Port of Seattle

Terminal 117 Upland Area

T-117 UPLAND AREA SOIL INVESTIGATION FIELD SAMPLING AND DATA REPORT

For submittal to:

US Environmental Protection Agency, Region 10
1200 Sixth Avenue
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Table of Contents

List of Tables

List of Figures (bound in separate folio)

Acronyms

Acronym	Definition
%D	percent difference
%RSD	percent relative standard deviation
AES	atomic emission spectrometry
ARI	Analytical Resources, Inc.
As	arsenic
ASAOC	Administrative Settlement Agreement and Order on Consent
ASTM	American Society for Testing and Materials
Boeing	The Boeing Company
CCV	continuing calibration verification
Cd	cadmium
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act (Superfund)
City	City of Seattle
COC	chain of custody
cPAH	carcinogenic polycyclic aromatic hydrocarbon
Cr	chromium
Cu	copper
DOF	Dalton, Olmsted & Fuglevand, Inc.
EAA	early action area
ECD	electron capture detection
Ecology	Washington State Department of Ecology
EPA	US Environmental Protection Agency
FC	field coordinator
FID	flame ionization detection
GC	gas chromatography
HCID	hydrocarbon identification
HPAH	high-molecular-weight polycyclic aromatic hydrocarbon
ICP	inductively coupled plasma
ICS	interference check sample
ICSA	interference check sample Solution A

Acronym	Definition
ICSAB	interference check sample Solution AB
ID	identification
J	estimated concentration
LCS	laboratory control sample
LDW	Lower Duwamish Waterway
LDWG	Lower Duwamish Waterway Group
LPAH	low-molecular weight polycyclic aromatic hydrocarbon
MLLW	mean lower low water
MS	mass spectrometry
MS/MSD	matrix spike/matrix spike duplicate
NR	no recovery
NWTPH-Dx	Northwest total petroleum hydrocarbons – diesel and oil extractable
NWTPH-G	Northwest total petroleum hydrocarbons – gasoline
NWTPH-HCID	Northwest total petroleum hydrocarbons – hydrocarbon identification
PAH	polycyclic aromatic hydrocarbon
Pb	lead
PCB	polychlorinated biphenyl
PID	photoionization detector
Port	Port of Seattle
QAPP	quality assurance project plan
QC	quality control
RPD	relative percent difference
SDG	sample delivery group
SOW	statement of work
SVOC	semivolatile organic compound
T-117	Terminal 117
TOC	total organic carbon
TPH	total petroleum hydrocarbons
TPH-Dx	total petroleum hydrocarbons – quantified in the diesel and motor oil ranges
TPH-G	total petroleum hydrocarbons – gasoline
TPH-HCID	total petroleum hydrocarbons – hydrocarbon identification

Acronym	Definition
TSCA	Toxic Substances Control Act
U	not detected at reporting limit shown
UJ	not detected at estimated reporting limit shown
VOC	volatile organic compound
Windward	Windward Environmental LLC
Zn	zinc

1.0 Introduction

This data report presents the results of the soil investigation conducted in January 2006 at the Terminal 117 (T-117) Upland Area in accordance with the T-117 quality assurance project plan (QAPP) (Windward and DOF 2006). This document fulfills the data report section of Task 3 of the US Environmental Protection Agency (EPA) Administrative Settlement Agreement and Order on Consent (ASAOC) Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) No. 10-2006-0072 (EPA 2005).

In 2005, elevated concentrations of polychlorinated biphenyls (PCBs) were detected in Upland Area boreholes installed as part of the ongoing design for the T-117 Lower Duwamish Waterway (LDW) Early Action Area (EAA) (to be completed under a separate EPA settlement agreement). The installation of these boreholes was performed under an existing Administrative Order on Consent (Cohen 2003) signed by the City of Seattle (City), King County, the Port of Seattle (Port), and The Boeing Company (Boeing) – working together in the LDW as the Lower Duwamish Waterway Group (LDWG).

Based on the borehole results (Windward et al. 2005b, c, d), EPA, the Port, and the City have agreed that a broader investigation of the entire T-117 property is warranted to further evaluate the extent of PCB contamination, examine additional contaminants that may be of concern at the site (i.e., total petroleum hydrocarbons [TPH], polycyclic aromatic hydrocarbons [PAHs], metals [arsenic, copper, cadmium, chromium, lead and zinc], pesticides [previously detected], and phthalates), obtain data necessary to address and control these contaminants, as needed, and make sure that the potential for unacceptable human and/or ecological exposure and sediment recontamination is minimized. Although the Port and the City have agreed with EPA that broader investigations are need to characterize the entire property, only the Port has entered into the ASAOC with EPA to perform the additional upland characterization for T-117.

1.1 SITE DESCRIPTION

T-117 is located at 8700 Dallas Avenue S in Seattle, Washington (Figure 1-1). The T-117 Upland Area property encompasses approximately 3 acres, including a 50-ft-wide section of land adjacent to the shoreline, which is owned by the Port as successor in interest to the King County Commercial Waterway District No. 1. In 1999, the Port acquired the inland parcels between the shoreline parcel and Dallas Avenue S, which was previously owned by the Malarkey Asphalt Company. These properties were consolidated to form the present-day T-117 (see Figure 1-2). Adjacent properties include Boeing to the south, the South Park Marina to the north-northwest, and the Basin Oil Company to the west (west of Dallas Avenue S).

1.2 SAMPLE DESIGN

The primary purpose of this investigation is to provide additional characterization of the extent of soil contamination in the of T-117 Upland Area, including the shoreline bank area approximately above elevation +14 mean lower low water (MLLW), in order to:

- Enable the Port to evaluate the extent of impacted soil onsite and design an anticipated Upland Area removal action that will be protective of human health and the environment.
- Design and implement engineering, maintenance, and institutional control measures for long-term site management.
- Generate sufficient information about the lateral and vertical extent of Upland Area contamination to design and implement effective source control measures to effectively reduce any potential for recontamination of the lower bank, mudflat, and sediments.

Further analysis of contaminants may be undertaken, if necessary, for the design of the removal action. The results of this investigation may also be used to supplement existing data previously collected to develop the engineering evaluation/cost analysis for the T-117 EAA (Windward et al. 2005a). The methods and design of the investigation and subsequent anticipated Upland Area removal action will be coordinated with the proposed T-117 EAA non-time-critical removal action for the bank and sediment (to be addressed under a separate EPA settlement agreement).

1.3 REPORT REQUIREMENTS AND ORGANIZATION

As outlined in the statement of work (SOW), which is Appendix A of the ASAOC (EPA 2005), this data report details all information regarding investigation and field sampling activities, including the following:

- Introduction and purpose
- Summary of field sampling effort, including:
  - Description of sampling equipment and field methods
  - Sampling dates
  - Sampling descriptions and field observations (e.g., characteristics of vertical sample profiles, odors, coloration/staining)
  - Tabular summary of sampling locations with exact coordinates
  - Tabular summary of data by sampling location and interval
  - Figures showing sampling locations and intervals with data
- Maps that show the extent of surface and subsurface contamination, any subsurface structures (e.g., buried slabs, lenses of asphalt) encountered during

the investigation, and any subsurface utilities or utility corridors (e.g., septic fields, drain tiles, sumps)

- Deviations from the QAPP
- Summary description of sample handling and shipment and an appendix with chain-of-custody forms for all samples
- Summary of data validation report
- Application files with data tables, maps, GIS coordinates, and figures

In order to satisfy the requirements in the SOW, information gathered during the completion of past assessment and investigation activities at T-117 are also included in this data report. Results of these past activities were reported as follows:

- *Focused Feasibility Study, Malarkey Asphalt Site* (SECOR 1998)
- Results of sampling conducted at the Malarkey Asphalt Company site by Ecology & Environment in 1995 as transmitted to EPA and reported in the *Draft Removal Action Work Plan, Malarkey Asphalt Site, Seattle, Washington (EMCON 1996)*
- *Site Assessment UST Decommissioning, Malarkey Asphalt Company* (Hart Crowser 1992)
- Malarkey Asphalt site utility corridor soil sampling results (Onsite 1999)
- *PCB Removal/Containment Action, South Park Site* (Onsite 2000a)
- Underground storage tank removal site check/assessment report, South Park Site (Onsite 2000b)
- *Terminal 117 South Building "Planter" Areas: Soil Sampling Procedures and Results* (Onsite 2004)
- *T-117 Sediment, Soil, and Water Field Sampling, Cruise, and Data Report* (Windward et al. 2005b)
- *T-117 Upland Soil – June 2005 Field Sampling and Data Report* (Windward et al. 2005c)
- *T-117 Uplands Soil Sampling – August 2005 Data Memorandum* (Windward et al. 2005d)

This report is organized into sections that address field methods, laboratory methods, results, and references. The following appendices support the text:

- Appendix A – results tables (by analyte)
- Appendix B – data management
- Appendix C – data validation report

- Appendix D – analytical laboratory data
- Appendix E – field forms and notes
- Appendix F – boring logs
- Appendix G – chain-of-custody (COC) forms

2.0 Field Methods

2.1 Sample Collection

All field activities were performed under the direction of the field coordinator (FC) or other qualified personnel, with EPA oversight as appropriate. Sampling was accomplished by a joint operation of Windward Environmental LLC (Windward) and Dalton, Olmsted & Fuglevand, Inc. (DOF). Soil borings were accomplished under the direction of DOF with assistance from a Cascade Drilling, Inc.

Soil borings were conducted using a hollow-stem auger drill, penetrating up to a maximum depth of 17 ft, deployed from a drill rig. Where necessary, a concrete corer was used to remove the overlaying concrete/asphalt surfaces to clear the way for subsurface drilling using the hollow-stem auger. Detailed descriptions of soil boring sampling methods are found in Section 3.2.2.4 of the QAPP (Windward and DOF 2006).

2.2 Sample Processing

Processing of the soil samples occurred on the T-117 upland property. After homogenization, soil samples were placed in appropriate-sized, certified-clean, wide-mouth glass jars capped with Teflon®-lined lids (QAPP Table 3-7 (Windward and DOF 2006)). Visible organisms and debris were removed prior to distribution to sample containers; removed materials were noted in the field logbooks. Each container was sealed, labeled, and stored under conditions specified in Table 2-1 of the QAPP (Windward and DOF 2006).

A photoionization detector (PID) was used on all samples that were collected for hydrocarbon identification (HCID) analyses to detect and measure volatile hydrocarbons (typically the gasoline-range of hydrocarbons) while in the field. The PID was used to rapidly determine the presence of volatile hydrocarbons, prior too much exposure to air or handling of the sample, which could results in a loss of volatile hydrocarbons. A 10.6 eV lamp was used in the PID, which is appropriate for ionizing and detecting the presence of gasoline-range hydrocarbons.

2.3 Field Equipment Decontamination

To prevent cross-contamination of samples, all sample processing equipment (i.e., spoons, bowls, split-spoon sampler) that came in contact with soil samples were

decontaminated based on EPA guidelines (EPA 1999, 2002) between locations or samples using the following procedures:

1. Rinse with site or distilled water and wash with scrub brush until free of soil.
2. Wash with phosphate-free detergent.
3. Rinse with site or distilled water.
4. Rinse with distilled water.

Soil boring equipment was steam cleaned in a self-contained decontamination trailer between locations.

2.4 FIELD QUALITY ASSURANCE AND QUALITY CONTROL

2.4.1 Duplicate samples

Collected soil was homogenized and analyzed in duplicate to evaluate heterogeneity attributable to sample handling. A minimum of one field duplicate was submitted per 20 samples. All samples collected were documented in the field logbook. Table 2-1 lists the field duplicate sample identifications (IDs) and the corresponding sample IDs collected from the same location.

Table 2-1. Duplicate sample IDs

SAMPLE ID	DUPLICATE SAMPLE ID	ANALYSES
T117-A7-SB-02	T117-A7-SB-201	PCBs, PAHs, TPH-Dx, total solids
T117-A4-SB-03	T117-A4-SB-202	PCBs, PAHs, TPH-Dx, select metals,[a] total solids
T117-B2-SB-01	T117-B2-SB-203	TOC, total solids
T117-B2-SB-07	T117-B2-SB-204	PCBs, PAHs, TPH-Dx, total solids
T117-B6-SB-02	T117-B6-SB-205	PCBs, PAHs, TPH-Dx, total solids
T117-A10-SB-01	T117-A10-SB-206	PCBs, PAHs, TPH-Dx, TOC, total solids
T117-D10-SB-01	T117-D1-SB-207	TOC, total solids
T117-B7-SB-8.0-9.5	T117-B7-SB-208	PCBs, PAHs, TPH-Dx, select metals,[a] total solids
T117-D6-SB-9.5-11.0	T117-D6-SB-209	Metals,[b] total solids
T117-D6-SB-11.0-12.5	T117-D6-SB-210	PCBs, PAHs, TPH-Dx, total solids
T117-D11-SB-06	T117-D11-SB-211	PCBs, PAHs, TPH-Dx, metals,[b] total solids
T117-E1-SB-6.5-8.0	T117-E1-SB-212	PCBs, PAHs, TPH-Dx, phthalates, total solids
T117-C3-SB-03	T117-C3-SB-213	PCBs, PAHs, pesticides, total solids
T117-B8-SB-02	T117-B8-SB-214	PCBs, PAHs, TPH-HCID, select metals,[a] total solids
T117-D7-SB-3.0-4.5	T117-D7-SB-215	TPH-Dx, total solids

[a] Select metals included arsenic, lead, chromium and zinc.

[b] Metals included the four select metals (arsenic, lead, chromium, and zinc) plus cadmium and copper.

PCB – polychlorinated biphenyl

PAH – polycyclic aromatic hydrocarbon

TOC – total organic carbon

TPH-Dx – total petroleum hydrocarbons – quantified in the diesel and motor oil ranges
TPH-HCID – total petroleum hydrocarbons – hydrocarbon identification

2.4.2 Rinsate blanks

Rinsate blanks are used to assess whether and/or to what degree contamination is crossing from one sample to the next during sample collection or processing. A rinsate blank was created by rinsing the decontaminated sample processing equipment with deionized water. This water was collected in a clean jar and submitted to the laboratory for analysis. A minimum of one rinsate blank per 20 samples was submitted for chemical analysis.

2.4.3 Trip blanks

Trip blanks are used to determine whether volatile contaminants are introduced to samples during holding, shipping, or storage prior to analysis. Trip blanks consisted of deionized water sealed in a volatile organic compound (VOC) sample container by the analytical laboratory. Trip blanks were transported from the laboratory to the field, remained in the cooler during sampling, and were returned to the laboratory unopened for total petroleum hydrocarbons – gasoline (TPH-G) analysis. One trip blank that contained samples for TPH-G analysis was included in the cooler delivered on January 18, 2002.

2.5 DISPOSAL OF UNUSED SAMPLE MATERIAL

Excess soil and any contaminated water (i.e., from equipment decontamination) that remained after the completion of sampling was stored in appropriate drums onsite. Drums were marked according to the contents, origin of materials, date of generation, address, and contact name. Materials were characterized and properly disposed of after completion of the sampling program. All disposable sampling materials and personal protective equipment used in sample processing, such as disposable coveralls, gloves, and paper towels, were placed in heavyweight garbage bags or other appropriate containers. Disposable supplies were removed from the site by sampling personnel and placed in a standard refuse container for disposal as solid waste.

Waste soils were disposed of appropriately at an approved landfill or incinerated, consistent with hazardous materials and Toxic Substances Control Act (TSCA) regulations. Decontamination water was also managed in accordance with hazardous materials and TSCA regulations as necessitated by the level of contamination.

2.6 SAMPLE IDENTIFICATION SCHEME

Each sampling location was assigned a unique alphanumeric ID number. The first four characters are T117 to designate the T-117 Upland Area followed by a letter (A, B, C, D, E, or F) and number combination to designate the area and location from which the sample was collected.

Individual sample IDs were further identified by the addition of "SB" to indicate that the type of sample was a soil boring. Sample IDs also included information on the sampling depth. Sample IDs for the eight boreholes that were sampled on a continuous basis (B-7, C-4, C-5, C-6, D-3, D-6, D-7, and E-1) included the depth range (at 1.5-ft intervals) up to the total depth of the borehole (e.g., 1.5 to 3 ft = 1.5-3.0, 3 to 4.5 ft = 3.0-4.5, 4.5 to 6 ft = 4.5-6.0). Thus, for example, a soil boring sample from location 117-B7 at a sampling depth interval of 3 to 4.5 ft was labeled T117-B7-SB-3.0-4.5.

Samples IDs for all other boreholes included characters that identify the depth interval of the soil collected (i.e., 01 = 0 to 1.5 ft, 02 = 2.5 to 4 ft, 03 = 5 to 6.5 ft, 04 = 7.5 to 9 ft, 05 = 10 to 11.5 ft, 06 = 12.5 to 14 ft, and 07=15 to 16.5 ft). For example, a soil boring sample from location T117-A1 at a depth of 0 to 2.5 ft was labeled T117-A1-SB-01.

Field quality control (QC) samples were assigned modified sample identifiers as described below:

- Field duplicates were blind and identified using sequential sample numbers starting with 201 (e.g., T117-A1-SB-201).
- Rinsate blanks were assigned an "RB" identifier (e.g., T117-A1-SB-RB).

2.7 SAMPLE DOCUMENTATION PROCEDURES

All field activities were recorded in a field logbook maintained by the FC (Appendix E). The field logbook provided sufficient data and observations to enable participants to reconstruct events that occurred during the sampling period. The field logbook included a description of all sampling activities, conferences associated with field sampling activities, as well as a record of sampling personnel. All modifications to the procedures and plans identified in this QAPP and the health and safety plan were documented in the field logbook and on protocol modification forms (Appendix E).

After sample collection, the following information was recorded on the boring log (Appendix F):

- Name of person logging sample
- Date and time of collection or logging
- Names of crew members
- Weather conditions
- Sample ID
- Sample depth
- Physical observations of soil, including the presence of foreign objects, color, presence of sheens, apparent grain size, moisture, plasticity, and odor
- Geologic stratigraphy and the presence of any water-bearing layers

- Sampler penetration depth
- Blow counts
- Standard penetration test results

2.8 CHAIN-OF-CUSTODY AND SAMPLE TRANSPORT PROCEDURES

COC forms were used to track sample custody (see Appendix G). All soil samples were placed in a cooler with ice and hand-delivered to Analytical Resources, Inc. (ARI), in Tukwila, Washington.

2.9 FIELD DEVIATIONS FROM THE QAPP

Field deviations from the QAPP included adding or moving boring locations, and increasing the number of sampling locations intended for continuous sampling. These field deviations did not affect data quality and are discussed below:

- Boring locations C-4, C-5, and C-6 were not identified in the final QAPP as locations selected for continuous sampling. Per EPA's request while providing oversight, continuous sampling was conducted at these locations.
- Sampling locations A-11 and A-12 were added per the request of EPA and the Washington State Department of Ecology (Ecology) during an oversight visit on January 19, 2006.
- Some sampling locations were moved off the target locations identified in the final QAPP due to the presence of immovable obstacles or overhead power lines. None of the locations were off by more than the allowable 10 ft as required in the QAPP. Table 2-2 identifies these locations.
- A trip blank was not included in the cooler that contained samples for TPH-G analysis on January 23, 2006.

Table 2-2. Deviations from target boring locations

Sampling Location	Distance from Target Location (ft)	Reason for Move
A-1	6.1	Too close to overhead power lines
A-5	7.4	Too close to overhead power lines
A-8	7.4	Too close to overhead power lines
A-10	5.7	Debris
B-6	5.5	Too close to sewer septic line
B-8	2.4	Too close to overhead power lines
D-3	2.7	Too close to ecology blocks
D-7	3.2	Concrete obstruction
E-3	7.5	Too close to overhead power lines
F-1	4.7	Too close to concrete curb
F-2	2.6	Too close to concrete curb
F-6	4.8	Too close to shelving in building
F-8	5.2	Too close to shelving in building

3.0 Laboratory Methods

ARI conducted chemical and physical testing for each sample. All borehole samples were analyzed for PCBs, PAHs, and TPH. Based on borehole locations, specified samples were analyzed for arsenic, copper, cadmium, chromium, lead, zinc, select pesticides, and phthalates. At the discretion of the FCs, select soil samples were analyzed for grain size. One sample from each borehole was analyzed for total organic carbon (TOC). The results of these analyses are discussed in Section 4.0.

3.1 Analytical Methods

The chemical and physical testing adhered to the most recent EPA analysis protocols and represent standard methods used for the analysis of these analytes in soil. Table 3-1 summarizes specific methods used to analyze the samples.

Table 3-1. Summary of analytical methods

ANALYSES	METHOD	REFERENCE
PCBs as Aroclors	GC/ECD	EPA 8082
Pesticides	GC/ECD	EPA 8081A
PAHs,[a] phthalates	GC/MS	EPA 8270D
Metals[b]	ICP-AES	EPA 6010B
TPH-HCID	GC/FID	NWTPH-HCID
TPH-G	GC/FID	NWTPH-G
TPH-Dx	GC/FID	NWTPH-D
Grain size	Sieve/hydrometer	ASTM D421/422
TOC	combustion	Plumb (1981)
Total solids	oven-dried	EPA 160.3

[a] Target PAHs include anthracene, pyrene, dibenzofuran, benzo(g,h,i)perylene, indeno(1,2,3-cd)pyrene, benzo(b)fluoranthene, fluoranthene, benzo(k)fluoranthene, acenaphthylene, chrysene, benzo(a)pyrene, dibenz(a,h)anthracene, benz(a)anthracene, acenaphthene, phenanthrene, fluorene, 1-methylnaphthalene, naphthalene, and 2-methylnaphthalene.

[b] Metals include arsenic, copper, cadmium, chromium, lead, and zinc.

AES – atomic emission spectrometry
ASTM – American Society for Testing and Materials
ECD – electron capture detection
FID – flame ionization detection
GC – gas chromatography
ICP – inductively coupled plasma
MS – mass spectrometry
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl
TOC – total organic carbon
TPH-Dx – total petroleum hydrocarbons – quantified in the diesel and motor oil ranges
TPH-G – total petroleum hydrocarbons – gasoline
TPD-HCID – total petroleum hydrocarbons – hydrocarbon identification

3.2 QUALITY ASSURANCE AND QUALITY CONTROL FOR CHEMICAL/PHYSICAL TESTING

Data quality objectives and laboratory QC procedures are discussed in Section 2.4 of the QAPP (Windward and DOF 2006). Analytical results were validated by EcoChem, Inc. The results of the validation are discussed and summarized in Section 4.4 are the data validation reports are presented in Appendix F. The results presented in this report are of good quality and should be considered acceptable for all project uses.

3.3 LABORATORY DEVIATIONS FROM THE QAPP

There were no laboratory deviations from the methods and procedures described in the QAPP (Windward and DOF 2006), with the following exception. The QAPP incorrectly lists ASTM D854 as the test method for grain size. ASTM D421/422 is the correct method reference for grain size analysis in soil samples.

4.0 Analytical Results

Results of the soil physical and chemistry analyses are presented below. These results have undergone data validation, as described in detail in Appendix C. The results presented in this report are of good quality and should be considered acceptable for all project uses. Raw laboratory data can be found in Appendix D.

Significant figure rules were applied when summing for totals (i.e., summing of Aroclors for total PCBs). A detailed discussion of the hierarchical approach used in averaging laboratory replicates, calculating totals, and application of significant figures is presented in Appendix B.

4.1 Sampling Locations and Sample Characteristics

The sampling locations are presented on Figure 4-1, and descriptions are presented in Table 4-1. All coordinates are reported in Washington State Plane North (NAD 83, US survey feet).

Table 4-1. Soil sampling locations and analyses

Location	X	Y	Date	No. of Sample Intervals	Total Depth (ft)	Analyses[a]
Area A						
A-1	1275110	195731	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-2	1275132	195701	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-3	1275175	195698	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-4	1275240	195697	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH, select metals
A-5	1275093	195698	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-6	1275107	195656	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH, select metals
A-7	1275160	195666	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-8	1275067	195658	16-Jan-06	3	6.5	PCB, TPH-Dx, PAH
A-9	1275142	195623	16-Jan-06	3	6.0	PCB, TPH-Dx, PAH
A-10	1275121	195771	17-Jan-06	1	1.5	PCB, TPH-Dx, PAH
A-11	1275115	195767	24-Jan-06	1	0.5	PCB, archive[b]
A-12	1275112	195773	24-Jan-06	2	1.5	PCB
Area B						
B-1	1275284	195664	17-Jan-06	4[c]	9.0[c]	PCB, TPH-Dx, PAH, select metals
B-2	1275339	195631	17-Jan-06	7	16.5	PCB, TPH-Dx, PAH
B-3	1275336	195600	17-Jan-06	3	7.0	PCB, TPH-Dx, PAH
B-4	1275345	195570	17-Jan-06	4[c]	9.0[c]	PCB, TPH-Dx, PAH
B-5	1275313	195557	17-Jan-06	3	6.5	PCB, TPH-Dx, PAH
B-6	1275241	195580	17-Jan-06	3	6.5	PCB, TPH-Dx, PAH
B-7[d]	1275265	195541	18-Jan-06	10	15.5	PCB, TPH-HCID, TPH-Dx, PAH, select metals

LOCATION	X	Y	DATE	NO. OF SAMPLE INTERVALS	TOTAL DEPTH (ft)	ANALYSES[a]
B-8	1275215	195544	23-Jan-06	3	6.5	PCB, TPH-HCID, TPH-Dx, PAH, select metals
Area C						
C-1	1275453	195502	20-Jan-06	6	14.0	PCB, TPH-Dx, PAH
C-2	1275475	195468	20-Jan-06	6	14.0	PCB, TPH-Dx, PAH
C-3	1275409	195520	19-Jan-06	3	9.0	PCB, TPH-Dx, PAH, pesticides, metals
C-4[d]	1275484	195394	20-Jan-06	7	14.0	PCB, TPH-Dx, PAH, pesticides, metals
C-5[d]	1275487	195358	20-Jan-06	6[e]	14.0	PCB, TPH-Dx, PAH, phthalates, select metals
C-6[d]	1275438	195424	20-Jan-06	7	14.0	PCB, TPH-Dx, PAH, select metals
C-7	1275460	195391	19-Jan-06	5	14.0	PCB, TPH-Dx, PAH, select metals
C-8	1275473	195354	19-Jan-06	3	6.5	PCB, TPH-Dx, PAH, metals
Area D						
D-1	1275344	195508	18-Jan-06	3	6.5	PCB, TPH-Dx, PAH
D-2	1275389	195440	18-Jan-06	5[e]	16.5	PCB, TPH-Dx, PAH
D-3[d]	1275434	195386	18-Jan-06	8	13.5	PCB, TPH-Dx, PAH, metals
D-4	1275301	195518	18-Jan-06	3	6.5	PCB, TPH-HCID, PAH, phthalates, select metals
D-5	1275374	195411	18-Jan-06	4[c]	9.0[c]	PCB, TPH-Dx, PAH
D-6[d]	1275391	195367	18-Jan-06	9	14.0	PCB, TPH-Dx, PAH, metals
D-7[d]	1275415	195331	24-Jan-06	8[e]	13.5	PCB, TPH-Dx, PAH, select metals
D-8	1275278	195476	18-Jan-06	3	6.5	PCB, TPH-HCID, TPH-G, PAH, select metals
D-9	1275293	195423	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH, select metals
D-10	1275319	195371	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH, metals
D-11	1275364	195331	19-Jan-06	7[c]	16.5[c]	PCB, TPH-Dx, PAH, metals
Area E						
E-1[d]	1275496	195332	19-Jan-06	10[f]	14.0	PCB, TPH-Dx, PAH, phthalates, metals
E-2	1275455	195312	19-Jan-06	5[f]	9.0	PCB, TPH-Dx, PAH, select metals
E-3	1275379	195281	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH, select metals
Area F						
F-1	1275534	195310	24-Jan-06	4	9.0	PCB, TPH-Dx, PAH
F-2	1275558	195261	24-Jan-06	5[c]	11.5[c]	PCB, TPH-Dx, PAH
F-3	1275510	195310	19-Jan-06	4	9.0	PCB, TPH-Dx, PAH, metals
F-4	1275535	195266	24-Jan-06	3	6.5	PCB, TPH-Dx, PAH
F-5	1275560	195210	24-Jan-06	4[e]	11.5[c]	PCB, TPH-Dx, PAH
F-6	1275484	195249	23-Jan-06	4[c]	9.0[c]	PCB, TPH-Dx, PAH
F-7	1275498	195185	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH
F-8	1275423	195241	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH
F-9	1275435	195186	23-Jan-06	3	6.5	PCB, TPH-Dx, PAH

[a] TOC was analyzed in one sample per location; samples were selected for grain size analysis at the discretion of the field coordinator; all samples were analyzed for total solids. Select metals included arsenic, chromium, lead, and zinc. Metals included select metals (arsenic, chromium, lead, and zinc) plus copper and cadmium.

[b] An additional sample from A-11 was collected at a depth interval of 0.5 to 1.5 ft and archived.

[c] Additional deeper samples were collected at these locations at the FC's discretion based on observations (i.e., non-native material, odor, or visible presence of contaminant).

[d] Continuous boring.

[e] There was no recovery for samples C5-SB-3.5-5.0, D2-SB-03, D2-SB-04, D7-SB-1.5-3.0, or F5-SB-04.

[f] Sample intervals E1-SB-5.0-6.5 and E2-SB-04 were split (into A and B) based on stratigraphy.

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

TPH-Dx – total petroleum hydrocarbons – quantified in the diesel and motor oil ranges

TPH-HCID – total petroleum hydrocarbons – hydrocarbon identification

4.2 PHYSICAL CHARACTERISTICS

All soil samples were analyzed for percent solids, and one sample per boring was analyzed for TOC. The shallowest soil sample with sufficient volume from each borehole was analyzed for TOC. Fifty-four samples were analyzed for TOC, of which 33 were collected from the top-most sample from each boring. Twenty-seven samples had TOC > 1%, which generally corresponded with elevated TPH concentrations. At the discretion of the FCs, select soil samples were analyzed for grain size based on the observed representation of encountered soil stratigraphy. Fifteen samples, representing nine locations, were analyzed for grain size. Most of these samples consisted of more than 90% fine material (< 450 microns, clays, slits, and fine sand). All results are presented in Appendix A, and the raw laboratory data are included as Appendix D.

4.3 CHEMISTRY RESULTS

All borehole samples were analyzed for PCBs, PAHs, and TPH. Certain samples were analyzed for arsenic, cadmium, chromium, copper, lead, and zinc at locations where elevated concentrations of waste oil are known or suspected to exist based on historical operations, site surface drainage areas, and prior investigation results. In addition, samples were collected from the base of the 1999 removal action area at C-3 and C-4 and analyzed for select pesticides, and soil samples from boring locations (C-5, D-4, and E-1) were analyzed for phthalates. The rationale for the selected analytes and sampling depths is discussed in detail in the QAPP (Windward and DOF 2006). Analytical results are summarized in tables presented by area. All results are presented in Appendix A, and the raw laboratory data is included as Appendix D.

As required in the SOW, figures are provided for each area to help illustrate the results of this and past data investigations at the T-117 Upland Area property. As detailed in the QAPP, most of the boring locations were sampled at standard intervals to specified depths (i.e., 0 to 1.5 ft, 2.5 to 4 ft, 5 to 6.5 ft). However, several boring locations were sampled at continuous intervals. For illustration purposes, the figures include interval maps for three intervals identified above plus > 7 ft. In presenting the

sampling results from the continuous borings on the interval figures, the closest sampling interval with the greatest overlap with the standard interval being present was chosen. In instances where two continuous sampling intervals overlapped one standard interval (e.g., continuous sampling intervals of 1.5 to 3 ft and 3 ft to 4.5 ft overlapped the standard interval of 2.5 to 4 ft), the highest single concentration from the two continuous sampling intervals was assigned to the 2.5-to-4-ft interval on the figure. All pertinent analytical data, whether continuous or not, are presented in the corresponding data tables provided on the figures.

4.3.1 Area A

Soil samples from locations A-1 through A-10 were analyzed for PCBs, PAHs, and total petroleum hydrocarbons – quantified in the diesel and motor oil ranges (TPH-Dx). Soil samples from locations A-4 and A-6 were also analyzed for select metals (arsenic, chromium, lead, and zinc). Soil samples from locations A-11 and A-12 were only analyzed for PCBs. Table 4-2 summarizes the PCB, PAH, TPH, and metals results for Area A.

Figures 4-2 and 4-3 present the total PCB and total TPH results, respectively, for Area A. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison. These figures help to demonstrate the minimal relative impact in Area A as compared to the central portion of the investigation area. The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

With the exception of locations A-3 and A-6, soil samples from the shallowest depth (top 2 ft) in Area A contained PCBs at concentrations ranging from 0.088 to 3.6 mg/kg. Concentrations at A-3 and A-6 were 9.0 and 10 mg/kg, respectively. Deeper soils (> 2 ft) from all Area A locations with the exception of A-5 contained PCBs at concentrations ranging from non-detect to 0.25 mg/kg. At A-5, a PCB concentration of 2.5 mg/kg was found at 2.5 to 4 ft but decreased to a non-detected value at the next deepest interval. Detected PCB concentrations in soil samples obtained from the neighboring marina yard ranged from 0.075 to 3.2 mg/kg.

Table 4-2. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area A

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Chromium	Lead	Zinc
A-1	T117-A1-SB-01	0.5 – 2.0	2.6	0.081 J	0.057 U	98	370	470	na	na	na	na
	T117-A1-SB-02	2.5 – 4.0	0.20	0.064 U	0.058 U	5.2	23	28	na	na	na	na
	T117-A1-SB-03	5.0 – 6.5	0.033 U	0.063 U	0.057 U	5.3 U	10 U	10 U	na	na	na	na
A-2	T117-A2-SB-01	0.5 – 2.0	0.72	0.065 U	0.059 U	11	94	105	na	na	na	na
	T117-A2-SB-02	2.5 – 4.0	0.081 J	0.066 U	0.060 U	5.8 U	22	22	na	na	na	na
	T117-A2-SB-03	5.0 – 6.5	0.033 U	0.064 U	0.058 U	5.1 U	10 U	10 U	na	na	na	na
A-3	T117-A3-SB-01	0.5 – 2.0	9.0	0.065 U	0.059 U	16	55	71	na	na	na	na
	T117-A3-SB-02	2.5 – 4.0	0.25	0.063 U	0.057 U	7.4	33	40	na	na	na	na
	T117-A3-SB-03	5.0 – 6.5	0.049	0.066 U	0.060 U	35	150	190	na	na	na	na
A-4	T117-A4-SB-01	0.5 – 2.0	3.6	0.064 U	0.058 U	360	870 J	1,230 J	10 U	20	9	62
	T117-A4-SB-02	2.5 – 4.0	0.064	0.065 U	0.059 U	30	98 J	128 J	10	23.9	38	65.8
	T117-A4-SB-03	5.0 – 6.5	0.14 J	0.13	0.12	200	930 J	1,130 J	8	14	28	45.3
	T117-A4-SB-202[a]	5.0 – 6.5	0.082 J	0.063 U	0.057 U	170	790 J	960 J	8	15.4	31	51.1
A-5	T117-A5-SB-01	0.5 – 2.0	1.4	0.065 U	0.059 U	12	74	86	na	na	na	na
	T117-A5-SB-02	2.5 – 4.0	2.1	0.070 J	0.059 U	300	1,300	1,600	na	na	na	na
	T117-A5-SB-03	5.0 – 6.5	0.032 U	0.066 U	0.060 U	5.2 U	18	18	na	na	na	na
A-6	T117-A6-SB-01	0.5 – 2.0	10	0.97 J	0.15 J	57	270	330	10 U	23	39	62
	T117-A6-SB-02	2.5 – 4.0	0.15	1.71 J	0.21	10	46	56	8	28.5	22	67.1
	T117-A6-SB-03	5.0 – 6.5	0.033 U	0.064 U	0.058 U	5.0 U	18	18	5 U	11.1	2	22.2
A-7	T117-A7-SB-01	0.5 – 2.0	0.45	0.064 UJ	0.058 U	8.7	72	81	na	na	na	na
	T117-A7-SB-02	2.5 – 4.0	0.030 J	0.066 UJ	0.060 U	14	55	69	na	na	na	na
	T117-A7-SB-201[a]	2.5 – 4.0	0.024 J	0.066 UJ	0.060 U	16	60	76	na	na	na	na
	T117-A7-SB-03	5.0 – 6.5	0.032 U	0.064 UJ	0.058 U	5.2 U	10 U	10 U	na	na	na	na
A-8	T117-A8-SB-01	0.5 – 2.0	2.0	0.062 U	0.056 U	22	160	180	na	na	na	na
	T117-A8-SB-02	2.5 – 4.0	0.049	0.064 U	0.058 U	8.0	13	21	na	na	na	na
	T117-A8-SB-03	5.0 – 6.5	0.032 U	0.065 U	0.059 U	5.2 U	10 U	10 U	na	na	na	na
A-9	T117-A9-SB-01	0.5 – 2.0	3.6	0.68 J	0.093 J	54	330	380	na	na	na	na
	T117-A9-SB-02	2.5 – 4.0	0.028 J	0.064 UJ	0.058 U	6.7 U	14 U	14 U	na	na	na	na
	T117-A9-SB-03	4.5 – 6.0	0.060	0.066 UJ	0.060 U	6.2 U	12 U	12 U	na	na	na	na

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Chromium	Lead	Zinc
A-10	T117-A10-SB-01	0.0 – 1.5	0.088	0.066 U	0.060 U	94	100	190	na	na	na	na
	T117-A10-SB-206[a]	0.0 – 1.5	0.075	0.066 U	0.060 U	66	72	138	na	na	na	na
A-11	T117-A11-SB-0.0-0.5	0.0 – 0.5	0.22 J	na	na	na	na	na	na	na	na	na
A-12	T117-A12-SB-0.0-0.5	0.0 – 0.5	3.2 J	na	na	na	na	na	na	na	na	na
	T117-A12-SB-0.5-1.5	0.5 – 1.5	0.59	na	na	na	na	na	na	na	na	na

[a] This sample is a field duplicate of the sample in the row directly above.

na – not analyzed

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

TPH concentrations were less than 1,000 mg/kg at all locations, except for A-4 and A-5, where the TPH concentrations ranged between 1,130 and 1,600 mg/kg. Total TPH concentrations consisted predominantly of motor oil.

PAHs were only detected in six samples from locations A-1, A-4, A-5, A-6, and A-9. Total PAH concentrations were below 1.0 mg/kg, with the exception of sample T117-A6-SB-02, which had a total PAH concentration of 1.71 J mg/kg. Total cPAH concentrations were all less than 1.0 mg/kg.

Arsenic was detected in four of the seven samples at concentrations ranging from 8 to 10 mg/kg. Chromium concentrations ranged from 11.1 to 28.5 mg/kg. Lead concentrations ranged from 2 to 39 mg/kg. Zinc concentrations ranged from 22.2 to 67.1 mg/kg. The concentration ranges of metals present in Area A are typical of the levels identified during investigations in the T-117 Upland Area. For all analytes, the highest concentrations were generally limited to the shallowest depths below ground surface (uppermost 2 ft) and decreased with depth.

4.3.2 Area B

All soil samples in Area B were analyzed for PCBs, PAHs, and TPH. Soil samples from locations B-1, B-7, and B-8 were analyzed for select metals (arsenic, chromium, lead, and zinc). Soil samples from locations B-7 and B-8 were also analyzed for TPH-HCID. Table 4-3 summarizes the PCB, PAH, TPH, and metals results for Area B.

Figures 4-4 and 4-5 present the total PCB and total TPH results, respectively, for Area B. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison. The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

With a few exceptions, Area B detected PCB concentrations fell within two discernable concentration ranges: non-detect to 15 mg/kg and a higher range from 110 to 9,200 mg/kg. The PCB concentrations greater than 10 mg/kg were typically limited to the uppermost 4 ft of soil, with the exception of soils sampled at location B-8, where a concentration of 83 mg/kg was detected at a depth interval of 5 to 6.5 ft.

Detected TPH concentrations ranged from 11 to 15,400 mg/kg. TPH concentrations above 4,000 mg/kg were limited to the uppermost 2 ft of soil at two stations, B-1 and B-3. TPH concentrations generally decreased with depth, except at location B-2, where TPH decreased between 5 and 9 ft and then slightly increased between 10 and 14 ft before decreasing at 15 ft. Total TPH concentrations consisted predominantly of motor oil, except at location B-8, where diesel-range hydrocarbons concentrations were higher than usual. At locations B-7 and B-8, where HCID screening analysis occurred prior to quantifying TPH, six samples were subsequently analyzed using method TPH-Dx (see Table 4-3), and one sample was analyzed using method TPH-G. Gasoline was detected at B-8 at a concentration of 70 mg/kg.

Total PAH concentrations typically ranged from non-detect to < 1.0 mg/kg. Total PAH concentrations greater than 1.0 mg/kg were detected at locations B-1, B-2, B-3, and B-4 and were generally limited to the to the top 6.5 ft of soil, except at B-2, where a total PAH concentration of 6.1 mg/kg was detected at 14 ft. Concentrations of cPAHs were below 1.0 mg/kg in all samples, except in the surface sample from B-1 and the two samples between 2.5 and 6.5 ft at B-4.

Arsenic was detected in 9 of the 19 samples at concentrations ranging from 5 to 14 mg/kg. Chromium concentrations ranged from 9.4 to 28.5 mg/kg. Lead concentrations ranged from 2 to 50 mg/kg. Zinc concentrations ranged from 19.6 to 97 mg/kg. The concentration ranges of metals present in Area B are typical of the levels identified during investigations in the T-117 Upland Area. For all analytes, the highest concentrations were generally limited to the uppermost 4 ft and decreased with depth.

Table 4-3. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area B

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Chromium	Lead	Zinc
B-1	T117-B1-SB-01	1.0 – 2.5	0.36	21.8	1.7	6,000	9,400	15,400	8	28	49	85.3
	T117-B1-SB-02	2.5 – 4.0	0.040 J	0.320 J	0.067 J	210	520	730	7	28.5	32	58.4
	T117-B1-SB-03	5.0 – 6.5	0.033 U	0.063 U	0.057 U	6.8	54	61	5	14.9	8	29.4
	T117-B1-SB-04	7.5 – 9.0	0.033 U	0.063 U	0.057 U	19	55	74	6 U	14.8	7	29.6
B-2	T117-B2-SB-01	0.5 – 2.0	11	0.92 J	0.13 J	1,300	7,700	9,000	na	na	na	na
	T117-B2-SB-02	2.5 – 4.0	0.16	1.22 J	0.11 J	860	4,600	5,500	na	na	na	na
	T117-B2-SB-03	5.0 – 6.5	0.11	0.147 J	0.059 J	47	190	240	na	na	na	na
	T117-B2-SB-04	7.5 – 9.0	0.36	0.064 U	0.058 U	17	130	150	na	na	na	na
	T117-B2-SB-05	10.0 – 11.5	0.79	0.96 J	0.094 J	530	860	1,390	na	na	na	na
	T117-B2-SB-06	12.5 – 14.0	1.15	6.1 J	0.47 J	640	960	1,600	na	na	na	na
	T117-B2-SB-07	15.0 – 16.5	0.033 U	0.064 U	0.058 U	12	23	35	na	na	na	na
	T117-B2-SB-204[a]	15.0 – 16.5	0.021 J	0.064 U	0.058 U	16	23	39	na	na	na	na
B-3	T117-B3-SB-01	0.5 – 2.0	6.8	2.14 J	0.40 J	3,800	10,000	14,000	na	na	na	na
	T117-B3-SB-02	2.5 – 4.0	8.4	0.207 J	0.12	510	2,700	3,200	na	na	na	na
	T117-B3-SB-03	5.5 – 7.0	0.026 J	0.065 U	0.059 U	6.5 U	14	14	na	na	na	na
B-4	T117-B4-SB-01	0.5 – 2.0	830	0.69 J	0.13 J	880	3,200	4,100	na	na	na	na
	T117-B4-SB-02	2.5 – 4.0	15	108 J	24	560	2,500	3,100	na	na	na	na
	T117-B4-SB-03	5.0 – 6.5	1.9	12.4 J	2.4 J	190	1,300	1,500	na	na	na	na
	T117-B4-SB-04	7.5 – 9.0	0.16	0.066 U	0.060 U	6.9 U	17	17	na	na	na	na
B-5	T117-B5-SB-01	0.5 – 2.0	0.028 J	0.064 U	0.058 U	66	240	310	na	na	na	na
	T117-B5-SB-02	2.5 – 4.0	0.021 J	0.066 U	0.060 U	5.2 U	11	11	na	na	na	na
	T117-B5-SB-03	5.0 – 6.5	0.032 U	0.064 U	0.058 U	6.0 U	12 U	12 U	na	na	na	na

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Chromium	Lead	Zinc
B-6	T117-B6-SB-01	0.5 – 2.0	220	0.066 U	0.060 U	440 J	760 J	1,200 J	na	na	na	na
	T117-B6-SB-02	2.5 – 4.0	13	0.064 U	0.058 U	120	1,000	1,100	na	na	na	na
	T117-B6-SB-205[a]	2.5 – 4.0	13	0.064 U	0.058 U	150	1,000	1,200	na	na	na	na
	T117-B6-SB-03	5.0 – 6.5	3.6	0.065 U	0.059 U	29	220	250	na	na	na	na
B-7	T117-B7-SB-0.5-2.0	0.5 – 2.0	110	0.423 J	0.075 J	110 J	310 J	420 J	5	14	13	41.4
	T117-B7-SB-2.0-3.5	2.0 – 3.5	110	0.181 J	0.058 J	110 J	190 J	300 J	5 U	13.1	8	37
	T117-B7-SB-3.5-5.0	3.5 – 5.0	400	0.042 J	0.058 J	110 J	150 J	260 J	5 U	11.8	16	35.8
	T117-B7-SB-5.0-6.5	5.0 – 6.5	4.2	0.066 U	0.060 U	nd[b]	nd[b]	nd[b]	5	10.2	10	26.1
	T117-B7-SB-6.5-8.0	6.5 – 8.0	0.86	0.063 U	0.057 U	nd[b]	nd[b]	nd[b]	5 U	9.4	2	19.6
	T117-B7-SB-8.0-9.5	8.0 – 9.5	0.10	0.064 U	0.058 U	nd[b]	nd[b]	nd[b]	8	16.4	4	32.9
	T117-B7-SB-208[a]	8.0 – 9.5	0.096	0.065 U	0.059 U	6.9 U	14 U	14 U	12	21.8	6	41.7
	T117-B7-SB-9.5-11.0	9.5 – 10.0	0.22	0.064 U	0.058 U	nd[b]	nd[b]	nd[b]	13	23.7	7	51.9
	T117-B7-SB-11.0-12.5	10.0 – 12.5	0.83	0.064 U	0.058 U	nd[b]	nd[b]	nd[b]	14	22	6	39.5
	T117-B7-SB-12.5-14.0	12.5 – 14.0	1.0	0.066 U	0.060 U	nd[b]	nd[b]	nd[b]	6 U	16.5	3	24.4
	T117-B7-SB-14.0-15.5	14.0 – 15.5	0.049	0.065 U	0.059 U	nd[b]	nd[b]	nd[b]	6 U	15.5	3	24.4
B-8	T117-B8-SB-01	0.5 – 1.0	9,200	0.32 J	0.11	4,300 J	3,000 J	7,300 J	10 UJ	20	50 J	97
	T117-B8-SB-02	2.5 – 4.0	1,500	0.130 J	0.071 J	490 J	640 J	1,130 J	6 UJ	13.6	12 J	30
	T117-B8-SB-214[a]	2.5 – 4.0	1,800	0.063 U	0.057 U	680 J	690 J	1,370 J	5 UJ	15.8	15 J	42.7
	T117-B8-SB-03	5.0 – 6.5	83	0.064 U	0.058 U	na	na	nd[b]	6 UJ	12	5 J	25.1

[a] This sample is a field duplicate of the sample in the row directly above.

[b] Sample analyzed for TPH-HCID, nothing was detected, so no further analysis was required as discussed in the QAPP.

na – not analyzed

nd – not detected

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

4.3.3 Area C

All Area C samples were analyzed for PCBs, PAHs, and TPH-Dx. Samples from locations C-5 through C-7 were analyzed for select metals (arsenic, chromium, lead, and zinc). Samples from locations C-3, C-4, and C-8 were analyzed for the four select metals as well as for copper and cadmium. Soil from locations C-3 and C-4 were analyzed for pesticides. Soil samples from location C-5 were also analyzed for phthalates.

Table 4-4 summarizes the PCB, PAH, TPH, and metals results; and Table 4-5 summarizes the phthalate and pesticide results for Area C. Samples from shallow intervals (0 to 2 ft) were only obtained from three locations (C-1, C-2, C-8) because all other locations were within the backfill of the 1999 removal action area.

Figures 4-6 and 4-7 present the total PCB and total TPH results, respectively, for Area C. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison. The information shaded in gray on the data tables represents analytical information collected during previous investigations from soil that has since been removed from the property. These data are included to illustrate the extent of sampling that has been completed in Area C, even though those results are not longer representative of current conditions. All sampling locations are presented on Figure 4-1 for cross reference. The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

Detected PCB concentrations in Area C ranged from 0.044 to 400 mg/kg. At locations C-1, C-2, andC-8, which are on the edge of the 1999 removal action area, PCB concentrations greater than 1.0 mg/kg were detected between 0 and 6.5 ft. The greatest PCB concentration, 400 mg/kg, was at the 2.5- to 4-ft interval at location C-1. At locations within the 1999 removal action area the highest PCB concentrations were generally detected just below the quarry spalls in the 3.5- to 5-ft samples. PCB concentrations greater than 50 mg/kg were detected as deep 8 ft at location C-6.

Detected total TPH concentrations ranged from 15 to 31,000 mg/kg. TPH concentrations above 10,000 mg/kg were detected at moderate depths (2.5 to 8 ft) at locations C-1 and C-6; at location C-8, a concentration of 12,000 mg/kg was detected in the uppermost 2 ft of soil just below the concrete slab. TPH consisted predominantly of motor oil, except from 2.5 to 4 ft at C-1, 3.5 to 5 ft at C-3, and 6.5 to 8 ft at C4, where diesel-range hydrocarbon concentrations were predominant.

Total PAH concentrations generally ranged from 0.078 to 14.6 mg/kg. However, the highest total PAH concentration (2,190 mg/kg) was detected at location C-4 at a depth of between 3.5 and 5 ft. Total cPAHs at location C-4 were also relatively high at 180 mg/kg. The only other cPAH concentration above 1.0 mg/kg was 1.7 mg/kg at the 2.5-to-4-ft depth at location C-1. Phthalates and pesticides were not detected in any of the Area C samples.

Arsenic was detected in 23 of the 31 samples at concentrations ranging from 6 to 10 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, of 55 mg/kg in the 0.5-to-2-ft sampling depth at location C-8. Chromium concentrations ranged from 14.6 to 41.5 mg/kg. Lead concentrations generally ranged from 2 to 37 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 58 and 215 mg/kg in the 3.5-to-6.5-ft sampling depth at locations C-4, C-6, C-7 and in the 0.5-to-4-ft sampling depth at location C-8.

Zinc concentrations generally ranged from 29.1 to 92.4 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 105 and 265 mg/kg in the 3.5-to-5-ft sampling depth at locations C-4, C-6, C-7 and in the 0.5-to-4-ft sampling depth at location C-8. Cadmium was detected in 3 of the 13 samples at concentration ranging from 0.6 to1.3 mg/kg in the 3.5-to-5-ft sampling depth at location C-4 and in the 0.5-to-4-ft sampling depth at location C-8. Copper concentrations generally ranged from 20 to 31.5 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 52.8 and 99.1 mg/kg in the 3.5-to-6.5-ft sampling depth at location C-4 and in the 0.5-to-4-ft sampling depth at location C-8. For all analytes, the highest concentrations were generally detected at depths of between 2.5 and 9.5 ft and decreased with depth.

Table 4-4. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area C

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
C-1	T117-C1-SB-01	0.0 – 1.5	4.2	0.058 U	0.052 U	17	130	150	na	na	na	na	na	na
	T117-C1-SB-02	2.5 – 4.0	400	14.6	1.7	21,000	10,000	31,000	na	na	na	na	na	na
	T117-C1-SB-03	5.0 – 6.5	2.4	0.063 U	0.057 U	7,600	18,000	26,000	na	na	na	na	na	na
	T117-C1-SB-04	7.5 – 9.0	0.32	0.063 U	0.057 U	27	51	78	na	na	na	na	na	na
	T117-C1-SB-05	10.0 – 11.5	0.70	0.063 U	0.057 U	55	120	180	na	na	na	na	na	na
	T117-C1-SB-06	12.5 – 14.0	0.033 U	0.064 U	0.058 U	6.8 U	24	24	na	na	na	na	na	na
C-2	T117-C2-SB-01	0.0 – 1.5	6.8	0.064 U	0.058 U	92	940	1,030	na	na	na	na	na	na
	T117-C2-SB-02	2.5 – 4.0	3.4	1.09	0.14	48	240	290	na	na	na	na	na	na
	T117-C2-SB-03	5.0 – 6.5	14	0.062 U	0.056 U	1,100	4,700	5,800	na	na	na	na	na	na
	T117-C2-SB-04	7.5 – 9.0	0.13	0.064 U	0.058 U	130	240	370	na	na	na	na	na	na
	T117-C2-SB-05	10.0 – 11.5	0.032 U	0.065 U	0.059 U	20	39	59	na	na	na	na	na	na
	T117-C2-SB-06	12.5 – 14.0	0.020 J	0.064 U	0.058 U	8.4	32	40	na	na	na	na	na	na
C-3	T117-C3-SB-01	3.5 – 5.0	1.6	6.6 J	0.61 J	78	61	139	9 J	0.2 U	17.7	27.5 J	8 J	42.6 J
	T117-C3-SB-02	5.0 – 6.5	0.40	0.066 U	0.060 U	6.9 U	14 U	14 U	7 J	0.3 U	17	25.5 J	5 J	35.0 J
	T117-C3-SB-03	7.5 – 9.0	0.14	0.064 U	0.058 U	9.6	23	33	10 J	0.3 U	21.5	30.2 J	6 J	47.6 J
	T117-C3-SB-213[a]	7.5 – 9.0	0.062	0.064 U	0.058 U	na	na	na	na	na	na	na	na	na
C-4	T117-C4-SB-3.5-5.0	3.5 – 5.0	5.1	2,190	180	1,800	5,000	6,800	10 U	0.6	25	61	215	127
	T117-C4-SB-5.0-6.5	5.0 – 6.5	26	9.8 J	0.66	1,800	5,900	7,700	6	0.2 U	17.5	52.8	36	54.4
	T117-C4-SB-6.5-8.0	6.5 – 8.0	0.054	1.98 J	0.092 J	560	560 J	1,120 J	9	0.3 U	18	29.3	6	36.9
	T117-C4-SB-8.0-9.5	8.0 – 9.5	0.072	0.064 U	0.058 U	21	64	85	8	0.3 U	22.2	30.8	6	45.3
	T117-C4-SB-9.5-11.0	9.5 – 11.0	0.057	0.066 U	0.060 U	7.2 U	14 U	14 U	7 U	0.3 U	16.9	27.6	5	29.3
	T117-C4-SB-11.0-12.5	11.0 – 12.5	0.052	0.064 U	0.058 U	8.6	21	30	8	0.3 U	18	29.2	4	34.8
	T117-C4-SB-12.5-14.0	12.5 – 14.0	0.82	0.266 J	0.060 J	16	40	56	7	0.3 U	15.7	20	3	29.1
C-5[b]	T117-C5-SB-5.0-6.5	5.0 – 6.5	0.087	0.066 U	0.060 U	7.0 U	23	23	8	na	19.7	na	6	36.9
	T117-C5-SB-6.5-8.0	6.5 – 8.0	0.033 U	0.066 U	0.060 U	7.3 U	15 U	15 U	10	na	17.3	na	5	35.3
	T117-C5-SB-8.0-9.5	8.0 – 9.5	0.033 U	0.066 U	0.060 U	7.6 U	32	32	7	na	19	na	5	44.2
	T117-C5-SB-9.5-11.0	9.5 – 11.0	0.033 U	0.066 U	0.060 U	7.2 U	18	18	7	na	17.8	na	4	36.2
	T117-C5-SB-11.0-12.5	11.0 – 12.5	0.032 U	0.064 U	0.058 U	7.1 U	21	21	9	na	14.6	na	4	31.7
	T117-C5-SB-12.5-14.0	12.5 – 14.0	0.033 U	0.066 U	0.060 U	7.0 U	15	15	7 U	na	17.6	na	4	37.1

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
C-6	T117-C6-SB-3.5-5.0	3.5 – 5.0	220	3.06	0.52	3,400	7,000	10,400	8	na	30	na	58	105
	T117-C6-SB-5.0-6.5	5.0 – 6.5	74	5.2	0.58	2,600	8,600	11,200	8	na	18.9	na	61	92.4
	T117-C6-SB-6.5-8.0	6.5 – 8.0	94	14.4	0.76	5,600	6,800	12,400	7	na	19.5	na	37	90.7
	T117-C6-SB-8.0-9.5	8.0 – 9.5	0.16	6.7	0.16	1,800	1,500	3,300	8	na	19.5	na	6	37.9
	T117-C6-SB-9.5-11.0	9.5 – 11.0	0.28	0.08	0.058 U	48	68	116	7	na	20.1	na	5	35.8
	T117-C6-SB-11.0-12.5	11.0 – 12.5	0.28	0.066 U	0.060 U	13	31	44	7	na	18.4	na	5	36
	T117-C6-SB-12.5-14.0	12.5 – 14.0	0.039	0.066 U	0.060 U	9.8	33	43	9	na	17.9	na	4	35.3
C-7	T117-C7-SB-01	3.5 – 5.0	240	4.88	0.40	2,200	7,000	9,200	10 U	na	26	na	78	165
	T117-C7-SB-02	5.0 – 6.5	0.047	0.078	0.060 U	1,600	3,300	4,900	8	na	22	na	13	68.7
	T117-C7-SB-03	7.5 – 9.0	0.52	1.16	0.064	810	790	1,600	7 U	na	17.6	na	5	41.6
	T117-C7-SB-04	10.0 – 11.5	0.088	0.064 U	0.058 U	14	82	96	7 U	na	21.3	na	5	39
	T117-C7-SB-05	12.5 – 14.0	0.033 U	0.064 U	0.058 U	9.1	37	46	6 U	na	17.5	na	4	35.6
C-8	T117-C8-SB-01	0.5 – 2.0	32	4.18 J	0.40	2,200	10,000	12,000	55 J	0.8	41.5	60.5 J	170 J	265 J
	T117-C8-SB-02	2.5 – 4.0	6.7	3.00 J	0.26 J	38	210 J	250 J	10 UJ	1.3	24	99.1 J	65 J	176 J
	T117-C8-SB-03	5.0 – 6.5	0.029 J	0.066 U	0.060 U	1,000	1,400	2,400	9 J	0.3 U	20.7	31.5 J	6 J	46.8 J

[a] This sample is a field duplicate of the sample in the row directly above.

[b] There was no recovery from C5-SB-3.5-5.0.

na – not analyzed

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

Table 4-5. Phthalate and pesticide results (mg/kg dw) for Area C

Location	Sample ID	Depth (ft)	Phthalates						Pesticides		
			BEHP	Butyl Benzyl Phthalate	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl Phthalate	Di-n-octyl Phthalate	4,4'-DDT[a]	Aldrin	Dieldrin
C-3	T117-C3-SB-01	3.5 – 5.0	na	na	na	na	na	na	0.21 U	0.012 U	0.063 U
	T117-C3-SB-02	5.0 – 6.5	na	na	na	na	na	na	0.025 U	0.0016 U	0.0070 U
	T117-C3-SB-03	7.5 – 9.0	na	na	na	na	na	na	0.0032 U	0.0016 U	0.0032 U
	T117-C3-SB-213[b]	7.5 – 9.0	na	na	na	na	na	na	0.0077 U	0.0016 U	0.0032 U
C-4	T117-C4-SB-3.5-5.0	3.5 – 5.0	na	na	na	na	na	na	0.42 U	0.21 U	0.42 U
	T117-C4-SB-5.0-6.5	5.0 – 6.5	na	na	na	na	na	na	2.6 U	0.22 U	0.99 U
	T117-C4-SB-6.5-8.0	6.5 – 8.0	na	na	na	na	na	na	0.048 U	0.024 U	0.048 U
	T117-C4-SB-8.0-9.5	8.0 – 9.5	na	na	na	na	na	na	0.018 U	0.0016 U	0.0085 U
	T117-C4-SB-9.5-11.0	9.5 – 11.0	na	na	na	na	na	na	0.0033 U	0.0016 U	0.0033 U
	T117-C4-SB-11.0-12.5	11.0 – 12.5	na	na	na	na	na	na	0.0033 U	0.0017 U	0.0033 U
	T117-C4-SB-12.5-14.0	12.5 – 14.0	na	na	na	na	na	na	0.0074 U	0.0046 U	0.026 U
C-5[c]	T117-C5-SB-5.0-6.5	5.0 – 6.5	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	na	na	na
	T117-C5-SB-6.5-8.0	6.5 – 8.0	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	na	na	na
	T117-C5-SB-8.0-9.5	8.0 – 9.5	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	na	na	na
	T117-C5-SB-9.5-11.0	9.5 – 11.0	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	na	na	na
	T117-C5-SB-11.0-12.5	11.0 – 12.5	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U	na	na	na
	T117-C5-SB-12.5-14.0	12.5 – 14.0	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	na	na	na

[a] 4,4'-DDT results are representative of all the reported DDT isomers (2,4'-DDD, 2,4'-DDT, 4,4'-DDD, 4,4'-DDT) because none were detected, and 4,4'-DDT has the highest reporting limit.

[b] This sample is a field duplicate of the sample in the row directly above.

[c] There was no recovery from C5-SB-3.5-5.0.

na – not analyzed

BEHP – Bis(2-ethylhexyl)phthalate

RL – reporting limit

J – estimated concentration

U – not detected at reporting limit shown

4.3.4 Area D

All samples from Area D were analyzed for PCBs, PAHs, and TPH. Samples from locations D-3, D-4, D-7, D-8, and D-9 were analyzed for select metals (arsenic, chromium, lead, and zinc). Soil samples from locations D-6, D-10, and D-11 were analyzed for the list of select metals plus copper and cadmium. Samples from locations D-4 and D-8 were analyzed for TPH-HCID. Soil samples from location D-4 were also analyzed for phthalates.

Table 4-6 summarizes the PCB, PAH, TPH, and metals results; and Table 4-7 summarizes the phthalates results from Area D. Figures 4-8 and 4-9 present the total PCB and total TPH results, respectively, for Area D. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

Area D detected PCB concentrations were typically below 1.0 mg/kg, with the exception of samples from locations D-2, D-6, D-10, and D-11. PCB concentrations greater than 50 mg/kg were detected in the uppermost 2 ft of soil at locations D-10 and D-11 at 62 and 4,200 mg/kg, respectively. At location D-6 there was a notable section of impacted soil from 2 to 8 ft, where PCB concentrations ranged from 3.0 to 40 mg/kg. At location D-11 there was a slight increase in PCB concentration at the sample depth between 12.5 to 14 ft.

Detected total TPH concentrations ranged from 12 to 10,400 mg/kg. The highest concentrations of TPH (9,000 and 10,400 mg/kg) were also found in the uppermost 2 ft of soil at locations D-10 and D-11, respectively. At D-6, elevated TPH concentrations ranging from 1,240 to 3,500 mg/kg were detected at depths of 2 to 8 ft. At location D-11 there was also a slight increase in TPH concentrations at the sample depth between 12.5 to 14 ft. TPH consisted predominantly of motor oil, except from the uppermost interval of D-11 and from the 7.5-to-9-ft interval at D-5, where diesel-range hydrocarbon concentrations were prevalent. At locations D-4 and D-8, where HCID screening analysis occurred prior to TPH quantification, no samples were subsequently analyzed using method TPH-Dx because nothing was detected in the screen. Total PAH concentrations were typically not detected or were less than 1.0 mg/kg, with the exception of samples from locations D-1, D-5, D-6, D-10, and D-11.

Total PAH concentrations greater than 1.0 mg/kg were typically found in the uppermost 2 ft of soil, with the exception of location D-6, where PAH concentrations exceeding 1.0 mg/kg were detected at depths of 2 to 8 ft. Concentrations of cPAHs were below 1.0 mg/kg in all samples except the 2-to-8-ft depth interval sample at D-6. BEHP was the only phthalate detected at concentrations below 0.1 mg/kg.

Arsenic was detected in 17 of the 46 samples at concentrations ranging from 6 to 11 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, of 40 mg/kg in the 2-to-3.5-ft sample at D-6 and 160 mg/kg in the 0.5-to-2-ft

sample at D-10. Chromium concentrations ranged from 9.6 to 43 mg/kg. Lead concentrations generally ranged from 2 to 45 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 82 and 207 mg/kg in the uppermost 2.5 ft of soil at locations D-10 and D-11 and in the 2-to-6.5-ft depth at location D-6.

Zinc concentrations generally ranged from 17.5 to 88.2 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 107 and 530 mg/kg in the top 2.5 ft of soil at locations D-9 and D-10 and in the 2-to-6.5-ft depth at location D-6. Cadmium was detected in 3 of the 11 samples at concentrations ranging from 0.3 to1.7 mg/kg in the 5-to-8-ft sampling depth at location D-6 and in the 1-to-2.5-ft sampling depth at location D-11. Copper concentrations generally ranged from 9.7 to 44.9 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, between 62.2 and 106 mg/kg in the 0.5-to-2-ft sampling depth at locations D-10 and in the 2-to-6.5-ft sampling depth at location D-6. For all analytes, the highest concentrations were generally found in the uppermost 2 ft and decreased with depth. Notable concentrations of all chemicals are typically found in the same samples throughout Area D: uppermost samples from D-10 and D-11, and the 2-to-8-ft depth from D-6.

Table 4-6. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area D

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
D-1	T117-D1-SB-01	1.0 – 2.5	0.049 U	3.32	0.47	540	1,400	1,900	na	na	na	na	na	na
	T117-D1-SB-02	2.5 – 4.0	0.032 U	0.064 U	0.058 U	5.4 U	11 U	11 U	na	na	na	na	na	na
	T117-D1-SB-03	5.0 – 6.5	0.033 U	0.065 U	0.059 U	6.5 U	13 U	13 U	na	na	na	na	na	na
D-2[b]	T117-D2-SB-01	0.5 – 2.0	0.25	0.066 U	0.060 U	5.9	21	27	na	na	na	na	na	na
	T117-D2-SB-02	2.5 – 4.0	3.7	0.064 U	0.058 U	44	160	200	na	na	na	na	na	na
	T117-D2-SB-05	10.0 – 12.0	0.17	0.065 U	0.059 U	7.1 U	29	29	na	na	na	na	na	na
	T117-D2-SB-06	12.5 – 14.0	0.10	0.064 U	0.058 U	11	35	46	na	na	na	na	na	na
	T117-D2-SB-07	15.0 – 16.5	0.053	0.064 U	0.058 U	12	50	62	na	na	na	na	na	na
D-3	T117-D3-SB-1.5-3.0	1.5 – 3.0	0.75	0.13	0.057 U	13	60	73	11	na	13.2	na	36	62.2
	T117-D3-SB-3.0-4.5	3.0 – 4.5	0.036 J	0.063 U	0.057 U	5.4 U	11 U	11 U	5 U	na	9.7	na	2 U	33.2
	T117-D3-SB-4.5-6.0	4.5 – 6.0	0.045	0.064 U	0.058 U	5.7 U	12 U	12 U	5 U	na	11.7	na	2	22.1
	T117-D3-SB-6.0-7.5	6.0 – 7.5	0.20	0.066 U	0.060 U	6.2 U	15	15	6 U	na	11.2 J	na	2 U	27.7
	T117-D3-SB-7.5-9.0	7.5 – 9.0	0.033 U	0.064 U	0.058 U	7.3 U	52	52	7 U	na	21.5 J	na	6	47.7
	T117-D3-SB-9.0-10.5	9.0 – 10.5	0.033 U	0.064 U	0.058 U	7.0 U	16	16	7 U	na	20.1 J	na	5	43.7
	T117-D3-SB-10.5-12.0	10.5 – 12.0	0.033 U	0.065 U	0.059 U	8.4	92	100	9	na	18.7 J	na	5	41
	T117-D3-SB-12.0-13.5	12.0 – 13.5	0.033 U	0.065 U	0.059 U	7.1 U	14 U	14 U	6 U	na	18.1 J	na	5	34.3
D-4	T117-D4-SB-01	1.0 – 2.5	0.40 U	0.066 U	0.060 U	na	na	na	5 U	na	11.9	na	2 U	21.8
	T117-D4-SB-02	2.5 – 4.0	0.032 U	0.065 U	0.059 U	na	na	na	5 U	na	10.3	na	3	24
	T117-D4-SB-03	5.0 – 6.5	0.033 U	0.065 U	0.059 U	na	na	na	5 U	na	15.2	na	2 U	19.7
D-5	T117-D5-SB-01	1.0 – 2.5	0.22	1.74	0.28	220	470	690	na	na	na	na	na	na
	T117-D5-SB-02	2.5 – 4.0	0.045	0.065 U	0.059 U	50	67	117	na	na	na	na	na	na
	T117-D5-SB-03	5.0 – 6.5	0.032 U	0.064 U	0.058 U	5.4 U	11 U	11 U	na	na	na	na	na	na
	T117-D5-SB-04	7.5 – 9.0	0.032 U	0.063 U	0.057 U	740	470	1,210	na	na	na	na	na	na

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
D-6	T117-D6-SB-0.5-2.0	0.5 – 2.0	0.26	0.065 U	0.059 U	11	110	120	7	0.2 U	21.0 J	23.8	7	51.1
	T117-D6-SB-2.0-3.5	2.0 – 3.5	40	255	23	260	980	1,240	40	0.5 U	26 J	62.2	82	170
	T117-D6-SB-3.5-5.0	3.5 – 5.0	3.0	2.66	0.38	120	460	580	6	0.2 U	13.4 J	23.5	16	42.1
	T117-D6-SB-5.0-6.5	5.0 – 6.5	6.2	17.8	2.3	850	2,600	3,500	8	1.7	39.8 J	64.4	95	107
	T117-D6-SB-6.5-8.0	6.5 – 8.0	23	8	1.0	350	1,200	1,600	9	0.3	31.0 J	44.9	45	74.6
	T117-D6-SB-8.0-9.5	8.0 – 9.5	0.17	0.164	0.060 U	75	280	360	6 U	0.2 U	14.6 J	20.5	17	51.4
	T117-D6-SB-9.5-11.0	9.5 – 11.0	0.16	0.32	0.10	63	260	320	6 U	0.2 U	14.1 J	23.6	28	61
	T117-D6-SB-209[a]	9.5 – 11.0	na	na	na	na	na	na	6 U	0.2 U	17.3 J	23.4	17	70.2
	T117-D6-SB-11.0-12.5	11.0 – 12.5	0.044	0.064 U	0.058 U	8.9	40	49	6 U	0.2 U	17.3 J	22.6	5	35.5
	T117-D6-SB-210[a]	11.0 – 12.5	0.072	0.064 U	0.058 U	11	36	47	na	na	na	na	na	na
	T117-D6-SB-12.5-14.0	12.5 – 14.0	0.10	0.064 U	0.058 U	16	55	71	6	0.2 U	17.1 J	25.6	9	36.8
D-7[b]	T117-D7-SB-0.0-1.5	0.0 – 1.5	0.032 U	0.066 U	0.060 U	5.3 U	20	20	6	na	20.9	na	4	37.8
	T117-D7-SB-3.0-4.5	3.0 – 4.5	0.63	0.064 U	0.058 U	13	82	95	5 U	na	9.9	na	4	44.6
	T117-D7-SB-215[a]	3.0 – 4.5	na	na	na	14	91	105	na	na	na	na	na	na
	T117-D7-SB-4.5-6.0	4.5 – 6.0	0.17	0.066 U	0.060 U	5.3 U	31	31	5 U	na	10.1	na	2 U	36.2
	T117-D7-SB-6.0-7.5	6.0 – 7.5	0.094	0.066 U	0.060 U	8.3	33	41	6 U	na	11.2	na	3	38.1
	T117-D7-SB-7.5-9.0	7.5 – 9.0	0.033 U	0.064 U	0.058 U	7.0 U	30	30	9	na	21.5	na	6	41.9
	T117-D7-SB-9.0-10.5	9.0 – 10.5	0.033 U	0.066 U	0.060 U	7.0 U	25	25	9	na	21	na	6	42
	T117-D7-SB-10.5-12.0	10.5 – 12.0	0.033 U	0.066 U	0.060 U	6.9 U	14 U	14 U	6 U	na	17.8	na	4	34.7
	T117-D7-SB-12.0-13.5	12.0 – 13.5	0.032 U	0.066 U	0.060 U	6.9 U	14 U	14 U	8	na	13.5	na	3	28.2
D-8	T117-D8-SB-01	0.5 – 2.0	0.032 U	0.065 U	0.059 U	na	na	na	5 U	na	12	na	2	25.1
	T117-D8-SB-02	2.5 – 4.0	0.033 U	0.066 U	0.060 U	na	na	na	6	na	12.7	na	3	26.3
	T117-D8-SB-03	5.0 – 6.5	0.037 U	0.066 U	0.060 U	na	na	na	6 U	na	14.7	na	3	24.2
D-9	T117-D9-SB-01	1.0 – 2.5	0.12	0.151 J	0.061 J	81	240	320	9 J	na	17.7	na	32 J	151
	T117-D9-SB-02	2.5 – 4.0	5.4	0.47 J	0.081 J	22	62	84	7 J	na	15.8	na	21 J	88.2
	T117-D9-SB-03	5.0 – 6.5	0.092	0.064 U	0.058 U	5.8 U	12 U	12 U	5 UJ	na	11.3	na	2 UJ	22
D-10	T117-D10-SB-01	0.5 – 2.0	62	3.05	0.34	2,600	6,400	9,000	160 J	0.5 U	43	106 J	207 J	530
	T117-D10-SB-02	2.5 – 4.0	0.044	1.21 J	0.23 J	6.0 U	16	16	6 UJ	0.2 U	12.3	14.8 J	3 J	28.5
	T117-D10-SB-03	5.0 – 6.5	0.071	0.065 U	0.059 U	5.8 U	12 U	12 U	6 UJ	0.2 U	12.9	18.6 J	2 J	17.5

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
D-11	T117-D11-SB-01	1.0 – 2.5	4,200	1.30 J	0.68 J	5,400	5,000	10,400	6	0.6	23.5	43.1	140	74.5
	T117-D11-SB-02	2.5 – 4.0	4.2	0.063 U	0.057 U	9.1	12	21	5 U	0.2 U	13.7	10.8	3	23.7
	T117-D11-SB-03	5.0 – 6.5	1.1	0.066 U	0.060 U	5.2 U	10 U	10 U	5 U	0.2 U	11.7	9.7	2 U	21.5
	T117-D11-SB-04	7.5 – 9.0	1.4	0.066 U	0.060 U	6.3 U	12 U	12 U	6 U	0.2 U	12.9	20.5	4	22.3
	T117-D11-SB-05	10.0 – 11.5	5.4	0.065 U	0.059 U	12	12 U	12	6 U	0.2 U	14.3	16.2	3	20.2
	T117-D11-SB-06	12.5 – 14.0	23	0.064 U	0.058 U	33	26	59	6 U	0.2 U	10.1	11.9	2 U	20.3
	T117-D11-SB-211[a]	12.5 – 14.0	33	0.063 U	0.057 U	48	39	87	6 U	0.2 U	9.6	11.1	2 U	20
	T117-D11-SB-07	15.0 – 16.5	2.6	0.065 U	0.059 U	6.2 U	12 U	12 U	6 U	0.2 U	12.7	11.9	2 U	22.5

[a] This sample is a field duplicate of the sample in the row directly above.

[b] There was no recovery from D2-SB-03, D2-SB-04, or D7-SB-1.5-3.0.

na – not analyzed

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

Table 4-7. Phthalate results (mg/kg dw) for Area D

Location	Sample ID	Depth (ft)	BEHP	Butyl Benzyl Phthalate	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl Phthalate	Di-n-octyl Phthalate
D-4	T117-D4-SB-01	1.0 – 2.5	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U
	T117-D4-SB-02	2.5 – 4.0	0.098	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
	T117-D4-SB-03	5.0 – 6.5	0.048 J	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U

[a] This sample is a field duplicate of the sample in the row directly above.

b There was no recovery from D2-SB-03, D2-SB-04, or D7-SB-1.5-3.0.

na – not analyzed

BEHP – Bis(2-ethylhexyl)phthalate

J – estimated concentration

U – not detected at reporting limit shown

4.3.5 Area E

All samples from Area E were analyzed for PCBs, PAHs, TPH-Dx, and select metals. Samples from location E-1 were also analyzed for phthalates, copper, and cadmium. Table 4-8 summarizes the PCB, PAH, TPH, and metals results; and Table 4-9 summarizes the phthalate results from Area E. Figures 4-10 and 4-11 present the total PCB and total TPH results, respectively, for Areas E and F. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison. The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

Detected PCB concentrations in Area E were less than 1.0 mg/kg below a depth of 5.5 ft, with the exception of a concentration of 3.3 mg/kg detected in the sample from the 7.5-to 8.2 ft sampling interval at location E-2. The highest PCB concentration, 1,100 mg/kg, was detected at E-1 from 3.5 to 5 ft. At E-2 and E-3, the highest PCB concentrations of 110 and130 mg/kg, respectively, were found in the uppermost samples.

Detected TPH concentrations were generally less than 500 mg/kg, except in the uppermost samples from locations E-2 and E-3, (1,600 and 1,140 mg/kg, respectively) and at E-1 from 0 to 5.5 ft, where TPH was detected at concentrations ranging from 2,400 to 28,000 mg/kg. TPH consisted predominantly of motor oil in all samples. Total PAH and cPAH concentrations were generally less than 1.0 mg/kg, except in the uppermost sample from location E-2 and between 2 and 6.5 ft from location E-1.

The highest concentrations of PCB, TPH, and PAH were detected at location E-1 at depths of 0 to 5 ft and in the uppermost samples from locations E-2 and E-3. BEHP was the only phthalate detected in two of the samples at concentrations below 0.1 mg/kg.

Arsenic was detected in 9 of the 18 samples at concentrations ranging from 7 to 20 mg/kg. Chromium concentrations ranged from 9.4 to 28.5 mg/kg. Lead concentrations generally ranged from 4 to 49 mg/k, with the exception of elevated concentrations, relative to other January 2006 data, of between 146 and 219 mg/kg in the 2-to-5.5-ft sampling depth at location E-1.

Zinc concentrations generally ranged from 25 to 72 mg/kg, with the exception of elevated concentrations, relative to other January 2006 data, of between 145 and 444 mg/kg in the 2-to-5.5-ft sampling depth at location E-1. Cadmium was detected in two of the ten samples analyzed at concentrations of 1.8 and 2.2 mg/kg in the 2-to-5-ft depth at location E-1. At location E-1, copper concentrations generally ranged from 4 to 16 mg/kg, except at depths between 2 and 5.5 ft, where copper concentrations ranged from 146 to 219 mg/kg.

Table 4-8. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area E

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
E-1	T117-E1-SB-0.6-2.0	0.6 – 2.0	8.1	0.10 J	0.12 J	360	2,000	2,400	5 U	0.2 U	26.1	23.1	12	43.5
	T117-E1-SB-2.0-3.5	2.0 – 3.5	100	6.0	0.79	9,000	8,900	17,900	20	1.8	29	56.6	146	417
	T117-E1-SB-3.5-5.0	3.5 – 5.0	1,100	329	28	13,000	11,000	24,000	9	2.2	20.2	46.8	154	444
	T117-E1-SB-5.0-6.5-A	5.0 – 5.5	14	98	9.9	13,000	15,000	28,000	20 U	0.6 U	26	81.2	219	145
	T117-E1-SB-5.0-6.5-B	5.5 – 6.5	0.62	1.36 J	0.16 J	260	240	500	8	0.3 U	18.9	32.3	16	40.6
	T117-E1-SB-6.5-8.0	6.5 – 8.0	0.28	0.066 U	0.060 U	51	64	115	6 U	0.3 U	16.8	24.8	4	31.3
	T117-E1-SB-212[a]	6.5 – 8.0	0.46	0.121 J	0.059 U	30	33	63	na	na	na	na	na	na
	T117-E1-SB-8.0-9.5	8.0 – 9.5	0.17	0.064 U	0.058 U	30	160	190	8 U	0.3 U	17.9	32	5	44.8
	T117-E1-SB-9.5-11.0	9.5 – 11.0	0.039	0.064 U	0.058 U	7.1 U	25	25	7 U	0.3 U	22.6	30.6	6	38.4
	T117-E1-SB-11.0-12.5	11.0 – 12.5	0.071	0.066 U	0.060 U	10	30	40	7	0.3 U	16.7	27.7	4	32.1
	T117-E1-SB-12.5-14.0	12.5 – 14.0	4.1	0.036 J	0.059 U	120	130	250	7	0.3 U	15.7	27.7	7	39.9
E-2	T117-E2-SB-01	0.6 – 2.0	110	26.5	2.8	390	1,200	1,600	12 J	na	18.2	na	49 J	72.0 J
	T117-E2-SB-02	2.5 – 4.0	0.14	0.063 U	0.057 U	5.4 U	11 U	11 U	5 UJ	na	10.8	na	2 UJ	22.7 J
	T117-E2-SB-03	5.0 – 6.5	0.031 J	0.064 U	0.058 U	6.1 U	12 U	12 U	6 UJ	na	10.4	na	2 UJ	19.8 J
	T117-E2-SB-04-A	7.5 – 8.2	3.3	0.238 J	0.060 J	7.9	23	31	6 UJ	na	34	na	4 J	26.3 J
	T117-E2-SB-04-B	8.2 – 9.0	0.032 U	0.067 U	0.061 U	7.3 U	15 U	15 U	11 J	na	20.1	na	6 J	40.7 J
E-3	T117-E3-SB-01	0.5 – 2.0	130	0.78	0.17	440 J	700 J	1,140 J	9 J	na	19.2	na	28 J	67.6
	T117-E3-SB-02	2.5 – 4.0	48	0.076 J	0.060 J	100 J	160 J	260 J	8 J	na	17.4	na	15 J	47.7
	T117-E3-SB-03	5.0 – 6.5	2.2	0.066 U	0.060 U	6.0 U	12 U	12 U	6 UJ	na	11.8	na	4 J	25

[a] This sample is a field duplicate of the sample in the row directly above.

na – not analyzed

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

Table 4-9. Phthalate results (mg/kg dw) for Area E

Location	Sample ID	Depth (ft)	BEHP	Butyl Benzyl Phthalate	Diethyl Phthalate	Dimethyl Phthalate	Di-n-butyl Phthalate	Di-n-octyl Phthalate
E-1	T117-E1-SB-0.6-2.0	0.6 – 2.0	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U	0.13 U
	T117-E1-SB-2.0-3.5	2.0 – 3.5	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U	0.86 U
	T117-E1-SB-3.5-5.0	3.5 – 5.0	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
	T117-E1-SB-5.0-6.5-A	5.0 – 5.5	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U	1.5 U
	T117-E1-SB-5.0-6.5-B	5.5 – 6.5	0.050 J	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U
	T117-E1-SB-6.5-8.0	6.5 – 8.0	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U
	T117-E1-SB-212[a]	6.5 – 8.0	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U
	T117-E1-SB-8.0-9.5	8.0 – 9.5	0.057 J	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U
	T117-E1-SB-9.5-11.0	9.5 – 11.0	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U	0.064 U
	T117-E1-SB-11.0-12.5	11.0 – 12.5	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U	0.066 U
	T117-E1-SB-12.5-14.0	12.5 – 14.0	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U	0.065 U

[a] This sample is a field duplicate of the sample in the row directly above.

na – not analyzed

BEHP – Bis(2-ethylhexyl)phthalate

J – estimated concentration

U – not detected at reporting limit shown

4.3.6 Area F

All Area F soil samples were analyzed for PCBs, PAHs, and TPH-Dx. Samples from location F-3 were also analyzed for all metals (arsenic, copper, cadmium, chromium, lead, and zinc). Table 4-10 summarizes the PCB, PAH, TPH, and metals results from Area F. Figures 4-10 and 4-11 present the total PCB and total TPH results, respectively, for Areas E and F. Each figure includes four sample interval maps and the corresponding data in table format for easy comparison. The concentration ranges and color designations indicated on these figures are for illustration purposes only and do not represent relevant or applicable cleanup levels.

Detected PCB concentrations in Area F ranged from 0.23 to 130 mg/kg. All PCB concentrations greater than 50 mg/kg were detected in soil from sampling locations between the building and the shoreline (F-1 through F-5). In contrast, PCB concentrations beneath the building (locations F-6 through F-9) typically ranged from 0.021 to 12 mg/kg.

The highest concentrations of TPH (9,600 and 4,800 mg/kg) were detected at location F-3. TPH consisted predominantly of motor oil, except at location F-8 at the depth interval of 2.5 to 4 ft, where the diesel-range hydrocarbon concentration was predominant. Total PAH concentrations ranged from 0.368 to 4.62 mg/kg. The highest total PAH concentration (as well as the highest TPH and PCB concentrations) was detected at location F-3 at depths of 5 to 6.5 ft. Concentrations of cPAHs were below 1.0 mg/kg in all samples.

Arsenic, cadmium, copper, chromium, lead, and zinc concentrations from samples collected from location F-3 were typical of the corresponding metals analyses results for the T-117 Upland Area, with the exception of the sample from the 5-to-6.5-ft depth, in which the concentrations of those metals were 16, 1.4, 21.4, 45.9, 112, and 203 mg/kg, respectively.

Table 4-10. Total PCB, total PAH, total TPH, and metals results (mg/kg dw) for Area F

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
F-1	T117-F1-SB-01	0.5 – 2.0	0.41	0.066 UJ	0.060 U	5.2 U	18	18	na	na	na	na	na	na
	T117-F1-SB-02	2.5 – 4.0	86	1.35	0.22	100	410	510	na	na	na	na	na	na
	T117-F1-SB-03	5.0 – 6.5	0.32	2.36 J	0.26 J	240	1,200	1,400	na	na	na	na	na	na
	T117-F1-SB-04	7.5 – 9.0	0.033 U	0.065 UJ	0.059 U	6.3	22	28	na	na	na	na	na	na
F-2	T117-F2-SB-01	0.5 – 2.0	110	1.80 J	0.16	330	1,400	1,700	na	na	na	na	na	na
	T117-F2-SB-02	2.5 – 4.0	0.77	0.94	0.14	8.8	27	36	na	na	na	na	na	na
	T117-F2-SB-03	5.0 – 6.5	0.40	0.93	0.14	52	230	280	na	na	na	na	na	na
	T117-F2-SB-04	7.5 – 9.0	0.25	0.158 J	0.064 J	81	730	810	na	na	na	na	na	na
	T117-F2-SB-05	10.0 – 11.5	0.024 J	0.066 UJ	0.060 U	8.4	72	80	na	na	na	na	na	na
F-3	T117-F3-SB-01	0.5 – 2.0	7.4	0.163 J	0.058 J	1,000	3,800	4,800	8 J	0.2 U	23.8	24.4 J	21 J	49.7 J
	T117-F3-SB-02	2.5 – 4.0	2.5	0.315 J	0.064 J	140	530	670	9 J	0.2 U	28.8	26.0 J	28 J	65.7 J
	T117-F3-SB-03	5.0 – 6.5	130	4.62 J	0.45 J	2,300	7,300	9,600	16 J	1.4	21.4	45.9 J	112 J	203 J
	T117-F3-SB-04	7.5 – 9.0	0.19	0.064 U	0.058 U	7.0 U	14 U	14 U	8 J	0.3 U	17.2	26.8 J	4 J	34.0 J
F-4	T117-F4-SB-01	0.5 – 2.0	12	0.76 J	0.11 J	55	280	340	na	na	na	na	na	na
	T117-F4-SB-02	2.5 – 4.0	1.5	0.042 J	0.057 U	27	150	180	na	na	na	na	na	na
	T117-F4-SB-03	5.0 – 6.5	26	1.31 J	0.077 J	81	270	350	na	na	na	na	na	na
F-5[a]	T117-F5-SB-01	0.5 – 2.0	58	1.44	0.21	88	420	510	na	na	na	na	na	na
	T117-F5-SB-02	2.5 – 4.0	2.5	1.18 J	0.15	12	56	68	na	na	na	na	na	na
	T117-F5-SB-03	5.0 – 6.5	0.77	0.70 J	0.11	33	160	190	na	na	na	na	na	na
	T117-F5-SB-05	10.0 – 11.5	0.23	0.368 J	0.086 J	20	100	120	na	na	na	na	na	na
F-6	T117-F6-SB-01	0.5 – 2.0	0.44	0.064 U	0.058 U	16	40	56	na	na	na	na	na	na
	T117-F6-SB-02	2.5 – 4.0	0.021 J	0.066 U	0.060 U	5.8	21	27	na	na	na	na	na	na
	T117-F6-SB-03	5.0 – 6.5	12	0.67 J	0.080 J	300	710	1,010	na	na	na	na	na	na
	T117-F6-SB-04	7.5 – 9.0	0.18	0.064 U	0.058 U	7.8	24	32	na	na	na	na	na	na
F-7	T117-F7-SB-01	0.5 – 2.0	0.27	0.063 U	0.057 U	5.4 U	10 U	10 U	na	na	na	na	na	na
	T117-F7-SB-02	2.5 – 4.0	0.23	0.063 U	0.057 U	10	52	62	na	na	na	na	na	na
	T117-F7-SB-03	5.0 – 6.5	0.032 U	0.066 U	0.060 U	16	10 U	16	na	na	na	na	na	na
F-8	T117-F8-SB-01	0.5 – 2.0	0.90	0.063 U	0.057 U	14	30	44	na	na	na	na	na	na
	T117-F8-SB-02	2.5 – 4.0	6.8	1.06 J	0.14 J	1,400	630	2,000	na	na	na	na	na	na
	T117-F8-SB-03	5.0 – 6.5	0.033 U	0.065 U	0.059 U	5.2 U	10 U	10 U	na	na	na	na	na	na

Location	Sample ID	Depth (ft)	Total PCBs	Total PAHs	Total cPAHs	Diesel-Range Hydrocarbons	Motor Oil	Total TPH	Arsenic	Cadmium	Chromium	Copper	Lead	Zinc
F-9	T117-F9-SB-01	0.5 – 2.0	1.8	0.065 U	0.059 U	5.5 U	11	11	na	na	na	na	na	na
	T117-F9-SB-02	2.5 – 4.0	0.73	0.067 U	0.061 U	10	14	24	na	na	na	na	na	na
	T117-F9-SB-03	5.0 – 6.5	0.033 U	0.063 U	0.057 U	5.7 U	10 U	10 U	na	na	na	na	na	na

[a] There was no recovery from F5-SB-04.

na – not analyzed

TPH – total petroleum hydrocarbons (sum of diesel- and motor oil-range hydrocarbons)

PAHs – polycyclic aromatic hydrocarbons (sum of acenaphthene, acenaphthylene, anthracene, fluorene, naphthalene, phenanthrene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluoranthene, indeno(1,2,3-cd)pyrene, pyrene)

cPAHs – carcinogenic polycyclic aromatic hydrocarbon

PCBs – polychlorinated biphenyls (sum of Aroclors 1016, 1221, 1232, 1242, 1248, 1254,1260)

J – estimated concentration

U – not detected at reporting limit shown

UJ – not detected at estimated reporting limit shown

4.3.7 Site-wide summary

The overall analysis has shown that PCBs are still the primary chemicals of concern at T-117 because they are they are the most widely present chemical of concern and at very high concentrations in soil.. Historical and recent sampling data indicate that PCB concentrations are greatest along the northeastern shoreline of Area B and in the areas adjacent to former plant operations. The highest concentrations of PCBs are generally found within the uppermost 2 ft of surface soils and tend to decrease with depth. The exceptions are in Area C, where the highest PCB concentrations are located at 2.5 to 8 ft below ground surface and then decrease with additional depth, and at location E-1, where elevated PCB concentrations range from 0 to 6.5 ft in depth.

Historical and recent sampling data indicate that TPH concentrations that are greatest in the areas adjacent to the former plant operations and former tank locations. Areas A and F have been impacted minimally by TPH constituents. In Area B, the highest concentrations of TPH are limited to the uppermost 4 ft of soil; whereas, near the former tanks in Area D, in Area C, and in the eastern portion of Area E, elevated TPH concentrations can be found as deep at 6.5 ft.

Historical and recent sampling data indicate that PAH concentrations are greatest in the areas adjacent to the former plant operations and former tank locations. Areas A and F have been impacted minimally by PAH constituents. In Area B, the highest concentrations of PAHs were found at location B-4, adjacent to the 1999 removal action area, at a depth interval of 2.5 to 6 ft. Elevated PAH concentrations were detected throughout Area C at varying depths. The highest concentrations were detected at location C-4. In area D, the highest PAH concentrations were detected in surface samples at the former tank farm (D-10, and D-11) and at depth next to a former underground storage tank (D-6). In Area E, elevated PAH concentrations were detected as deep at 5.5 ft and were highest at E-1. Phenanthrene was the most commonly detected low-molecular-weight polycyclic aromatic hydrocarbon (LPAH) and also had some of the highest concentrations. Benzo(a)anthracene, benzo(a)pyrene, chrysene, fluoranthene, and pyrene were the most commonly detected high-molecular-weight polycyclic aromatic hydrocarbons (HPAHs) and also had some of the highest concentrations. HPAHs were detected in 24 more samples than LPAHs.

Pesticides were not detected in any samples. BEHP was the only detected phthalate at concentrations below 0.1 mg/kg.

Recent sampling data indicate that metals concentrations are the greatest in the southern portion of the former plant operations area. Areas A and B have been impacted minimally by metals. In Area C, the highest concentrations of metals were detected in the southwestern corner, either at the surface or at the 3.5-to-5-ft depth interval. In Area D, the highest metals concentrations were found in surface samples at the former tank farm (D-9, D-10, and D-11) and at depth next to a former underground

storage tank (D-6). In Areas E and F, elevated metals concentrations were detected as deep as 6.5 ft at E-1 and F-3.

Figures 4-12 through 4-29 provide a site-wide summary of analytical concentrations of PCBs, TPH, cPAHs, and metals at the T-117 Upland Area property. Corresponding data are presented in Sections 4.3.1 through 4.3.6, on associated area-specific figures, and in Appendix A. The PCB, TPH, and cPAH site-wide figures are presented as separate sampling interval maps that correspond to the identified sampling intervals (e.g., 0 to 1.5 ft). The metals site-wide figures are presented as a single figure for each metal; each figure includes the concentration associated with every depth at a location analyzed for that metal. These figures have been prepared to help interpret overall trends on the T-117 property.

4.4 DATA VALIDATION RESULTS

Independent data validation of all results of the chemical analyses was conducted by EcoChem. The complete data validation report is provided in Appendix C. The following sections summarize the results of the validation, but do not list every sample affected by a qualification. Detailed information regarding every qualified sample is available in Appendix C.

4.4.1 Overall data quality

The soil samples submitted to ARI were analyzed in 18 sample delivery groups (SDGs). EcoChem conducted full data validation for all chemistry parameters on two ARI SDGs and on a third SDG for PCB Aroclors only. This meets QAPP requirements that a minimum of 20% or two SDGs undergo full data validation. All sampling results that were not selected for full validation underwent a summary validation. The summary validation involved a review of the QC summary forms provided by the laboratory, including calibration, internal standard, and inductively coupled plasma (ICP) ICS summary forms. Table 4-11 provides a summary of the number of samples in each ARI SDG, the analyses performed, and the level of data validation.

The majority of the data did not require qualification, or were qualified with a J, indicating an estimated value. Based on the information reviewed, the overall data quality is considered acceptable for use, as qualified. The results of the validation are summarized below by analyte group.

Table 4-11. Numbers of soil samples and level of data validation performed for each ARI SDG

SDG	Validation Level	PCB Aroclors	NWTPH-Dx	PAHs	Phthalates	Select Metals	Metals	Pesticides	NWTPH-HCID	NWTPH-G	TOC	Grain Size	Total Solids
IY32	summary/full[a]	20	20	20	0	3	0	0	0	0	6	1	20
IY33	summary	9	9	9	0	4	0	0	0	0	3	1	9
IY35	summary	19	19	19	0	4	0	0	0	0	5	0	20
IY36	summary	9	9	9	0	0	0	0	0	0	4	1	9
IY64	summary	12	3	12	2	12	0	0	12	0	2	1	12
IY65	summary	7	3	7	1	4	0	0	4	0	3	0	8
IY71	summary	13	13	13	0	4	0	0	0	0	3	1	13
IY72	summary/full[b]	15	15	15	0	5	10	0	0	0	1	0	16
IY78	summary/full[c]	19	19	19	11	0	18	0	0	0	2	0	19
IY79	summary/full[b]	5	5	5	0	5	0	0	0	0	1	1	5
IY82	summary/full[d]	16	15	16	0	5	10	4	0	0	4	0	16
IY86	summary/full[e]	19	19	19	0	7	0	0	0	0	3	5	19
IY93	summary	13	13	13	6	6	7	7	0	0	2	0	13
IZ04	summary	13	12	13	0	10	3	0	4	1	4	0	13
IZ05	summary	13	13	13	0	0	0	0	0	0	4	0	13
IZ15	summary	16	16	16	0	0	0	0	0	0	4	4	16
IZ16	summary	10	9	8	0	8	0	0	0	0	3	0	11
JA73	summary	1	0	0	0	0	0	0	0	0	0	0	1
Percentage of samples that underwent full validation		25%	18%	17%	55%	13%	21%	36%	na[f]	0%	17%	40%	17%

[a] Full level data validation was performed for PCB Aroclors, TOC, grain size, and total solids.

[b] Full level data validation was performed for metals.

[c] Full level data validation was performed for PCB Aroclors, PAHs, phthalates, and NWTPH-Dx.

[d] Full level data validation was performed for pesticides.

[e] Full level data validation was performed for PCB Aroclors, PAHs, phthalates, NWTPH-Dx, TOC, grain size, and total solids.

[f] This method is designed to be only a semi-quantitative screening analysis. Full level data validation is not applicable.

na –not applicable

NWTPH-Dx – Northwest total petroleum hydrocarbons –diesel motor oil extractables

NWTPH-HCID – Northwest total petroleum hydrocarbons – hydrocarbon identification

NWTPH-G – Northwest total petroleum hydrocarbons – gasoline

PAH – polycyclic aromatic hydrocarbon

PCB – polychlorinated biphenyl

SDG – sample delivery group

TOC – total organic carbon

4.4.2 Sample transport and holding times

All soil sample analyses were conducted within the QAPP-specified maximum holding times with the following exception. Sample T117-A12-SB-0.5-1.5 was maintained in frozen archive storage upon receipt at the laboratory until just prior to extraction. The holding time was extended for 3 days by the independent data validator for this archived sample, and no data qualification was deemed necessary. The COC documents were reviewed for documentation of cooler temperatures. Several sample coolers were outside the control limit of 2°C to 6°C, ranging from 0.0°C to 6.7°C. Samples were received by the laboratory on the same day as collection; therefore, the temperature outliers were judged to have no impact on the reported results.

4.4.3 Field duplicate results

Field duplicate samples were collected at a rate of one per twenty field samples and were submitted for each of the analytical chemistry parameters. Field precision was acceptable for all field duplicate samples and all analyses with one exception. The relative percent difference (RPD) of 77% for Aroclor 1260 exceeded the guidance control limit of 75% between sample pairs T117-C3-SB-3 and T117-C3-SB-213. The data were not qualified due to this exceedance.

4.4.4 Field blank results

Rinsate blanks were submitted for each of the organic chemistry and metals analyses, at a minimum of one per twenty field samples. No target analytes were detected in any of the rinsate blank samples.

4.4.5 Analytical results

This subsection presents the data validation results for each of the following analytes or groups of analytes: semivolatile organic compounds (SVOCs), including PAHs and phthalates; PCB as Aroclors; TPH-Dx; TPH-G; TPH-HCID; pesticides; metals; and conventional analyses including TOC, grain size, and total solids.

4.4.5.1 SVOCs (including PAHs and phthalates)

Calibration

The initial calibration was conducted correctly. The percent relative standard deviations (%RSDs) for all analytes were within QC limits of 30%. All correlation coefficients and relative response factors and were adequate. Continuing calibration verifications (CCVs) were conducted at the required frequencies. All compounds had percent differences (%Ds) within the control limit of ±25% in the CCV relative to the initial calibration with one exception. Benzo(g,h,i)perylene exceeded the control limit in the CCVs in SDGs IY32 and IZ15, ranging from 27.4% to 29.2%. This outlier was

indicative of a low bias, and results for this chemical were J-qualified (J/UJ) in all associated samples.

Blanks

Method blanks were extracted and analyzed at the proper frequency. No target analytes were detected in any of the method blanks at concentrations greater than or equal to the reporting limits.

Surrogate recovery

Surrogates were added to all samples and blanks as required by the test method. All surrogate recoveries were within QC limits.

Matrix spike

Matrix spike/matrix spike duplicate (MS/MSD) samples were analyzed at the proper frequency. All percent recovery and RPD values were within QC limits.

Laboratory control samples

Laboratory control samples (LCS) were analyzed at the proper frequency of one per extraction batch. All LCS percent recovery results were within the QAPP specified control limits.

Internal standards

The areas and retention times of all internal standards were reviewed. All internal standard results were within acceptance limits with the following exceptions. The recovery of perylene-d12 was below QC limits in four samples. These four samples were reanalyzed at a dilution, and all internal standards were within control limits. Results for chemicals associated with this internal standard were selected from either the original analysis or the dilution, as determined appropriate by the data validator. Those results selected from the original analysis were J-qualified (J/UJ) in the associated samples.

Compound identification and quantification

All compound IDs were reviewed and are acceptable. No false positives or negatives were found. Several compound quantification and reporting limit results were verified by recalculation. No transcription or calculation errors were found. When detected concentrations exceeded the calibration range of the instrument, extracts were diluted and reanalyzed to obtain results within the calibrated range. Results for compounds that exceeded calibrated range were rejected. The results for all other analytes in the dilution were rejected so that a single usable result remains for all analytes.

4.4.5.2 PCBs as Aroclors

Calibration

The initial calibration and continuing calibration verifications were conducted as required by the test method. All initial calibration %RSDs were less than or equal to 20%, and retention times of all Aroclor peaks were within QC limits. All %Ds calculated for the continuing calibration verifications were within QC limits of 15%.

Blanks

Method blanks were extracted and analyzed at the proper frequency. No PCB Aroclors were detected in any of the method blanks at concentrations exceeding the reporting limit.

Surrogate recovery

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were acceptable; however, surrogate recovery could not be calculated in five samples due to the required analytical dilution.

Internal standards

The laboratory used internal standards for quantification. All internal standard results were within QC limits.

Matrix spike

MS/MSD samples were analyzed at the proper frequency. All percent recovery and RPD values were acceptable.

Laboratory control samples

LCS were analyzed at the proper frequency of one per extraction batch. All LCS percent recovery results were within the QAPP-specified control limits.

Compound identification and quantification

All compound IDs were reviewed and are acceptable. No false positives or negatives were found. Several compound quantification and reporting limit results were verified by recalculation. No transcription or calculation errors were found. When detected concentrations exceeded the calibration range of the instrument, extracts were diluted and reanalyzed to obtain results within the calibrated range. Results for compounds which exceeded calibrated range were rejected. The results for all other analytes in the dilution were rejected, so that a single usable result remains for all analytes.

The detected results for Aroclor 1260 from the two analytical columns in two samples exceeded the RPD QC limit of 40%. Consequently, the Aroclor 1260 results in these samples, T117-A11-SB-0.0-0.5 and T117-A12-SB-0.0-0.5, are J-qualified as estimated.

When comparing the results from the two analytical columns, the greater of the two values was reported.

Quantification limits for Aroclor 1254 were elevated in 26 samples because of chromatographic interferences caused by the presence of Aroclor 1260. The quantification limit for Aroclor 1260 was elevated in one additional sample due to chromatographic interferences.

4.4.5.3 TPH-Dx

Calibration

The initial calibration was conducted correctly, and all %RSD values were acceptable. CCVs were conducted at the required frequencies. All compounds had %Ds within the control limit of ±15% in the CCV with the following exceptions. The recovery for motor oil exceeded the control limit in two CCVs, ranging from 16.3% to 26.5%. Motor oil was detected in the eight associated samples, and these results were J-qualified to indicate potential low bias.

Blanks

Method blanks were extracted and analyzed at the proper frequency. No contaminants were detected in any of the method blanks at concentrations exceeding the reporting limit.

Surrogate recovery

Surrogates were added to all samples and blanks as required by the method. All surrogate recoveries were acceptable; however, surrogate recovery could not be accurately calculated in 20 samples because of the required analytical dilution as well as the high concentrations of diesel and/or motor oil.

Matrix spike

MS/MSD samples were analyzed at the proper frequency. All percent recovery and RPD values were acceptable.

Laboratory control samples

LCS were analyzed at the proper frequency of one per extraction batch. All LCS percent recovery results were within the QAPP-specified control limits.

Compound identification and quantification

All compound IDs were reviewed and are acceptable. No false positives or negatives were found; however, the chromatographic pattern for nine samples did not match those of the diesel or motor oil standards used for calibration. The laboratory noted that the presence of PCB Aroclors contributed to the response in the TPH-Dx analysis for these samples. As a result, the values from the following nine samples may be

biased high and are J-qualified as estimated: T117-B6-SB-01, T117-B7-SB-0.5-2.0, T117-B7-SB-2.0-3.5, T117-B7-SB-3.5-5.0, T117-B8-SB-01, T117-B8-SB-02, T117-B8-SB-214, T117-E3-SB-01 and T117-E3-SB-02.

4.4.5.4. TPH-G

Calibration

The initial calibration was conducted correctly, and the %RSD values were acceptable. CCVs were conducted at the required frequencies, and all %D were within QC limits.

Blanks

A method blank was extracted and analyzed at the proper frequency. Gasoline-range hydrocarbons were not detected in the method blank at a concentration exceeding the reporting limit.

Surrogate recovery

Surrogates were added to all samples and blanks. All surrogate recoveries were within QC limits.

Matrix spike

MS/MSD samples were analyzed at the proper frequency. All percent recovery and RPD values were acceptable.

Laboratory control samples

LCS and LCS duplicate samples were analyzed at the proper frequency. All LCS percent recovery results and RPD were within the acceptance limits.

Compound identification and quantification

The chromatographic pattern in sample T117-B8-SB-01 did not match that of the gasoline standard used for calibration; consequently, this gasoline result is J-qualified as estimated.

4.4.5.5 TPH-HCID

Calibration

Single-point initial calibrations were conducted correctly for gasoline-, diesel-, and motor oil-range hydrocarbons. Sample responses were correctly compared to the responses of the single-point calibrations in order to positively identify the hydrocarbon ranges.

Blanks

Method blanks were extracted and analyzed at the proper frequency. No gasoline-, diesel-, or motor oil-range hydrocarbons were detected in any of the method blanks at concentrations exceeding the reporting limit.

Surrogate recovery

Surrogates were added to all samples and blanks prior to extraction. All surrogate recoveries were acceptable; however, surrogate recovery could not be accurately calculated in sample T117-B8-SB-01 because of the high concentration of petroleum hydrocarbons.

Laboratory duplicate samples

Laboratory duplicate samples were analyzed at the proper frequency of one per ten samples. The laboratory duplicate samples were reviewed for confirmation of gasoline, diesel, and motor oil hydrocarbon ranges. RPD values were not calculated, as this method is designed to be a semi-quantitative analysis.

Compound identification and quantification

All compound IDs were reviewed and are acceptable. No false positives or negatives were found; however, the chromatographic patterns for several samples also indicate the presence of PCB Aroclors.

4.4.5.6 Pesticides

Calibration

Initial calibration and continuing calibration verifications were conducted as required by the method. The %RSDs and %Ds calculated for the all compounds were within QC limits.

Blanks

Method blanks were extracted and analyzed at the proper frequency. No target analytes were detected in any of the method blanks at concentrations exceeding the reporting limit.

Surrogate recovery

Surrogates were added to all samples and blanks. All surrogate recoveries were acceptable.

Matrix spike

MS/MSD samples were analyzed at the proper frequency. Percent recovery and RPD values were acceptable.

Laboratory control samples

LCS were analyzed at the proper frequency of one per extraction batch. All LCS percent recovery results were within the QAPP-specified control limits.

Compound identification and quantification

Quantification limits for dieldrin and 4,4′-DDT were elevated because of chromatographic interferences in five samples. The quantification limit for 4,4′-DDT was elevated in one additional sample due to interferences.

4.4.5.7 Metals

Calibration

The initial calibration was performed, and the frequency and analysis criteria of the initial calibration verification and continuing calibration verification were met.

Blanks

The required frequency of analysis of calibration blanks was met. Method blanks were also prepared and analyzed at the required frequency. Zinc was detected in one method blank. Samples were not qualified because concentrations were greater than five times the blank concentration.

Interference check sample analysis

Interference check samples (ICSs) were analyzed for all metals at the beginning of the analytical sequences. The ICS results were within QC limits of 80 to 120% for all reported analytes. Several field samples contained concentrations of the interfering element iron at levels greater than the concentration in the ICS solutions. In these cases, the ISC Solution A (ICSA) and ISC Solution AB (ICSAB) results were carefully evaluated. All ICSA results for unspiked analytes were less than the method detection limit, indicating that no significant interferences were present.

Matrix spike

Matrix spike samples were prepared and analyzed at the required frequency of one per batch. All matrix spike results were within the QC limits of 70 to 130% with the following exceptions. The percent recovery for lead was 137% in SDG IY82; as a result, all associated detects were J-qualified. In SDG IZ04, the percent recovery values for arsenic (65.1%), copper (57.8%), and lead (58.1%) resulted in the J/UJ-qualification of all associated results.

Laboratory duplicate samples

Laboratory duplicate samples were analyzed at the proper frequency of one per batch. The laboratory duplicate samples had RPD values within QC limits of 30% with the following exceptions. The RPD for chromium (31%) in SDG IY72 resulted in

J-qualification of all associated samples. The RPD values for copper (78.6%) and zinc (82.8%) in SDG IY82 resulted in J/UJ-qualification of associated results. In IY82, arsenic was outside of secondary acceptance limits; the sample concentration was less than five times the RL, while the difference between the sample and duplicate was greater than two times the RL. These results were also J/UJ-qualified.

Laboratory control samples

LCS were analyzed at the required frequencies, and all percent recoveries were within acceptance limits.

Sample result verification and quantification

Several results were verified by recalculation from the raw data. No calculation or transcription errors were found. Sample E1-SB-5.0-6.5A had a high concentration of iron, which required an analytical dilution of 1:5 to minimize analytical interferences. As a result, the arsenic RL of 20 mg/kg was above the QAPP-specified minimum RL of 5 mg/kg.

4.4.5.8 Total solids, grain size, and total organic carbon

Calibration

All criteria for the initial calibration were met. Continuing calibrations were also analyzed at the proper frequency, and all percent recovery values were acceptable.

Blanks

Method blanks were analyzed at the proper frequency. No analytes were detected in any of the method blanks at concentrations exceeding the reporting limit. Initial and continuing calibration blanks were also analyzed at the proper frequency for TOC. TOC was not detected above the reporting limit.

Matrix spike

Matrix spike samples were analyzed for TOC at the proper frequency. All results were within acceptance limits.

Laboratory duplicate samples

Laboratory duplicate and/or triplicate samples were analyzed at acceptable frequencies. All results were within control limits of 30%.

Laboratory control samples and standard reference material

LCS and standard reference material samples were analyzed for TOC at the proper frequency. All results were within QC limits.

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