VI) reaction with Diphenylcarbazide is the most common and reliable method for analysis of Cr (VI) solubilized in the alkaline digestate. The use of Diphenylcarbazide has been well established in the colorimetric procedure (method 7196A) and in the IC method for Cr (VI) (7199A), it is highly selective for Cr (VI) and few interferences are encountered when it is used on alkaline digestates.

3.0 Detection Limits

3.1 Table 1 lists the quantitation limits for all target analytes. If an individual project has its own QAPP with client specific requirements different to those in Table 1, the client QAPP limits are used.

4.0 Definitions

See SOP# DOC019

5.0 Interferences and Potential Problems

5.1 The Chromium reaction with Diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the Chromium concentration is relatively low. Hexavalent Molybdenum and Mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for Chromium are at the specified pH.

5.2 Certain substances, not typically found in the alkaline digests of soils, may interfere in the analytical methods for Cr (VI) following alkaline extraction if the concentrations of these interfering substances are high and the Cr (VI) concentration is low. Refer to appropriate analysis methods for specific agents that interfere with Cr (VI) quantification. Analytical techniques that reduce bias caused by co-extracted matrix components may be applicable in correcting these biases after validation of their performance effectiveness.

5.3 Method-induced oxidation is usually not observed except in soils high in Mn and amended with soluble Cr (III) salts or freshly precipitated Cr $(OH)_3$.

5.4 Iron in concentrations greater than 1mg/L may produce a yellow color, but the Ferric iron color is not strong and difficulty is not normally encountered.

5.5 For waste materials or soils containing soluble Cr (III) concentrations greater than four times the reporting limit for Cr (VI), Cr (VI) results obtained using this method may be biased high due to method-induced oxidation. The addition of MG in a phosphate buffer to the alkaline extraction solution has been shown to suppress this oxidation. The presence of soluble Cr (III) can be approximated by extracting the sample with DI and analyzing the resultant leachate for both Cr (VI) and total Cr (the difference approximates Cr (III)).

6.0 Health and Safety

6.1 Lab coats safety glasses and gloves are used at all times. Handle reagents and samples using good laboratory practices.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 Samples should be collected using devices and placed in containers that do not contain stainless steel (e.g., plastic or glass).

7.2 Samples should be stored field-moist at 4±2°C until digestion.

7.3 The holding time for Cr^{+6} for solid samples is 30 days from sample collection and 168 hours after alkaline digestion.

8.0 Quality Control

8.1 QC Criteria

8.1.1 The quality control set consists of a method blank, laboratory control spike (LCS), sample duplicate and a matrix spike for each batch of 20 samples or less. For USACE a LCS and LCSD must be performed

8.1.2 A Preparation blank must be prepared and analyzed with each digestion batch. Detected Cr (VI) concentrations must be less than the MDL or one-tenth the regulatory limit or action level, whichever is greater or the entire batch must be re-digested.

8.1.3 Spike QC limits: The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean. (See SOP# QC016 for control chart generation.)

8.1.3.1 A Laboratory Control Sample will be analyzed using the matrix spike solution or the $PbCrO_4$ to spike into 1.25g sand.

8.1.3.1.1 Corrective Action: If the % recovery of a specific compound in the laboratory control spike is greater than the upper control limit and there are no positive findings for that compound, no further action is taken. If there are positive findings for that compound reanalyze the spike and all effected samples or flag the results with a 'Q'. If the % recovery of any compound fall below the lower control limit, reanalyze the spike and all effected samples. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.1.4 A separately prepared duplicate soil sample must be analyzed at a frequency of one per batch. Duplicate samples must have a RPD ≤ 20%.

8.1.5 MS/MSD: A matrix spike for both soluble and insoluble pre-digestion matrix spikes must be analyzed for each batch.

8.1.5.1 A matrix spike will be analyzed for every sample matrix, or more frequently if the soil characteristics within the analytical batch appear to have significant variability based on visual observation. The recovery limits can be found on Table 3. Client specific criteria supercede the method criteria.

8.1.5.2 One soluble and one insoluble matrix spike will be digested for the soil digestions. The recovery limits can be found on Table 3. Client specific criteria supercede the method criteria.

8.1.5.3 The control limits established above in section 8.1.3.1 are also used for the upper and lower control limits for the MS/MSD. Acceptance limit RPD between MS and MSD - Waters ≤ 20% RPD, Soils ≤ 30% RPD.

8.1.5.4 Corrective Action: Examine the project specific DQOs and contact the project manager who will in turn contract the client. Flag the parent sample with a "J" for failed analytes. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.1.5.5 Corrective Action: If the MS/MSD does not meet acceptance criteria for RPD: Report with appropriate data qualifying codes. For DoD projects, "J" flag the parent sample result for the failing analytes

8.1.6 A post-digestion spike must be analyzed per batch. The post-digestion spike should be performed on the sample that had the matrix spike performed. The post-digestion spike should be equivalent to 4mg/kg or twice the sample concentration observed in the unspiked aliquot of the test sample, whichever is greater. If necessary, dilute the sample so the concentration is within the calibration curve.

8.1.6.1 The post spike recovery acceptance criteria is 85-115%. If recovery is not within limits, check how the matrix spike recovered. If both are out of acceptance limits, it indicates matrix interference.

8.1.7 Blanks: Acceptance criteria: All target analytes in the method blank must be < RL. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ LOQ. For common laboratory contaminants, no analytes detected ≥ RL.

8.1.7.1 Corrective Action: If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank.

8.1.8 Method Detection Limits: Establish the LOD, LOQ and MDL according to SOP# QC018.

9.0 Equipment/Apparatus

9.1 Class A volumetric pipettes.
9.2 Class A graduated cylinder - 100mL
9.3 Class A volumetric flasks - 1000mL, 100mL
9.4 Class A Beakers -150mL
9.5 Watch glasses
9.6 Calibrated balance – Mettler AT200. Or equivalent
9.7 Calibrated pH meter – VWR SP10. Or Equivalent
9.8 Laboratory Centrifuge, capability 3500rpm or greater
9.9 Deena II automated digestion block
9.10 DEENA Digestion vessels-plastic
9.11 Magnetic Stir Plate
9.12 Magnetic stir bars- teflon
9.13 Thermometer capable of measuring up to 100°C.

10.0 Reagents and Standards

Reagent grade chemicals are used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the analysis. All reagents used are traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.1 Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.
10.2 All reagents are prepared and analysis is done using DI water and Class A volumetric glassware. Record standard preparation in the Standards logbook. Note date, time, analyst initials, stock standard manufacturer, lot number, and date received. Analyst should be familiar with the MSDS for the following chemicals and also with safe laboratory practices. Use reagent grade chemicals.
10.3 Nitric acid: 5.0M HNO_3, analytical reagent grade or spectrograde quality. Store at 20-25°C in the dark. Do not use concentrated HNO_3 to make up 5.0M solution if it has a yellow tinge; this is indicative of photo reduction of NO_3^- to NO_2, a reducing agent for Cr^{+6}.
10.4 Sodium carbonate: Na_2CO_3, anhydrous, analytical reagent grade. Store at 20-25°C in a tightly sealed container.
10.5 Sodium hydroxide: NaOH, analytical reagent grade. Store at 20-25°C in a tightly sealed container.
10.6 Magnesium chloride: $MgCl_2$ anhydrous, analytical reagent grade. A mass of 400mg $MgCl_2$ is approximately equivalent to 100mg Mg^{2+}. Store at 20-25°C in a tightly sealed container.
10.7 1.0 M Phosphate Buffer:

10.7.1 K_2HPO_4: analytical reagent grade.
10.7.2 KH_2PO_4: analytical reagent grade.
10.7.3 0.5M K_2HPO_4/ 0.5M KH_2PO_4 buffer at pH 7: Dissolve 87.09 g K_2HPO_4 and 68.04 g KH_2PO_4 into 700 mL of DI water and dilute to 1L.

10.8 Lead chromate: $PbCrO_4$, analytical reagent grade. Store at 20-25°C in a tightly sealed container.
10.8.1 Insoluble Matrix spike and Laboratory Control Spike (LCS), ~1300mg/kg: Add ~0.01g of $PbCrO_4$ to 1.25g sample or 1.25g sand.

10.9 Digestion solution: Dissolve 20.0 ± 0.05g NaOH and 30.0 ± 0.05g Na_2CO_3 in DI water in a one-liter volumetric flask and dilute to the mark. Store the solution in a tightly capped polyethylene bottle at 20-25°C and prepare fresh monthly. The pH of the digestion fluid must be checked before using. Record this pH on the analysis page. The pH must be 11.5 or greater. If the pH is less than 11.5, discard and re-prepare solution.

10.10 Potassium dichromate, $K_2Cr_2O_7$, spiking solution (1000mg/L Cr (VI)): Dissolve 2.829g of dried (105°C) $K_2Cr_2O_7$ in DI water in a one-liter volumetric flask and dilute to the mark. Store at 20-25°C in a tightly sealed container for use up to six months. Alternatively, a solution of 1000mg/L Hexavalent Chromium can be purchased. Follow the manufacturer's expiration date.
10.10.1 Matrix spiking solution (ICV Intermediate Solution), 10mg/L: Dilute 10mL of 100mg/L ICV stock to 100mL with DI water. Intermediate standards should be prepared once every year within manufacturer's expiration date. Take 1ml of 100mg/L, bring to volume 10mL with DI (=10mg/L Cr VI)
10.10.1.1 Soluble Matrix Spike (MS) and Laboratory Control Spike (LCS): 4mg/Kg: Add 1mL of the 10mg/L ICV Intermediate Stock to 2.5g sample and 1mL to 2.5g Ottawa sand for the LCS. Note the lot number of the sand on your digestion sheet.

11.0 Calibration and Standardization - NA

12.0 Procedure

12.1 Soil Digestion Procedure for determining total Cr6+.
12.1.1 Acquire and label 50mL digestion vials for use with Deena ii digestion block. Weigh 1.25g ± .05g sample into vial (for low-level analysis, weigh 2.50g ± 0.5g), replacing sample with sand or glass beads for quality control samples. Add approximately 0.2g $MgCl_2$ to all samples and quality control. Add 40uL 100ppm Cr6+ ICV stock to LCS/LCSD/MS/MSD. Add .01g $PbCrO_4$ to insoluble LCS and insoluble MS.
12.1.2 Using Deena II, add 25mL digestion solution and 0.25mL phosphate buffer to all samples including a temperature blank. Preheat the block for 30 minutes, lower the samples to 60% height, shake, and monitor temperature every 5 minutes for 2 hours. Raise the samples and continue to shake for 30 minutes. Check that the temperature blank was between 90 and 95 for at least 60 minutes.
12.1.2.1 For operation and maintenance of the DEENA II, refer to SOP INS009 for more information.
12.1.2.2 After digestion, transfer the DEENA sample digestion vessels into a centrifuge apparatus and turn on using 3500 rpm or greater for 10 minutes.Remove the DEENA vessels from the centrifuge and decant the liquid into a clean container, taking care not to transfer any

particulate matter into the container. Rinse the DEENA vessel with 5-10mL DI water and return to the centrifuge for another 10 minutes. Repeat the decanting step and rinsing step again for a **total** of three repetitions.

12.1.3 Place a magnetic stir bar into the container with the sample. Constantly stir on the magnetic stir plate, while adjusting the pH to 7.5 ± 0.5 for Method 7196A and pH 9.0 ± 0.5 for Method 7199, using 5M Nitric acid and pH meter. Addition of 5M nitric acid should be added **slowly** (dropwise). This step should be adjusted under a hood since CO_2 will be evolved. If the pH of the digestate falls below the desired range, discard and re-digest the sample. If the sample repeatedly falls below the desired range, adjust the pH of the sample using diluted nitric acid. If after adjusting pH the sample contains a flocculent precipitate, filter the sample through a 0.45µm membrane filter (if filter becomes clogged a larger size filter paper may be used to pre-filter the samples). Record pH adjustment on the worksheet.

12.1.4 Dilute to the 50mL mark on the vial with DI water. A further dilution in DI water is performed according to SOP ANA7199-218 for instrument analysis.

12.1.5 Post digestion spikes are prepared just prior to analysis, spiking similarly to an LCS. That is, 500uL 100ppb intermediate second source for method 7199 and 40uL 100ppm stock for 7196.

12.2 Determination of Cr^{+6} in Soil Digestates

12.2.1 Determine the Cr (VI) concentration in mg/kg by method 7196A or Method 7199. See applicable SOPs.

12.3 Once digestates are ready for disposal, wastes are neutralized as acid waste.

13.0 Data Analysis and Calculations

$$\text{Sample concentration (mg/kg)} = \frac{A \times D \times E}{B \times C}$$

A = Concentration observed in digest (mg/L)
B = Initial moist sample weight (kg)
C = % Solids / 100
D = Dilution factor
E = Final digest volume (L)

14.0 Data Assessment and Acceptance Criteria for QC

14.1 Check to see if the QC criteria were met, and the appropriate standards were analyzed. Check documentation of the standards and spike prep. Verify a sample of the calculation.

14.2 Enter the results, analysis date, and QCG into LIMS database.

14.3 The section manager or another qualified chemist performs the second level of review. The review person signs off the Multilevel Quality Control Sign off Worksheet. The MQCS sheets are filed with the data package.

14.3.1 Check to see if the QC criteria were met, and the appropriate standards were analyzed. Verify a sample of the calculation. Verify Labworks entry.

14.3.2 After the data has been validated and reduced, reviewer puts her/his initials on the schedule page attached to the run log.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

15.1 The following steps are to be followed whenever the results of your work did not conform to our SOPs or your work did not conform to the agreed requirements of our clients.

15.2 It is the responsibility of the analyst to immediately inform his/her Supervisor of any problems that may have occurred during the extraction and/or analysis of client's samples. The supervisor immediately informs the Project Manager.

15.3 The Supervisor, analyst and Project Manager evaluates the significance of the non-conforming work and determine what impact it may have on results and what actions must immediately be taken to correct the situation.

15.4 If the data quality is impacted, the client shall be notified immediately after assessment.

15.5 A Non-conforming Work Report (NWR) is initiated when:

15.5.1 An out of control situation has significant impact on the outcome of finalized data. Such as (LCS, Surrogate, Calibration, RPD, CCV, ICV failure), hold time expired, blank contamination, or other situations that affected the results.

15.6 The NWR form is located in ARF Summary on your desktop.

15.7 The NWRs are filled out as completely as by the analyst or section manager.

15.8 Refer to APPL SOP # QC033 for more information on nonconforming work.

15.9 In the event that an out of control situation occurs, the project manager is notified immediately. The affect of the out of control situation is assessed according to the project DQO. If sufficient sample remains, and the situation significantly affects the quality of the results, the analysis is repeated. If the situation does not significantly affect the quality of the data, the project manager notifies the client and instructions from the client will be are followed. In the event no sample remains, the client is notified immediately. All situations are documented on the multi level review sheet and initialed by the project manager. All out of control situations are brought to the attention of the QAU in the form of a NWR. The QAU has the final authority to approve any actions taken.

16.0 Method deviations

This SOP was compared to method 3060A. The following step is a deviation to the method: Ancillary parameter data is not obtained. The method was reduced in scale by a factor of two to meet the maximum volume of the Deena II digestion block. There are no other deviations from the method.

17.0 Pollution Prevention

All hazardous materials that are generated during the testing of samples must be properly collected and stored. Drums are available in the storage room for the following types of wastes- acidic, basic and solvents.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance

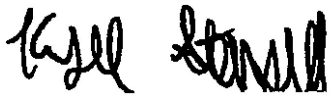
19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.
19.2 A method detection Limit (MDL) study is run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. An MDL study is performed for each matrix per instrument after major instrument changes take place, such as a column change and is performed in accordance with SOP# QC018.
19.3 The method is not performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study.

20.0 Equipment/Instrument Maintenance and Troubleshooting - NA
21.0 Computer hardware and software - NA

22.0 References
22.1 Test Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Revision 2, 1994, Method 3060A, Revision 1, 1996
22.2 DOD QSM, version 5.3, May 2019
22.3 ISO/IEC 17025:2017

23.0 Any tables, diagrams, flowcharts, validation data
23.1 Table 1: Quantitation limits
23.2 Table 2: Laboratory Control limits
23.3 Table 3: Matrix spike Control limits
23.4 Table 4: Post digestion spike limits
23.5 Table 5: Matrix Duplicate precision limits
23.6 Table 6: DoD QSM 5.3 2019, Table 10

Section Manager Name: Kyle Stansell



Section Manager Signature: _____ Date: 05/12/2022

QAU Director Name: Paula McCartney



QAU Director Signature: _____ Date: 05/12/2022

Table 1
Cr+6 Quantitation Limits

Compound	**Soil** LOQ (mg/Kg)	**Low-Level Soil** LOQ (mg/kg)
Cr+6	0.6 mg/Kg	0.1 mg/Kg

Table 2
Cr+6 Laboratory Control Spike Control Limits

Compound	**Soil** Control Limit (%R)
Cr+6	72-116%

Table 3
Cr+6 Matrix Spike Control Limits

Compound	**Soil** Control Limit (%R)
Cr+6	72-116%

Table 4
Cr+6 Post-Digestion Matrix Spike Control Limits

Compound	**Soil** Control Limit (%R)
Cr+6	85-115%

Table 5
Cr+6 Matrix Duplicate Precision Limits

Compound	Precision (%RPD)
Cr+6	20%

Table 6

DoD QSM, Table 10

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Initial Calibration (ICAL)	Daily ICAL prior to sample analysis.	$r^2 \geq 0.99$.	Correct problem, then repeat ICAL.	Flagging is not appropriate.	Minimum three standards and a reagent blank. No samples shall be analyzed until ICAL has passed.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within ± 10% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.
Continuing Calibration Verification (CCV)	Daily before sample analysis, after every 15 field samples and at the end of the analysis sequence.	All reported analytes within ± 10% of true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for hexavalent chromium in all samples since the last acceptable calibration verification.	Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Table 6, continued

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for hexavalent chromium in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for hexavalent chromium in all samples in the associated preparatory batch.	Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	Once per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error. Verification check ensures lack of reducing conditions or interference from matrix.

Table 6, continued

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	Minimum Frequency	Acceptance Criteria	Corrective Action	Flagging Criteria	Comments
Matrix spike Duplicate (MSD) or Matrix Duplicate (MD)	Aqueous matrix: One per every 10 project samples. Solid matrix: One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method. Re-prep and reanalyze all samples in the prep batch.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	The data shall be evaluated to determine the source of difference. Results may not be reported without a valid pair. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Soluble and Insoluble Pre-Digestion Matrix Spikes (solid matrix samples only)	One soluble and insoluble pre-digestion MS analyzed per preparatory batch prior to analysis.	MS recoveries within 75 – 125%.	Correct problem and re-homogenize, redigest, and reanalyze samples. If that fails, evaluate against LCS results.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	
Post-digestion Matrix Spike (solid matrix samples)	One per preparatory batch.	Recovery within 85 - 115%.	No specific corrective action, unless required by the project.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	Criteria apply for samples with concentrations > 50 X LOQ prior to dilution.

Standard Operating Procedure

HEXAVALENT CHROMIUM ANALYSIS
Method 7196A

STATEMENT OF PURPOSE

This procedure defines the EPA method for determination of Hexavalent Chromium (Cr^{+6}) from soluble, adsorbed, and precipitated forms of Chromium compounds in soils, sludges, sediments, and similar waste materials. Dissolved Hexavalent Chromium (Cr^{+6}) can be determined in EP/TCLP characteristic extracts, ground waters and domestic and industrial wastes without alkaline digestion. Samples containing Molybdenum, Vanadium, and/or Mercury may interfere with the reaction of Chromium and Diphenylcarbazide giving inaccurate results.

INSTRUCTIONS

1.0 Scope and Application

1.1 This method is used to determine the concentration of dissolved Hexavalent Chromium in water samples. This method may be used to analyze samples containing from 0.02 to 0.5 mg of Cr^{+6} per liter. This method is also used to determine soil digestates using method 3060A and DI extractions of soils using a 1:10 extraction.

1.2 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method.

1.3 If an individual project has its own QAPP with client specific requirements that are different than the SOP, the QAPP overrides the SOP. This information will be specified in the comment section of the ARF.

2.0 Method Summary

Hexavalent Chromium, in the absence of interfering amounts of substances such as Molybdenum, Vanadium, and Mercury, may be determined colorimetrically by reaction with Diphenylcarbazide in an acid solution. Addition of an excess of Diphenylcarbazide yields a red-violet product, and its absorbance is measured photometrically at 540nm.

3.0 Detection Limits

Table 1 lists the quantitation limits (LOQ for DoD QSM) for all target analytes. If an individual project has its own QAPP with client specific requirements different to those in Table 1, the client QAPP limits are used.

4.0 Definitions

See SOP# DOC019

5.0 Interferences and Potential Problems

5.1 The Chromium reaction with Diphenylcarbazide is usually free from interferences. However, certain substances may interfere if the Chromium concentration is relatively low. Hexavalent Molybdenum and Mercury salts also react to form color with the reagent; however, the red-violet intensities produced are much lower than those for Chromium are at the specified pH.

5.2 Iron in concentrations greater than 1mg/L may produce a yellow color, but the Ferric Iron color is not strong and difficulty is not normally encountered at the appropriate wavelength.

6.0 Health and Safety

Lab coats safety glasses and gloves are used at all times. Handle reagents and samples using good laboratory practices.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 The sample should be analyzed as soon as possible after sampling and stored in a glass or plastic container at 4℃ until analysis.

7.2 The maximum holding time for Cr^{+6} in water samples prior to analysis is 24 hours from sample collection.

7.3 The maximum holding time for Cr+6 in soil samples is 24 hours from DI extraction or 168 hours after alkaline digestion.

7.4 Preserved samples: The sample must be filtered and the pH adjusted with the prescribed buffer (10.5) to the range of 9.3-9.7 within 15 minutes of sample collection. The sample should be analyzed as soon as possible after sampling and stored in a glass or plastic container at ≤ 6°C until analysis. The holding time for Cr(VI) in water samples is 28 days.

8.0 Quality Control

8.1 QC Criteria

8.1.1 Acceptable recovery for CCV, and ICV is ±10% the true value.

8.1.2 A CCB and CCV will be analyzed for every ten sample readings.

8.1.3 Acceptable recovery for CCB's is less than the reporting limit.

8.1.4 Acceptable recovery for water LCS is ±15% the true value.

8.1.5 Acceptable recovery for soil LCS is ±20% the true value

8.1.6 The quality control set consists of a method blank, laboratory control spike (LCS), matrix duplicate and a matrix spike/matrix spike duplicate for each batch of 20 samples or less. For USACE a LCS and LCSD must be performed.

8.1.7 Blanks: Acceptance criteria: All target analytes in the method blank must be < RL. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ LOQ. For common laboratory contaminants, no analytes detected ≥ RL.

8.1.7.1 Corrective Action: If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank'.

8.1.8 One matrix duplicate will be analyzed for every twenty samples

8.1.8.1 Acceptable precision for matrix duplicate (soils) should be ≤ 20% RPD if both the original and the duplicate are ≥ 4x the PQL. A control limit of ± 40% is used when either the original or the duplicate sample is < 4x the PQL.

8.1.9 A matrix spike and spike duplicate will be analyzed for every twenty samples.

8.1.9.1 A matrix spike will be analyzed for every sample matrix. The recovery limits can be found on Table 3. Client specific criteria supercede the method criteria.

8.1.9.2 Two matrix spikes will be digested for the soil digestions. One soluble and one insoluble. The recovery limits can be found on Table 3. Client specific criteria supercede the method criteria.

8.1.10 Spike QC limits: The upper and lower control limits are established on 30 data points using control charts and are established on ± 3 standard deviations from the mean. (See SOP# QC016 for control chart generation.)

8.1.10.1 Corrective Action:

8.1.10.1.1 Waters - If the LCS is recovered outside of control limits reanalyze the spike (Table 2). If the LCS is still outside of acceptable limits re-prepare and reanalyze the batch.

8.1.10.1.2 Soil - If the LCS is not within 80-120% recovery, then the entire batch should be redigested and reanalyzed.

8.1.10.1.3 If the LCS was within acceptance criteria and the matrix spike recoveries were less than the acceptance range minimum of 75%, this indicates that the soil samples reduced Cr+6 and no measurable native Cr+6 existed in the unspiked sample.

8.1.10.1.4 DoD - If there are positive findings for that compound reanalyze the spike and all effected samples or flag the results with a 'Q'.

8.1.10.1.5 Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.1.10.2 Matrix Spike failures: The control limits established above in section 9.1.10 are also used the upper and lower control limits for the MS/MSD. Acceptance limit RPD between MS and MSD - Waters ≤ 20% RPD, Soils ≤ 30% RPD. For DoD projects, an LCSD is required, if there is insufficient volume for MS/MSD.

8.1.10.2.1 Waters - MS/MSD recoveries outside of acceptable control limits (Table 3) re-prepare a new MS/MSD set and re-analyze. If the spike is still outside of acceptable limits, dilute the parent sample and spike. If the diluted MS/MSD is out of acceptable limits, the failure can be attributed to matrix interference.

8.1.10.2.2 Soil - MS/MSD recoveries outside of acceptable limits (Table 3) re-homogenize, redigest, and reanalyze the entire batch. If the MS/MSD are still outside of acceptable limits and the LCS is within acceptable limits, the client will be contacted to determine if further action is required.

8.1.10.2.3 Corrective Action: Examine the project specific DQOs and contact the project manager who will in turn contract the client. Flag the parent sample with a "J" for failed analytes. Client specific requirements for the exceptions are listed on the APPL Analysis Request Form (ARF).

8.1.10.2.4 Corrective Action: If the MS/MSD does not meet acceptance criteria for RPD: Report with appropriate data qualifying codes. For DoD projects, "J" flag the parent sample result for the failing analyte.

8.1.11 Instrument calibration: Requirements for calibration are listed in the calibration section of this SOP.

8.1.12 Corrective action: If the initial calibration curve does not meet the requirements, the standards will be reformulated and reanalyzed. If the continuing calibration verification does not meet the requirements a new CCV is prepared and analyzed.

8.1.13 For DoD projects, if a CCV fails, the laboratory can immediately analyze two additional consecutive CCVs (immediately is defined as starting a consecutive pair within one hour; no samples can be run between the failed CCV and the two additional CCVs). This approach allows for spurious failures of analytes to be reported without reanalysis of samples. Any corrective actions that change the dynamics of the system (e.g., clip column, clean injection port, run blanks) requires that all samples since the last acceptable CCV be reanalyzed. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without reanalysis. If either of these two CCVs fail or if the laboratory cannot immediately analyze two CCVs, the associated samples cannot be reported and must be reanalyzed. Flagging of data for a failed CCV is only appropriate when the affected samples cannot be reanalyzed. The lab must notify the client prior to reporting data associated with a failed CCV.

8.1.14 Method Detection Limits: Establish the LOD, LOQ and MDL according to SOP# QC018.

9.0 Equipment/Apparatus

9.1 Class A volumetric glassware and pipettes.

9.2 Spectrophotometer: Suitable for measurements at 540nm with a 1.0cm cell. The Thermo Genesys 10µv spectrophotometer is used. Or equivalent

9.3 Class A Beakers: 150mL

9.4 Calibrated balance – Mettler AT200. Or equivalent

9.5 Calibrated pH meter – VWR SP10 or equivalent.

10.0 Reagents and Standards

Reagent grade inorganic chemicals shall be used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. All reagents used will be traceable at all steps of the procedure. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability. All reagents are prepared and analysis is done using DI water and Class A volumetric glassware. Record standard preparation in the Standards logbook. Note date, time, analyst initials, stock standard manufacturer, lot number, and date received. Analyst should be familiar with the MSDS for the following chemicals and also with safe laboratory practices. Use reagent grade chemicals.

10.1 The expiration date for analytical standards may be extended by following re-certification procedures below:

10.1.1 Contact the standard supplier and request an expiration date extension. If the supplier is not able to extend the date, then in-house re-certification may be performed as follows:

10.1.1.1 Analyze the expired standard and quantitate it against an unexpired standard from a different supplier or different lot # from same supplier.

10.1.1.2 For inorganic standards, the acceptance criteria is 10%D.

10.1.1.3 If the expired standard meets the above acceptance criteria, then extend the date by 6 months for inorganics.

10.1.1.4 The re-certification with extended expiration date is documented in the standard prep log book, along with the analysis date, instrument name, data file ID, and name of standard supplier with current unexpired lot number that was used to re-certify the expired standard.

10.1.2 Email this information to QAU.

10.2 Sulfuric acid: To 250mL DI slowly add 250mL-concentrated H_2SO_4.

10.3 Color reagent: Dissolve 0.50g of 1,5 Diphenylcarbazide in 100mL of Acetone. Store in a brown bottle, good for 1 year or discard when discolored.

10.4 Acetone: Purchase reagent grade.

10.5 Buffer for preservation: Dissolve 3.3g Ammonium Sulfate in 50mL DI water and add 6.5mL Ammonium hydroxide. Dilute to 100mL with DI water.

10.6 Hexavalent Chromium Stock Standard Solution, 1000mg/L: This standard is purchased. Follow manufacturer's expiration date.

10.7 Hexavalent Chromium Intermediate Standard, 100mg/L: Dilute 10mL of 1,000mg/L to 100mL with DI water. Intermediate standards should be prepared once every year within manufacturer's expiration date.

10.7.1 Working Standards: Working standards are prepared daily.

10.7.2 1.0mL x 100mg/L Intermediate standard / 200mL DI water ➔0.50mg/L Cr^{+6}

10.8 Prepare a set of calibration standards, using the working standard: 0.50mg/L Cr^{+6}:

0.00mL x 0.50mg/L Cr+6/25mL DI water ➔ 0.00mg/L Cr^{+6}
1.00mL x 0.50mg/L Cr+6/ 25mL DI water ➔ 0.02mg/L Cr^{+6}
2.50mL x 0.50mg/L Cr+6/ 25mL DI water ➔ 0.05mg/L Cr^{+6}
5.00mL x 0.50mg/L Cr+6/ 25mL DI water ➔ 0.10mg/L Cr^{+6}
10.0mL x 0.50mg/L Cr^{+6} / 25mL DI water ➔ 0.20mg/L Cr^{+6}
25.0mL x 0.50mg/L Cr^{+6}/ 25mL DI water ➔ 0.50mg/L Cr^{+6}

10.9 Hexavalent Chromium Initial Calibration Verification (ICV): The ICV is a second source standard (a standard from a different source than the stock standards), which is used to verify the calibration curve. One ICV per each QCG must be analyzed.

10.9.1 ICV stock Chromium solution, 1000mg/L: This standard is purchased. Follow manufacturer's expiration date.

10.9.2 ICV Intermediate Solution, 100mg/L: Dilute 10mL of 1,000mg/L ICV stock to 100mL with DI water. Intermediate standards should be prepared once every year within manufacturer's expiration date.

10.9.3 ICV Working Solution, 0.16mg/L: Add 40µL of the 100mg/L ICV Intermediate Stock to 25mL DI water.

10.10 Ascorbic acid, reagent grade.

11.0 Calibration and Standardization

11.1 Zero the spectrophotometer using the blank. Read the standards and construct a calibration curve by plotting absorbance vs. concentration. Between each standard or sample rinse the cuvette with DI water followed by the next sample to be read, refill with that sample, and blot outside dry with a Kimwipe.

11.2 Calculate the correlation coefficient using an Excel spreadsheet for hexavalent chromium.

11.3 The correlation coefficient for the standard curve must be at least 0.995.

12.0 Procedure

12.1 Preparation procedures for soils:

12.1.1 SOP ANA3060A – Alkaline digestion of soils and SOP INO002 – DI extraction of soils.

12.2 Determination of Cr^{+6} in Soil Digestates and Waters

12.2.1 Turn on the spectrophotometer and set the absorbance to 540nm. To do these enter 540, -second function, then go to λ. Allow the spectrophotometer to warm up for about 30min before use.

12.2.2 If a sample is turbid has soil in it, etc., filter it through a 0.45µm membrane filter and use the filtrate for analysis. If color persists read the sample on the spectrophotometer before adding carbazide and note the absorbance in the logbook. Correct the absorbance reading of the final colored solution by subtracting the absorbance measured previously.

12.2.3 Measure 25mL of sample or standard or digestate in a graduated cylinder. Pour into a beaker. Add 0.5mL of the color reagent to each beaker and swirl. The laboratory control spike and any designated matrix spikes should be spiked now (for water analyses.)

12.2.4 Laboratory Control Spike, 0.16mg/L: Add 40µL of the 100mg/L ICV Intermediate Stock to 25mL of sample or DI water.

12.2.5 Adjust the pH of the sample to 2 ± 0.5. Record the pH. Allow samples to develop color for 5-10 minutes

12.2.6 After the calibration curve is calculated, read the absorbance of the ICV, calculate the concentration using the calibration curve, and determine the percent recovery. Make sure QC is acceptable before analyzing samples. (±10%) Record results in the Cr^{+6} logbook.

12.3 After calibration is complete, read the absorbance of each sample.

12.3.1 Calculate sample concentration from the standard curve by entering the absorbance of your sample. If a sample analyte exceeds the calibration range, dilute the sample and analyze it again. Record results in the Cr^{+6} logbook.

12.4 A CCV (intermediate range standard, 0.2mg/L), and a CCB (blank) must be analyzed after every ten sample readings.

12.5 Post-spike: For each sample matrix analyzed, one sample matrix spike is subjected to verification.

12.5.1 Waters - Take the 25mL water matrix spike and add an additional aliquot of 40µL. This concentration will be at least twice the original Cr^{+6} concentration. The spike recovery should be ±15% (85-115%).

12.5.1.1 If the concentration is above the calibration range, dilute the spike with DI water and re-analyze.

12.5.1.2 Alternatively, for low spike recoveries, the sample can be adjusted to pH 8.0-8.5 using 1 N NaOH, spiked, and analyzed. If the recoveries are within limits, it can be concluded that the sample contains residual reducing agent.

12.5.1.3 If the interference persists after dilution, the client will be contacted to determine if further action is required.

12.5.2 Soil digestates – Take your 25mL soluble digestate matrix spike and add 250µL of the 100ppm matrix spike solution (section 6.9.1 of SOP # ANA3060A). This should be equivalent to 40mg/kg or twice the sample concentration observed in the unspiked aliquot, whichever is greater. The spike recovery should be ±15% (85-115%).

12.5.2.1 Acceptance criteria for the matrix spike:

12.5.2.1.1 If the LCS is not within 80-120% recovery, then the entire batch should be redigested and reanalyzed.

12.5.2.1.2 If the LCS was within acceptance criteria and the matrix spike recoveries were less than the acceptance range minimum of 75%, this indicates that the soil samples reduced Cr+6 and no measurable native Cr+6 existed in the unspiked sample.

12.6 Pour spent Cr^{+6} reagents and samples into a single container and treat with ascorbic acid or other reducing agent to reduce Cr^{+6} to Cr^{+3}. Add approximately 25g ascorbic acid into a 2L waste container, shake to dissolve, adjust the pH, if needed, between 5-9 and discard down the sink. Put glass volumetric pipettes in the Nalgene wash containers. Put other glassware on the dishware counter. Return all other laboratory equipment to the proper storage place and clean your work area. Turn off the spectrophotometer.

13.0 Data Analysis and Calculations

13.1 The following calculation is used to determine the Cr+6 concentration in a soil sample with 3060A digestion:

$$\text{Concentration (mg/kg)} = \frac{A \times D \times E}{B \times C}$$

Where:

A = Concentration observed in the digest (mg/L)
B = Initial moist sample weight (0.0025kg)
C = % Solids / 100
D = Dilution factor
E = Final digest volume (0.1L

13.2 The following calculation is used to determine the Cr+6 concentration in a soil sample with 1:10 extraction:

$$\text{Concentration (mg/kg)} = \frac{A \times C \times D}{B}$$

Where

A = Concentration observed in the extract (mg/L)
B = Initial sample weight (10.0g)
C = Final volume (100mL)
D = Dilution Factor

13.3 The following calculation is used to obtain percent spike recovery:

$$\% \text{ Recovery} = \frac{SSR - SR}{SA} \times 100$$

Where:

SSR = Spike sample result
SR = Sample (unspiked) result
SA = Spike added

13.4 The following calculation is used to obtain % RPD:

$$\% \text{ RPD} = \frac{\text{Sample result} - \text{duplicate result}}{[(\text{Sample result} + \text{duplicate result})/2]} \times 100$$

13.5 Report two significant figures when result is less than 10 and three significant figures when result is greater than 10.

14.0 Data Assessment and Acceptance Criteria for QC

14.1 The analyst completing the work first reviews data. The initial calibration curve is reviewed, the continuing calibration %D is reviewed and the spike recovery and precision is reviewed. If at any point the review shows an out of control situation, complete an NWR form. See SOP QC033. The section manager is notified verbally and the problem is investigated. The correction may be one of several points considered; standard preparation, improper injection size, extraction technique, etc. The problem is potentially solved and reanalysis or re-extraction/reanalysis is performed if possible. If reanalysis is not possible, flag the reported data accordingly. All pertinent information on the NWR is included in the case narrative. These points are documented on the Multilevel Quality Control Sign-Off worksheet.

14.2 The second level of review is either by a peer in the same section, the section manager, or someone designated by the QAU. The Multilevel Quality Control Sign Off worksheet is signed off by the review person. The MQCS sheets are filed with the data package.

14.3 When QC parameters are exceeded, the following takes place: When the matrix spike criteria are exceeded, contact the project manager who will contact the client as to additional measures to be taken. For the specific analyte(s) in the parent sample, apply appropriate flags if acceptance criteria are not met If the MS/MSD. When the LCS is outside of limits see section 8.10.1 above.

14.4 Specific QC limits are discussed in section 8.0 above and Table 2-4 below.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

In the event that an out of control situation occurs, the project manager will be notified immediately. The affect of the out of control situation will be assessed according to the project DQO. If sufficient sample remains, and the situation will significantly affect the quality of the results, the analysis will be repeated. If the situation does not significantly affect the quality of the data, the project manager will notify the client and instructions form the client will be followed. In the event no sample remains, the client will be notified immediately. All situations will be documented on the multi level sheet and initialed by the project manager. All out of control situations will be brought to the attention of the QAU in the form of a NWR. The QAU has the final authority to approve the actions taken.

16.0 Method deviations

This SOP was compared to EPA method 7196A and 3060A. The following deviations are followed:

16.1 Samples with turbidity are filtered.

16.2 Sample volume used is 25mL, not 95mL; all reagents are adjusted accordingly.

17.0 Pollution Prevention

All hazardous materials that are generated during the testing of samples must be properly collected and stored. Drums are available in the storage room for the following types of wastes- acidic, basic and solvents.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and land disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance

19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.

19.2 A method detection Limit (MDL) study is run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. An MDL study is performed for each matrix per instrument in accordance with SOP# QC018.

19.3 The method is not performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study.

20.0 Equipment/Instrument Maintenance and Troubleshooting

20.1 Gensys 10uv Spectrophotometer. Calibration for spectrophotometer must be checked, see SOP INO22.

21.0 Computer hardware and software

21.1 Gensys 10µv Spectrophotometer. Data is input into Excel, and uploaded via Direct Upload to Labworks.

22.0 References

22.1 Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Revision 2, September 1994; Method 7196A, Revision 1, July 1992.

22.2 Methods for Evaluating Solid Waste, Physical/Chemical Methods (SW846), Revision 2, September 1994, Method 3060A, Revision 1, 1996

22.3 DoD QSM, Revision 5.3, 2019

22.4 ISO/IEC 17025:2017

23.0 Any tables, diagrams, flowcharts, validation data

Table 1: Quantitation limits
Table 2: Control limits
Table 3: Matrix spike/Matrix spike duplicate control limits
Table 4: Soil matrix duplicate precision limits
Table 5: Table 10 from DoD QSM, revision 5.3, 2019

Section Manager Name: Kyle Stansell

Section Manager Signature: _____ Date: 05/12/2022

QAU Director Name: Paula McCartney

QAU Director Signature: _____ Date: 05/12/2022

Table 1

Cr+6 Quantitation Limits

Compound	Water Quantitation Limit (mg/L)	**Soil** Quantitation Limit (mg/Kg)
Cr+6	0.02 mg/L	0.8 mg/Kg

Table 2

Cr+6 Laboratory Control Spike Control Limits

Compound	Water Control Limit (%R)	Precision (%RPD)	Soil Control Limit (%R) Limit (%R)
Cr+6	85-115%	20%	80-120%

Table 3

Cr+6 Matrix Spike/Matrix Spike Duplicate Control Limits

Compound	Water Control Limit (%R)	Precision (%RPD)	Soil Control Limit (%R) Limit (%R)
Cr+6	85-115%	20%	75%

Table 4

Cr+6 Soil Matrix Duplicate Precision Limits

Compound	Precision (>4x PQL) (%RPD)	Precision (<4x PQL) (%RPD)
Cr+6	20%	40%

Table 5

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Initial Calibration (ICAL)	Daily ICAL prior to sample analysis.	$r^2 \geq 0.99$.	Correct problem, then repeat ICAL.	Flagging is not appropriate.	Minimum three standards and a reagent blank. No samples shall be analyzed until ICAL has passed.
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	All reported analytes within ± 10% of true value.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.
Continuing Calibration Verification (CCV)	Daily before sample analysis, after every 15 field samples and at the end of the analysis sequence.	All reported analytes within ± 10% of true value.	Recalibrate, and reanalyze all affected samples since the last acceptable CCV; or Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for hexavalent chromium in all samples since the last acceptable calibration verification.	Results may not be reported without a valid CCV. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

Table 5

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Method Blank (MB)	One per preparatory batch.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for hexavalent chromium in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for hexavalent chromium in all samples in the associated preparatory batch.	Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	Once per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	If MS results are outside the limits, the data shall be evaluated to determine the source(s) of difference, i.e., matrix effect or analytical error. Verification check ensures lack of reducing conditions or interference from matrix.

Table 5

Table – 10. Inorganic Analysis by Colorimetric Hexavalent Chromium					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Matrix spike Duplicate (MSD) or Matrix Duplicate (MD)	Aqueous matrix: One per every 10 project samples. Solid matrix: One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Dilute and reanalyze sample; persistent interference indicates the need to use the method of standard addition, alternative analytical conditions, or an alternative method. Re-prep and reanalyze all samples in the prep batch.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	The data shall be evaluated to determine the source of difference. Results may not be reported without a valid pair. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Soluble and Insoluble Pre-Digestion Matrix Spikes (solid matrix samples only)	One soluble and insoluble pre-digestion MS analyzed per preparatory batch prior to analysis.	MS recoveries within 75 – 125%.	Correct problem and re-homogenize, redigest, and reanalyze samples. If that fails, evaluate against LCS results.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	
Post-digestion Matrix Spike (solid matrix samples)	One per preparatory batch.	Recovery within 85 - 115%.	No specific corrective action, unless required by the project.	Apply J-flag to all results for hexavalent chromium if acceptance criteria are not met and explain in the case narrative.	Criteria apply for samples with concentrations > 50 X LOQ prior to dilution.

Standard Operating Procedure

**Instrumental Analysis of Polychlorinated Dibenzodioxins (PCDD)
and Polychlorinated Dibenzofurans (PCDF)
BY HRGC-HRMS (EPA METHOD 8290)**

STATEMENT OF PURPOSE

This procedure describes the proper way to extract and cleanup samples from solid, tissue, and aqueous matrices and analyze them for PCDD (Dioxins) and PCDF (Furans) using high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS).

INSTRUCTIONS

1.0 Scope and Application

1.1 This method describes the part-per-quadrillion (ppq) instrumental analysis of PCDD (Dioxins) and PCDF (Furans) in extracts from solid, tissue and aqueous matrices using high resolution gas chromatography/high resolution mass spectrometry (HRGC/HRMS). This method also describes the required extraction and cleanup steps for all matrices prior to analysis.

1.2 The following compounds can be determined by this method:

Compound	CAS No.
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746-01-6
1,2,3,7,8-Pentachlorodibenzo-p-dioxin (PeCDD)	40321-76-4
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	57653-85-7
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin (HxCDD)	39227-28-6
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin (HxCDD)	19408-74-3
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin (HpCDD)	35822-39-4
1,2,3,4,6,7,8,9-Octachlorodibenzo-p-dioxin (OCDD)	3268-87-9
2,3,7,8-Tetrachlorodibenzofuran (TCDF)	51207-31-9
1,2,3,7,8-Pentachlorodibenzofuran (PeCDF)	57117-41-6
2,3,4,7,8-Pentachlorodibenzofuran (PeCDF)	57117-31-4
1,2,3,6,7,8-Hexachlorodibenzofuran (HxCDF)	57117-44-9
1,2,3,7,8,9-Hexachlorodibenzofuran (HxCDF)	72918-21-9
1,2,3,4,7,8-Hexachlorodibenzofuran (HxCDF)	70648-26-9
2,3,4,6,7,8-Hexachlorodibenzofuran (HxCDF)	60851-34-5
1,2,3,4,6,7,8-Heptachlorodibenzofuran (HpCDF)	67562-39-4
1,2,3,4,7,8,9-Heptachlorodibenzofuran (HpCDF)	55673-89-7
1,2,3,4,6,7,8,9-Octachlorodibenzofuran (OCDF)	39001-02-0

1.3 The quantitation range of 2,3,7,8-TCDD for 1 liter water sample (final vol. 50µL) is 5 – 10,000 ppq (pg/L). The quantitation range of 2,3,7,8-TCDD for 10g soil/tissue (final vol. 50µL) is 0.5 – 1,000ppq (pg/g). Reporting limits are based upon the lowest calibration point and the dilution factor, however Practical Quantitation Limits (PQL) are dependent on the potential interferences caused by the sample matrix.

1.4 The Toxicity Equivalent Quotient (TEQ) using 2,3,7,8 TCDD may also be determined by this method.

1.5 This method is restricted to use by or under the supervision of trained analysts. Each analyst must demonstrate the ability to generate acceptable results with this method. If

an individual project has its own QAPP with client specific requirements that are different than the SOP, the QAPP overrides the SOP. This information will be specified in the comment section of the ARF.

1.6 Precautions must be taken to exposure to materials known or believed to contain PCDDs or PCDFs. Many of these compounds are extremely toxic and it is the responsibility of laboratory personnel to practice safe laboratory procedures.

2.0 Method Summary

2.1 Samples are spike with internal standards then extracted and cleaned up using a variety of procedures. Extraction processes may include Soxhlet or separatory funnel shake. Clean up procedures may include acid/base shake, acid/base silica gel column, and carbon column.

2.2 C_{13} labeled recovery standards are added to each sample extract prior to instrument analysis. The analytes are separated by HRGC using a Restek DB-5 column and detected by HRMS.

2.3 An analyte is identified in a sample by comparing the RT and ion abundance ratios (of the two most abundant m/z) to the standard RT and theoretical ion abundance ratios.

2.4 Quantitation is achieved based on a minimum five-point calibration curve, using the internal standard quantitation technique.

3.0 Detection Limits

The following list shows the various sample types and the 2,3,7,8-TCDD-based method calibration limits (MCLs) that are cover in this procedure.

	Water	Soil	Fish Tissue
Lower MCL	5 pg/L	0.5 pg/g	0.5pg/g
Upper MCL	10000 pg/L	1000 pg/g	1000 pg/g
Weight / Volume	1000 mL	10g	10g
IS spiking levels	5000pg/L	500pg/g	500pg/g
Final volume	50µl	50µl	50µl

4.0 Definitions

Calibration standard - A solution prepared from the primary dilution standard solution or stock standard solution and the internal standards and surrogate analytes. The calibration solutions are used to calibrate the instrument response with respect to analyte concentration.

Detection Limit (DL) - The lowest concentration or amount of the target analyte that can be identified, measured, and reported with confidence that the analyte concentration is not a false positive value. (NELAC) The smallest analyte concentration that can be demonstrated to be different from zero or a blank concentration at the 99% level of confidence. At the DL, the false positive rate (Type I error) is 1%.

Extracted Ion Current Profile (EICP)—The computer must have software that allows searching any GC/MS data file for ions of a specified mass and plotting such ion abundance versus time or scan number.

Field Reagent Blank - An aliquot if reagent water or other blank matrix that is placed in a sample container in the laboratory and treated as a sample in all respects, including shipment to the sampling site, exposure to sampling site conditions, storage, preservation, and all analytical

procedures. The purpose of the FRB is to determine if method analytes or other interferences are present in the field environment.

Instrument blank (Blk) - An aliquot of reagent water or other blank matrix to demonstrate that the instrument is not contributing contaminants to the samples.

Internal Standard (IS) - A pure analyte(s) added to a sample, extract, or standard solution in known amount(s) and used to measure the relative responses of other method analytes and surrogates that are components of the same sample or solution. The internal standard must be an analyte that is not a sample component.

Instrument Performance Check (IPC) - A solution of one or more compounds (analytes, surrogate, internal standard, or other test compounds) used to evaluate the performance of the instrument system with respect to a defined set of method criteria.

Laboratory control spike (LCS) - An aliquot of reagent water or other matrix to which known quantities of the method analytes are added in the laboratory. The LCS is analyzed exactly like a sample, and its purpose is to determine whether the methodology is in control, and whether the laboratory is capable of making accurate and precise measurements.

Laboratory Reagent Blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The LRB is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Limit of Detection - An estimate of the minimum amount of a substance that an analytical process can reliably detect. An LOD is analyte- and matrix-specific and may be laboratory-dependent. The smallest amount or concentration of a substance that must be present in a sample in order to be detected at a high level of confidence (99%)

Limit of Quantitation - The minimum levels, concentrations, or quantities of a target analyte that can be reported with a specified degree of confidence. The lowest concentration that produces a quantitative result within specified limits of precision and bias. For DoD projects, the LOQ shall be set at or above the concentration of the lowest initial calibration standard. This also equates with the term Practical Quantitation Limit (PQL).

Matrix - A surrounding substance within which something originates, develops, or is contained, such as: drinking water, saline/estuarine water, aqueous substance other than drinking water or saline/estuarine water, non-aqueous liquid, biological tissue, solids, soils, chemical waste, and air.

Matrix duplicate (MD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix sample and matrix sample duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.
Matrix spike (MS) - An aliquot of an environmental sample to which known quantities of the method analytes are added in the laboratory. The matrix spike is analyzed exactly like a sample, and its purpose is to determine whether the sample matrix contributes bias to the

analytical results. The background concentrations of the analytes in the sample matrix must be determined in a separate aliquot and the measured values in the matrix spike corrected for background concentrations.

Matrix spike duplicate (MSD) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analysis of a matrix spike and matrix spike duplicate, indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Method blank - An aliquot of reagent water or other blank matrix that is treated exactly as a sample including exposure to all glassware, equipment, solvents, reagents, internal standards, and surrogates that are used with other samples. The method blank is used to determine if method analytes or other interferences are present in the laboratory environment, the reagents, or the apparatus.

Method Calibration Limit, Lower (LCML) – The low standard on the calibration method.
Method Calibration Limit, Upper (UCML) – The high standard on the calibration method.
Method detection limit (MDL) - The minimum concentration of a substance (an analyte) that can be measured and reported with 99% confidence that the analyte concentration is greater than zero and is determined from analysis of a sample in a given matrix containing the analyte., as described in 40 CFR Part 136, Appendix B, 1 July 1995 edition.

Practical quantitation limit - The lowest concentration that can be reliably achieved within specified limits of precision and accuracy during routine laboratory operating conditions. The practical quantitation limit is generally three to ten times greater than the method detection limit.
Primary Dilution Standard - A solution of several analytes prepared in the laboratory from stock solution and diluted as needed to prepare calibrations solutions and other needed analyte solutions.

Quality Control Sample (QCS) - A solution of method analytes of known concentrations which is used to fortify an aliquot of LCS or sample matrix. The QCS is obtained from a source external to the laboratory and different from the source of calibration standards. It is used to check laboratory performance with externally prepared test materials.

Sample Duplicate (DUP1/DUP2) - Two aliquots of the same sample taken in the laboratory and analyzed separately with identical procedures. Analytes of DUP1/DUP2 indicates precision associated with laboratory procedures, but not with sample collection, preservation, or storage procedures.

Stock Standard Solution - A concentrated solution containing one or more method analytes prepared in the laboratory using assayed reference materials purchased from a reputable commercial source.

Surrogate - A pure analyte(s), which is extremely unlikely to be found in any sample, and which is added to a sample aliquot in known amount(s) before extraction or other processing and is measured with the same procedures used to measure other sample components. The purpose of the surrogate is to monitor method performance with each sample.

5.0 Interferences and Potential Problems

5.1 Solvents, reagents, glassware, and other sample processing hardware may yield artifacts, elevated baselines, and/or lock-mass suppression causing misinterpretation of chromatograms. Specific selection of reagents and purification of solvents by distillation in all-glass systems may be required. Where possible, reagents are cleaned by extraction or solvent rinse. Baking of glassware in a kiln or furnace at 450 - 500 °C may be necessary to remove contaminants.

5.2 All materials used in the analysis must be demonstrated to be free from interferences by running reference matrix method blanks before each sample batch.

5.3 Interferences co-extracted from samples will vary considerably from source to source, depending on the diversity of the site being sampled. Interfering compounds may be present at concentrations several orders of magnitude higher than the target analytes. The most frequently encountered interferences are polychlorinated biphenyls. Because very low levels of Dioxins and Furans are measured by this method, the elimination of interferences is essential. The cleanup steps given in the extraction SOPs can be used to reduce or eliminate these interferences and thereby permit reliable determination of the analytes at low levels.

5.4 In order to prevent contamination of the calibration solutions, the solutions must be prepared in an area free from contamination using glassware free from contamination.

5.5 If the laboratory air is a potential source of contamination, samples, reagents, glassware, and other materials should be dried in a fume hood or other area free from contamination.

6.0 Health and Safety

6.1 Lab coats and gloves are to be used at all times. Follow all safety procedures as describes in the SOPs for samples suspected of containing biological hazards.

6.2 2,3,7,8-TCDD has been classified as a known human or mammalian carcinogen and teratogen. On the basis of the available toxicological and physical properties of the Dioxins and Furans, pure standards should be handled only by highly trained personnel thoroughly familiar with handling and cautionary procedures and the associated risks. Standards should be prepared using gloves, goggles and lab coats under a fume hood. Soil sample homogenization should be performed under a hood to reduce inhalation of dust particles.

6.3 The pure standards and samples suspected to contain these compounds are handled using essentially the same techniques employed in handling radioactive or infectious materials. Well-ventilated, controlled access laboratories are required. Assistance in evaluating the health hazards of particular laboratory conditions may be obtained from certain consulting laboratories and from State Departments of Health or Labor, many of which have an industrial health service.

6.4 Protective Equipment

6.4.1 Handle standards and samples under a hood to minimize contamination of the laboratory.

6.4.2 Always wear safety glasses and throw away any plastic gloves, apron, or lab coat after each use.

6.4.3 PVC gloves should never be used.

6.5 Training

6.5.1 Workers must be trained in the proper method of removing contaminated gloves and clothing without contacting the exterior surfaces.

6.6 Personal Hygiene

6.6.1 Thoroughly wash hands and forearms after each manipulation and before breaks.

6.7 Confinement - Dioxin and Furan extractions require an isolated work area posted with signs.

6.8 Waste

6.8.1 Try to minimize any contaminated waste.

6.8.2 Use plastic bag liners in waste cans.

6.8.3 Liquid waste should be dissolved in methanol or ethanol and irradiated with UV light at a wavelength less than 290nm for several days. Dispose when the 2,3,7,8-TCDD/TCDF congeners can no longer be detected.

6.9 Decontamination

6.9.1 If exposed to skin, apply a mild soap with plenty of scrubbing action.

6.9.2 On glassware, tools, and other surfaces, use a solvent such as Methylene chloride. First rinse with Methylene chloride then wash with a detergent and water. Follow with a series of four rinses: 1) methanol, 2) 50% Methylene chloride 50% Hexane, 3) Witches Brew [containing equal amounts of toluene, hexane, acetone, and Methylene chloride], 4) Methylene chloride.

6.10 Laundry

6.10.1 Contaminated clothing need to be kept away from other clothing in a designated container labeled under “Disposal of Hazardous Wastes.”

6.10.2 Contaminated clothing to be laundered should be collected in plastic bags to minimize any direct contact. Clothing could be de-contaminated by running them through a full laundry cycle. An empty laundry cycle should be run afterwards to clean up any contamination.

6.11 Inhalation

6.11.1 It is good practice to provide good ventilation and to work under a hood to minimize any airborne contamination.

6.11.2 Finely divided dry soils contaminated with PCDDs and PCDFs are particularly hazardous because of the potential for inhalation and ingestion.

6.11.3 Masks fitted with charcoal filters are recommended to prevent inhalation of dust.

6.12 Accidents

6.12.1 Remove any contaminated clothing immediately

6.12.2 Wash exposed skin vigorously and repeatedly until medical attention is obtained.

6.13 Employee Health Monitoring

6.13.1 A urinary porphyrin profile may be conducted annually as needed in order to monitor the toxic body burden for employees who work directly with Dioxin/Furan sample extraction.

6.13.2 Porphyrins are enzymes involved in the formation of the blood component, heme, measured in urine. Heme is essential for the proper function of many proteins including oxygen transport, energy production, and detoxification. Proper porphyrin production is essential for our body's capacity to detoxify toxins.

6.13.3 Any disturbance in the Heme chemical pathway tends to cause rapid and relatively large accumulations of porphyrins. These enzymes are widely distributed in human tissues, and are highly sensitive to the presence of various toxins (such as metals, dioxins or pesticides), creating the large accumulation of porphyrins in the urine[2].

6.13.4 The urine test kits may be ordered through Direct Labs 1-800-308-0000 (www.directlabs.com). The kit can then be used at home and mailed to Metametrix for porphyrin profiling (www.metametrix.com). The necessary paper work and mailing instructions are provided by Metametrix in the kit. The results are recorded in a logbook.

6.13.5 If the porphyrin profile exhibits elevated enzyme levels corresponding to possible toxic build-up in the body, then further blood analysis may be done.

6.14 Wipe Tests This procedure is used for periodic evaluation of potential contamination of dioxins and furans in the working environment. It is recommended to perform a wipe test at a minimum when there is evidence of contamination in the method blanks.

6.14.1 Collecting wipe samples

6.14.1.1 Using stainless steel forceps and glass fiber paper saturated with distilled acetone, wipe down surface areas of two inches by one foot.

6.14.1.2 Combine the wipes in a glass jar containing 200mL distilled acetone.

6.14.1.3 For the control, place an equal number of unused wipers in a glass jar containing 200mL distilled acetone

6.14.1.4 Spike each composite sample with 20µL of sample fortification solution.

6.14.2 Extraction

6.14.2.1 Shake jar for 20 minutes and transfer extract to a Rotovap flask.

6.14.2.2 Using a Rotovap, concentrate down to 1.0 mL.

6.14.2.3 Using hexane, transfer extract to a centrifuge tube and concentrate down to 300µL.

6.14.2.4 Transfer to injection vial and using nitrogen, concentrate down to 30µL.

6.14.2.5 Rinse centrifuge tube twice with 300µL of hexane and transfer to injection vial.

6.14.2.6 Solvent transfer extract to about 30µL of nonane.

6.14.2.7 Spike sample with 20µL of recovery standard.

6.14.3 Calculations

6.14.3.1 Report as ng/wipe (WTE).

6.14.3.2 A lower limit of 10pg/WTE is expected for 2,3,7,8-TCDD.

6.14.3.3 A positive response for 2,3,7,8-TCDD is considered any hit at or above 3pg/WTE.

6.14.3.4 The multiplication factor for TCDF/PeCDD/PeCDF = 1.

6.14.3.5 The multiplication factor for HxCDD/HxCDF/HpCDD/HpCDF = 2.5.

6.14.3.6 The multiplication factor for OCDD/OCDF =5.

For example, in the case of HxCDD, the lower MCL is 10 X 2.5 = 25pg/WTE and the positive response for the blank would be 3 X 2.5 = 7.5pg.

7.0 Sample Preservation, Containers, Handling and Storage

7.1 Containers used to collect samples for the determination of Dioxin and Furan compounds are purchased pre-cleaned. The sample containers for solids are wide mouth, amber glass, 500mL minimum containers with Teflon lined screw caps. The sample containers for waters are 1 liter amber glass bottles with Teflon lined screw caps. Filleted fish tissue samples may be collected in aluminum foil and kept frozen until receipt by the laboratory.

7.2 All samples will be taken and held at a temperature of 4°C ± 2°C in the dark until delivery

to the laboratory. Water and solid samples are then placed into a refrigerator that is kept at 4℃ ± 2℃ until extraction. Tissue samples are to be stored frozen by the laboratory until extraction.

7.3 For solids and aqueous samples, extraction hold time is 30 days from date of collection, and analysis hold time is 45 days from date of extraction.

7.4 For tissue samples, extraction hold time is 30 days from date of collection, and analysis hold time is 45 days from date of collection.

8.0 Quality Control

8.1 Each analyst must have an initial demonstration of competency study (IDC) for solid and aqueous matrices, by generating data of acceptable accuracy and precision for target analytes using four replicate spikes that have undergone the entire preparation, extraction, and cleanup procedures outlined in the method and respective APPL SOPs. The laboratory must also repeat the following operations whenever new staff is trained. See Table 1 of this SOP for recovery and %RSD limits for the IDC.

8.2 Sample quality control for preparation and analysis include the analysis of a method blank, a matrix spike/matrix spike duplicate, and laboratory control sample in each analytical batch of 20 samples, and the addition of labeled internal standards and labeled C13 surrogates to each sample and QC sample.

8.3 The method blank must be shown to contain no analytes of interest above ½ the RL. If sample volume allows, samples with hits of analytes detected above ½ the RL in the method blank must be reanalyzed. Acceptance criteria for DoD clients: No analytes detected at ≥ ½ LOQ.

8.4 Corrective Action: If there is a detection above the quantitation limit (or > ½ LOQ for DoD) in the method blank the entire batch associated with the blank will be re-extracted and reanalyzed except when the sample analysis resulted in a non-detect. If not enough sample volume exists for a re-extraction the sample will be qualified with a 'B' with the flag 'compound found in the associated blank.

8.5 The laboratory control sample will be included with each batch of 20 samples or less. The LCS consists of an aliquot of control matrix similar to the sample matrix and of the sample weight or volume. The LCS is spiked with the same analytes at the same concentrations as the matrix spike/matrix spike duplicate. See Table 1 in this SOP for compounds, spike levels and spike acceptance criteria. When the results of the matrix spike analysis indicate a potential problem due to the sample matrix itself, the LCS results are used to verify that the laboratory can perform the analysis in a clean matrix.

8.6 The matrix spike and matrix spike duplicate will be included with each sample batch as per client. The client is to determine which sample is designated with MS/MSD. The %RPD limit for the MS/MSD is ≤20%. If the criteria is not met notify the project manager who will examine the DQOs and contact the client. For DoD projects, an LCSD is required, if there is insufficient volume for MS/MSD.

8.7 Any native hits associated in the sample and sample duplicate, if applicable, must have at %RPD limit of ≤25%. For DoD clients the acceptance limits for sample and sample duplicate must be ≤20%.

8.8 If the recoveries of the LCS, MS/MSD, or sample duplicate are not within limits, the following are required:

8.8.1 Confirm that there are no errors in calculations or surrogate solutions.

8.8.2 Instrument performance should also be checked for problems.

8.8.3 Examine chromatograms for interfering peaks and for integrated areas.

8.8.4 Recalculate the data and/or reanalyze the extract if any of the above checks reveal a problem.

8.8.5 Re-extract and reanalyze the sample if none of the above is the problem.

8.9 The EPA 8290 method does not have an MDL requirement; however APPL Inc. will perform an initial MDL study for both soil and water extraction methods and cleanup procedures and then quarterly MDL checks according to SOP QC018. The study samples will not be screened for J-values between the MDL and the PQL, since the method requires screening to the dynamic LOD/EDL or EMPC values generated by the quantitation software. These values are significantly lower than the PQL.

8.10 Deviations: Any activity not performed in accordance with laboratory procedures or Quality Assurance Project Plans is considered a deviation from plan. All deviations from plan will be documented as to the extent of, and reason for, the deviation.

8.11 Corrective Action: Errors, deficiencies, deviations, or laboratory events or data that fall outside of established acceptance criteria will be investigated. In some instances, corrective action may be needed to resolve the problem and restore proper functioning to the analytical system. The investigation of the problem and any subsequent corrective action taken is documented on a Nonconformance Work Report (NWR) and/or a Corrective Action Report (CAR).

8.12 Data Reporting Criteria: Data is obtained from the primary column. If all the isomers are resolved within 25% using the DB-5 column, then the DB-225 confirmation column is not needed.

9.0 Equipment/Apparatus

9.1 Gas chromatograph—Must have splitless or on-column injection port for capillary column, temperature program with isothermal hold, and must meet all of the performance specifications in the method.

9.2 GC column

9.2.1 The suggested primary column is the 60m DB-5 from Restek, and the suggested confirmation column (for resolving 2,3,7,8-TCDF from the individual isomers) is 30m DB-225. If the isomers listed in the method (2,3,7,8-TCDF from 2,3,4,7-TCDF and 1,2,3,9-TCDF) are resolved by 25% on the DB-5 column, then the confirmation column analysis is not necessary for 2,3,7,8-TCDF.

9.2.2 The column must meet the specifications listed in this SOP for retention time and resolution of peaks.

9.3 Mass spectrometer - electron impact ionization, must be capable of selectively monitoring ions 304.9824 and 380.9760 at minimum high resolution (10,000) during a period less than 1.0 second.

9.4 GC/MS interface - The mass spectrometer (MS) must be interfaced to the GC such that the end of the capillary column terminates within 1 cm of the ion source but does not intercept the electron or ion beams.

9.5 Data system—Capable of collecting, recording, storing, and processing MS data (MassLynx Software). Data acquisition—The signal at each exact m/z must be collected repetitively throughout the monitoring period and stored on a mass storage device.

9.6 Laboratory Fume Hood.

9.7 Analytical balance capable of weight ±0.1 mg.

9.8 Extraction apparatus

9.8.1 Soxhlet extractor apparatus

9.8.2 Soxhlet 50mm ID, 200mL capacity with 500mL flask
9.8.3 Heating mantle
9.8.4 Chiller
9.8.5 Liquid/liquid 2000mL separatory funnels with fluoropolymer stopcocks
9.8.6 125mL Separatory funnel (for soil-back extraction)

9.9 Glassware (Class A)
9.9.1 500mL flat bottom boiling flasks
9.9.2 1-L graduated cylinder (Class A)
9.9.3 Beakers 400 to 500mL
9.9.4 Conical glass centrifuge tube (15mL)
9.9.5 Erlenmeyer flasks (250mL)
9.9.6 Glass funnel 125 to 250mL
9.9.7 Glass wool, extracted with Methylene chloride, dried and stored in a clean glass jar.
9.9.8 Glass-fiber filter paper
9.9.9 Pipettes, disposable, Pasteur, 150mm long X 5mm ID
9.9.10 Pipettes, disposable, serological, 25mL
9.9.11 Sample vials – 2mL amber glass
9.9.12 Sample vials – 0.3mL conical glass
9.9.13 Class A volumetric syringes-10µL, 100µL, 500µL, and 1.0mL for standard and spike preparation.

9.10 Miscellaneous Equipment
9.10.1 Blender
9.10.2 Desiccator
9.10.3 Laboratory oven capable of sustaining temperatures up to 400° C
9.10.4 Glass-fiber thimble
9.10.5 Mortar and Pestle
9.10.6 Aluminum foil
9.10.7 Stainless steel spoons and spatulas

9.11 Concentration apparatus
9.11.1 Rotary evaporator
9.11.1.1 Vacuum for rotary evaporator equipped with shutoff valve at the evaporator and vacuum gauge.
9.11.1.2 A recirculating water pump and chiller.
9.11.1.3 Adjustable water bath

9.12 Nitrogen blowdown apparatus.

10.0 Reagents and Standards

10.1 Reagent or pesticide grade chemicals shall be used in all tests. Other grades may be used, provided it is first ascertained that the reagent is of sufficiently high purity to permit its use without lessening the accuracy of the determination. All reagent and chemical lots will be documented properly for traceability. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.2 The expiration date for analytical standards may be extended by following re-certification procedures below:

10.2.1 Contact the standard supplier and request an expiration date extension. If the supplier is not able to extend the date, then in-house re-certification may be performed as follows:

10.2.1.1 Analyze the expired standard and quantitate it against an unexpired standard from a different supplier or different lot # from same supplier.

10.2.1.2 For organic standards, the acceptance criteria is 20%D.

10.2.1.3 If the expired standard meets the above acceptance criteria, then extend the date by 3 months for organics.

10.2.1.4 The re-certification with extended expiration date is documented in the standard prep log book, along with the analysis date, instrument name, data file ID, and name of standard supplier with current unexpired lot number that was used to re-certify the expired standard.

10.2.2 Email this information to QAU.

10.3 Store the standard solutions (stock, calibration and internal standards) at room temperature in Teflon-sealed containers in the dark. All stock standard solutions must be replaced after one year or sooner if routine QC indicates a problem. All other standard solutions must be replaced after six months or sooner if routine QC indicates a problem. It is recommended that the laboratory purchase dilute standard solutions of the analytes in this Method. If primary solutions are prepared, they must be prepared in a hood.

10.4 Organic-free reagent water: All references to water in this method refer to organic-free reagent water.

10.5 Stock standard solutions may be purchased as individual manufacturer certified solutions. The certified solutions must be accompanied by a certificate of analysis that states balances used in the manufacture of this standard are calibrated with weights traceable to NIST in compliance with ANSI/NCSL Z-540-1 and ISO 9001. Reference standards must be calibrated by a body that can provide ILAC-signatory (MRA) traceability.

10.5.1 Calibration Standards- may be purchased from a manufacturer such as Cambridge Isotope Laboratories in five separate solutions in nonane, as listed in Table 1 of this SOP. The calibration standards should include the seventeen unlabeled Dioxins and Furans, as well as the nine C13-labeled internal standards and the two C13-labeled recovery standards. The CS-3 standard is used for calibration verification (CCV).

10.5.2 Performance check solution- may be purchased in nonane solvent from a manufacturer such as Cambridge Isotope Laboratories to include the compounds listed in Table 2 of this SOP.

10.5.3 Internal Standards- may be purchased from a manufacturer such as Cambridge Isotope Laboratories to include the compounds listed in Table 3 of this SOP. This mix is prepared in nonane and added to each sample, blank and spike prior to extraction.

10.5.4 Recovery Standards- may be purchased from a manufacturer such as Cambridge Isotope Laboratories to include the compounds listed in Table 3 of this SOP. This mix is prepared in nonane and added to each sample, blank and spike at the final concentration step of the extraction procedure.

10.5.5 Spike Mix- may be purchased from a manufacturer such as Cambridge Isotope Laboratories to include the compounds listed in Table 4 of this SOP. This mix is prepared in nonane and spiked to each LCS and MS/ MSD prior to extraction.

10.6 Reagents.

10.6.1 Organic free water

10.6.2 Quartz sand (or Ottawa Sand)
10.6.3 Concentrated Sulfuric acid – regent grade
10.6.4 20% Potassium Hydroxide solution - (20g KOH dissolved into 100mL DI Water)
10.6.5 5% Sodium Chloride solution – (5g NaCl dissolved into 100mL of DI Water)
10.6.6 Methylene chloride – regent grade
10.6.7 Nonane – regent grade
10.6.8 Toluene – regent grade
10.6.9 Hexane – regent grade
10.6.10 Acetone – regent grade
10.6.11 Methanol – regent grade
10.6.12 Cyclohexane – regent grade
10.6.13 Activated Silica Gel-100 mesh (Soxhlet overnight with Methylene chloride then bake overnight @ 180℃: cooled in Desiccator and stored in glass jar with Teflon-screw cap)
10.6.14 Acidic Silica Gel (100g activated silica gel + 44g concentrated H_2SO_4 mixed well and stored in glass jar with Teflon-screw cap)
10.6.15 Basic Silica Gel (100g activated silica gel + 30g of 1N NaOH mixed well and stored in glass jar with Teflon screw cap)
10.6.16 Celite 545 (stored in a sealed container at room temperature)
10.6.17 Active carbon AX-21 (prewashed with methanol and dried in vacuum at 110°C. Store in a glass bottle sealed with a Teflon lined screw cap.
10.6.18 Activated Anhydrous Sodium Sulfate (Soxhlet overnight with Methylene chloride then bake for four hours @ 400℃: cooled in Desiccator and stored in glass jar with Teflon-screw cap)

11.0 Calibration and Standardization

Please refer to the Procedure section on this SOP for any calibration and standardization instructions.

12.0 Procedure

12.1 Aqueous Samples
12.1.1 Dioxin/Furan Separatory Funnel Extraction (EPA Method 8290)
12.1.1.1 Allow time for sample to reach room temperature.
12.1.1.2 Mark the water meniscus of the sample bottle to later determine the exact sample volume.
12.1.1.3 Spike the samples, blanks, LCS and MS/MSD with the acetone diluted surrogate solution. Spike the LCS and MS/MSD with spike mix.

NOTE: The addition of spike and surrogate will be witnessed by a second person and will be documented on the extraction sheet.

12.1.1.4 For samples with >1% solids, filter through a 0.45µm glass fiber filter that has been rinsed with toluene. If there is too much solids to filter, then centrifuge sample, decant and then filter the aqueous phase.
12.1.1.5 Combine the solids from the filter paper and the centrifuge contents and proceed to the extraction process for soils/sediment for this sample portion.

12.1.1.6 Pour the aqueous filtrate into a 2L separatory funnel. Rinse out the sample bottle with 60mL Methylene chloride and add the liquid to the separatory funnel. Shake the funnel for two minutes with periodic venting.

12.1.1.7 Allow the organic layer to separate from the water phase. Making sure the emulsion interface between layers is not more than one third the volume of the solvent layer.

12.1.1.8 Pass the Methylene chloride through a filter funnel packed with a glass wool plug and 5g anhydrous sodium sulfate into a Rotovap flask.

12.1.1.9 Repeat the extraction twice with fresh 60mL portions of Methylene chloride. After the third extraction, rinse the sodium sulfate filter funnel with an additional 30mL Methylene chloride to ensure quantitative transfer.

12.1.1.10 Concentrate the extract in a rotary evaporator (35°C water bath), to a volume of 5mL. Allow it to cool.

12.1.1.11 Add 50mL hexane and (if applicable) the concentrate obtained from the solid soil extraction and concentrate down to 5mL..

12.1.1.12 Transfer the concentrate to a 125mL separatory funnel.

12.1.1.13 Rinse the flask and the lower joint with two 15mL portions of hexane and combine the rinses with the extract to ensure quantitative transfer.

12.1.1.14 Determine the original sample volume of the sample bottle by filling the sample bottle to the mark and determining the volume by using a 1000mL graduated cylinder. Record the sample volume to the nearest 5mL.

12.1.1.15 Proceed to cleanup stage.

12.2 Soils and Sediment Samples

12.2.1 Allow time for sample to reach room temperature.

12.2.2 Add 10g of anhydrous powdered sodium sulfate to 10g of soil (dry weight) and mix thoroughly.

12.2.3 Place mixture in Soxhlet apparatus on top of a glass wool plug or Soxhlet thimble and add 250mL of Methylene chloride to the boiling flask.

12.2.4 Spike the samples, blanks, LCS and MS/MSD with the acetone diluted surrogate solution. Spike the LCS and MS/MSD with spike mix.

NOTE: The addition of spike and surrogate will be witnessed by a second person and will be documented on the extraction sheet.

12.2.5 Reflux for 16 hours. The solvent must cycle completely through the system five times per hour.

12.2.6 Cool and filter through a glass fiber filter into a 500mL round bottom flask.

12.2.7 Rinse filter with 10mL of Methylene chloride and using a Rotovap, concentrate to near dryness at 40˚C. Solvent transfer to hexane. Allow to cool.

12.2.8 Transfer the residue to a 125mL separatory funnel with 15mL of hexane and rinse flask with two additional 15mL portions of hexane.

12.2.9 Proceed to cleanup stage.

12.3 Fish Tissue / Paper Pulp Samples

12.3.1 For fish tissue samples, homogenize at least 20 grams of frozen fish tissue using a stainless steel meat grinder with a 3 to 5 mm hole size inner plate. The client may specify which part of the fish is to be tested (i.e. skin, edible meat, vital organs or the entire fish).

12.3.2 Weigh two 10g (dry weight) aliquots of homogenized fish tissue sample into clean glass beakers. One aliquot will be used for dioxin analysis and the other for lipid determination.

12.3.3 Prepare glass beakers for the method blank and the lab control spike using 1-2 grams of vegetable or corn oil. One blank and LCS per 20 samples or less. If the client requests a matrix spike/matrix spike duplicate, then weigh 10g (dry weight) of tissue into two separate glass beakers.

12.3.4 Add 60g anhydrous sodium sulfate to each of the beakers and mix thoroughly.

12.3.5 Add 250mL of Methylene chloride or hexane/Methylene chloride (1:1 v:v) to the Soxhlet apparatus.

12.3.6 Spike the samples, blanks, LCS and MS/MSD with the acetone diluted surrogate solution. Spike the LCS and MS/MSD with spike mix.

NOTE: The addition of spike and surrogate will be witnessed by a second person and will be documented on the extraction sheet.

12.3.7 Transfer sample from glass beakers to Soxhlet thimbles.

12.3.8 Reflux for 16 hours. The solvent must cycle completely through the system five times per hour.

12.3.9 For partially dewatered paper pulp samples, follow the same steps using different amounts: 10g sample, 30g of anhydrous sodium sulfate and 250mL of toluene.

12.3.10 Concentrate the extract in a Rotovap to a volume of 10mL. Allow to cool for 5 min. Perform a solvent transfer from the Methylene chloride to hexane. Make sure all the Methylene chloride have been completely removed before proceeding with the next step.

12.3.11 Decant the contents of the flask into a 125mL separatory funnel.

12.3.12 Rinse the flask with two additional 15mL portions of hexane and add the rinses to the funnel.

12.3.13 Proceed to cleanup stage.

12.3.14 Lipid Content Determination

Tare a 250mL round bottom flask and add the second aliquot fish tissue extract. Rinse the flask with two additional 5mL portions of hexane and add the rinses to the flask. Concentrate fish tissue on a rotary evaporator until a constant weight is achieved.

$$\text{Percent lipid} = \frac{100 \times \text{weight of concentrate}}{10}$$

12.4 Cleanup Stage

12.4.1 Acid/Base Partition

12.4.1.1 Add 40mL of the concentrated H_2SO_4 to the hexane extract and shake for 2min with periodic venting and discard the aqueous layer. Repeat the “acid washing” until no color is visible in the aqueous layer for a maximum of 4 washings.

12.4.1.2 Add 40mL of NaCl solution and shake for 2min with periodic venting and discard the aqueous layer.

12.4.1.3 Add 40mL of 20% potassium hydroxide. Shake for 2min and discard the aqueous layer. Repeat the "base washing" until no color is visible in the aqueous layer for a maximum of 4 washings.

12.4.1.4 Add 40mL of NaCl solution. Shake for 2min and discard the aqueous layer.

12.4.1.5 Dry the extract by pouring it through a filter funnel containing anhydrous sodium sulfate on a glass wool plug, and collect it in a Rotovap flask. Rinse the funnel with the sodium sulfate with two 15mL portions of hexane, add the rinses to the flask, and concentrate the hexane solution to near dryness on a rotary evaporator (35°C water bath).

12.4.2 Silica Column Cleanup

12.4.2.1 Preparation of Acid/Base silica gel columns for sample cleanup (as needed). Pack a Fresno Scientific customized glass tube with the following materials from bottom to top:

Glass wool plug
Activated silica gel (1.0g)
Basic silica gel (2.0 g)
Activated silica gel (1.0g)
Acidic silica gel (10g)
Anhydrous sodium sulfate (1.0g)

12.4.2.2 Elute the column with 50mL hexane. Be careful not to let the column run dry.

12.4.2.3 Dissolve the sample residue in 2.0mL of hexane and apply the hexane solution to the top of the silica gel column. Rinse the flask with enough hexane (3-4mL) to complete transfer of sample. Elute the silica gel column with 90mL of hexane.

12.4.2.4 Concentrate the eluent on a rotary evaporator (35°C water bath) to approximately 1mL.

12.4.3 Carbon Column Cleanup

12.4.3.1 Preparation of AX-21/Celite 545 carbon columns for sample cleanup (as needed). Pack a Fresno Scientific customized glass tube with the following materials from bottom to top:

Glass wool plug
1cm plug of Celite 545
1cm plug of the AX-21/Celite 545 Mixture
1cm plug of Celite 545
Glass wool plug

12.4.3.2 Rinse the AX-21/Celite 545 column with 5mL of toluene.

12.4.3.3 Rinse with 2.0mL of (75:20:5, v/v) Methylene chloride/methanol/toluene solution.

12.4.3.4 Rinse with 1mL of (1:1, v/v) Cyclohexane/methylene chloride solution.
12.4.3.5 Rinse with 5mL of hexane.
12.4.3.6 The flow rate should be less than 0.5mL/min. Discard the rinses.
12.4.3.7 While column is still wet with hexane, add the sample concentrate.
12.4.3.8 Rinse the concentrator tube twice with 1mL portions of hexane.
12.4.3.9 Rinse column sequentially with two 2mL portions of hexane, 2mL Cyclohexane/Methylene chloride (50:50, v/v), and 2mL-methylene chloride/methanol/toluene (75:20:5, v/v). Combine these eluents: This combined fraction may be used as a check on column efficiency.
12.4.3.10 Turn the column upside down and elute the PCDD/PCDF fraction with 20mL of toluene. Add the rinse to the eluent.
12.4.3.11 Concentrate the extract in a rotary evaporator (50°C water bath), to near dryness. Solvent transfer to 1.0mL of hexane.

12.4.4 Micro-Concentration: Quantitatively transfer the sample extract from the boiling flask to a 15mL centrifuge tube. Rinse out flask with two 5mL portions of hexane and add it to the centrifuge tube. Concentrate the extracts using a nitrogen blow-down apparatus.
12.4.4.1 Adjust the flow of the Nitrogen gas until the surface of the solvent is just visibly disturbed. When the volume of the eluent has concentrated to approximately 100µL, transfer the concentrate extract into a 300µL conical injection vial (marked at the 50µL level) for further concentration. Rinse centrifuge tube three times with 300µL of hexane. Between rinses, continue concentrating to 100µL volume and transfer concentrate to injection vial.
12.4.4.2 Add 20µL of 100ng/mL recovery standard and 30µL of nonane to the extract and continue concentrating under nitrogen until the 50µL level is reached. The sample is now ready for instrument analysis.

12.5 Recommended Operating Conditions for HRGC:
Column: Carrier gas (He) flow rate: 1 mL/min

Oven Temperature: 200℃
Equilibration Time: 1.0min
Initial Temp: 200℃
Initial Time: 2min
Temp Ramp: 5 ℃/min to 220℃ and hold 16 min, ramp 5℃/min to 235℃ and hold 7 min, then ramp 5℃/min to 330℃ and hold 5 min.
Total Run Time: 60 min
Injector Temp: 270℃
Interface Temp: 290°
Injection Volume: 1µL

12.6 These conditions may be used as guidelines to establish an optimal GC temperature program. With the possible coelution of sample components, it may be necessary to adjust chromatographic conditions to give adequate separation of the characteristic peaks between individual congener peaks. Once a temperature program has been established, all samples must be analyzed under the same operating conditions as standards.

12.7 The HRGC run sequence should be arranged in the following manner:
GC Column Performance Check Solution
CS-0.2
CS-1
CS-2
CS-3
CS-4
CS-5
GC Column Performance Check Solution
CS-3 (CCV)
12 hour analytical shift (including blanks, spikes and samples)
CS-3 (CCV)

12.8 Instrument Calibration for Quantitative Analysis.

12.8.1 One of the concentrations will be at the quantitation limit. The analyst must refer to the incoming sample notice for the lab works code and look at the detection limits listed on the appropriate form 1 to determine the quantitation limit standard. The initial calibration curve is a reflection of the performance of the instrument at any given time. Compounds react to the changing dynamic of the instrument. Therefore it is sometimes necessary to delete levels for compounds in an initial calibration curve. When this occurs the following rules are followed to ensure integrity of the data:

12.8.1.1 A standard must be included in the curve for each compound, which is less than or equal to the reporting limit. If the responses of a sample peak exceed the calibration range of the system, dilute the extract and reanalyze.

12.8.1.2 The deletion of discrete points must never result in a calibration curve consisting of less than five points for each analyte of interest.

12.8.1.3 Points for an individual analyte in the middle of the curve may not be deleted, however unforeseen circumstances may occur such as a miss injection by the autosampler, a loose cap on an injection vial, etc. In this situation the entire level is deleted for all compounds and the reason for deletion is noted on the multilevel form. If this results in a calibration curve that consists of less than five points, another level may be run before the analysis of samples begin.

12.8.1.4 Points at the low end and high end of the curve may be deleted if it is determined the compound ceases to be linear at either end. Any positive findings in the samples will be analyzed so as to fall within the linear range of that particular compound.

12.8.2 Tuning with PFK – The PFK ions monitored in the tune are 304.9825 m/z and 380.9760 m/z. Acceptance criteria is > 10,000 resolution.

12.8.3 Initial Calibration (ICAL) Analyze the five calibration standards (see Table 1) by HRGC. Record the sum of the peak areas for each of the two m/z of interest for each congener. The results can be used to prepare a calibration curve for each analyte. The ratio of the response to the amount injected, defined as the response factor (RF), can be calculated for each analyte at each standard concentration. If the percent relative standard deviation (%RSD) of the calibration factor is less than 20% over the working range, linearity through the origin can be assumed, and the average response factor can be used in place of a calibration curve. When this criterion is exceeded, inspect the HRGC system to

determine the cause and perform whatever maintenance is necessary before re-calibrating and proceeding with analysis. The following criteria must also be met for the ICAL in order for sample analysis to proceed, otherwise the mass spec will need to be adjusted and the ICAL repeated.

12.8.3.1 The signal to noise ratio for each native and C_{13} labeled standard must be ≥10.

12.8.3.2 The ion abundance ratios must be within acceptance method criteria (See Table 5).

12.8.3.3 The %RSD for native compounds is equal or less than 20%, and the %RSD for C_{13} labeled compounds is equal or less than 30%.

12.8.3.4 Internal Standard Calibration Technique is used to determine PCDD/PCDF C_{13} surrogates.

12.8.3.4.1 Calibration is achieved using the average response factors of the fixed concentrations of C_{13} surrogates in each of the points of the calibration curve (See Table 1). The nearest-eluted C_{13} I.S. is used for quantitation for each C_{13} surrogate. The %RSD for the labeled standards should be 30% or lower.

12.8.3.4.2 Response factors are calculated as follows:

$$\text{Response Factor (RF)} = \frac{A_s C_{is}}{A_{is} C_s}$$

Where:
A_s = Sum areas of both m/z for the C_{13} surrogate
A_{is} = Sum areas of both m/z for the IS
C_s = Quantity of C_{13} surrogate (pg)
C_{is} = Quantity of IS (pg)

12.8.3.5 Isotope Dilution Technique is used to determine the native PCDD/PCDF compounds.

12.8.3.5.1 Calibration is achieved using the average response factors of the increasing concentrations of native PCDD/PCDF in the initial calibration curve. The corresponding C_{13} surrogate is used to quantitate each native compound in the samples and spikes. The %RSD for the native standards average RF should be 20% or lower.

12.8.3.5.2 Response factors are calculated as follows:

$$\text{Relative Response Factor (RR)} = \frac{A_n C_L}{A_L C_n}$$

Where:
A_n = Sum areas of both m/z for the native PCDD/PCDF
A_L = Sum areas of both m/z for the C_{13} PCDD/PCDF
C_n = Quantity of native calibration standard (pg)
C_L = Quantity of C_{13} surrogate (pg)

The % RSD is calculated as follows:

$$\%RSD = (SD)(100\%)/(RF_{X1}))$$

Where:
%RSD = Percent relative standard deviation.
RF_{x1} = Mean of the initial RR for a compound.
SD = Standard deviation of the average RRF for a compound

12.9 Continuing Calibration Verifications (CCVs) must be analyzed at the beginning and end of each 12-hour analytical shift, by injecting the CS-3 calibration standard. The following CCV acceptance criteria must be met in order for analysis, otherwise the mass spec must be adjusted and a fresh CCV prepared and analyzed until the acceptance criteria can be met. If the mass spec adjustment includes changing the resolution, then a new resolution check must also be prepared and analyzed. If these corrective actions are not successful, then a new ICAL must be prepared and analyzed.

12.9.1 The ion abundance ratios must be within acceptance method criteria (See Table 5).

12.9.2 For the beginning and ending CCV, the %D of the native PCDD/PCDF should be within 20% from the average RF from the ICAL. The %D of the C_{13} labeled compounds should be within 30% from the average RF from the ICAL.

$$\%D = A-B / A$$

D = Difference
A = Average RF from the ICAL
B = RF from the CCV

NOTE: The method allows for marginal %D failures in certain cases, such as the C_{13} labeled compound has a %D outside control limits while the corresponding native compound is acceptable.

12.10 Each sample analysis sequence must include an acceptable initial calibration; calibration verification standards and resolution check standards. When a CCV or Resolution Check fails to meet the acceptance criteria, all samples that were injected after the last acceptable check must be re-injected.

12.11 For DoD 5.0 projects, if a CCV fails, the laboratory can immediately analyze two additional consecutive CCVs (immediately is defined as starting a consecutive pair within one hour; no samples can be run between the failed CCV and the two additional CCVs). This approach allows for spurious failures of analytes to be reported without reanalysis of samples. Any corrective actions that change the dynamics of the system (e.g., clip column, clean injection port, run blanks) requires that all samples since the last acceptable CCV be reanalyzed. Both of these CCVs must meet acceptance criteria in order for the samples to be reported without reanalysis. If either of these two CCVs fail or if the laboratory cannot immediately analyze two CCVs, the associated samples cannot be reported and must be reanalyzed. Flagging of data for a failed CCV is only appropriate when the affected samples cannot be reanalyzed. The lab must notify the client prior to reporting data associated with a failed CCV.

12.12 Sample injection may continue for as long as all the calibration verification standard requirements listed above are met.

12.13 Mass Spec Resolution

12.13.1 Using Perfluorokerosene (PFK) and a molecular leak, tune the instrument to meet resolution 10,000 (10% valley) at high reference m/z 380.9760 and low reference m/z 304.9824.

12.13.2 PFK is used to correct for mass-drift that may occur during the long analysis time. The lock-mass is established from PFK and is dependent on the m/z monitored within each descriptor. The deviation between the m/z values listed in the method and the actual m/z values must be less than 5ppm.

12.13.3 Resolution checks must be analyzed at the beginning and end of each analytical shift or at least every 12 hours. The MassLynx software includes a feature called “Experimental Calibration” that meets the resolution check method requirement. If the MS resolution criteria listed above can not be met, then analysis may not proceed. Samples affected by poor closing resolution check must be re-analyzed.

12.14 GC Performance Check

12.14.1 At the beginning of each 12 hour analytical shift a performance check standard will be run. See table 2. The peak to valley resolution for the tetra dioxin must be <25% of the highest peak in the chromatogram.

12.15 Qualitative Determination: A native or labeled congener is identified in a standard, blank or sample when all of the following criteria are met:

12.15.1 The signals for the two m/z isomers must be present and must maximize within ±2 seconds of the two scans. The area ratio of the two ions must be within the criteria listed in Table 5 of this SOP for positive identification to be determined.

12.15.2 The S/N ratio at the m/z of interest must be greater or equal to 2.5 for each compound detected in the sample extract and greater or equal to 10 for all congeners in the ICAL and CCV standards.

12.15.3 Retention times are crucial to the identification of target congener compounds. Retention time windows are established to compensate for minor shifts in absolute retention times as a result of sample loading and normal chromatographic variability. The RT of a native compound must be within (-1 to +3) seconds of the corresponding C_{13} compound. If the native compound does not have a corresponding C_{13} compound (as shown in Table 1), then the RT of the native must fall within 0.005 units of the relative RT measured in the nearest CCV.

12.15.4 Use the calibration standards analyzed during the sequence to evaluate retention time stability. If any of the standards fall outside their retention time windows, the system is out of control. Determine the cause of the problem and correct it.

12.16 Homolog Totals by LOC Estimation: The total concentration of all PCDD/PCDFs at a given Level of Chlorination may be reported by summing the concentrations of all congeners detected at that LOC.

12.17 Toxicity Equivalent Concentration (TEQ): The TEQ for a particular environmental sample may be determined by summing the concentrations of each individual toxic PCDD/PCDF multiplied by their respective Toxicity Equivalent Factors (TEF) as described in the EPA method 8290[1].

12.18 Manual integration: The TargetLynx software program is used for integration and quantitation of Dioxin / Furan data. Manual integration of peaks should be consistent with the ICAL integrations for each standard level. If method acceptance criteria are

not met for a particular analyte, then examine the software's integration for that analyte, and determine whether or not the integration is consistent with the ICAL integration at each level. If not, then perform the appropriate manual integration. It may be necessary to integrate other levels also to keep the integration consistent. If it is not possible to meet the criterion while maintaining the same baseline, make any adjustments necessary and recalibrate the instrument. If method acceptance criteria are met, but the software's integration for a peak is inconsistent with the ICAL integration at each level and performing a manual integration would not cause the ICAL to be unacceptable, do not manually integrate. It is the intent of the laboratory to minimize the amount of manual integrations performed by the chemist. The TargetLynx software shows the "before" integration with a dashed line, and the "after" integration with a bold line on the chromatogram. Note a "M" followed by the number for the reason (see list below) a new integration was performed next to the peak on the chromatogram and initial and date. Save the manual integration electronically so that it can be retrieved at a later date if necessary. Place the chromatogram with the manual integration(s) in the data folder to be reviewed by the section manager or his/her designee.

MI1) Integration does not follow baseline

MI2) Non-target peak interference

MI3) To split a peak that was integrated as one peak by the computer.

MI4) To integrate a split peak

MI5) The whole peak or part of the peak was not integrated.

MI6) Computer integrated wrong peak

MI7) Other – (See case narrative)

After review by the section manager, the manager will date and initial. Upon client request, the integrations will be reviewed by the QAU or his/her designee initialed and dated. The hard copies will be filed with the raw data.

12.18 For any DoD samples, please refer to Table 8 for client specific criteria.

13.0 Data Analysis and Calculations

13.1 The sample and spikes are calculated against the initial calibration curve for the native PCDD/PCDF using isotope dilution. The C_{13} labeled surrogates are calculated using the two recovery standards, C_{13}-1,2,3,4-TCDD and C_{13}-1,2,3,7,8,9-HxCDD.

13.2 Quantitation algorithm check: The quantitation of the analytes is performed by the Waters Data System. The algorithm is checked at least once per computer file (daily) by calculating the amount of analyte injected from the peak response, using the calibration curve. The following calculation is used to check the quantitation:

13.2.1 Concentration (pg/L or pg/g) Isotope Dilution Technique $= \frac{(A_s)(C_L)}{(A_i)(RF)(V_o)}$

Where:
A_s = Sum areas of both m/z of analyte
A_i = Sum areas of both m/z of internal standard

C_L = Labeled Congener quantity (pg)
RF = Relative Response Factor of analyte from ICAL (see Sect 7.5.6)
V_o = Volume/weight of sample extracted (L or g)

13.3 Reporting Positive Findings: The Target Lynx software calculates the LOD and EMPC values, which are dynamic and dependent on the S/N ratio of each sample. The laboratory establishes the PQL, and it is a static value based on the lowest point in the calibration curve. J-values are reported between the LOC or EMPC and the PQL according to the following criteria:

13.3.1 If there is no peak present in the sample, then report "not detected" along with an LOD (or EDL) value in the EMPC/EDL column in Labworks.
13.3.2 If there is a peak present in the sample, but it does not meet all the criteria for RRT or Isotope Ratio, then report "not detected" along with the EMPC value.
13.3.3 If there is a peak in the sample that is a confirmed hit above the PQL, then report that value along with the EMPC value listed in the EMPC/EDL column in Labworks.
13.3.4 If a peak exists but have a signal to noise ratio below 2.5, then report "not detected" along with the EDL value.
13.3.5 LOD (Limit of Quantitation) or EDL (Estimated Detection Limit)

13.4 LOD/EDL = $$\frac{2.5 \text{ X } (H_x^1 + H_x^2) \text{ X } Q_{is}}{(H_{is}^1 + H_{is}^2) \text{ X W X RRF}}$$

Where:
H_x^1 and H_x^2 = peak heights of the noise level for both quantitation ions of the native
H_{is}^1 and H_{is}^1 = peak heights of the noise level both quantitation ions of the appropriate IS
Q_{is} = quantity of the appropriate IS injected (pg)
RRF_n = calculated RRF from the CCV
W = volume or weight of sample extracted in liters or grams.

13.5 EMPC (Estimated Maximum Possible Concentration)

$$\frac{Q_{is} \text{ X } (A_x^1 + A_x^2) \text{ X } D}{V \text{ X } (A_{is}^1 + A_{is}^2) \text{ X RRF}}$$

Where:
A_x^1 and A_x^2 = areas of both quantitation ions of the noise. For the EMPC, this represent the sum of the area under the smaller peak and of the other peak area calculated using the theoretical chlorine isotope ratio.
A_{is}^1 and A_{is}^1 = integrated areas of both quantitation ions of the appropriate IS
D = Dilution Factor
Q_{is} = quantity of the appropriate IS injected (pg)

RRF_n = calculated RRF from the CCV
V = volume or weight of sample extracted

13.6 PQL (Practical Quantitation Limit)

$PQL = CS_1 \times E \times D$

Where:

CS_1 = concentration of low calibration standard (pg/mL)
E = extraction ratio (for waters: 0.05mL / 1L) and (for soils (0.05mL / 10g)
D = Dilution Factor

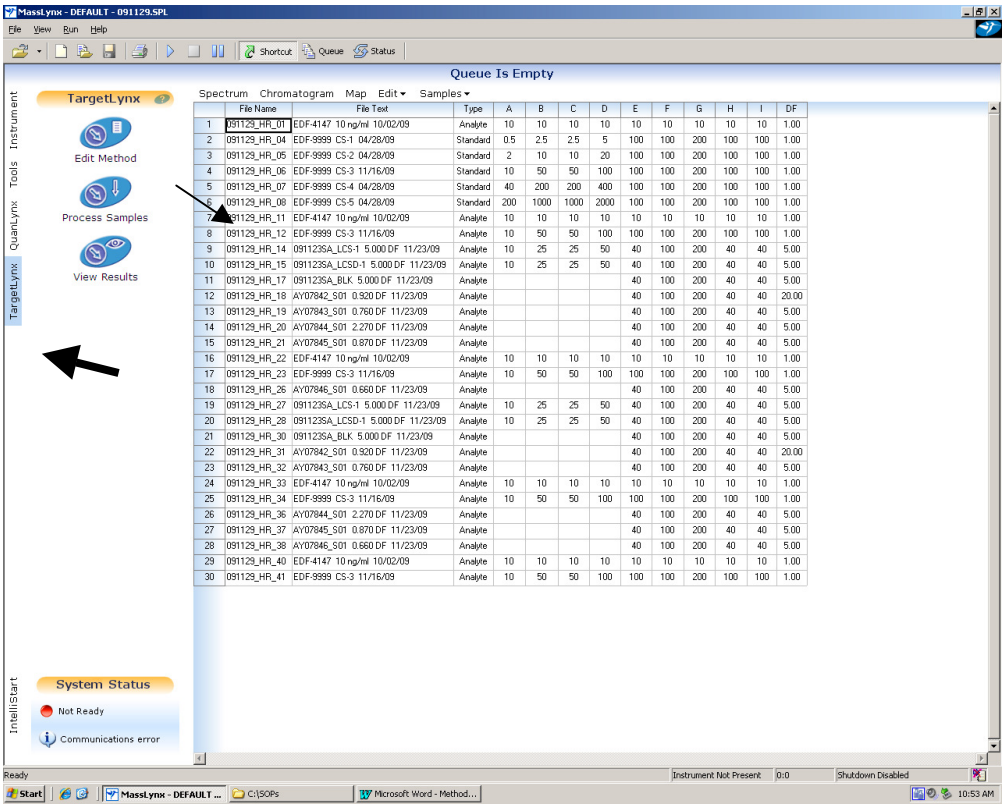
13.7 Using the MassLynx Program (software v4.1 SCN627)

13.7.1 Quantitation methods are built in the MassLynx program, according to specific criteria stated in each EPA method (8290 or 1668).

13.7.2 The quantitation method is then used to calculate an initial calibration. The resulting responses for the initial calibration are then used to calculate results for samples and QC.

13.7.3 Retention Time and Signal to Noise Forms are generated for data interpretation purposes.

13.7.4 There are two different formats by which data can be quanted: QuanLynx and TargetLynx. For this analysis, be sure to highlight TargetLynx. It is located at the left-hand side of the MassLynx window.



13.7.5 Building a Method

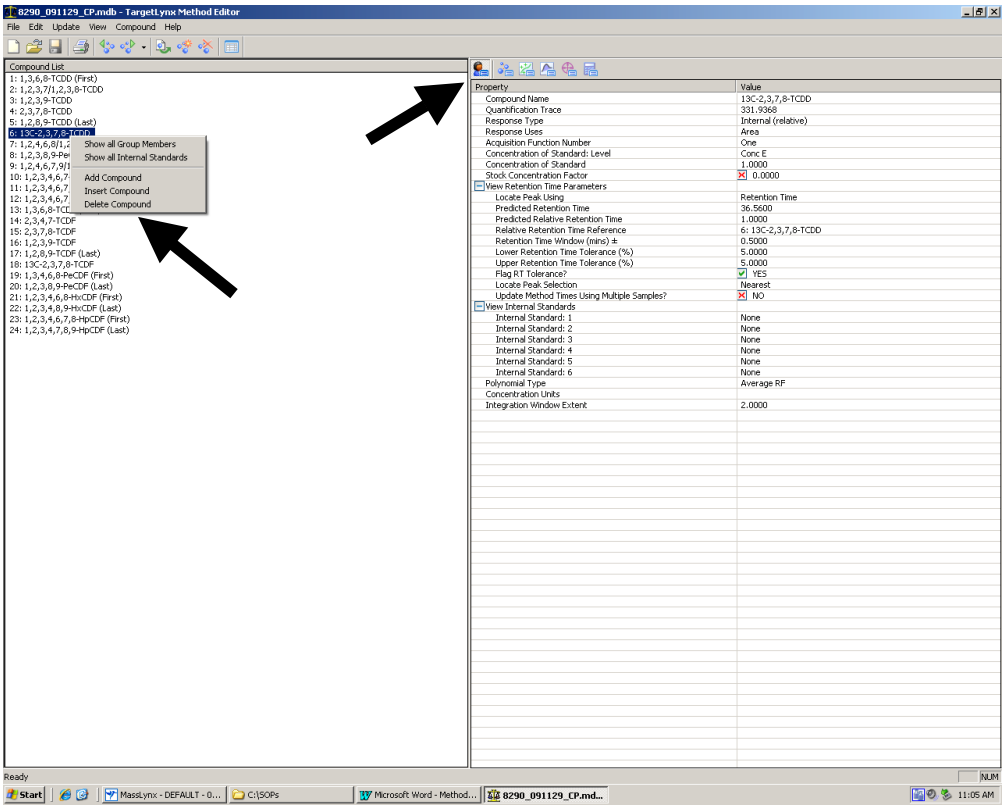
13.7.5.1 In the TargetLynx format, click on the 'Edit Method' icon. The method editor window should pop up. The most recent method that was previously viewed should be displayed.

13.7.5.2 It is best to do a 'Save As' to make sure any previous methods are not overwritten. Under 'File' → 'Save As' → method name.

13.7.5.3 The format for which the method should be saved is in the following order: the method name, date and method type. For example, an 8290 method on Nov 1st, 2009 would be: 8290_091101. In the case of an 8290 column performance method on the same date, the proper name would be" 8290_091101_CP.

13.7.5.4 The TargetLynx Method Editor has an extremely large number of parameters with which to build the method. It is nearly impossible to list and explain every single parameter. The goal of this SOP is to target the main parameters that are used in the 8290 methods.

13.7.5.5 To the left of the Method Editor window is the compound list.



Right clicking and selecting 'Show all Group Members' will highlight the compounds that are linked with the selected compound. Selecting 'Show all Internal Standards' would highlight the specific internal standard that the compound is linked to. Designating groups and internal standards will be explained later in the SOP. Selecting the 'Add Compound' would add a new compound at the end of the list. The

'Insert Compound' option would add a new compound just above any highlighted compound.

13.7.5.6 To the right of Method Editor are the six different property parameters of the compound: User-defined Properties, Compound Properties, Calibration Properties, Integration Properties, Targeting Properties, and Calculation Factors.

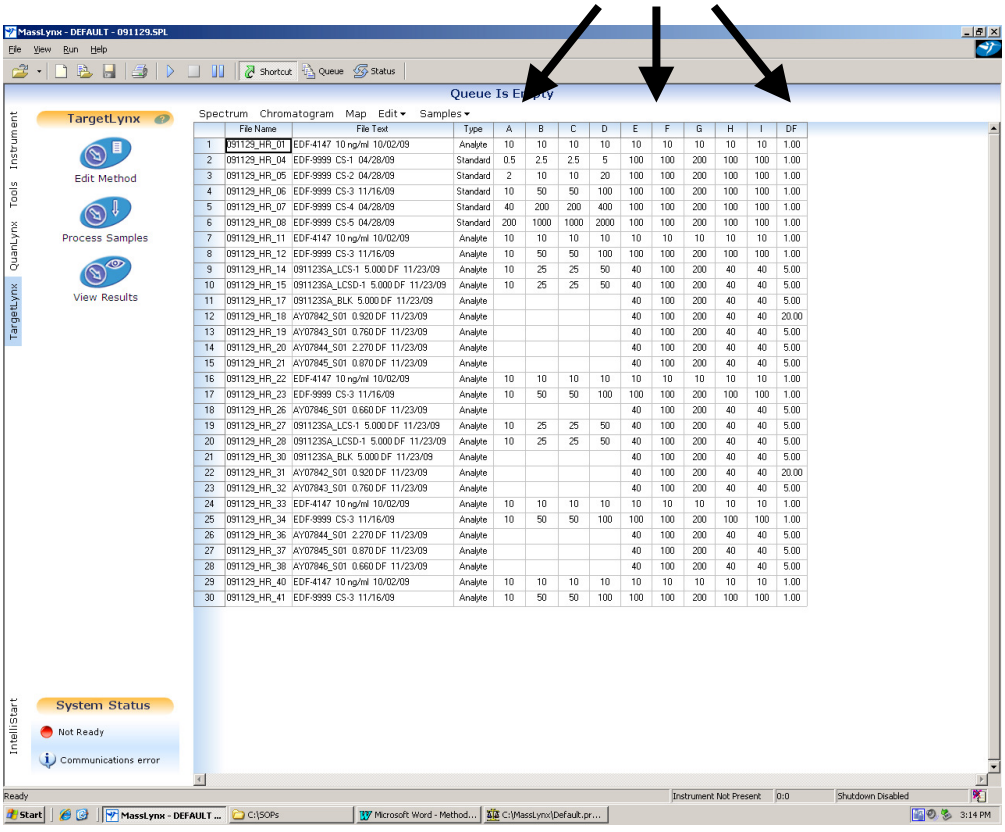
13.7.5.7 User-defined Properties

13.7.5.7.1 Enter the 'Compound Name' and 'Quantification Trace' for the specific compound.

13.7.5.7.2 The 'Response Type' should be set to 'Internal (relative)' and the 'Responses Uses' should be set to 'Area'.

13.7.5.7.3 The 'Acquisition Function Number' is dependent on the actual function method of the HR-MS. Usually in 8290 analysis, any tetra compounds would be in the first function, the penta compounds in the second function, and so forth. For method 1668, this is not the case. For example, a tetra compound might be found in the sixth function.

13.7.5.7.4 The 'Concentration of Standard: Level' will use whatever value is set in the sequence list. Usually in an 8290 method, columns A through D are the spike concentrations of tetra through octa groups. Columns E through G are surrogate concentrations while columns H and I are internal standard concentrations.



13.7.5.7.5 The 'Concentration of Standard' is set to '1.000' and the 'Stock Concentration Factor' is 'X' out.

13.7.5.7.6 For target analytes and surrogates in method 8290, the 'Locate Peak Using' option is set to 'Relative Retention Time.' The only compounds that will use 'Retention Time' would be the internal standards.

13.7.5.7.7 The 'Predicted Retention Time' is not used for the target and surrogate analytes. However, it is required for the internal standards.

13.7.5.7.8 The 'Predicted Relative Retention Time' is determined by taking the ratio of the retention time of the analyte to its surrogate/IS. Use the midpoint of the initial calibration to determine the ratio.

13.7.5.7.9 The 'Relative Retention Time Reference' are the surrogate/IS compounds to the target analytes.

13.7.5.7.10 'Retention Time Windows' are decided by the user. Keep in mind that a narrow window might not allow for the target analyte to be picked up while a broad window will pick up too many peaks. Values that seem to do very good for 8290 and 1668 analysis are ±0.200 min for the retention time windows and lower/upper retention time tolerance of 0.500%. The retention time checks will be done later using Excel.

13.7.5.7.11 The 'Flag RT Tolerance' option is usually checked.

13.7.5.7.12 The 'Locate Peak Selection' is always set to 'Nearest'.

13.7.5.7.13 The 'Update Method Times Using Multiple Samples' is 'X' out.

13.7.5.7.14 In the internal standard:1 option, enter the corresponding surrogate/IS for the compound. In method 8290, there is only one surrogate/IS for each analyte. In method 1668, a compound could have multiple internal standards.

13.7.5.7.15 The 'Polynomial Type' is set to 'Average RF'.

13.7.5.7.16 The 'Integration Window Extent' is set to '2.0000'.

13.7.5.8 Compound Properties – there will be parameters in this section that would already be inputted from the User-defined Properties section.

13.7.5.8.1 The 'Include Quan Trace in Response' and 'Use absolute mass window' options should be checked 'Yes'.

13.7.5.8.2 The 'View Acceptance Flag Parameters' section should all been 'X' out and labeled 'No'.

13.7.5.8.3 Each compound can be designated a totals group. In method 8290 names of totals include: TD, PD, HxD, HpD, TF, PF, HxF, and HpF. The 'Symmetry Threshold (%)' is usually set to '90.00'.

13.7.5.9 Calibration Properties - there will be parameters in this section that would already be inputted from the User-defined Properties section.

13.7.5.9.1 The 'Calibration Origin' should be set to 'Exclude'.

13.7.5.9.2 Both 'Weighting Function' and 'Axis Transformation' parameters should be set to 'None'.

13.7.5.9.3 The 'User RF Value', 'Minimum Coefficient of Determination', and 'Maximum Relative Response Standard Deviation' should all be 'X' out.

13.7.5.9.4 The 'Propagate Calibration Parameters' should be check 'Yes'.

13.7.5.10 Integration Properties

13.7.5.10.1 The 'Smoothing Enabled' should be checked 'Yes'.

13.7.5.10.2 The 'Smoothing Method' should be set to 'Mean.'

13.7.5.10.3 The 'Smoothing Iterations' and 'Smoothing Width' parameters are dependent on the quality of the chromatography. To reduced the number of manual Q-edits, the values are usually both set to '4' and '2'.

13.7.5.10.4 The "Apex Track Enabled?' is checked 'Yes'.

13.7.5.10.5 The 'Peak-to-Peak Baseline Noise' and 'Peak With at 5% Height' options are checked at a value of '5'.

13.7.5.10.6 The 'Baseline Start Threshold %' and 'Baseline End Threshold' options are set to '0'.

13.7.5.10.7 The 'Detect Should Peaks' option should be checked 'Yes'.

13.7.5.10.8 The 'Automatic Noise Measurement' option should be 'X' out and labeled 'No'.

13.7.5.10.9 The 'Minimum Signal/Noise Ratio' is usually set to '2.5'.

13.7.5.10.10 The 'Flag Signal/Noise Ratio' option should be checked 'Yes'.

13.7.5.11 Targeting Properties

13.7.5.11.1 The 'Calculate Ion Ratio Tolerance As' option should be set to 'Ratio'.

13.7.5.11.2 The 'Target Ion Ratio Method' option should be set to 'Quan/Target'.

13.7.5.11.3 The 'Quantification Ratio' should be set to '1.000'.

13.7.5.11.4 The 'Use trace in response calculation' should be checked 'Yes'.

13.7.5.11.5 The 'Target Ion Ratio' and the 'Target Ion Ratio Tolerance' options are method specific.

13.7.5.11.6 The 'Target Ion Must Exist' option is checked 'Yes' while the 'Target Ion Must Past Ratio' and 'Calculate Ion Ratio As (Target/Primary)' options are 'X' out and labeled 'No'.

13.7.5.12 Calculation Factors

13.7.5.12.1 The 'Toxic Equivalence Factors could be used to calculate the TEQ for each compound. However, keep in mind that each client may have their own specific TEF values.

13.7.5.12.2 The 'Signal-to-noise method' should be set to 'Peak-to-Peak' and the 'Noise calculation factor' set to '1.000'.

13.7.5.12.3 The 'Noise window start and end' should both be set to '0'.

13.7.5.12.4 The 'Measure peak signal level from' should be set to 'Avg Noise Level'.

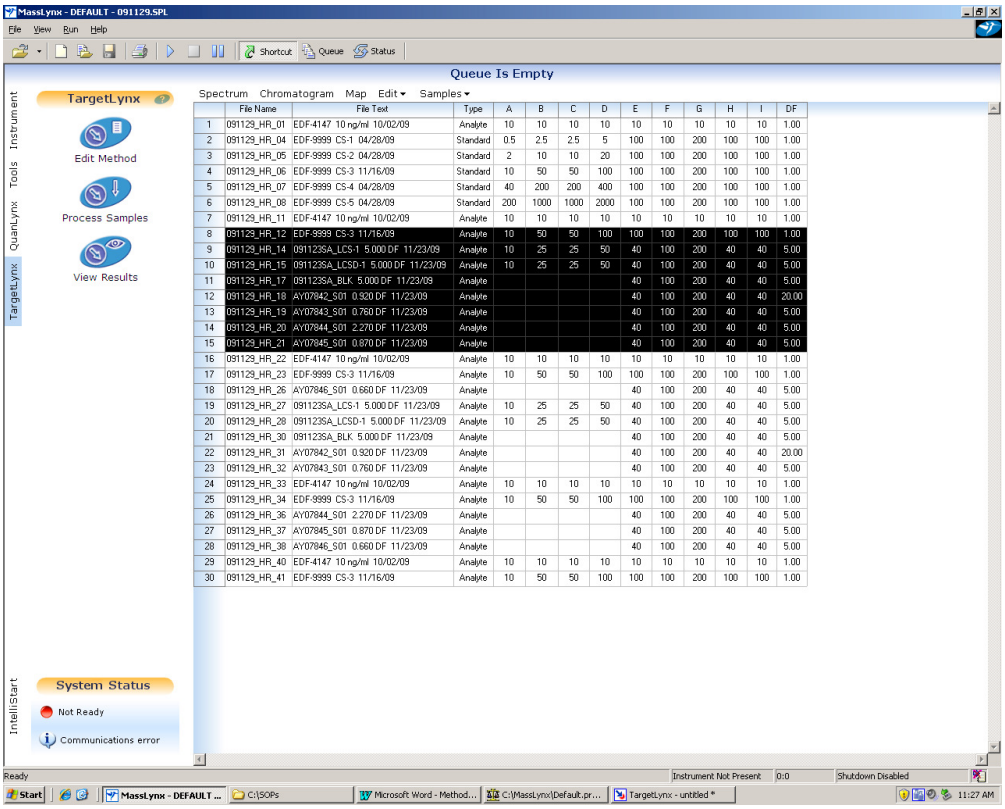
13.7.5.12.5 The 'Detection Limit Factor' is client dependent. For method 8290, designate a signal to noise ratio of 2.5.

13.7.5.12.6 The 'Quantitation Limit Factor' should to set to "1.000".

13.7.5.12.7 Both the 'Propagate Detection Limit Settings' and 'Use EMPC' options should be checked 'Yes'.

13.7.6 Sequence Setup

13.7.6.1 Different sections of the sequence can be processed by highlighting the data files and clicking 'Process Samples'. It is not possible to highlight different sections of a sequence at the same time. The only way to do this is to quant different sections one at a time. This will create numerous datasets.



From the above sequence, data 091129_HR_12 thru 091129_HR_21 will be quanted to generate a new dataset.

13.7.7 Processing the Method

13.7.7.1 Highlight the data files that will be processed.

13.7.7.2 Click on the 'Process Samples' icon on the left side of the screen.

13.7.7.3 Under the 'Operations' options, the 'Integrate Samples', 'Calibrate Standards', and 'Quantify Samples' parameters should all be check marked.

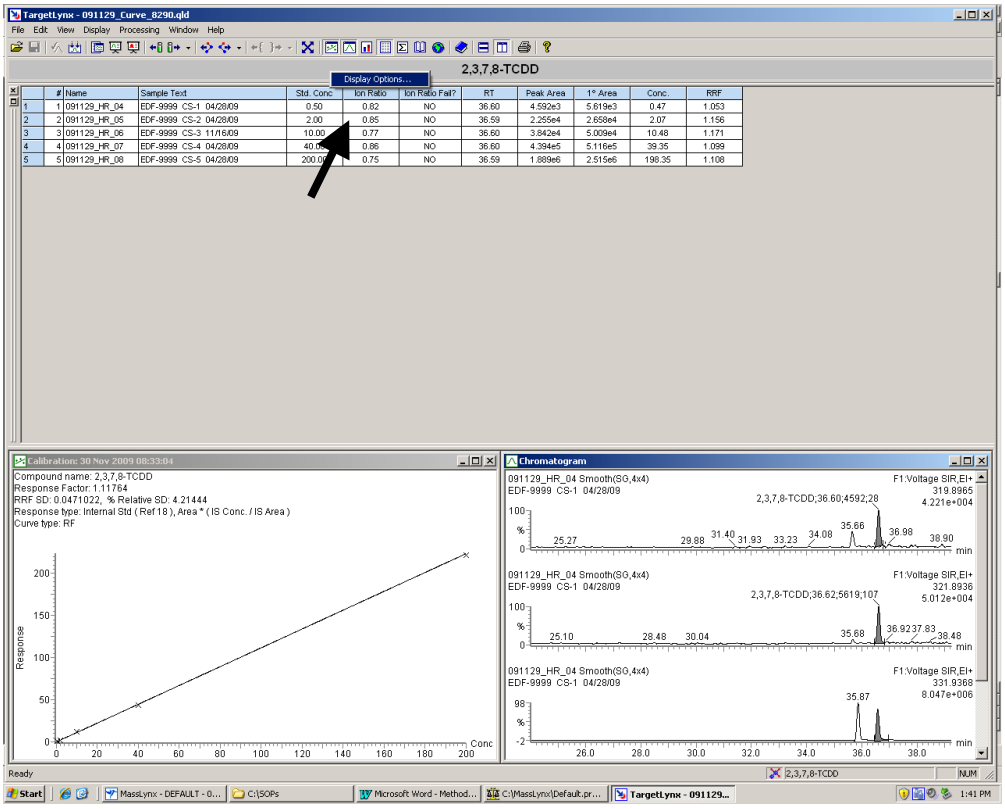
13.7.7.4 Under the 'Quantify' options, the method that should be loaded is the one saved for the sequence. The curve parameter would be highlighted.

13.7.7.5 Click on 'OK'. A data set would be generated and a 'TargetLynx – untitled' window will pop up.

13.7.7.6 In the 'TargetLynx – untitled' window, click on 'File' → 'Save As'. For curve data sets, the data on date 11-29-09 is save as 091129_Curve_8290.

13.7.7.7 There are different layouts by which a data set could be displayed. To apply the curve format, click on File → Apply Layout → pick Layout_Curve_8290.

13.7.7.8 Right clicking on the name header will give some display options. Go to the summary tab and select 'List by compound'. This will display each compound with calibration and chromatograph data.



13.7.7.9 The green injection vial icons are used to scroll through each data file. The blue and red dot icons are used to scroll through the analytes. For both of these icons, use the left / right arrows to scroll back and forth through injections or analytes.

13.7.7.10 Two of the main parameters that need to be reviewed are the ion ratios and the %RSD. The ion ratios are located on the display options window. The ion ratio and whether or not it passes method criteria is displayed in the table. This is shown under the column 'Ion Ratio Fail?' 'No' means the ion ratio passes, and 'Yes' means the ion ratio fails. The %RSD is shown in the calibration window. Methods 8290 and 1668 require a %RSD of 20% or lower. Check the peak integrations in order to make sure the software integrated the peaks properly, according to APPL Inc. protocol.

13.7.7.11 Once a passing initial calibration is achieved, click on 'File' → 'Save As' → 091129_Curve_8290. The name of the curve is date dependent.

13.7.7.12 The calibration data also needs to be exported to a file for future use. Click on 'File' → 'Export' → 'Calibration' → '091129_8290.

13.7.8 Processing the Samples

13.7.8.1 Highlight the samples that are to be processed, and click on the 'Process Samples' icon on the left side of the screen.

13.7.8.2 Under the 'Operations' options, only the 'Integrate Samples' and 'Quantify Samples' parameters should be checked marked.

13.7.8.3 Under the 'Quantify' options, load the saved method pertinent to the current sequence. The curve parameter is the data file that was saved during the exportation of the calibration curve.

13.7.8.4 Click on 'OK'. A data set will be generated and a 'TargetLynx – untitled' window will pop up.

13.7.8.5 In the 'TargetLynx – untitled' window, click on 'File' → 'Save As' and save the data set using the following convention: for example, the data from date 11-29-09 would be saved as 091129_Samples_5-10_8290. The '5-10' represents the data files being quanted.

13.7.8.6 There are different layouts by which a data set could be displayed. To apply the sample format, click on 'File' → 'Apply Layout' → pick 'Layout_Samples_8290'. To apply the signal to noise format, click on 'File' → 'Apply Layout' → pick 'Layout_SignalNoise'. To apply the retention time format, click on 'File' → 'Apply Layout' → pick 'Layout_RRT'.

13.7.9 Processing for Column Performance

13.7.9.1 Quantify the column performance standard (EDF-4147) using method 8290_091129_CP. The '091129' represents the date in which the column performance method was saved.

13.7.9.2 Highlight the samples that are to be processed and click on the 'Process Samples' icon on the left side of the screen.

13.7.9.3 Under the 'Operations' options, the 'Integrate Samples', 'Calibrate Standards', and 'Quantify Samples' parameters should all be check marked.

13.7.9.4 To apply the column performance format, click on 'File' → 'Apply Layout' → pick 'Layout_CP'.

13.7.9.5 Print the column performance data.

13.7.9.6 To display the chromatogram, highlight the sample in the MassLynx sequence. Click on 'Chromatogram' above the sequence table and another window will appear. Click on 'Display' → 'Mass' then pick the appropriate function and mass. For tetra-dioxins, use the 319.1985 m/z ion. For tetra-furans, use the 303.9016 m/z ion. Print the chromatogram.

13.7.10 Retention Time Form Generation

13.7.10.1 Load the dataset and apply the retention time format, click on 'File' → 'Apply Layout' → pick 'Layout_RRT'.

13.7.10.2 To generate the data to notepad, click on 'File' → 'Export' → 'Complete Summary'. Save to H:\Magneto\Raw data for RRT. Paid attention to the format of the data being saved.

13.7.10.3 Load the notepad data, press Control A to select all, and then paste into an excel spreadsheet.

13.7.10.4 Load a previous retention time check under H:\MAGNETO\8290 Forms\Method 8290B\RRT_Form_….

13.7.10.5 Locate the continuing in the raw data and copy and paste the RRT of the continuing under the column with the heading 'RRT of congener in CCV'. Make sure to just paste the values under the paste special format. Change the data file name under the header to reflect the correct data file.

13.7.10.6 Locate the sample in the raw data and copy and paste the 'RT', 'IS RT, and 'RRT' to the headers 'RT of congener in sample', 'RT of 13C congener in sample', and 'RRT of congener in sample'. Make sure to just paste the values under the paste special format. Change the data file name under the header 'RT of congener in sample'. The other headers will automatically reflect the change in data file.

13.7.10.7 Type in the sample name.

13.7.10.8 The 'Qualifiers' column will show if the analyte passes the required retention time windows.

13.7.11 Signal to Noise Form Generation

13.7.11.1 Load the dataset and apply the signal to noise format, click on 'File' → 'Apply Layout' → pick 'Layout_SignalNoise'

13.7.12 Data Interpretation

13.7.12.1 Forms needed during data interpretation

13.7.12.1.1 The sample format pages which includes the sample summary sheet and the ion chromatograms obtained from TargetLynx under 'Layout_Samples_8290'.

13.7.12.1.2 The retention times pages which includes the excel sheet and the raw data obtained from TargetLynx under 'Layout_RRT'.

13.7.12.1.3 The signal to noise pages obtained from TargetLynx under 'Layout_SignalNoise'.

13.7.12.2 Q-edits - It may be necessary to scan through the ion chromatograms of each sample to determine if any q-edits are needed.

13.7.12.3 Identification Criteria

13.7.12.3.1 Retention Times

a. For any congener that have an Isotopically-labeled internal standard, the retention time of both primary and secondary ions must be within –1 to +3 sec of the Isotopically-labeled standard.
b. For any congener that do not have an Isotopically-labeled internal standard, the retention time must fall within 0.005 retention time units of the relative retention times of the continuing calibration verification.
c. The peaks for both primary and secondary ions of both the congener and surrogates must be +/- 2 sec.
d. Using the excel sheet that was generated from the relative retention times, look for any failures. Note any failures with a 'RT' on the sample summary sheet.

13.7.12.3.2 Ion Abundance Rations

a. The ion abundance ratios must not exceed the control limits set in Table 8.
b. The ion ratio pass/fail column is displayed in the sample summary sheet.

13.7.12.3.3 Signal-to-Noise Ratio

a. The signal to noise ratio for congeners must be S/N ≥ 2.5 times noise level.
b. The signal to noise ratio for labeled congeners must be S/N ≥ 10 times noise level.
c. The signal to noise pass/fail column is displayed in the sample summary sheet.

13.7.12.3.4 Polychlorinated Diphenyl Ether Interferences

a. In order for a peak to constitute being a hit, there must not be any peaks in the polychlorinated diphenyl ether channel that's has S/N ≥ 2.5 times noise level and ± 2 seconds.
b. Contamination could be determined by looking at the ion chromatogram of the sample and comparing it to di-phenol ether channel.

13.7.12.3.5 Using EDL or EMPC - If the signal to noise ratio for a hit is below 2.5 or there is any retention time failure, report the EDL value. Otherwise, report the EMPC value.

13.7.13 Reporting the Data

13.7.13.1 It is not an option to direct upload data from the TargetLynx software directly in the LIMS system. An excel spreadsheet is set up so that raw data can be properly adjusted and then exported into LIMS.

13.7.13.2 Exporting raw data into excel

13.7.13.3 Load up the data set and apply the sample format, click on 'File' → 'Apply Layout' → pick 'Layout_Samples_8290'. This data should be in notepad format. Press 'Control A' then 'Control C' to highlight and copy everything.

13.7.13.4 Go to H:\MAGNETO\Labworks Ready Data\ and click on the last dated excel spreadsheet.

13.7.13.5 Click on the 'A1' cell and press 'Control V' to paste the data from notepad.

13.7.13.6 Save the data under the most recent date.

13.7.13.7 Column W will display the Labworks format of which the specific data is displayed. For example it might display $8290S Sample or $8290S Blk. In order to apply the right format for each sample, copy the data from columns R thru AC of one sample and paste it into another. The format of the cells should transfer over.

13.7.13.8 With the raw data in front of you, delete all non-hits from column K.

13.7.13.9 Delete all EDL values are used in column M. The EMPC values in column N do not need to be deleted because the spreadsheet will adjust accordingly for LOD/EMPC usage from column M.

13.7.13.10 Significant figures will need to be adjusted in columns Z and AA.

13.7.13.11 Change any values accordingly for the Dilution Factor, Sequence, Run, etc in column Z.

13.7.13.12 To add the DL or PC after the EDL/EMPC numbers, click on 'Tools' → 'Macro' → 'Macros' → 'ColumnAAtoAC_Rounding Macro'. This should generate the EDL/EMPC values with the DL/PC on column AC. Specific clients will sometimes request this format.

13.8 For any DoD samples, please refer to Table 8 for client specific criteria.

14.0 Data Assessment and Acceptance Criteria for QC

14.1 When QC parameters are exceeded, the following will take place: When the matrix spikes are outside of the limits they are re-digested and re-analyzed. When the LCS is outside of limits the entire batch is re-digested and re-analyzed. Due to the cost of ICAL and spike mix standards, the spike mix may be injected and the quantitated concentrations may be used to calculate spike recoveries for LCS and MS/MSD. If there is not enough sample for re-digestion the Project Manager is notified whom in turn notifies the client by phone or fax. The case narrative or case letter explains the sequence of events and the data is qualified. If the calibration parameters are not met the standards are re-prepared and reanalyzed.

14.2 The analyst completing the work first reviews data. The initial calibration curve is reviewed, the continuing calibration %D is reviewed, the spike recovery and precision is reviewed, the performance check solution is reviewed, and the closing continuing calibration %D is reviewed. If at any point the review shows an out of control situation, the section manager is notified verbally and the problem is investigated. The correction may be one of several points considered: standard preparation, improper injection size, extraction technique, etc. The problem is potentially solved and reanalysis or re-extraction/reanalysis is completed.

14.3 The second level of review is either by a peer in the same section or the section manager. There is a Multilevel Quality Control Sign Off worksheet that is filled out in its entirety by the review person.

14.4 When QC parameters are exceeded, the following will take place: When the matrix spikes are outside of the limits they are re-injected and the client is notified. When the LCS is outside of limits the entire batch is re-extracted and reanalyzed. If there is not enough sample for re-extract, the Project Manger is notified who in turn notifies the client by phone, fax, or e-mail. The case narrative or case letter explains the sequence of events and the data is qualified. If the calibration parameters are not met, the standards are re-prepared and reanalyzed.

14.5 TargetLynx is the program used to quant all generated data. Consequently, flagging of data is mostly done using the TargetLynx program. This is flagged either with a "No" or "Yes". In TargetLynx, the question asked when checking tolerance such is the target ratio is "Does the measured value fall outside the specified tolerance?" or in essence, "Does the test fail?" Thus the value outside of the tolerance is flagged with a "Yes." Those within tolerance are flagged with a "No." The program does not allow changing of the flags from YES/NO to FAIL/PASS. This information is noted to avoid any confusion involved in flagging of data.

14.6 Quick check List for acceptance of 8290 data:

14.6.1 Tuning

14.6.1.1 The instrument needs to main static resolving power ≥ 10,000 (10% valley) for identified masses per period.
14.6.1.2 This should be check at the beginning and the end of each 12-hour period of analysis.
14.6.2 GC column performance check
14.6.2.1 Needs to be performed prior to ICAL or CCV performance check solution
14.6.2.2 There must be at least 25% valley peak separation between 2,3,7,8-TCDD and other TCDD isomers.
14.6.2.3 All first and last eluters of the homologue retention time windows needs to be identified with a “F” or “L”
14.6.2.4 The absolute retention times for switching from one homologous series to the next is ≥ 10 seconds for all components of the mixture.
14.6.3 Initial calibration
14.6.3.1 Ion abundance ratios need to pass according to Method 8290
14.6.3.2 Signal to noise ratio is ≥ 10 for all target analytes.
14.6.3.3 % RSD is =< 20% for all natives and labeled internal standards.
14.6.4 Calibration verification
14.6.4.1 The calibration verification should be run at the beginning of each 12-hour period and at the end of each analytical sequence.
14.6.4.2 Ion abundance ratios need to pass according to Method 8290.
14.6.4.3 Signal to noise ratio is ≥ 10 for all target analytes.
14.6.4.4 % RSD is =< 20% for all natives and =< 30% for labeled internal standards.
14.6.5 Internal standard
14.6.5.1 The control limits for all internal standards is 40-135%.
14.6.6 Sample PCDD/PCDF identification
14.6.6.1 For 2,3,7,8-substituted isomers with labeled standards, the absolute retention time should be within –1 to +3 seconds of the corresponding labeled standard.
14.6.6.2 For 2,3,7,8-substituted isomers without labeled standards, the relative retention time should be within 0.005 RRT units of the retention time in the calibration verification standard.
14.6.6.3 Primary and secondary ions should elute with ±2 seconds of each other.
14.6.6.4 Ion abundance ratios need to pass according to Method 8290.
14.6.6.5 Signal to noise ratio is ≥ 2.5 for all target analytes and ≥ 10 for all labeled standards.
14.6.6.6 There should be no signal present having a S/N ratio ≥ 2.5 or the corresponding ether (PCDPE) detected at the same retention time (±2 sec).
14.7 For any DoD samples, please refer to Table 8 for client specific criteria.

15.0 Corrective Actions and Contingencies for Out of Control Data or Unacceptable Data

In the event that an out of control situation occurs, the project manager will be notified immediately. The affect of the out of control situation will be assessed according to the project DQO. If sufficient sample remains, and the situation will significantly affect the quality of the results, the analysis will be repeated. If the situation does not significantly affect the quality of the data, the project manager will notify the client and instructions from the client will be followed. In

the event no sample remains, the client will be notified immediately. All situations will be documented on the multi level sheet and initialed by the project manager. All out of control situations will be brought to the attention of the QAU in the form of a NWR. The QAU has the final authority to approve the actions taken

16.0 Method Deviations

This SOP was compared to EPA method 8290[1]. If the TCDF isomers listed in the method are resolved by 25% on the DB-5 column, then the confirmation column analysis is not necessary for 2,3,7,8-TCDF. The column performance mix purchased by APPL Inc. contains 2,3,4,7-TCDF and 1,2,3,9-TCDF in order to show the separation needed to eliminate the confirmation column analysis.

The method requirement will be followed for re-calibrating the instrument whenever a new CS-3 lot number is purchased, if the new lot number does not meet the 20%D CCV requirement. If the new lot number for CS-3 does meet the 20%D requirement, then the instrument will not be re-calibrated, due to the high cost of 8290 prepared standards.

17.0 Pollution Prevention

All hazardous materials that are generated during the testing of samples must be properly collected and stored. Drums are available in the storage room for the following types of wastes- acidic, basic and solvents.

18.0 Waste Management

It is the laboratory's responsibility to comply with all federal, state, and local regulations governing waste management, particularly the hazardous waste identification rules and lands disposal restrictions. The laboratory has the responsibility to protect the environment by minimizing and controlling all releases from fume hoods and bench operations.

19.0 Method Performance

19.1 Continuing method performance is monitored by analysis of LCS samples with each batch and control charting the results as per SOP# QC016.

19.2 A method detection Limit (MDL) study is run to ensure the performance of the instrumentation is able to satisfy data quality objectives of the client by reaching the reporting limits necessary. An MDL study is performed for each matrix per instrument after major instrument changes take place, such as a column change and is performed in accordance with SOP# QC018.

19.3 The method is not performed by any analyst until a Demonstration of Capability (DOC) is completed. Every analyst who performs this method has demonstrated acceptable accuracy and precision by passing a Demonstration of Capability study.

20.0 Equipment / Instrument Maintenance and Troubleshooting

20.1 The HRMS is under service contract with Waters, Inc. For any major problems, it is best to allow certified technicians to work on the instrument. Service contract #P608. Telephone 1-800-252-4752

20.2 Routine GC maintenance:

20.2.1 At least once a week or for every 100 injections, the capillary inlet inserts will be replaced. The septa will be checked at least every 100 injections or more often as necessary.

20.2.2 Chromatograms exhibiting peak tailing, low peak response of standards or breakdown products may indicate that immediate maintenance is needed.

20.2.3 Instructions

20.2.3.1 Allow the injection port to cool to room temperature and shut off the gas flows to the instrument. Remove the septa nut and replace the used septa with a new one. Replace the nut with hand tight plus ¼ turn of a wrench.

20.2.3.2 Remove the injection port assembly using a wrench to loosen the nut. Take out the used glass inlet liner and replace it with a new one.

20.2.3.3 Bake the GC for one hour using the following temperatures: Oven 290℃, injector ports 275℃, and detectors 350℃. Column maximum temperatures are listed in the documentation accompanying a new column.

20.2.3.4 A continuing calibration check standard will be injected to verify the calibration curve. If continuing calibration fails to meet criteria as stated in the method, a complete linearity of standards applicable to each type of analysis will be injected.

20.3 Periodic GC maintenance:

20.3.1 Replacing split seal (frit) for capillary inlet systems:

20.3.1.1 The split seal (frit) (fig. 18-3 HP ref. Manual II) is commonly contaminated when dirty samples are run through the GC. Reduced peak size or breakdown peaks may indicate cleaning of the split seal is needed.

20.3.1.2 After turning GC temperatures down, remove the column from the injection port and unscrew the reducing nut.

20.3.1.3 The split seal (frit) and flat washer located inside the reducing nut are removed and replaced.

20.3.1.4 Re-install column and turn the oven temperature up to 290℃ until the detector signal is stable.

20.3.2 Cleaning injector ports:

20.3.2.1 Turn off the oven and remove the analytical column when the oven has cooled.

20.3.2.2 Lower the injection port temperature to room temperature.

20.3.2.3 Remove the glass injection port insert.

20.3.2.4 Place a beaker beneath the injector port inside the GC oven. Using a Teflon wash bottle, serially rinse the entire inside of the injector port with acetone and then toluene, catching the rinsate in the beaker.

20.3.2.5 Prepare a solution of deactivation agent (Sylon-CT or equivalent) following manufacturer's directions. Coat all metal surfaces inside the injector body with the deactivation solution, then serially rinse the injector body with toluene, methanol, acetone and hexane.

20.3.2.6 Reassemble the injector and replace the GC column.

20.3.3 Cutting the Column:

20.3.3.1 With continued sample analysis, contaminants tend to build up in the injection port side of the capillary column, causing decreased peak response and peak tailing.

20.3.3.2 Using a wrench, remove the column inlet nut from inside the GC oven. Pull the column out of the nut and remove the graphite ferrule within the nut.

20.3.3.3 Use a column scoring tool to remove 1 –2 loops from the inlet side of the column and discard.

20.3.3.4 Thread the inlet nut back onto the column, and then slide a new ferrule onto the column. Allow the column to protrude 6mm from the top of the ferrule and replace back into the inlet using a wrench to tighten.

20.4 Annual Gas Line Purifier Replacement

20.4.1 Changing oxygen/moisture indicator tube (OM-1): The OMI-1 tube, located downstream from the gas purifier, indicates potential contamination within the carrier gas by rate of color change in the tube.

20.4.1.1 Turn down GC temperatures.

20.4.1.2 Unplug the heated converter tube. Turn off gas flow to line.

20.4.1.3 Using the parts in the OMI-1 installation kit, slide end caps onto ends of gas line, then finger tighten reducing union bodies to line ends. Wrench tighten approximately 1¼ additional turns.

20.4.1.4 Carefully remove plastic end caps from new tube. Avoid damaging foil seals that protect tube contents from exposure to air. Seals will be punctured by piercing needles in reducing unions when the tube is connected to the system.

20.4.1.5 Place nuts and new ferrules on the tube. Push exit of the tube into the reducing body closest to the instrument. Screw the nut and ferrule onto the union body and finger tighten. The piercing needle will penetrate the foil seal as you push the tube into the union. Slide the tube holder over the OMI-1 tube and gas line until the tube inlet is exposed.

20.4.1.6 Push the inlet end of the tube into the reducing union body. Position a slotted washer for the tube holder over the junction in one reducing union. Place the end cap on the tube holder and tighten until snug. Repeat at other end of tube holder. Turn the gas back on.

20.4.1.7 DO NOT ATTEMPT TO REMOVE THE CONTENTS OR REUSE THE TUBE. Spent resin contains a strong alkali.

20.4.1.8 Any partially spent tube should be placed in a glass beaker and stored away from combustible materials until the resin is a uniform brown. Dispose of the tube as a hazardous solid waste in accordance with applicable federal, state and local regulations.

20.5 HR Mass Spec Maintenance

20.5.1 APPL Inc. maintains a service contract with the instrument manufacturer (Waters Inc). Due to the technical nature of the HRMS, only Waters Inc service engineers are allowed to perform maintenance on the following mass spec components: the source, the flight tube and the mass spec detector.

20.5.2 Place a service call to Waters Inc if the following are observed: decrease in detector response, problems calibrating the mass axis, decreased beam transmission, low resolution checks or standard calibration problems with the ICAL or CCVs.

21.0 Computer Hardware and Software

21.1 Waters Laboratory Informatics. MassLynx v4.1 SCN 714 Desktop. Copyright © 2009 Waters Inc. All rights reserved.

21.1.1 This software is used in both acquiring the data from the HRMS and for processing data.

21.1.2 Most questions can be answered by accessing the 'Help' section of the software.

21.2 Computers needed to run the MassLynx software are at minumn Pentium® 4 CPU with 1.0 GB of RAM.

22.0 References

22.1 Method 8290. Polychlorinated Dibenzodioxins (PCDDs) and Polychlorinated Dibenzofurans (PCDFs) by High-Resolution Gas Chromatography / High-Resolution Mass Spectrometry (HRGC/HRMS). Environment Protection Agency. Revision 0, September 1994.

22.2 American Porphyria Foundation, www.porphyriafoundation.com © 2010 American Porphyria Foundation. All Rights Reserved

22.3 TargetLynx Software User's Guide. MassLynx SCN509 71500103302/A. Copyright © Waters Corporation 2005. All Rights Reserved.

22.4 Environmental Contaminant Standards. Cambridge Isotope Laboratories, Inc. Copyright © 2004. All Rights Reserved.

22.5 DoD QSM, Version 5.3, May 2019

22.6 ISO/IEC 17025:2017

23.0 Tables, Diagrams, Flowcharts, Validation Data

Table 1: Calibration Standard Concentrations and Acceptance Criteria for CCV, LCS and IDP Study
Table 2: GC Performance Standard
Table 3: C_{13} Internal Standards and Recovery Standards
Table 4: Dioxin and Furan Spike Mix
Table 5: Theoretical Ion Abundance Ratios and QC Limits
Table 6: 2.3.7.8-TCDD Toxicity Equivalency Factors (TEFs)
Table 7: Sample Reporting Criteria - Flow Chart
Table 8: DoD QSM 8290 Table 7

Section Manager Name: Hart Hedgepeth



Section Manager Signature: _____ Date: 01/27/22

QAU Director Name: Paula McCartney



QAU Director Signature: _____ Date: 01/27/22

TABLE 1
Calibration Standard Concentrations and
Acceptance Criteria for CCV, LCS and IDP Study

ANALYTE	ICAL CS-0.2 ng/ml	ICAL CS-1 ng/ml	ICAL CS-2 ng/ml	ICAL CS-3 ng/ml	ICAL CS-4 ng/ml	ICAL CS-5 ng/ml		CCV % D		IDC Study % REC	LCS % REC	Labeled C13 surrogate % REC (in sample)
2,3,7,8-TCDD	0.1	0.50	2.0	10	40	200		20		70-130	70-130	*
2,3,7,8-TCDF	0.1	0.50	2.0	10	40	200		20		70-130	70-130	*
1,2,3,7,8-PeCDD	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,7,8-PeCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
2,3,4,7,8-PeCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,4,7,8-HxCDD	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,6,7,8-HxCDD	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,7,8,9-HxCDD	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,4,7,8-HxCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,6,7,8-HxCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,7,8,9-HxCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
2,3,4,6,7,8-HxCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,4,6,7,8-HpCDD	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,4,6,7,8-HpCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
1,2,3,4,7,8,9-HpCDF	0.50	2.5	10	50	200	1000		20		70-130	70-130	*
OCDD	1.0	5.0	20	100	400	2000		20		70-130	70-130	*
OCDF	1.0	5.0	20	100	400	2000		20		70-130	70-130	*

Labeled Surrogate Standards

C_{13} -2,3,7,8,-TCDD	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -2,3,7,8,-TCDF	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,7,8,-PeCDD	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,7,8,-PeCDF	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,6,7,8,-HxCDD	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,6,7,8,-HxCDF	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,4,6,7,8,-HpCDD	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} -1,2,3,4,6,7,8,-HpCDF	100	100	100	100	100	100		30		40-135	*	40-135
C_{13} –OCDD	200	200	200	200	200	200		30		40-135	*	40-135

C13 Labeled Internal Standards

C_{13} –1,2,3,4-TCDD [A]	100	100	100	100	100	100		30		*	*	*
C_{13} -1,2,3,7,8,9-HxCDD [B]	100	100	100	100	100	100		30		*	*	*

[A] Used to determine the recoveries of the TCDD, TCDF, PeCDD and PeCDF surrogates.
[B] Used to determine the recoveries of the HxCDD, HxCDF, HpCDD, HpCDF and OCDD surrogates

TABLE 2
GC Performance Check Standard

Analyte	No. Cl Atoms	Concentration ng/ml
1,3,6,8-TCDD and -TCDF	4	80
1,2,8,9- TCDD and -TCDF	4	80
C_{13}-2,3,7,8 –TCDD and -TCDF	4	80
2,3,7,8-TCDD and -TCDF	4	80
1,2,3,4 and 1,2,3,7-TCDD	4	80
1,2,3,8 and 1,2,3,9-TCDD	4	80
2,3,4,7 and 1,2,3,9-TCDF	4	80
1,2,4,6,8 and 1,2,4,7,9-PeCDD	5	80
1,3,4,6,8-PeCDF	5	80
1,2,3,8,9-PeCDD and -PeCDF	5	80
1,2,4,6,7,9 and 1,2,4,6,8,9-HxCDD	6	80
1,2,3,4,6,7-HxCDD	6	80
1,2,3,4,6,8 and 1,2,3,4,8,9-HxCDF	6	80
1,2,3,4,6,7,9-HpCDD	7	80
1,2,3,4,6,7,8-HpCDD and -HpCDF	7	80
1,2,3,4,7,8,9-HpCDF	7	80

TABLE 3
C_{13} Internal Standards and Recovery Standards

Analyte	Internal Standard Concentration ng/ml	Recovery Standard Concentration ng/ml
C_{13} -2,3,7,8,-TCDD	40	----
C_{13} -2,3,7,8,-TCDF	40	----
C_{13} -1,2,3,7,8,-PeCDD	40	----
C_{13} -1,2,3,7,8,-PeCDF	40	----
C_{13} -1,2,3,6,7,8,-HxCDD	100	----
C_{13} -1,2,3,4,7,8,-HxCDF	100	----
C_{13} -1,2,3,4,6,7,8,-HpCDD	100	----
C_{13} -1,2,3,4,6,7,8,-HpCDF	100	----
C_{13} -OCDD	200	----
C_{13} –1,2,3,4-TCDD	-----	40
C_{13} -1,2,3,7,8,9-HxCDD	----	40

TABLE 4
Dioxin and Furan Spike Mix

Analyte	Concentration ng/ml
2,3,7,8-TCDD	100
2,3,7,8-TCDF	100
1,2,3,7,8-PeCDD	250
1,2,3,7,8-PeCDF	250
2,3,4,7,8-PeCDF	250
1,2,3,4,7,8-HxCDD	250
1,2,3,6,7,8-HxCDD	250
1,2,3,7,8,9-HxCDD	250
1,2,3,4,7,8-HxCDF	250
1,2,3,6,7,8-HxCDF	250
1,2,3,7,8,9-HxCDF	250
2,3,4,6,7,8-HxCDF	250
1,2,3,4,6,7,8-HpCDD	250
1,2,3,4,6,7,8-HpCDF	250
1,2,3,4,7,8,9-HpCDF	250
OCDD	500
OCDF	500

TABLE 5
Theoretical Ion Abundance Ratios and QC Limits

Cl Atom	m/z Forming Ratio	Theoretical Ratio	Ratio Acceptance Range
4	m/m+2	0.77	0.65 – 0.89
5	m/(m+2)	1.55	1.32 - 1.78
6	(m+2)/(m+4)	1.24	1.05 – 1.43
6	m/(m+2)	0.51	0.43 – 0.51
7	(m+2)/(m+4)	1.04	0.88 – 1.20
7	m/(m+2)	0.44	0.37 – 0.051
8	(m+2)/(m+4)	0.89	0.76 – 1.02

TABLE 6
2.3.7.8-TCDD Toxicity Equivalency Factors (TEFs)

Analyte	1998 TEF	2005 TEF
2,3,7,8-TCDD	1	1
1,2,3,7,8-PeCDD	1	1
1,2,3,6,7,8-HxCDD	0.1	0.1
1,2,3,7,8,9-HxCDD	0.1	0.1
1,2,3,4,7,8-HxCDD	0.1	0.1
1,2,3,4,6,7,8-HpCDD	0.01	0.01
1,2,3,4,6,7,8,9-OCDD	0.001	0.003
2,3,7,8-TCDF	0.1	0.1
1,2,3,7,8-PeCDF	0.05	0.03
2,3,4,7,8-PeCDF	0.5	0.3
1,2,3,6,7,8-HxCDF	0.1	0.1
1,2,3,7,8,9-HxCDF	0.1	0.1
1,2,3,4,7,8-HxCDF	0.1	0.1
2,3,4,6,7,8-HxCDF	0.1	0.1
1,2,3,4,6,7,8-HpCDF	0.01	0.01
1,2,3,4,7,8,9-HpCDF	0.01	0.01
1,2,3,4,6,7,8,9-OCDF	0.001	0.003

TABLE 7
Sample Reporting Criteria - Flow Chart

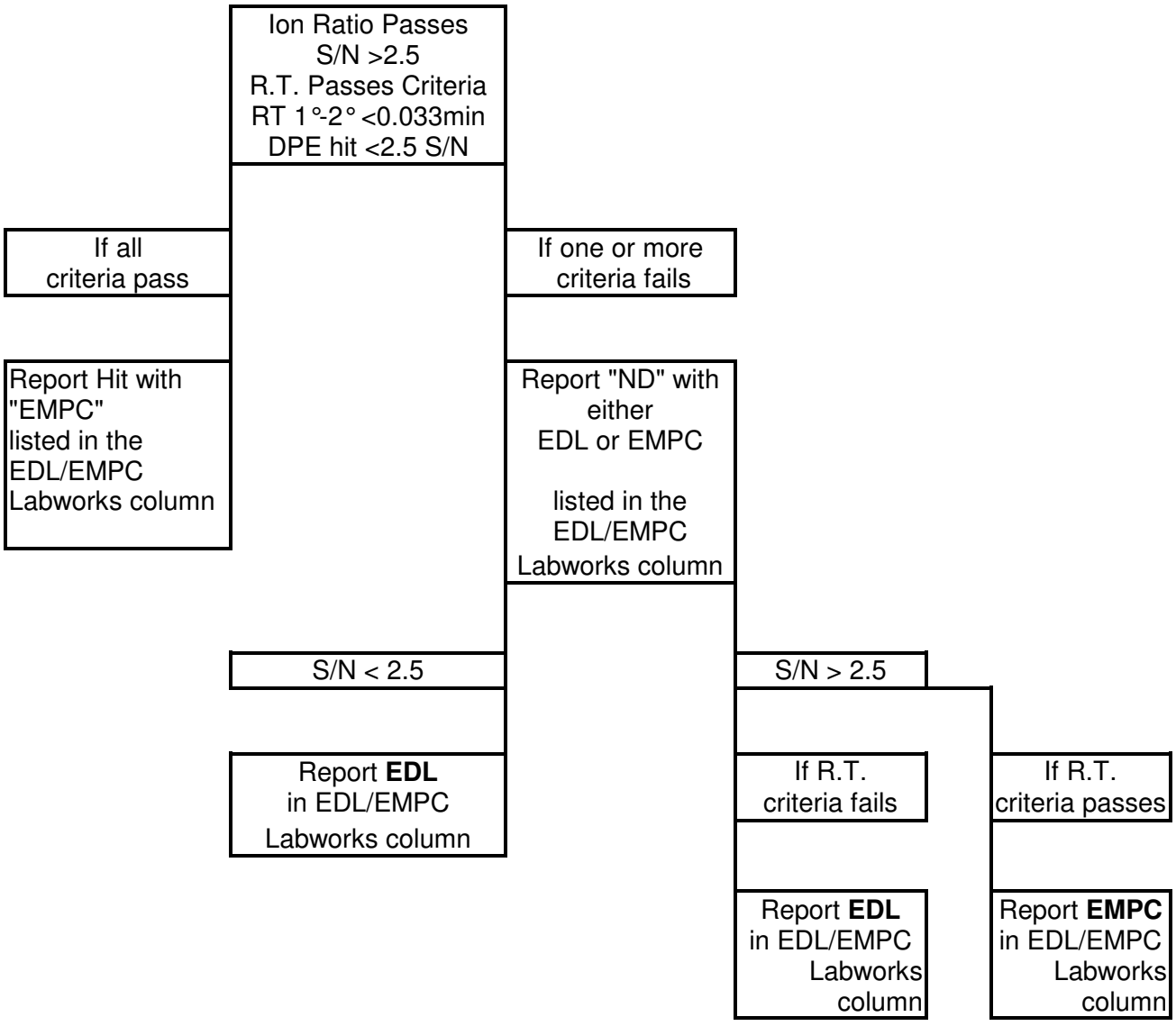


TABLE 8

Table - 6. Dioxin/Furan Analysis by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (Method 8290)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Resolving Power	Prior to ICAL and at the beginning and the end of each 12-hour period of analysis.	Static resolving power ≥ 10,000 (10% valley) for identified masses.	Retune instrument and verify. Rerun affected samples.	Flagging is not appropriate.	No samples shall be analyzed without a valid tune.
Performance Check	Prior to ICAL or calibration verification. At the beginning of each 12-hr period during which samples or calibration solutions are analyzed.	Peak separation between 2,3,7,8-TCDD and other TCDD isomers: Resolved with a valley of ≤ 25%. Identification of all first and last eluters of the eight homologue retention time windows and documentation by labeling (F/L) on the chromatogram. Absolute retention times for switching from one homologous series to the next ≥ 10 sec. for all components of the mixture.	Correct problem then repeat column performance check.	Flagging is not appropriate.	Use GC column performance check solution If the laboratory operates during consecutive 12-hr periods. No samples shall be analyzed until performance check is within criteria.
Initial calibration (ICAL) for all analytes identified in method	At instrument setup and after ICV or CCV failure, prior to sample analysis, and when a new lot is used as standard source for HRCC-3, sample fortification (IS), or recovery solutions.	Ion abundance ratios in accordance with the method. S/N ratio ≥ 10 for all reported analyte ions. RSD ≤ 20% for the response factors (RF) for all 17 unlabeled standards. RSD ≤ 20% for the RFs for the 9 labeled IS.	Correct problem, then repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed run until ICAL has passed. Calibration may not be forced through origin.

TABLE 8, continued

Table - 6. Dioxin/Furan Analysis by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (Method 8290)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Initial Calibration Verification (ICV)	Once after each ICAL, analysis of a second source standard prior to sample analysis.	Ion abundance specified in the method must be met;. For unlabeled standards, RF within ± 20% D of RF established in ICAL; and For labeled standards, RF within ± 30%D of the mean of RF established in ICAL.	Correct problem. Rerun ICV. If that fails, repeat ICAL.	Flagging is not appropriate.	No samples shall be analyzed until calibration has been verified with a second source.
Calibration Verification (CCV)	At the beginning of each 12-hour period, and at the end of each analytical sequence.	Ion abundance specified in the method must be met. For unlabeled standards, RF within ± 20% D of RF established in ICAL; and For labeled standards, RF within ± 30% D of RF established in ICAL.	Immediately analyze two additional consecutive CCVs. If both pass, samples may be reported without reanalysis. If either fails, take corrective action(s) and re-calibrate; then reanalyze all affected samples since the last acceptable CCV. End-of-run CCV: If the RF for unlabeled standards ≤ 25% RPD and the RF for labeled standards ≤ 35% RPD (relative to the RF established in the ICAL), the mean RF from the two daily CCVs must be used for quantitation of impacted samples instead of the ICAL mean RF value. If the starting and ending	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to all results for the specific analyte(s) in all samples since the last acceptable CCV.	Results may not be reported without a valid calibration verification. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

TABLE 8, continued

Table - 6. Dioxin/Furan Analysis by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (Method 8290)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Calibration Verification (CCV)			CCVRFs differ by more than 25% RPD for unlabeled compounds or 35% RPD for labeled compounds, the sample may be quantitated against a new initial calibration if it is analyzed within two hours. Otherwise analyze samples with positive detections, if necessary.		
Internal Standards (IS)	Every field sample, standard, and QC sample.	% Recovery for each IS in the original sample (prior to dilutions) must be within 40 – 135% of the ICAL average RF.	Correct problem, then re-prep and reanalyze the samples with failed IS.	Apply Q-flag to results of all affected samples and explain in the case narrative.	
Method Blank (MB)	One per preparatory batch, run after calibration standards and before samples.	No analytes detected > 1/2 LOQ or > 1/10 the amount measured in any sample or 1/10 the regulatory limit, whichever is greater.	Correct problem. If required, reprep and reanalyze method blank and all samples processed with the contaminated blank.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply B-flag to all results for the specific analyte(s) in all samples in the associated preparatory batch.	Results may not be reported without a valid method blank. Flagging is only appropriate in cases where the samples cannot be reanalyzed.

TABLE 8, continued

Table - 6. Dioxin/Furan Analysis by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (Method 8290)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Laboratory Control Sample (LCS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Correct problem, then re-prep and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	If reanalysis cannot be performed, data must be qualified and explained in the case narrative. Apply Q-flag to specific analyte(s) in all samples in the associated preparatory batch.	Must contain all surrogates and all analytes to be reported. Results may not be reported without a valid LCS. Flagging is only appropriate in cases where the samples cannot be reanalyzed.
Matrix Spike (MS)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified.	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	Must contain all surrogates and all analytes to be reported. If MS results are outside the limits, the data shall be evaluated to determine the source of difference and to determine if there is a matrix effect or analytical error.
Matrix Spike Duplicate (MSD) or Matrix Duplicate (MD)	One per preparatory batch.	A laboratory must use the QSM Appendix C Limits for batch control if project limits are not specified. If the analyte(s) are not listed, use in-house LCS limits if project limits are not specified. MSD or MD: RPD of all analytes ≤ 20% (between MS and MSD or sample and MD).	Examine the project-specific requirements. Contact the client as to additional measures to be taken.	For the specific analyte(s) in the parent sample, apply J-flag if acceptance criteria are not met and explain in the case narrative.	The data shall be evaluated to determine the source of difference.

TABLE 8, continued

Table - 6. Dioxin/Furan Analysis by High-Resolution Gas Chromatography/High-Resolution Mass Spectrometry (Method 8290)					
QC Check	**Minimum Frequency**	**Acceptance Criteria**	**Corrective Action**	**Flagging Criteria**	**Comments**
Internal Standards (IS)	Every field sample, standard, and QC sample.	% Recovery for each IS in the original sample (prior to dilutions) must be within 40 – 135%.	Correct problem, then re-prep and reanalyze the samples with failed IS.	Apply Q-flag to results of all affected samples.	
Sample Estimated Maximum Possible Concentration (EMPC)	Every sample with a response S/N ≥ 2.5 for both quantitation ions.	Identification criteria per method must be met, and the S/N of response for both quantitation ions must be ≥ 2.5.	NA.	Flagging is not appropriate.	
Sample 2,3,7,8-TCDD toxicity equivalents (TEQ) concentration	All positive detections.	Per method.	NA.	Flagging is not appropriate.	Recommended reporting convention by the EPA and CDC for positive detections in terms of toxicity of 2,3,7,8-TCDD.

Standard Operating Procedure

DATA INTEGRITY AND REVIEW OF FINAL DATA

1.0 PURPOSE

This SOP explains the steps required for reviewing data packages using three tiers of review: Tier #1 is the analyst, tier #2 is the technical reviewer, and tier #3 is administrative review. The QAU also reviews a minimum of 10% of data packages produced by the laboratory. This SOP explains the process to ensure that the reported data are free from transcription and calculation errors. This SOP also describes the procedures used at APPL Inc. to assess data integrity.

2.0 DISCUSSION

Final result concentrations produced are recorded in Labworks. Data recorded may include results for samples, blanks, spikes, duplicates and confirmations. Electronic reports generated contain results that have been entered into Labworks by each analyst. Analytical results include the name of the instrument, sequence name, data file name, initials of the analyst, date and time extracted, and date and time analyzed. Additional information may also be entered for clients requiring electronic data deliverables. Labworks automatically enters the ARF number, APPL ID, client ID and name of method used to analyze the sample(s).

Each analyst must be knowledgeable in the steps needed for generating a data package and what is required when corrections are required.

APPL, Inc. uses the following procedures to ensure data integrity and are performed during the processing of data:

2.1 Data Validation
2.2 Direct Upload of the majority of data into Labworks to omit operator error.
2.3 Manual entry - Analytical measurements that are not interfaced to LIMS are verified to be accurate through peer review, batch QC, as well as through ethics training.
2.4 Peer review of all data.
2.5 Supervisor, Lab Director, QAU Director, or President sign-off of all manual integrations.
2.6 Labworks internal error indicator for numerous QC exceedences
2.7 AccRep form prints error report whenever there is a problem indicated.
2.8 EDD validator performs data integrity checks.

3.0 DEFINITIONS

3.1 ARF: Analysis Request Form

3.2 Labworks: A laboratory information systems (LIMS) software that logs sample receipt, assigns testing methods, tracks client project specifications, and reports sample results.

3.3 Data package: All forms provided to the client, such as: Chain of custody (COC), Analysis request form (ARF), Labworks forms, quantitation forms, and standard preparation copies.

4.0 PROCEDURE

Data review consists of three tiers, two technical and one administrative. Checklists are used to guide and record these reviews. A different person performs each review. Records of the three tier review sheets are filed in hard copy with the ARF in the receptionist's locked file room. These review sheets are made available to the client or third party validation upon request. All reports must go through the following review process, including client reports, proficiency testing reports, and special research studies in which the lab participates. This data review process must be completed prior to submitting the final report to the client. Under no circumstances or time constraint pressures may this process be omitted. The analyst must communicate with their department supervisor, who communicates with the project manager regarding any data quality issues prior to finalizing the report.

4.1 Tier 1 Review (The Analyst)

4.1.1 The analyst initially reviews the instrument data for potential QC failures including, but not limited to: surrogates, LCS, MS/MSD, Internal Standards, ICAL, CCV, carryover from previous high samples, etc.

4.1.2 All quality failures or method exceptions are noted on the Multi-level Review sheet by the analyst (See Appendix A).

4.1.3 If failures are noted in the data, then the analyst immediately notifies the supervisor, who notifies the project manager, who notifies the client. Corrective actions are taken in-house on a case-by-case basis as appropriate for each type of failure. Corrective actions include, but are not limited to: re-injection, re-extraction, client contact for guidance before the final report is generated.

NOTE: If re-extraction is required, it is imperative to re-extract within hold time.

4.1.4 Re-extraction should immediately be initiated for any quality failure, in order to meet hold times. Secondary corrective actions, such as re-injection on the instrument are simultaneously performed while the re-extraction is in process.

4.1.5 If there is a notation in the comment section of the ARF indicating that the data is to be used for screening purposes then some QC failures are allowed as long as the data is useable to the client. It is acceptable to report a result out of the linear range of the instrument. It is acceptable to have slight exceptions to ICVs, CCVs and LCS recovery with approval of the project manager.

4.1.6 If the data quality failure is significantly outside the acceptance criteria, then re-extraction should take place immediately without waiting for instrument re-injection.

4.1.7 All QC failures are documented on the Multi-level Review Sheets in the Appendix of this SOP, as well as, an NWR Form when appropriate for laboratory failures not related to sample matrix. See QC033 Non-conforming Work Reports.

4.1.8 For MS/MSD failures on DOD projects, the corrective action listed in the QSM states that the client will be notified. Section supervisors will email the project manager, and the project manager will email the client a copy of the MS/MSD form showing the failures.

4.1.9 After completion of analysis, the analyst assembles a data package according to SOP QC002, Generating cover letters and case narratives for the final report.

4.1.10 Manual integrations are reviewed and approved by the section supervisor, technical reviewer, laboratory director, technical director, or QAU Director, as per SOP QC044 Manual Integration.

4.1.11 **Each analyst performs a 100% review of his/her work**, recording the review on the appropriate multilevel review checklist. Appendix A is an example of the review form.

4.1.12 If the analyst finds an error with his/her own work prior to peer review, then the correction is made by:

- Error is amended
- Amended page(s) are reprinted and placed in package
- Incorrect page(s) are put into recycling bin

4.1.13 If hand-input corrections are made, such as revising results in LabWorks by hand, then the analyst makes a note on the Multi-level indicating that a hand-input change has been made. All hand-input entries need to be peer reviewed.

4.1.14 Package sent to technical peer reviewer for Tier 2 Review.

4.2 Tier 2 Review (Technical Peer Reviewer)

4.2.1 A second tier review is performed by a technically qualified reviewer, recording the results on the same multilevel review checklist as used by the analyst.

4.2.2 If the second reviewer identifies an error it is corrected by:

4.2.3 The peer reviewer hand writes (with date/initials) the needed corrections on the front of the ARF and either makes the correction himself/herself or returns the package to the initial analyst for correction.

- Error is amended
- Amended page(s) are reprinted
- Incorrect page(s) are put into recycling bin

4.2.4 If hand-input corrections are made at this point, be sure to note it on the Multi-level sheet. All hand-input entries need to be peer reviewed.

4.2.5 The signed multilevel review checklist is included in the data package and sent for Tier 3 Administrative Review.

4.3 Tier 3 Review (Administrative Reviewer- Project Manager)

4.3.1 Administrative review is performed by a qualified reviewer and results of the review are recorded on the administrative checklist. This review insures that all other review checklists have been documented properly and are complete. Appendix B is an example of the administrative review checklist. The “Cooler Receipt Form” and “Sample Receiving QC Sign Off Form” to be reviewed by administration are described in SOP SHR001.

4.3.2 If the administrative reviewer identifies an error it is corrected by:

4.3.3 The administrative reviewer hand writes (with date/initials) the needed corrections on the front of the ARF, which is the top page of the package, and returns the entire package back to the analyst for correction.

4.3.4 The analyst makes the necessary corrections by:

- Error is amended
- Amended page(s) are reprinted
- Amended page(s) are placed sideways in the package
- Incorrect page(s) are KEPT IN THE PACKAGE

4.3.5 If hand-input corrections are made at this point, be sure to note it on the Multi-level sheet. All hand-input entries need to be peer reviewed.

4.3.6 Package is returned to the administrative reviewer

4.3.7 The administrative reviewer verifies that corrections were made properly and discards the incorrect page(s) in the recycling bin.

4.3.8 The administrative reviewer completes the data package assembly and signs the administrative review sheet.

4.4 Report Revisions AFTER Delivery to Client:

4.4.1 For final report needs to be revised AFTER it has been sent to the client, such as in the case where a third party validator requests amendments, the project manager will initiate the following:

4.4.2 For tracking purposes, the PM flags the client or validator's email.

4.4.3 If the corrections are clerical and not analytical, then the PM may perform the corrections, such as sample IDs or case narratives etc.

4.4.4 For analytical report revisions, the PM forwards the client's email to the lab director and QA Director, who both flag the email for tracking purposes and determine which department and supervisor will be handling the report revisions.

4.4.5 If only a few pages need revisions, then the hard copy report does not need to be pulled. The scanned report stored in the scanner directory may be accessed and the page numbers that need revision may be electronically swapped out, rather than revising the hard copy.

4.4.6 If multiple pages need revision, then it may be easiest to pull the hard copy and re-scan the entire report with amended or added pages.

4.4.7 The department supervisor ensures that the report is amended by:

- Error is amended
- Amended page(s) are reprinted and stamped "amended" or "added" *(depending on client's instructions- check with PM)*
- Incorrect page(s) are KEPT IN THE PACKAGE with a line through the page with date / initials.
- Amended or added pages are PLACED SIDEWAYS in front of the incorrect pages.
- The amended data package is given back to the project manager.

4.4.8 If hand-input corrections are made at this point, be sure to note it on the Multi-level sheet. All hand-input entries need to be peer reviewed.

4.4.9 The amended data package is given back to the project manager

4.4.10 The PM reviews the amendments and either gives the package to the receptionist or tells the receptionist which page numbers were amended for pages that can be swapped out electronically in the pdf.

4.4.11 The receptionist re-scans the report (or swaps out amended pages in the scanner) and coordinates with the PM on how the amended report should be delivered and to whom the amendments should be delivered.

4.4.12 The PM un-checks ARF Summary's "EDD sent" button, which will notify the IT personnel that an EDD revision is needed. The PM makes a note

in the ARF Summary Comments summarizing the corrections made and which dept was effected.

4.4.13 The PM, Lab Director, QA Director, and Receptionist unflag the email once their duties are complete as listed above.

4.5 The QAU reviews a minimum of 10% of packages for technical completeness and accuracy. The ARF Summary software will be used to identify data packages completed for the QAU's data audit. The results of this review are documented on a checklist, Appendix C

5.0 HEALTH and SAFETY

None for this procedure.

6.0 RECORDS MANAGEMENT

Data review checklists and data packages are retained and managed according to SOP DOC010, Document Control and DOC012 Records Management.

7.0 REFERENCES

7.1 ISO/IEC 17025:2017 Control of Data.

7.2 DoD Quality Systems Manual for Environmental Laboratories, Vs. 5.3, May 2019

8.0 APPENDICES

8.1 Appendix A: Multilevel Review Example (VOA Dept):
8.2 Appendix B: Final Report Check List (example)
8.3 Appendix C: QAU Data Package Review (example)

Laboratory Director:_____ Date: 05/12/2022

Paula McCartney

QAU Director:_____ Date: 05/12/2022

Appendix A: Example of Multilevel Review Sheet (Tier 1 & 2 Analyst and Peer Review)

Rev 5, 06/05/18

VOA - MultiLevel Review

ARF number(s)

SAMPLE PREPARATION **Preparation Method_____ APPL SOP _____**

The technician's initials below indicate the following criteria were met with the exceptions being noted in the comments:

HT met: HT date(s):_____ Ext. date:_____
Sample preservation is acceptable: pH strip Lot#: _____
Method and client-specific QC requirements were performed (DoD etc)
Information was entered into proper lab notebooks
The client ID on the sample label matches the client ID on the APPL label
Soil samples were corrected for % Moisture (or Encores) Yes No NA
Sufficient sample was provided for matrix QC Yes No NA
#1 Initials of technician(s)/Date:
#2 Initials of reviewer/Date:
Comments:

INSTRUMENTATION LABORATORY **Analytical Method _____ APPL SOP _____**

The analyst(s) initials below indicate the following criteria were met with the exceptions being noted below:

Holding times were met for all analyses
Checked ARF and COC for specific reporting requirements
Correct quantitation method used
Calibrations include all pertinent analytes
Initial calibration in control
Internal standards in control (when applicable)
Second source calibrations in control
Continuing calibrations in control
Tune within control (when applicable)
LCS(/LCSD) passes
Method blank/calibration blank passes
Matrix Duplicate and MS/MSD passes (when applicable)
Surrogate(s) passes
Client-specific QC requirements met (DoD or client QAPP)
The units on the Form 1 were properly transcribed
Algorithm checked (SS) Data File:
Correct multiplier used to quantitate sample data
The dilutions agree (when applicable)
Soil samples were corrected for % Moisture (when applicable)
Samples were checked for TICs (when applicable)
Manual integration(s) were dated / signed (when applicable)
Sample results were reviewed in EnviroQuant
LA/MA Target Analyte Values are correct
#1 Initials of analyst(s)/Date:
Initials of data entry/Date:
#2 Initials of technical reviewer/Date:
Comments / Case Narrative Data Qualifiers:

Were Hand-input Entries Made? Need peer review: Yes: No: NA:
Is a NWR needed for the above failures? : NWR#: _____ Yes: No: NA:

Appendix B: Example of Final Report Checklist (Tier 3 Administrative Review)

			INVOICING INFORMATI		**ARF#**	
		INVOICES		Initials/date		
	Invoice w/report	Y	N		**Client Name:**	
	Draft/Sales Order	Y	N			
	PM check Sales Order	Y	N		**Project Name:**	
	Corrections needed	Y	N			
	Corrections made	Y	N			
	Corrections reviewed	Y	N		**Addendum**	**Amendment**
	Invoicing	Electronic				
	Invoicing	Email				
	Invoicing	Hardcopy				
	Ship Date					
PM		Y	N			
Comments:						
			ADMINISTRATIVE REVIEW			
			Cooler Receipt Form documented properly			
			Sample Receiving QC Sign Off documented properly			
			All Multilevel Review Forms documented properly			
VOA	GC	LC	HR-GCMS	Metals	Wetlab	Subwork
			CoC Requests Complete			
			All forms complete and in proper order			
			Package arranged with proper page dividers			
			Data Package(s) Complete			
			Case Narrative(s) Complete			
			Cover Letter Complete			
			EDD notification "checked" in ARF Summary			
			Administrative Review Date / Initials			
			Lab Manager / Designee sign cover letter			
Comments:						
			DELIVERY INFORMATION			
			Date/Initials Mailed		GSH Report	Y DO NOT MAIL
					Date/Initials e-mailed	
			Date/Initials Fed X'd		e-mailed to attention	
			Priority			
			Std		CD sent	
			Mailed to attention:		FTP/upload	
			Copies to attention:			
					Date/Initials Re-sent:	
			Date/Initials Faxed		Mailed	
					Fed X'd	
Comments:						

Appendix C: QAU Data Package Review

Client_____ **ARF#** _____ **Name of QAU / Date:** _____

Analytical Methods: _____

Receiving Review Forms complete and accurate:	Yes:	No:	NA:
Does ARF document CoC and special project requirements:	Yes:	No:	NA:
CoC db complete for all technicians and methods:	Yes:	No:	NA:
CoC db CONTAINERS CHECKED OUT up to date:	Yes:	No:	NA:
Extraction / Digestion Holding times met:	Yes:	No:	NA:
Initial calibration in control:	Yes:	No:	NA:
Second source calibrations in control:	Yes:	No:	NA:
Continuing calibrations in control:	Yes:	No:	NA:
Internal standards in control:	Yes:	No:	NA:
DDT Degradation Check Passes for EPA 8081A: (15%)	Yes:	No:	NA:
Column Resolution Check passes for EPA 8290 (25%)	Yes:	No:	NA:
Tune within control:	Yes:	No:	NA:
Check continuous inj log for rinse blanks before QC or CCVs	Yes:	No:	NA:
Method blank/calibration blank passes:	Yes:	No:	NA:
LCS(/LCSD) passes:	Yes:	No:	NA:
Matrix Duplicate and MS/MSD passes:	Yes:	No:	NA:
Surrogate(s) passes:	Yes:	No:	NA:
Standard Prep Logs correct and complete:	Yes:	No:	NA:
Algorithm checked (LCS): Data File:	Yes:	No:	NA:
Manual integration dated / signed?	Yes:	No:	NA:
NWR complete for QC failures:	Yes:	No:	NA:
Multilevel Review complete and accurate:	Yes:	No:	NA:
Case Narrative / Cover Letter complete and accurate:	Yes:	No:	NA:

Comments

Findings