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Primary Document

Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky

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Prepared for the
U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
PADUCAH REMEDIATION SERVICES, LLC
managing the
Environmental Remediation Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-06EW05001

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ACRONYMS

ACGIH	American Conference of Governmental Industrial Hygienists
ACO	Administrative Consent Order
AHA	activity hazard analysis
AIHA	American Industrial Hygiene Association
AL	action level
ALARA	as low as reasonably achievable
amsl	above mean sea level
ANSI	American National Standards Institute, Inc.
AOC	area of concern
ARAR	applicable or relevant and appropriate requirement
AT123D	Analytical Transient 1-,2-,3- Dimensional
BERA	Baseline Ecological Risk Assessment
BGOU	Burial Grounds Operable Unit
bgs	belowground surface
BHHRA	baseline human health risk assessment
BRA	baseline risk assessment
CAAS	criticality accident alarm system
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COE	U.S. Army Corps of Engineers
COPC	chemical of potential concern
cpm	counts per minute
CRZ	Contamination Reduction Zone
CSM	Conceptual Site Model
CSOU	Comprehensive Site Operable Unit
CZ	construction zone
D&D	Decontamination and Decommissioning
DCN	Design Change Notice
DMC	Document Management Center
DMIP	data management implementation plan
DMSA	DOE Material Storage Area
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
DQO	data quality objective
DUF_6	depleted uranium hexafluoride
EDD	electronic data deliverable
ELCR	excess lifetime cancer risk
EM	electromagnetometer
EMS	Environmental Management System
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ER	Environmental Restoration
ES&H	Environment, Safety, and Health
EZ	exclusion zone
FCN	Field Change Notice
FCR	Field Change Request

FFA	Federal Facility Agreement
FI/CR	Final Inventory/Characterization Report
FIDLER	Field Instrument for the Detection of Low Energy Radiation
FLM	front line manager
FS	feasibility study
FSP	field sampling plan
FTM	Field Team Manager
GDP	gaseous diffusion plant
GIS	geographic information system
GPS	Global Positioning System
GWOU	Groundwater Operable Unit
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
HF	hydrogen fluoride
HI	hazard index
HP	Health Physics
HSWA	Hazardous and Solid Waste Amendments
HU	hydrostratigraphic unit
HVAC	heating, ventilation, and air conditioning
IDW	investigation-derived waste
ISMS	Integrated Safety Management System
KAR	*Kentucky Administrative Record*
KDEP	Kentucky Department for Environmental Protection
KDWM	Kentucky Division of Waste Management
KPDES	Kentucky Pollutant Discharge Elimination System
LBC	Little Bayou Creek
LCS	Laboratory Control Sample
LLW	low-level waste
MDC	minimum detectable concentration
MDL	method detection limit
MEPAS	Multimedia Environmental Pollutant Assessment System Model
MS	matrix spike
MSD	matrix spike duplicate
MSDS	material safety data sheet
NA	not applicable
NaI	sodium iodide
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NCR	Nonconformance Report
ND	nondetect
NEPA	National Environmental Policy Act
NFA	No Further Action
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
NSDD	North-South Diversion Ditch
OA	observational approach
OREIS	Oak Ridge Environmental Information System
ORPS	Occurrence Reporting System
OSHA	Occupational Safety and Health Administration
OSWER	Office of Solid Waste and Emergency Response

OU	operable unit
PAH	polycyclic aromatic hydrocarbon
PARCC	precision, accuracy, representativeness, completeness, and comparability
PCB	polychlorinated biphenyl
PEL	permissable exposure limit
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
pH	negative logarithm of the hydrogen-ion concentration
PM	Project Manager
PPE	personal protective equipment
ppm	parts per million
PRG	Preliminary Remediation Goal
PSS	Plant Shift Superintendent
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RADCON	radiation control
RAGS	Risk Assessment Guidance
RAO	remedial action objective
RAR	Remedial Action Report
RCRA	Resource Conservation and Recovery Act
RCT	Radiological Control Technician
RCW	recirculating water
RESRAD	Residual Radioactive Materials Model
RFD	Request for Disposal
RGA	Regional Gravel Aquifer
RGO	remedial goal option
RI	remedial investigation
ROD	Record of Decision
RTL	ready-to-load
RWP	Radiological Work Permit
SADA	Spatial Analysis and Decision Assistance
SAP	Sampling and Analysis Plan
SAR	SWMU Assessment Report
SE	Site Evaluation
SERA	screening-level ecological risk assessment
SESOIL	Seasonal Soil Compartment Model
S&H	safety and health
SHR	Safety & Health Representative
SI	site investigation
SMO	Sample Management Office
SMP	site management plan
SOP	standard operating procedure
SOU	Soils Operable Unit
SOW	statement of work
SRM	standard reference material
SVOA	semivolatile organic analyte
SVOC	semivolatile organic compound
SWMU	solid waste management unit
SWOU	Surface Water Operable Unit
SZ	support zone

TAL	target analyte list
TCA	trichloroethane
TCE	trichloroethene
TCL	target compound list
TCLP	Toxicity Characteristic Leaching Procedure
TLV	threshold limit value
TSCA	Toxic Substances Control Act
TVA	Tennessee Valley Authority
UCL	upper confidence limit
UCRS	Upper Continental Recharge System
UF_4	uranium tetrafuoride
UF_6	uranium hexafluoride
USEC	United States Enrichment Corporation
USGS	U.S. Geological Survey
VOA	volatile organic analyte
VOC	volatile organic compound
WAC	waste acceptance criteria
WAG	Waste Area Group
WGP	Waste Generation Plan
WKWMA	West Kentucky Wildlife Management Area
WMC	Waste Management Coordinator
WMP	waste management plan
XRF	X-ray fluorescence

EXECUTIVE SUMMARY

The Paducah Gaseous Diffusion Plant (PGDP) is an active uranium enrichment facility that is owned by the U.S. Department of Energy (DOE). DOE is conducting environmental restoration activities at PGDP in accordance with the requirements of the Paducah Federal Facility Agreement (FFA), which coordinated the Resource Conservation and Recovery Act (RCRA) and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) cleanup requirements. PGDP was placed on the National Priorities List in 1994. DOE, the U.S. Environmental Protection Agency (EPA), and the Commonwealth of Kentucky (Kentucky) entered into an FFA in 1998 (EPA 1998).

This Remedial Investigation/Feasibility Study (RI/FS) Work Plan has been developed to outline the RI/FS requirements for the Soils Operable Unit (SOU) at PGDP. The solid waste management units (SWMUs) and Areas of Concern (AOCs) associated with the SOU are listed in Appendix 4 of the Paducah Site Management Plan (SMP) (DOE 2009a). The SWMUs/AOCs being addressed under this work plan are 1, 11, 12, 13, 14, 15, 16, 19, 20, 26, 27, 31, 32, 40, 47, 56, 57, 74, 75, 76, 77, 78, 79, 80, 81, 99, 135, 137, 138, 153, 154, 155, 156, 158, 160, 163, 165, 169, 170, 172, 176, 177, 180, 181, 194, 195, 196, 200, 211, 212, 213, 214, 215, 216, 217, 218, 219, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229, 483, 488, 489, 493, 517, 518, 520, 531, and 561 and 3 AOCs 204, 492, and 541. Seven additional locations that have been added to this document and that will be included in the 2010 SMP are SWMU/AOC 486, 487, 562, 563, 564, 565, and 567.

PROJECT OBJECTIVES AND GOALS

The goals for the SOU RI/FS are consistent with those established in the Paducah FFA and the SMP (DOE 2009a) negotiated among DOE, EPA, and Kentucky. The primary objectives for the SOU presented in the SMP are to protect human health and the environment by taking actions necessary to prevent both on-site and off-site human exposure that presents an unacceptable risk and implement actions that provide the greatest opportunities to achieve significant risk reduction before site closure.

The goals of this RI/FS are as follows:

- Goal 1: Characterize Nature of Source Zone—characterize the nature of contaminant source materials using existing data and, if required, by collecting additional data;

- Goal 2: Define Extent of Source Zone and Contamination in Soil—define the extent (vertical and lateral) and magnitude of contamination in soils and perform a multimedia evaluation to ensure that all exposure pathways for the subject units are assessed adequately to support cleanup decisions;

- Goal 3: Determine Soil Transport Mechanisms and Pathways—gather existing data and, if necessary, collect additional data to analyze contaminant transport mechanisms;

- Goal 4: Complete a baseline human health risk assessment and screening ecological risk assessment for the SOU; and

- Goal 5: Complete an Evaluation of Remedial Alternatives—determine if the existing data are sufficient to evaluate alternatives that will reduce risk to human health and the environment and support a No Further Action (NFA).

This document utilizes a compilation of sampling information collected on and around PGDP over the course of the last 20 years. The table below identifies the previously completed reports and/or investigations primarily used to prepare this document.

Summary of Historical Information

Year	Title	SWMUs/AOCs
1989	Inventory of Polychlorinated Biphenyls (PCBs) Volume 1 (MMES 1989)	75, 78
1991	Results of the Site Investigation, Phase I (CH2M HILL 1991)	1, 11, 12, 14, 15, 16, 20, 26, 27, 31, 32, 56, 57, 74, 75, 77, 78, 79, 80, 81, 99, 135, 137
1992	Groundwater Phase III Investigation (Clausen, *et al.* 1992)	99
1992	Results of the Site Investigation, Phase II (CH2M HILL 1992)	1, 11, 12, 13, 14, 15, 16, 19, 20, 26, 27, 31, 32, 40, 47, 56, 57, 74, 75, 77, 78, 79, 80, 81, 99, 135, 137
1993	Interim Corrective Measure Work Plan for Containment of Scrap Yard Sediment Runoff (DOE 1993)	12, 14, 15
1994	RFI Work Plan for Waste Area Group 13 at the Paducah Gaseous Diffusion Plant (DOE 1994a)	138
1994	Interim Corrective Measures Report & Operation and Maintenance Plan for Containment of Scrap Yard Sediment Runoff at the PGDP (DOE 1994b)	12, 13, 14, 15, 16
1994	Waste Area Group 13 and 6 Reprioritization and Special Requests (KDEP 1994)	138
1995	C-400 Process and Structure Review (DOE 1995a)	11, 26, 40, 47
1995	Final Site Evaluation Report for the Outfall 010, 011, and 012 Areas, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1995b)	204
1995	Northeast Plume Preliminary Characterization Summary Report (DOE 1995c)	99, 194
1995	Treatability Study Report for Waste Area Group 23 PCB Sites at PGDP (DOE 1995d)	32, 56, 57, 74, 79, 80, 81
1995	Work Plan for Phase I of the Waste Area Group 6 Remedial Investigation Industrial Hydrogeologic Study at Paducah Gaseous Diffusion Plant (DOE 1995e)	11, 26, 40, 47
1996	Feasibility Study for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27 at the Paducah Gaseous Diffusion Plant (DOE 1996a)	1, 32, 56, 57, 80, 81

Year	Title	SWMUs/AOCs
1996	Phase I: Paducah Gaseous Diffusion Plant Waste Area Group 6 Industrial Hydrogeologic Study (DOE 1996b)	11, 26, 40, 47
1997	Action Memorandum for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1997a)	1, 32, 56, 57, 74, 79, 80, 81
1997	Integrated Remedial Investigation/Feasibility Study Work Plan for Waste Area Group 6 (DOE 1997b)	11, 26, 40, 47
1997	Proposed Remedial Action Plan for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites (DOE 1997c)	1, 56, 57, 80, 81
1997	Treatability Study Program Plan for Waste Area Group 6 at the Paducah Gaseous Diffusion Plant (DOE 1997d)	11, 26, 40, 47
1997	Sampling and Analysis Plan for the Site Evaluation of Waste Area Group 9 and 11 at the Paducah Gaseous Diffusion Plant (DOE 1997e)	19, 20, 27, 165, 170
1997	Information Package for Waste Area Grouping 16 & 19 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1997f)	137, 153, 155, 156, 135, 154, 160, 163
1998	Work Plan for Waste Area Group 28 Remedial Investigation/Feasibility Study and Waste Area Group 8 Preliminary Assessment/Site Investigation at the Paducah Gaseous Diffusion Plant (DOE 1998a)	99, 194, 194
1998	Integrated Remedial Investigation/Feasibility Study Work Plan for Waste Area Group 27 at Paducah Gaseous Diffusion Plant (DOE 1998b)	1, 74, 196, 211
1998	Proposed Remedial Action Plan for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites (DOE 1998c)	1, 74, 196, 211
1998	Sampling and Analysis, Quality Assurance, and Data Management Plan for the Site Evaluation of Waste Area Groupings 16 and 19 (DOE 1998d)	137, 153, 155, 156, 135, 154, 160, 163
1999	Remedial Investigation Report for Waste Area Group 27 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1999a)	1, 74, 196, 211
1999	Remedial Investigation Report for Waste Area Group 6 (C-400) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1999b)	11, 26, 40, 47
1999	WAGs 9 and 11 Site Evaluation Report at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 1999c)	19, 20, 27, 165, 170
1999	Engineering Evaluation/Cost Analysis (EE/CA) for Scrap Metal Removal at PGDP (DOE 1999d)	13, 14, 15, 16, 518, 520
1999	Engineering Evaluation/Cost Analysis for Drum Mountain at PGDP (DOE 1999e)	12
1999	Proposed Remedial Action Plan for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites (DOE 1999f)	1, 74, 196, 211
1999	Remedial Investigation/Feasibility Study Work Plan for the Surface Water Operable Unit at PGDP (DOE 1999g)	1, 74, 165
1999	Residual Risk Evaluation Report for Waste Area Group 23 and Solid Waste Management Unit 1 of Waste Area Group 27, PCB Sites (DOE 1999h)	1, 74, 196, 211

Year	Title	SWMUs/AOCs
1999	Surfactant Enhanced Subsurface Remediation Treatability Study Report for the WAG 6 (DOE 1999i)	11, 26, 40, 47
2000	Action Memorandum for Drum Mountain at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 2000a)	12
2000	Remedial Investigation Report for Waste Area Group 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 2000b)	99, 194, 204
2000	Removal Action Work Plan for Drum Mountain at the PGDP (DOE 2000c)	12
2001	Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant (DOE 2001a)	12, 13, 14, 15, 16
2001	Baseline Human Health Risk Assessment and Screening Ecological Risk Assessment for the Proposed Site of the UF_6 Conversion Facility, Including the Eastern Portion of SWMU 194, McGraw Construction Facilities (South Side), at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 2001b)	194
2001	Depleted Uranium Hexafluoride ($DUF_{6)}$ Conversion Facility Site Characterization Report, Paducah Gaseous Diffusion Plant, Paducah, Kentucky (BJC 2001)	194
2002	Final Inventory/Characterization Report for the OS-02 (DOE 2002a), OS-03 (DOE 2002b), OS-04 (DOE 2002c), OS-05 (DOE 2002d), OS-06 (DOE 2004a), OS-07 (DOE 2004b), OS-09 (DOE 2002e), OS-10 (DOE 2002f), OS-11 (DOE 2002g), OS-12 (DOE 2004c), OS-13 (DOE 2002h), OS-14 (DOE 2001c), OS-15 (DOE 2004d), OS-16 (DOE 2004e), OS-17 (DOE 2004f), OS-18 (DOE 2003a) Department of Energy Material Storage Area at the Paducah Gaseous Diffusion Plant	213, 214, 215, 216, 217, 218, 220, 221, 222, 223, 224, 225, 226, 227, 228, 229
2007	Engineering Evaluation/Cost Analysis for Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE 2007)	19, 40, 181

During development of this work plan, existing data were evaluated relative to the data quality objectives defined in this work plan. The evaluation shows what data gaps exist for each SWMU/AOC. The SWMUs/AOCs were divided into seven divisions to assist in sampling plan development. These divisions are Former Facility Site, PCBs, Soil/Rubble Pile, Scrap Yard, Underground/Tank, Storage Area, and Chromium Areas.

1. INTRODUCTION

The Paducah Gaseous Diffusion Plant (PGDP), located within the Jackson Purchase region of western Kentucky, is an active uranium enrichment complex that is owned by the U.S. Department of Energy (DOE). PGDP was owned and managed, first by the Atomic Energy Commission and the Energy Research and Development Administration, DOE's predecessors; DOE then managed PGDP until 1993. On July 1, 1993, the United States Enrichment Corporation assumed management and operation of the PGDP enrichment complex under a lease agreement with DOE. DOE, however, still owns the enrichment complex and is responsible for environmental restoration (ER) activities associated with legacy operation of PGDP (CERCLIS #KY8-890-008-982). DOE is the lead agency for remedial actions, and the U.S. Environmental Protection Agency (EPA) and the Kentucky Department for Environmental Protection (KDEP) have regulatory oversight responsibilities.

In 1988, off-site groundwater contamination was detected in groundwater wells north of PGDP. Consequently, DOE and EPA Region 4 entered into an Administrative Consent Order (ACO) under Section 104 and 106 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). In 1994, PGDP was placed on the National Priorities List (NPL), a list of sites designated by EPA as having the highest priority for site remediation. Additionally, Section 120 of CERCLA requires NPL sites to enter into a Federal Facility Agreement (FFA). An FFA was finalized among DOE, EPA, and the Commonwealth of Kentucky (Kentucky) in 1998.

Source units and areas of contamination at PGDP have been combined into operable units (OUs) for evaluation of remedial actions. These OUs include the Surface Water Operable Unit (SWOU), the Burial Grounds Operable Unit (BGOU), the Soils Operable Unit (SOU), the Groundwater Operable Unit (GWOU), and the Decontamination and Decommissioning (D&D) OU. Each OU is designed to remediate contaminated media associated with PGDP. After completion of these activities, the Comprehensive Site OU (CSOU) evaluation will be conducted, with implementation of additional actions, as needed, to ensure long-term protectiveness.

For the SOU, a phased approach is used to meet the primary objectives. A phased approach is used because the complex soil contamination problems at the site (i.e., ongoing operational activities, multiple sources of contamination, and the potential for a complicated contaminant fate and transport process) prevent PGDP from implementing one comprehensive, cost-effective remedy at this time. Additionally, the phased approach allows the site to use information gained in earlier phases of the cleanup to refine and implement subsequent cleanup objectives and actions in support of final cleanup status. Slabs, subsurface structures, and underlying soils left after completing D&D of the operating gaseous diffusion plant (GDP), will be addressed in subsequent actions.

The following steps, illustrated in Figure 1.1, are being used at PGDP to implement the phased approach for the SOU [adapted from the Site Management Plan (SMP) (DOE 2009a)]:

(1) Prevent human exposure to contamination presenting an unacceptable risk (short-term protection goal);

(2) Prevent or minimize further off-site migration (intermediate performance goals); and

(3) Reduce, control, or minimize contaminated soil hot spots contributing to off-site contamination (intermediate performance goals).

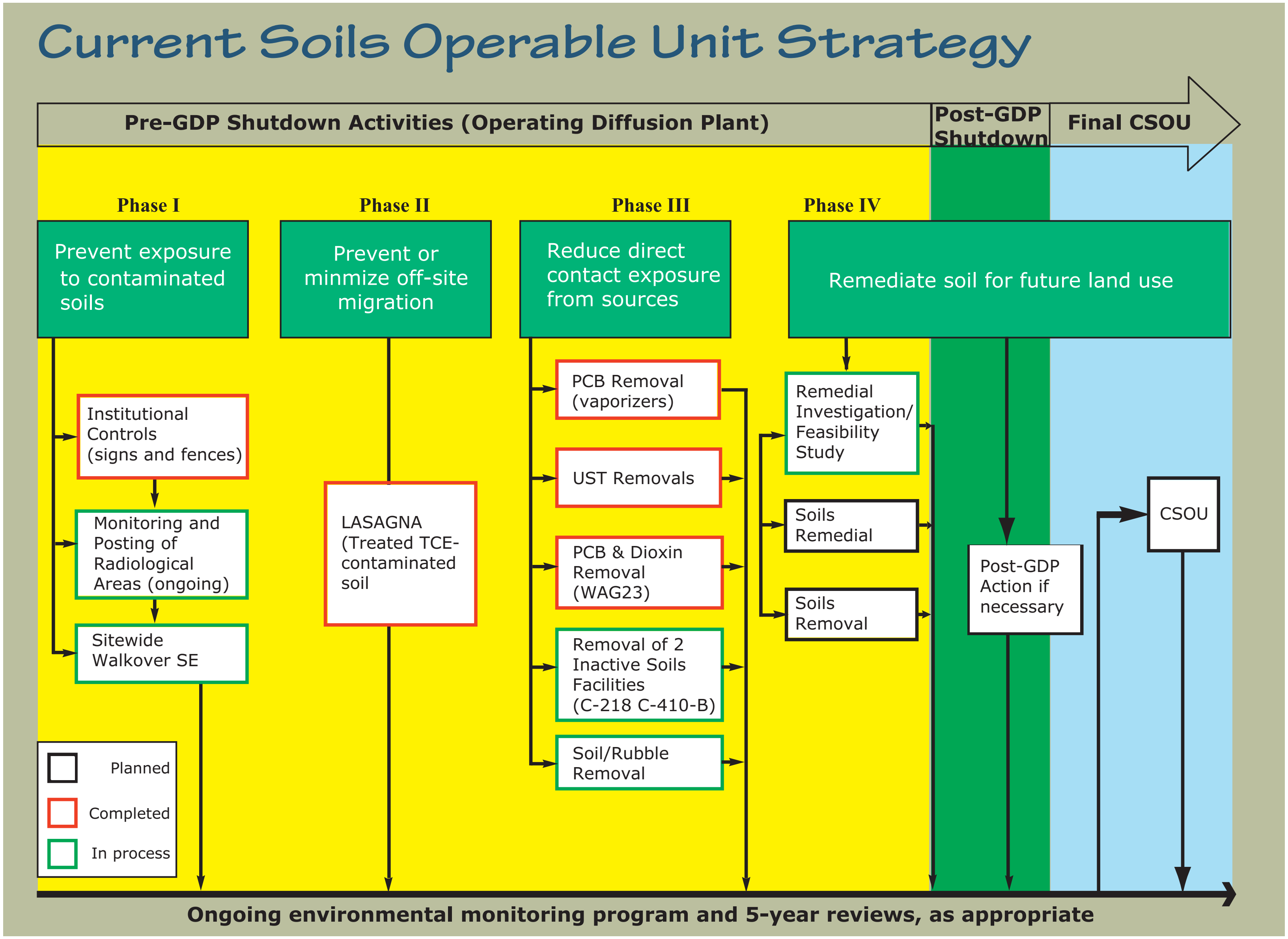

Figure 1.1. SOU Paducah Soils Strategy

Data collected during the Remedial Investigation/Feasibility Study (RI/FS) may be incorporated into the GWOU and SWOU and used in development of complex-wide models, as appropriate. Incorporation of these data will allow the significant sources of groundwater contamination to be considered in the human health risk assessment of the GWOU. For surface water, data collected during the RI/FS concerning contaminant migration to the surface water may be used along with the complex-wide surface water transport models developed for the human health and ecological risk assessments of the SWOU.

1.1 PROJECT SCOPE

The general scope of this work plan is the Solid Waste Management Units (SWMUs)/Areas of Concern (AOCs) Evaluation, which is to conduct an RI, baseline human health risk assessment (BHHRA), screening ecological risk assessment (SERA), evaluation of remedial alternatives, and remedy selection for SWMUs/AOCs associated with the Soils OU. The primary focus of the SOU RI/FS will be to (1) collect field and analytical data necessary to determine the nature and extent of soil contamination at SOU SWMUs/AOCs; (2) support the completion of a BHHRA; (3) and evaluate appropriate remedial alternatives for each targeted area.

This RI/FS Work Plan has been prepared to implement additional investigations for the SOU and to provide information to fill data gaps. The RI/FS Work Plan follows the outline prescribed in the FFA. The document utilizes a compilation of sampling information collected at and around PGDP over the course of the last 20 years. Data were compiled and screened against significant chemicals of potential concern (COPCs) listed in the *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* Volume *1: Human Health, Volume 2: Ecological* (DOE 2001d). Significant COPCs for the PGDP are listed in Table 1.1.

Table 1.1. Significant Chemicals of Potential Concern at the PGDP[1]

Inorganic Chemicals		Organic Compounds		Radionuclides	
Analyte	**CAS Number**	**Analyte**	**CAS Number**	**Analyte**	**CAS Number**
Antimony	7440360	Acenaphthene	83329	Americium-241	14596102
Arsenic	7440382	Acenaphthylene	208968	Cesium-137+D	10045973
Beryllium	7440417	Acrylonitrile	107131	Cobalt-60	10198400
Cadmium	7440439	Anthracene	120127	Neptunium-237+D	13994202
Chromium III	16065831	Benzene	71432	Plutonium-238	13981163
Chromium VI	18540299	Carbon tetrachloride	56235	Plutonium-239	15117483
Copper	7440508	Chloroform	67663	Plutonium-240	14119336
Iron	7439896	1,1-Dichloroethene	75354	Radium-226+D	13982633
Lead	7439921	1,2-Dichloroethene (mixed)	540590	Radon-222+D	14859677
Manganese	7439965	*trans*-1,2-Dichloroethene	156605	Stontium-90+D	10098972
Mercury	7439976	*cis*-1,2-Dichloroethene	156592	Technetium-99	14133767
Molybdenum	7439987	Ethylbenzene	100414	Thorium-228	14274829
Nickel	7440020	Fluoranthene	206440	Thorium-230	14269637
Selenium	7782492	Fluorene	86737	Thorium-232	7440291
Silver	7440224	Naphthalene	91203	Uranium-234	13966295
Thallium	7440280	Phenanthrene	85018	Uranium-235+D	15117961
Uranium	NA	Pyrene	129000	Uranium-238+D	7440611
Vanadium	7440622	Tetrachloroethene	127184		
Zinc	7440666	Trichloroethene	79016		
		Total Dioxins/Furans	1746016		
		2,3,7,8-HpCDD	37871004		
		2,3,7,8-HpCDF	38998753		
		2,3,7,8-HxCDD	34465468		
		2,3,7,8-HxCDF	55684941		
		OCDD	3268879		
		OCDF	39001020		
		2,3,7,8-PeCDD	36088229		

Table 1.1. Significant Chemicals of Potential Concern at the PGDP[1] (Continued)

Inorganic Chemicals		Organic Compounds		Radionuclides	
Analyte	CAS Number	Analyte	CAS Number	Analyte	CAS Number
		1,2,3,7,8-PeCDF	57117416		
		2,3,4,7,8-PeCDF	57117314		
		2,3,7,8-TCDD	1746016		
		2,3,7,8-TCDF	5127319		
		Total PAHs	50328		
		Benz(a)anthracene	56553		
		Benzo(a)pyrene	50328		
		Benzo(b)fluoranthene	205992		
		Benzo(k)fluoranthene	207089		
		Chrysene	218019		
		Dibenz(a,h)anthracene	53703		
		Indeno(1,2,3-cd)pyrene	193395		
		Total PCBs	1336363		
		Aroclor 1016	12674112		
		Aroclor 1221	11104282		
		Aroclor 1232	11141165		
		Aroclor 1242	53469219		
		Aroclor 1248	12672296		
		Aroclor 1254	11097691		
		Aroclor 1260	11096825		
		Vinyl chloride	75014		
		Xylenes (Mixture)	1330207		
		p-Xylene	106423		
		m-Xylene	108383		
		o-Xylene	95476		

CAS = Chemical Abstract Service
[1] This list of chemicals, compounds, and radionuclides was compiled from COPCs retained as COCs in baseline risk assessments performed at PGDP between 1990 and 2000 (DOE 2001d).

The RI/FS process is an interactive one in which DOE, EPA, and Kentucky evaluate and conduct or revise work conducted during various stages of the investigation. To facilitate implementation of the RI/FS work plan, flexibility will be included in the sampling plans for each SWMU/AOC to allow some adjustments to be made in the field.

1.1.1 SOU SWMU/AOC Evaluation

The scope of the SWMU/AOC Evaluation includes an RI, BHHRA, SERA, evaluation of remedial alternatives, remedy selection, and implementation of actions (i.e., early removal, radiological postings), as necessary, for protection of human health and the environment for the following SWMUs/AOCs.

No.	SWMU/AOC #	Location	Description	Work Plan Division
1	1	C-747-C	Oil Landfarm	Former Facility Site
2	11	C-400	C-400 Trichloroethylene Leak Site	Underground/Tank
3	12	C-747-A	UF_4 Drum Yard	Scrap Yard
4	13	C-746-P	Clean Scrap Yards	Scrap Yard
5	14	C-746-E	Contaminated Scrap Yard	Scrap Yard
6	15	C-746-C	Scrap Yard	Scrap Yard

No.	SWMU/AOC #	Location	Description	Work Plan Division
7	16	C-746-D	Scrap Yard	Scrap Yard
8	19	C-410-B	Hydrogen Fluoride (HF) Neutralization Lagoon	Soil/Rubble Pile
9	20	C-410-E	Emergency Holding Pond	Soil/Rubble Pile
10	26	C-400 to C-404	Underground Transfer Line	Underground/Tank
11	27	C-722	Acid Neutralization Tank	Underground/Tank
12	31	C-720	Compressor Pit Water Storage Tank	Underground/Tank
13	32	C-720	Clean Waste Oil Tanks	Underground/Tank
14	40	C-403	Neutralization Tank	Underground/Tank
15	47	C-400	Technetium Storage Tank Area	Storage Area
16	56	C-540-A	PCB Staging Area	PCBs
17	57	C-541-A	PCB Waste Staging Area	PCBs
18	74	C-340	PCB Transformer Spill Site	PCBs
19	75	C-633	PCB Spill Site	PCBs
20	76	C-632-B	Sulfuric Acid Storage Tank	Underground/Tank
21	77	C-634-B	Sulfuric Acid Storage Tank	Underground/Tank
22	78	C-420	PCB Spill Site	PCBs
23	79	C-611	PCB Spill Site	PCBs
24	80	C-540	PCB Spill Site	PCBs
25	81	C-541	PCB Spill Site	PCBs
26	99	C-745	Kellogg Bldg. Site	Former Facility Site
27	135	C-333	PCB Soil Contamination	PCBs
28	137	C-746-A	Inactive PCB Area	PCBs
29	138	C-100	Southside Berm	Soil/Rubble Pile
30	153	C-331	PCB Soil Contamination (West)	PCBs
31	154	C-331	PCB Soil Contamination (Southeast)	PCBs
32	155	C-333	PCB Soil Contamination (West)	PCBs
33	156	C-310	PCB Soil Contamination (West Side)	PCBs
34	158	C-720	Chilled Water System Leak Site	Chromium Areas
35	160	C-745	Cylinder Yard Spoils (PCB soils)	PCBs
36	163	C-304	Bldg./Heating, Ventilation, and Air Conditioning (HVAC) Piping System (Soil Backfill)	PCBs
37	165	C-616-L	Pipeline & Vault Soil Contamination	Underground/Tank
38	169	C-410-E	HF Vent Surge Protection Tank	Chromium Area
39	170	C-729	Acetylene Bldg. Drain Pits	Underground/Tank
40	172	C-726	Sandblasting Facility	Former Facility Site
41	176	C-331	RCW Leak Northwest Side	Chromium Areas
42	177	C-331	Leak East Side	Chromium Areas
43	180	WKWMA	Outdoor Firing Range (WKWMA)	Soil/Rubble Pile
44	181	West Side	Outdoor Firing Range (PGDP)	Soil/Rubble Pile
45	194	DUF Facility	McGraw Construction Facilities (Southside)	Former Facility
46	195	SW PGDP	Curlee Road Contaminated Soil Mounds	Soil/Rubble Pile
47	196	C-746-A	Septic System	Former Facility
48	200	Central PGDP	Soil Contamination South of TSCA Waste Storage Facility	Storage Area
49	204	Dyke Road	Dyke Road Historical Staging Area	Soil/Rubble Pile
50	211	C-720	TCE Spill Site Northeast	Former Facility
51	212	C-745-A	Radiological Contamination Area	Storage Area

No.	SWMU/AOC #	Location	Description	Work Plan Division
52	213	C-745-A	OS-02	Storage Area
53	214	C-611	OS-03	Storage Area
54	215	C-743	OS-04	Storage Area
55	216	C-206	OS-05	Storage Area
56	217	C-740	OS-06	Storage Area
57	218	C-741	OS-07	Storage Area
58	219	C-728	OS-08	PCBs
59	220	C-409	OS-09	Storage Area
60	221	C-635	OS-10	Storage Area
61	222	C-410	OS-11	Storage Area
62	223	C-301	OS-12	Storage Area
63	224	C-340	OS-13	Storage Area
64	225	C-533-1	OS-14	Storage Area
65	226	C-745-B	OS-15	Storage Area
66	227	C-746-B	OS-16	Storage Area
67	228	C-747-B	OS-17	Storage Area
68	229	C-746-F	OS-18	Storage Area
69	483	C-603	Nitrogen Generating Facilities	Former Facility
70	486	West of PGDP	Rubble Pile WKWMA	Soil/Rubble Pile
71	487	West of PGDP	Rubble Pile WKWMA	Soil/Rubble Pile
72	488	C-410 Trailers	PCB Contamination Area by C-410 Trailer Complex	PCBs
73	489	C-710 North	Septic Tank, North of C-710	Former Facility
74	492	Outfall 011	Contaminated Soil Area, North of Outfall 10	Soil/Rubble Pile
75	493	Outfall 001	Concrete Rubble Piles Near Outfall 001	Soil/Rubble Pile
76	517	West of PGDP	Rubble and Debris Erosion Control Fill Area	Soil/Rubble Pile
77	518	C-746-P1	Field south of C-746- P1 Clean Scrap Yard	Scrap Yard
78	520	C-746-A	Scrap Material West of C-746-A	Scrap Yard
79	531	C-746-A South	Aluminum Slag Reacting Area	Former Facility
80	541	Outfall 011	Contaminated area by Outfall 011	Soil/Rubble Pile
81	561	Near Outfall 2	Soil Pile I	Soil/Rubble Pile
82	562	North of Soil Pile I, West of Little Bayou Creek (LBC)	Soil Piles D, H, and J in Subunit 1	Soil/Rubble Pile
83	563	North of Outfall 12, West of LBC	Soil Piles 20 and BW in Subunit 4	Soil/Rubble Pile
84	564	East of NSDD, North of P, S, and T Landfill	Soils Pile AT in Subunit 5	Soil/Rubble Pile
85	565	North of C-611 WTP	Along Bayou Creek north of C-611 Water Treatment Plant. Rubble Area K-19	Soil/Rubble Pile
86	567	Near Outfall 013 and west of LBC	Contaminated Soil Area K013	Soil/Rubble Pile

Figure 1.2 shows the location of these SWMUs/AOCs. Project uncertainties that potentially could affect the scope and schedule include the amount and scope of RI characterization needed (e.g., field samples, test pits, borings, etc.) and whether additional actions beyond remediation will be required. The SMP includes a planning date for a D1 Record of Decision (ROD) of the first quarter, 2013 (DOE 2009a).

The objective of this investigation is to determine the nature and extent of contamination in the soils to a depth of 10 ft below ground surface (bgs) or up to 16 ft bgs at infrastructure (e.g., pipelines). For all source units, the initial focus of the investigation will be surface and subsurface soil contamination to a depth of 4 ft bgs. If contamination at the 4 ft bgs is found, then secondary sources from the unit located in the subsurface soil, which extend to a depth of 10 ft bgs, will be investigated. Any contamination that is found to extend past the depths specified in this investigation will be addressed under another OU. If a SWMU/AOC has a pipeline located within its boundary, then sampling will occur to a depth of 1 ft below the invert of the pipeline.

If interim remedial or removal actions are implemented at any of the SWMUs/AOCs addressed in this work plan before the development of a final remedy, they will be consistent with the anticipated final action for the SOU and will contribute to the final remediation of the site. Remedial alternatives will be screened at the time the remedial action objectives (RAOs) for the SOU are developed.

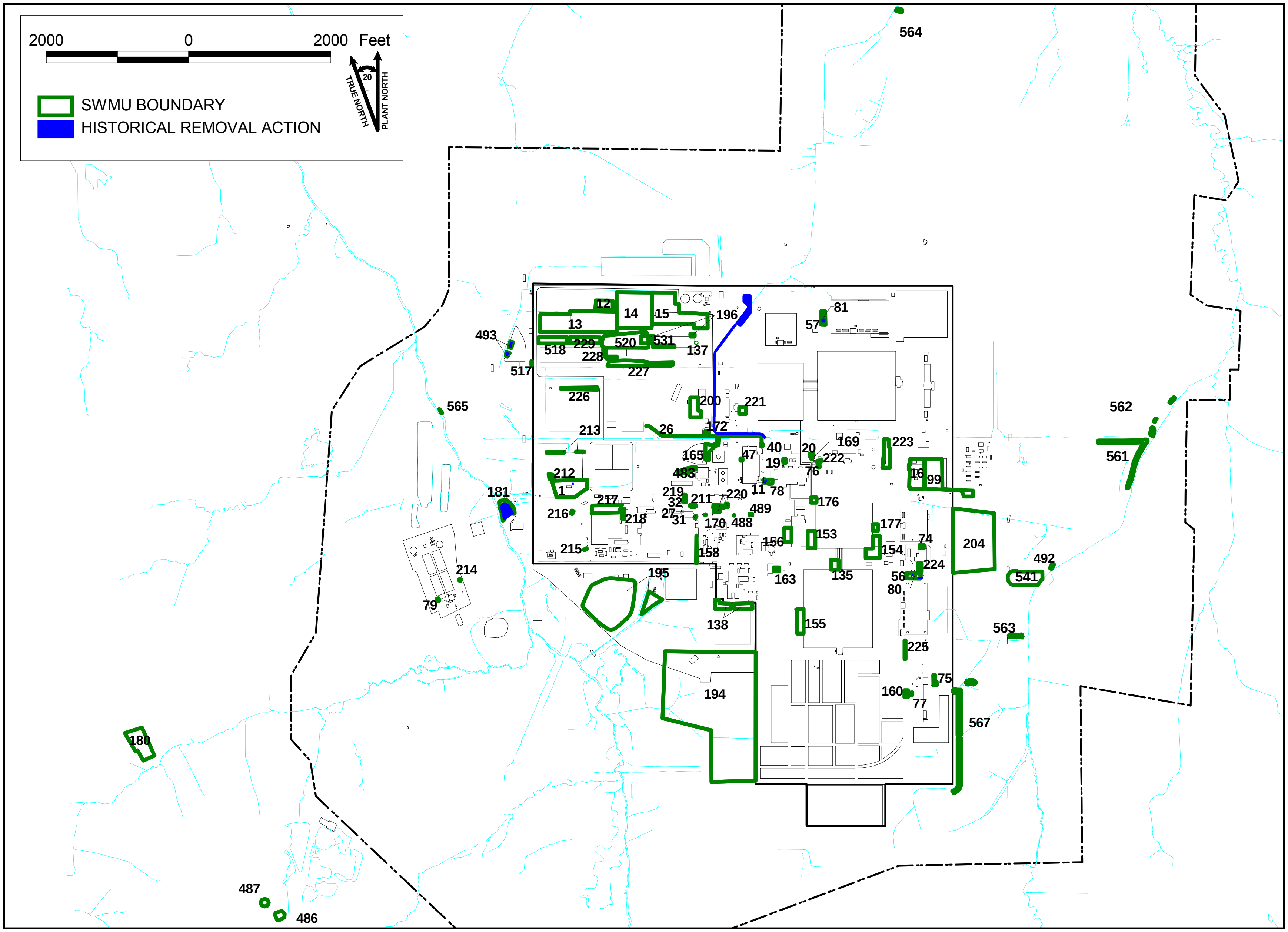

Figure 1.2. Location of SWMUs/AOCs

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1.2 PROJECT OBJECTIVES AND GOALS

The goals for the SOU RI/FS are consistent with those established in the Paducah Site FFA and the Paducah SMP (DOE 2009a) negotiated among DOE, EPA, and Kentucky. The FFA requires that DOE identify, investigate, and remediate all AOCs and SWMUs that potentially could pose a threat to human health and the environment. The goals of this RI/FS are as follows:

- Goal 1: Characterize Nature of Source Zone—characterize the nature of contaminant source materials using existing data, and if required, by collecting additional data;

- Goal 2: Define Extent of Source Zone and Contamination in Soil—define the extent (vertical and lateral) and magnitude of contamination in soils and perform a multimedia evaluation (e.g., groundwater, surface water) to ensure that all exposure pathways for the subject units are assessed adequately to support cleanup decisions;

- Goal 3: Determine Soil Transport Mechanisms and Pathways—gather existing data, and if necessary, collect additional data to analyze contaminant transport mechanisms and support a feasibility study;

- Goal 4: Complete a BHHRA and SERA for the SOU; and

- Goal 5: Complete an Evaluation of Remedial Alternatives—determine if the existing data are sufficient to evaluate alternatives that will reduce risk to human health and the environment and support a No Further Action (NFA).

1.3 PROJECT DATA QUALITY OBJECTIVES

The Data Quality Objective (DQO) process is a planning tool, based on the scientific method, that identifies an environmental problem and defines the data collection process needed to support decisions regarding that problem [Guidance on Systematic Planning Using the Data Quality Objectives Process EPA QA/G-4 (2006)]. The steps outlined in the DQO process have been used in the development of the RI/FS work plan. These steps formulate a set of criteria that will achieve the desired control of uncertainty, allowing the decision to be made with acceptable confidence.

The first step in the DQO process is to identify the problem to be resolved. It is possible that contaminants originating from the SWMUs/AOCs have been released to the environment. The overall problem statement developed for the DQO process is as follows:

Past releases from the PGDP may have resulted in the contamination of soil found at the SWMUs and AOCs. The nature and extent of contamination has not been adequately defined, nor is it known whether these potential contaminants pose unacceptable risks to current and reasonably anticipated future receptors under some exposure scenarios.

Figure 1.3 shows the DQO process chart. In order to facilitate discussion, the seven steps of the DQO process have been initiated, in accordance with the above-referenced guidance (EPA 2006), and a set of decision rules and questions to be answered to complete the DQO process are provided in Table 1.2. As part of the process, meetings have taken place with DOE, EPA, and Kentucky to review and discuss the scoping document, these discussions included Table 1.2 in this document. Table 1.2 states the goals and outlines the decision rules, evaluation methods, and data needs that will determine the final action undertaken at the SOU SWMUs/AOCs.

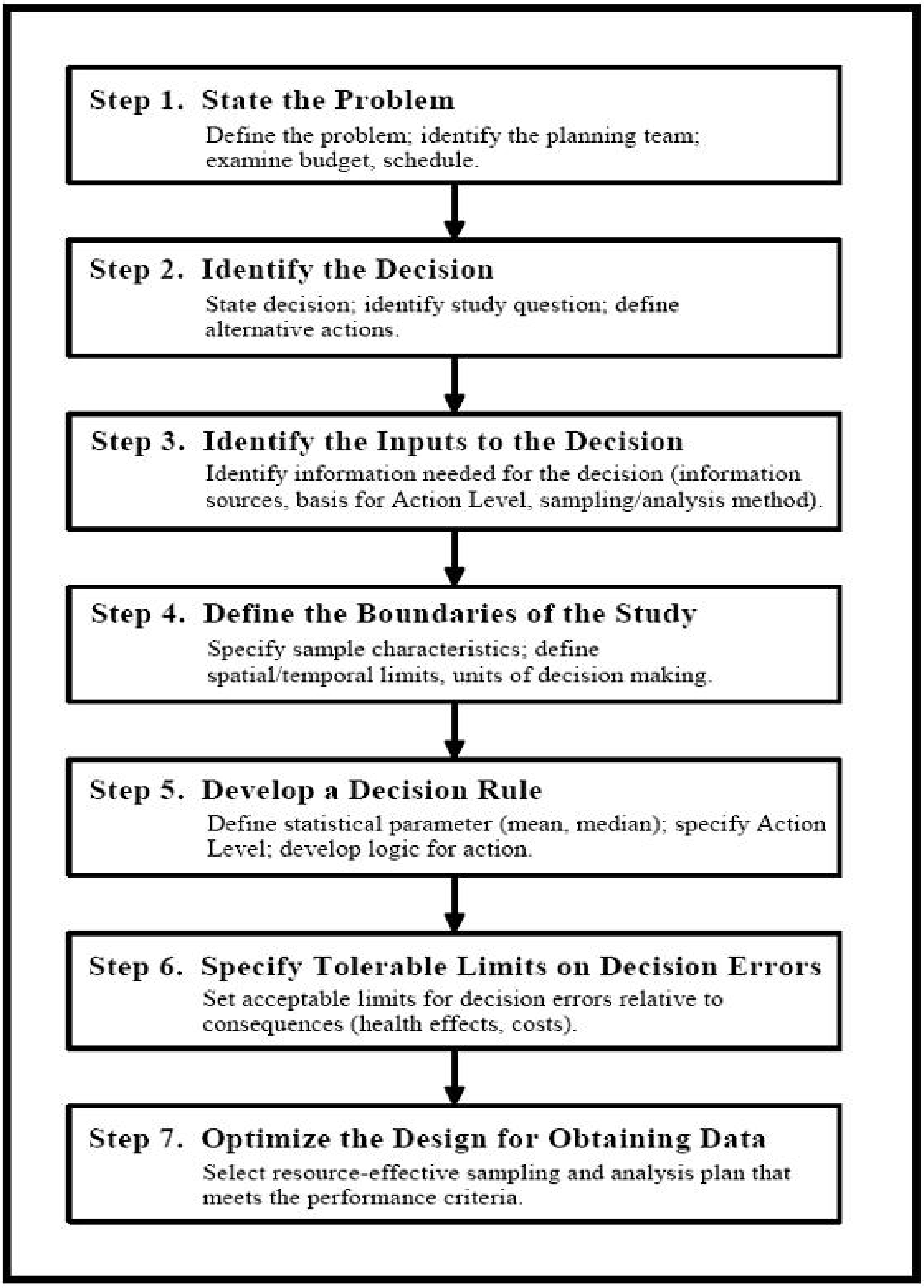

Figure 1.3. DQO Process

Table 1.2. Decision Rules, Evaluation Methods, and Data Needs for SOU

GOAL 1: CHARACTERIZE NATURE AND EXTENT OF SOURCE ZONE AND CONTAMINATION IN SOIL

Decisions and questions

1-1: What are the suspected contaminants?

1-2: What are the plant processes that could have contributed to the contamination? When and over what duration did releases occur?

1-3: What are the concentrations and activities at the source?

1-4: What is the area and volume of the source zone? What is the vertical and lateral extent of contamination?

1-5: What are the chemical and physical properties of associated material at the source areas?

1-6: What are the past, current, and potential future migratory paths?

Decision rule	Evaluation method	Data needs
D1a: If contamination is detected, then determine the concentration(s), the vertical and lateral extent, and the potential future migration paths. If the concentration of analytes found in the source zone could result in a cumulative excess lifetime cancer risk (ELCR) greater than 1×10^{-6} or a cumulative Hazard Index (HI) greater than 1 through contact with contaminated media, **or** if the concentration of analytes in the source zone could result in detrimental impacts to nonhuman receptors through contact with contaminated media as indicated by exceeding ecological screening criteria, **and** if the concentrations of analytes in the source zone are greater than those expected to occur naturally in the environment, then evaluate actions that will mitigate risk; otherwise pursue a "no further action" decision (see D1b and D1c).	<u>Screening</u> Quantitative comparisons by medium between maximum detected concentrations of analytes in the source zone and preliminary remediation goals (PRGs) (industrial worker scenario inside secure area and teen recreator scenario outside secure area) and background concentrations Quantitative comparison by medium between maximum detected concentrations of analytes and nonhuman receptor benchmarks <u>Baseline</u> Completion of baseline human health risk (BHHRA) and screening ecological risk assessments (SERA)	Results of previous investigations and reports to target sampling locations and analytical requirements Sampling data from each medium and subsurface characterization information including stratigraphy Site use and activity history Procedures and methods for human health and ecological risk assessments of source units

Table 1.2.Decision Rules, Evaluation Methods, and Data Needs for SOU (Continued)

Decision rule	Evaluation method	Data needs
D1b: If concentrations of analytes found in the source zone exceed applicable or relevant and appropriate requirements (ARARs), then evaluate actions that will bring contamination within the source zone into compliance with ARARs; seek an ARAR waiver; or propose/obtain alternative standards.	Quantitative comparison by medium between analyte concentrations and ARARs	Results of previous investigations and reports to target sampling locations and analytical requirements Sampling data from each medium Site use and activity history List of chemical-specific ARARs Procedures and methods for performing comparisons
D1c: If contaminants found at the site are known to transform or degrade into chemicals that could lead to increased risks to human health or the environment or into chemicals for which there are ARARs, **and** if the concentrations of these contaminants could result in risks greater than those defined in D1a or concentrations greater than ARARs, then evaluate actions that will mitigate potential future risk or obtain compliance with ARARs; seek an ARAR waiver in accordance with EPA guidance; or propose/obtain alternative standards.	Completion of a BHHRA and SERA that considers transformation and degradation of contaminants found in the source zone Quantitative comparison by medium between analyte concentrations and ARARs	Results of previous investigations and reports to target sampling locations and analytical requirements Sampling data from each medium Site use and activity history Analyte degradation or transformation paths List of chemical-specific ARARs Geochemical and biological parameters that could affect chemical degradation and transformation Procedures and methods for human health and ecological risk assessments and comparison with ARARs

Table 1.2. Decision Rules, Evaluation Methods, and Data Needs for SOU (Continued)

GOAL 2: DETERMINE SURFACE AND SUBSURFACE TRANSPORT MECHANISMS AND PATHWAYS

Decisions and questions

2-1: What are the contaminant migration trends?

2-2: What are the effects of underground pipelines and plant operations on migration pathways including ditches?

2-3: What are the physical and chemical properties of the formations and subsurface matrices?

Decision rule	Evaluation method	Data needs
D2a: If contaminants are found in the source zone, **and** if these contaminants are found to be migrating from the source zone at concentrations that result in a cumulative ELCR greater than 1 x 10^{-6} or a cumulative HI greater than 1 through use of contaminated media at downgradient points of exposure, **and** the concentrations of analytes are greater than those expected to occur naturally in the environment, then evaluate actions that will mitigate risk; otherwise do not consider risk posed by migratory pathways when evaluating remedial alternatives for the unit (see D3b).	<u>Screening</u> Quantitative comparisons by medium between modeled contaminant concentrations and PRGs (industrial worker scenario inside secure area and teen recreator scenario outside secure area) and background concentrations <u>Baseline</u> Completion of a BHHRA for exposure points located away from the unit to which contaminants may migrate	Results of analyses performed under D1a Procedures and methods for human health and ecological risk assessment of source units Current and expected land use patterns Results of models [e.g., Multimedia Environmental Pollutant Assessment System (MEPAS), Residual Radioactive Materials (RESRAD), Seasonal Soil Compartment Model (SESOIL)] that can predict future soil contaminant concentrations at exposure points Modeling parameters including chemical parameters, mineralogy, reduction-oxidation potential, porosity, and stratigraphy

Table 1.2. Decision Rules, Evaluation Methods, and Data Needs for SOU (Continued)

Decision rule	Evaluation method	Data needs
D2b: If contaminants are found in the source zone and if these contaminants are found to be migrating from the source zone at concentrations that exceed ARARs, then evaluate actions that will bring migratory concentrations into compliance with ARARs; waive ARARs or obtain alternate standards; otherwise, do not consider ARARs when examining migratory pathways during the evaluation of remedial actions (see D3a).	Quantitative comparison by medium between modeled analyte concentrations at downgradient exposure points and ARARs	Results of analyses performed under D1b List of chemical-specific ARARs Current and expected land use patterns Results of models (e.g., MEPAS, RESRAD, SESOIL) that can predict future soil contaminant concentrations at exposure points (Geochemical equilibrium will be addressed in the RI report.) Modeling parameters including chemical parameters, mineralogy, reduction-oxidation potential, porosity, and stratigraphy

Table 1.2. Decision Rules, Evaluation Methods, and Data Needs for SOU (Continued)

GOAL 3: COMPLETE A BASELINE RISK ASSESSMENT FOR THE SOU

Decisions and questions

3-1: Where do the contaminant concentrations exceed no action levels?

3-2: Are isolated areas of contamination present or is contamination general?

3-3: What are the contaminants of concern (COCs) that define the contamination?

3-4: What are the no action levels?

3-5: Are SWMUs/AOCs within the SOU similar enough to be addressed in the same manner?

Decision rule	Evaluation method	Data needs
D3a: Determine if isolated contamination exists or if contamination is general; if isolated contamination exists, determine its extent. Use this information to determine where action is required and where no further action is necessary.	Quantitative comparisons by medium between maximum detected concentrations of analytes in the source zone and PRGs (industrial worker scenario inside secure area and teen recreator scenario outside secure area) and background concentrations Quantitative comparison by medium between maximum detected concentrations of analytes and nonhuman receptor benchmarks Quantitative comparison by medium between analyte concentrations and ARARs	Historical data Proposed no action levels Analytical levels Resource levels

Table 1.2. Decision Rules, Evaluation Methods, and Data Needs for SOU (Continued)

GOAL 4: COMPLETE EVALUATION OF REMEDIAL ALTERNATIVES

Decisions and questions

4-1: What are the possible remedial technologies applicable for this unit?
4-2: What are the physical and chemical properties of media to be remediated?
4-3: Are cultural impediments present?
4-4: What is the extent of contamination (geologic limitations presented by the source zone)?
4-5: What would be the impact of action on and by other sources?
4-6: What would the impact of an action at the source be on the integrator units?
4-7: What are stakeholders' perceptions of contamination at or migrating from source zone?

Decision rule	Evaluation method	Data needs
D4a: If Decision D1a, D1b, D1c, D2a, or D2b indicates that response actions are needed, then evaluate response actions to attain ARARs and mitigate risk in the source zone.	Use of results of BHHRA and SERA to determine if action is needed Use of results of comparison of contaminant concentrations to ARARs to determine if action is needed Qualitative (or quantitative) assessment of decrease or increase in risk to human health and the environment as a result of implementation Evaluation of ARARs Evaluation of existing risk management procedures or activities currently being conducted at the site	Data listed for D1a, D1b, D1c, D2a, and D2b Methods for qualitative (or quantitative) analyses of decrease or increase in risk to human health and the environment as a result of implementation Additional physical parameters including compaction, grain size, cation exchange, thermodynamic conductivity, dielectric constants, chemical oxygen demand, pH, and moisture content of soils List of ARARs

1.4 OBSERVATIONAL APPROACH

The Observational Approach (OA) is a method for identifying and managing uncertainties. The OA emphasizes determining what to do next by evaluating existing information and iterating between collecting new data and taking further action. The name “Observational Approach” is derived from observing parameters during implementation. OA should be encouraged in situations where the uncertainty is large, the vision of what is expected or required is poor, and the cost of obtaining more certainty is very high.

The philosophy of OA, when applied to waste site remediation, is that a remedial action can be expedited. The approach provides a logical decision framework through which planning, design, and implementation of remedial actions can proceed with increased confidence. OA incorporates the concepts of data sufficiency, identification of reasonable deviations, preparation of contingency plans, observation of the systems for deviations, and implementation of the contingency plans. Determinations of performance measures and the quality of new data are completed as the steps are implemented.

The iterative steps of site characterization, developing and refining a site conceptual model, and identifying uncertainties in the conceptual model are similar to traditional approaches. The concept of addressing uncertainties as reasonable deviations is unique to OA and offers a qualitative description of data sufficiency for proceeding with site remediation.

To deal with uncertainties identified in the SOU, OA has been used to design the sampling strategy for the SOU RI/FS. The key concepts are as follows:

- The RI strategy is based on a specified “most probable site condition,” which, for the SOU RI/FS, assumes that contamination is limited to surface and near surface soil (0 to 4 ft bgs) and is potentially adversely impacting human health and welfare or an impact to the environment has occurred.

- Reasonable deviations from the most probable site condition are identified. One reasonable deviation for the SOU RI/FS is that no contamination is adversely impacting human health and welfare or the environment. Other reasonable deviations would be that contamination has migrated to depths greater than 4 ft bgs, but still within the SOU bound of 10 ft bgs (16 ft bgs at pipelines) and to either the SWOU or GWOU. Site conditions should not differ significantly from the postulated conditions shown in the conceptual models.

- Site assessment factors are identified for observation to detect contamination. These factors include sensory observation of contamination (sight and smell), field screening with portable instruments, geophysical surveys, historical data evaluation, and laboratory analysis of samples.

- The Field Sampling Plan (FSP), discussed in Chapter 9 of this document, presents the method by which the most probable site conditions will be investigated. It also presents a contingency plan to deal with deviations from the most probable site conditions.

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2. PROJECT ORGANIZATION AND MANAGEMENT PLAN

This section presents the project organization for this SOU RI/FS. The topics addressed in this section include project organization, project coordination, and project schedule.

2.1 PROJECT ORGANIZATION, RESPONSIBILITIES, AND STAFFING

The organization chart shown in Figure 2.1 outlines the management structure that will be used for implementing the SOU RI/FS. The responsibilities of key personnel are described in the following paragraphs.

2.1.1 DOE Project Manager

The DOE Project Manager will provide technical and management oversight for DOE for the SOU RI/FS. This individual also will be the primary interface between EPA and Kentucky regulators and the DOE Prime Contractor.

2.1.2 DOE Prime Contractor ER Manager

The DOE Prime Contractor ER Manager will have overall programmatic responsibility for the Contractor for the technical, financial, and scheduling of matters related to the SOU RI/FS. This individual will interface with DOE and the regulators, as appropriate.

2.1.3 DOE Prime Contractor Data Manager

The DOE Prime Contractor Data Manager is responsible for long-term storage of project data and for transmitting data to external agencies according to DOE 1998e and the Paducah Data Management Policy. The DOE Prime Contractor Data Manager ensures compliance to policies and procedures relating to data management with respect to the project.

2.1.4 DOE Prime Contractor Lab Coordinator

The DOE Prime Contractor Lab Coordinator is responsible for contracting any fixed-base laboratory utilized during the SOU sampling activities. The DOE Prime Contractor Lab Coordinator also provides coordination for sample shipment to the laboratory, reviews the contractual screening section of data assessment packages, and transmits data packages to the Paducah Document Management Center (DMC).

2.1.5 DOE Prime Contractor RI Project Manager

The RI Project Manager will have overall responsibility for implementing the investigation, including all plans and field activities conducted as part of the RI/FS, including monitoring the work plan implementation, including sampling and waste management activities. This individual will serve as the RI technical lead and the principal point of contact. The RI Project Manager will track the project budget and schedules and will delegate specific responsibilities to project team members. This individual also is responsible for the preparation of any field change orders.

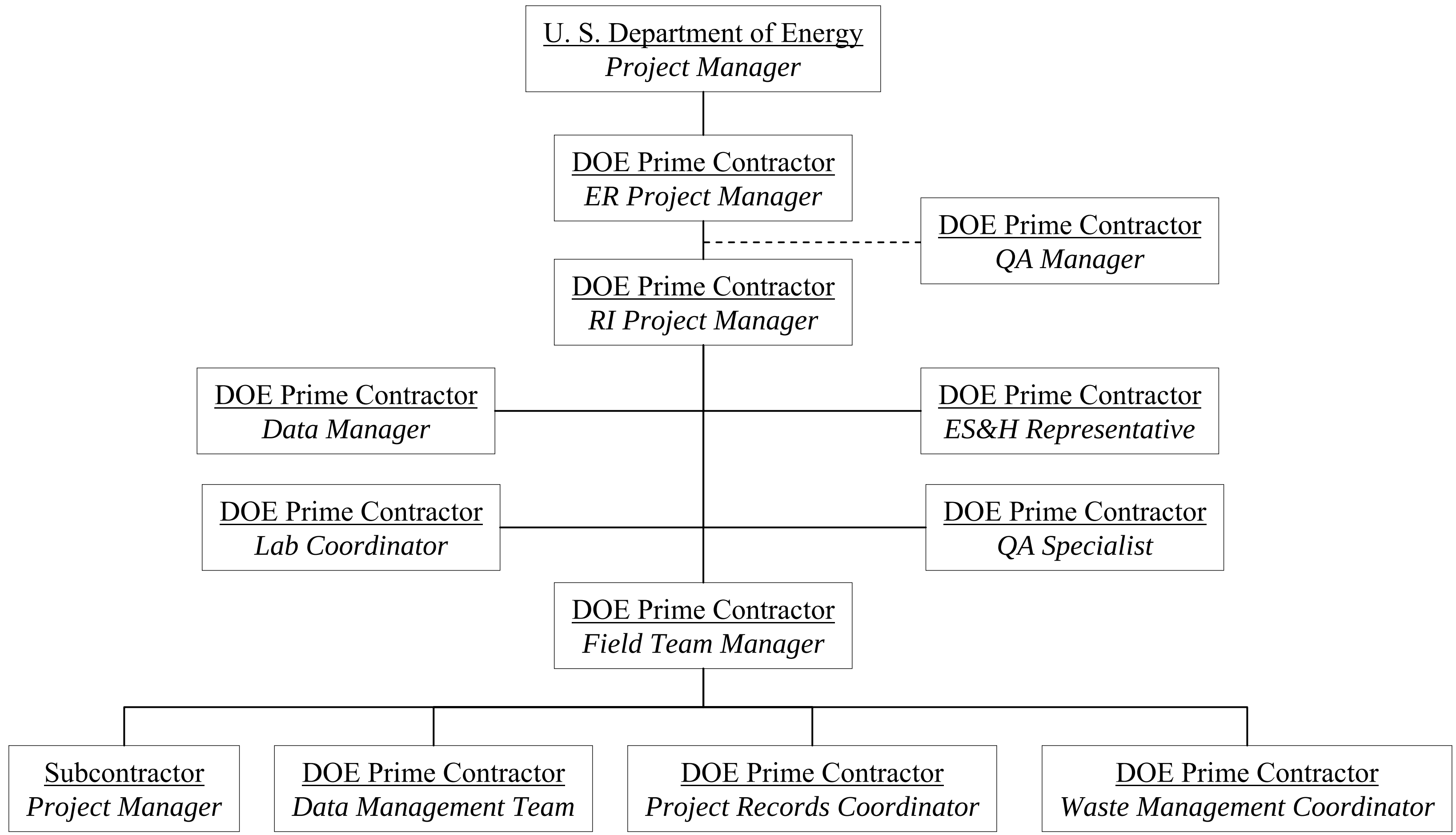

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Figure 2.1 SOU Project Organizational Chart

2.1.6 DOE Prime Contractor Safety & Health Representative

The Safety and Health Representative (SHR), oversees that health and safety procedures designed to protect project personnel are maintained throughout the field effort for this project. This individual will also ensure the implementation of an Integrated Safety Management System (ISMS) for all aspects of the assessment. ISMS is dedicated to the concept that all accidents are preventable. Accordingly, the DOE Prime Contractor, the RI Team, and all subcontractors will be expected to achieve and sustain "Zero-Accident Performance" through continuous improvement practices. "Zero-Accident Performance" includes zero unpermitted discharges or releases with respect to protection of the environment.

2.1.7 DOE Prime Contractor QA Specialist

The Quality Assurance (QA) Specialist will provide oversight and approval for the project. This individual also may conduct audits and surveillances and approve any field changes that may impact project quality.

2.1.8 DOE Prime Contractor Field Team Manager

The Field Team Manager (FTM) provides technical oversight for all field team activities during the investigation.

2.1.9 DOE Prime Contractor Project Records Coordinator

The Project Records Coordinator will be responsible for all activities relating to identification, acquisition, classification, indexing, and storage of project records related to the investigation. The project records will include data documentation materials, plans, procedures, and all project file requirements.

2.1.10 DOE Prime Contractor Waste Management Coordinator

The Waste Management Coordinator (WMC) will be responsible for ensuring adherence to the Waste Management Plan (WMP) that is described in Chapter 13 of this document and for documenting and tracking field-related activities, including waste generation and handling, waste characterization sampling, waste transfer, and waste labeling.

2.1.11 DOE Prime Contractor Data Management Team

The Data Management Team will be responsible for the coordination of all investigation-sampling activities, including coordination with the DOE Prime Contractor Sample Management Office (SMO). This group will ensure all quality control (QC) sampling requirements are met, chain-of-custody forms are properly generated, and that compliance with off-site shipping requirements is achieved. The Data Management Team also will be responsible for managing data generated during the investigation in accordance with the Data Management Implementation Plan (DMIP) described in Chapter 12 of this document.

2.2 PROJECT COORDINATION

Coordination and liaison between the DOE Prime Contractor and Subcontractor personnel will occur at various levels and among personnel appropriate to each level. Routine reports, such as monthly reports, will be prepared by the Subcontractor Project Manager and then submitted to the DOE Prime Contractor RI Project Manager, Contracts Procurement Office, Contracts Coordinator, or other designated recipient.

2.3 PROJECT TASKS AND IMPLEMENTATION PLAN

The RI/FS Implementation Plan for this project is shown in Figure 2.2. This plan represents a logical approach to implementation of the project, as described below.

(1) The first step in this process was initial scoping of the project internally and with EPA and Kentucky.

(2) The next step was preparation of this RI/FS Work Plan. As part of this task, existing data were evaluated to develop the conceptual models. In turn, the conceptual models were used to identify site unknowns, and a sampling strategy was designed to meet the FFA requirements and to address these unknowns.

(3) Implementation of the work plan will begin with procurement of subcontract services, such as sampling and surveying.

(4) Field activities will consist of several discrete activities, as outlined in this work plan, including sampling, sample handling, decontamination, waste management, and documentation. In addition, Environment, Safety, and Health (ES&H) and field QA coordination will occur concurrently with the other activities.

(5) Field and laboratory data will be reduced, validated, verified, and assessed. Data validation will be conducted by an independent third party and will be initiated once the first sample delivery group of data has been received and checked for completeness. Each of these steps will be handled separately and will follow prescribed procedures to ensure that defensible data are obtained. The data will be formatted for incorporation into the PGDP database and archived for future use.

(6) Technical exchange meetings will be conducted among personnel from EPA, Kentucky, DOE, and DOE Prime Contractor to evaluate the existing and collected data and determine future actions.

(7) Non-field-related tasks that also will be performed during the RI/FS include coordination of community relations during the project, preparation of a BHHRA, SERA, implementation of the QA program, evaluation of remedial technologies, and implementation of treatability studies.

(8) An RI report, followed by an FS report, will be prepared and issued after samples and data have been processed.

(9) Project management, tracking, and reporting will be conducted concurrently with all activities.

2.4 PROJECT SCHEDULE

Figure 2.2 provides a schedule of the activities proposed for the SOU RI/FS Work Plan implementation. These schedules are estimates for planning and are included here for informational purposes only and are not intended to establish enforceable schedules or milestones. Enforceable milestones are contained in Appendix C of the FFA and Appendix 5 of the SMP (DOE 2009a).

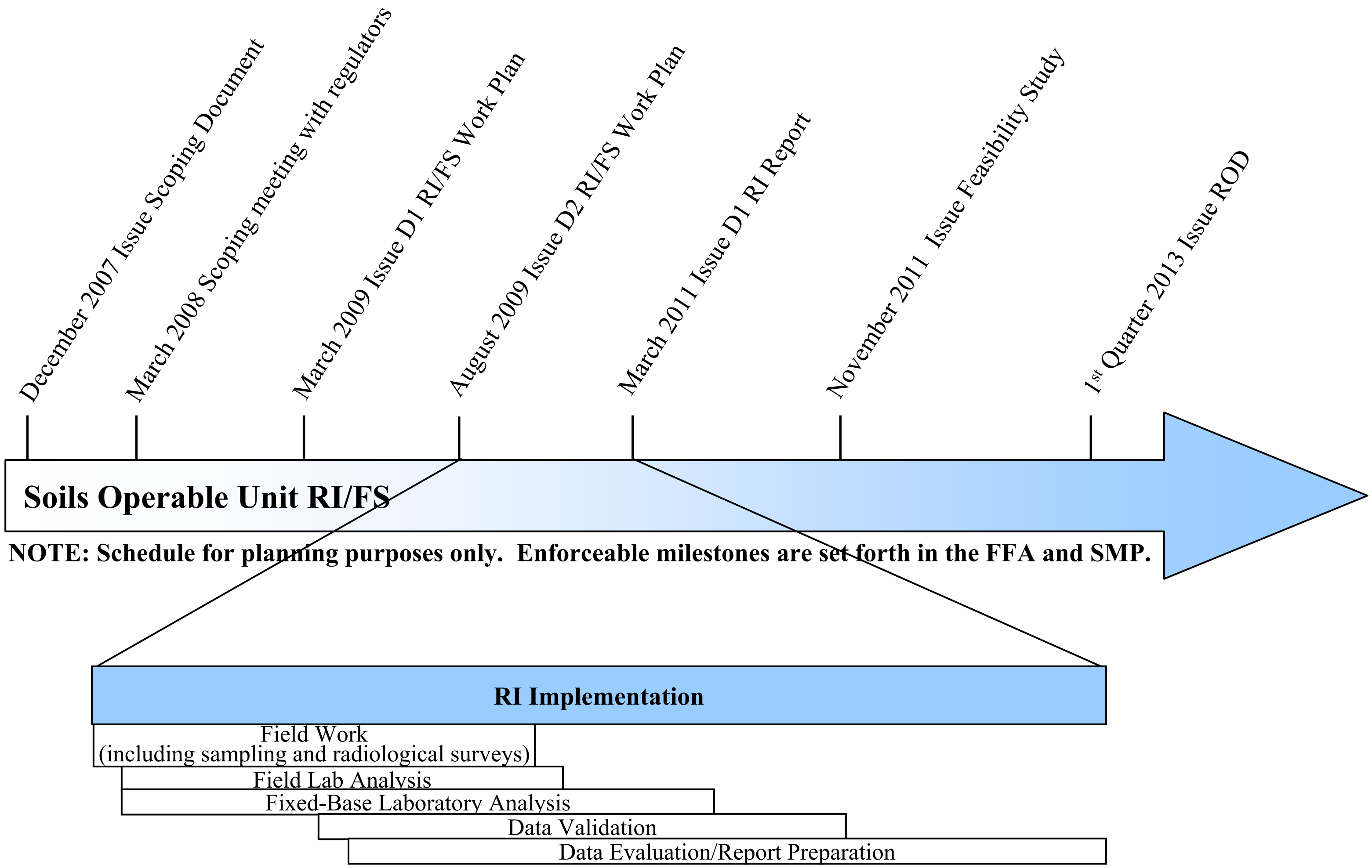

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Figure 2.2. Implementation Plan Schedule

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The following assumptions were used to develop this schedule. Delays in or changes to any of these assumptions could result in overall scope delay.

- EPA and KDEP will approve the D2 SOU RI/FS Work Plan by September 14, 2009.
- The DOE Prime Contractor will initiate the procurement process to allow a Notice-to-Proceed, with field activities to be issued to the Subcontractor in Fiscal Year 2009 in accordance with current funding profiles.
- The schedule, as shown, does not account for schedule delays resulting from inclement weather conditions such as rain or snow.
- Laboratory analysis reports for individual data packages will be received within 60 days of the completion of all samples contained in that data package.
- Data verification, validation, and assessment activities for individual data packages will be available within 60 days of receipt of the laboratory analysis reports for the data package.
- If additional sampling is required, then the completion date of subsequent tasks will be delayed.

2.5 RI/FS WORK PLAN ACTIVITIES

2.5.1 Security Plan

A security plan will be written for the SOU RI/FS fieldwork. This plan will address security issues/concerns for the project, while working inside the security fence at PGDP. The classification status could result in restricting access during RI field activities, as well as additional reviews and oversight. This security plan will be completed prior to field mobilization. All field team members will be required to read the plan prior to participating in SOU field activities.

2.5.2 Field Preparation Activities

The FTM will ensure that a field planning meeting occurs before the internal field review and before work begins at the site so that all involved personnel, including employees of the subcontractors, DOE Prime Contractor, and DOE, as appropriate, will be informed of the requirements of the fieldwork associated with the project.

In addition, an internal field review will be held in accordance with DOE Prime Contractor procedures. Any contingency items identified during the review must be completed prior to the DOE Prime Contractor providing a notice to proceed to the subcontractor for initiating fieldwork activities.

2.5.3 Field Investigation

Activities to be conducted during the field investigation include mobilization, implementation of ES&H procedures, geophysical surveys, soil sampling, waste management, and implementation of QA procedures. In addition, surveying activities will be performed to provide horizontal and vertical references for characterizing of locations.

2.5.4 Data and Analytical Activities

Activities concerning the data and analytical assessments are discussed in the following chapters:

- Baseline Risk Assessment—Chapter 6
- Treatability Studies—Chapter 7
- FS—Chapter 8
- Data and Records Management—Chapter 12

Additionally, the following support the work to be conducted during this RI/FS:

- Community Relations—Chapter 14
- ARARs—Appendix A
- Document Outlines—Appendix B
- Historical Data Summary—Appendix C
- Decision Trees—Appendix D
- Early Action Options—Appendix E

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3. REGULATORY SETTING

The sections that follow provide a condensed version of the regulatory framework for PGDP. The summary in this chapter is intended to provide readers with general knowledge of the facility and the regulatory protocol that guides environmental management activities at PGDP. Detailed descriptions can be found in the *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2009a).

3.1 ADMINISTRATIVE CONSENT ORDER

Kentucky, EPA, and DOE entered into the ACO effective November 23, 1988, after the discovery of contamination in residential wells north of PGDP. The ACO is a legally binding agreement for the participating parties that initiated the investigation into the nature and extent of the contamination in these wells. The contaminants are believed to have originated as process-derived wastes or commonly used materials employed during the operational history of PGDP.

The ACO initiated the investigative activities designed to determine the extent and sources of off-site contamination surrounding PGDP. The site investigation (SI) was completed in 1992 under the guidelines of the ACO. The prior requirements of the ACO were superseded by the execution of the FFA.

3.2 ENVIRONMENTAL PROGRAMS

Environmental sampling at PGDP is a multimedia (air, water, soil, sediment, direct radiation, and biota) program of chemical, radiological, and ecological monitoring and environmental monitoring that consists of two activities: effluent monitoring and environmental surveillance. Although the evaluation and assessment of unplanned releases are addressed in this plan, emergency monitoring and responsibilities for this activity are not included. As part of the ongoing ER activities, SWMUs and AOCs both on and off DOE property have been identified. Characterization and/or remediation of these sites will continue pursuant to the CERCLA, and the Hazardous and Solid Waste Amendments (HSWA) corrective action conditions of the Resource Conservation and Recovery Act (RCRA) Permit. RCRA and CERCLA requirements are coordinated by DOE, EPA, and Kentucky through the FFA.

3.3 RESOURCE CONSERVATION AND RECOVERY ACT

The primary purpose of RCRA is to protect human health and the environment through the proper management of hazardous wastes at operating sites.

RCRA requirements for PGDP are contained in PGDP's Hazardous Waste Management Permit (KY8-890-008-982, originally issued July 1991, reissued September 2004). This permit originally was issued by both Kentucky and EPA. EPA's portion of the RCRA permit was limited to the HSWA provisions of RCRA, which include corrective action requirements for SWMUs. Kentucky became authorized in 1996 for corrective actions. The RCRA permit contains regulatory provisions for treatment, storage, and disposal units, as well as provisions requiring corrective action for SWMUs.

3.4 CERCLA/NATIONAL PRIORITIES LIST

PGDP was placed on the NPL on May 31, 1994. In accordance with Section 120 of CERCLA, DOE entered into an FFA with EPA and Kentucky. The FFA established one set of consistent requirements for achieving comprehensive site remediation in accordance with RCRA and CERCLA, including stakeholder involvement.

Section XVIII of the FFA requires DOE to submit an annual SMP, which details the strategic approach for achieving cleanup under the FFA.

3.5 NATIONAL ENVIRONMENTAL POLICY ACT

The intent of the National Environmental Policy Act (NEPA) is to promote a decision making process that results in minimization of adverse impacts to human health and the environment. On June 13, 1994, the Secretary of Energy issued a Secretarial Policy (Policy) on NEPA that addresses NEPA requirements for actions taken under CERCLA. Section II.E of the Policy indicates that to facilitate meeting the environmental objectives of CERCLA and respond to concerns of regulators consistent with the procedures of most other federal agencies, DOE hereafter will rely on the CERCLA process for review of actions to be taken under CERCLA and will address NEPA values. DOE CERCLA documents will incorporate NEPA values, such as analysis of cumulative, off-site, ecological, and socioeconomic impacts, to the extent practicable.

3.6 INVESTIGATIVE OVERVIEW

This SOU RI/FS Work Plan defines the additional sampling necessary to obtain sufficient data to complete the risk assessment and the FS for the SOU. Many of these SWMUs/AOCs have been investigated previously during an RI. The strategy for this work plan is to complete a characterization of the nature and extent of contamination for each SWMU/AOC.

4. PHYSICAL CHARACTERISTICS OF THE STUDY AREA

The sections that follow provide a condensed version of the environmental setting for PGDP. This summary provides an overview of information pertaining to location, demography, geology, hydrogeology, ecology, and climatology.

4.1 LOCATION AND DESCRIPTION

PGDP is located ~10 miles west of Paducah, Kentucky (population ~26,000), and 3.5 miles south of the Ohio River in the western part of McCracken County (Figure 4.1). The DOE site is composed of approximately 650 acres within a fenced security area, approximately 800 acres outside the security fence, and 1,986 acres are licensed to Kentucky as part of the West Kentucky Wildlife Management Area (WKWMA). Bordering the PGDP reservation to the northeast, between the plant and the Ohio River, is a Tennessee Valley Authority (TVA) reservation on which the Shawnee Steam Plant is located (Figure 4.2).

4.2 DEMOGRAPHY AND LAND USE

PGDP is surrounded by WKWMA and some sparsely populated agricultural lands. The closest communities to the plant are Heath, Grahamville, and Kevil, all of which are located within three miles of DOE Reservation boundaries. The closest municipalities are Paducah, Kentucky; Cape Girardeau, Missouri, which is ~40 miles west of the plant; and the cities of Metropolis and Joppa, Illinois, which are located across the Ohio River from PGDP. Figure 4.3 shows the locations of sensitive subpopulations such as schools and churches and their relative locations to PGDP.

Historically, the economy of western Kentucky has been based on agriculture, although there has been increased industrial development in recent years. The population of McCracken County is estimated to be ~65,000 with a population density of 885 to 3,188 persons per square mile and Ballard County has ~8,300 with a population density of 72 to 254 persons per square mile according to the 2000 U.S. Census, 2007 estimates.

In addition to the residential population surrounding the plant, WKWMA draws thousands of visitors each year for recreational purposes. This area is used by visitors, primarily for hunting and fishing, but other activities include horseback riding, hiking, and bird watching. According to WKWMA management, an estimated 5,000 fishermen visit the area each year.

4.3 SURFACE FEATURES

The dominant topographic features are nearly level to gently sloping dissected plains with shallow, narrow valleys and ridgetops and with steep ridge slopes and valley sides. The elevations of the stream valleys in the dissected plains are up to 30.5 m (100 ft) lower than the adjoining uplands.

Local elevations range from 290 ft above mean sea level (amsl) along the Ohio River to 450 ft amsl southwest of PGDP near Bethel Church Road. Generally, the topography in the PGDP area slopes toward the Ohio River at an approximate gradient of 27 ft per mile (CH2M HILL 1992). Ground surface elevations vary from 360 to 390 ft amsl within the PGDP plant boundary.

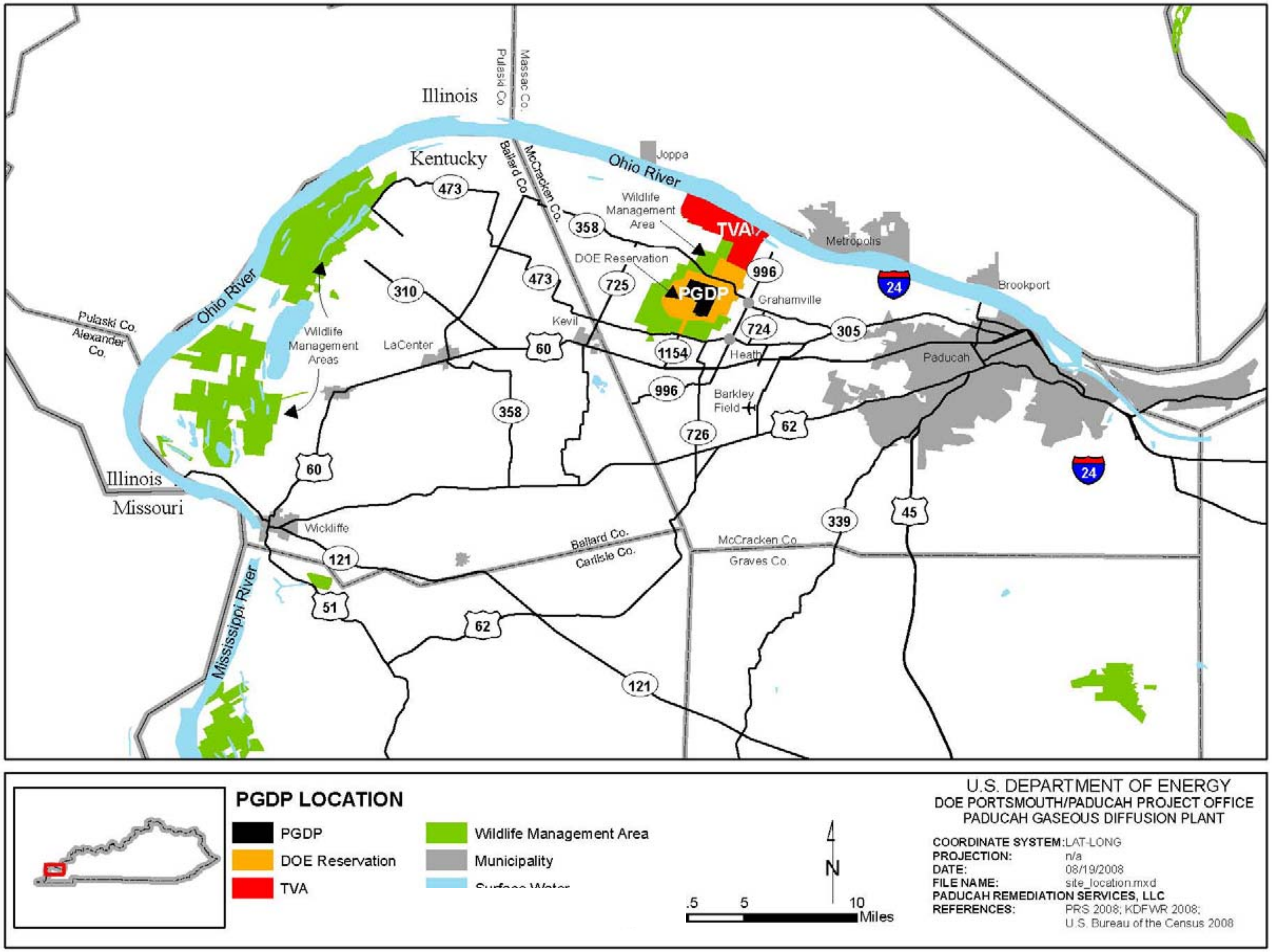

Figure 4.1. PGDP Site Location

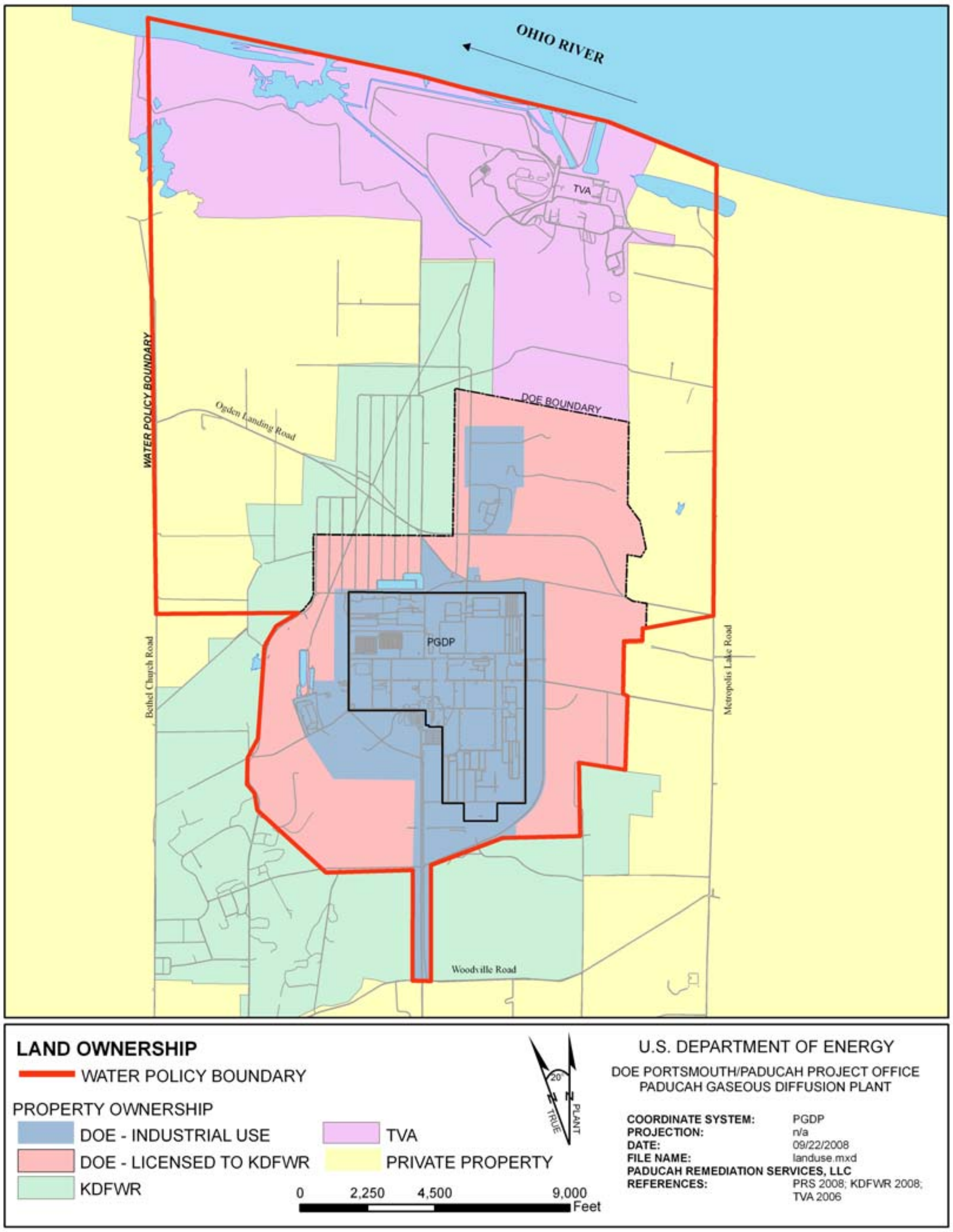

Figure 4.2. Land Ownership in Proximity to DOE Site

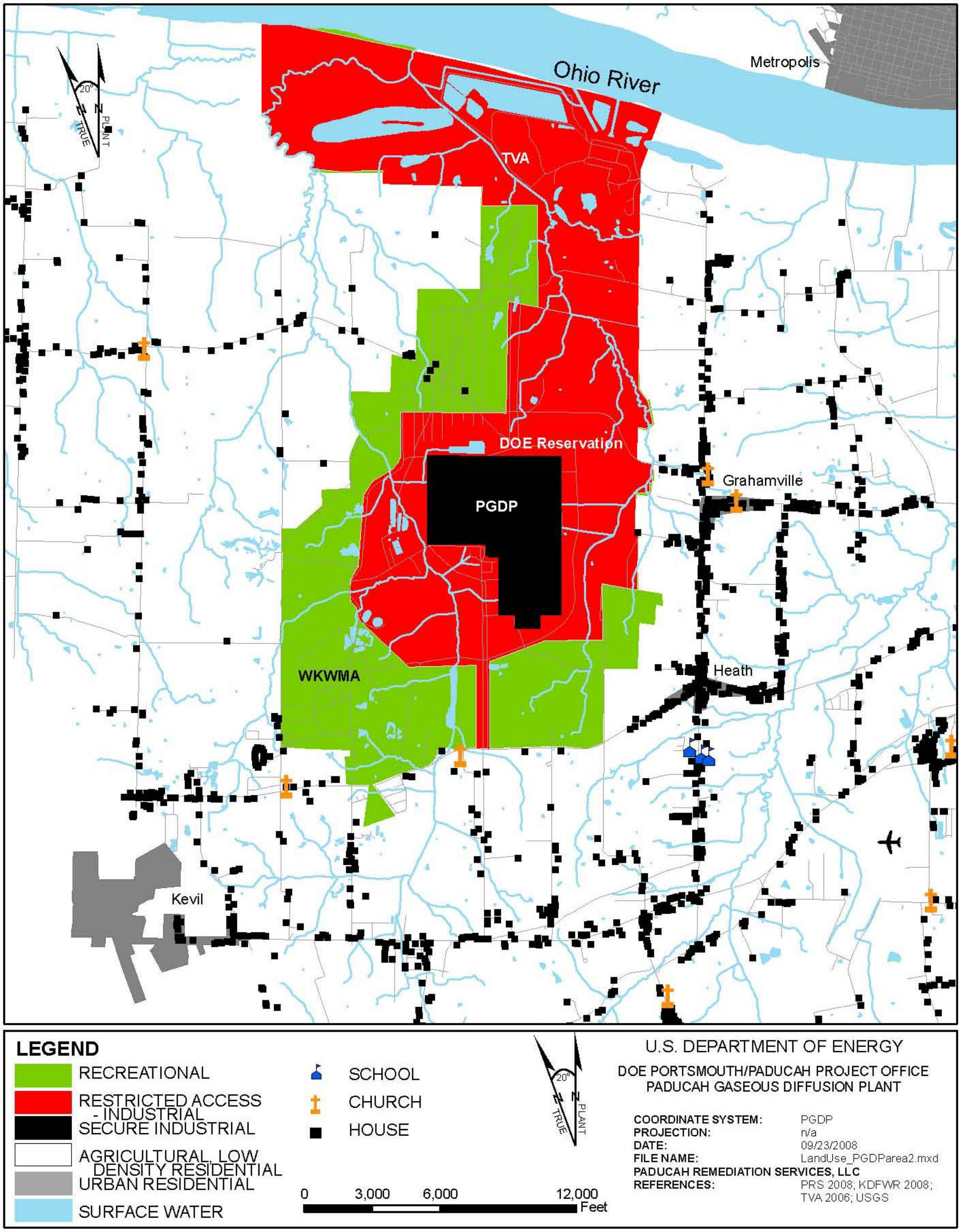

Figure 4.3. Sensitive Subpopulations in Proximity to DOE Site

4.4 METEOROLOGY

The climate of the region may be broadly classified as humid-continental. The term "humid" refers to the surplus of precipitation versus evapotranspiration that normally is experienced throughout the year. The "continental" nature of the local climate refers to the dominating influence of the North American landmass. Continental climates typically experience large temperature changes between seasons.

Current and historical meteorological information regarding temperature, precipitation, and wind speed/direction was obtained from the National Oceanic and Atmospheric Administration's (NOAA) National Climatic Data Center. Additional data were obtained from the National Weather Service office at Barkley Regional Airport.

The 22-year average monthly temperature is 58.0 °F, with the coldest month being January with an average temperature of 35.1 °F and the warmest month being July with an average temperature of 79.2 °F.

The 22-year average monthly precipitation is 4.00 inches, varying from an average of 2.73 inches in August (the monthly average low) to an average of 4.58 inches in April (the monthly average high). The total precipitation for 2005 was 37.45 inches, compared to the normal of 49.24 inches.

4.5 SURFACE WATER HYDROLOGY

PGDP is located in the western portion of the Ohio River basin, approximately 15 miles downstream of the confluence of the Ohio River with the Tennessee River and approximately 35 miles upstream of the confluence of the Ohio River with the Mississippi River. Multiple groundwater aquifers underlie the PGDP. The shallowest aquifers occur in the Continental Deposits and the McNairy Formation, both of which discharge into the Ohio River north of PGDP. Surface water/groundwater relationships vary significantly across the SWOU. A large, downward, vertical hydraulic gradient across the shallow groundwater system typically limits the amount of groundwater discharge to the ditches of the PGDP and adjacent creeks. Gaining reaches in the creeks are found on Bayou Creek south of PGDP and on Little Bayou Creek (LBC) to the north of PGDP near the Ohio River. Bayou Creek also is a gaining stream north of the plant near the Ohio River.

Locally, PGDP is within the drainage areas of the Ohio River, Bayou Creek (also known as Big Bayou Creek) and LBC. The Ohio River is located approximately 3.5 miles north of the PGDP. It is the most significant surface-water feature in the region, carrying over 25 billion gal/day of water through its banks. Several dams regulate flow in the Ohio River. The Ohio River stage near PGDP is measured at Metropolis, Illinois, by a United States Geological Survey (USGS) gauging station. River stage typically varies between 293 and 335 ft amsl over the course of a year. Water levels on the lower Ohio River generally are highest in late winter and early spring and lowest in late spring and early summer. The entire PGDP is above the historical high water floodplain of the Ohio River (CH2M HILL 1991) and above the local 100-year flood elevation of the Ohio River (333 ft).

The plant is situated on the divide between Little Bayou and Bayou Creeks (Figure 4.4). Surface flow is east-northeast toward LBC and west-northwest toward Bayou Creek. Bayou Creek is a perennial stream on the western boundary of the plant that flows generally northward, from approximately 2.5 miles south of the plant site to the Ohio River along a 9-mile course. An 11,910-acre drainage basin supplies Bayou Creek. LBC becomes a perennial stream at the east outfalls of PGDP. The LBC drainage originates within

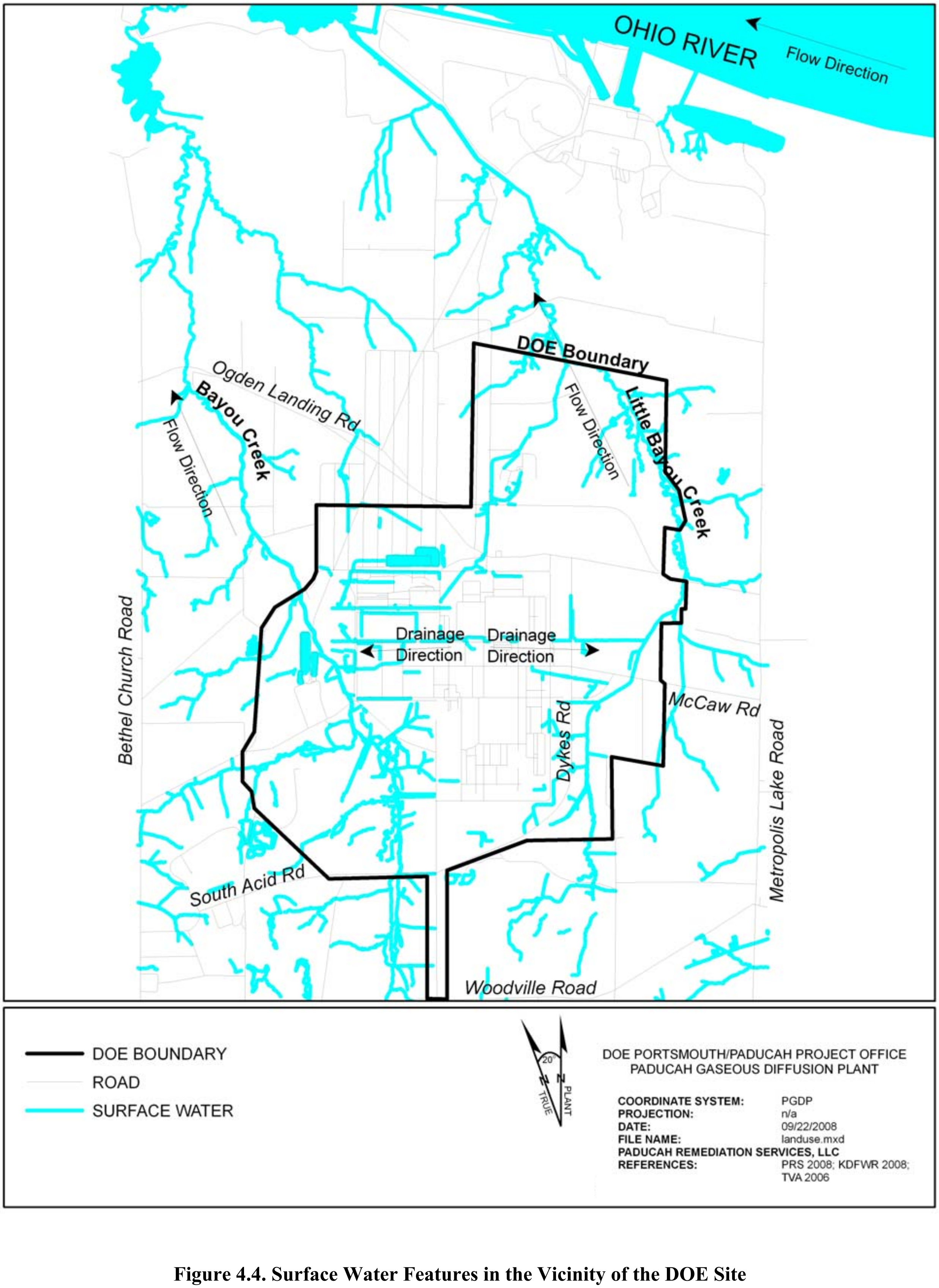

Figure 4.4. Surface Water Features in the Vicinity of the DOE Site

WKWMA and extends northward and joins Bayou Creek near the Ohio River along a 6.5-mile course within a 6,000-acre drainage basin. Drainage areas for both creeks are generally rural; however, they receive surface drainage from numerous swales that drain residential and commercial properties, including WKWMA, PGDP, and the TVA Shawnee Steam Plant. The confluence of the two creeks is approximately 3 miles north of the plant site, just upstream of the location at which the combined flow of the creeks discharge into the Ohio River.

The USGS has maintained gauging stations on Bayou Creek at 4.1 and 7.3 miles upstream of the Ohio River and a gauging station on LBC at 2.2 miles upstream from its confluence with Bayou Creek. The mean monthly discharges vary from 20.5 to 38.8 million gal/day on Bayou Creek and from 0.7 to 20.5 million gal/day on LBC.

Most of the flow within Bayou and LBCs is from process effluents or surface water runoff from PGDP. Contributions from PGDP comprise approximately 85% of flow within Bayou Creek and 100% of flow within LBC. A network of ditches discharge effluent and surface water runoff from PGDP to the creeks. Plant discharges are monitored at the Kentucky Pollutant Discharge Elimination System (KPDES) outfalls prior to discharge into the creeks. Outfalls 002, 010, 011, 012, 013, and 018 receive water from the eastern-most portion of the plant and discharge to LBC. Water from the western portion of the plant drains to Bayou Creek through Outfalls 001, 006, 008, 009, 014, 015, 016, and 017. Outfall 019 monitors runoff discharge to the North-South Diversion Ditch (NSDD) from the C-746-U Landfill, located north of PGDP.

Several major surface water impoundments are located within the plant property and are utilized for various sanitary or process water management needs. The C-616 Lagoons are located near the northwest corner of the plant. Effluent from the plant's phosphate water processing facility is discharged into the C-616-F Lagoon, where sludge is allowed to settle. These lagoons discharge through Outfall 001 to Bayou Creek. The C-611 Lagoons are located to the southwest of the main plant complex. These lagoons serve as settling basins for effluent from the C-611 Sanitary Water Processing Plant. Water from the Ohio River is brought into the water plant where it is treated, primarily with water softening agents, and fed to PGDP for multiple uses. These lagoons discharge through Outfalls 006 and 014 to Bayou Creek.

In the fall of 2002 and winter of 2003, DOE constructed a sedimentation basin (C-613 Northwest Storm Water Control Facility) near the northwest corner of the plant to support removal and disposition of scrap metal. Effluent from the C-613 basin discharges through Outfall 001 to Bayou Creek. In March 2004, DOE completed construction of a detention basin in Section 2 of the NSDD (north central area of the plant). This detention basin contains storm-water runoff to the NSDD until it can be transferred to the C-616-F Lagoon for treatment, via the C-616-C Lift Station. Prior to the detention basin's construction, three culverts were plugged (Fall 2003) at the north security fence to prevent runoff from exiting the plant via the NSDD; therefore, no effluents from the industrialized areas of PGDP currently flow through Sections 3, 4, and 5 of the NSDD.

Other surface water bodies in the vicinity of PGDP include the following: Metropolis Lake, located east of the Shawnee Steam Plant; several small ponds, clay and gravel pits, and settling basins scattered throughout the area; and a marshy area just south of the confluence of Bayou Creek and LBC. The smaller surface water bodies are expected to have only localized effects on the regional groundwater flow pattern.

4.6 GEOLOGY OF PGDP

PGDP is located in the Jackson Purchase region of western Kentucky, which represents the northern tip of the Mississippi Embayment portion of the Coastal Plain Province. The Jackson Purchase region is an area of land that includes all of Kentucky west of the Tennessee River. The stratigraphic sequence in the region consists of Cretaceous, Tertiary, and Quaternary sediments unconformably overlying Paleozoic bedrock.

Information presented herein regarding the geologic setting at PGDP was derived from the *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (Clausen *et al.* 1992). Subsequent sections will briefly discuss the formations represented in Figure 4.5 to acquaint the reader with PGDP geology.

4.6.1 Bedrock

The entire PGDP area is underlain by Mississippian carbonates, consisting of dark gray limestone with some interbedded chert and shale.

4.6.2 Rubble Zone

A rubble zone of chert gravel commonly is encountered in soil borings at the top of the bedrock. The age and continuity of the rubble zone remain undefined.

4.6.3 McNairy Formation

The McNairy Formation consists of Upper Cretaceous sediments of grayish-white to dark-gray micaceous silt and clay with interbedded, gray to yellow to reddish-brown, very fine- to medium-grained sand. A basal sand member also is present at PGDP.

4.6.4 Porters Creek Clay/Porters Creek Terrace

The Paleocene Porters Creek Clay occurs in the southern portions of the site and consists of dark-gray to black silt with varying amounts of clay and fine-grained, micaceous, commonly glauconitic, sand. The Porters Creek Clay subcrops along a buried terrace slope that extends east–west across the site. Erosion into the Paleocene Porters Creek Clay, after the deposition of overlying Eocene through Pleistocene sediments (Eocene sands and terrace gravels), resulted in an important hydrogeologic feature known as the Porters Creek terrace. The Porters Creek terrace lies immediately south of PGDP; the terrace slope extends northward toward the southern boundary of the PGDP fenced security area. The Porters Creek terrace is hydrogeologically important because it is the southern extent of the lower continental deposits and the Regional Gravel Aquifer (RGA).

4.6.5 Eocene Sands

Eocene sands are found south of PGDP above the Porters Creek Clay. These sands are believed to be composed of undifferentiated sediments of the Claiborne Group and Wilcox Formation. Olive (1980) describes the sands as predominantly clear quartz with minor amounts of gray quartz and chert with interbedded and interlensing silts and clays. The Eocene sands thicken south of PGDP and may serve as a significant water-bearing unit south of the plant.

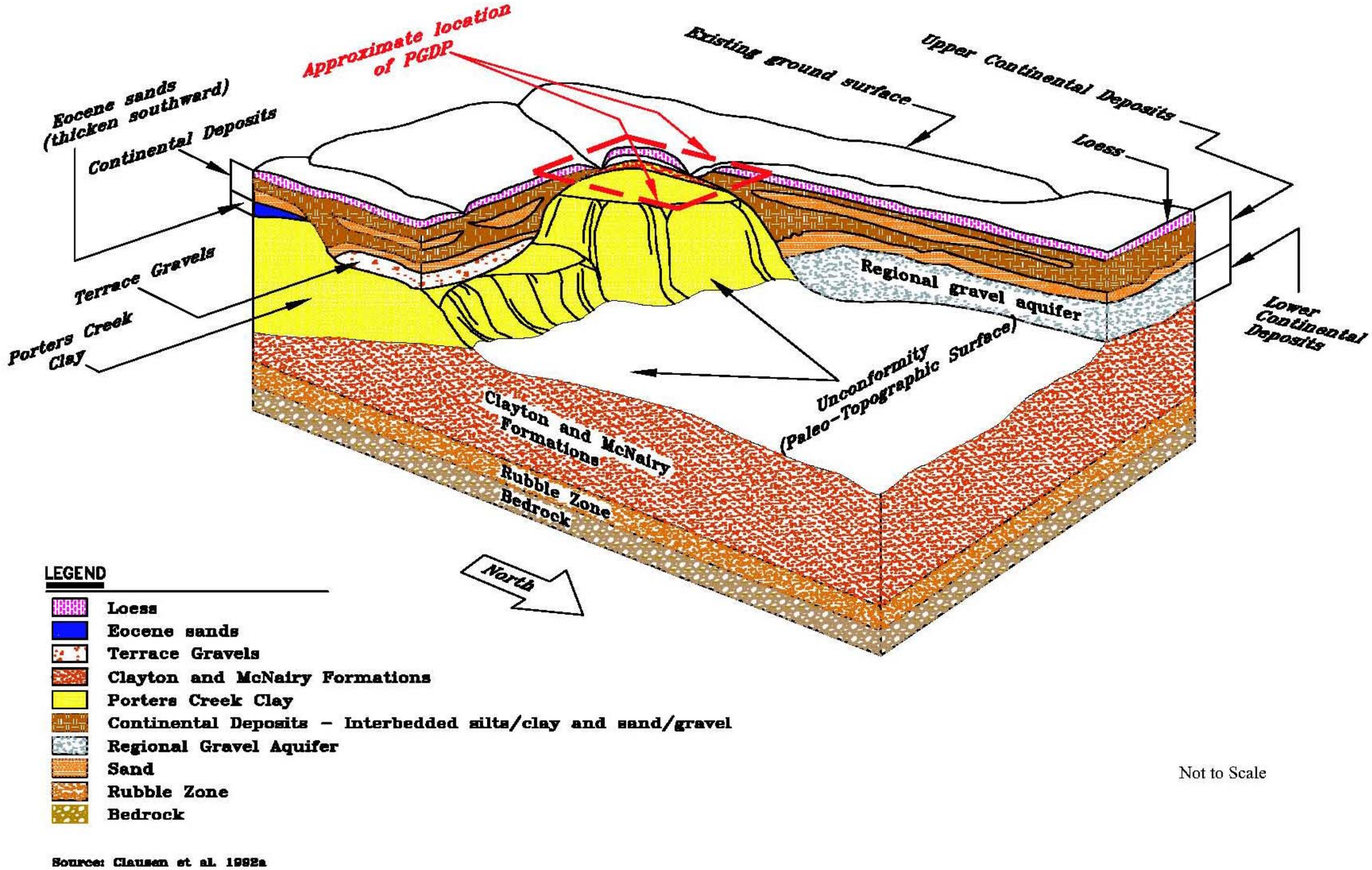

Figure 4.5. CSM for Geologic Formations at PGDP

4.6.6 Continental Deposits

Continental sediments [Pliocene(?) to Pleistocene—a question mark indicates uncertain age] unconformably overlie the Cretaceous through Eocene strata throughout the area. These continental sediments were deposited on an irregular erosional surface exhibiting steps or terraces. The thicker sequences represent valley fill sediments that comprise a fining-upward cycle. The continental sediments have been divided into the two distinct facies described below.

(1) Lower Continental Deposits. The lower continental deposits are a gravel facies consisting of chert pebbles to cobbles in a matrix of poorly sorted sand and silt. The lower continental deposits have been found at three distinct horizons in the PGDP area.

    The first horizon consists of the terrace gravel [consisting of a Pliocene(?) gravel ranging in thickness from 0 to 30 ft], occurring in the southern portion of PGDP area at elevations greater than 350 ft amsl, and overlying the Eocene sands and Porters Creek Clay. The terrace gravel is a potential source of the sediments forming the RGA.

    The second gravel horizon is terrace gravels located in the southeastern and eastern portions of the DOE boundary on an erosional surface at approximately 320 to 345 ft amsl. The thickness of this unit ranges from 15 to 20 ft.

    The third and most prominent of the three horizons consists of a Pleistocene gravel deposit resting on an erosional surface at approximately 280 ft amsl. This gravel is found throughout the plant area and to the north, but pinches out to the south along the slope of the Porters Creek terrace. The gravel deposit averages approximately 30 ft in thickness, but some thicker deposits (as much as 50 ft) exist in deeper scour channels that trend east–west across the site.

(2) Upper Continental Deposits. The upper facies is composed of fine-grained clastics varying in thickness from 15 to 55 ft. These upper continental deposits have been differentiated into three general horizons: (1) an upper silt and clay interval, (2) an inner-bedded sand and gravel interval, and (3) a lower silt and clay interval. The sand and gravel interval appears relatively discontinuous in cross-sections, but portions may be inner-connected.

4.7 SOILS

The surficial deposits found in the vicinity of PGDP are Pleistocene to Recent in age and consist of loess and alluvium. Both units are composed of clayey silt or silty clay and range in color from yellowish-brown to brownish-gray or tan, making field differentiation difficult.

The loess (wind-blown) deposits overlie the upper continental deposits over the entire PGDP area. Loess deposition probably occurred in upland areas during all stages of the glaciation that extended into the Ohio and Mississippi River Valleys.

4.8 HYDROGEOLOGY OF PGDP

Information presented herein regarding the groundwater setting was derived from the *Report of the Paducah Gaseous Diffusion Plant Groundwater Investigation Phase III* (Clausen *et al.* 1992). The discussion provides the reader with an overview of the groundwater flow regime for PGDP. The local groundwater flow system at the PGDP site occurs within the sands of the Cretaceous McNairy Formation, Pliocene terrace gravel, Pleistocene lower continental gravel deposits and upper continental deposits, and Holocene alluvium. Four specific components have been identified for the groundwater flow system and are defined in the following paragraphs.

(1) **McNairy Flow System.** This component consists of the interbedded and interlensing sand, silt, and clay of the Cretaceous McNairy Formation. Sand facies account for 40–50% of the total formation's thickness of approximately 225 ft. Groundwater flow is predominantly north.

(2) **Terrace Gravel.** This component consists of Pliocene(?)-aged gravel deposits and later reworked sand and gravel deposits found at elevations higher than 320 ft amsl in the southern portion of the plant site; they overlie the Paleocene Porters Creek Clay and Eocene sands. These deposits usually lack sufficient thickness and saturation to constitute an aquifer.

(3) **RGA.** This component consists of the Quaternary sand and gravel facies of the lower continental deposits and Holocene alluvium found adjacent to the Ohio River and is of sufficient thickness and saturation to constitute an aquifer. These deposits are commonly thicker than the Pliocene(?) gravel deposits, having an average thickness of 30 ft, and range up to 50 ft along an axis that trends east-west through the plant site. The RGA is the primary local aquifer. Groundwater flow is predominantly north toward the Ohio River.

(4) **Upper Continental Recharge System (UCRS).** This component consists of the surficial alluvium and upper continental deposits. Sand and gravel lithofacies appear relatively discontinuous in cross-section, but portions may be interconnected. The most prevalent sand and gravel deposits occur at an elevation of approximately 345 to 351 ft amsl; less prevalent deposits occur at elevations of 337 to 341 ft amsl. Groundwater flow is predominantly downward into the RGA from the UCRS, which has a limited horizontal component in the vicinity of PGDP.

Five hydrostratigraphic units (HUs) proposed by Douthitt and Phillips (1991) explain groundwater flow at the PGDP site. In descending order, the HUs are as described below.

Upper Continental Deposits

— HU 1 (UCRS): Loess that covers the entire site.

— HU 2 (UCRS): Discontinuous, sand and gravel lenses in a clayey silt matrix.

— HU 3 (UCRS): Relatively impermeable clay layer that acts as the upper semiconfining-to-confining layer for the RGA. The lithologic composition of this unit varies from clay to sand, but is predominantly clay or silt.

— HU 4 (RGA): Predominantly continuous sand unit with a clayey silt matrix that directly overlies the RGA. This unit is in hydraulic connection with HU 5 and is included as part of the RGA.

Lower Continental Deposits

— HU 5 (RGA): Gravel, sand, and silt.

4.9 ECOLOGICAL SETTING OF PGDP

The following sections give an overview of the terrestrial and aquatic systems at PGDP. A more detailed description, including identification and discussion of sensitive habitats and threatened/endangered species, is contained in the *Investigation of Sensitive Ecological Resources Inside the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (CDM 1994) and *Environmental Investigations at the Paducah Gaseous Diffusion Plant and Surrounding Area, McCracken County, Kentucky, Volume V: Floodplain Investigation, Part A: Results of Field Survey* (COE 1994). PGDP and the surrounding area have not had changes that would invalidate the findings of these reports since they were finalized.

4.9.1 Terrestrial Systems

The terrestrial component of the PGDP ecosystem includes the plants and animals that use the upland habitats for food, reproduction, and protection. The upland vegetative communities consist primarily of grassland, forest, and thicket habitats with agricultural areas. Important crops grown in the PGDP area include soybeans, corn, tobacco, and sorghum.

Most of the area in the vicinity of PGDP has been cleared of vegetation at some time, and much of the grassland habitat currently is mowed by PGDP personnel. A large percentage of the adjacent WKWMA is managed to promote native prairie vegetation by burning, mowing, and various other techniques. These areas have the greatest potential for restoration and for establishment of a sizeable prairie preserve in the Jackson Purchase area (KSNPC 1991).

Dominant overstory species of the forested areas include oaks, hickories, maples, elms, and sweetgum. Understory species include snowberry, poison ivy, trumpet creeper, Virginia creeper, and Solomon's seal.

Thicket areas consist predominantly of maples, black locust, sumac, persimmon, and forest species in the sapling stage with herbaceous ground cover similar to that of the forest understory.

Wildlife commonly found in the PGDP area consists of species indigenous to open grassland, thicket, and forest habitats. The species documented to occur in the area are discussed in the following paragraphs.

Small mammal surveys conducted on WKWMA documented the presence of southern short-tailed shrew, prairie vole, house mouse, rice rat, and deer mouse (KSNPC 1991). Large mammals commonly present in the area include coyote, eastern cottontail, opossum, groundhog, whitetail deer, raccoon, and gray squirrel.

Typical birds of the area include European starling, cardinal, red-winged blackbird, mourning dove, bobwhite quail, turkey, killdeer, American robin, eastern meadowlark, eastern bluebird, bluejay, red-tail hawk, and great horned owl.

Amphibians and reptiles present include cricket frog, Fowler's toad, common snapping turtle, green tree frog, chorus frog, southern leopard frog, eastern fence lizard, and red-eared slider (KSNPC 1991).

Mist netting activities in the area have captured red bat, little brown bat, Indiana bat, northern long-eared bat, evening bat, and eastern pipistrelle (KSNPC 1991).

4.9.2 Aquatic Systems

The aquatic communities in and around the PGDP area that could be impacted by plant discharges include two perennial streams (Bayou Creek and LBC), the NSDD, a marsh located at the confluence of Bayou

Creek and LBC, and other smaller drainage areas. The dominant taxa in all surface waters include several species of sunfish, especially bluegill and green sunfish, as well as bass and catfish. Shallow streams, characteristic of the two main area creeks, are dominated by bluegill, green and longear sunfish, and stonerollers.

4.9.3 Wetlands and Floodplains

Wetlands were identified during the 1994 U.S. Army Corps of Engineers (COE) environmental investigations of 11,719 acres surrounding PGDP. These investigations identified 1,083 separate wetland areas and grouped them into 16 vegetative cover types encompassing forested, scrub/shrub, and emergent wetlands (COE 1994). Wetland vegetation consists of species such as sedges, rushes, spike rushes, and various other grasses and forbs in the emergent portions; red maple, sweet gum, oaks, and hickories in the forested portions; and black willow and various other saplings of forested species in the thicket portions.

At the PGDP, three bodies of water cause most area flooding: the Ohio River, Bayou Creek, and LBC. A floodplain analysis performed by COE (1994) found that much of the built-up portions of the plant lie outside the 100- and 500-year floodplains of these streams. In addition, this analysis reports that ditches within the plant area can contain the expected 100- and 500-year discharge. It should be noted that precipitation frequency estimates for the 100- and 500-year events were updated in 2004 in the NOAA's Atlas 14. For example, the mean precipitation estimate for the 100-year, 24-hour event in Atlas 14 for the Paducah area is 10.1% to 15% greater than the mean estimate in previous publications. As stated in Atlas 14, in many cases, the mean precipitation estimate used previously still is within the confidence limits of that provided in Atlas 14; therefore, it is assumed the plant ditches still will contain the 100- and 500-year discharges.

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5. CHARACTERIZATION OF SITE/PREVIOUS ANALYTICAL DATA

Several documents have been produced containing data pertinent to the various SWMUs/AOCs within the SOU. Additionally, data were downloaded from the Paducah Oak Ridge Environmental Information System (OREIS) database in March 2008. These data were binned for several statistical comparison scenarios.

The historical data set was used to compile various risk-screening tables required by the Risk Methods Document for scoping activities. Historical data is provided in Appendix C of this document. Historical information summarized in this section highlights the background of each SWMU/AOC. Some of the SWMUs/AOCs are under multiple OUs; this is noted in applicable area descriptions. For SWMUs/AOCs that are assigned to multiple OUs, only the portion of the SWMU/AOC that is 0 to 10 ft bgs or 16 ft bgs, where infrastructure (e.g., pipelines) is present, is addressed by this work plan. If data gathered during implementation of this work plan indicate that contamination extends beyond the bounds of this work plan, the data will be utilized in the other OUs. Historical summaries within this section are compared to PGDP background values and action/no action levels available in the Risk Methods Document (DOE 2001d) These summaries are presented for information only. All historical data have been used in these summaries regardless of data quality. Adjustments have not been considered based on analytical method.

Risk assessment results, which are included in the Previous Investigation Results, are documented as they were originally reported, consistent with the *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* Volume *1: Human Health, Volume 2: Ecological* (DOE 2001d).

Soil sample depth descriptions are as follows:

Description	Depth
Surface Soil	0 ft to 1 ft bgs
Shallow Soil	1 ft to 16 ft bgs
Subsurface Soil	0 ft to 10 ft bgs
Vadose Zone	0 ft to water table

5.1 EXISTING DATA/SITE DESCRIPTION

5.1.1 Group 1–Former Facility Site

SWMU 1 (C-747-C Oil Landfarm)

Area description

The C-747-C Oil Landfarm (SWMU 1) is located in the extreme west-central portion of the plant. This SWMU is part of the SOU and the GWOU.

Process history

SWMU 1 was used from 1975 to 1979 for the biodegradation of waste oils contaminated with trichloroethene (TCE), PCBs, 1,1,1-trichloroethane (TCA), and uranium. It is estimated that approximately 5,000 gal of waste oil were applied to the landfarm during its period of operation (DOE 1999a). These waste oils were believed to have been derived from a variety of plant processes. The landfarm consisted of two 1,125 ft^2 plots that were plowed to 1 to 2 ft depth. Waste oils were spread on the surface every 3 to 4 months, then limed and fertilized. The area now is mowed regularly as part of PGDP maintenance operations.

Previous investigation results

Investigations that have collected data on SWMU 1 include the Phase I and Phase II SI (CH2M HILL 1991; 1992). Additional sampling was performed to support the Waste Area Group (WAG) 23 FS (DOE 1996a), the WAG 23 Proposed Remedial Action Plan (DOE 1998c), the WAG 27 RI (DOE 1999a), and the Southwest Plume SI (DOE 2004g). These investigations and actions identified solvents, PCBs, dioxins, semivolatile organic compounds (SVOCs), heavy metals, and radionuclides as potential COCs (DOE 1999a).

A summary of conclusions from the WAG 23 effort is as follows:

> Following the removal action at WAG 23 sites, the residual polychlorinated byphenyl (PCB) ELCR based on a 250 day/year exposure scenario is 2 x 10^{-6} at SWMUs 56 and 80 and below *de minimis* (i.e., 1 x 10^{-6}) at SWMUs 57 and 81. In addition, the PCB ELCR at SWMU 1 also are below *de minimis*. These risk levels are well within the EPA's acceptable risk range of 1 x 10^{-4} to 1 x 10^{-6}, as required by the NCP [National Oil and Hazardous Substances Pollution Contingency Plan].

The WAG 27 RI found TCE in SWMU 1 soils. The areal extent of TCE contamination in the vadose (vadose zone is defined as extending from the top of the ground surface to the water table) zone soils on the north side of the site is approximately 175 x 115 ft. The TCE-impacted soil was found to extend from 5 ft bgs to the top of the water table at 50 ft bgs. Metals also were detected in the subsurface soils at concentrations that were 27 times (silver) background levels. The metals are widely dispersed throughout the SWMU, but the highest metal concentrations generally are restricted to the upper 20 ft of vadose soil.

The primary COCs indentified in WAG 27 RI are beryllium and lead for surface and subsurface soils. Scenarios that were assessed in the WAG 27 baseline risk assessment (BRA) are current on-site industrial worker, future on-site industrial worker, future on-site excavation worker, future on-site recreational user, future off-site recreational user, future on-site rural resident, and future off-site rural resident. The following is an excerpt on land use scenarios from WAG 27 RI:

> At SWMU 1 and SWMU 91 all scenarios assessed are a land use scenario of concern for both systemic toxicity and ELCR.

The maximum volume of soil contaminated by metals covers an area that is 290 x 200 x 28 ft for a volume of over 1,624,000 ft^3.

Table 5.1 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.1).

Area utilities

No recirculating water lines or sewers were associated with the operation of this facility. Storm sewers and recirculating water lines are coincidentally located within the boundary of the SWMU. Average depths to these utilities are 3 and 13 ft bgs, respectively. The storm sewer is a 60-inch reinforced concrete pipe, while the recirculating water lines are 36-inch pipe.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.1. Summary of Surface and Subsurface Historical Data at SWMU 1

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	7.00E-06	1.30E-04	4.52E-05	5/6	5.00E-05	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	7.00E-06	3.05E-03	6.11E-04	6/6	1.00E-03	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	3.00E-06	8.00E-06	5.50E-06	2/6	1.60E-04	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzofuran	3.00E-06	5.00E-05	2.10E-05	3/6	1.60E-04	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzofuran	1.00E-05	8.00E-05	3.60E-05	5/6	1.00E-03	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.00E-05	8.00E-05	4.00E-05	5/6	1.00E-03	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	1.00E-05	1.00E-05	1.00E-05	1/6	1.60E-04	1.00E-03	n/a	n/a	0/6	3.39E-02	0/6	5.07E-05
1,2,3,7,8-Pentachlorodibenzofuran	2.00E-05	9.00E-05	5.40E-05	5/6	1.00E-03	1.00E-03	n/a	n/a	0/6	2.81E-03	5/6	1.24E-05
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	4.00E-05	1.20E-04	7.60E-05	5/6	4.00E-05	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4,7,8-Pentachlorodibenzofuran	1.00E-05	5.00E-05	3.00E-05	2/6	6.00E-05	1.00E-03	n/a	n/a	0/6	2.81E-02	0/6	1.24E-04
2,3,7,8-Tetrachlorodibenzofuran	1.00E-05	1.10E-04	4.20E-05	5/10	1.00E-04	1.00E-03	n/a	n/a	0/10	1.40E-02	1/10	6.19E-05
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.00E-05	1.43E-03	2.67E-04	7/12	6.00E-05	1.00E-03	n/a	n/a	1/12	6.19E-04	7/12	6.19E-06
Heptachloro-dibenzo[b,e][1,4]dioxin	5.35E-03	5.35E-03	5.35E-03	1/7	3.00E-04	2.00E-03	n/a	n/a	0/7	6.19E-02	1/7	6.19E-04
Octachloro-dibenzo[b,e][1,4]dioxin	4.00E-05	3.93E-02	5.79E-03	11/12	1.00E-03	4.00E-03	n/a	n/a	0/12	6.19E-01	1/12	6.19E-03
Octachlorodibenzofuran	1.00E-05	1.80E-03	4.20E-04	7/12	1.00E-04	1.00E-03	n/a	n/a	0/12	1.40E+00	0/12	6.19E-03
Tetrachloro-dibenzo[b,e][1,4]dioxin	1.38E-03	8.82E-03	5.10E-03	2/7	1.00E-04	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	4.29E+03	1.24E+04	7.90E+03	23/23	1.31E+00	1.95E+01	1/23	1.30E+04	0/23	1.00E+05	22/23	4.64E+03
Antimony	3.20E+00	3.20E+00	3.20E+00	1/28	3.60E-01	1.23E+01	1/28	2.10E-01	0/28	4.63E+02	1/28	3.79E-01
Arsenic	3.17E+00	9.00E+00	5.70E+00	20/28	8.27E-02	4.83E+00	2/28	1.20E+01	0/28	3.15E+02	20/28	5.23E-01
Barium	3.74E+01	1.59E+02	9.07E+01	28/28	2.42E-02	2.44E+00	0/28	2.00E+02	0/28	1.00E+05	0/28	2.29E+02
Beryllium	4.67E-01	1.05E+01	1.97E+00	18/23	1.88E-02	6.00E-01	6/23	6.70E-01	0/23	1.28E+03	4/23	9.48E-01
Cadmium	7.90E-01	6.50E+00	3.20E+00	5/28	4.89E-02	1.95E+00	5/28	2.10E-01	0/28	7.05E+01	0/28	2.13E+01
Calcium	2.29E+01	4.60E+04	6.77E+03	23/23	5.00E-03	9.75E+01	7/23	2.00E+05	n/a	n/a	n/a	n/a
Chromium	4.50E+00	2.58E+02	2.52E+01	28/28	1.33E-01	2.44E+00	4/28	1.60E+01	n/a	n/a	0/28	3.56E+02
Cobalt	3.40E+00	1.37E+01	6.73E+00	23/23	8.47E-02	3.00E+00	2/23	1.40E+01	0/23	1.00E+05	0/23	1.92E+03
Copper	6.70E+00	2.31E+02	2.19E+01	23/23	1.07E-01	2.44E+00	2/23	1.90E+01	0/23	1.00E+05	0/23	4.93E+02
Iron	9.13E+03	1.83E+04	1.35E+04	23/23	6.68E-01	1.95E+01	0/23	2.80E+04	0/23	1.00E+05	23/23	2.07E+03
Lead	1.02E-01	3.23E+02	3.01E+01	19/28	2.40E-03	1.95E+01	1/28	3.60E+01	0/28	1.25E+03	1/28	5.00E+01
Magnesium	8.34E+02	1.12E+04	1.75E+03	23/23	3.75E+00	4.88E+01	1/23	7.70E+03	n/a	n/a	n/a	n/a
Manganese	4.39E+00	1.06E+03	5.13E+02	23/23	3.00E-04	2.44E+00	2/23	1.50E+03	0/23	4.64E+04	22/23	4.52E+01
Mercury	1.99E-02	7.70E+00	8.78E-01	10/28	7.80E-03	1.30E-01	5/28	2.00E-01	0/28	8.25E+02	1/28	9.82E-01
Molybdenum	1.42E+01	1.42E+01	1.42E+01	1/7	4.49E+00	4.88E+00	n/a	n/a	0/7	2.50E+04	0/7	8.30E+01
Nickel	4.95E+00	1.16E+02	2.34E+01	23/28	1.28E-01	6.80E+00	6/28	2.10E+01	0/28	9.30E+04	0/28	2.42E+02
Potassium	6.20E+00	1.29E+03	5.34E+02	21/23	2.05E-02	3.82E+02	1/23	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.71E-01	9.80E-01	3.84E-01	8/28	8.91E-02	1.95E+01	1/28	8.00E-01	0/28	2.56E+04	0/28	9.49E+01
Silver	4.25E+01	4.25E+01	4.25E+01	1/28	1.80E-01	3.20E+00	1/28	2.30E+00	0/28	2.07E+04	1/28	4.11E+01
Sodium	4.46E+01	1.81E+02	8.84E+01	15/23	2.73E+00	9.75E+01	0/23	3.20E+02	n/a	n/a	n/a	n/a
Thallium	3.70E-01	3.70E-01	3.70E-01	1/28	2.40E-01	1.95E+01	1/28	2.10E-01	n/a	n/a	n/a	n/a
Uranium	1.79E+00	1.59E+01	5.54E+00	14/14	1.30E-01	9.70E-01	7/14	4.90E+00	0/14	3.34E+03	0/14	2.02E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.1. Summary of Surface and Subsurface Historical Data at SWMU 1 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Vanadium	2.53E-01	4.21E+01	2.06E+01	23/23	1.40E-03	2.44E+00	1/23	3.80E+01	0/23	4.47E+03	22/23	3.32E+00
Zinc	2.31E+01	3.90E+02	5.86E+01	23/23	8.06E-02	1.95E+01	4/23	6.50E+01	0/23	1.00E+05	0/23	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.20E-01	1.71E+01	1.96E+00	13/88	1.10E-01	1.00E+00	n/a	n/a	0/88	4.25E+01	10/88	1.99E-01
PCB-1242	2.70E-01	6.10E-01	4.70E-01	4/150	5.00E-02	1.10E+00	n/a	n/a	0/150	4.25E+01	4/150	1.99E-01
PCB-1248	2.00E-02	3.50E+01	1.99E+00	21/148	8.50E-02	1.10E+00	n/a	n/a	0/148	4.25E+01	7/148	1.99E-01
PCB-1254	9.30E-02	1.40E+00	3.11E-01	15/148	8.00E-02	2.30E+00	n/a	n/a	0/148	1.82E+01	9/148	1.99E-01
PCB-1260	1.00E-01	1.10E+01	1.29E+00	10/149	9.00E-02	2.30E+00	n/a	n/a	0/149	4.25E+01	5/149	1.99E-01
PCB-1268	4.20E+00	5.60E+00	4.90E+00	2/79	7.00E-02	8.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	6.00E-05	8.05E+02	2.67E+01	81/88	8.10E-01	9.51E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	9.92E-02	7.83E+00	2.91E+00	6/18	3.00E-02	5.00E-02	n/a	n/a	0/18	5.16E+02	2/18	5.16E+00
Beta activity	1.00E-05	6.60E+02	3.49E+01	85/88	8.00E-01	1.81E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-5.80E-01	7.24E+01	2.72E+00	80/85	5.00E-02	2.20E+00	51/85	4.90E-01	5/85	8.58E+00	68/85	8.58E-02
Neptunium-237	2.00E-02	1.22E+01	1.50E+00	10/27	3.00E-02	5.00E-01	6/27	1.00E-01	0/27	2.71E+01	5/27	2.71E-01
Plutonium-238	5.36E-02	1.11E-01	8.23E-02	2/7	2.00E-02	4.00E-02	1/7	7.30E-02	0/7	1.17E+03	0/7	1.17E+01
Plutonium-239	1.70E-02	2.80E-01	8.45E-02	6/9	5.00E-02	6.00E-02	5/9	2.50E-02	0/9	1.15E+03	0/9	1.15E+01
Plutonium-239/240	4.39E-02	2.68E+01	3.70E+00	11/17	2.00E-02	2.00E-02	n/a	n/a	0/17	1.15E+03	1/17	1.15E+01
Technetium-99	1.58E+00	6.40E+02	5.49E+01	18/27	8.10E-01	8.70E+00	17/27	2.50E+00	0/27	3.62E+04	1/27	3.62E+02
Thorium-228	2.52E-01	7.64E-01	4.55E-01	7/7	4.00E-02	1.60E-01	0/7	1.60E+00	0/7	2.80E+00	7/7	2.80E-02
Thorium-230	2.10E-01	1.88E+02	1.18E+01	25/26	4.00E-02	2.10E-01	8/26	1.50E+00	0/26	1.49E+03	3/26	1.49E+01
Thorium-232	1.59E-01	7.94E-01	4.96E-01	7/7	3.00E-02	5.00E-02	0/7	1.50E+00	0/7	1.35E+03	0/7	1.35E+01
Uranium	3.20E+00	2.95E+02	2.43E+01	47/68			n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.80E-01	1.20E+02	7.95E+00	21/21	8.00E-02	1.25E+00	6/21	2.50E+00	0/21	1.98E+03	1/21	1.98E+01
Uranium-235	1.30E-02	4.20E+00	3.57E-01	16/18	2.00E-02	3.00E-02	5/18	1.40E-01	0/18	3.95E+01	1/18	3.95E-01
Uranium-238	-1.62E+01	2.90E+02	8.77E+00	86/88	4.00E-02	1.36E+01	62/88	1.20E+00	1/88	1.71E+02	62/88	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	3.00E-01	2.50E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Octadecene	7.00E-01	7.00E-01	7.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4-Trimethylhexane	5.00E-01	5.00E-01	5.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,4-Dimethylphenol	1.50E+01	1.50E+01	1.50E+01	1/17	3.30E-01	4.60E-01	n/a	n/a	0/17	4.51E+04	0/17	2.25E+02
2-Methylnaphthalene	9.00E-02	9.00E-02	9.00E-02	1/16	3.30E-01	4.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
3- and 4- Methylphenol	8.60E+00	8.60E+00	8.60E+00	1/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Benz(a)anthracene	5.70E-02	6.40E-02	6.05E-02	2/23	3.30E-01	5.00E-01	n/a	n/a	0/23	2.08E+02	0/23	2.12E-01
Benzo(a)pyrene	6.40E-02	7.80E-02	7.10E-02	2/23	3.30E-01	5.00E-01	n/a	n/a	0/23	2.08E+01	2/23	2.12E-02
Benzo(b)fluoranthene	8.70E-02	8.70E-01	3.62E-01	3/23	3.30E-01	5.00E-01	n/a	n/a	0/23	2.08E+02	1/23	2.12E-01
Benzo(k)fluoranthene	8.10E-02	8.30E-02	8.20E-02	2/23	3.30E-01	5.00E-01	n/a	n/a	0/23	2.08E+03	0/23	2.12E+00
Bis(2-ethylhexyl)phthalate	8.90E-02	5.50E-01	2.31E-01	6/16	3.30E-01	4.60E-01	n/a	n/a	0/16	7.40E+03	0/16	8.84E+00
Chrysene	8.40E-02	5.10E-01	2.30E-01	3/23	3.30E-01	5.00E-01	n/a	n/a	0/23	2.08E+04	0/23	2.12E+01
Di-n-butyl phthalate	5.70E-02	9.00E+00	3.04E+00	3/17	3.30E-01	4.60E-01	n/a	n/a	0/17	1.00E+05	0/17	2.13E+03
Fluoranthene	8.30E-02	6.20E-01	3.54E-01	4/23	3.30E-01	5.00E-01	n/a	n/a	0/23	6.50E+04	0/23	2.21E+02
Naphthalene	6.30E-02	6.30E-02	6.30E-02	1/25	5.70E-03	5.00E-01	n/a	n/a	0/25	7.66E+02	0/25	2.36E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.1. Summary of Surface and Subsurface Historical Data at SWMU 1 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Octadecene	8.00E-01	8.00E-01	8.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phenanthrene	4.50E-02	6.00E-01	2.33E-01	3/23	3.30E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Phenol	1.80E+00	2.30E+01	9.23E+00	3/18	3.30E-01	4.60E-01	n/a	n/a	0/18	1.00E+05	0/18	1.16E+04
Pyrene	9.50E-02	6.80E-01	3.46E-01	4/23	3.30E-01	5.00E-01	n/a	n/a	0/23	4.87E+04	0/23	1.65E+02
Total Cresols	8.60E+00	8.60E+00	8.60E+00	1/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,1,1-Trichloroethane	5.00E-04	8.40E-03	4.45E-03	2/19	5.00E-03	7.00E-03	n/a	n/a	0/19	9.38E+03	0/19	1.56E+02
1,1,2-Trichloroethane	2.40E-03	2.40E-03	2.40E-03	1/12	5.70E-03	7.00E-03	n/a	n/a	0/12	1.69E+02	0/12	1.18E+00
1,1-Dichloroethane	2.40E-03	2.40E-03	2.40E-03	1/12	5.70E-03	7.00E-03	n/a	n/a	0/12	5.52E+03	0/12	1.55E+02
1,1-Dichloroethene	8.30E-03	8.30E-03	8.30E-03	1/17	5.70E-03	7.00E-03	n/a	n/a	0/17	1.21E+01	0/17	9.59E-02
1-Methyl-2-propylcyclohexane	1.60E-01	1.60E-01	1.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyl-3-penten-2-one	2.90E-01	2.90E-01	2.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	7.70E-03	1.20E-02	9.85E-03	2/12	1.10E-02	2.50E-02	n/a	n/a	0/12	1.91E+04	0/12	3.58E+02
Carbon disulfide	1.00E-03	1.00E-03	1.00E-03	1/12	5.70E-03	7.00E-03	n/a	n/a	0/12	3.17E+03	0/12	1.06E+02
Chloroform	2.00E-04	4.00E-03	1.61E-03	3/17	5.70E-03	7.00E-03	n/a	n/a	0/17	3.70E+00	0/17	1.23E-01
cis-1,2-Dichloroethene	2.90E-02	4.70E-01	2.60E-01	3/3	5.70E-03	2.90E-01	n/a	n/a	0/3	4.63E+02	0/3	1.34E+01
Ethylbenzene	7.00E-03	7.00E-03	7.00E-03	1/12	5.70E-03	7.00E-03	n/a	n/a	0/12	2.12E+03	0/12	2.12E+01
Methylene chloride	3.50E-03	6.00E-03	4.53E-03	3/12	5.70E-03	6.30E-02	n/a	n/a	0/12	2.16E+03	0/12	1.34E+01
Toluene	4.00E-03	4.00E-03	4.00E-03	1/12	5.70E-03	7.00E-03	n/a	n/a	0/12	7.28E+03	0/12	2.11E+02
trans-1,2-Dichloroethene	4.50E-04	4.50E-04	4.50E-04	1/2	5.70E-03	6.00E-03	n/a	n/a	0/2	7.43E+02	0/2	2.20E+01
Trichloroethene	1.00E-03	1.30E+00	4.88E-01	8/25	1.00E-03	2.90E-01	n/a	n/a	0/25	2.98E+02	0/25	2.51E+00
Trichlorofluoromethane	1.40E-03	1.40E-03	1.40E-03	1/2	5.70E-03	6.00E-03	n/a	n/a	0/2	4.73E+03	0/2	1.28E+02
Vinyl acetate	5.70E-03	5.70E-03	5.70E-03	1/12	5.70E-03	1.40E-02	n/a	n/a	0/12	4.42E+03	0/12	1.44E+02
Vinyl chloride	4.50E-03	2.70E-01	1.14E-01	3/17	1.00E-03	1.40E-02	n/a	n/a	0/17	4.14E+01	1/17	1.34E-01
Wetchem (mg/kg)												
Cyanide	7.10E-01	7.10E-01	7.10E-01	1/16	2.90E-01	6.20E-01	n/a	n/a	0/16	2.02E+04	0/16	7.92E+01
Subsurface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	1.60E-03	2.60E-03	2.00E-03	3/4	1.00E-04	1.80E-03	n/a	n/a	0/4	6.19E-01	0/4	6.19E-03
Octachlorodibenzofuran	2.00E-04	2.00E-04	2.00E-04	1/4	1.00E-04	1.00E-04	n/a	n/a	0/4	1.40E+00	0/4	6.19E-03
Metals (mg/kg)												
Aluminum	1.04E+03	1.62E+04	7.15E+03	108/109	1.31E+00	1.31E+01	2/109	1.20E+04	0/109	1.00E+05	89/109	4.64E+03
Antimony	1.30E-02	5.00E+00	1.33E+00	15/109	5.20E-03	2.10E+01	14/109	2.10E-01	0/109	4.63E+02	14/109	3.79E-01
Arsenic	7.60E-01	1.67E+01	4.35E+00	106/109	8.27E-02	4.60E+00	7/109	7.90E+00	0/109	3.15E+02	106/109	5.23E-01
Barium	1.27E+00	2.47E+02	9.53E+01	109/109	2.00E-04	1.71E-01	6/109	1.70E+02	0/109	1.00E+05	1/109	2.29E+02
Beryllium	5.94E-03	2.20E+00	5.17E-01	106/109	1.00E-04	5.00E-01	21/109	6.90E-01	0/109	1.28E+03	3/109	9.48E-01
Cadmium	4.33E-03	3.84E+00	1.53E+00	54/109	4.00E-04	4.00E+00	39/109	2.10E-01	0/109	7.05E+01	0/109	2.13E+01
Calcium	4.12E+02	5.31E+03	1.14E+03	109/109	1.00E-01	6.63E+00	0/109	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.29E-01	6.35E+01	1.57E+01	107/109	1.30E-03	2.30E+00	29/109	4.30E+01	n/a	n/a	0/109	3.56E+02
Cobalt	5.76E-02	1.54E+01	5.59E+00	107/109	8.00E-04	3.50E+00	5/109	1.30E+01	0/109	1.00E+05	0/109	1.92E+03
Copper	2.09E-01	6.01E+01	9.55E+00	108/109	2.10E-03	9.53E-01	1/109	2.50E+01	0/109	1.00E+05	0/109	4.93E+02
Iron	1.32E+02	3.14E+04	1.38E+04	109/109	7.00E-03	2.36E+01	2/109	2.80E+04	0/109	1.00E+05	105/109	2.07E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.1. Summary of Surface and Subsurface Historical Data at SWMU 1 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Lead	1.98E+00	7.04E+01	8.95E+00	107/109	2.00E-01	2.48E+00	2/109	2.30E+01	0/109	1.25E+03	1/109	5.00E+01
Magnesium	1.17E+02	2.63E+03	1.31E+03	109/109	1.00E-01	6.79E+00	10/109	2.10E+03	n/a	n/a	n/a	n/a
Manganese	3.04E+00	2.16E+03	3.75E+02	109/109	3.00E-04	2.01E-01	8/109	8.20E+02	0/109	4.64E+04	108/109	4.52E+01
Mercury	2.71E-04	2.80E-01	3.62E-02	79/109	0.00E+00	1.25E-01	2/109	1.30E-01	0/109	8.25E+02	0/109	9.82E-01
Nickel	2.98E-01	4.02E+01	1.18E+01	105/109	1.20E-03	8.00E+00	7/109	2.20E+01	0/109	9.30E+04	0/109	2.42E+02
Potassium	6.10E+01	7.34E+02	2.81E+02	83/109	2.00E+00	8.16E+02	0/109	9.50E+02	n/a	n/a	n/a	n/a
Selenium	8.91E-02	5.90E-01	2.36E-01	25/109	8.00E-04	2.00E+00	0/109	7.00E-01	0/109	2.56E+04	0/109	9.49E+01
Silver	1.85E-03	7.39E+01	1.38E+01	7/109	1.70E-03	5.00E+00	5/109	2.70E+00	0/109	2.07E+04	1/109	4.11E+01
Sodium	5.22E+00	8.82E+02	2.96E+02	105/109	2.72E-02	1.21E+02	45/109	3.40E+02	n/a	n/a	n/a	n/a
Thallium	1.17E-01	1.56E+00	2.11E-01	28/109	5.30E-03	9.30E+00	3/109	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	2.31E-01	6.89E+01	2.40E+01	108/109	1.40E-03	6.02E-01	9/109	3.70E+01	0/109	4.47E+03	107/109	3.32E+00
Zinc	7.40E+00	1.65E+02	4.18E+01	109/109	8.06E-02	1.44E-01	20/109	6.00E+01	0/109	1.00E+05	0/109	2.73E+03
Pesticides/PCBs (mg/kg)												
4,4'-DDT	2.20E-02	2.20E-02	2.20E-02	1/31	1.70E-02	9.30E-01	n/a	n/a	0/31	7.55E+02	0/31	3.59E+00
PCB, Total	3.00E-01	3.00E-01	3.00E-01	1/135	1.70E-02	1.00E+00	n/a	n/a	0/135	4.25E+01	1/135	1.99E-01
PCB-1248	2.40E-01	1.10E+01	3.85E+00	3/112	1.70E-02	4.70E+00	n/a	n/a	0/112	4.25E+01	3/112	1.99E-01
PCB-1254	1.69E-01	1.69E-01	1.69E-01	1/111	1.70E-02	9.30E+00	n/a	n/a	0/111	1.82E+01	0/111	1.99E-01
Tetrachlorobiphenyl	4.00E-01	7.00E-01	5.50E-01	4/4			n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	1.29E+00	1.07E+02	9.31E+00	187/208	1.30E+00	1.06E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	8.00E-02	1.00E-01	9.00E-02	2/61	n/a	n/a	n/a	n/a	0/61	5.16E+02	0/61	5.16E+00
Beta activity	9.50E-01	2.70E+02	2.19E+01	191/208	8.00E-01	1.87E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	9.00E-02	5.10E-01	3.00E-01	2/61	n/a	n/a	1/61	2.80E-01	0/61	8.58E+00	2/61	8.58E-02
Neptunium-237	1.70E-01	2.00E-01	1.85E-01	2/71	5.00E-01	5.00E-01	n/a	n/a	0/71	2.71E+01	0/71	2.71E-01
Plutonium-239	2.30E-01	2.30E-01	2.30E-01	1/10	5.00E-02	5.00E-02	n/a	n/a	0/10	1.15E+03	0/10	1.15E+01
Plutonium-239/240	6.00E-02	2.72E+00	1.39E+00	2/61	n/a	n/a	n/a	n/a	0/61	1.15E+03	0/61	1.15E+01
Technetium-99	6.00E-01	9.90E+01	1.44E+01	9/73	4.00E-02	1.40E+00	5/73	2.80E+00	0/73	3.62E+04	0/73	3.62E+02
Thorium-230	1.80E-01	1.84E+01	9.48E-01	43/71	3.00E-02	1.70E-01	2/71	1.40E+00	0/71	1.49E+03	1/71	1.49E+01
Uranium	1.50E+00	2.20E+01	3.33E+00	40/62	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.00E-01	7.10E+01	2.98E+00	50/71	2.00E-02	1.30E-01	8/71	2.40E+00	0/71	1.98E+03	1/71	1.98E+01
Uranium-235	2.08E-02	3.60E+00	1.61E-01	42/65	n/a	n/a	5/65	1.40E-01	0/65	3.95E+01	2/65	3.95E-01
Uranium-238	1.20E-01	1.90E+02	5.51E+00	50/71	2.00E-02	1.30E-01	25/71	1.20E+00	1/71	1.71E+02	13/71	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	1.00E-01	4.00E-01	2.90E-01	10/10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dichlorobenzene	7.90E-02	1.20E-01	9.54E-02	5/120	3.30E-01	2.50E+00	n/a	n/a	0/120	1.29E+04	0/120	2.68E+02
1-Octadecene	6.00E-01	6.00E-01	6.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3- and 4- Methylphenol	2.30E+00	2.30E+00	2.30E+00	1/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-alpha-Cumylphenol	1.60E+00	1.60E+00	1.60E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methylphenol	8.50E-01	8.50E-01	8.50E-01	1/98	3.30E-01	4.50E-01	n/a	n/a	0/98	1.32E+04	0/98	7.18E+01
Benzoic acid	5.10E-02	3.80E+00	1.31E+00	3/116	1.65E+00	2.50E+00	n/a	n/a	0/116	1.00E+05	0/116	8.52E+04
Bis(2-butoxyethyl) ether	6.80E-01	6.80E-01	6.80E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	3.90E-02	2.40E+00	3.49E-01	31/115	2.00E-02	2.50E+00	n/a	n/a	0/115	7.40E+03	0/115	8.84E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.1. Summary of Surface and Subsurface Historical Data at SWMU 1 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Butyl benzyl phthalate	2.00E-01	2.00E-01	2.00E-01	1/115	2.00E-02	2.50E+00	n/a	n/a	0/115	1.00E+05	0/115	2.71E+03
Di-n-butyl phthalate	4.80E-02	2.20E+01	2.72E+00	12/117	1.00E-02	2.50E+00	n/a	n/a	0/117	1.00E+05	0/117	2.13E+03
Hexadecane	1.80E-01	1.80E-01	1.80E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
N-Nitrosodiphenylamine	4.80E-02	8.20E-02	6.42E-02	6/115	3.30E-01	2.50E+00	n/a	n/a	0/115	2.63E+04	0/115	3.30E+01
n-Octacosane	2.90E-01	3.50E-01	3.20E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Octadecene	6.00E-01	6.00E-01	6.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pentachlorophenol	5.50E-02	1.10E-01	8.25E-02	2/117	4.00E-01	2.50E+00	n/a	n/a	0/117	2.56E+03	0/117	2.12E+00
Phenol	7.00E-01	1.70E+01	8.85E+00	2/116	3.30E-01	2.50E+00	n/a	n/a	0/116	1.00E+05	0/116	1.16E+04
Total Cresols	2.30E+00	4.40E+00	3.35E+00	2/19	2.50E+00	4.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.30E-02	1.30E-02	1.30E-02	1/40	2.00E-03	3.10E-02	n/a	n/a	0/40	9.38E+03	0/40	1.56E+02
1,1-Dichloroethane	9.00E-02	4.30E+00	1.12E+00	5/58	2.00E-03	3.10E-02	n/a	n/a	0/58	5.52E+03	0/58	1.55E+02
1,2,4-Trimethylbenzene	4.80E-02	4.80E-02	4.80E-02	1/1	n/a	n/a	n/a	n/a	0/1	1.00E+05	0/1	3.67E+02
2-Butanone	5.00E-02	5.00E-02	5.00E-02	1/40	1.10E-02	5.00E-01	n/a	n/a	0/40	3.94E+04	0/40	1.03E+03
4-Methyl-2-pentanone	8.10E-02	8.10E-02	8.10E-02	1/40	1.10E-02	2.50E-01	n/a	n/a	0/40	2.18E+03	0/40	6.51E+01
4-Methyl-3-penten-2-one	1.80E-01	1.80E-01	1.80E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	3.00E-03	8.00E-01	1.28E-01	19/40	6.00E-03	5.00E-01	n/a	n/a	0/40	1.91E+04	0/40	3.58E+02
Benzene	9.00E-03	9.00E-03	9.00E-03	1/40	2.00E-03	3.10E-02	n/a	n/a	0/40	7.45E+01	0/40	1.13E+00
Carbon disulfide	1.00E-03	2.00E-03	1.89E-03	9/40	2.00E-03	3.10E-02	n/a	n/a	0/40	3.17E+03	0/40	1.06E+02
Chlorobenzene	1.00E-03	1.00E-03	1.00E-03	1/40	2.00E-03	3.10E-02	n/a	n/a	0/40	1.64E+03	0/40	2.89E+01
cis-1,2-Dichloroethene	2.60E-02	2.40E+03	2.01E+02	12/169	2.00E-03	1.90E+01	n/a	n/a	1/169	4.63E+02	1/169	1.34E+01
Decane	9.70E-02	9.70E-02	9.70E-02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Methylene chloride	3.90E-02	1.40E-01	7.15E-02	12/40	2.00E-03	1.20E-01	n/a	n/a	0/40	2.16E+03	0/40	1.34E+01
Toluene	2.00E-03	3.00E-03	2.25E-03	4/40	2.00E-03	3.10E-02	n/a	n/a	0/40	7.28E+03	0/40	2.11E+02
trans-1,2-Dichloroethene	2.00E-02	1.60E+01	2.54E+00	22/167	2.00E-03	1.90E+01	n/a	n/a	0/167	7.43E+02	0/167	2.20E+01
Trichloroethene	6.00E-04	4.39E+02	1.53E+01	54/205	1.00E-03	1.90E+01	n/a	n/a	1/205	2.98E+02	13/205	2.51E+00
Vinyl chloride	3.30E-03	4.80E+00	1.07E+00	7/198	9.90E-04	1.90E+01	n/a	n/a	0/198	4.14E+01	6/198	1.34E-01
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	3.45E+02	4.55E+03	9.21E+02	83/83	1.00E+00	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

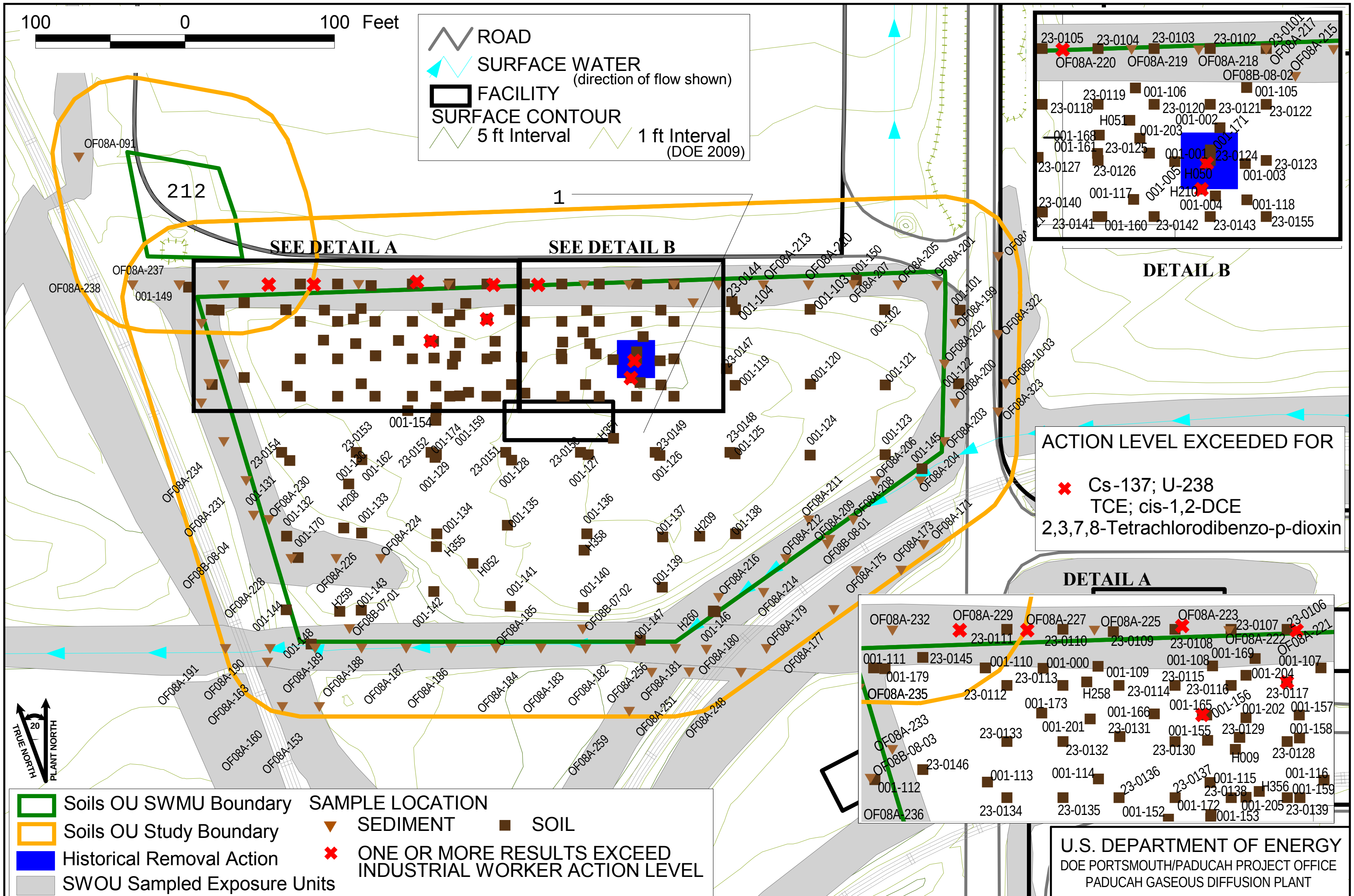

Figure 5.1. Soils Operable Unit: SWMUs 1 and 212

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 99 (C-745 Kellogg Building Site)

Area description

The C-745 Kellogg Building Site (SWMU 99) is located in the east central portion of the plant site. Included in the SWMU are a former septic tank, leach field, and clay piping southeast of the former building location (concrete pad) and the gravel covered parking area. SWMU 99 totals approximately 2.7 acres.

Process history

The C-745 Kellogg Building Sites was constructed in 1951 as facilities for pipe fabrication and pipe cleaning activities during construction of the plant. The building was demolished in 1955, but the remaining concrete pads are used to store uranium hexafluoride (UF_6) cylinders and waste at the C-745-E Cylinder Storage Yard the C-746-D Scrap Yard (SWMU 16), respectively.

The area also contained a former septic tank and leach field used by the Kellogg Buildings. The tank and associated leach field were connected to the Kellogg Buildings by a vitreous clay drain line. The tank and the leaching field are believed to have been designed to receive sanitary waste from the buildings' operations; however, the actual configuration of the drainage system is unknown. No records exist as to what was done with the residual contents of the tank after the buildings were demolished or whether any closure or removal actions were taken. The lateral lines for the leaching field were found intact when they were encountered during construction activities in late 1994.

Previous investigation results

SWMU 99 was investigated during the Phase II SI (CH2M HILL 1992). Volatile organic compounds (VOCs) (primarily TCE), metals, and radionuclides were reported in the groundwater samples collected.

The WAG 28 RI/FS (DOE 2000b) conducted in 1999 focused on potential metals contamination in soils of SWMU 99 based on previous studies and the process knowledge of the activities conducted in this area at the Kellogg Buildings. These studies noted the sporadic presence of some metals in soil at slightly above background levels for subsurface soils. These metals include antimony, barium, beryllium, cadmium, chromium, iron, lead, manganese, and vanadium.

The data from WAG 28 RI/FS was assessed for risk. The results are documented in *Remedial Investigation Report for Waste Area Grouping 28 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2000b). The SWMU was divided into two (2) sections, 99a (Kellogg Building Sites) and 99b (septic system/leach field), in the risk assessment.

Land use scenarios evaluated for 99a are current on-site industrial worker, future on-site industrial worker, future on-site excavation worker, future on-site recreational user, future on-site rural resident, and future off-site rural resident. COCs listed were beryllium; lead; chromium; barium; benz(a)anthracene; benzo(a)pyrene; benzo(b)fluoranthene; dibenz(a,h)anthracene; indeno (1,2,3,-cd)pyrene; PCB-1016; PCB-1254; neptunium-237; technetium-99; thorium-234; uranium-234; uranium-238; trichloroethene; radon-222; aluminum; arsenic; iron; manganese; vanadium; 1;1 dichloroethane; trichloroethene; carbon tetracholoride; *cis*-1,2-dichloroethene; *trans*-1,2-dichloroethene; 1,1-dichloroethene; and lithium.

Land use scenarios evaluated for 99b are future on-site industrial worker, future on-site excavation worker, future on-site rural resident, and future off-site rural resident. COCs for 99b are beryllium, TCE, lead, radon-222, and chromium.

Significant results of the BHHRA and baseline ecological risk assessment (BERA) pertinent to this investigation are as follows:

- Scenarios for which human health risk exceeds *de minimis* levels [i.e., a cumulative human health excess lifetime cancer risk of 1E-6 or a cumulative HI of 1]: future industrial worker exposure to RGA groundwater and McNairy groundwater; future on-site resident exposure to soil, RGA groundwater and McNairy groundwater; off-site resident exposure to groundwater; future excavation worker exposure to soil; current industrial worker exposure to soil; future industrial worker exposure to soil; future on-site residential exposure to soil; future recreational user exposure to soil; and future excavation worker exposure to soil.

- Although chromium and zinc exceed benchmarks for plants and soil invertebrates and barium exceeds benchmarks for plants, potential risks to plant and soil invertebrate communities from future exposure to surface soil at this site appear low.

- Estimated doses from exposure to radionuclides in soil are below recommended dose rate limits for wildlife, but dose rates for plants and soil invertebrates are higher than the recommended dose rate limit of 1 rad/day. Technetium-99 is the radionuclide of concern based on its occurrence in a single sample.

Table 5.2 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.2).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, they cross the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples needed at this location.

Table 5.2. Summary of Surface and Subsurface Historical Data at SWMU 99

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	1.81E+03	9.79E+03	5.24E+03	10/10	1.92E+01	2.00E+01	0/10	1.30E+04	0/10	1.00E+05	5/10	4.64E+03
Arsenic	1.92E+00	8.04E+00	5.97E+00	5/10	9.60E-01	5.00E+00	1/10	1.20E+01	0/10	3.15E+02	5/10	5.23E-01
Barium	3.26E+01	2.47E+03	3.47E+02	10/10	1.00E+00	2.43E+00	2/10	2.00E+02	0/10	1.00E+05	2/10	2.29E+02
Beryllium	8.40E-01	8.90E-01	8.65E-01	2/10	4.80E-01	5.00E-01	2/10	6.70E-01	0/10	1.28E+03	0/10	9.48E-01
Calcium	8.76E+03	3.05E+05	1.72E+05	10/10	5.00E+01	2.50E+03	10/10	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.59E+00	4.57E+01	1.66E+01	10/10	2.00E+00	2.43E+00	4/10	1.60E+01	n/a	n/a	0/10	3.56E+02
Cobalt	1.68E+00	9.67E+00	4.04E+00	8/10	1.00E+00	2.43E+00	0/10	1.40E+01	0/10	1.00E+05	0/10	1.92E+03
Copper	4.37E+00	9.28E+00	6.24E+00	8/10	2.00E+00	2.43E+00	0/10	1.90E+01	0/10	1.00E+05	0/10	4.93E+02
Iron	1.45E+03	2.33E+04	1.06E+04	10/10	5.00E+00	1.94E+01	0/10	2.80E+04	0/10	1.00E+05	9/10	2.07E+03
Lithium	4.52E+00	1.29E+01	8.88E+00	7/7	2.00E+00	2.00E+00	n/a	n/a	0/7	1.00E+05	0/7	6.41E+02
Magnesium	1.20E+03	2.73E+04	9.55E+03	10/10	4.81E+00	7.50E+02	7/10	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.93E+01	4.30E+02	1.95E+02	10/10	1.00E+00	2.43E+00	0/10	1.50E+03	0/10	4.64E+04	9/10	4.52E+01
Molybdenum	5.88E+00	1.60E+01	1.09E+01	2/3	4.81E+00	4.86E+00	n/a	n/a	0/3	2.50E+04	0/3	8.30E+01
Nickel	5.47E+00	2.16E+01	8.77E+00	6/10	4.81E+00	5.00E+00	1/10	2.10E+01	0/10	9.30E+04	0/10	2.42E+02
Potassium	3.44E+02	1.12E+03	5.94E+02	10/10	9.61E+01	1.00E+02	1/10	1.30E+03	n/a	n/a	n/a	n/a
Sodium	2.97E+02	3.66E+02	3.18E+02	4/10	9.61E+01	2.00E+02	1/10	3.20E+02	n/a	n/a	n/a	n/a
Strontium	1.46E+01	5.14E+02	3.00E+02	7/7	2.00E+00	2.00E+00	n/a	n/a	0/7	1.00E+05	0/7	5.45E+03
Uranium	1.40E+00	4.53E+00	2.96E+00	4/6	1.20E-01	9.70E-01	0/6	4.90E+00	0/6	3.34E+03	0/6	2.02E+01
Vanadium	4.48E+00	3.55E+01	1.54E+01	10/10	2.00E+00	2.43E+00	0/10	3.80E+01	0/10	4.47E+03	10/10	3.32E+00
Zinc	4.47E+01	1.14E+02	7.51E+01	10/10	1.50E+01	1.94E+01	8/10	6.50E+01	0/10	1.00E+05	0/10	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.80E-01	1.90E-01	1.85E-01	2/44	1.00E-01	1.30E-01	n/a	n/a	0/44	4.25E+01	0/44	1.99E-01
PCB-1254	1.90E-01	1.90E-01	1.90E-01	1/51	8.00E-02	1.18E-01	n/a	n/a	0/51	1.82E+01	0/51	1.99E-01
PCB-1260	6.00E-02	1.80E-01	1.13E-01	4/51	9.00E-02	1.18E-01	n/a	n/a	0/51	4.25E+01	0/51	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.38E+00	2.85E+01	1.31E+01	8/13	7.60E-01	9.69E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.33E+00	3.66E+01	1.95E+01	8/13	8.90E-01	7.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-3.50E-01	7.70E-01	2.02E-01	40/48	4.00E-02	3.50E+00	12/48	4.90E-01	0/48	8.58E+00	27/48	8.58E-02
Technetium-99	3.41E+00	5.12E+00	4.09E+00	3/10	2.81E+00	4.48E+00	3/10	2.50E+00	0/10	3.62E+04	0/10	3.62E+02
Thorium-228	2.68E-01	3.33E-01	3.01E-01	2/3	5.00E-02	1.60E-01	0/3	1.60E+00	0/3	2.80E+00	2/3	2.80E-02
Thorium-230	2.69E-01	3.02E-01	2.86E-01	2/3	2.00E-01	2.00E-01	0/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	6.19E-02	3.00E-01	2.16E-01	3/3	4.00E-02	4.00E-02	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Uranium-234	1.53E-01	5.06E-01	3.21E-01	3/3	8.00E-02	1.50E-01	0/3	2.50E+00	0/3	1.98E+03	0/3	1.98E+01
Uranium-235	4.25E-02	4.25E-02	4.25E-02	1/10	1.00E-02	7.50E+00	0/10	1.40E-01	0/10	3.95E+01	0/10	3.95E-01
Uranium-238	-1.15E+01	1.46E+01	2.65E+00	41/41	4.00E-02	1.73E+01	26/41	1.20E+00	0/41	1.71E+02	19/41	1.71E+00
Semivolatiles (mg/kg)												
Benzo(b)fluoranthene	1.70E-01	3.00E-01	2.23E-01	3/10	4.70E-01	5.00E-01	n/a	n/a	0/10	2.08E+02	1/10	2.12E-01
Fluoranthene	1.40E-01	1.40E-01	1.40E-01	1/10	4.70E-01	5.00E-01	n/a	n/a	0/10	6.50E+04	0/10	2.21E+02
Pyrene	1.30E-01	1.30E-01	1.30E-01	1/10	4.70E-01	5.00E-01	n/a	n/a	0/10	4.87E+04	0/10	1.65E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.2. Summary of Surface and Subsurface Historical Data at SWMU 99 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Metals (mg/kg)												
Aluminum	5.31E+03	1.50E+04	9.97E+03	36/36	2.00E+01	2.00E+01	6/36	1.20E+04	0/36	1.00E+05	36/36	4.64E+03
Antimony	2.90E+00	2.90E+00	2.90E+00	1/36	1.70E+00	2.00E+01	1/36	2.10E-01	0/36	4.63E+02	1/36	3.79E-01
Arsenic	1.40E+00	8.20E+00	3.95E+00	11/36	5.00E+00	5.00E+00	1/36	7.90E+00	0/36	3.15E+02	11/36	5.23E-01
Barium	1.29E+01	2.13E+02	5.53E+01	36/36	1.00E+00	1.00E+00	2/36	1.70E+02	0/36	1.00E+05	0/36	2.29E+02
Beryllium	2.20E-01	1.25E+00	6.09E-01	24/36	5.00E-01	5.00E-01	7/36	6.90E-01	0/36	1.28E+03	2/36	9.48E-01
Calcium	5.03E+02	7.17E+03	1.66E+03	36/36	5.00E+01	5.00E+01	1/36	6.10E+03	n/a	n/a	n/a	n/a
Chromium	6.90E+00	5.77E+01	1.45E+01	36/36	2.00E+00	2.00E+00	7/36	4.30E+01	n/a	n/a	0/36	3.56E+02
Cobalt	1.08E+00	1.19E+01	4.37E+00	35/36	1.00E+00	1.00E+00	0/36	1.30E+01	0/36	1.00E+05	0/36	1.92E+03
Copper	2.41E+00	1.64E+01	6.29E+00	36/36	2.00E+00	2.00E+00	0/36	2.50E+01	0/36	1.00E+05	0/36	4.93E+02
Iron	4.79E+03	2.21E+04	1.25E+04	36/36	5.00E+00	2.50E+02	0/36	2.80E+04	0/36	1.00E+05	36/36	2.07E+03
Lead	7.00E+00	4.73E+01	1.51E+01	12/36	2.00E+01	2.00E+01	1/36	2.30E+01	0/36	1.25E+03	0/36	5.00E+01
Lithium	2.62E+00	1.14E+01	5.72E+00	21/25	2.00E+00	2.00E+00	n/a	n/a	0/25	1.00E+05	0/25	6.41E+02
Magnesium	3.63E+02	2.61E+03	1.15E+03	36/36	1.50E+01	1.50E+01	4/36	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.29E+00	1.46E+03	1.96E+02	36/36	1.00E+00	1.00E+00	2/36	8.20E+02	0/36	4.64E+04	20/36	4.52E+01
Nickel	2.50E+00	2.90E+01	1.04E+01	24/36	5.00E+00	5.00E+00	4/36	2.20E+01	0/36	9.30E+04	0/36	2.42E+02
Potassium	1.39E+02	8.87E+02	3.78E+02	36/36	1.00E+02	1.00E+02	0/36	9.50E+02	n/a	n/a	n/a	n/a
Sodium	6.63E+01	4.05E+02	2.72E+02	21/36	2.00E+02	2.00E+02	6/36	3.40E+02	n/a	n/a	n/a	n/a
Strontium	2.66E+00	2.22E+01	8.61E+00	25/25	2.00E+00	2.00E+00	n/a	n/a	0/25	1.00E+05	0/25	5.45E+03
Vanadium	7.83E+00	6.61E+01	2.30E+01	36/36	2.00E+00	2.00E+00	2/36	3.70E+01	0/36	4.47E+03	36/36	3.32E+00
Zinc	5.00E+00	5.70E+01	2.48E+01	27/36	1.50E+01	1.50E+01	0/36	6.00E+01	0/36	1.00E+05	0/36	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	2.31E+00	2.40E+01	1.10E+01	46/48	6.10E-01	9.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.03E+00	2.30E+01	1.11E+01	48/48	7.90E-01	8.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	3.30E-01	6.70E-01	5.55E-01	4/4	n/a		0/4	1.40E+00	0/4	1.49E+03	0/4	1.49E+01
Uranium-234	8.00E-02	5.40E-01	3.10E-01	4/4	n/a		0/4	2.40E+00	0/4	1.98E+03	0/4	1.98E+01
Uranium-235	7.20E-03	4.10E-02	2.41E-02	2/31	1.80E+00	1.40E+01	0/31	1.40E-01	0/31	3.95E+01	0/31	3.95E-01
Uranium-238	9.00E-02	2.40E+00	8.08E-01	4/4			1/4	1.20E+00	0/4	1.71E+02	1/4	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.20E+00	1.20E+00	1.20E+00	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	6.67E+04	0/41	3.16E+02
Anthracene	1.40E+00	1.40E+00	1.40E+00	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	1.00E+05	0/41	3.79E+03
Benz(a)anthracene	7.50E-01	7.50E-01	7.50E-01	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	2.08E+02	1/41	2.12E-01
Benzo(a)pyrene	1.84E-01	1.84E-01	1.84E-01	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	2.08E+01	1/41	2.12E-02
Benzo(b)fluoranthene	1.40E+00	1.40E+00	1.40E+00	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	2.08E+02	1/41	2.12E-01
Bis(2-ethylhexyl)phthalate	7.10E-02	2.20E-01	1.37E-01	10/41	3.60E-01	5.00E-01	n/a	n/a	0/41	7.40E+03	0/41	8.84E+00
Chrysene	8.10E-01	8.10E-01	8.10E-01	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	2.08E+04	0/41	2.12E+01
Dibenzofuran	6.40E-01	6.40E-01	6.40E-01	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	9.02E+03	0/41	1.86E+01
Di-n-butyl phthalate	4.80E-02	9.50E-01	4.99E-01	2/41	3.60E-01	5.00E-01	n/a	n/a	0/41	1.00E+05	0/41	2.13E+03
Fluoranthene	1.20E+00	2.40E+00	1.80E+00	2/41	3.60E-01	5.00E-01	n/a	n/a	0/41	6.50E+04	0/41	2.21E+02
Fluorene	1.60E+00	1.60E+00	1.60E+00	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	7.09E+04	0/41	3.39E+02
Indeno(1,2,3-cd)pyrene	1.30E-01	1.30E-01	1.30E-01	1/41	3.60E-01	5.00E-01	n/a	n/a	0/41	2.08E+02	0/41	2.12E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.2. Summary of Surface and Subsurface Historical Data at SWMU 99 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Phenanthrene	1.40E+00	2.10E+00	1.75E+00	2/41	3.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	7.60E-01	1.90E+00	1.33E+00	2/41	3.60E-01	5.00E-01	n/a	n/a	0/41	4.87E+04	0/41	1.65E+02
Volatiles (mg/kg)												
2-Butanone	6.00E-03	6.00E-03	6.00E-03	1/63	1.00E-02	1.20E+00	n/a	n/a	0/63	3.94E+04	0/63	1.03E+03
Acetone	1.10E-02	1.40E+00	1.64E-01	12/63	1.00E-02	1.20E+00	n/a	n/a	0/63	1.91E+04	0/63	3.58E+02
Methylene chloride	2.00E-03	1.40E-02	6.71E-03	7/63	6.00E-03	1.20E+00	n/a	n/a	0/63	2.16E+03	0/63	1.34E+01
Total Xylene	4.00E-03	4.00E-03	4.00E-03	1/11	6.00E-03	6.00E-03	n/a	n/a	0/11	2.20E+04	0/11	7.24E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

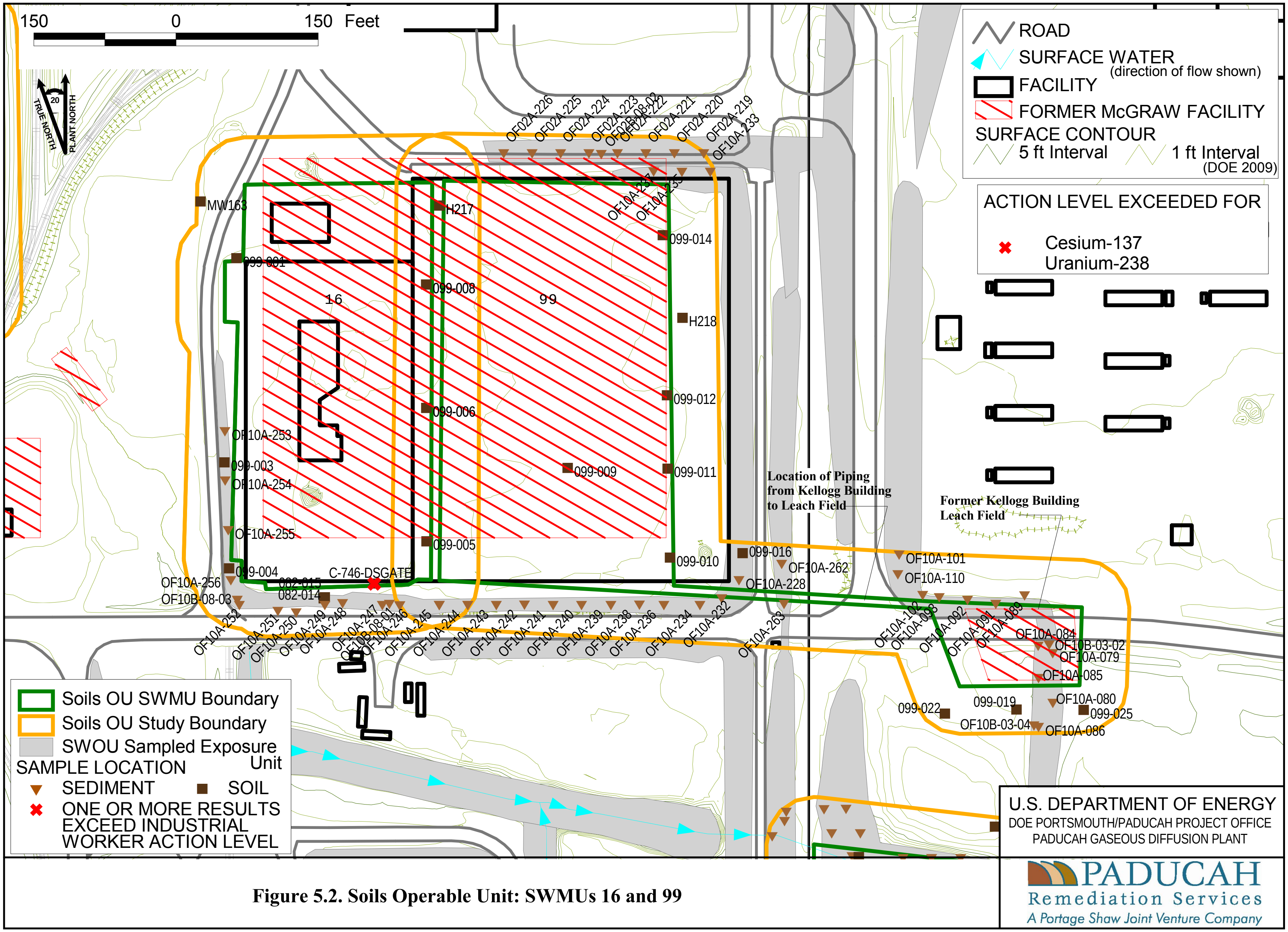

Figure 5.2. Soils Operable Unit: SWMUs 16 and 99

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 172 (C-726 Sandblasting Facility)

Area description

The C-726 Sandblasting Facility (SWMU 172) is located in the central portion of the plant site. SWMU 172 is approximately 45 ft long by 40 ft wide. This SWMU is part of the SOU and the D&D OU.

Process history

The original facility was a concrete pad with a roof, and it was used for cleaning and sandblasting of plant equipment. The facility was shutdown in 1989; it was restarted in March of 1991 and modified to meet air emissions requirements. Modifications included partial enclosure and installation of an air filtering system. The facility has not undergone D&D. Process knowledge indicates that activities may have included cleaning radiologically contaminated equipment.

Previous investigation results

No previous investigations are available.

Table 5.3 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.3).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location. This location has not undergone D&D; consequently, no samples can be taken at this time. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

Table 5.3. Summary of Surface and Subsurface Historical Data at SWMU 172

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	2.40E-01	1.04E+00	6.40E-01	2/3	1.20E-01	1.30E-01	n/a	n/a	0/3	4.25E+01	2/3	1.99E-01
PCB-1254	8.10E-01	8.10E-01	8.10E-01	1/3	9.00E-02	9.00E-02	n/a	n/a	0/3	1.82E+01	1/3	1.99E-01
PCB-1260	2.30E-01	2.40E-01	2.35E-01	2/3	9.00E-02	1.00E-01	n/a	n/a	0/3	4.25E+01	2/3	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	1.13E+00	4.93E+00	2.42E+00	3/3	2.20E-01	5.00E-01	3/3	4.90E-01	0/3	8.58E+00	3/3	8.58E-02
Uranium-238	3.86E+00	1.71E+01	9.88E+00	3/3	2.18E+00	7.01E+00	3/3	1.20E+00	0/3	1.71E+02	3/3	1.71E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	1.46E+04	1.47E+04	1.47E+04	2/2	1.00E+02	1.00E+02	2/2	1.20E+04	0/2	1.00E+05	2/2	4.64E+03
Antimony	7.00E-01	7.00E-01	7.00E-01	1/2	3.90E-01	6.00E-01	1/2	2.10E-01	0/2	4.63E+02	1/2	3.79E-01
Arsenic	8.30E+00	1.08E+01	9.55E+00	2/2	7.00E-02	7.00E-02	2/2	7.90E+00	0/2	3.15E+02	2/2	5.23E-01
Barium	1.03E+02	1.66E+02	1.35E+02	2/2	2.00E-02	2.00E-02	0/2	1.70E+02	0/2	1.00E+05	0/2	2.29E+02
Beryllium	9.80E-01	1.68E+01	8.89E+00	2/2	1.00E-02	1.00E-02	2/2	6.90E-01	0/2	1.28E+03	2/2	9.48E-01
Cadmium	1.40E+00	1.40E+00	1.40E+00	1/2	2.00E-02	2.00E-02	1/2	2.10E-01	0/2	7.05E+01	0/2	2.13E+01
Calcium	7.20E+03	7.71E+03	7.46E+03	2/2	1.00E-01	1.00E-01	2/2	6.10E+03	n/a	n/a	n/a	n/a
Chromium	2.06E+01	2.30E+01	2.18E+01	2/2	9.00E-02	9.00E-02	2/2	4.30E+01	n/a	n/a	0/2	3.56E+02
Cobalt	8.30E+00	1.09E+01	9.60E+00	2/2	1.00E-01	1.00E-01	0/2	1.30E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.23E+01	1.58E+01	1.41E+01	2/2	1.00E-01	1.00E-01	0/2	2.50E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	1.90E+04	2.68E+04	2.29E+04	2/2	1.00E+02	1.00E+02	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	1.65E+01	1.74E+01	1.70E+01	2/2	2.00E-01	2.00E-01	0/2	2.30E+01	0/2	1.25E+03	0/2	5.00E+01
Magnesium	2.05E+03	2.10E+03	2.08E+03	2/2	1.00E-01	1.00E-01	0/2	2.10E+03	n/a	n/a	n/a	n/a
Manganese	5.22E+02	8.52E+02	6.87E+02	2/2	1.00E-01	1.00E-01	1/2	8.20E+02	0/2	4.64E+04	2/2	4.52E+01
Mercury	1.68E-02	1.00E-01	5.84E-02	2/2	9.70E-03	9.70E-03	0/2	1.30E-01	0/2	8.25E+02	0/2	9.82E-01
Nickel	1.72E+01	2.56E+01	2.14E+01	2/2	1.00E-01	1.00E-01	1/2	2.20E+01	0/2	9.30E+04	0/2	2.42E+02
Potassium	3.22E+02	9.53E+02	6.38E+02	2/2	2.00E+00	2.00E+00	1/2	9.50E+02	n/a	n/a	n/a	n/a
Selenium	9.00E-01	9.00E-01	9.00E-01	1/2	2.00E-01	2.20E-01	1/2	7.00E-01	0/2	2.56E+04	0/2	9.49E+01
Silver	1.40E+00	1.40E+00	1.40E+00	1/2	9.00E-02	9.00E-02	0/2	2.70E+00	0/2	2.07E+04	0/2	4.11E+01
Sodium	3.01E+02	3.52E+02	3.27E+02	2/2	1.00E+00	1.00E+00	1/2	3.40E+02	n/a	n/a	n/a	n/a
Thallium	3.00E-01	3.00E-01	3.00E-01	1/2	3.00E+00	3.00E+00	1/2	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	3.14E+01	3.60E+01	3.37E+01	2/2	3.00E+00	3.00E+00	0/2	3.70E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	4.52E+01	6.10E+01	5.31E+01	2/2	1.00E-01	1.00E-01	1/2	6.00E+01	0/2	1.00E+05	0/2	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	5.00E+00	3.24E+01	1.86E+01	3/3	8.50E+00	8.50E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	n/a	n/a	0/1	5.16E+02	0/1	5.16E+00
Beta activity	2.20E+01	4.76E+01	3.10E+01	3/3	1.66E+01	1.66E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	0/1	2.80E-01	0/1	8.58E+00	1/1	8.58E-02
Neptunium-237	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	n/a	n/a	0/1	2.71E+01	0/1	2.71E-01
Plutonium-239	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	n/a	n/a	0/1	1.15E+03	0/1	1.15E+01
Technetium-99	3.00E-01	3.00E-01	3.00E-01	1/1	n/a	n/a	0/1	2.80E+00	0/1	3.62E+04	0/1	3.62E+02
Thorium-230	1.20E+00	1.20E+00	1.20E+00	1/1	n/a	n/a	0/1	1.40E+00	0/1	1.49E+03	0/1	1.49E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.3. Summary of Surface and Subsurface Historical Data at SWMU 172 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Uranium	8.00E-01	8.00E-01	8.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	9.00E-01	9.00E-01	9.00E-01	1/1	n/a	n/a	0/1	2.40E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	0/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	1.10E+00	1.10E+00	1.10E+00	1/1	n/a	n/a	0/1	1.20E+00	0/1	1.71E+02	0/1	1.71E+00
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	4.00E-02	4.00E-02	4.00E-02	1/3	n/a	8.20E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Di-n-butyl phthalate	1.64E+00	1.64E+00	1.64E+00	1/3	4.30E-01	8.20E-01	n/a	n/a	0/3	1.00E+05	0/3	2.13E+03
Volatiles (mg/kg)												
cis-1,2-Dichloroethene	4.40E-03	4.40E-03	4.40E-03	1/2	6.00E-03	1.00E+00	n/a	n/a	0/2	4.63E+02	0/2	1.34E+01
Trichloroethene	3.10E-03	3.10E-03	3.10E-03	1/3	6.00E-03	1.00E+00	n/a	n/a	0/3	2.98E+02	0/3	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

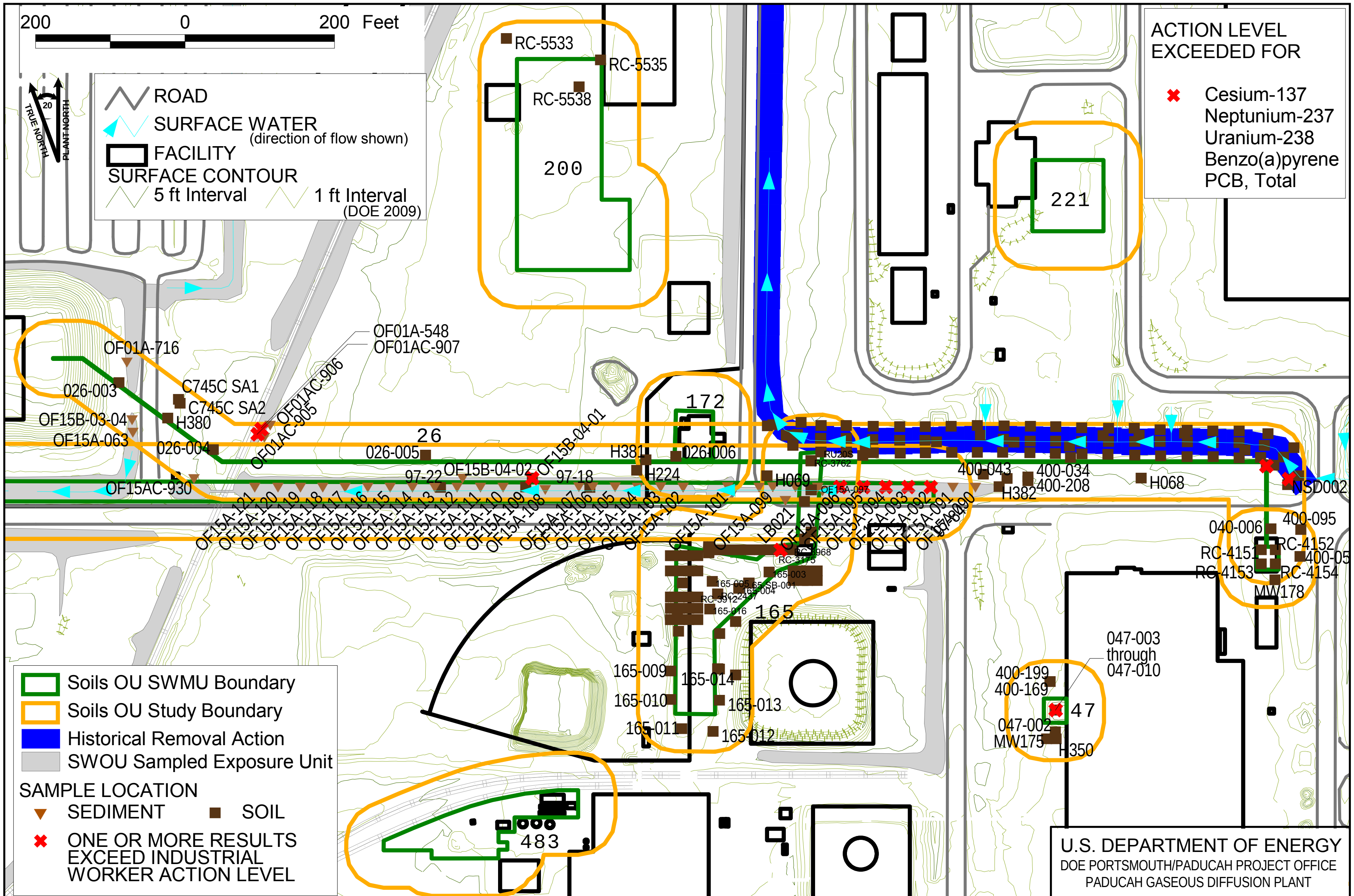

Figure 5.3. Soils Operable Unit: SWMUs 26, 47, 165, 172, 20, 221, and 483

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 194 [McGraw Construction Facilities (South Side)]

Area description

The McGraw Construction Facilities (South Side) (SWMU 194) is an open field located southwest of the plant site. SWMU 194 is approximately 540,000 ft^2 (600 ft x 900 ft). This SWMU is part of the SOU and the D&D OU.

Process history

The McGraw Construction Facility was constructed in 1951 as buildings for support of original plant construction. Buildings located in this area included an administration building, a cafeteria, a boiler house, guard headquarters, a hospital, and a purchasing building. The facilities were demolished following completion of PGDP construction. The area was graded and has been maintained as a grassy area since that time. A portion of the site east of the Hobbs access road and south of the C-100 Parking Lot is the location of the depleted uranium hexafluoride (DUF_6) Conversion Facility. Concrete footers and debris possibly may remain below grade, although no known disposal of hazardous constituents have occurred.

Previous investigation results

The Northeast Plume Investigation (DOE 1995c) was conducted in 1995 to identify possible sources of contamination associated with various buildings and operations within SWMU 194. The results of this investigation indicated potential metal contamination. The WAG 28 RI conducted in 1999 focused on potential metals contamination of SWMU 194 based on the previous study and the process knowledge of the activities conducted in this area by the McGraw Construction Facilities. This study noted the sporadic presence of some metals at slightly above background levels. These metals include aluminum, beryllium, cadmium, calcium, iron, lead, magnesium, sodium, vanadium, and zinc (DOE 2000b).

Additional site characterization was conducted in 2000 in support of the DUF_6 Conversion Project. The results of this investigation are documented in *DUF_6 Conversion Facility Site Characterization Report, Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (BJC 2001).

The data contained in the aforementioned studies have been assessed for risk. The results are documented in *Baseline Human Health Risk Assessment and Screening Ecological Risk Assessment for the Proposed Site of the UF_6 Conversion Facility, Including the Eastern Portion of SWMU 194, McGraw Construction Facilities (South Side), at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2001b). Data used in the BHHRA are documented in Table 5.4, taken from the BHHRA.

Significant results of the BHHRA and SERA were the soil at the proposed site of the UF_6 Conversion Facility and that portion of SWMU 194 overlain by the proposed site have been well characterized, the risks to the health of the most likely future users of the proposed site from exposure to soil containing site-related COCs fall within the acceptable risk range, and adverse impacts from contamination in soil to ecological receptors are not expected.

The risk assessment supports an NFA recommendation for the proposed site of the UF_6 Conversion Facility if the site is developed and maintained as an industrial area.

Table 5.4. Sampling Stations and Samples Used in the BHHRA for the Proposed Site of the UF_6 Conversion Facility

			How Used in BHHRA			Source Project		
Sampling Station	Sample Identifiers	Depth of Sampling (ft bgs)	Direct Contact—Surface	Direct Contact—Subsurface	Transport Modeling	Northeast Plume Report	WAG 28 RI Report	DUF_6 Siting Study
194-1	1110101-0001	5		X	X	X		
194-1	1110101-0002	10		X	X	X		
194-1	1110101-0004	15		X	X	X		
194-2	1110101-0035	5				X		
194-2	1110101-0036	10				X		
194-2	1110101-0037	15				X		
194-3	1110101-0029	5				X		
194-3	1110101-0030	5.5				X		
194-3	1110101-0031	10				X		
194-3	1110101-0032	10.5				X		
194-3	1110101-0033	15				X		
194-3	1110101-0034	15.5				X		
194-4	1110101-0026	5		X	X	X		
194-4	1110101-0027	10		X	X	X		
194-4	1110101-0028	15		X	X	X		
194-5	1110101-0039	5				X		
194-5	1110101-0040	10				X		
194-5	1110101-0041	15				X		
194-6	1110101-0014	5				X		
194-6	1110101-0015	10				X		
194-6	1110101-0016	15				X		
194-7	1110101-0013	5		X	X	X		
194-7	1110101-0009	10		X	X	X		
194-7	1110101-0010	15		X	X	X		
194-008	194008SA005	2 – 5		X	X		X	
194-008	194000SA010	7 – 10		X	X		X	
194-008	194000SA015	12 – 15		X	X		X	
194-008	194000SA020	17 – 20			X		X	
194-008	194000SA030	27 – 30			X		X	
194-009	194000SA005	2 – 5		X	X		X	
194-009	194000SA010	7 – 10		X	X		X	
194-009	194000SA015	12 – 15		X	X		X	
194-009	194000SA020	17 – 20			X		X	
194-009	194000SA030	27 – 30			X		X	
194-009	194000SD015	12 – 15		X	X		X	
194-010	194010SA005	2 – 5					X	
194-010	194010SA010	7 – 10					X	
194-010	194010SA015	12 – 15					X	
194-010	194010SA020	17 – 20					X	
194-010	194010SA030	27 – 30					X	
194-011	194011SA005	2 – 5					X	
194-011	194011SA010	7 – 10					X	
194-011	194011SA015	12 – 15					X	
194-011	194011SA020	17 – 20					X	
194-011	194011SA030	27 – 30					X	
UFSB-01	UFSB01S001	0 – 1	X	X	X			X
UFSB-01	UFSB01S005	3 – 5		X	X			X
UFSB-01	UFSB01S010	6 – 10		X	X			X
UFSB-01	UFSB01S013	11 –13		X	X			X
UFSB-01	UFSB01S018	16 – 18			X			X
UFSB-01	UFSB01S023	21 – 23			X			X

Table 5.4 Sampling Stations and Samples Used in the BHHRA for the Proposed Site of the UF_6 Conversion Facility (Continued)

			How Used in BHHRA			Source Project		
Sampling Station	Sample Identifiers	Depth of Sampling (ft bgs)	Direct Contact—Surface	Direct Contact—Subsurface	Transport Modeling	Northeast Plume Report	WAG 28 RI Report	DUF_6 Siting Study
UFSB-02	UFSB02S001	0 – 1	X	X	X	X		
UFSB-02	UFSB02S005	1 – 5		X	X	X		
UFSB-02	UFSB02S005D	1 – 5		X	X	X		
UFSB-02	UFSB02S010	6 – 10		X	X	X		
UFSB-02	UFSB02S015	11 – 15		X	X	X		
UFSB-02	UFSB02S020	16 – 20			X	X		
UFSB-03	UFSB03S001	0 – 0–5	X	X	X	X		
UFSB-03	UFSB03S005	3.5 – 5		X	X	X		
UFSB-03	UFSB03S010	5 – 9		X	X	X		
UFSB-03	UFSB03S015	11 – 15		X	X	X		
UFSB-03	UFSB03S017	15 – 17			X	X		
UFSB-03	UFSB03S023	20 – 23			X	X		
UFSB-04	UFSB04S001	0 – 0.5	X	X	X	X		
UFSB-04	UFSB04S005	1 – 5		X	X	X		
UFSB-04	UFSB04S009	5 – 9		X	X	X		
UFSB-04	UFSB04S013	11 – 13		X	X	X		
UFSB-04	UFSB04S017	15 – 17			X	X		
UFSB-04	UFSB04S023	21 – 23			X	X		
UFSB-04	UFSB04S027	25 – 27			X	X		
UFSB-05	UFSB05S001	0 – 1	X	X	X	X		
UFSB-05	UFSB05S005	1 – 5		X	X	X		
UFSB-05	UFSB05S010	6 – 8		X	X	X		
UFSB-05	UFSB05S013	11 – 13		X	X	X		
UFSB-05	UFSB05S017	15 – 17			X	X		
UFSB-05	UFSB05S023	21 – 23			X	X		
UFSB-06	UFSB06S001	0 – 1	X	X	X	X		
UFSB-06	UFSB06S001D	0 – 1	X	X	X	X		
UFSB-06	UFSB06S005	1 – 5		X	X	X		
UFSB-06	UFSB06S007	5 – 7		X	X	X		
UFSB-06	UFSB06S013	11 – 13		X	X	X		
UFSB-07	UFSB07S001	0 – 1	X	X	X	X		
UFSB-07	UFSB07S005	1 – 5		X	X	X		
UFSB-07	UFSB07S010	6 – 10		X	X	X		
UFSB-07	UFSB07S015	11 – 15		X	X	X		
UFSB-08	UFSB08S001	0 – 1	X	X	X	X		
UFSB-08	UFSB08S005	1 – 5		X	X	X		
UFSB-08	UFSB08S010	6 – 10		X	X	X		
UFSB-08	UFSB08S015	11 – 15		X	X	X		
UFSB-09	UFSB09S001	0 – 1	X	X	X	X		
UFSB-09	UFSB09S005	1 – 5		X	X	X		
UFSB-09	UFSB09S010	6 – 10		X	X	X		
UFSB-09	UFSB09S015	11 – 15		X	X	X		
UFSB-09	UFSB09S020	16 – 20			X	X		
UFSB-10	UFSB10S001	0 – 1	X	X	X	X		
UFSB-10	UFSB10S005	1 – 5		X	X	X		
UFSB-10	UFSB10S005D	1 – 5		X	X	X		
UFSB-10	UFSB10S010	6 – 10		X	X	X		
UFSB-10	UFSB10S015	11 – 15		X	X	X		
UFSB-11	UFSB11S001	0 – 1	X	X	X	X		
UFSB-11	UFSB11S005	1 – 5		X	X	X		
UFSB-11	UFSB11S010	6 – 10		X	X	X		
UFSB-11	UFSB11S015	11 – 15		X	X	X		

Table 5.4 Sampling Stations and Samples Used in the BHHRA for the Proposed Site of the UF_6 Conversion Facility (Continued)

			How Used in BHHRA			Source Project		
Sampling Station	Sample Identifiers	Depth of Sampling (ft bgs)	Direct Contact—Surface	Direct Contact—Subsurface	Transport Modeling	Northeast Plume Report	WAG 28 RI Report	DUF_6 Siting Study
UFSB-11	UFSB11S020	16 – 20			X	X		
UFSB-11	UFSB11S025	21 – 25			X	X		
UFSB-11	UFSB11S027	26 – 27			X	X		
UFSB-12	UFSB12S001	0 – 1	X	X	X	X		
UFSB-12	UFSB12S005	1 – 5		X	X	X		
UFSB-12	UFSB12S010	6 – 10		X	X	X		
UFSB-12	UFSB12S015	11 – 15		X	X	X		
UFSB-12	UFSB12S020	16 – 20			X	X		
UFSB-13	UFSB13S001	0 – 1	X	X	X	X		
UFSB-13	UFSB13S005	1 – 5		X	X	X		
UFSB-13	UFSB13S010	6 – 8		X	X	X		
UFSB-13	UFSB13S015	11 – 15		X	X	X		
UFSB-13	UFSB13S020	16 – 18			X	X		
UFSB-14	UFSB14S001	0 – 1	X	X	X	X		
UFSB-14	UFSB14S005	1 – 5		X	X	X		
UFSB-14	UFSB14S010	6 – 10		X	X	X		
UFSB-14	UFSB14S015	11 – 15		X	X	X		
UFSB-14	UFSB14-S018	16 – 18			X	X		
UFSB-16	UFSB16S001	0 – 1	X	X	X	X		
UFSB-16	UFSB16S005	1 – 5		X	X	X		
UFSB-16	UFSB16S010	6 – 10		X	X	X		
UFSB-16	UFSB16S015	11 – 15		X	X	X		
UFSB-16	UFSB16S020	16 – 20			X	X		
UFSB-16	UFSB16S025	21 – 23			X	X		
UFSB-17	UFSB17S001	0 – 1	X	X	X	X		
UFSB-17	UFSB17S005	1 – 5		X	X	X		
UFSB-17	UFSB17S010	6 – 10		X	X	X		
UFSB-17	UFSB17S015	11 – 15		X	X	X		
UFSB-17	UFSB17S020	16 – 20			X	X		
UFSB-18	UFSB18S001	0 – 1	X	X	X	X		
UFSB-18	UFSB18S005	1.5 – 5		X	X	X		
UFSB-18	UFSB18S010	6 – 10		X	X	X		
UFSB-18	UFSB18S015	11.5 – 15		X	X	X		
UFSB-18	UFSB18S017	16 – 17		X	X	X		
UFSB-19	UFSB19S001	0 – 1	X	X	X	X		
UFSB-19	UFSBS001D	0 – 1	X	X	X	X		
UFSB-19	UFSB19S005	1 – 5		X	X	X		
UFSB-19	UFSB19S010	6 – 10		X	X	X		
UFSB-19	UFSB19S015	11 – 15		X	X	X		
UFSB-19	UFSB19S020	16 – 20			X	X		
UFSB-20	UFSB20S001	0 – 1	X	X	X	X		
UFSB-20	UFSB20S005	1 – 5		X	X	X		
UFSB-20	UFSB20S010	6 – 10		X	X	X		
UFSB-20	UFSB20S015	11 – 15		X	X	X		
UFSB-20	UFSB20S020	16 – 20			X	X		
UFSB-20	UFSB20S025	21 – 25			X	X		

Note: Several samples collected during the project contributing to the development of the WAG 28 RI Report and the Northeast Plume Report were from the western portion of SWMU 194. Because that portion of SWMU 194 is not overlain by the proposed site of the UF_6 Conversion Facility, these data are not included in this BHHRA.

The SERA identified 12 inorganic chemicals and 14 organic compounds but no radionuclides in surface soil as contaminants of potential concern for ecological receptors. The inorganic chemicals were aluminum, arsenic, barium, beryllium, calcium, chromium, copper, lead, nickel, silver, vanadium, and zinc. The organic compounds included several polycyclic aromatic hydrocarbons (PAHs) and phthalates. The SERA also determined that the proposed site (i.e., open grassy field) contained no critical habitat for wildlife found at the PGDP. The construction of the DUF_6 Conversion Facility and supporting structures would cover the site surface and modify habitat to such an extent that the presence of these chemicals would be of little ecological concern.

Table 5.5 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.4).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.5. Summary of Surface and Subsurface Historical Data at SWMU 194

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	3.86E+03	1.13E+04	7.48E+03	12/12	2.00E+01	2.00E+01	0/12	1.30E+04	0/12	1.00E+05	10/12	4.64E+03
Arsenic	5.11E+00	6.72E+00	5.92E+00	2/12	5.00E+00	5.00E+00	0/12	1.20E+01	0/12	3.15E+02	2/12	5.23E-01
Barium	2.72E+01	1.00E+02	6.65E+01	12/12	5.00E+00	5.00E+00	0/12	2.00E+02	0/12	1.00E+05	0/12	2.29E+02
Beryllium	5.10E-01	9.80E-01	6.78E-01	4/12	5.00E-01	5.00E-01	2/12	6.70E-01	0/12	1.28E+03	1/12	9.48E-01
Calcium	1.04E+03	2.18E+05	6.31E+04	12/12	1.00E+02	1.00E+04	6/12	2.00E+05	n/a	n/a	n/a	n/a
Chromium	5.85E+00	6.75E+01	1.66E+01	11/12	2.50E+00	2.50E+00	3/12	1.60E+01	n/a	n/a	0/12	3.56E+02
Copper	4.63E+00	3.86E+01	1.20E+01	12/12	2.50E+00	2.50E+00	2/12	1.90E+01	0/12	1.00E+05	0/12	4.93E+02
Lead	2.03E+01	2.38E+01	2.25E+01	3/12	2.00E+01	2.00E+02	2/12	3.60E+01	0/12	1.25E+03	0/12	5.00E+01
Nickel	7.12E+00	8.37E+01	1.60E+01	12/12	5.00E+00	5.00E+00	1/12	2.10E+01	0/12	9.30E+04	0/12	2.42E+02
Silver	4.30E+00	4.63E+00	4.47E+00	2/12	4.00E+00	4.00E+00	2/12	2.30E+00	0/12	2.07E+04	0/12	4.11E+01
Uranium	1.00E+00	1.00E+02	9.60E+00	25/25	n/a	n/a	2/25	4.90E+00	0/25	3.34E+03	2/25	2.02E+01
Vanadium	1.00E+01	6.30E+01	2.20E+01	12/12	2.50E+00	2.50E+00	1/12	3.80E+01	0/12	4.47E+03	12/12	3.32E+00
Zinc	3.04E+01	2.73E+02	7.23E+01	9/12	2.00E+01	2.00E+02	4/12	6.50E+01	0/12	1.00E+05	0/12	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.80E+01	1.80E+01	1.80E+01	1/13	1.00E-01	1.00E-01	n/a	n/a	0/13	4.25E+01	1/13	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.04E+00	9.47E+00	6.40E+00	9/12	8.20E-01	8.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.81E+00	1.32E+01	5.50E+00	10/12	8.10E-01	4.67E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	7.75E-02	1.06E+00	3.60E-01	11/13	2.48E-02	1.06E-01	5/13	4.90E-01	0/13	8.58E+00	10/13	8.58E-02
Lead-212	6.60E-01	6.60E-01	6.60E-01	1/1	1.70E-01	1.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Lead-214	6.80E-01	6.80E-01	6.80E-01	1/1	1.50E-01	1.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Potassium-40	1.75E+00	1.40E+01	6.88E+00	13/13	2.13E-01	1.00E+00	0/13	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-234m	1.66E+01	1.66E+01	1.66E+01	1/12	3.27E+00	1.25E+01	n/a	n/a	n/a	n/a	n/a	n/a
Radium-226	6.03E-01	8.58E-01	7.31E-01	2/12	9.43E-02	4.14E-01	0/12	1.50E+00	0/12	2.56E+00	2/12	2.56E-02
Technetium-99	4.10E+00	4.10E+00	4.10E+00	1/13	2.50E+00	3.25E+00	1/13	2.50E+00	0/13	3.62E+04	0/13	3.62E+02
Thorium-228	1.36E-01	5.14E-01	2.74E-01	12/12	8.68E-03	1.23E-01	0/12	1.60E+00	0/12	2.80E+00	12/12	2.80E-02
Thorium-230	1.49E-01	6.05E-01	4.08E-01	12/12	2.19E-02	1.21E-01	0/12	1.50E+00	0/12	1.49E+03	0/12	1.49E+01
Thorium-232	1.52E-01	4.73E-01	2.72E-01	12/12	1.88E-02	5.70E-02	0/12	1.50E+00	0/12	1.35E+03	0/12	1.35E+01
Thorium-232 Daughters	6.50E-01	6.50E-01	6.50E-01	1/1	2.50E-01	2.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	3.40E+01	3.40E+01	3.40E+01	1/12	1.15E+00	5.50E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	5.70E-01	1.51E+01	7.84E+00	2/13	8.00E-02	2.46E+00	1/13	2.50E+00	0/13	1.98E+03	0/13	1.98E+01
Uranium-235	7.76E-01	7.76E-01	7.76E-01	1/13	2.95E-02	1.22E-01	1/13	1.40E-01	0/13	3.95E+01	1/13	3.95E-01
Uranium-238	5.90E-01	1.82E+01	9.40E+00	2/13	8.00E-02	2.96E+00	1/13	1.20E+00	0/13	1.71E+02	1/13	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	9.80E-01	2.20E+00	1.59E+00	2/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+02	2/12	2.12E-01
Benzo(a)pyrene	9.50E-01	2.20E+00	1.58E+00	2/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+01	2/12	2.12E-02
Benzo(b)fluoranthene	4.90E-01	2.80E+00	1.46E+00	3/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+02	3/12	2.12E-01
Benzo(ghi)perylene	4.80E-01	1.20E+00	8.40E-01	2/12	4.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	9.20E-01	1.80E+00	1.36E+00	2/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+03	0/12	2.12E+00
Chrysene	5.50E-01	2.50E+00	1.42E+00	3/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+04	0/12	2.12E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.5. Summary of Surface and Subsurface Historical Data at SWMU 194 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Di-n-butyl phthalate	6.60E-01	2.60E+00	1.49E+00	6/12	4.70E-01	5.00E-01	n/a	n/a	0/12	1.00E+05	0/12	2.13E+03
Fluoranthene	5.40E-01	4.70E+00	2.09E+00	4/12	4.70E-01	5.00E-01	n/a	n/a	0/12	6.50E+04	0/12	2.21E+02
Indeno(1,2,3-cd)pyrene	5.70E-01	1.40E+00	9.85E-01	2/12	4.70E-01	5.00E-01	n/a	n/a	0/12	2.08E+02	2/12	2.12E-01
Phenanthrene	1.10E+00	2.20E+00	1.65E+00	2/12	4.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	7.60E-01	3.40E+00	1.95E+00	3/12	4.70E-01	5.00E-01	n/a	n/a	0/12	4.87E+04	0/12	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.94E+03	1.55E+04	8.74E+03	65/65	2.00E+01	2.00E+01	8/65	1.20E+04	0/65	1.00E+05	61/65	4.64E+03
Arsenic	4.40E+00	1.34E+01	6.94E+00	8/65	5.00E+00	5.00E+00	1/65	7.90E+00	0/65	3.15E+02	8/65	5.23E-01
Barium	1.46E+01	2.08E+02	7.03E+01	65/65	1.00E+00	5.00E+00	2/65	1.70E+02	0/65	1.00E+05	0/65	2.29E+02
Beryllium	5.00E-01	4.80E+00	8.93E-01	26/65	4.00E-01	5.00E-01	14/65	6.90E-01	0/65	1.28E+03	3/65	9.48E-01
Cadmium	8.55E+00	8.55E+00	8.55E+00	1/89	8.00E-01	2.00E+00	1/89	2.10E-01	0/89	7.05E+01	0/89	2.13E+01
Calcium	3.95E+02	1.32E+05	3.96E+03	65/65	5.00E+01	1.00E+03	4/65	6.10E+03	n/a	n/a	n/a	n/a
Chromium	3.57E+00	1.03E+02	1.89E+01	89/89	2.00E+00	2.50E+00	32/89	4.30E+01	n/a	n/a	0/89	3.56E+02
Cobalt	1.45E+00	9.46E+00	4.53E+00	18/18	1.00E+00	1.40E+00	0/18	1.30E+01	0/18	1.00E+05	0/18	1.92E+03
Copper	2.41E+00	4.21E+01	8.04E+00	64/65	2.00E+00	2.50E+00	1/65	2.50E+01	0/65	1.00E+05	0/65	4.93E+02
Iron	6.41E+03	2.80E+04	1.29E+04	18/18	5.00E+00	5.00E+00	0/18	2.80E+04	0/18	1.00E+05	18/18	2.07E+03
Lead	5.03E+00	3.60E+02	2.61E+01	23/89	2.00E+01	2.00E+02	3/89	2.30E+01	0/89	1.25E+03	1/89	5.00E+01
Lithium	2.11E+00	9.00E+00	5.87E+00	15/17	2.00E+00	2.00E+00	n/a	n/a	0/17	1.00E+05	0/17	6.41E+02
Magnesium	3.90E+02	2.34E+03	1.06E+03	18/18	1.50E+01	1.50E+01	2/18	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.94E+01	6.91E+02	1.52E+02	18/18	1.00E+00	1.00E+00	0/18	8.20E+02	0/18	4.64E+04	11/18	4.52E+01
Nickel	5.74E+00	5.05E+01	1.09E+01	51/65	5.00E+00	8.50E+00	3/65	2.20E+01	0/65	9.30E+04	0/65	2.42E+02
Potassium	1.36E+02	6.32E+02	3.29E+02	18/18	1.00E+02	3.24E+02	0/18	9.50E+02	n/a	n/a	n/a	n/a
Sodium	6.21E+01	3.69E+02	2.75E+02	12/18	2.00E+02	2.00E+02	5/18	3.40E+02	n/a	n/a	n/a	n/a
Strontium	2.86E+00	2.60E+01	1.03E+01	17/17	2.00E+00	2.00E+00	n/a	n/a	0/17	1.00E+05	0/17	5.45E+03
Vanadium	9.61E+00	6.39E+01	2.43E+01	65/65	2.00E+00	2.50E+00	7/65	3.70E+01	0/65	4.47E+03	65/65	3.32E+00
Zinc	1.57E+01	1.23E+02	3.66E+01	42/65	1.50E+01	2.00E+02	3/65	6.00E+01	0/65	1.00E+05	0/65	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.20E+00	1.02E+01	4.88E+00	81/83	8.20E-01	8.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.21E+00	3.14E+01	5.02E+00	77/83	8.00E-01	4.46E+00	n/a	n/a	n/a	n/a	n/a	n/a
Potassium-40	1.21E+00	1.29E+01	7.76E+00	45/47	4.26E-02	1.15E+00	0/47	1.60E+01	n/a	n/a	n/a	n/a
Radium-226	2.07E-01	8.55E-01	4.92E-01	6/47	9.56E-02	4.13E-01	0/47	1.50E+00	0/47	2.56E+00	6/47	2.56E-02
Technetium-99	3.56E+00	1.23E+01	6.58E+00	6/49	1.30E+00	3.25E+00	6/49	2.80E+00	0/49	3.62E+04	0/49	3.62E+02
Thorium-228	1.21E-01	6.75E-01	3.44E-01	46/47	4.86E-03	1.31E-01	0/47	1.60E+00	0/47	2.80E+00	46/47	2.80E-02
Thorium-230	1.06E-01	5.49E-01	3.13E-01	45/47	9.64E-03	1.27E-01	0/47	1.40E+00	0/47	1.49E+03	0/47	1.49E+01
Thorium-232	8.17E-02	5.59E-01	3.42E-01	47/47	1.28E-02	5.57E-02	0/47	1.50E+00	0/47	1.35E+03	0/47	1.35E+01
Uranium-235	5.53E-02	1.64E-01	1.07E-01	3/47	9.12E-05	9.02E-02	1/47	1.40E-01	0/47	3.95E+01	0/47	3.95E-01
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	4.90E-01	2.50E+00	1.50E+00	2/48	4.60E-01	8.40E-01	n/a	n/a	0/48	7.40E+03	0/48	8.84E+00
Di-n-butyl phthalate	5.10E-01	2.20E+01	2.33E+00	28/48	4.20E-01	5.00E-01	n/a	n/a	0/48	1.00E+05	0/48	2.13E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.5. Summary of Surface and Subsurface Historical Data at SWMU 194 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Volatiles (mg/kg)												
2-Butanone	1.00E-02	1.00E-02	1.00E-02	1/48	1.00E-02	1.20E-02	n/a	n/a	0/48	3.94E+04	0/48	1.03E+03
Acetone	1.10E-02	4.10E-01	1.27E-01	12/48	1.00E-02	1.20E-02	n/a	n/a	0/48	1.91E+04	0/48	3.58E+02
Ethylbenzene	1.50E-02	1.50E-02	1.50E-02	1/68	6.00E-03	1.00E-02	n/a	n/a	0/68	2.12E+03	0/68	2.12E+01
Total Xylene	5.00E-03	5.00E-03	5.00E-03	1/68	6.00E-03	3.00E-02	n/a	n/a	0/68	2.20E+04	0/68	7.24E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

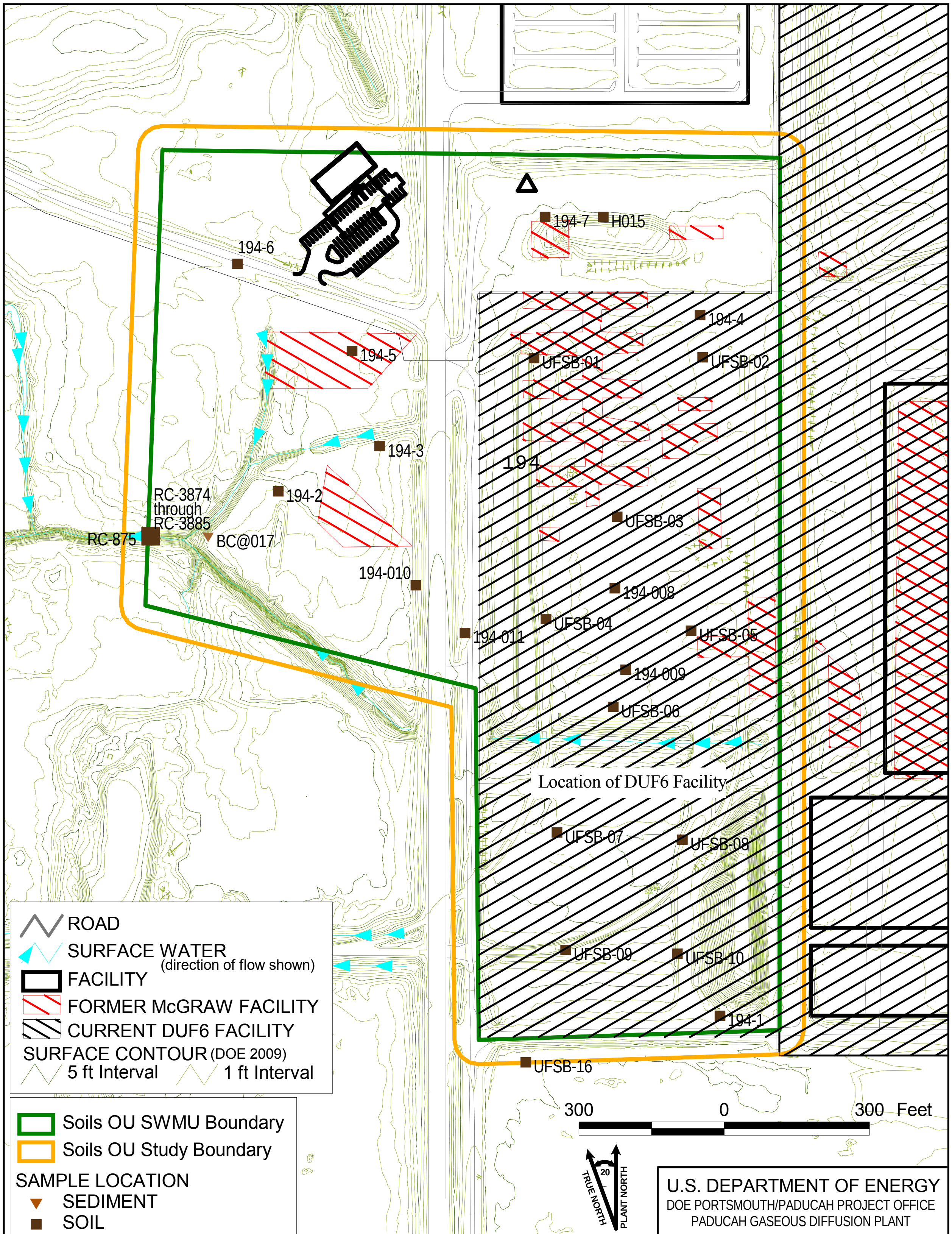

Figure 5.4. Soils Operable Unit: SWMU 194

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 196 (C-746-A Septic System)

Area description

The C-746-A Septic System (SWMU 196) is located in the northwest portion of the plant site. The C-746-A Septic System consists of two systems: System 1, on the northwest corner of C-746-A, is a 500-gal tank, and System 2, on the northeast corner of C-746-A, is a 950-gal concrete tank and a drainage field 60 ft by 20 ft.

Process history

Both systems were used to process the sanitary waste coming from C-746-A. The system was abandoned in place in 1980. The contents of the septic tanks were removed. The empty tanks were backfilled with clean sand and the site was graded to the surface.

Previous investigation results

Subsurface soil samples and groundwater samples were obtained during the WAG 27 RI/FS. The COCs from WAG 27 RI Report are lead, antimony, beryllium, and iron (DOE 1999a).

The area impacted by metals at the NE septic system is approximately 70 ft x 60 ft (includes septic tank and leachfield) and extends to approximately 10 ft bgs. The area impacted by the metals contamination along the NW drain lines is more extensive and is approximately 100 ft x 10 ft along the line extending north-south to the west of the building and 180 ft x 10 ft along the line extending east-west to the west of the septic tank. The contamination extends to approximately 10 ft bgs along both of these lines.

Scenarios that were assessed in the WAG 27 RI Report are current on-site industrial worker, future on-site industrial worker, future on-site excavation worker, future on-site recreational user, future off-site recreational user, future on-site rural resident, and future off-site rural resident. An excerpt on land use scenarios from WAG 27 RI Report follows:

> At SWMU 196 for all scenarios assessed, including lead as a COPC, only the future recreational user exposure to soil for both systemic toxicity and ELCR is not of concern. Possible exceptions at SWMU 196 are the current and future industrial worker exposure to soil which has a total hazard index which falls below 1 if contribution from lead is not considered.

Table 5.6 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.5).

Area utilities

No recirculating water lines are associated with the operation of this facility; sanitary sewers are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location to delineate further the extent of contamination associated with the northeast portion (System 2).

Table 5.6. Summary of Surface and Subsurface Historical Data at SWMU 196

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	6.06E+03	1.13E+04	8.68E+03	2/2	1.63E+00	1.63E+00	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Antimony	2.92E-01	3.74E-01	3.33E-01	2/2	2.30E-01	2.30E-01	2/2	2.10E-01	0/2	4.63E+02	0/2	3.79E-01
Arsenic	4.44E+00	7.33E+00	5.58E+00	4/8	8.27E-02	8.27E-02	0/8	1.20E+01	0/8	3.15E+02	4/8	5.23E-01
Barium	7.62E+01	2.02E+02	1.20E+02	8/8	1.71E-01	1.71E-01	1/8	2.00E+02	0/8	1.00E+05	0/8	2.29E+02
Beryllium	2.58E-01	2.58E-01	2.58E-01	1/2	1.81E-01	1.81E-01	0/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Cadmium	1.83E+00	2.53E+00	2.18E+00	2/8	2.45E-01	2.45E-01	2/8	2.10E-01	0/8	7.05E+01	0/8	2.13E+01
Calcium	3.67E+03	2.25E+04	1.31E+04	2/2	6.63E+00	6.63E+00	1/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	8.26E+00	2.07E+01	1.61E+01	8/8	3.83E-01	3.83E-01	5/8	1.60E+01	n/a	n/a	0/8	3.56E+02
Cobalt	3.45E+00	6.53E+00	4.99E+00	2/2	3.73E-01	3.73E-01	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.61E+01	2.09E+01	1.85E+01	2/2	2.11E-01	2.11E-01	1/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	9.49E+03	1.49E+04	1.22E+04	2/2	6.68E-01	6.68E-01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	1.93E+01	2.75E+01	2.39E+01	3/8	2.48E+00	2.48E+00	2/8	3.60E+01	0/8	1.25E+03	0/8	5.00E+01
Magnesium	1.78E+03	1.86E+03	1.82E+03	2/2	6.79E+00	6.79E+00	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.64E+02	2.78E+02	2.71E+02	2/2	2.01E-01	2.01E-01	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Mercury	4.13E-02	5.21E-02	4.67E-02	2/8	7.80E-03	7.80E-03	0/8	2.00E-01	0/8	8.25E+02	0/8	9.82E-01
Nickel	3.17E+01	7.36E+01	5.27E+01	2/2	1.28E+00	1.28E+00	2/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Potassium	3.31E+02	7.50E+02	5.41E+02	2/2	1.07E+02	1.07E+02	0/2	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.52E-01	3.52E-01	3.52E-01	1/8	8.91E-02	8.91E-02	0/8	8.00E-01	0/8	2.56E+04	0/8	9.49E+01
Sodium	3.22E+02	4.23E+02	3.73E+02	2/2	1.11E+01	1.11E+01	2/2	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.47E-01	1.57E-01	1.52E-01	2/2	1.16E-01	1.16E-01	0/2	2.10E-01	n/a	n/a	n/a	n/a
Vanadium	1.54E+01	1.73E+01	1.64E+01	2/2	6.02E-01	6.02E-01	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	1.48E+02	2.22E+02	1.85E+02	2/2	1.44E-01	1.44E-01	2/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Other Organics (mg/kg)												
Diesel Range Organics	1.34E+00	1.53E+00	1.44E+00	2/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pesticides/PCBs (mg/kg)												
PCB, Total	6.75E-01	1.51E+00	1.09E+00	2/13	1.30E-01	1.30E-01	n/a	n/a	0/13	4.25E+01	2/13	1.99E-01
PCB-1242	6.75E-01	6.75E-01	6.75E-01	1/11	6.00E-02	6.00E-02	n/a	n/a	0/11	4.25E+01	1/11	1.99E-01
PCB-1254	1.06E+00	1.06E+00	1.06E+00	1/11	9.00E-02	9.00E-02	n/a	n/a	0/11	1.82E+01	1/11	1.99E-01
PCB-1260	4.50E-01	4.50E-01	4.50E-01	1/11	1.00E-01	1.00E-01	n/a	n/a	0/11	4.25E+01	1/11	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.70E+00	1.66E+01	7.45E+00	8/8	1.05E+01	1.05E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.26E+00	9.74E+01	3.28E+01	8/8	1.85E+01	1.86E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	4.00E-02	3.70E-01	1.98E-01	4/4	3.50E-01	3.60E-01	1/4	4.90E-01	0/4	8.58E+00	3/4	8.58E-02
Neptunium-237	6.80E-01	6.80E-01	6.80E-01	1/2	n/a	n/a	1/2	1.00E-01	0/2	2.71E+01	1/2	2.71E-01
Plutonium-239/240	3.70E-01	3.70E-01	3.70E-01	1/2	n/a	n/a	n/a	n/a	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	1.23E+01	3.34E+01	2.29E+01	2/2	n/a	n/a	2/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-230	4.30E-01	5.60E-01	4.95E-01	2/2	n/a	n/a	0/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium	3.90E+00	5.00E+00	4.45E+00	2/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.50E+00	1.80E+00	1.65E+00	2/2	n/a	n/a	0/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	8.26E-02	1.03E-01	9.28E-02	2/2	n/a	n/a	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.6. Summary of Surface and Subsurface Historical Data at SWMU 196 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Uranium-238	-7.10E-01	4.50E+00	2.30E+00	4/4	4.57E+00	6.57E+00	3/4	1.20E+00	0/4	1.71E+02	3/4	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthylene	3.47E-01	3.47E-01	3.47E-01	1/17	1.70E-01	1.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	1.34E+00	1.34E+00	1.34E+00	1/17	1.70E-01	1.70E-01	n/a	n/a	0/17	1.00E+05	0/17	3.79E+03
Dodecane	7.72E-01	2.28E+00	1.53E+00	2/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexadecane	7.09E-01	2.41E+00	1.56E+00	2/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polycyclic aromatic hydrocarbons (PAH)	6.80E-01	6.80E-01	6.80E-01	1/9	n/a	n/a	n/a	n/a	0/9	2.08E+01	1/9	2.12E-02
Pyrene	3.30E-01	3.30E-01	3.30E-01	1/17	1.70E-01	1.70E-01	n/a	n/a	0/17	4.87E+04	0/17	1.65E+02
Tetradecane	5.00E-02	1.82E+00	9.35E-01	2/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
Decane	1.71E-01	1.71E-01	1.71E-01	1/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.21E+02	1.79E+04	8.59E+03	93/93	1.31E+00	2.70E+01	18/93	1.20E+04	0/93	1.00E+05	85/93	4.64E+03
Antimony	7.66E-01	1.21E+02	2.12E+01	26/93	2.30E-01	1.84E+01	26/93	2.10E-01	0/93	4.63E+02	26/93	3.79E-01
Arsenic	1.26E-01	1.05E+01	3.91E+00	91/93	8.27E-02	1.74E+01	4/93	7.90E+00	0/93	3.15E+02	90/93	5.23E-01
Barium	1.51E+01	3.89E+02	9.70E+01	93/93	2.42E-02	1.41E+00	8/93	1.70E+02	0/93	1.00E+05	2/93	2.29E+02
Beryllium	4.90E-02	1.13E+02	1.70E+00	91/91	1.88E-02	1.81E-01	8/91	6.90E-01	0/91	1.28E+03	2/91	9.48E-01
Cadmium	5.50E-02	1.16E+02	3.63E+00	39/93	4.89E-02	2.21E+00	21/93	2.10E-01	1/93	7.05E+01	1/93	2.13E+01
Calcium	2.57E+02	2.23E+05	1.74E+04	91/91	5.10E-01	6.63E+02	25/91	6.10E+03	n/a	n/a	n/a	n/a
Chromium	3.07E+00	1.12E+02	1.52E+01	93/93	1.33E-01	3.52E+00	25/93	4.30E+01	n/a	n/a	0/93	3.56E+02
Cobalt	1.97E-01	1.12E+02	5.99E+00	91/91	8.47E-02	3.73E-01	4/91	1.30E+01	0/91	1.00E+05	0/91	1.92E+03
Copper	6.94E-01	1.12E+02	1.04E+01	91/91	1.07E-01	2.11E-01	3/91	2.50E+01	0/91	1.00E+05	0/91	4.93E+02
Iron	1.10E+02	3.02E+04	1.29E+04	91/91	6.68E-01	2.36E+01	2/91	2.80E+04	0/91	1.00E+05	88/91	2.07E+03
Lead	9.37E-01	1.16E+02	1.03E+01	92/93	2.40E-01	1.83E+01	2/93	2.30E+01	0/93	1.25E+03	1/93	5.00E+01
Magnesium	1.16E+02	1.00E+04	1.93E+03	93/93	3.75E+00	4.02E+01	30/93	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.29E+00	1.98E+03	3.17E+02	91/91	3.00E-02	2.01E-01	3/91	8.20E+02	0/91	4.64E+04	88/91	4.52E+01
Mercury	9.40E-03	1.43E-01	2.79E-02	89/93	7.80E-03	2.50E-02	1/93	1.30E-01	0/93	8.25E+02	0/93	9.82E-01
Nickel	1.74E+00	5.87E+02	2.61E+01	93/93	1.28E-01	4.95E+00	14/93	2.20E+01	0/93	9.30E+04	2/93	2.42E+02
Potassium	1.19E+02	6.43E+03	5.09E+02	88/91	2.05E+00	2.08E+02	6/91	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.39E-03	6.29E+01	1.47E+00	53/93	8.00E-04	3.58E+01	3/93	7.00E-01	0/93	2.56E+04	0/93	9.49E+01
Silver	1.93E-01	6.54E+01	4.49E+00	16/93	1.80E-01	4.48E+00	1/93	2.70E+00	0/93	2.07E+04	1/93	4.11E+01
Sodium	8.71E+01	5.92E+03	2.88E+02	91/91	2.73E+00	1.11E+01	13/91	3.40E+02	n/a	n/a	n/a	n/a
Thallium	1.23E-01	1.14E+02	1.45E+01	8/91	1.16E-01	5.34E-01	3/91	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	2.49E+00	6.25E+01	2.19E+01	91/91	1.45E-01	6.02E-01	3/91	3.70E+01	0/91	4.47E+03	90/91	3.32E+00
Zinc	4.21E+00	1.65E+03	6.84E+01	93/93	8.06E-02	1.70E+00	22/93	6.00E+01	0/93	1.00E+05	0/93	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.47E+00	2.11E+01	9.31E+00	112/121	8.49E+00	1.06E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.80E-01	1.80E-01	1.80E-01	1/30	n/a	n/a	n/a	n/a	0/30	5.16E+02	0/30	5.16E+00
Beta activity	1.45E+00	1.24E+02	2.70E+01	121/121	1.78E+01	1.87E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	6.00E-02	6.00E-02	6.00E-02	1/30	n/a	n/a	0/30	2.80E-01	0/30	8.58E+00	0/30	8.58E-02
Neptunium-237	6.00E-02	6.00E-02	6.00E-02	1/30	n/a	n/a	n/a	n/a	0/30	2.71E+01	0/30	2.71E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.6. Summary of Surface and Subsurface Historical Data at SWMU 196 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Plutonium-239/240	7.00E-02	1.90E-01	1.23E-01	3/30	n/a	n/a	n/a	n/a	0/30	1.15E+03	0/30	1.15E+01
Technetium-99	5.00E+00	5.00E+00	5.00E+00	1/30	n/a	n/a	1/30	2.80E+00	0/30	3.62E+04	0/30	3.62E+02
Thorium-230	2.60E-01	8.10E-01	4.03E-01	21/30	n/a	n/a	0/30	1.40E+00	0/30	1.49E+03	0/30	1.49E+01
Uranium	1.60E+00	5.00E+00	2.46E+00	19/30	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.50E-01	2.00E+00	8.96E-01	19/30	n/a	n/a	0/30	2.40E+00	0/30	1.98E+03	0/30	1.98E+01
Uranium-235	1.93E-02	1.10E-01	5.08E-02	18/30	n/a	n/a	0/30	1.40E-01	0/30	3.95E+01	0/30	3.95E-01
Uranium-238	8.00E-01	3.00E+00	1.52E+00	19/30	n/a	n/a	12/30	1.20E+00	0/30	1.71E+02	6/30	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.70E-01	1.50E+00	6.48E-01	6/14	1.70E-01	5.00E-01	n/a	n/a	0/14	6.67E+04	0/14	3.16E+02
Acenaphthylene	4.30E-01	4.30E-01	4.30E-01	1/14	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	8.50E-01	2.90E+00	1.61E+00	4/14	1.70E-01	5.00E-01	n/a	n/a	0/14	1.00E+05	0/14	3.79E+03
Benz(a)anthracene	2.20E-01	6.90E+00	3.06E+00	5/14	1.50E-01	5.00E-01	n/a	n/a	0/14	2.08E+02	5/14	2.12E-01
Benzo(a)pyrene	2.40E-01	7.00E+00	2.83E+00	5/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+01	5/14	2.12E-02
Benzo(b)fluoranthene	3.40E-01	8.70E+00	3.73E+00	5/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+02	5/14	2.12E-01
Benzo(ghi)perylene	4.40E-01	4.40E+00	1.76E+00	4/14	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	6.20E-01	3.10E+00	1.66E+00	4/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+03	1/14	2.12E+00
Chrysene	2.50E-01	7.50E+00	3.21E+00	5/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+04	0/14	2.12E+01
Dibenz(a,h)anthracene	1.40E-01	2.90E-01	2.13E-01	3/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+01	3/14	2.12E-02
Fluoranthene	1.50E-01	1.80E+01	4.81E+00	10/14	1.70E-01	5.00E-01	n/a	n/a	0/14	6.50E+04	0/14	2.21E+02
Fluorene	2.50E-01	2.30E+00	1.05E+00	8/14	1.70E-01	5.00E-01	n/a	n/a	0/14	7.09E+04	0/14	3.39E+02
Indeno(1,2,3-cd)pyrene	4.80E-01	4.40E+00	1.90E+00	4/14	1.70E-01	5.00E-01	n/a	n/a	0/14	2.08E+02	4/14	2.12E-01
Naphthalene	4.30E-01	1.10E+00	7.65E-01	2/14	1.70E-01	5.00E-01	n/a	n/a	0/14	7.66E+02	0/14	2.36E+01
Phenanthrene	3.60E-01	1.40E+01	4.23E+00	8/14	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	1.30E-01	1.60E+01	3.73E+00	10/14	1.70E-01	5.00E-01	n/a	n/a	0/14	4.87E+04	0/14	1.65E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

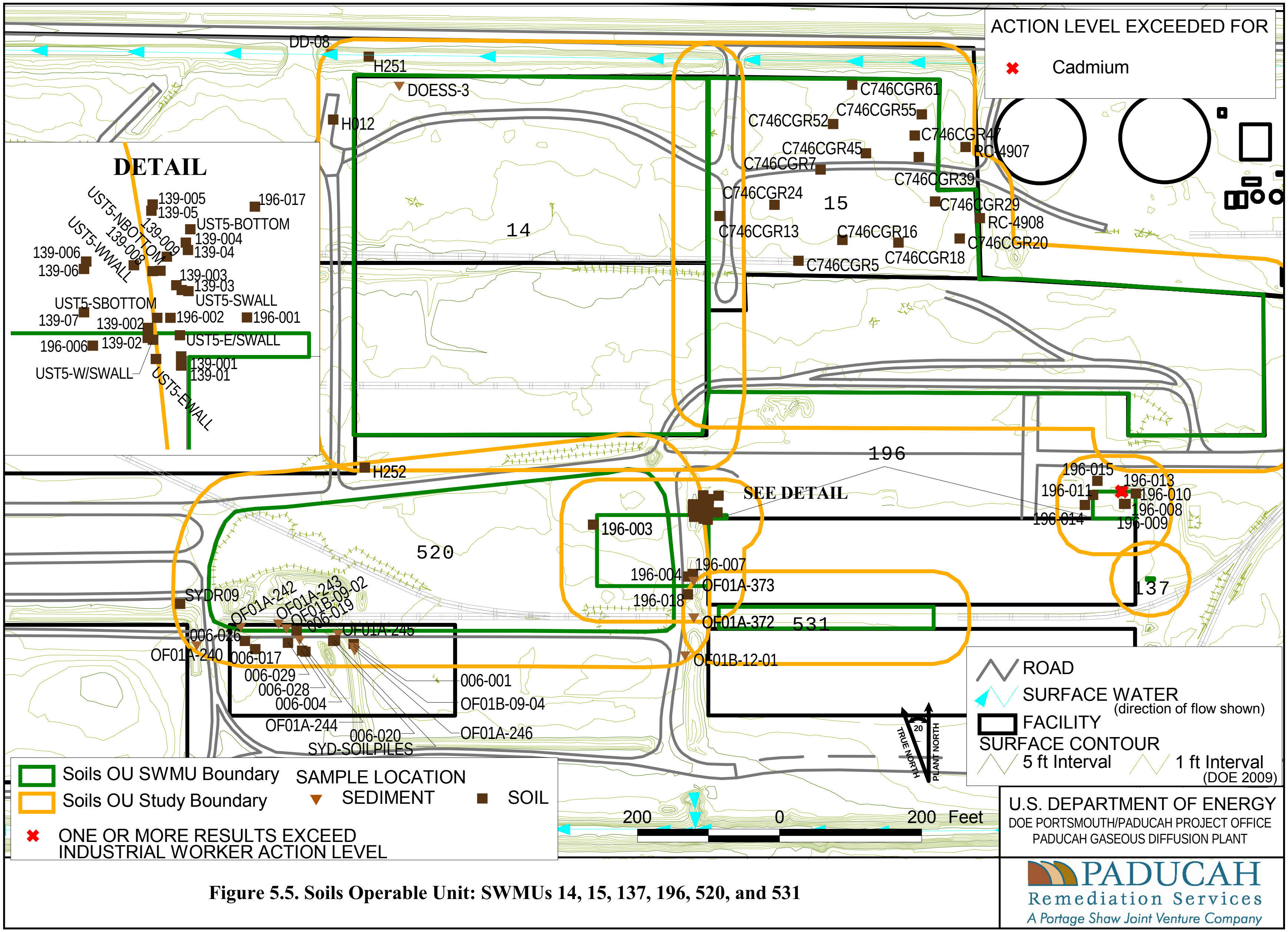

Figure 5.5. Soils Operable Unit: SWMUs 14, 15, 137, 196, 520, and 531

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 211 (C-720 TCE Spill Site Northeast)

Area description

The C-720 TCE Spill Site Northeast (SWMU 211) is located northeast of the C-720 Building in the central portion of the plant site. This SWMU is part of the SOU and the GWOU.

Process history

Suspected past practices were to rinse and clean parts with TCE and to dispose of the solvent on the ground.

Previous investigation results

Subsurface soil borings and groundwater samples were collected and analyzed as part of the WAG 27 RI/FS for the C-720 complex. Results of the investigation detected the presence of arsenic, beryllium, and vinyl chloride in subsurface soils. WAG 27 stated that surface soils were not evaluated since most of the surface surrounding the C-720 was covered with asphalt and concrete. Conclusions from WAG 27 are the ELCR and systemic toxicity exceed KDEP and EPA accepted standards for future excavation worker (DOE 1999a).

Table 5.7 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.6).

Area utilities

No recirculating water lines or sewers were associated with this SWMU. A recirculating water line is coincidentally located within the boundary of the SWMU. Depth to this 10-inch line is approximately 12 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.7. Summary of Surface and Subsurface Historical Data at SWMU 211

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB-1254	1.20E-02	2.30E-02	1.75E-02	4/14	2.00E-01	2.00E-01	n/a	n/a	0/14	1.82E+01	0/14	1.99E-01
PCB-1260	2.00E-02	4.00E-02	3.20E-02	3/14	2.00E-01	2.00E-01	n/a	n/a	0/14	4.25E+01	0/14	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.50E+00	1.05E+01	5.03E+00	12/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.00E+00	1.20E+01	7.33E+00	12/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	2.50E+00	5.60E+00	4.04E+00	8/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,2,4-Trimethylbenzene	6.30E-04	6.30E-04	6.30E-04	1/1	5.60E-03	5.60E-03	n/a	n/a	0/1	1.00E+05	0/1	3.67E+02
Acetone	8.70E-03	8.70E-03	8.70E-03	1/3	1.20E-02	2.20E-02	n/a	n/a	0/3	1.91E+04	0/3	3.58E+02
cis-1,2-Dichloroethene	1.00E-03	1.00E-03	1.00E-03	1/2	5.60E-03	6.00E-03	n/a	n/a	0/2	4.63E+02	0/2	1.34E+01
Trichloroethene	1.10E-02	1.10E-02	1.10E-02	1/3	5.60E-03	6.00E-03	n/a	n/a	0/3	2.98E+02	0/3	2.51E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.80E+03	9.08E+03	6.42E+03	6/6	1.31E+00	2.00E+01	0/6	1.20E+04	0/6	1.00E+05	5/6	4.64E+03
Antimony	5.30E-01	1.59E+00	1.06E+00	2/6	5.22E-01	1.00E+00	2/6	2.10E-01	0/6	4.63E+02	2/6	3.79E-01
Arsenic	9.64E-01	1.00E+01	4.47E+00	5/6	8.27E-02	1.00E+01	1/6	7.90E+00	0/6	3.15E+02	5/6	5.23E-01
Barium	1.13E+01	1.40E+02	5.54E+01	6/6	2.42E-02	2.50E+00	0/6	1.70E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	3.96E-01	1.99E+00	8.22E-01	6/6	1.88E-02	5.00E-01	3/6	6.90E-01	0/6	1.28E+03	1/6	9.48E-01
Calcium	3.74E+02	1.29E+03	1.02E+03	6/6	5.10E-01	1.00E+02	0/6	6.10E+03	n/a	n/a	n/a	n/a
Chromium	9.06E+00	5.22E+01	2.34E+01	6/6	1.33E-01	2.50E+00	2/6	4.30E+01	n/a	n/a	0/6	3.56E+02
Cobalt	1.83E+00	1.14E+01	6.07E+00	5/6	8.47E-02	1.00E+01	0/6	1.30E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	2.88E+00	1.12E+01	7.17E+00	6/6	1.07E-01	2.50E+00	0/6	2.50E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	2.29E+03	3.02E+04	1.30E+04	6/6	2.36E+00	2.36E+01	1/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	5.33E+00	1.23E+01	8.38E+00	6/6	2.40E-01	1.00E+00	0/6	2.30E+01	0/6	1.25E+03	0/6	5.00E+01
Magnesium	1.76E+02	1.58E+03	7.34E+02	6/6	3.75E+00	5.00E+00	0/6	2.10E+03	n/a	n/a	n/a	n/a
Manganese	2.07E+01	3.20E+02	1.04E+02	6/6	3.00E-02	2.50E+00	0/6	8.20E+02	0/6	4.64E+04	3/6	4.52E+01
Mercury	2.32E-02	9.61E-01	3.43E-01	3/6	7.80E-03	2.00E-02	1/6	1.30E-01	0/6	8.25E+02	0/6	9.82E-01
Nickel	4.09E+00	1.37E+01	9.06E+00	4/6	1.28E-01	5.00E+00	0/6	2.20E+01	0/6	9.30E+04	0/6	2.42E+02
Potassium	7.69E+01	4.94E+02	2.17E+02	6/6	2.05E+00	1.00E+02	0/6	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.76E-01	1.76E-01	1.76E-01	1/6	8.91E-02	1.00E+00	0/6	7.00E-01	0/6	2.56E+04	0/6	9.49E+01
Silver	2.74E+00	2.74E+00	2.74E+00	1/6	1.80E-01	1.00E+00	1/6	2.70E+00	0/6	2.07E+04	0/6	4.11E+01
Sodium	7.65E+01	2.84E+02	2.02E+02	4/6	2.73E+00	2.00E+02	0/6	3.40E+02	n/a	n/a	n/a	n/a
Thallium	6.02E-01	6.02E-01	6.02E-01	1/6	5.34E-01	2.00E+00	1/6	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	1.18E+01	6.33E+01	2.57E+01	6/6	1.45E-01	2.50E+00	1/6	3.70E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	1.09E+01	1.24E+02	6.69E+01	4/6	8.06E-02	2.00E+01	2/6	6.00E+01	0/6	1.00E+05	0/6	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.84E+00	1.13E+01	6.28E+00	4/6	1.01E+00	9.48E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.74E+00	4.26E+01	1.82E+01	6/6	1.07E+00	1.81E+01	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.7. Summary of Surface and Subsurface Historical Data at SWMU 211 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Volatiles (mg/kg)												
1,1-Dichloroethane	9.50E-01	9.50E-01	9.50E-01	1/3	2.00E-03	1.80E-02	n/a	n/a	0/3	5.52E+03	0/3	1.55E+02
Trichloroethene	2.60E-02	5.00E+00	1.96E+00	4/9	2.00E-03	5.00E+00	n/a	n/a	0/9	2.98E+02	2/9	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

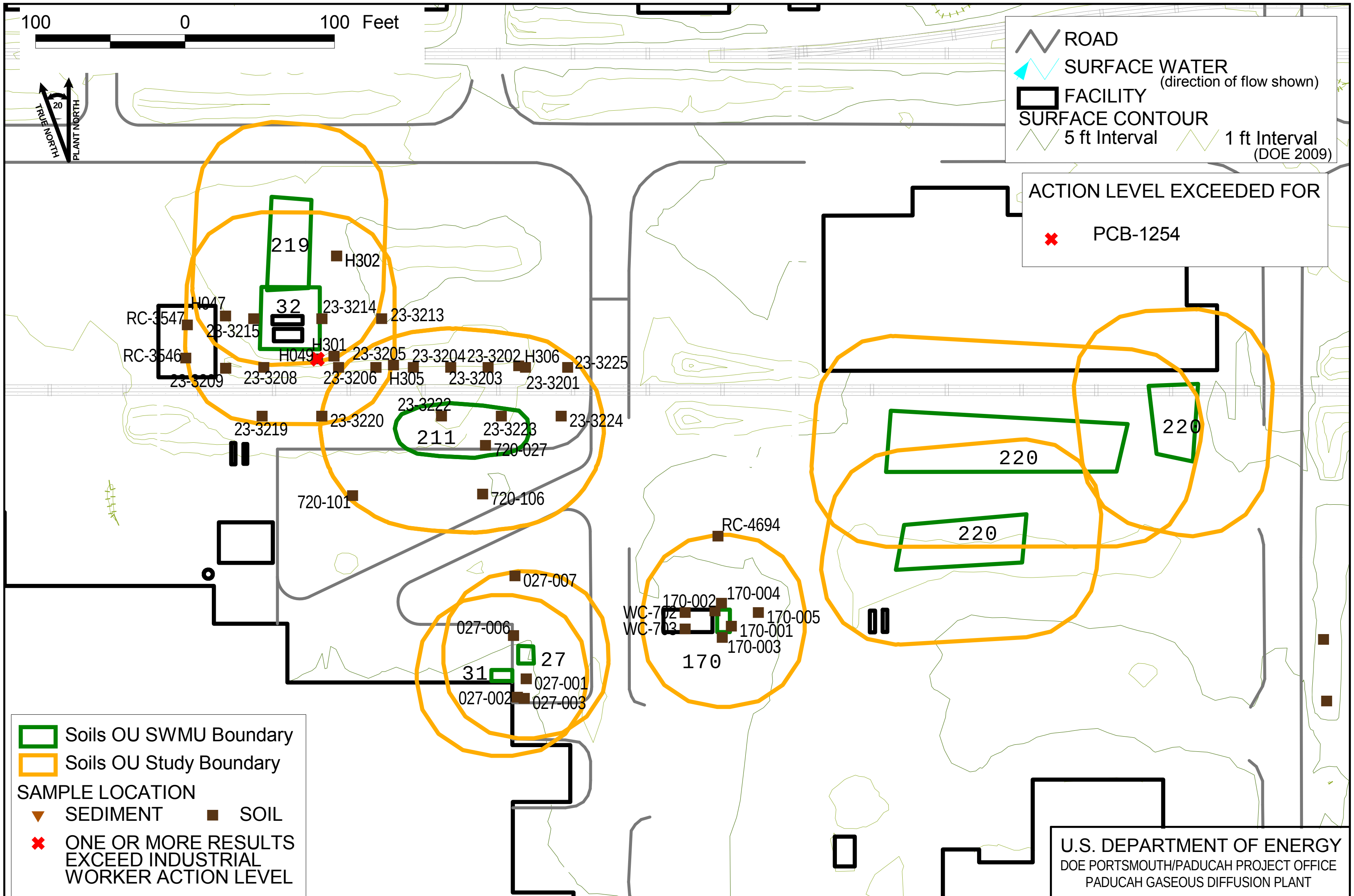

Figure 5.6. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 483 [Nitrogen Generating Facilities (Soils Under Facility)]

Area description

SWMU 483 is the area of soil located under the C-603 Nitrogen Facility in the central portion of the plant site.

Process history

Nitrogen was produced by a cryogenic generator located at C-603. This facility was abandoned in the late 1970s. In September 2002, a Generator Staging Area was established to house asbestos containing material during removal work on C-603 tanks. In October 2005, C-603-A, C, D, H, and I were decommissioned and removed as part of a maintenance action with a categorical exclusion for NEPA.

Previous investigation results

C-603 was removed by DOE in 2005 as part of a routine maintenance activity due to the detection of lead and PCBs in the paint. No soil samples have been collected from this site; however, paint chip samples were taken from the C-603 surfaces and analyzed for PCBs, metals, and radiological contaminants. These results indicated the presence of lead, chromium, and PCBs. During D&D, most paint chips (from the nitrogen tower) that fell onto soil surfaces around the C-603 facilities were collected for disposal. As a result, there is a potential for subsurface soil migration of paint chips that were too small to be collected or spotted by a walkover inspection.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

A map of historical sample locations within a 50-ft boundary is provided in Figure 5.7.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

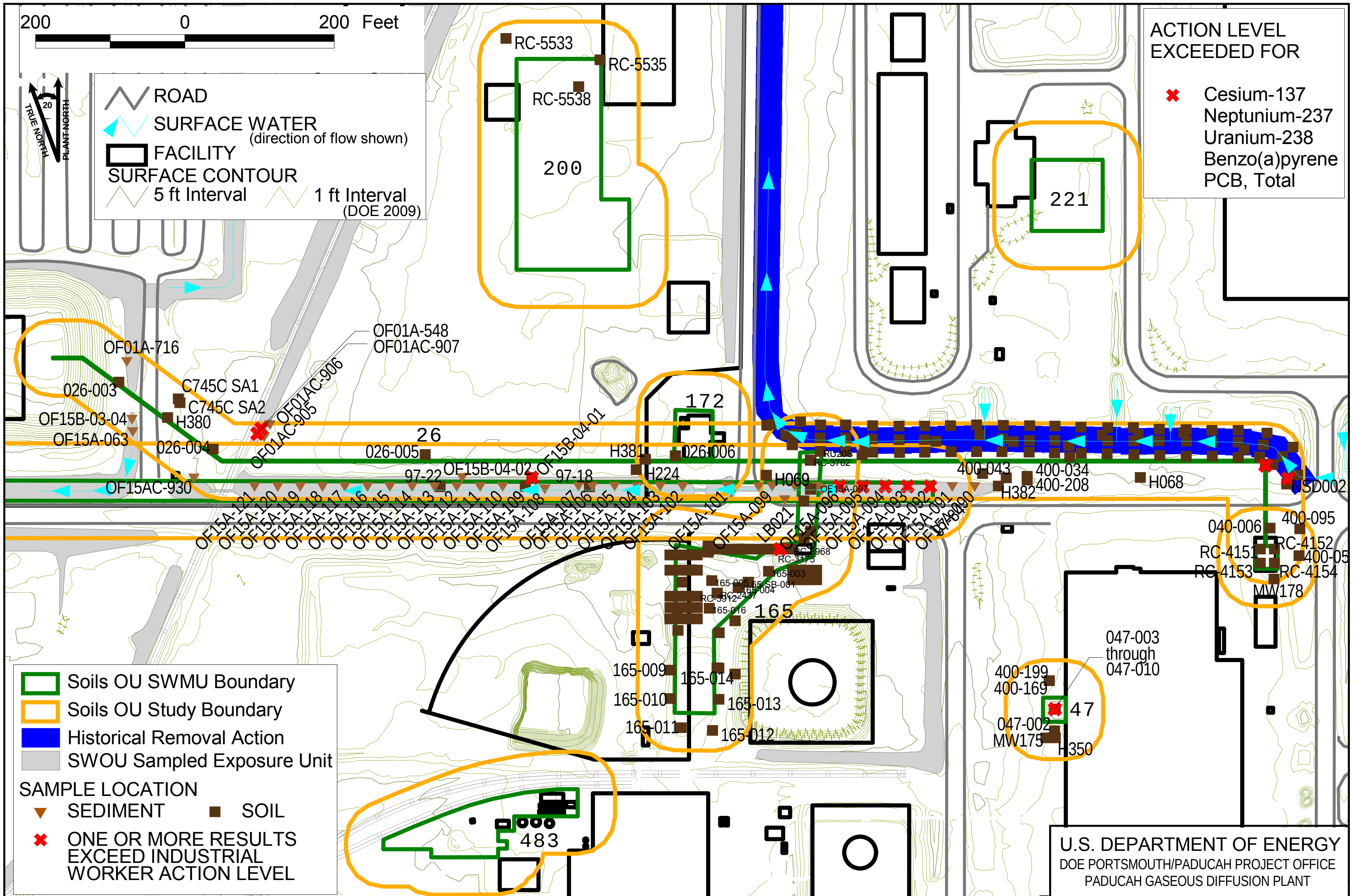

Figure 5.7. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 489 (Septic Tank, North of C-710)

Area description

The Septic Tank, North of C-710 (SWMU 489), is constructed of cement blocks and located in the central portion of the plant site. SWMU 489 is approximately 200 ft^3 (8 ft x 5 ft x 5ft). The tank is below a doublewide trailer.

Process history

Due to the construction materials and the manner in which it was constructed, it is believed that the septic tank was associated with the original construction activities of the PGDP in the early 1950s. SWMU 489 was discovered on June 1, 2001, as a result of a construction project for the DOE Material Storage Area (DMSA) trailers in the field north of the C-710 Laboratory. During excavation, what appeared to be an abandoned septic tank was discovered. The tank appeared to have had the top removed, contents removed, and backfilled with sand prior to burial in place. When the septic tank was uncovered, water was present in the interior of the tank from past rainfall events. A sample of the sand was obtained from the interior of the tank. The septic tank has been backfilled, compacted, and graded, and also has 9–10 inches of dense grade aggregate on top of the tank area.

Previous investigation results

In May 2001, radiological surveys of this area and materials were performed. Results of this survey indicate no radiological contamination is present. Additionally, a sample of the sand showed no results above background.

A map of historical sample locations within a 50-ft boundary is provided in Figure 5.8.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

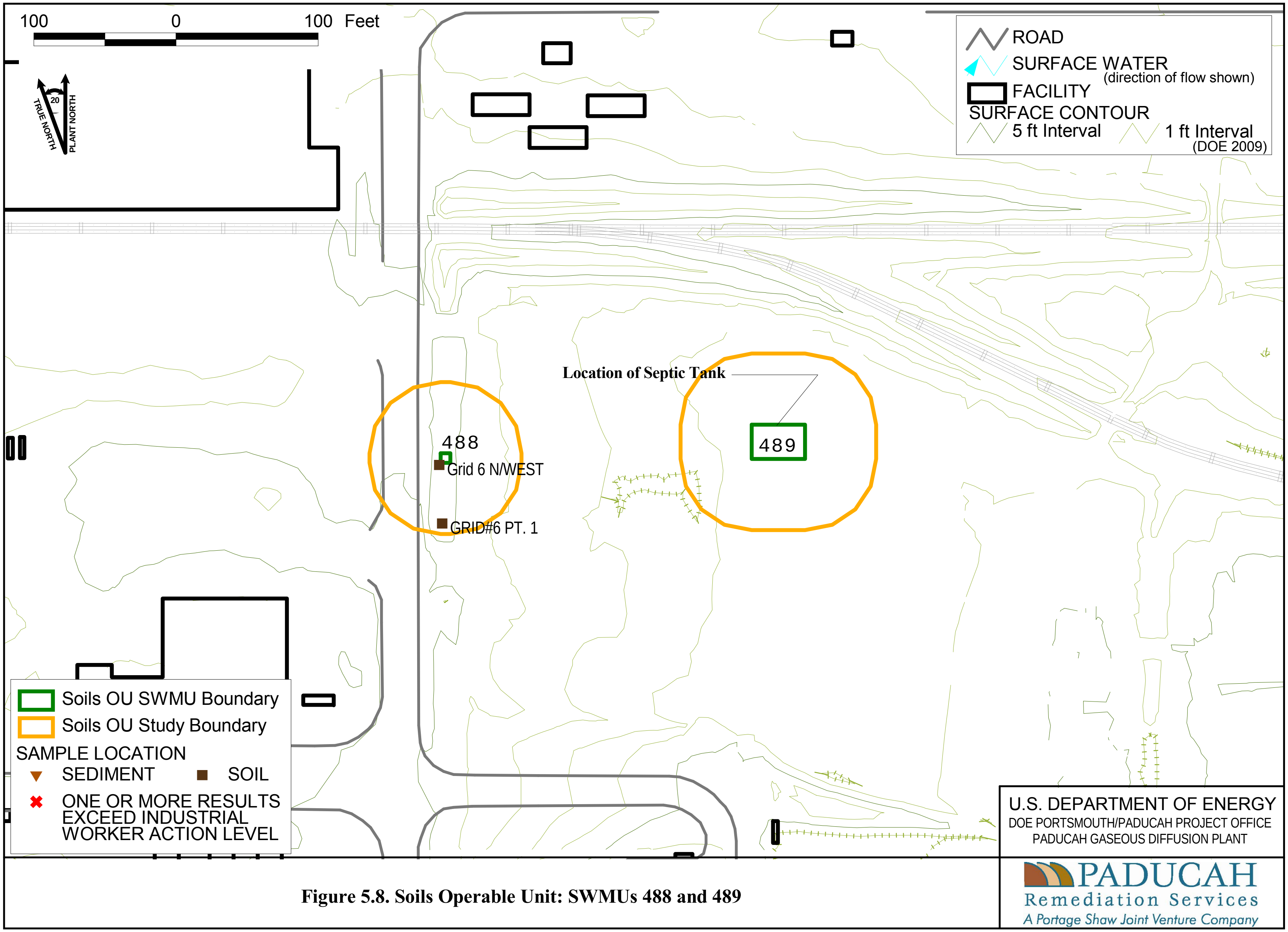

Figure 5.8. Soils Operable Unit: SWMUs 488 and 489

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 531 (Aluminum Slag Reacting Area)

Area description

The Aluminum Slag Reacting Area (SWMU 531) is a concrete pad located adjacent to the south side of C-746-A, Hazardous and Mixed Waste Storage Facility, which is located in the northwestern portion of PGDP. SWMU 531 is approximately 9,000 ft^2 (30 ft x 300 ft).

Process history

The Aluminum Slag Reacting Area was used for treatment of stored aluminum slag from the aluminum smelter. Aluminum slag was brought from a sweat furnace in the west end of C-746-B smelter. Water was slowly added to dumpsters and possibly drums to react with the aluminum slag. Slag was allowed to react with no agitation for several days. Hydrogen that was produced from the reaction escaped to the atmosphere. The slag was dewatered, and the resulting waste was placed in the C-746-F Landfill. It is unknown how long this operation was in practice.

Previous investigation results

From analyses of samples collected from SWMUs 139 and 196A, which are located near SWMU 531, some elevated concentrations of metals (aluminum, calcium, iron, and magnesium) in soils were noted as presented in the 1992 SWMU Assessment Report (SAR).

Table 5.8 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.9).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.8. Summary of Surface and Subsurface Historical Data at SWMU 531

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Radionuclides (pCi/g)												
Cesium-137	2.30E-01	2.30E-01	2.30E-01	1/1	3.50E-01	3.50E-01	0/1	4.90E-01	0/1	8.58E+00	1/1	8.58E-02
Uranium-238	-7.10E-01	-7.10E-01	-7.10E-01	1/1	6.57E+00	6.57E+00	0/1	1.20E+00	0/1	1.71E+02	0/1	1.71E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.58E+03	1.65E+04	1.23E+04	11/11	1.31E+00	1.31E+01	7/11	1.20E+04	0/11	1.00E+05	11/11	4.64E+03
Arsenic	9.38E-01	7.00E+00	3.75E+00	11/11	8.27E-02	8.27E-02	0/11	7.90E+00	0/11	3.15E+02	11/11	5.23E-01
Barium	4.93E+01	1.94E+02	1.24E+02	11/11	2.42E-02	2.42E-02	3/11	1.70E+02	0/11	1.00E+05	0/11	2.29E+02
Beryllium	2.92E-01	6.72E-01	4.92E-01	11/11	1.88E-02	1.88E-02	1/11	6.90E-01	0/11	1.28E+03	0/11	9.48E-01
Cadmium	5.70E-02	5.70E-02	5.70E-02	1/11	4.89E-02	4.89E-02	0/11	2.10E-01	0/11	7.05E+01	0/11	2.13E+01
Calcium	6.25E+02	1.07E+04	2.83E+03	11/11	5.10E-01	5.10E-01	2/11	6.10E+03	n/a	n/a	n/a	n/a
Chromium	9.25E+00	1.81E+01	1.57E+01	11/11	1.33E-01	1.33E-01	7/11	4.30E+01	n/a	n/a	0/11	3.56E+02
Cobalt	1.97E+00	1.43E+01	5.85E+00	11/11	8.47E-02	8.47E-02	1/11	1.30E+01	0/11	1.00E+05	0/11	1.92E+03
Copper	3.48E+00	1.55E+01	1.07E+01	11/11	1.07E-01	1.07E-01	0/11	2.50E+01	0/11	1.00E+05	0/11	4.93E+02
Iron	6.89E+03	2.31E+04	1.77E+04	11/11	2.36E+00	2.36E+01	0/11	2.80E+04	0/11	1.00E+05	11/11	2.07E+03
Lead	5.41E+00	1.51E+01	9.13E+00	11/11	2.40E-01	2.40E-01	0/11	2.30E+01	0/11	1.25E+03	0/11	5.00E+01
Magnesium	5.59E+02	3.43E+03	2.02E+03	11/11	3.75E+00	3.75E+00	7/11	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.16E+02	8.55E+02	3.73E+02	11/11	3.00E-02	3.00E-02	1/11	8.20E+02	0/11	4.64E+04	11/11	4.52E+01
Mercury	9.60E-03	4.50E-02	2.71E-02	11/11	7.80E-03	7.80E-03	0/11	1.30E-01	0/11	8.25E+02	0/11	9.82E-01
Nickel	3.74E+00	2.06E+01	1.23E+01	11/11	1.28E-01	1.28E-01	0/11	2.20E+01	0/11	9.30E+04	0/11	2.42E+02
Potassium	2.15E+02	1.09E+03	5.97E+02	11/11	2.05E+00	2.05E+00	1/11	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.20E-01	2.45E-01	1.75E-01	4/11	8.91E-02	8.91E-02	0/11	7.00E-01	0/11	2.56E+04	0/11	9.49E+01
Sodium	1.09E+02	3.23E+02	2.63E+02	11/11	2.73E+00	2.73E+00	1/11	3.40E+02	n/a	n/a	n/a	n/a
Thallium	5.60E-01	5.74E-01	5.67E-01	2/11	5.34E-01	5.34E-01	2/11	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	1.15E+01	3.24E+01	2.50E+01	11/11	1.45E-01	1.45E-01	0/11	3.70E+01	0/11	4.47E+03	11/11	3.32E+00
Zinc	1.25E+01	7.74E+01	4.41E+01	11/11	8.06E-02	8.06E-02	2/11	6.00E+01	0/11	1.00E+05	0/11	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	6.69E+00	1.96E+01	1.21E+01	11/11	9.42E+00	9.51E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.46E+01	5.44E+01	3.50E+01	11/11	1.80E+01	1.82E+01	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

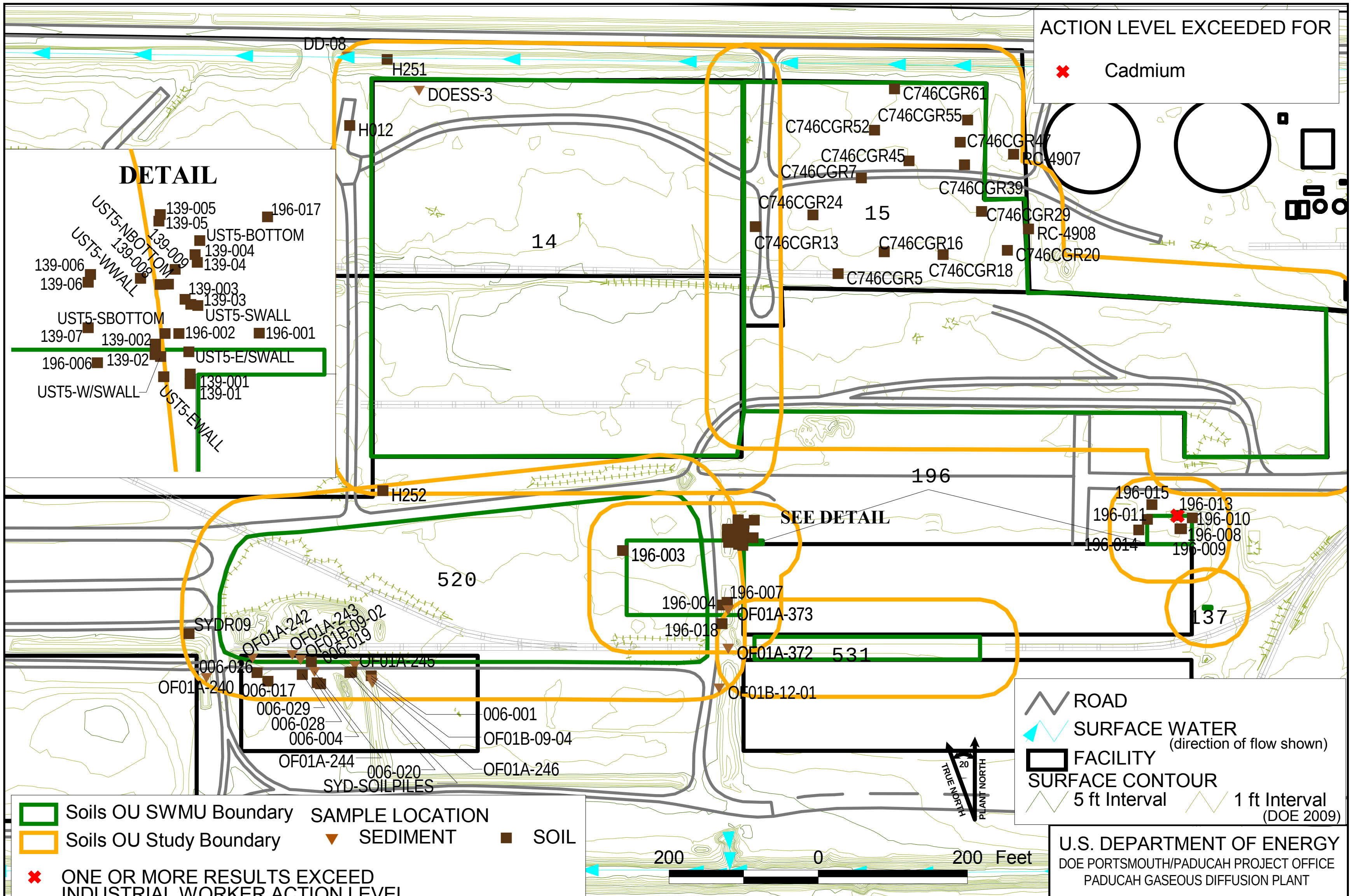

Figure 5.9. Soils Operable Unit: SWMUs 14, 15, 137, 196, 520, and 531

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

5.1.2 Group 1–Storage Area

SWMU 47 (C-400 Technetium Storage Tank Area)

Area description

The C-400 ^{99}Tc Storage Tank Area (SWMU 47) is located west of the C-400 Building in the central portion of the plant site. Prior to dismantling and disposal, the 4,000 gal tank was located on a concrete pad.

Process history

From the early 1960s to 1986, the C-400 ^{99}Tc Storage Tank was used in the technetium recovery process to store a waste solution of chromium and ^{99}Tc.

Previous investigation results

The tank was emptied of liquids (approximately 200 gal of solution) and removed in 1986. Soil boring and groundwater samples were obtained during the WAG 6 RI (DOE 1999b), which placed SWMU 47 into Sector 6 (refer to Section 5.1.3, SWMU 11, *"Previous Investigation Results"* for a definition of Sectors used in WAG 6 RI). Results of this sampling indicate the potential for radiological, chromium, and PAH contamination. Shallow surface soil samples collected at 4.5 ft bgs in this boring contained the highest concentration of many of the identified radionuclides, but no PAHs. The radioactivity of the soil decreased substantially below 4.5 ft bgs. TCE was reported at high levels between 4.5 and 29.5 ft bgs (the deepest sample collected). The level of TCE in the subsurface soils remained relatively constant from near surface to the total depth. Other borings drilled and sampled within Sector 6 to assess the utility corridors and C-400 Area perimeter contained no contaminants of concern, or exhibited only isolated occurrences of contaminant concentrations.

The summary table from the BRA for WAG 6, showing which human health risk exceed *de minimis*, is located in the *"Previous Investigation Results"* of Section 5.1.3.

Table 5.9 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.10).

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU. An electrical conduit passes under the SWMU.

Data gap determination

Additional samples are needed at this location to help delineate extent of contamination from the building.

Table 5.9. Summary of Surface and Subsurface Historical Data at SWMU 47

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	6.55E+03	1.50E+04	1.19E+04	9/9	2.00E+01	1.00E+02	6/9	1.30E+04	0/9	1.00E+05	9/9	4.64E+03
Antimony	7.00E-01	9.00E-01	8.00E-01	3/9	5.00E-01	6.00E-01	3/9	2.10E-01	0/9	4.63E+02	3/9	3.79E-01
Arsenic	5.46E+00	4.52E+01	1.60E+01	9/9	7.00E-02	7.00E-01	5/9	1.20E+01	0/9	3.15E+02	9/9	5.23E-01
Barium	3.53E+01	1.27E+02	9.95E+01	9/9	2.00E-02	2.00E-02	0/9	2.00E+02	0/9	1.00E+05	0/9	2.29E+02
Beryllium	2.20E-01	6.40E-01	5.10E-01	9/9	1.00E-02	1.00E-02	0/9	6.70E-01	0/9	1.28E+03	0/9	9.48E-01
Cadmium	4.00E-02	4.25E+00	7.33E-01	7/9	2.00E-02	2.00E-02	4/9	2.10E-01	0/9	7.05E+01	0/9	2.13E+01
Calcium	2.18E+03	7.15E+04	1.35E+04	9/9	1.00E-01	1.00E+00	5/9	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.27E+01	4.58E+01	2.00E+01	9/9	7.00E-02	9.00E-02	n/a	1.60E+01	0/9	n/a	0/9	3.56E+02
Cobalt	3.00E+00	1.43E+01	7.39E+00	9/9	8.00E-02	1.00E-01	1/9	1.40E+01	0/9	1.00E+05	0/9	1.92E+03
Copper	1.16E+01	2.79E+01	1.81E+01	9/9	9.00E-02	1.00E-01	3/9	1.90E+01	0/9	1.00E+05	0/9	4.93E+02
Iron	1.50E+04	2.49E+04	2.00E+04	9/9	2.00E+01	1.00E+02	0/9	2.80E+04	0/9	1.00E+05	9/9	2.07E+03
Lead	1.01E+01	1.52E+01	1.23E+01	9/9	2.00E-01	2.00E-01	0/9	3.60E+01	0/9	1.25E+03	0/9	5.00E+01
Magnesium	1.04E+03	4.17E+03	2.28E+03	9/9	1.00E-01	1.00E-01	5/9	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.65E+02	5.38E+02	3.62E+02	9/9	2.00E-02	2.00E-02	0/9	1.50E+03	0/9	4.64E+04	9/9	4.52E+01
Mercury	2.15E-02	6.76E-02	3.34E-02	9/9	8.00E-03	9.50E-03	0/9	2.00E-01	0/9	8.25E+02	0/9	9.82E-01
Nickel	1.06E+01	2.55E+01	1.68E+01	9/9	1.00E-01	1.00E-01	1/9	2.10E+01	0/9	9.30E+04	0/9	2.42E+02
Potassium	3.35E+02	1.00E+03	6.41E+02	9/9	2.00E+00	2.00E+00	1/9	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.00E-01	3.00E-01	3.00E-01	2/9	2.00E-01	1.00E+00	0/9	8.00E-01	0/9	2.56E+04	0/9	9.49E+01
Silver	6.00E-01	6.00E-01	6.00E-01	1/9	7.00E-02	9.00E-02	0/9	2.30E+00	0/9	2.07E+04	0/9	4.11E+01
Sodium	1.80E+02	6.81E+02	5.13E+02	9/9	1.00E+00	1.00E+00	8/9	3.20E+02	n/a	n/a	n/a	n/a
Vanadium	1.91E+01	3.34E+01	2.69E+01	9/9	1.00E-01	1.00E-01	0/9	3.80E+01	0/9	4.47E+03	9/9	3.32E+00
Zinc	3.30E+01	7.57E+01	5.25E+01	9/9	8.00E-02	1.00E-01	3/9	6.50E+01	0/9	1.00E+05	0/9	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	7.70E-02	9.60E-01	3.86E-01	3/12	1.80E-02	1.00E+00	n/a	n/a	0/12	4.25E+01	1/12	1.99E-01
PCB-1254	7.70E-02	9.60E-01	3.86E-01	3/3	1.80E-02	2.10E-01	n/a	n/a	0/3	1.82E+01	1/3	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	5.80E+00	1.75E+02	3.29E+01	20/22	1.27E+01	1.42E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	2.00E-01	1.22E-01	9/9			n/a	n/a	0/9	5.16E+02	0/9	5.16E+00
Beta activity	8.80E+00	2.48E+02	6.06E+01	22/22	1.93E+01	1.96E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.00E-01	1.50E+00	3.78E-01	9/9			3/9	4.90E-01	0/9	8.58E+00	9/9	8.58E-02
Neptunium-237	2.00E-01	3.00E+00	7.90E-01	11/11			11/11	1.00E-01	0/11	2.71E+01	10/11	2.71E-01
Plutonium-239	1.00E-01	1.70E+00	4.05E-01	11/11			11/11	2.50E-02	0/11	1.15E+03	0/11	1.15E+01
Technetium-99	4.50E+00	1.40E+02	3.40E+01	11/11			11/11	2.50E+00	0/11	3.62E+04	0/11	3.62E+02
Thorium-230	1.60E+00	1.09E+01	3.91E+00	11/11			11/11	1.50E+00	0/11	1.49E+03	0/11	1.49E+01
Uranium	5.70E+00	7.26E+01	1.58E+01	9/9			n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.40E+00	3.11E+01	6.00E+00	11/11			9/11	2.50E+00	0/11	1.98E+03	1/11	1.98E+01
Uranium-235	1.00E-01	1.90E+00	3.49E-01	11/11			8/11	1.40E-01	0/11	3.95E+01	2/11	3.95E-01
Uranium-238	2.60E+00	3.95E+01	7.47E+00	11/11			11/11	1.20E+00	0/11	1.71E+02	11/11	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.9. Summary of Surface and Subsurface Historical Data at SWMU 47 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Semivolatiles (mg/kg)												
2-Methylnaphthalene	9.00E-01	9.00E-01	9.00E-01	1/17	7.39E-01	1.65E+01	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	1.80E+00	7.07E+00	4.03E+00	5/17	7.39E-01	1.65E+01	n/a	n/a	0/17	6.67E+04	0/17	3.16E+02
Anthracene	3.59E-01	8.43E+01	1.19E+01	10/17	7.39E-01	1.65E+01	n/a	n/a	0/17	1.00E+05	0/17	3.79E+03
Benz(a)anthracene	1.40E-01	3.92E+01	1.01E+01	12/17	7.39E-01	1.65E+01	n/a	n/a	0/17	2.08E+02	11/17	2.12E-01
Benzo(a)pyrene	1.30E-01	3.77E+01	9.31E+00	12/17	7.39E-01	1.65E+01	n/a	n/a	2/17	2.08E+01	12/17	2.12E-02
Benzo(b)fluoranthene	1.10E-01	6.24E+01	1.39E+01	11/17	7.39E-01	1.65E+01	n/a	n/a	0/17	2.08E+02	10/17	2.12E-01
Benzo(ghi)perylene	9.10E-02	8.84E+00	4.25E+00	7/17	7.39E-01	1.65E+01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.30E-01	9.41E+01	1.39E+01	11/17	7.39E-01	1.65E+01	n/a	n/a	0/17	2.08E+03	7/17	2.12E+00
Bis(2-ethylhexyl)phthalate	1.00E-01	1.00E-01	1.00E-01	1/17	7.39E-01	1.65E+01	n/a	n/a	0/17	7.40E+03	0/17	8.84E+00
Chrysene	1.60E-01	4.37E+01	1.12E+01	12/17	7.39E-01	1.65E+01	n/a	n/a	0/17	2.08E+04	2/17	2.12E+01
Dibenz(a,h)anthracene	3.20E+00	4.27E+00	3.73E+00	2/17	7.20E-01	1.65E+01	n/a	n/a	0/17	2.08E+01	2/17	2.12E-02
Dibenzofuran	1.10E+00	3.60E+00	1.85E+00	4/17	7.39E-01	1.65E+01	n/a	n/a	0/17	9.02E+03	0/17	1.86E+01
Di-n-butyl phthalate	2.05E-01	2.05E-01	2.05E-01	1/17	7.39E-01	1.65E+01	n/a	n/a	0/17	1.00E+05	0/17	2.13E+03
Fluoranthene	3.50E-01	9.68E+01	2.25E+01	14/17	7.39E-01	1.65E+01	n/a	n/a	0/17	6.50E+04	0/17	2.21E+02
Fluorene	9.00E-01	4.54E+00	2.51E+00	5/17	7.39E-01	1.65E+01	n/a	n/a	0/17	7.09E+04	0/17	3.39E+02
Indeno(1,2,3-cd)pyrene	8.10E-02	9.69E+00	4.55E+00	7/17	7.39E-01	1.65E+01	n/a	n/a	0/17	2.08E+02	6/17	2.12E-01
Naphthalene	5.00E-01	1.90E+00	9.50E-01	4/17	7.39E-01	1.65E+01	n/a	n/a	0/17	7.66E+02	0/17	2.36E+01
Phenanthrene	2.30E-01	7.75E+01	1.69E+01	14/17	7.39E-01	1.65E+01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	1.99E-01	1.11E+02	1.88E+01	15/17	7.39E-01	1.65E+01	n/a	n/a	0/17	4.87E+04	0/17	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.12E+03	1.40E+04	9.01E+03	10/10	1.00E+01	1.00E+02	2/10	1.20E+04	0/10	1.00E+05	9/10	4.64E+03
Antimony	7.00E-01	9.00E-01	8.00E-01	2/10	6.00E-01	1.30E+01	2/10	2.10E-01	0/10	4.63E+02	2/10	3.79E-01
Arsenic	4.56E-02	8.35E+00	3.52E+00	10/10	7.00E-04	4.00E-01	1/10	7.90E+00	0/10	3.15E+02	9/10	5.23E-01
Barium	1.33E+01	1.68E+02	8.37E+01	10/10	2.00E-02	2.00E-02	0/10	1.70E+02	0/10	1.00E+05	0/10	2.29E+02
Beryllium	3.70E-01	6.90E-01	5.57E-01	10/10	1.00E-02	1.00E-02	1/10	6.90E-01	0/10	1.28E+03	0/10	9.48E-01
Cadmium	5.00E-02	1.28E+01	3.91E+00	4/10	2.00E-02	8.90E-01	3/10	2.10E-01	0/10	7.05E+01	0/10	2.13E+01
Calcium	8.93E+02	1.26E+04	3.69E+03	9/10	1.00E-01	1.36E+03	2/10	6.10E+03	n/a	n/a	n/a	n/a
Chromium	3.30E+00	5.19E+01	2.11E+01	10/10	8.00E-02	9.00E-02	n/a	4.30E+01	0/10	n/a	0/10	3.56E+02
Cobalt	5.10E+00	6.80E+00	6.00E+00	6/10	9.00E-02	7.40E+00	0/10	1.30E+01	0/10	1.00E+05	0/10	1.92E+03
Copper	4.70E+00	2.56E+01	1.18E+01	10/10	1.00E-01	1.00E-01	1/10	2.50E+01	0/10	1.00E+05	0/10	4.93E+02
Iron	1.32E+04	2.38E+04	1.74E+04	10/10	1.00E+01	1.00E+02	0/10	2.80E+04	0/10	1.00E+05	10/10	2.07E+03
Lead	4.80E+00	4.66E+01	1.43E+01	10/10	2.00E-01	2.00E-01	2/10	2.30E+01	0/10	1.25E+03	0/10	5.00E+01
Magnesium	4.76E+02	2.22E+03	1.42E+03	10/10	1.00E-01	1.00E-01	2/10	2.10E+03	n/a	n/a	n/a	n/a
Manganese	3.15E+01	7.69E+02	2.96E+02	10/10	2.00E-02	2.00E-02	0/10	8.20E+02	0/10	4.64E+04	9/10	4.52E+01
Mercury	1.88E-02	2.79E-02	2.27E-02	5/10	8.90E-03	1.10E-01	0/10	1.30E-01	0/10	8.25E+02	0/10	9.82E-01
Nickel	5.40E+00	2.24E+01	1.16E+01	8/10	1.00E-01	1.03E+01	1/10	2.20E+01	0/10	9.30E+04	0/10	2.42E+02
Potassium	1.37E+02	4.85E+02	3.26E+02	7/10	2.00E+00	2.64E+02	0/10	9.50E+02	n/a	n/a	n/a	n/a
Selenium	4.00E-01	4.30E-01	4.15E-01	2/10	2.00E-01	3.20E-01	0/10	7.00E-01	0/10	2.56E+04	0/10	9.49E+01
Silver	1.30E-01	3.10E-01	2.37E-01	3/10	8.00E-02	2.30E+00	0/10	2.70E+00	0/10	2.07E+04	0/10	4.11E+01
Sodium	8.97E+01	4.95E+02	2.95E+02	6/10	1.00E+00	5.33E+02	3/10	3.40E+02	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.9. Summary of Surface and Subsurface Historical Data at SWMU 47 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Vanadium	1.16E+01	4.78E+01	2.88E+01	10/10	1.00E-01	1.00E-01	2/10	3.70E+01	0/10	4.47E+03	10/10	3.32E+00
Zinc	9.10E+00	4.88E+01	2.47E+01	10/10	9.00E-02	1.00E-01	0/10	6.00E+01	0/10	1.00E+05	0/10	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	7.60E+00	3.89E+02	7.68E+01	11/13	1.24E+01	1.41E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	1.00E-01	1.00E-01	3/5			n/a	n/a	0/5	5.16E+02	0/5	5.16E+00
Beta activity	4.20E+00	7.56E+02	1.07E+02	13/13	1.78E+01	1.96E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.00E-01	1.00E-01	1.00E-01	3/5			0/5	2.80E-01	0/5	8.58E+00	3/5	8.58E-02
Neptunium-237	1.00E-01	2.00E-01	1.67E-01	3/7			n/a	n/a	0/7	2.71E+01	0/7	2.71E-01
Plutonium-239	1.00E-01	1.00E-01	1.00E-01	4/7			n/a	n/a	0/7	1.15E+03	0/7	1.15E+01
Technetium-99	5.00E-01	8.20E+00	4.75E+00	4/7			2/7	2.80E+00	0/7	3.62E+04	0/7	3.62E+02
Thorium-230	1.10E-01	3.40E+00	1.20E+00	7/7			1/7	1.40E+00	0/7	1.49E+03	0/7	1.49E+01
Uranium	1.10E+00	1.34E+02	2.79E+01	5/5			n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	8.80E-02	4.17E+01	6.73E+00	7/7			1/7	2.40E+00	0/7	1.98E+03	1/7	1.98E+01
Uranium-235	3.70E-03	2.20E+00	4.92E-01	5/7			1/7	1.40E-01	0/7	3.95E+01	1/7	3.95E-01
Uranium-238	7.70E-02	4.28E+01	6.91E+00	7/7			2/7	1.20E+00	0/7	1.71E+02	2/7	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	8.80E-02	8.80E-02	8.80E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
Benzo(a)pyrene	7.20E-02	7.20E-02	7.20E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+01	1/12	2.12E-02
Benzo(b)fluoranthene	8.50E-02	8.50E-02	8.50E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
Benzo(ghi)perylene	5.40E-02	5.40E-02	5.40E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	8.40E-02	8.40E-02	8.40E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+03	0/12	2.12E+00
Bis(2-ethylhexyl)phthalate	5.00E-02	1.00E-01	7.33E-02	3/12	3.60E-01	8.10E-01	n/a	n/a	0/12	7.40E+03	0/12	8.84E+00
Butyl benzyl phthalate	1.30E-01	1.30E-01	1.30E-01	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	1.00E+05	0/12	2.71E+03
Chrysene	9.60E-02	9.60E-02	9.60E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+04	0/12	2.12E+01
Di-n-butyl phthalate	1.20E-01	3.60E+00	1.86E+00	2/12	3.60E-01	8.10E-01	n/a	n/a	0/12	1.00E+05	0/12	2.13E+03
Fluoranthene	4.00E-02	2.40E-01	1.40E-01	2/12	3.60E-01	8.10E-01	n/a	n/a	0/12	6.50E+04	0/12	2.21E+02
Indeno(1,2,3-cd)pyrene	5.10E-02	5.10E-02	5.10E-02	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
Phenanthrene	1.70E-01	1.70E-01	1.70E-01	1/12	3.60E-01	8.10E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	1.30E-01	1.30E-01	1.30E-01	1/12	3.60E-01	8.10E-01	n/a	n/a	0/12	4.87E+04	0/12	1.65E+02
Volatiles (mg/kg)												
1,1-Dichloroethane	6.00E-03	6.00E-03	6.00E-03	1/10	5.00E-03	6.00E-03	n/a	n/a	0/10	5.52E+03	0/10	1.55E+02
1,2-Dichloroethene	1.00E-03	1.00E-03	1.00E-03	1/5	5.00E-03	6.00E-03	n/a	n/a	0/5	2.66E+04	0/5	6.60E+01
2-Propanol	2.20E-01	2.20E-01	2.20E-01	1/5	6.00E-02	6.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	1.30E-02	1.60E-01	9.10E-02	3/10	1.10E-02	1.00E-01	n/a	n/a	0/10	1.91E+04	0/10	3.58E+02
cis-1,2-Dichloroethene	2.90E-03	8.20E-02	4.25E-02	2/10	6.00E-03	9.00E-01	n/a	n/a	0/10	4.63E+02	0/10	1.34E+01
Methylene chloride	1.40E-03	1.20E-01	3.87E-02	8/10	5.00E-03	6.00E-03	n/a	n/a	0/10	2.16E+03	0/10	1.34E+01
Tetrachloroethene	2.00E-03	2.00E-03	2.00E-03	1/10	5.00E-03	6.00E-03	n/a	n/a	0/10	1.46E+03	0/10	3.90E+00
Toluene	1.50E-03	5.60E-03	3.03E-03	3/10	5.00E-03	6.00E-03	n/a	n/a	0/10	7.28E+03	0/10	2.11E+02
trans-1,2-Dichloroethene	2.30E+00	2.50E+00	2.40E+00	2/10	6.00E-03	9.00E-01	n/a	n/a	0/10	7.43E+02	0/10	2.20E+01
Trichloroethene	9.00E-03	1.70E+00	6.29E-01	5/15	1.00E-03	9.00E-01	n/a	n/a	0/15	2.98E+02	0/15	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

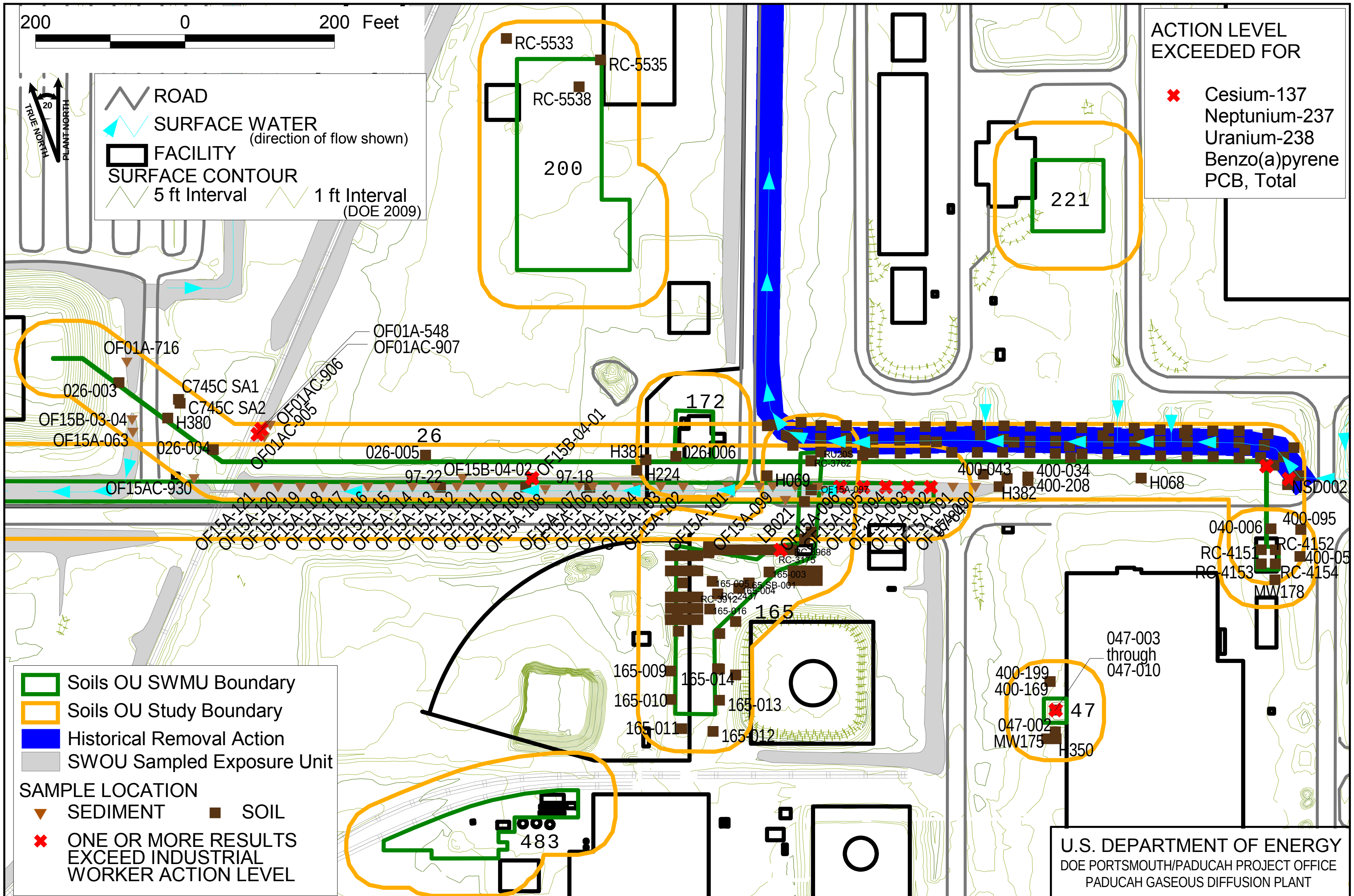

Figure 5.10. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 200 (Soil Contamination South of TSCA Waste Storage Facility)

Area description

The Soil Contamination South of Toxic Substances Control Act (TSCA) Waste Storage Facility (SWMU 200) is located in the central portion of the plant site. This area is approximately 282 ft wide by 304 ft long.

Process history

Past practices utilized the SWMU 200 area for placement of dredged material from the NSDD.

Previous investigation results

Site characterization sampling was performed prior to construction of a TSCA Waste Storage Facility. The surface sampling showed elevated levels of PCBs and radiological contaminants to be present.

Table 5.10 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.11).

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU. A portion of the raw water line passes under the southeast corner of the facility.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.10. Summary of Surface and Subsurface Historical Data at SWMU 200

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-01	2.60E+00	1.45E+00	2/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	2/3	1.99E-01
Radionuclides (pCi/g)												
Neptunium-237	2.52E+01	2.52E+01	2.52E+01	1/3	n/a	n/a	1/3	1.00E-01	0/3	2.71E+01	1/3	2.71E-01
Plutonium-239	1.08E+01	1.08E+01	1.08E+01	1/3	n/a	n/a	1/3	2.50E-02	0/3	1.15E+03	0/3	1.15E+01
Technetium-99	4.20E+01	4.20E+01	4.20E+01	1/3	n/a	n/a	1/3	2.50E+00	0/3	3.62E+04	0/3	3.62E+02
Thorium-230	5.10E+01	5.10E+01	5.10E+01	1/3	n/a	n/a	1/3	1.50E+00	0/3	1.49E+03	1/3	1.49E+01
Uranium	6.90E+00	1.00E+02	4.70E+01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

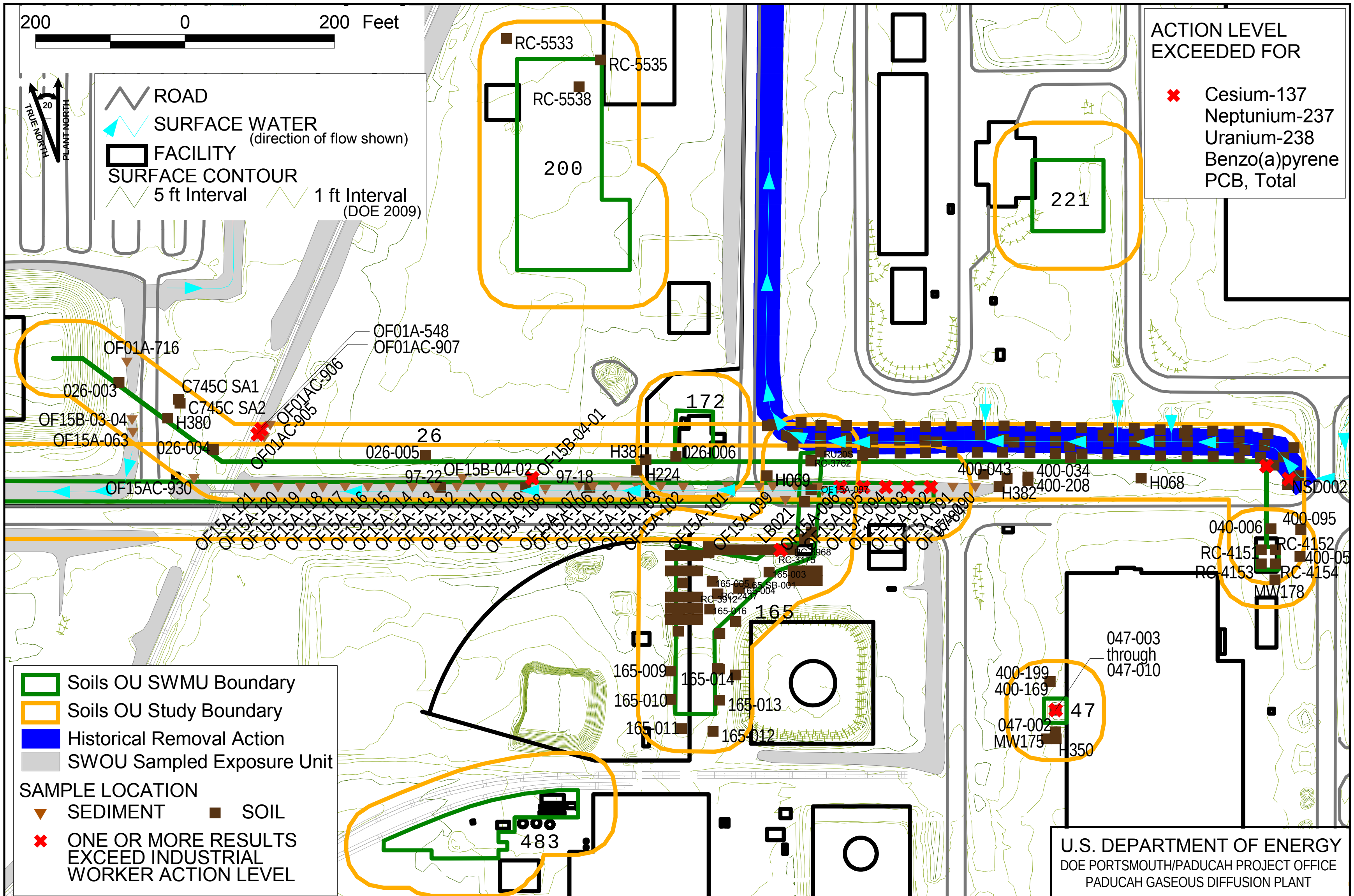

Figure 5.11. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 212 (C-745-A Radiological Contamination Area)

Area description

The C-745-A Radiological Contamination Area (SWMU 212) is located in the west central portion of the plant site. The area is approximately 2,500 ft^2.

Process history

While the exact history is unknown, supposition is that the area may have been used as an unloading site near railroad tracks, and a release of radiological contaminants may have occurred.

Previous investigation results

Subsurface soil samples were obtained in support of the C-745-A Cylinder Storage Yard construction project. Results of the sampling effort indicated the following were detected contaminants: technetium-99, thorium-230, plutonium-239/240, americium-241, cesium-137, neptunium-237, uranium-234, uranium-235 and uranium-238.

Table 5.11 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.12).

Area utilities

No recirculating water lines or sewers are associated with this contamination area; however several storm sewers are located within the boundary of the SWMU. These storm sewers are approximately 1 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.11. Summary of Surface and Subsurface Historical Data at SWMU 212

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	9.89E+03	9.89E+03	9.89E+03	1/1	1.31E+00	1.31E+00	0/1	1.30E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	5.60E+00	5.60E+00	5.60E+00	1/1	8.27E-02	8.27E-02	0/1	1.20E+01	0/1	3.15E+02	1/1	5.23E-01
Barium	1.05E+02	1.05E+02	1.05E+02	1/1	2.42E-02	2.42E-02	0/1	2.00E+02	0/1	1.00E+05	0/1	2.29E+02
Beryllium	4.98E-01	4.98E-01	4.98E-01	1/1	1.88E-02	1.88E-02	0/1	6.70E-01	0/1	1.28E+03	0/1	9.48E-01
Calcium	1.69E+03	1.69E+03	1.69E+03	1/1	5.10E-01	5.10E-01	0/1	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.41E+01	1.41E+01	1.41E+01	1/1	1.33E-01	1.33E-01	0/1	1.60E+01	n/a	n/a	0/1	3.56E+02
Cobalt	4.51E+00	4.51E+00	4.51E+00	1/1	8.47E-02	8.47E-02	0/1	1.40E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	1.27E+01	1.27E+01	1.27E+01	1/1	1.07E-01	1.07E-01	0/1	1.90E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	1.67E+04	1.67E+04	1.67E+04	1/1	6.68E-01	6.68E-01	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	7.73E+00	7.73E+00	7.73E+00	1/1	2.40E-01	2.40E-01	0/1	3.60E+01	0/1	1.25E+03	0/1	5.00E+01
Magnesium	1.69E+03	1.69E+03	1.69E+03	1/1	3.75E+00	3.75E+00	0/1	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.75E+02	1.75E+02	1.75E+02	1/1	3.00E-02	3.00E-02	0/1	1.50E+03	0/1	4.64E+04	1/1	4.52E+01
Mercury	2.99E-02	2.99E-02	2.99E-02	1/1	7.80E-03	7.80E-03	0/1	2.00E-01	0/1	8.25E+02	0/1	9.82E-01
Nickel	1.19E+01	1.19E+01	1.19E+01	1/1	1.28E-01	1.28E-01	0/1	2.10E+01	0/1	9.30E+04	0/1	2.42E+02
Potassium	6.75E+02	6.75E+02	6.75E+02	1/1	2.05E+00	2.05E+00	0/1	1.30E+03	n/a	n/a	n/a	n/a
Sodium	5.36E+01	5.36E+01	5.36E+01	1/1	2.73E+00	2.73E+00	0/1	3.20E+02	n/a	n/a	n/a	n/a
Vanadium	2.45E+01	2.45E+01	2.45E+01	1/1	1.45E-01	1.45E-01	0/1	3.80E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	6.70E+01	6.70E+01	6.70E+01	1/1	8.06E-02	8.06E-02	1/1	6.50E+01	0/1	1.00E+05	0/1	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	8.30E+00	8.05E+02	2.40E+02	4/4	9.42E+00	9.42E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	7.83E+00	7.83E+00	7.83E+00	1/1	n/a	n/a	n/a	n/a	0/1	5.16E+02	1/1	5.16E+00
Beta activity	9.00E+00	3.01E+02	9.68E+01	4/4	1.79E+01	1.79E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.30E-01	8.85E+00	2.60E+00	7/7	3.90E-01	2.20E+00	6/7	4.90E-01	1/7	8.58E+00	7/7	8.58E-02
Neptunium-237	1.22E+01	1.22E+01	1.22E+01	1/1	n/a	n/a	1/1	1.00E-01	0/1	2.71E+01	1/1	2.71E-01
Plutonium-239/240	2.68E+01	2.68E+01	2.68E+01	1/1	n/a	n/a	n/a	n/a	0/1	1.15E+03	1/1	1.15E+01
Technetium-99	2.43E+01	2.43E+01	2.43E+01	1/1	n/a	n/a	1/1	2.50E+00	0/1	3.62E+04	0/1	3.62E+02
Thorium-230	1.88E+02	1.88E+02	1.88E+02	1/1	n/a	n/a	1/1	1.50E+00	0/1	1.49E+03	1/1	1.49E+01
Uranium	8.10E+00	9.80E+00	8.95E+00	2/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.50E+00	3.50E+00	3.50E+00	1/1	n/a	n/a	1/1	2.50E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	1.83E-01	1.83E-01	1.83E-01	1/1	n/a	n/a	1/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	6.00E-01	1.50E+01	8.64E+00	7/7	3.35E+00	1.18E+01	6/7	1.20E+00	0/7	1.71E+02	6/7	1.71E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.63E+03	9.47E+03	7.77E+03	4/4	1.31E+00	1.31E+00	0/4	1.20E+04	0/4	1.00E+05	4/4	4.64E+03
Antimony	5.52E-01	1.40E+00	1.02E+00	3/4	5.22E-01	5.22E-01	3/4	2.10E-01	0/4	4.63E+02	3/4	3.79E-01
Arsenic	1.62E+00	3.93E+00	2.64E+00	4/4	8.27E-02	8.27E-02	0/4	7.90E+00	0/4	3.15E+02	4/4	5.23E-01
Barium	2.77E+01	1.52E+02	7.16E+01	4/4	2.42E-02	2.42E-02	0/4	1.70E+02	0/4	1.00E+05	0/4	2.29E+02
Beryllium	4.54E-01	6.99E-01	5.73E-01	4/4	1.88E-02	1.88E-02	1/4	6.90E-01	0/4	1.28E+03	0/4	9.48E-01
Cadmium	1.27E-01	2.87E-01	1.96E-01	3/4	4.89E-02	4.89E-02	1/4	2.10E-01	0/4	7.05E+01	0/4	2.13E+01
Calcium	6.04E+02	1.64E+03	1.07E+03	4/4	5.10E-01	5.10E-01	0/4	6.10E+03	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.11. Summary of Surface and Subsurface Historical Data at SWMU 212 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Chromium	1.34E+01	5.62E+01	2.61E+01	4/4	1.33E-01	1.33E-01	2/4	4.30E+01	n/a	n/a	0/4	3.56E+02
Cobalt	3.76E+00	9.87E+00	6.02E+00	4/4	8.47E-02	8.47E-02	0/4	1.30E+01	0/4	1.00E+05	0/4	1.92E+03
Copper	6.13E+00	1.35E+01	8.24E+00	4/4	1.07E-01	1.07E-01	0/4	2.50E+01	0/4	1.00E+05	0/4	4.93E+02
Iron	1.04E+04	2.35E+04	1.57E+04	4/4	6.68E-01	6.68E-01	0/4	2.80E+04	0/4	1.00E+05	4/4	2.07E+03
Lead	6.25E+00	1.02E+01	8.00E+00	4/4	2.40E-01	2.40E-01	0/4	2.30E+01	0/4	1.25E+03	0/4	5.00E+01
Magnesium	3.51E+02	2.16E+03	1.07E+03	4/4	3.75E+00	3.75E+00	1/4	2.10E+03	n/a	n/a	n/a	n/a
Manganese	9.12E+01	5.25E+02	2.75E+02	4/4	3.00E-02	3.00E-02	0/4	8.20E+02	0/4	4.64E+04	4/4	4.52E+01
Mercury	9.80E-03	2.46E-02	1.96E-02	3/4	7.80E-03	7.80E-03	0/4	1.30E-01	0/4	8.25E+02	0/4	9.82E-01
Nickel	3.07E+00	2.68E+01	1.05E+01	4/4	1.28E-01	1.28E-01	1/4	2.20E+01	0/4	9.30E+04	0/4	2.42E+02
Potassium	1.71E+02	5.01E+02	2.81E+02	4/4	2.05E+00	2.05E+00	0/4	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.01E-01	1.01E-01	1.01E-01	1/4	8.91E-02	8.91E-02	0/4	7.00E-01	0/4	2.56E+04	0/4	9.49E+01
Sodium	8.21E+01	4.31E+02	2.59E+02	4/4	2.73E+00	2.73E+00	2/4	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	2.15E+01	5.33E+01	3.60E+01	4/4	1.45E-01	1.45E-01	2/4	3.70E+01	0/4	4.47E+03	4/4	3.32E+00
Zinc	1.92E+01	3.80E+01	2.47E+01	4/4	8.06E-02	1.44E-01	0/4	6.00E+01	0/4	1.00E+05	0/4	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	4.97E+00	1.32E+01	7.83E+00	5/6	8.56E+00	1.06E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.63E+00	3.03E+01	1.73E+01	6/6	1.80E+01	1.87E+01	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	4.50E+00	4.50E+00	4.50E+00	1/2	n/a	n/a	1/2	2.80E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-230	3.00E-01	3.00E-01	3.00E-01	1/2	n/a	n/a	0/2	1.40E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium	1.60E+00	1.60E+00	1.60E+00	1/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	6.00E-01	6.00E-01	6.00E-01	1/2	n/a	n/a	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	3.24E-02	3.24E-02	3.24E-02	1/2	n/a	n/a	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	1.00E+00	1.00E+00	1.00E+00	1/2	n/a	n/a	0/2	1.20E+00	0/2	1.71E+02	0/2	1.71E+00
Volatiles (mg/kg)												
Trichloroethene	9.00E-03	9.00E-03	9.00E-03	1/7	5.00E-01	1.10E+00	n/a	n/a	0/7	2.98E+02	0/7	2.51E+00
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	3.95E+02	9.28E+02	7.59E+02	4/4	1.00E+00	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

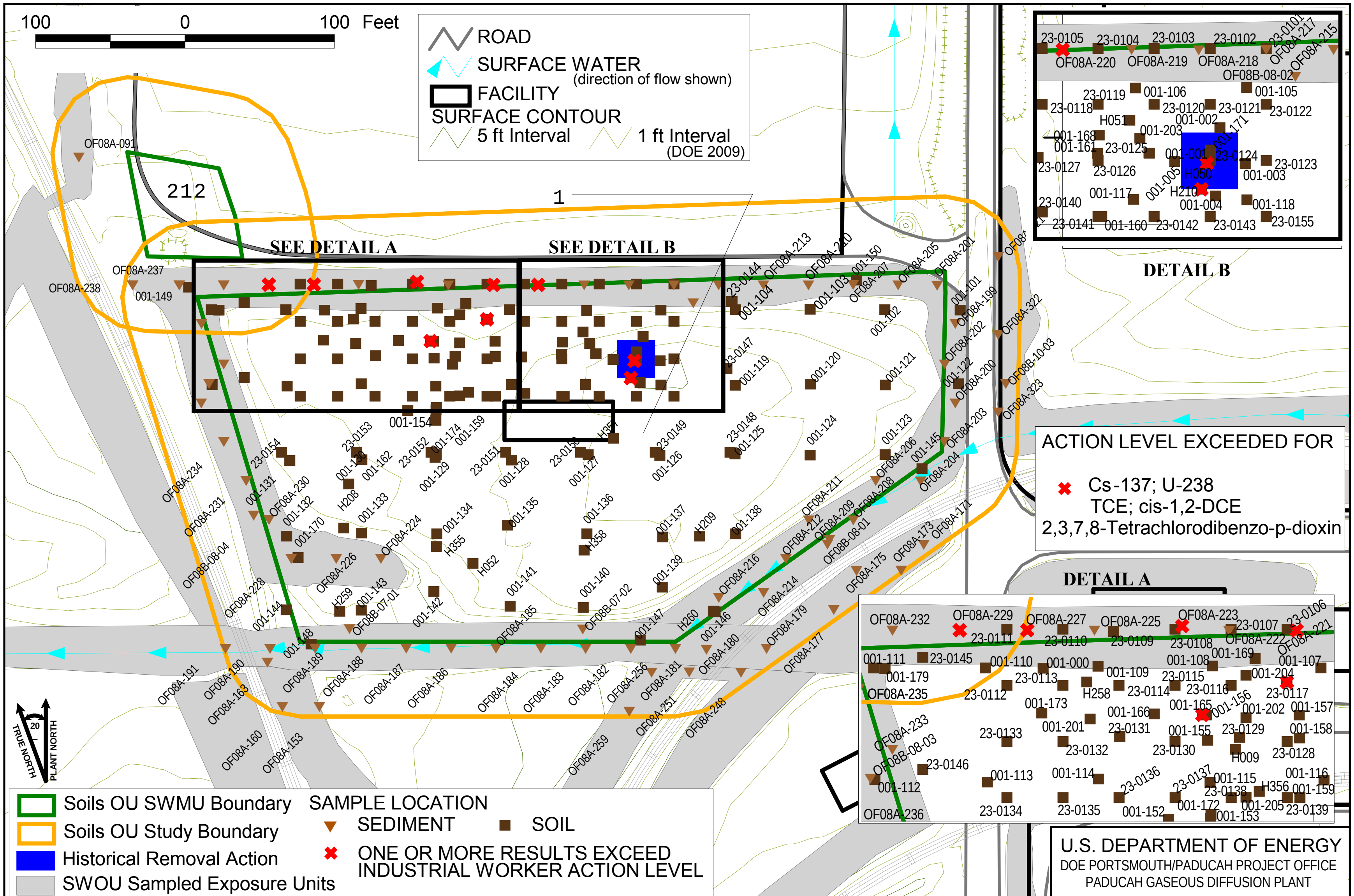

Figure 5.12. Soils Operable Unit: SWMUs 1 and 212

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 213 (DMSA OS-02)

Area description

DMSA OS-02 (SWMU 213) is located north of C-745-A in the west central portion of the plant site. SWMU 213 is approximately 7,000 ft^2.

Process history

SWMU 213 was used to store excess or unused material. Storage at this location included a spill storage tank; an old “drop test” cylinder with over pack, metal parts from forklifts, cranes, cylinder slings and carts; and wood to make cylinder saddles.

The spill tank has three closed valves located near the bottom. The tank was used extensively during a 1979 No. 2 fuel oil spill to “decant” the water from the fuel oil/water mixture and possibly utilized to contain other spills.

Previous investigation results

This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2002a). The SWMU currently is empty.

The Final Inventory and Characterization Report (FI/CR) was submitted September 16, 2002, to the Kentucky Division of Waste Management and approved on July 21, 2005. RCRA closure was not required for this SWMU because no hazardous wastes were stored in this unit.

Table 5.12 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.13).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional sampling is required.

Table 5.12. Summary of Surface and Subsurface Historical Data at SWMU 213

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	2.81E+03	4.00E+03	3.41E+03	2/2	1.87E+01	1.88E+01	0/2	1.30E+04	0/2	1.00E+05	0/2	4.64E+03
Barium	5.76E+01	6.17E+01	5.97E+01	2/2	2.34E+00	2.35E+00	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Calcium	1.35E+03	2.53E+04	1.33E+04	2/2	9.37E+01	9.38E+01	1/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	4.10E+00	9.84E+00	6.97E+00	2/2	2.34E+00	2.35E+00	0/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	4.54E+00	4.77E+00	4.66E+00	2/2	2.34E+00	2.35E+00	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	5.77E+00	7.10E+00	6.44E+00	2/2	2.34E+00	2.35E+00	0/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	5.43E+03	1.32E+04	9.32E+03	2/2	1.87E+01	1.88E+01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Magnesium	3.17E+02	2.38E+03	1.35E+03	2/2	4.69E+00	4.69E+00	1/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.98E+02	5.41E+02	4.70E+02	2/2	2.34E+00	2.35E+00	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Molybdenum	8.48E+00	8.48E+00	8.48E+00	1/2	4.69E+00	4.69E+00	n/a	n/a	0/2	2.50E+04	0/2	8.30E+01
Nickel	7.75E+00	7.75E+00	7.75E+00	1/2	4.69E+00	4.69E+00	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Potassium	1.49E+02	1.93E+02	1.71E+02	2/2	9.37E+01	9.38E+01	0/2	1.30E+03	n/a	n/a	n/a	n/a
Sodium	1.34E+02	1.34E+02	1.34E+02	1/2	9.37E+01	9.38E+01	0/2	3.20E+02	n/a	n/a	n/a	n/a
Uranium	2.01E+00	5.57E+01	1.66E+01	4/4	1.30E-01	4.69E+00	2/4	4.90E+00	0/4	3.34E+03	1/4	2.02E+01
Vanadium	1.02E+01	2.36E+01	1.69E+01	2/2	2.34E+00	2.35E+00	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	5.74E+01	5.74E+01	5.74E+01	1/2	1.87E+01	1.88E+01	0/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.90E-01	1.90E-01	1.90E-01	2/23	1.20E-01	1.30E-01	n/a	n/a	0/23	4.25E+01	0/23	1.99E-01
PCB-1254	1.00E-01	1.90E-01	1.45E-01	2/23	8.00E-02	9.00E-02	n/a	n/a	0/23	1.82E+01	0/23	1.99E-01
PCB-1260	1.90E-01	1.90E-01	1.90E-01	1/23	9.00E-02	1.00E-01	n/a	n/a	0/23	4.25E+01	0/23	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	6.76E+00	1.59E+01	1.13E+01	2/2	1.18E+00	2.58E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	5.70E+00	8.73E+00	7.22E+00	2/2	1.04E+00	1.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-4.10E-01	5.80E-01	8.89E-02	22/22	6.00E-02	9.60E-01	6/22	4.90E-01	0/22	8.58E+00	12/22	8.58E-02
Plutonium-239/240	3.50E-02	3.50E-02	3.50E-02	1/2	2.00E-02	2.00E-02	n/a	n/a	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	3.31E+00	3.31E+00	3.31E+00	1/2	2.78E+00	2.78E+00	1/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-228	2.20E-01	3.81E-01	3.01E-01	2/2	1.50E-01	1.60E-01	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	5.59E-01	1.43E+00	9.95E-01	2/2	1.90E-01	1.90E-01	1/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Thorium-232	2.43E-01	3.79E-01	3.11E-01	2/2	3.00E-02	3.00E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium-234	5.70E-01	6.06E-01	5.88E-01	2/2	8.00E-02	8.00E-02	0/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	3.35E-02	3.62E-02	3.49E-02	2/2	1.00E-02	1.00E-02	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	-2.22E+00	1.22E+01	3.39E+00	22/22	4.00E-02	4.22E+00	15/22	1.20E+00	0/22	1.71E+02	14/22	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

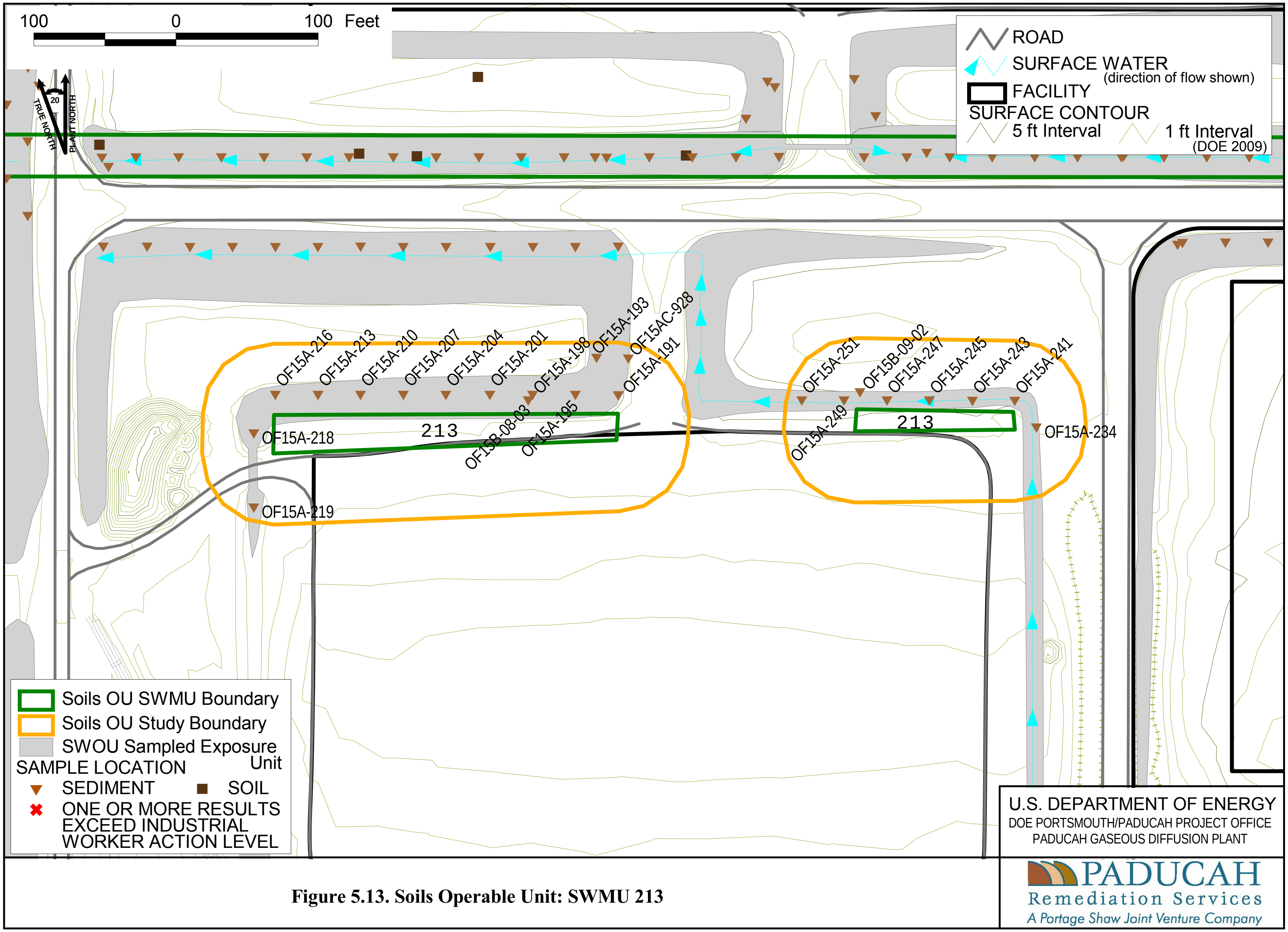

Figure 5.13. Soils Operable Unit: SWMU 213

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 214 (DMSA OS-03)

Area description

DMSA OS-03 (SWMU 214) is located at C-611 west of the plant site. SWMU 214 is 384 ft^2 (16 ft x 24 ft).

Process history

This DMSA was created by PGDP Utilities Operations for storage of DOE materials upon transition from DOE to United States Enrichment Corporation (USEC) operations. Prior to 1994, the area was a partially gravel and grass covered area. The material stored is covered by a 16 ft x 24 ft aluminum carport type shed without walls. Materials stored within the SWMU are as follows:

- 55-gal drums of absorbent pads and other solid waste generated by PGDP Utilities Operations at C-611 and from a clean-up at KPDES Outfall 008;
- 55-gal drums of ferric sulfate marked for reuse;
- Fiberglass panels removed from either the C-611-C Flocculator or the C-611-U Chemical Storage Area in 1993;
- A small quantity of scrap metal banding material;
- One out-of-use fuel oil tank that was removed from the basement of C-611 that fed the back-up diesel generators (empty);
- One pole type electrical disconnect;
- Scrap pieces of lumber;
- Several wooden pallets;
- Several 55-gal drums marked empty; and
- Two empty plastic oil containment dikes

All RCRA-regulated items and other waste have been dispositioned properly (DOE 2002b).

Previous investigation results

There have been no known spills or releases of materials from this facility to the environment. A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending. The Closure report documented that no sign of spill or release was found. There have been no known spills or releases of materials from this SWMU to the environment.

A map of the area is represented in Figure 5.14.

Area utilities

No current recirculating water lines or sewers are associated with this DMSA, none are within the boundary of the SWMU.

Data gap determination

Since no historical soil samples are available, sampling is required.

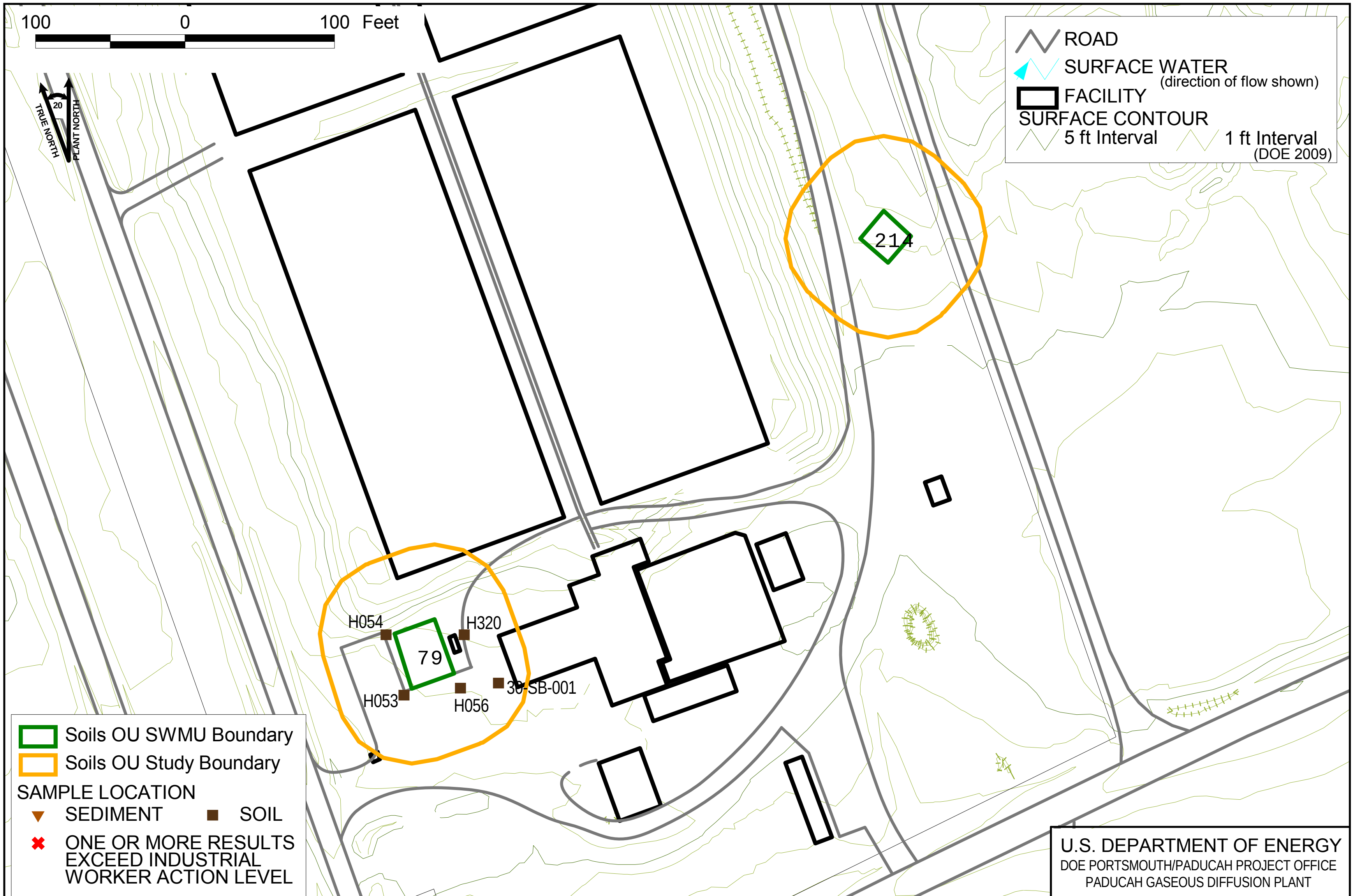

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Figure 5.14. Soils Operable Unit: SWMUs 79 and 214

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 215 (DMSA OS-04)

Area description

DMSA OS-04 (SWMU 215) included a rail tank car located west of the C-743 Trailer Complex in the west central portion of the plant site. The roped area defining SWMU 215 is approximately 480 ft^2 (40 ft x 12 ft). The SWMU is currently empty and the waste was properly dispositioned.

Process history

The history of this railcar could not be definitively ascertained. It was likely brought on-site to deliver an acid compound. Subsequent uses may have included water storage for fire fighting, spill control (storage), and/or fire training. In August of 2005, as part of the DMSA characterization and remediation project, the railcar was removed.

Previous investigation results

The railcar, valve, and ground beneath the rail car were surveyed for radiological contamination in April 1999. Results indicated contamination on randomly selected rock from beneath the valve. In addition, results from sampling the liner of the railcar in February 2006 indicated uranium contamination. This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2002c). As part of the DMSA characterization, soil samples were collected, based on the radiological survey in April and December 2002. Eight samples were collected from six sampling locations. Two of the locations were identified as hot spots on a Health Physics (HP) survey. Radiological results concluded the highest Alpha reading was 5,376 disintegrations per minute (dpm)/100cm^2 and the highest Beta/Gamma reading was 506,500 dpm/cm^2. Two samples at two separate depths were collected at these two hot spots. The other four locations were chosen to verify the HP survey results. The table below, excerpted from the FI/CR, lists the sample numbers, grid location, and soil depth for samples collected and Figure 5.15 shows a grid of these sample locations [no global positioning system (GPS) coordinates are available].

Project ID	Grid location	Soil Depth (ft)
OS04Z01CSSOIL0001	5'0" X 4'6"	2
OS04Z01CSSOIL0002	5'0" X 9'0"	2
OS04Z01CSSOIL0003*	12'0" X 8'0"	3
OS04Z01CSSOIL0004*	12'0" X 8'0"	2
OS04Z01CSSOIL0005*	12'0" X 9'6"	3
OS04Z01CSSOIL0006*	12'0" X 9'6"	2
OS04Z01CSSOIL0007	15'0" X 4'6"	2
OS04Z01CSSOIL0008	15'0" X 9'6"	2
* Hot spots from survey		

Table 5.13 is a summary of historical data from the FI/CR (DOE 2002c).

There are no TSCA concerns for these samples. All bulk metals results were below the RCRA twenty times rule. The highest U-235 assay using the inductively coupled plama/ matrix spike (ICP/MS) method was 0.882 wt. % for sample OS04Z01CSSOIL003. The FI/CR concluded that all soil/gravel would not be characteristic hazardous waste and recommended that the soil and gravel, if removed and containerized, should be considered low-level waste (LLW).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

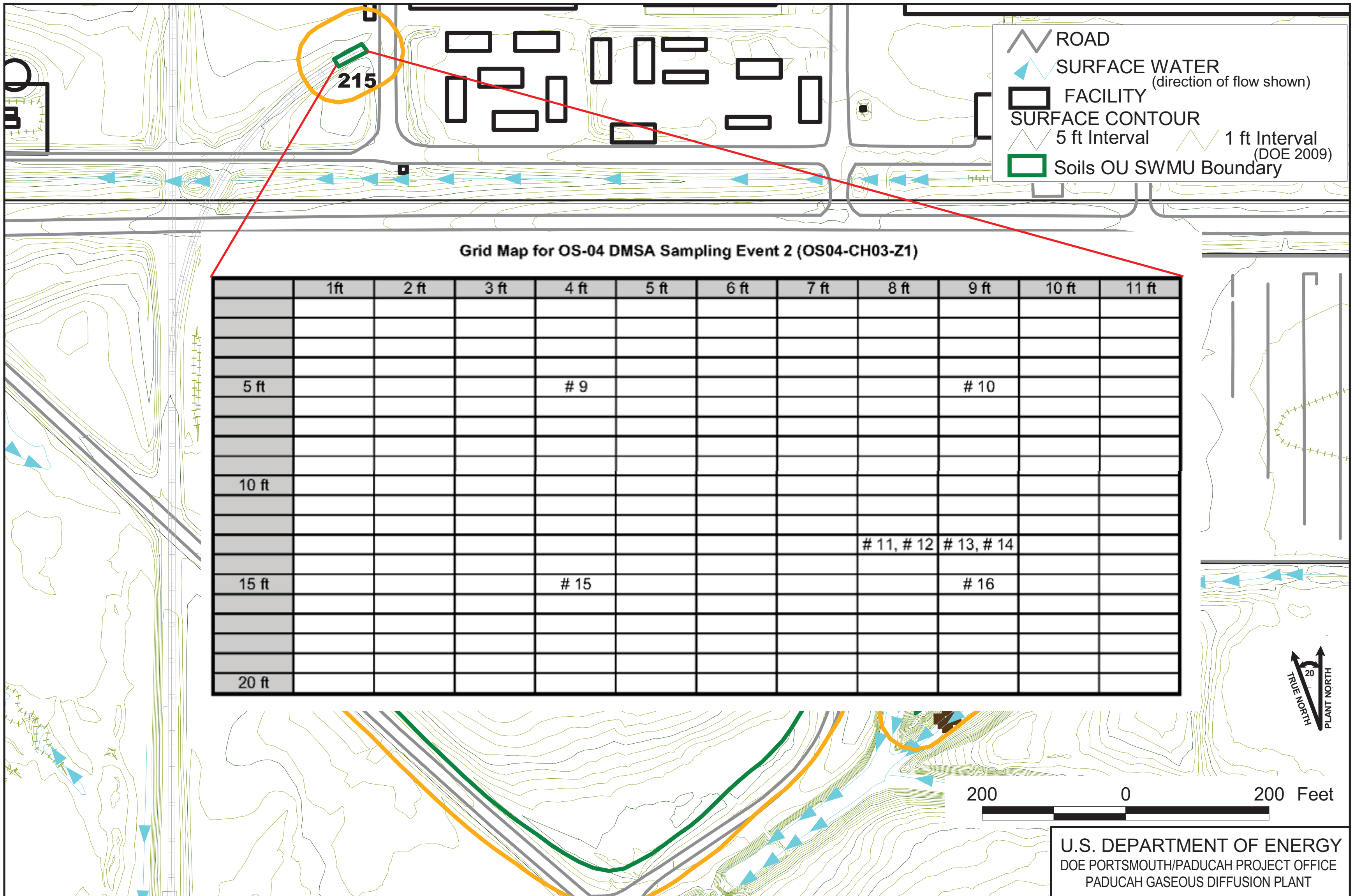
Data gap determination

Historical data do not fully delineate nature and extent of contamination; therefore, additional sampling is required.

Table 5.13. Summary of Surface and Subsurface Historical Data at SWMU 215

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Surface Soils												
Metals (mg/kg)												
Barium	4.25E+01	8.16E+01	6.30E+01	10/10	2.50E+00	2.50E+00	0/10	2.00E+02	0/10	1.00E+05	0/10	2.29E+02
Chromium	1.00E+01	7.69E+01	1.89E+01	10/10	2.50E+00	2.50E+00	1/10	1.60E+01	n/a	n/a	0/10	3.56E+02
Uranium	5.76E+03	6.05E+03	5.91E+03	2/2	4.39E+00	4.89E+00	2/2	4.90E+00	2/2	3.34E+03	2/2	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB-1260	5.60E-01	1.08E+00	8.20E-01	2/2	4.80E-01	4.90E-01	n/a	n/a	0/2	4.25E+01	2/2	1.99E-01
Polychlorinated biphenyl	1.08E+00	1.08E+00	1.08E+00	1/2	6.20E-01	6.40E-01	n/a	n/a	0/2	4.25E+01	1/2	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.14E+00	2.64E+01	1.28E+01	10/10	1.93E+00	1.93E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.36E+00	1.28E+01	6.53E+00	9/10	2.05E+00	2.05E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.01E-02	2.01E-02	2.01E-02	1/12	1.48E-02	3.18E+00	0/12	4.90E-01	0/12	8.58E+00	0/12	8.58E-02
Mass of U-235	5.00E+01	7.72E+01	6.25E+01	4/4	3.80E-02	2.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	1.26E+00	1.26E+00	1.26E+00	1/12	2.53E-02	6.55E-01	1/12	1.00E-01	0/12	2.71E+01	1/12	2.71E-01
Plutonium-239/240	1.06E+00	1.06E+00	1.06E+00	1/12	5.63E-02	2.14E-01	n/a	n/a	0/12	1.15E+03	0/12	1.15E+01
Technetium-99	9.31E+02	1.21E+03	1.07E+03	2/12	3.57E+00	1.26E+01	2/12	2.50E+00	0/12	3.62E+04	2/12	3.62E+02
Thorium-228	1.66E-01	3.30E-01	2.65E-01	10/12	8.67E-02	8.66E-01	0/12	1.60E+00	0/12	2.80E+00	10/12	2.80E-02
Thorium-230	2.26E-01	7.29E+00	1.42E+00	12/12	1.19E-01	8.02E-01	2/12	1.50E+00	0/12	1.49E+03	0/12	1.49E+01
Thorium-232	1.63E-01	3.34E-01	2.66E-01	10/12	4.31E-02	4.15E-01	0/12	1.50E+00	0/12	1.35E+03	0/12	1.35E+01
Thorium-234	1.94E+03	2.97E+03	2.46E+03	2/2	2.74E+01	3.14E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	8.23E+00	4.38E+03	1.73E+03	5/12	2.85E-01	2.11E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.53E+00	2.28E+03	9.06E+02	5/12	1.07E-01	9.15E-01	5/12	2.50E+00	2/12	1.98E+03	2/12	1.98E+01
Uranium-235	2.64E-02	1.67E+02	2.67E+01	12/12	1.86E-02	5.83E-01	7/12	1.40E-01	2/12	3.95E+01	3/12	3.95E-01
Uranium-238	6.07E-01	1.93E+03	3.17E+02	12/12	1.54E-01	7.35E-01	9/12	1.20E+00	2/12	1.71E+02	8/12	1.71E+00
Subsurface Soils												
Semivolatiles (mg/kg)												
Benzo(b)fluoranthene	4.60E-01	4.60E-01	4.60E-01	1/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+02	1/10	2.12E-01
Di-n-butyl phthalate	5.20E-01	9.90E-01	7.38E-01	5/10	4.60E-01	5.00E-01	n/a	n/a	0/10	1.00E+05	0/10	2.13E+03
Fluoranthene	6.00E-01	6.00E-01	6.00E-01	1/10	4.60E-01	5.00E-01	n/a	n/a	0/10	6.50E+04	0/10	2.21E+02
Pyrene	5.80E-01	5.80E-01	5.80E-01	1/10	4.60E-01	5.00E-01	n/a	n/a	0/10	4.87E+04	0/10	1.65E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



Grid Map for OS-04 DMSA Sampling Event 2 (OS04-CH03-Z1)

	1ft	2 ft	3 ft	4 ft	5 ft	6 ft	7 ft	8 ft	9 ft	10 ft	11 ft
5 ft				# 9					# 10		
10 ft											
								# 11, # 12	# 13, # 14		
15 ft				# 15					# 16		
20 ft											

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Figure 5.15. Soils Operable Unit: SWMU 215

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 216 (DMSA OS-05)

Area description

DMSA OS-05 (SWMU 216) is located north of C-206 in the west central portion of the plant site. SWMU 216 is approximately 7,000 ft^2.

Process history

This area was controlled by Fire Services and used to store excess material and supplies, primarily fire extinguishers. The initiation of this area as a storage area for fire extinguishers is unknown; however, in 1997 or 1998, the majority of the fire extinguishers were placed in a covered metal bin located next to the roped portion of the DMSA.

Additional material stored within SWMU 216 include a motor, pallets, three 5-gal containers, three 55-gal drums (one labeled "metal-C-310"), wheels, and miscellaneous scrap metal and equipment. All RCRA-regulated items and other waste have been dispositioned properly (DOE 2002d).

Previous investigation results

No evidence of a release was found and process knowledge indicates none has occurred. Vegetation in the area is flourishing. A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending. The closure report documented that no sign of spill or release was found. There have been no known spills or releases of materials from this SWMU to the environment.

Table 5.14 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.16).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional sampling is required.

Table 5.14. Summary of Surface and Subsurface Historical Data at SWMU 216

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	8.09E+03	8.09E+03	8.09E+03	1/1	1.98E+01	1.98E+01	0/1	1.30E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	5.57E+00	5.57E+00	5.57E+00	1/1	4.95E+00	4.95E+00	0/1	1.20E+01	0/1	3.15E+02	1/1	5.23E-01
Barium	8.35E+01	8.35E+01	8.35E+01	1/1	2.48E+00	2.48E+00	0/1	2.00E+02	0/1	1.00E+05	0/1	2.29E+02
Calcium	1.82E+03	1.82E+03	1.82E+03	1/1	9.90E+01	9.90E+01	0/1	2.00E+05	n/a	n/a	n/a	n/a
Chromium	2.96E+01	2.96E+01	2.96E+01	1/1	2.48E+00	2.48E+00	1/1	1.60E+01	n/a	n/a	0/1	3.56E+02
Cobalt	4.87E+00	4.87E+00	4.87E+00	1/1	2.48E+00	2.48E+00	0/1	1.40E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	8.32E+00	8.32E+00	8.32E+00	1/1	2.48E+00	2.48E+00	0/1	1.90E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	1.23E+04	1.23E+04	1.23E+04	1/1	1.98E+01	1.98E+01	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Magnesium	1.25E+03	1.25E+03	1.25E+03	1/1	4.95E+00	4.95E+00	0/1	7.70E+03	n/a	n/a	n/a	n/a
Manganese	5.47E+02	5.47E+02	5.47E+02	1/1	2.48E+00	2.48E+00	0/1	1.50E+03	0/1	4.64E+04	1/1	4.52E+01
Nickel	6.31E+00	6.31E+00	6.31E+00	1/1	4.95E+00	4.95E+00	0/1	2.10E+01	0/1	9.30E+04	0/1	2.42E+02
Potassium	5.68E+02	5.68E+02	5.68E+02	1/1	9.90E+01	9.90E+01	0/1	1.30E+03	n/a	n/a	n/a	n/a
Sodium	1.24E+02	1.24E+02	1.24E+02	1/1	9.90E+01	9.90E+01	0/1	3.20E+02	n/a	n/a	n/a	n/a
Uranium	1.89E+00	2.58E+00	2.24E+00	2/2	4.60E-01	9.90E-01	0/2	4.90E+00	0/2	3.34E+03	0/2	2.02E+01
Vanadium	2.21E+01	2.21E+01	2.21E+01	1/1	2.48E+00	2.48E+00	0/1	3.80E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	3.50E+01	3.50E+01	3.50E+01	1/1	1.98E+01	1.98E+01	0/1	6.50E+01	0/1	1.00E+05	0/1	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	3.18E+00	3.18E+00	3.18E+00	1/1	8.60E-01	8.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	5.39E+00	5.39E+00	5.39E+00	1/1	9.90E-01	9.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-2.30E-01	7.90E-01	3.60E-01	13/13	8.00E-02	1.27E+00	7/13	4.90E-01	0/13	8.58E+00	12/13	8.58E-02
Technetium-99	3.43E+00	3.43E+00	3.43E+00	1/1	2.98E+00	2.98E+00	1/1	2.50E+00	0/1	3.62E+04	0/1	3.62E+02
Thorium-228	3.71E-01	3.71E-01	3.71E-01	1/1	4.00E-02	4.00E-02	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	5.20E-01	5.20E-01	5.20E-01	1/1	1.80E-01	1.80E-01	0/1	1.50E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	3.51E-01	3.51E-01	3.51E-01	1/1	3.00E-02	3.00E-02	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium-234	5.42E-01	5.42E-01	5.42E-01	1/1	1.30E-01	1.30E-01	0/1	2.50E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	3.56E-02	3.56E-02	3.56E-02	1/1	2.00E-02	2.00E-02	0/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	-3.60E+00	8.54E+00	8.72E-01	13/13	1.50E-01	1.03E+01	5/13	1.20E+00	0/13	1.71E+02	5/13	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

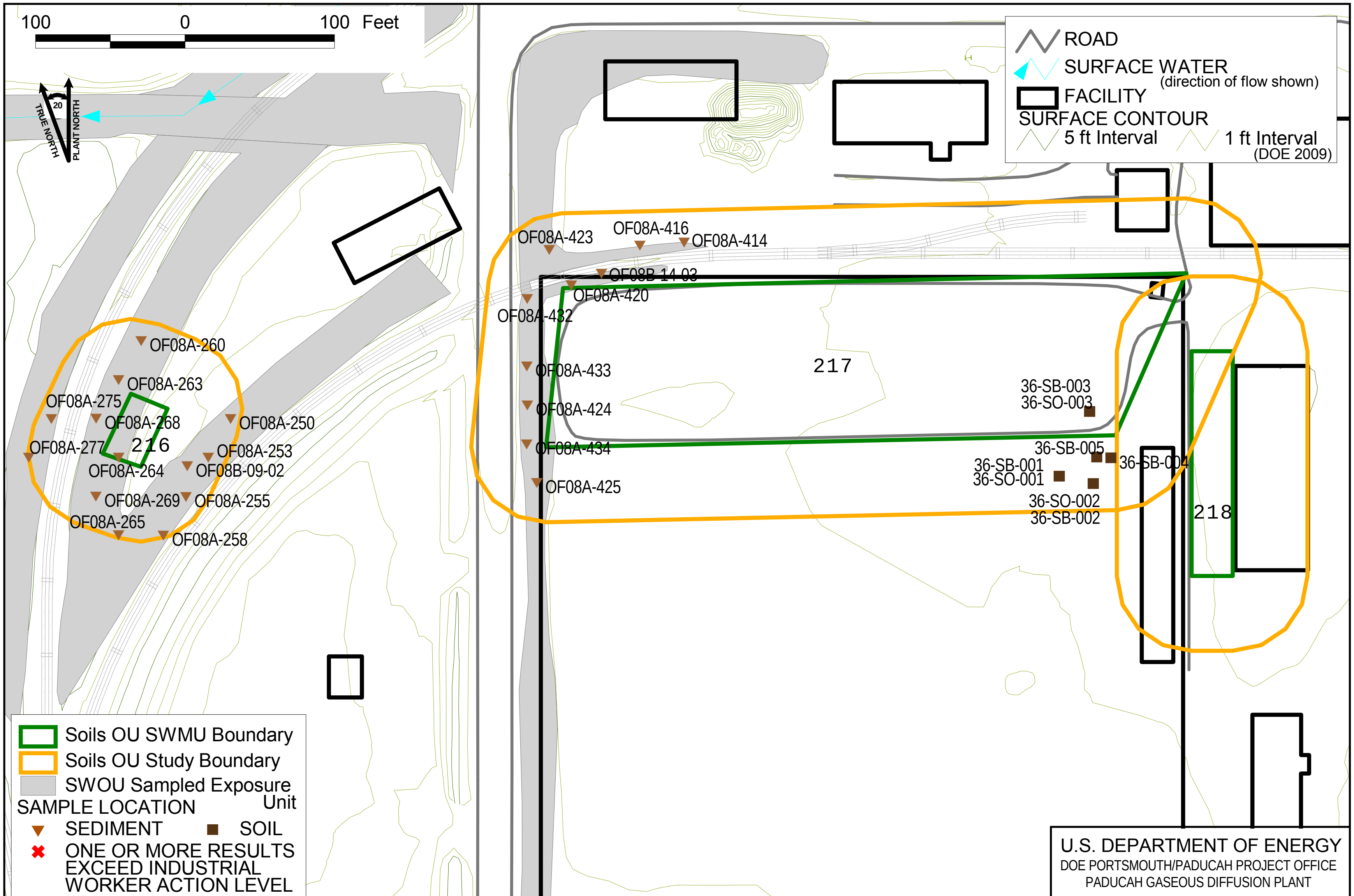

Figure 5.16. Soils Operable Unit: SWMUs 216, 217, and 218

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 217 (DMSA OS-06)

Area description

DMSA OS-06 (SWMU 217) is located at C-740 in the west central portion of the plant site. SWMU 217 is approximately 57,600 ft^2.

Process history

Beginning in the late 1970s, this area originally was used as an excess material and/or staging area for C-720. Over time, DMSA OS-06 became a storage area for excess materials from various areas within the plant. In 2001, DOE began characterization and remediation of the materials in the DMSA. Material stored within the SWMU includes rechargeable batteries, nickel arc-welding rods, wood pallets, hoses, empty buckets and containers, scrap metal, water heaters, a wash basin, commodes, grass seeder, ingots, motors, gear boxes, piping, paint color mix machine, jib crane boom, scaffolding, a sand blasting tank, and sump pumps. All RCRA-regulated items and other waste have been dispositioned properly (DOE 2004a). DMSA OS-06 currently is used as a hot shop and loading area. It is set up for size reducing large equipment and loading and staging shipping containers.

Previous investigation results

There are no known releases associated with this SWMU. A certified RCRA Closure Report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending. The Closure Report documented that no sign of spill or release was found. There have been no known spills or releases of materials from this SWMU to the environment.

The area is a Radiological Material Area and has a posted Contamination Area inside.

Table 5.15 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.17).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; however, storm sewers are present within the boundary of the SWMU. These storm sewers are approximately 4-8 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional sampling is required.

Table 5.15. Summary of Surface and Subsurface Historical Data at SWMU 217

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Anions (mg/kg)												
Sulfate	9.72E+02	9.72E+02	9.72E+02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	2.58E+03	7.24E+03	4.56E+03	4/4	1.91E+01	1.91E+01	0/4	1.30E+04	0/4	1.00E+05	1/4	4.64E+03
Antimony	1.70E+00	1.70E+00	1.70E+00	1/4	9.53E+00	9.53E+00	1/4	2.10E-01	0/4	4.63E+02	1/4	3.79E-01
Arsenic	2.70E+00	6.10E+00	4.49E+00	4/4	4.77E+00	4.77E+00	0/4	1.20E+01	0/4	3.15E+02	4/4	5.23E-01
Barium	2.71E+01	7.24E+01	4.62E+01	4/4	2.38E+00	2.38E+00	0/4	2.00E+02	0/4	1.00E+05	0/4	2.29E+02
Beryllium	2.00E-01	4.30E-01	3.33E-01	3/4	4.70E-01	4.70E-01	0/4	6.70E-01	0/4	1.28E+03	0/4	9.48E-01
Cadmium	2.60E-01	2.49E+00	1.38E+00	2/4	1.91E+00	1.91E+00	2/4	2.10E-01	0/4	7.05E+01	0/4	2.13E+01
Calcium	7.59E+02	5.95E+04	2.19E+04	4/4	9.53E+02	9.53E+02	2/4	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.90E+00	2.90E+01	1.59E+01	4/4	2.38E+00	2.38E+00	1/4	1.60E+01	n/a	n/a	0/4	3.56E+02
Cobalt	6.04E+00	2.70E+01	1.35E+01	4/4	2.38E+00	2.38E+00	2/4	1.40E+01	0/4	1.00E+05	0/4	1.92E+03
Copper	1.90E+00	6.00E+00	4.24E+00	4/4	2.38E+00	2.38E+00	0/4	1.90E+01	0/4	1.00E+05	0/4	4.93E+02
Iron	9.03E+03	2.13E+04	1.72E+04	4/4	1.91E+01	1.91E+01	0/4	2.80E+04	0/4	1.00E+05	4/4	2.07E+03
Lead	3.60E+00	6.50E+00	5.50E+00	3/4	1.91E+01	1.91E+01	0/4	3.60E+01	0/4	1.25E+03	0/4	5.00E+01
Magnesium	1.72E+02	9.26E+03	2.58E+03	4/4	4.77E+01	4.77E+01	1/4	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.61E+02	8.56E+02	5.34E+02	4/4	2.38E+00	2.38E+00	1/4	1.50E+03	0/4	4.64E+04	4/4	4.52E+01
Molybdenum	2.45E+01	2.45E+01	2.45E+01	1/1	4.77E+00	4.77E+00	n/a	n/a	0/1	2.50E+04	0/1	8.30E+01
Nickel	2.40E+00	9.41E+00	6.70E+00	4/4	4.77E+00	4.77E+00	0/4	2.10E+01	0/4	9.30E+04	0/4	2.42E+02
Potassium	1.15E+02	2.78E+02	1.97E+02	4/4	9.53E+01	9.53E+01	0/4	1.30E+03	n/a	n/a	n/a	n/a
Sodium	3.69E+01	8.67E+01	6.13E+01	3/4	9.53E+01	9.53E+01	0/4	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.40E-01	1.40E-01	1.40E-01	1/4	1.91E+01	1.91E+01	0/4	2.10E-01	n/a	n/a	n/a	n/a
Uranium	2.17E+00	2.27E+00	2.22E+00	2/2	4.80E-01	9.50E-01	0/2	4.90E+00	0/2	3.34E+03	0/2	2.02E+01
Vanadium	8.90E+00	2.43E+01	1.63E+01	4/4	2.38E+00	2.38E+00	0/4	3.80E+01	0/4	4.47E+03	4/4	3.32E+00
Zinc	1.02E+01	8.73E+01	3.50E+01	4/4	1.91E+01	1.91E+01	1/4	6.50E+01	0/4	1.00E+05	0/4	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	4.44E+00	5.63E+00	4.94E+00	3/4	3.23E+00	3.23E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.54E+00	6.78E+00	5.91E+00	3/4	2.43E+00	2.43E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-7.00E-02	1.07E+00	2.44E-01	10/10	4.00E-02	8.40E-01	3/10	4.90E-01	0/10	8.58E+00	6/10	8.58E-02
Neptunium-237	3.93E-02	3.93E-02	3.93E-02	1/1	3.00E-02	3.00E-02	0/1	1.00E-01	0/1	2.71E+01	0/1	2.71E-01
Technetium-99	6.20E-01	9.70E-01	7.95E-01	2/4	3.15E+00	3.15E+00	0/4	2.50E+00	0/4	3.62E+04	0/4	3.62E+02
Thorium-228	1.41E-01	1.41E-01	1.41E-01	1/1	4.00E-02	4.00E-02	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	3.67E-01	3.67E-01	3.67E-01	1/1	1.90E-01	1.90E-01	0/1	1.50E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	1.66E-01	1.66E-01	1.66E-01	1/1	3.00E-02	3.00E-02	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium-234	4.80E-01	8.30E-01	6.08E-01	4/4	1.50E-01	1.50E-01	0/4	2.50E+00	0/4	1.98E+03	0/4	1.98E+01
Uranium-235	3.00E-02	4.00E-02	3.50E-02	2/4	4.00E-02	4.00E-02	0/4	1.40E-01	0/4	3.95E+01	0/4	3.95E-01
Uranium-238	-2.07E+00	1.02E+01	2.18E+00	13/13	1.50E-01	9.60E+00	6/13	1.20E+00	0/13	1.71E+02	5/13	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	3.80E-01	3.80E-01	3.80E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+02	1/4	2.12E-01
Benzo(a)pyrene	5.20E-01	5.20E-01	5.20E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+01	1/4	2.12E-02
Benzo(b)fluoranthene	6.40E-01	6.40E-01	6.40E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+02	1/4	2.12E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.15. Summary of Surface and Subsurface Historical Data at SWMU 217 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Benzo(ghi)perylene	2.70E-01	2.70E-01	2.70E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	2.30E-01	2.30E-01	2.30E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+03	0/4	2.12E+00
Chrysene	4.50E-01	4.50E-01	4.50E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+04	0/4	2.12E+01
Dibenz(a,h)anthracene	8.10E-02	8.10E-02	8.10E-02	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+01	1/4	2.12E-02
Di-n-butyl phthalate	2.20E-01	2.20E-01	2.20E-01	1/3			n/a	n/a	0/3	1.00E+05	0/3	2.13E+03
Fluoranthene	3.40E-01	3.40E-01	3.40E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	6.50E+04	0/4	2.21E+02
Indeno(1,2,3-cd)pyrene	3.10E-01	3.10E-01	3.10E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	2.08E+02	1/4	2.12E-01
Phenanthrene	7.90E-02	7.90E-02	7.90E-02	1/4	4.80E-01	4.80E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	2.80E-01	2.80E-01	2.80E-01	1/4	4.80E-01	4.80E-01	n/a	n/a	0/4	4.87E+04	0/4	1.65E+02
Volatiles (mg/kg)												
Benzene	2.00E-03	2.00E-03	2.00E-03	1/3	n/a	n/a	n/a	n/a	0/3	7.45E+01	0/3	1.13E+00
Trichloroethene	4.00E-03	4.00E-03	4.00E-03	1/4	5.00E-03	5.00E-03	n/a	n/a	0/4	2.98E+02	0/4	2.51E+00
Wetchem (mg/kg)												
Ammonia as Nitrogen	9.90E-01	9.90E-01	9.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cyanide	3.73E-01	4.53E-01	4.13E-01	2/3	n/a	n/a	n/a	n/a	0/3	2.02E+04	0/3	7.92E+01
Kjeldahl Nitrogen	3.20E+00	3.20E+00	3.20E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Organic Carbon (TOC)	5.55E+02	5.55E+02	5.55E+02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.78E+03	1.59E+04	8.87E+03	35/35	n/a	n/a	7/35	1.20E+04	0/35	1.00E+05	30/35	4.64E+03
Antimony	1.50E+00	3.10E+00	2.28E+00	8/35	n/a	n/a	8/35	2.10E-01	0/35	4.63E+02	8/35	3.79E-01
Arsenic	7.10E-01	5.40E+00	2.79E+00	17/35	n/a	n/a	0/35	7.90E+00	0/35	3.15E+02	17/35	5.23E-01
Barium	1.75E+01	1.53E+02	5.78E+01	35/35	n/a	n/a	0/35	1.70E+02	0/35	1.00E+05	0/35	2.29E+02
Beryllium	1.60E-01	8.80E-01	4.38E-01	32/35	n/a	n/a	2/35	6.90E-01	0/35	1.28E+03	0/35	9.48E-01
Cadmium	2.70E-01	4.30E-01	3.50E-01	2/35	n/a	n/a	2/35	2.10E-01	0/35	7.05E+01	0/35	2.13E+01
Calcium	4.84E+02	2.64E+03	1.05E+03	35/35	n/a	n/a	0/35	6.10E+03	n/a	n/a	n/a	n/a
Chromium	5.20E+00	2.18E+01	1.34E+01	35/35	n/a	n/a	12/35	4.30E+01	n/a	n/a	0/35	3.56E+02
Cobalt	1.70E+00	1.72E+01	4.52E+00	33/35	n/a	n/a	1/35	1.30E+01	0/35	1.00E+05	0/35	1.92E+03
Copper	2.20E+00	1.74E+01	5.06E+00	35/35	n/a	n/a	0/35	2.50E+01	0/35	1.00E+05	0/35	4.93E+02
Iron	2.54E+03	3.02E+04	1.29E+04	35/35	n/a	n/a	2/35	2.80E+04	0/35	1.00E+05	35/35	2.07E+03
Lead	4.30E+00	1.29E+01	7.81E+00	35/35	n/a	n/a	0/35	2.30E+01	0/35	1.25E+03	0/35	5.00E+01
Magnesium	3.32E+02	2.05E+03	9.53E+02	35/35	n/a	n/a	0/35	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.82E+01	6.40E+02	1.43E+02	34/35	n/a	n/a	0/35	8.20E+02	0/35	4.64E+04	26/35	4.52E+01
Mercury	3.90E-01	3.20E+00	1.33E+00	3/35	n/a	n/a	3/35	1.30E-01	0/35	8.25E+02	1/35	9.82E-01
Nickel	1.80E+00	2.01E+01	6.41E+00	35/35	n/a	n/a	0/35	2.20E+01	0/35	9.30E+04	0/35	2.42E+02
Potassium	9.35E+01	6.46E+02	3.42E+02	35/35	n/a	n/a	0/35	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.20E-01	1.10E+00	4.79E-01	14/35	n/a	n/a	4/35	7.00E-01	0/35	2.56E+04	0/35	9.49E+01
Sodium	5.32E+01	6.30E+02	1.81E+02	35/35	n/a	n/a	2/35	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	6.20E+00	4.60E+01	2.18E+01	34/35	n/a	n/a	2/35	3.70E+01	0/35	4.47E+03	34/35	3.32E+00
Zinc	4.90E+00	4.01E+01	1.57E+01	35/35	n/a	n/a	0/35	6.00E+01	0/35	1.00E+05	0/35	2.73E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.15. Summary of Surface and Subsurface Historical Data at SWMU 217 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Radionuclides (pCi/g)												
Alpha activity	3.32E+00	1.38E+01	8.43E+00	35/35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	5.32E+00	2.63E+01	1.16E+01	35/35	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	4.70E-01	8.80E-01	6.75E-01	6/35	n/a	n/a	0/35	2.80E+00	0/35	3.62E+04	0/35	3.62E+02
Uranium-234	3.80E-01	9.70E-01	6.72E-01	35/35	n/a	n/a	0/35	2.40E+00	0/35	1.98E+03	0/35	1.98E+01
Uranium-235	2.00E-02	1.90E-01	6.00E-02	19/35	n/a	n/a	1/35	1.40E-01	0/35	3.95E+01	0/35	3.95E-01
Uranium-238	3.90E-01	9.70E-01	7.09E-01	35/35	n/a	n/a	0/35	1.20E+00	0/35	1.71E+02	0/35	1.71E+00
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	1.00E-01	1.00E-01	1.00E-01	1/35	n/a	n/a	n/a	n/a	0/35	7.40E+03	0/35	8.84E+00
Di-n-butyl phthalate	2.60E-01	2.60E-01	2.60E-01	1/35	n/a	n/a	n/a	n/a	0/35	1.00E+05	0/35	2.13E+03
Volatiles (mg/kg)												
1,1,1-Trichloroethane	6.10E-01	6.10E-01	6.10E-01	1/35	n/a	n/a	n/a	n/a	0/35	9.38E+03	0/35	1.56E+02
1,1-Dichloroethene	1.50E-02	3.00E-02	2.25E-02	2/35	n/a	n/a	n/a	n/a	0/35	1.21E+01	0/35	9.59E-02
1,2-Dichloroethane	1.20E-02	1.20E-02	1.20E-02	1/35	n/a	n/a	n/a	n/a	0/35	6.39E+01	0/35	5.28E-01
Acetone	2.30E-02	8.20E-02	5.14E-02	5/35	n/a	n/a	n/a	n/a	0/35	1.91E+04	0/35	3.58E+02
Benzene	2.00E-03	1.00E-02	4.40E-03	5/35	n/a	n/a	n/a	n/a	0/35	7.45E+01	0/35	1.13E+00
Ethylbenzene	2.00E-03	2.00E-03	2.00E-03	1/35	n/a	n/a	n/a	n/a	0/35	2.12E+03	0/35	2.12E+01
Methylene chloride	1.20E-02	1.20E-02	1.20E-02	1/35	n/a	n/a	n/a	n/a	0/35	2.16E+03	0/35	1.34E+01
Toluene	7.00E-03	7.00E-03	7.00E-03	1/35	n/a	n/a	n/a	n/a	0/35	7.28E+03	0/35	2.11E+02
Total Xylene	1.70E-02	1.70E-02	1.70E-02	1/35	n/a	n/a	n/a	n/a	0/35	2.20E+04	0/35	7.24E+02
Trichloroethene	2.00E-03	1.40E-02	8.00E-03	2/35	n/a	n/a	n/a	n/a	0/35	2.98E+02	0/35	2.51E+00
Wetchem (mg/kg)												
Cyanide	2.83E-01	6.38E-01	4.55E-01	12/35	n/a	n/a	n/a	n/a	0/35	2.02E+04	0/35	7.92E+01
Kjeldahl Nitrogen	2.27E+01	2.27E+01	2.27E+01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

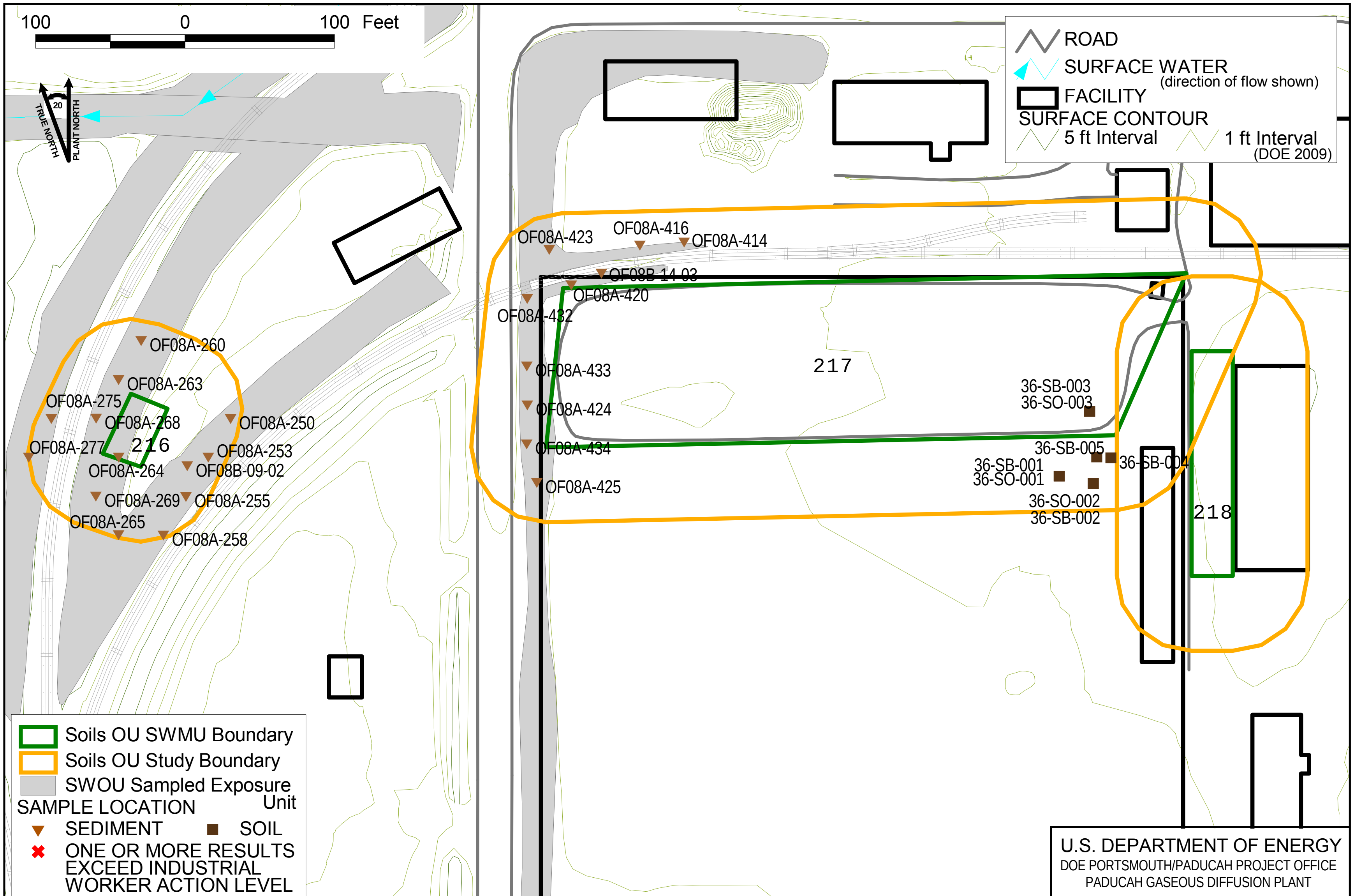

Figure 5.17. Soils Operable Unit: SWMUs 216, 217, and 218

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Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 218 (DMSA OS-07)

Area description

DMSA OS-07 (SWMU 218) is located west of the C-741 Equipment Storage Shed in the west central portion of the plant site. SWMU 218 is approximately 6,000 ft^2.

Process history

Beginning in 1993, the C-720 shops segregated material during the transition operations to be returned to DOE, (i.e., not leased by USEC). In 2001, DOE began characterization and remediation of the materials in the DMSAs. Material stored within the SWMU included fuses, fluorescent light bulbs, nickel cadmium batteries, sealed beam headlight, 55-gal drum of carburizing material, container of water mixed with oil and grease, circuit boards, light bulbs, vacuum tubes, wooden pallets, drums of miscellaneous materials (i.e., metal parts, steel, concrete, personal protective equipment (PPE), trash, asbestos containing materials, oily rags, paper, plastic, etc.), a dumpster, metal storage cabinets, motors, and miscellaneous equipment/parts. All RCRA-regulated items and other waste have been dispositioned properly (DOE 2004b).

This SWMU currently houses a break trailer for field crews and also is used to store equipment utilized by the DMSA field teams.

Previous investigation results

There is no evidence of any historical releases that may pose a threat to the environment. A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending. The Closure Report documented that no sign of spill or release was found. There have been no known spills or releases of materials from this SWMU to the environment.

The area is a Radiological Material Area and has a posted Contamination Area. Figure 5.18 is the area historical map.

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

Since no historical soil data are available, sampling is required.

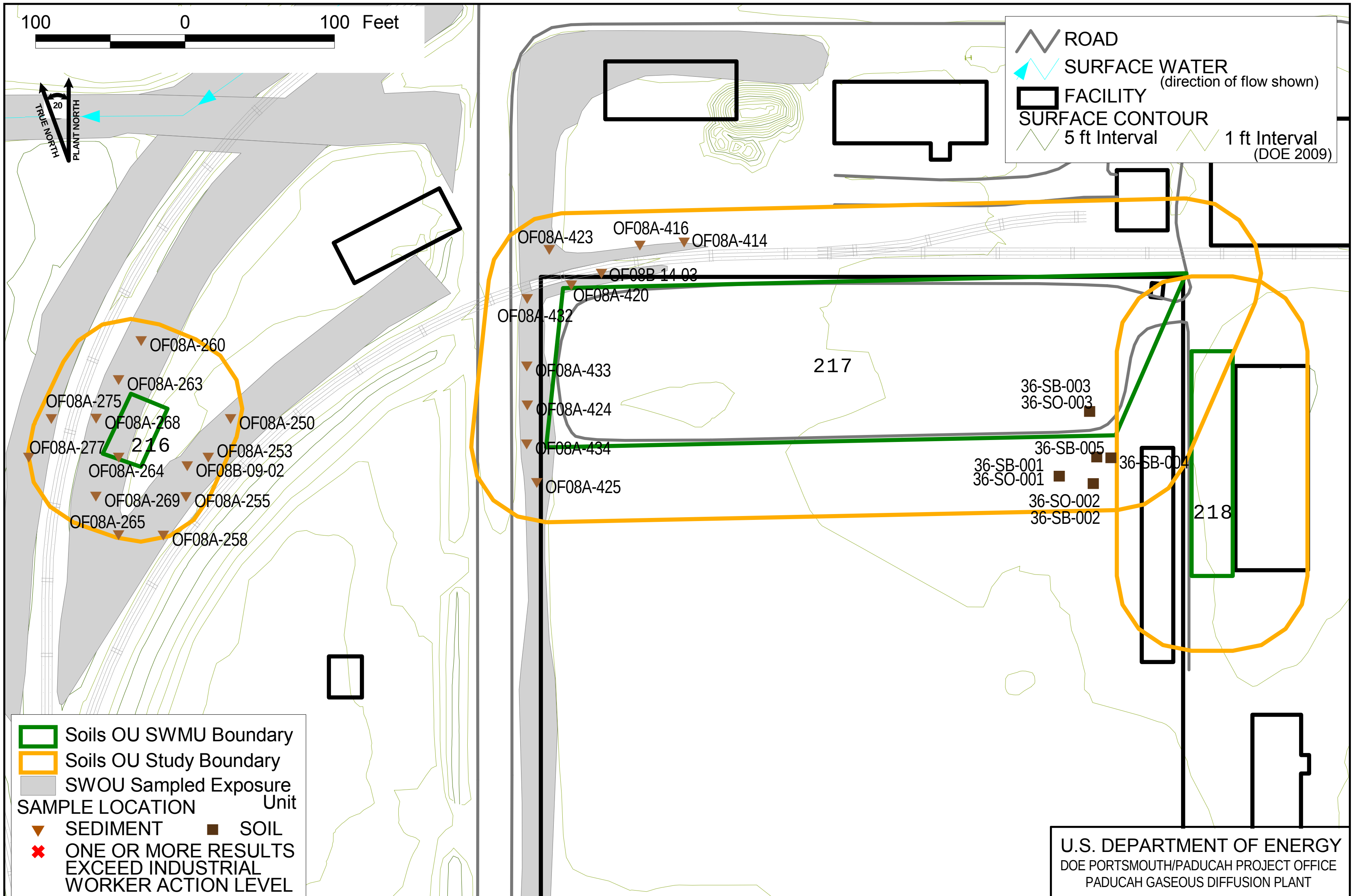

Figure 5.18. Soils Operable Unit: SWMUs 216, 217, and 218

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Figure No. \SoilsOU\SOU_SWMUsR5.apr
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SWMU 220 (DMSA OS-09)

Area description

DMSA OS-09 (SWMU 220) is located south of C-409 in the central portion of the plant site. SWMU 220 is approximately 10,500 ft^2.

Process history

Beginning in 1993, this area was used to store vehicles and equipment not being transitioned to USEC. Most of the vehicles themselves had been excess prior to then. In 2001, DOE began characterization and remediation of the materials in the DMSAs. Material previously contained within this SWMU include a fluorescent light starter, fuses, a battery post connector, sealed beam headlights, indicator lamps, collection drums of antifreeze, various light bulbs and vehicle bulbs, wheel weights, scrap Cushmans and golf carts, tires, metal, an industrial washing machine, wooden pallets, eight passenger vehicles, one tow motor, and fluids that had been drained from the vehicles. This DMSA is located outside and formerly contained vehicles that had been drained of fluids. All materials previously located in SWMU 220 have been properly disposed or currently are located in permitted storage (DOE 2002e). This SWMU is currently being utilized to store Sealands and other shipping containers that are pending disposition.

Previous investigation results

A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending. The Closure Report documented that no sign of spill or release was found. There have been no known spills or releases of materials from this SWMU to the environment.

Area has concrete surface and is posted as a Fixed Contamination Area. Figure 5.19 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; storm sewers are within the boundary of the SWMU.

Data gap determination

Since no historical soil data are available, sampling is required.

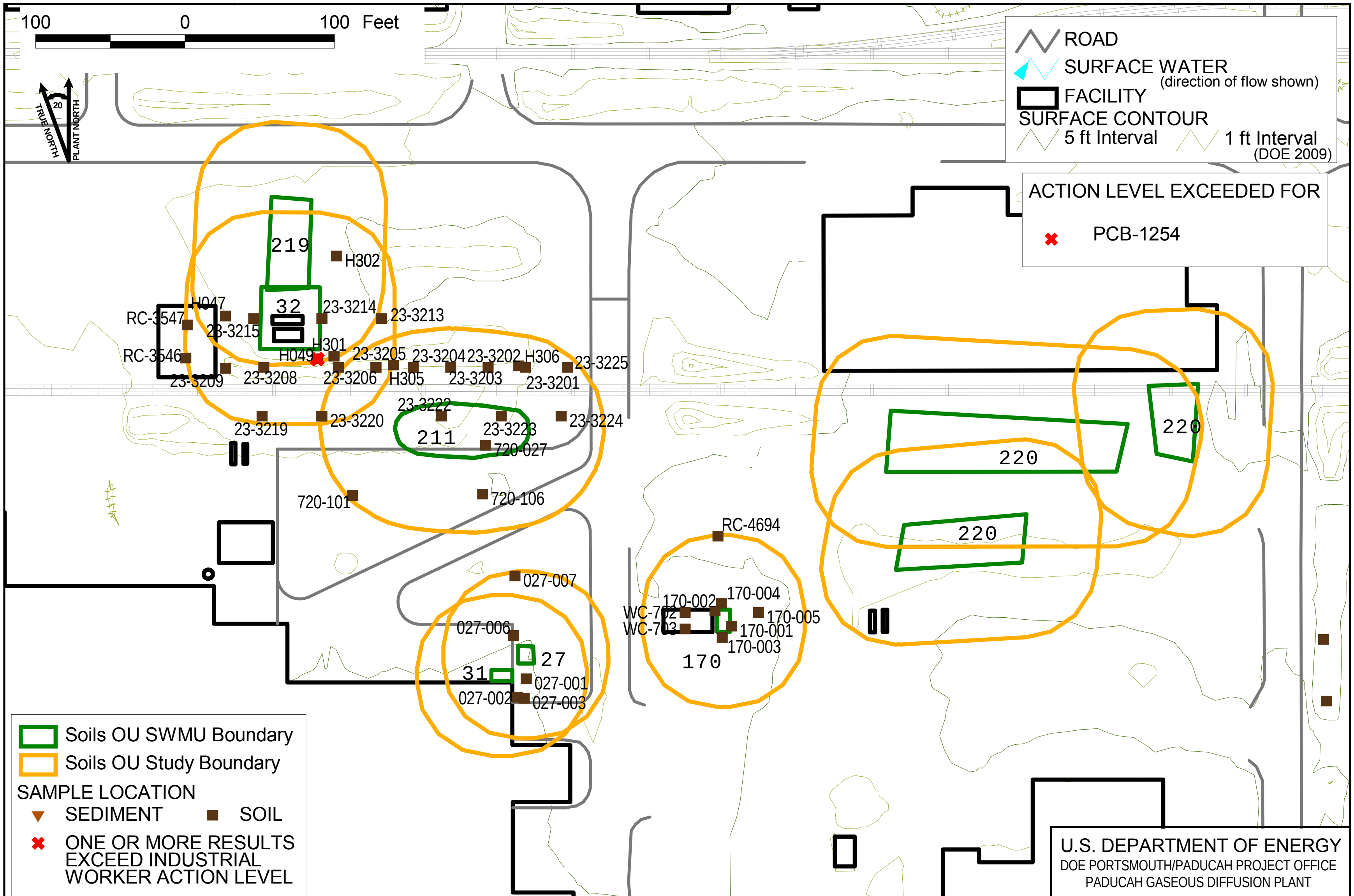

Figure 5.19. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

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SWMU 221 (DMSA OS-10)

Area description

DMSA OS-10 (SWMU 221) is a 750 ft^2 area located east of the C-635 Recirculating Cooling Water (RCW) Pump House in the central portion of the plant site.

Process history

This DMSA initially was classified as a Phase I DMSA (expected to have no fissionable material, but not fully characterized). The area contained approximately 414 ft^3 of scrap metal and an empty sulfuric acid tank. The items were properly characterized and dispositioned.

Previous investigation results

This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material. There have been no known spills or releases of materials from this SWMU to the environment. Radiological survey of the area did not find anything above background levels (DOE 2002f). The Closure Report documented that no sign of spill or release was found. The FI/CR was submitted September 18, 2002, to the Kentucky Division of Waste Management (KDWM). KDWM approved the FI/CR on April 15, 2004. RCRA closure was not required for this SWMU, because no hazardous wastes were stored in this unit. The area currently is empty.

Figure 5.20 shows the area historical map.

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; however, recirculating water lines and storm sewers are present within the boundary of the SWMU. These lines are approximately 4 ft bgs.

Data gap determination

Since no historical soil data are available, sampling is required.

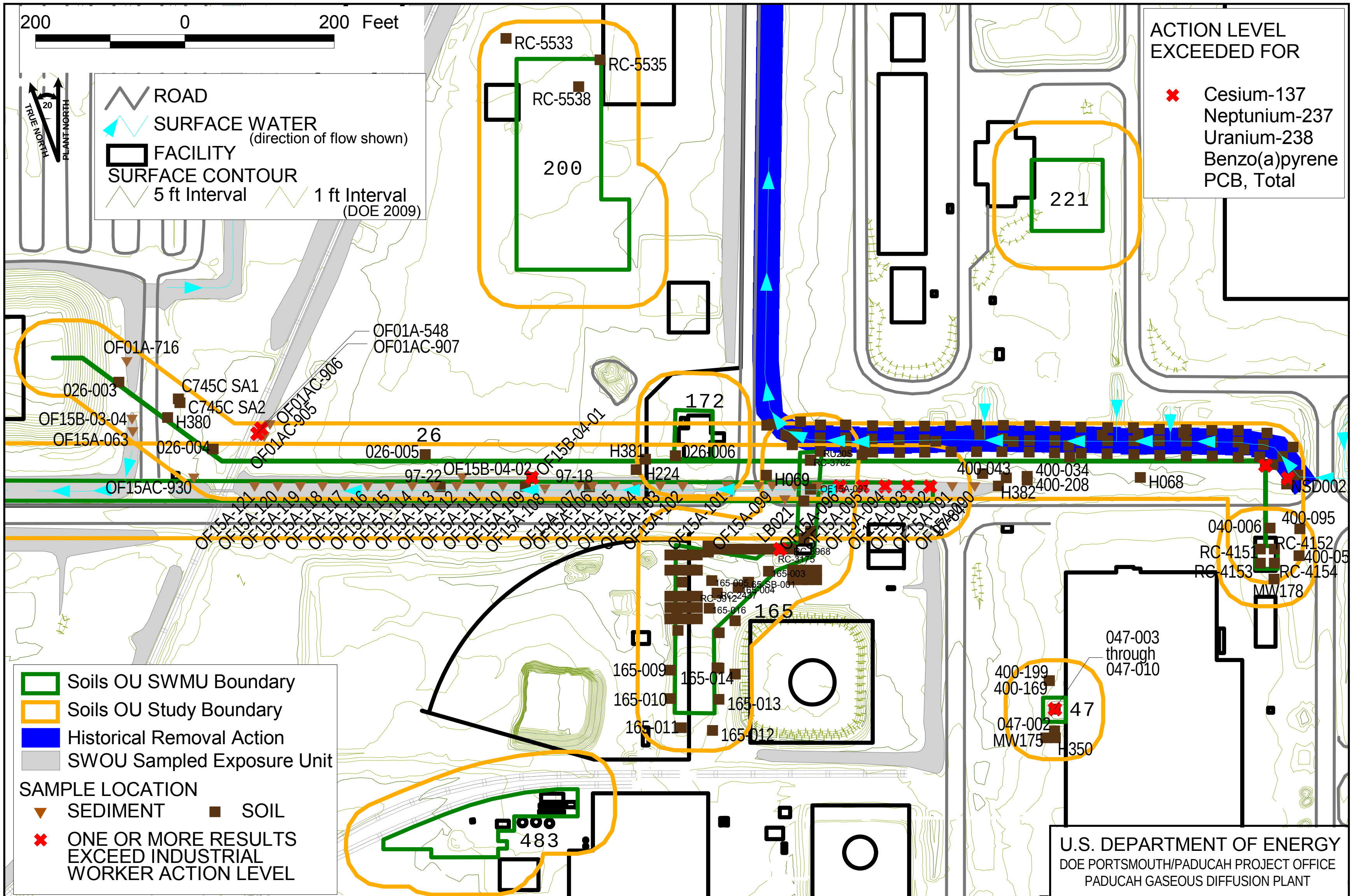

Figure 5.20. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
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SWMU 222 (DMSA OS-11)

Area description

DMSA OS-11 consists of both SWMU 76 and SWMU 222 at the south and north ends, respectively. SWMU 222 is located east of the C-410 facility and west of the C-651 Pump House and Cooling Tower near the central portion of the plant site. SWMU 222 is approximately 1,738 ft^2.

Process history

This area was probably created around 1993 during the USEC/DOE transition. Miscellaneous materials were placed in this area, the majority of which were radiologically surveyed and sent to the scrap yards around 1998. In 2001, DOE began characterization and remediation of the materials in the DMSAs. Material found within this area included a light bulb base, a collection container for antifreeze, ladders, wooden pallets, railroad ties/pieces, hoses, waste water, a gasoline engine, a generator, a motor, and gasoline and fluids drained from equipment.

All materials previously located in SWMU 222 either have been properly disposed of or currently are located in permitted storage (DOE 2002g).

Previous investigation results

A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending.

Figure 5.21 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

No historical soil data are available; therefore, sampling is required.

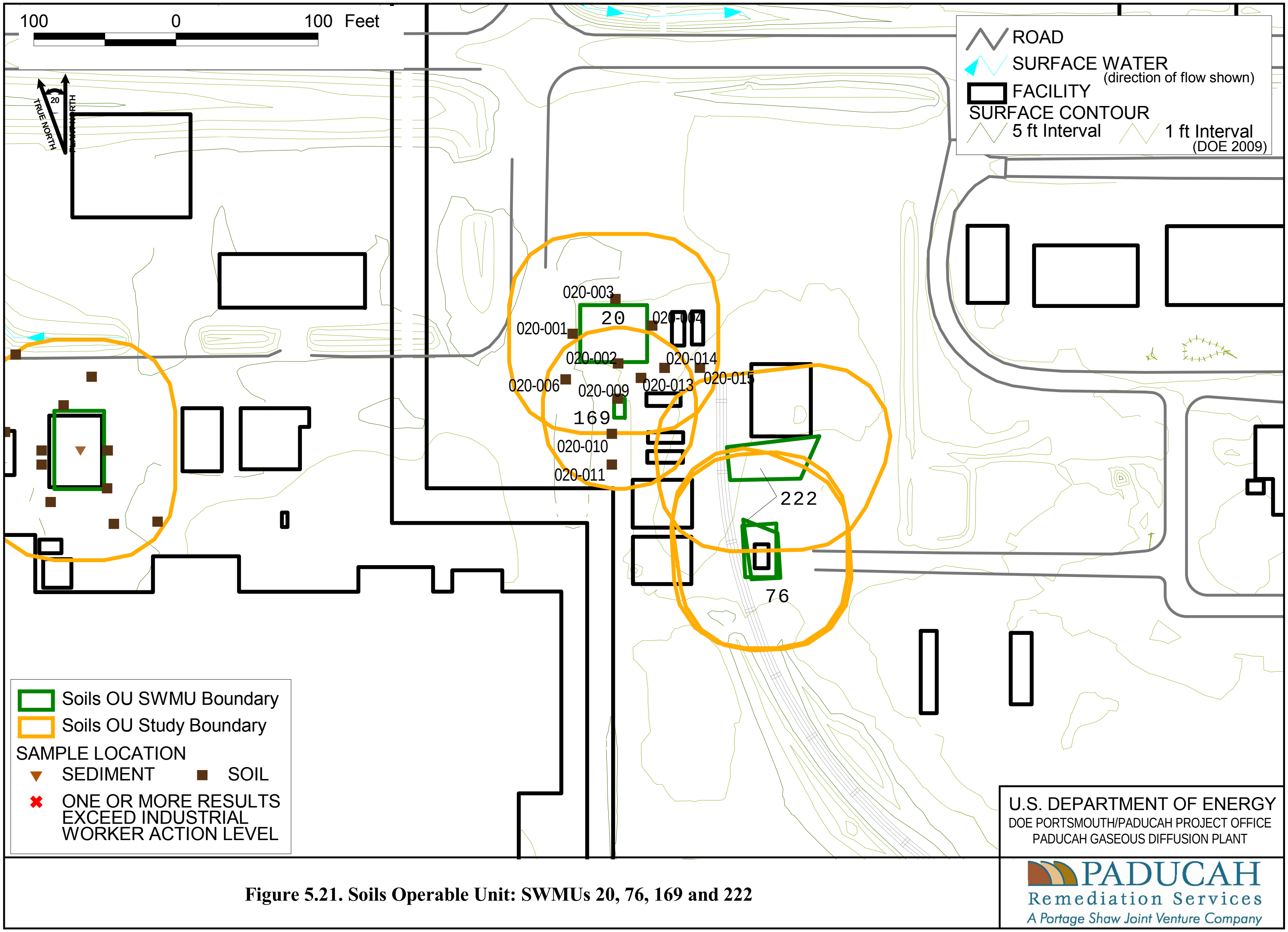

Figure 5.21. Soils Operable Unit: SWMUs 20, 76, 169 and 222

Figure No. \SoilsOU\SOU_SWMUsR5.apr
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SWMU 223 (DMSA OS-12)

Area description

DMSA OS-12 (SWMU 223) is located in the east central portion of the plant site. The C-301 Building is located within the southern portion of the DMSA. SWMU 223 is approximately 11,120 ft^2.

Process history

The C-301 Building, located within the DMSA, was used as a Fire Services training facility until 1985. The area then became storage for excess electrical equipment and cooling tower wood. The excess electrical equipment included electrical motors, transformers, electrical supplies, asbestos, scrap metal and spill cleanup material. Waste Management also has utilized this area for the storage of LLW. Some of the LLW drums managed by Waste Operations were observed leaking during routine inspections. The drums were over-packed to prevent further release. None of the material from the drums came in contact with the storage pad (i.e., the leaks were observed on the side of the drum).

All RCRA-regulated items and other waste have been dispositioned properly (DOE 2004c).

Previous investigation results

A certified RCRA Closure report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending.

Figure 5.22 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

No historical soil data are available; therefore, samples are needed at this location.

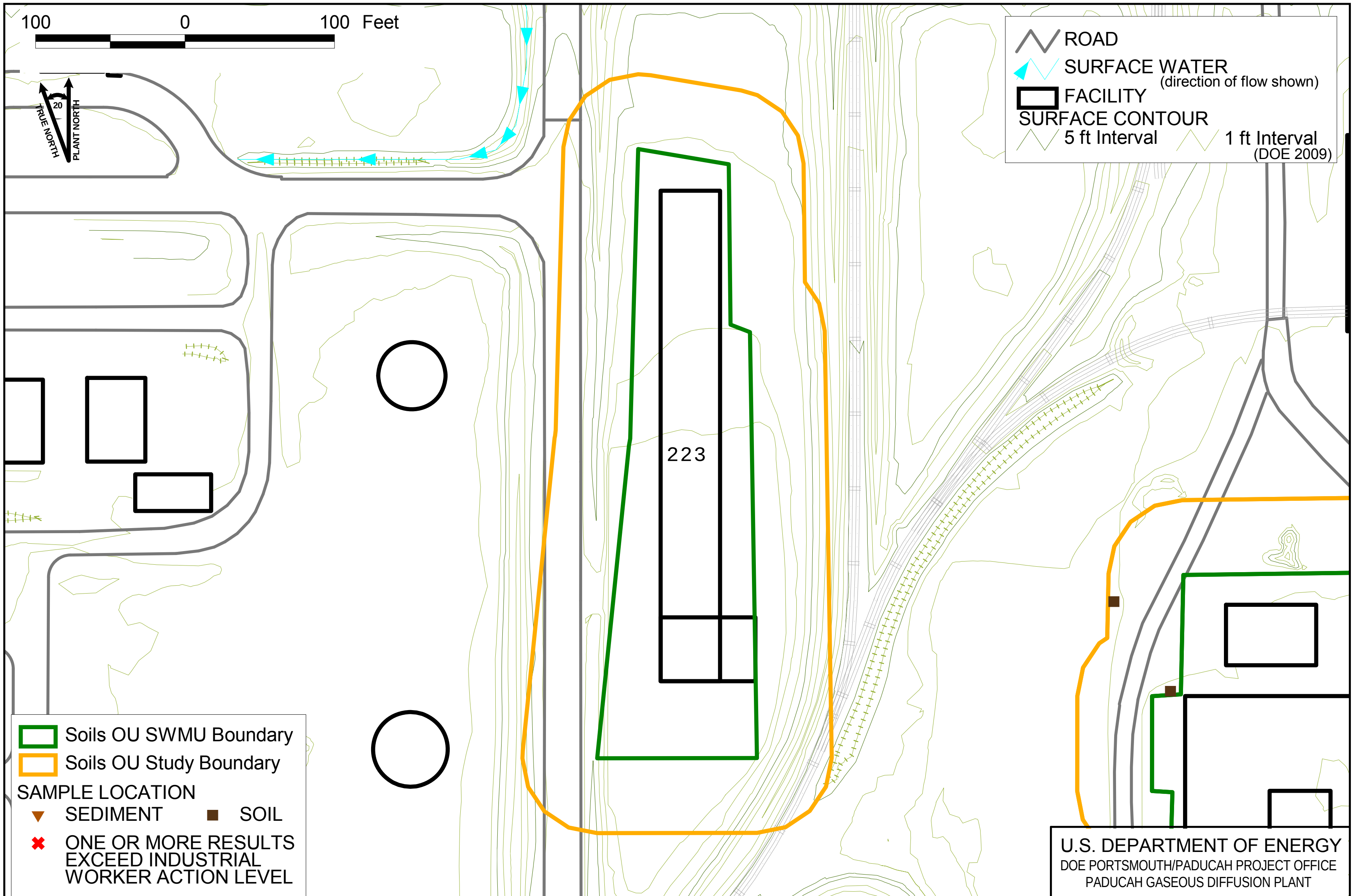

Figure 5.22. Soils Operable Unit: SWMU 223

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SWMU 224 (DMSA OS-13)

Area description

DMSA OS-13 (SWMU 224) is located south of C-340 in the east central portion of the plant site. SWMU 224 is approximately 800 ft^2.

Process history

Empty vendor drums used for the C-340 reroofing project were stored here, beginning in 1996. During 1997 or 1998, the drums were removed.

Previous investigation results

This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2002h).

Table 5.16 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.23).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; however, both sanitary and storm water sewers are present within the boundary of the SWMU. These lines are approximately 5 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.16. Summary of Surface and Subsurface Historical Data at SWMU 224

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	3.79E-05	3.79E-05	3.79E-05	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	7.53E-05	7.53E-05	7.53E-05	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	6.70E-06	6.70E-06	6.70E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzofuran	1.55E-05	1.55E-05	1.55E-05	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	2.64E-06	2.64E-06	2.64E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzofuran	5.02E-06	5.02E-06	5.02E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	3.44E-06	3.44E-06	3.44E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzofuran	3.46E-07	3.46E-07	3.46E-07	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	3.11E-06	3.11E-06	3.11E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	0/1	3.39E-02	0/1	5.07E-05
1,2,3,7,8-Pentachlorodibenzofuran	2.51E-06	2.51E-06	2.51E-06	1/1	1.11E-06	1.11E-06	n/a	n/a	0/1	2.81E-03	0/1	1.24E-05
2,3,4,6,7,8-Hexachlorodibenzofuran	7.17E-06	7.17E-06	7.17E-06	1/1	2.77E-06	2.77E-06	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4,7,8-Pentachlorodibenzofuran	6.10E-06	6.10E-06	6.10E-06	1/1	1.11E-06	1.11E-06	n/a	n/a	0/1	2.81E-02	0/1	1.24E-04
2,3,7,8-Tetrachlorodibenzofuran	1.24E-05	1.24E-05	1.24E-05	1/1	1.11E-06	1.11E-06	n/a	n/a	0/1	1.40E-02	0/1	6.19E-05
Octachloro-dibenzo[b,e][1,4]dioxin	7.08E-03	7.08E-03	7.08E-03	1/1	5.54E-06	5.54E-06	n/a	n/a	0/1	6.19E-01	1/1	6.19E-03
Octachlorodibenzofuran	3.54E-05	3.54E-05	3.54E-05	1/1	5.54E-06	5.54E-06	n/a	n/a	0/1	1.40E+00	0/1	6.19E-03
Metals (mg/kg)												
Aluminum	2.56E+03	9.86E+03	6.75E+03	6/6	2.00E+01	2.00E+01	0/6	1.30E+04	0/6	1.00E+05	4/6	4.64E+03
Barium	1.20E+01	7.30E+01	4.51E+01	6/6	1.00E+00	1.00E+00	0/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	6.30E-01	1.37E+00	1.00E+00	3/6	5.00E-01	5.00E-01	2/6	6.70E-01	0/6	1.28E+03	2/6	9.48E-01
Calcium	5.57E+04	2.91E+05	1.41E+05	6/6	5.00E+02	2.50E+03	6/6	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.88E+01	3.71E+02	1.20E+02	6/6	2.00E+00	2.00E+00	6/6	1.60E+01	n/a	n/a	1/6	3.56E+02
Cobalt	1.24E+00	9.65E+00	5.53E+00	6/6	1.00E+00	1.00E+00	0/6	1.40E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	6.64E+00	1.58E+02	5.55E+01	6/6	2.00E+00	2.00E+00	3/6	1.90E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	3.58E+03	1.78E+04	1.23E+04	6/6	5.00E+00	5.00E+00	0/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	2.14E+01	7.05E+01	5.33E+01	4/6	2.00E+01	2.00E+01	3/6	3.60E+01	0/6	1.25E+03	3/6	5.00E+01
Lithium	2.29E+00	8.52E+00	6.30E+00	5/6	2.00E+00	2.00E+00	n/a	n/a	0/6	1.00E+05	0/6	6.41E+02
Magnesium	2.08E+03	5.89E+03	4.35E+03	6/6	1.50E+01	1.50E+01	5/6	7.70E+03	n/a	n/a	n/a	n/a
Manganese	6.80E+01	5.94E+02	2.78E+02	6/6	1.00E+00	1.00E+00	0/6	1.50E+03	0/6	4.64E+04	6/6	4.52E+01
Mercury	4.30E-01	4.30E-01	4.30E-01	1/6	2.00E-01	2.00E-01	1/6	2.00E-01	0/6	8.25E+02	0/6	9.82E-01
Nickel	7.18E+00	3.82E+02	1.06E+02	6/6	5.00E+00	5.00E+00	3/6	2.10E+01	0/6	9.30E+04	1/6	2.42E+02
Potassium	3.56E+02	1.40E+03	8.15E+02	6/6	1.00E+02	1.00E+02	2/6	1.30E+03	n/a	n/a	n/a	n/a
Sodium	2.50E+02	2.81E+02	2.67E+02	5/6	2.00E+02	2.00E+02	0/6	3.20E+02	n/a	n/a	n/a	n/a
Strontium	7.03E+01	1.98E+02	1.21E+02	6/6	2.00E+00	2.00E+00	n/a	n/a	0/6	1.00E+05	0/6	5.45E+03
Vanadium	5.63E+00	2.26E+01	1.56E+01	6/6	2.00E+00	2.00E+00	0/6	3.80E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	6.51E+01	2.72E+02	1.78E+02	6/6	1.50E+01	1.50E+01	6/6	6.50E+01	0/6	1.00E+05	0/6	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.00E-01	2.00E-01	2.00E-01	4/4			n/a	n/a	0/4	4.25E+01	4/4	1.99E-01
PCB-1248	7.04E+01	1.08E+03	5.69E+02	3/10	9.40E-02	1.92E+02	n/a	n/a	3/10	4.25E+01	3/10	1.99E-01
PCB-1254	8.10E+00	8.36E+01	4.59E+01	2/10	1.04E-01	1.92E+02	n/a	n/a	1/10	1.82E+01	2/10	1.99E-01
PCB-1260	1.06E-01	2.62E+01	5.88E+00	6/10	5.00E-04	1.92E+02	n/a	n/a	0/10	4.25E+01	4/10	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.16. Summary of Surface and Subsurface Historical Data at SWMU 224 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Radionuclides (pCi/g)												
Alpha activity	1.10E+01	9.50E+03	2.44E+03	10/10	2.70E+00	5.40E+02	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	9.00E+00	1.74E+04	4.19E+03	10/10	2.05E+00	2.10E+02	n/a	n/a	n/a	n/a	n/a	n/a
Plutonium-239/240	7.91E-02	3.04E-01	1.92E-01	4/6	5.05E-02	6.51E-02	n/a	n/a	0/6	1.15E+03	0/6	1.15E+01
Protactinium-234m	8.80E+02	5.00E+03	2.76E+03	3/6	7.90E+01	6.89E+02	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	5.07E+00	1.05E+02	3.79E+01	4/6	4.08E+00	4.50E+00	4/6	2.50E+00	0/6	3.62E+04	0/6	3.62E+02
Thorium-234	2.20E+01	2.89E+03	5.84E+02	11/12	9.38E-01	1.02E+02	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	8.60E+00	3.16E+03	6.71E+02	7/12	2.12E+00	1.37E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.12E+00	3.79E+02	1.07E+02	6/6	3.15E-01	1.63E+00	6/6	2.50E+00	0/6	1.98E+03	4/6	1.98E+01
Uranium-235	8.70E+00	4.90E+01	3.12E+01	3/6	4.90E+00	1.90E+01	3/6	1.40E-01	1/6	3.95E+01	3/6	3.95E-01
Uranium-238	2.64E+01	2.74E+03	7.30E+02	6/6	1.72E+00	1.17E+01	6/6	1.20E+00	4/6	1.71E+02	6/6	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.65E+00	1.20E+01	5.64E+00	5/6	5.00E-01	5.00E-01	n/a	n/a	0/6	6.67E+04	0/6	3.16E+02
Anthracene	3.32E+00	4.50E+01	1.46E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	1.00E+05	0/6	3.79E+03
Benz(a)anthracene	4.74E+00	9.00E+01	2.91E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	2.08E+02	6/6	2.12E-01
Benzo(a)pyrene	8.77E+00	1.13E+02	3.43E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	3/6	2.08E+01	6/6	2.12E-02
Benzo(b)fluoranthene	1.31E+01	1.21E+02	4.70E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	2.08E+02	6/6	2.12E-01
Benzo(ghi)perylene	4.06E+00	8.40E+01	2.86E+01	5/5	5.00E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.40E+00	9.30E+01	2.83E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	2.08E+03	6/6	2.12E+00
Chrysene	8.15E+00	8.60E+01	2.98E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	2.08E+04	3/6	2.12E+01
Dibenz(a,h)anthracene	5.40E+00	6.00E+01	3.27E+01	2/6	5.00E-01	5.00E-01	n/a	n/a	1/6	2.08E+01	2/6	2.12E-02
Dibenzofuran	1.00E+00	4.60E+00	3.08E+00	3/6	5.00E-01	5.00E-01	n/a	n/a	0/6	9.02E+03	0/6	1.86E+01
Fluoranthene	7.55E+00	7.10E+01	2.89E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Fluorene	1.61E+00	1.60E+01	6.54E+00	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	7.09E+04	0/6	3.39E+02
Indeno(1,2,3-cd)pyrene	4.75E+00	9.40E+01	4.15E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	2.08E+02	6/6	2.12E-01
Naphthalene	6.00E-01	4.75E+00	2.51E+00	4/6	5.00E-01	5.00E-01	n/a	n/a	0/6	7.66E+02	0/6	2.36E+01
Phenanthrene	9.74E+00	7.20E+01	2.68E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	6.48E+00	1.08E+02	3.63E+01	6/6	5.00E-01	5.00E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.83E+03	1.14E+04	8.12E+03	2/2	2.00E+01	2.00E+01	0/2	1.20E+04	0/2	1.00E+05	2/2	4.64E+03
Barium	1.22E+01	6.32E+01	3.77E+01	2/2	1.00E+00	1.00E+00	0/2	1.70E+02	0/2	1.00E+05	0/2	2.29E+02
Beryllium	6.70E-01	1.38E+00	1.03E+00	2/2	5.00E-01	5.00E-01	1/2	6.90E-01	0/2	1.28E+03	1/2	9.48E-01
Calcium	1.10E+03	1.33E+03	1.22E+03	2/2	5.00E+01	5.00E+01	0/2	6.10E+03	n/a	n/a	n/a	n/a
Chromium	2.22E+01	4.28E+01	3.25E+01	2/2	2.00E+00	2.00E+00	2/2	4.30E+01	n/a	n/a	0/2	3.56E+02
Cobalt	2.86E+00	4.17E+00	3.52E+00	2/2	1.00E+00	1.00E+00	0/2	1.30E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	2.77E+00	6.53E+00	4.65E+00	2/2	2.00E+00	2.00E+00	0/2	2.50E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	1.53E+04	2.08E+04	1.81E+04	2/2	5.00E+00	5.00E+00	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lithium	8.41E+00	8.41E+00	8.41E+00	1/2	2.00E+00	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	6.41E+02
Magnesium	2.96E+02	1.39E+03	8.43E+02	2/2	1.50E+01	1.50E+01	0/2	2.10E+03	n/a	n/a	n/a	n/a
Manganese	4.33E+01	1.99E+02	1.21E+02	2/2	1.00E+00	1.00E+00	0/2	8.20E+02	0/2	4.64E+04	1/2	4.52E+01
Nickel	1.48E+01	1.48E+01	1.48E+01	1/2	5.00E+00	5.00E+00	0/2	2.20E+01	0/2	9.30E+04	0/2	2.42E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.16. Summary of Surface and Subsurface Historical Data at SWMU 224 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Potassium	1.07E+02	3.53E+02	2.30E+02	2/2	1.00E+02	1.00E+02	0/2	9.50E+02	n/a	n/a	n/a	n/a
Sodium	2.14E+02	2.14E+02	2.14E+02	1/2	2.00E+02	2.00E+02	0/2	3.40E+02	n/a	n/a	n/a	n/a
Strontium	2.95E+00	8.75E+00	5.85E+00	2/2	2.00E+00	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	5.45E+03
Vanadium	3.17E+01	4.61E+01	3.89E+01	2/2	2.00E+00	2.00E+00	1/2	3.70E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	1.78E+01	2.36E+01	2.07E+01	2/2	1.50E+01	1.50E+01	0/2	6.00E+01	0/2	1.00E+05	0/2	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	5.95E+00	2.22E+01	1.46E+01	3/3	6.90E+00	9.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.00E+00	1.82E+01	1.16E+01	3/3	4.40E+00	7.10E+00	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

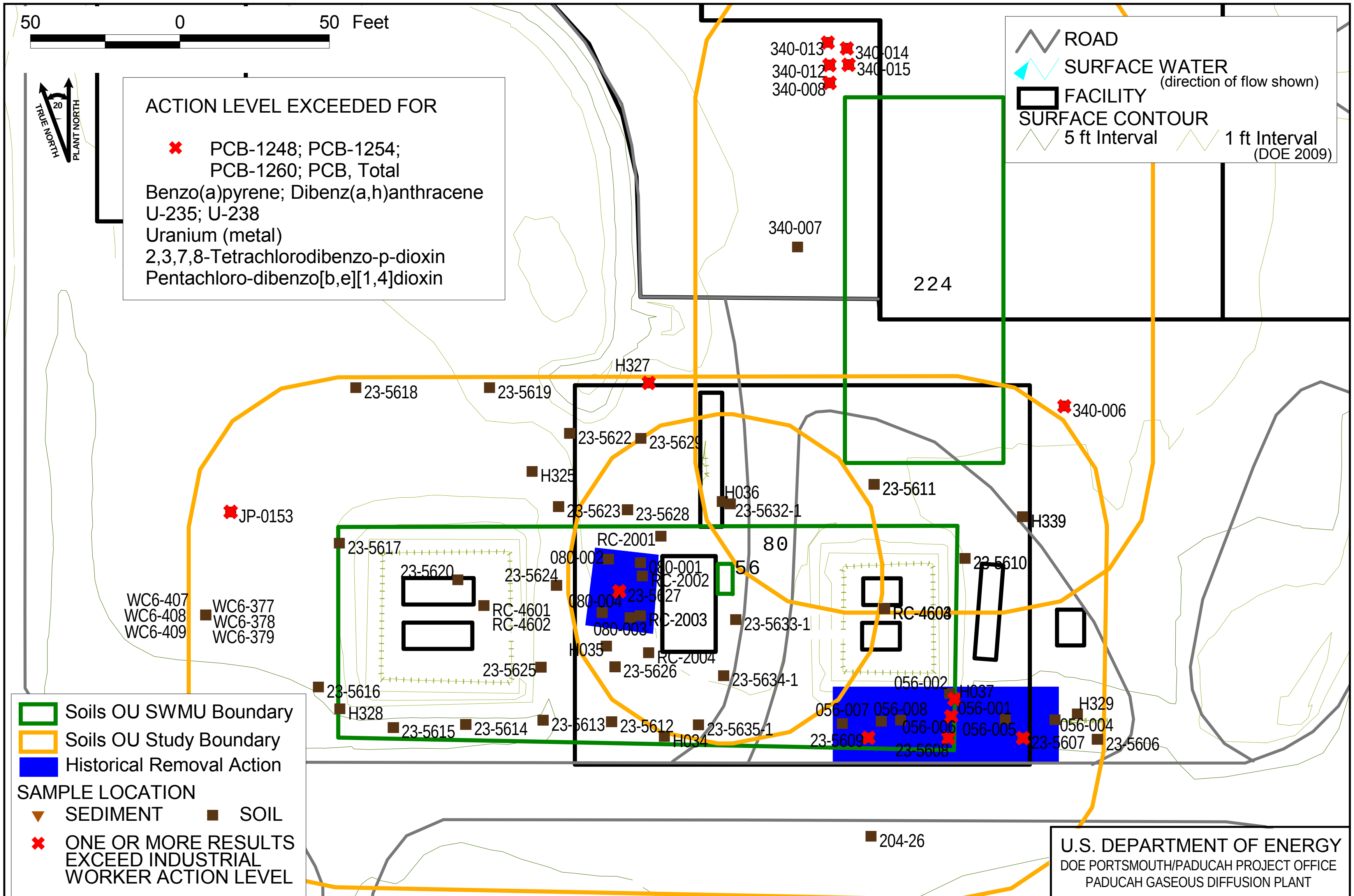


Figure 5.23. Soils Operable Unit: SWMUs 56, 80, and 224

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 225 (DMSA OS-14)

Area description

DMSA OS-14 (SWMU 225) consists of four tanker cars, three empty flatbeds, and one flatbed with three tanks/containers on it located south of C-533-1, west of the C-633 Cooling Towers in the southeast portion of the plant site. The area containing SWMU 225 is approximately 7,800 ft^2 (390 ft x 20 ft).

Process history

Rail tank cars and liquid containers were used as material storage areas. The tanker cars may have been brought on-site containing acid product, lube oil, or Freon®. Some personnel recall the three containers on the flatbed being used to hold water for fire-fighting purposes.

Previous investigation results

This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2001c).

Figure 5.24 shows the area historical map.

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; however, both storm water sewers are present within the boundary of the SWMU. These lines are approximately 2 ft bgs.

Data gap determination

No historical soil data are available; therefore, samples are needed at this location.

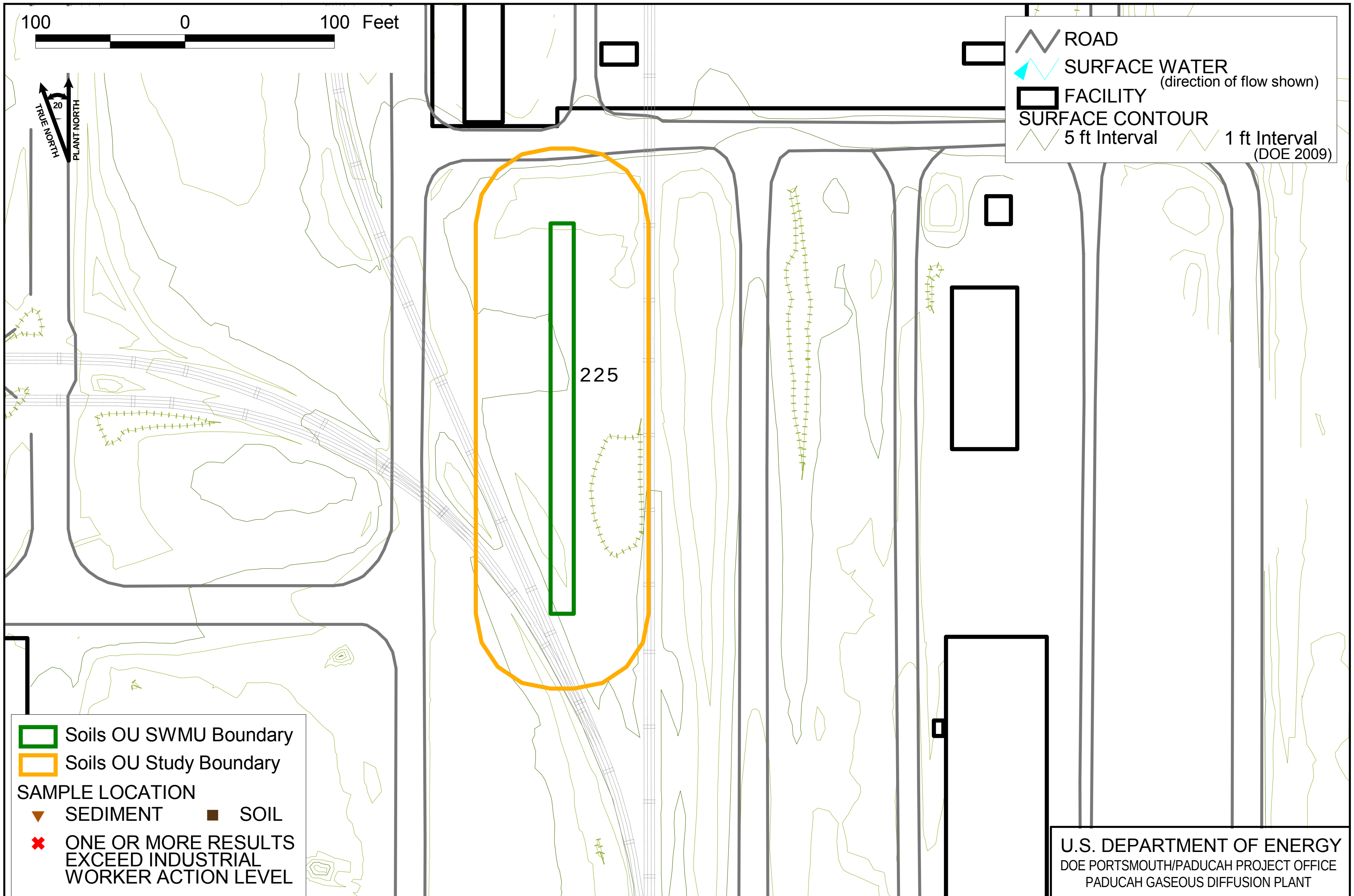


Figure 5.24. Soils Operable Unit: SWMU 225

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 226 (DMSA OS-15)

Area description

DMSA OS-15 (SWMU 226) is located north of C-745-B, in the west central portion of the plant site. SWMU 226 is approximately 10,170 ft^2 (339 ft x 30 ft).

Process history

This DMSA was used for the storage of process coolers and excess equipment, beginning during the Process Equipment Modification program: 1976-1979. In April 2000, during a routine inspection, two UF_6 tails cylinders stored within the SWMU were observed to have plugs missing. Green oxide material was observed on the ground under one of the cylinders. This material was sampled and found to be radioactive. These cylinders and all but two of the tails cylinders and one other cylinder with unknown contents were relocated. Excavation of the soil around the area where the UF_6 tails material contaminated the ground was completed in November 2000, as documented in the SAR issued on December 1, 2000.

Previous investigation results

Radiological surveys of the ground in 1995, prior to the discovery of the green oxide material, indicated soil contamination exists. This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2004d).

Table 5.17 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.25).

Area utilities

No recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

No historical soil data are available within the boundary of the SWMU; therefore, samples are needed at this location.

Table 5.17. Summary of Surface and Subsurface Historical Data at SWMU 226

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	8.26E+03	9.04E+03	8.65E+03	2/2	1.90E+01	1.95E+01	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Barium	6.92E+01	7.02E+01	6.97E+01	2/2	2.38E+00	2.44E+00	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Calcium	6.77E+02	1.47E+03	1.07E+03	2/2	9.50E+01	9.74E+01	0/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.09E+01	1.14E+01	1.12E+01	2/2	2.38E+00	2.44E+00	0/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	2.44E+00	2.76E+00	2.60E+00	2/2	2.38E+00	2.44E+00	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	7.19E+00	7.19E+00	7.19E+00	1/2	2.38E+00	2.44E+00	0/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	7.27E+03	9.04E+03	8.16E+03	2/2	1.90E+01	1.95E+01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Magnesium	6.85E+02	8.05E+02	7.45E+02	2/2	4.75E+00	4.87E+00	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.88E+02	2.17E+02	2.03E+02	2/2	2.38E+00	2.44E+00	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	5.58E+00	7.18E+00	6.38E+00	2/2	4.75E+00	4.87E+00	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Potassium	5.01E+02	7.07E+02	6.04E+02	2/2	9.50E+01	9.74E+01	0/2	1.30E+03	n/a	n/a	n/a	n/a
Uranium	3.12E+00	1.94E+01	9.70E+00	4/4	1.30E-01	4.75E+00	2/4	4.90E+00	0/4	3.34E+03	0/4	2.02E+01
Vanadium	1.71E+01	1.71E+01	1.71E+01	2/2	2.38E+00	2.44E+00	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	2.35E+01	2.77E+01	2.56E+01	2/2	1.90E+01	1.95E+01	0/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	4.90E-01	1.49E+00	8.25E-01	8/21	1.20E-01	1.30E-01	n/a	n/a	0/21	4.25E+01	8/21	1.99E-01
PCB-1254	1.20E-01	1.00E+00	6.08E-01	9/21	8.00E-02	9.00E-02	n/a	n/a	0/21	1.82E+01	8/21	1.99E-01
PCB-1260	2.20E-01	4.90E-01	3.13E-01	4/21	9.00E-02	1.00E-01	n/a	n/a	0/21	4.25E+01	4/21	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.36E+00	1.37E+01	9.03E+00	2/2	8.50E-01	8.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	6.10E-02	6.10E-02	6.10E-02	1/2	3.00E-02	3.00E-02	n/a	n/a	0/2	5.16E+02	0/2	5.16E+00
Beta activity	5.14E+00	2.00E+01	1.26E+01	2/2	9.70E-01	9.80E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.61E-01	8.74E+00	2.05E+00	20/20	5.00E-02	9.80E-01	18/20	4.90E-01	1/20	8.58E+00	20/20	8.58E-02
Neptunium-237	5.21E-01	5.21E-01	5.21E-01	1/2	3.00E-02	3.00E-02	1/2	1.00E-01	0/2	2.71E+01	1/2	2.71E-01
Plutonium-239/240	4.04E-01	4.04E-01	4.04E-01	1/2	2.00E-02	2.00E-02	n/a	n/a	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	6.22E+00	6.22E+00	6.22E+00	1/2	3.19E+00	3.38E+00	1/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-228	4.49E-01	6.32E-01	5.41E-01	2/2	1.60E-01	1.60E-01	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	3.71E-01	4.33E+00	2.35E+00	2/2	2.00E-01	2.00E-01	1/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Thorium-232	4.18E-01	6.64E-01	5.41E-01	2/2	4.00E-02	4.00E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium-234	7.16E-01	3.72E+00	2.22E+00	2/2	8.00E-02	8.00E-02	1/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	4.45E-02	2.12E-01	1.28E-01	2/2	2.00E-02	2.00E-02	1/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	1.04E+00	7.71E+02	6.41E+01	20/20	4.00E-02	1.08E+01	19/20	1.20E+00	1/20	1.71E+02	18/20	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

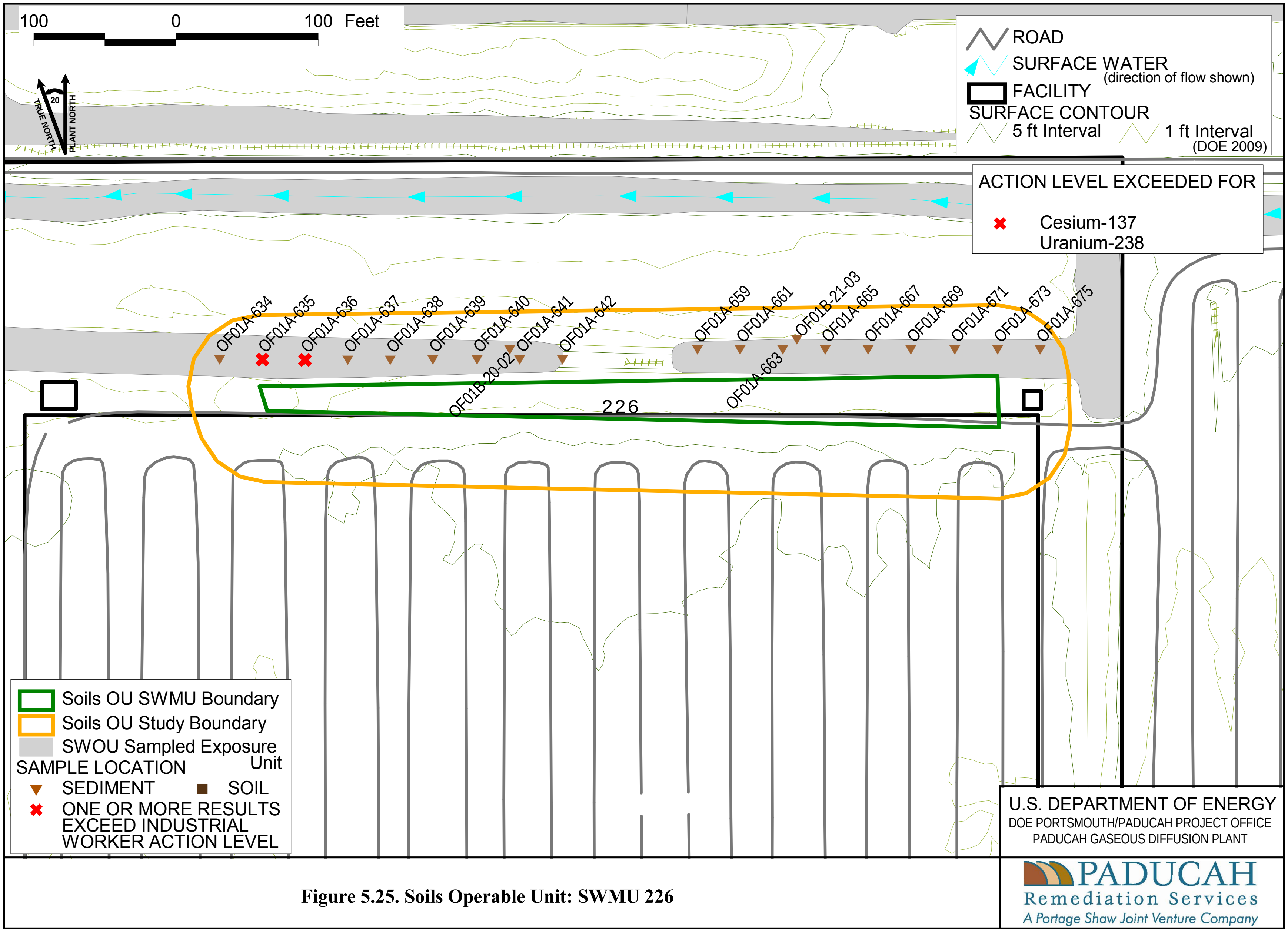


Figure 5.25. Soils Operable Unit: SWMU 226

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 227 (DMSA OS-16)

Area description

DMSA OS-16 (SWMU 227) is located south of the C-746-B Warehouse, in the northwest portion of the plant site. SWMU 227 is approximately 37,000 ft^2.

Process history

This area was used for many years as a storage area for miscellaneous excess process equipment and UF_6 cylinders since the 1970s. Materials stored within this area included wood/metal pallets, stainless steel tanks, air conditioners, scrap metal, miscellaneous equipment/parts, office furniture, floor buffers, empty poly tanks, spools of wire and cable, incandescent light bulbs, fluorescent light tubes, a broken fluorescent light tube, and light bulb bases. In 2001, DOE began characterization and remediation of the materials in the DMSAs. All RCRA-regulated items and other waste have been dispositioned properly (DOE 2004e).

Previous investigation results

A certified RCRA Closure Report was approved by Kentucky on February 13, 2007, for this DMSA. The Division of Waste Management "determined that the characterization, removal and disposal of hazardous waste meets the applicable requirements of the approved Agreed Order Closure Plan for DMSAs, dated December 23, 2005" (Webb 2007). An NFA is pending.

Table 5.18 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.26).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA; however, both storm water sewers are present within the boundary of the SWMU. These lines are approximately 3 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.18. Summary of Surface and Subsurface Historical Data at SWMU 227

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	5.01E+03	9.29E+03	6.80E+03	12/12	1.81E+01	2.00E+01	0/12	1.30E+04	0/12	1.00E+05	12/12	4.64E+03
Arsenic	4.47E+00	5.17E+00	4.82E+00	2/12	9.90E-01	5.00E+00	0/12	1.20E+01	0/12	3.15E+02	2/12	5.23E-01
Barium	4.07E+01	9.51E+01	7.04E+01	12/12	1.00E+00	5.00E+00	0/12	2.00E+02	0/12	1.00E+05	0/12	2.29E+02
Beryllium	4.93E-01	5.40E-01	5.17E-01	2/12	4.50E-01	5.00E-01	0/12	6.70E-01	0/12	1.28E+03	0/12	9.48E-01
Calcium	1.02E+03	7.35E+04	1.35E+04	12/12	9.05E+01	5.00E+02	4/12	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.38E+00	4.35E+01	1.37E+01	12/12	2.00E+00	2.50E+00	2/12	1.60E+01	n/a	n/a	0/12	3.56E+02
Cobalt	2.61E+00	1.48E+01	5.94E+00	11/12	1.00E+00	2.50E+00	1/12	1.40E+01	0/12	1.00E+05	0/12	1.92E+03
Copper	5.72E+00	1.98E+01	9.99E+00	12/12	2.00E+00	2.50E+00	1/12	1.90E+01	0/12	1.00E+05	0/12	4.93E+02
Iron	6.08E+03	1.56E+04	1.03E+04	12/12	5.00E+00	1.88E+02	0/12	2.80E+04	0/12	1.00E+05	12/12	2.07E+03
Magnesium	6.92E+02	2.72E+03	1.27E+03	12/12	4.52E+00	1.50E+01	2/12	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.11E+02	1.15E+03	3.82E+02	12/12	1.00E+00	1.00E+01	1/12	1.50E+03	0/12	4.64E+04	12/12	4.52E+01
Molybdenum	5.21E+00	5.21E+00	5.21E+00	1/9	2.35E+00	4.83E+00	n/a	n/a	0/9	2.50E+04	0/9	8.30E+01
Nickel	8.64E+00	2.07E+01	1.22E+01	11/12	4.52E+00	5.00E+00	0/12	2.10E+01	0/12	9.30E+04	0/12	2.42E+02
Potassium	2.18E+02	5.83E+02	4.05E+02	10/10	9.05E+01	1.00E+02	0/10	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.37E+00	1.37E+00	1.37E+00	1/12	1.00E+00	1.99E+01	1/12	8.00E-01	0/12	2.56E+04	0/12	9.49E+01
Sodium	1.20E+02	2.07E+02	1.62E+02	4/10	9.05E+01	2.00E+02	0/10	3.20E+02	n/a	n/a	n/a	n/a
Uranium	1.08E+00	1.88E+01	8.74E+00	14/20	1.30E-01	2.00E+02	8/20	4.90E+00	0/20	3.34E+03	0/20	2.02E+01
Vanadium	1.04E+01	2.78E+01	1.70E+01	12/12	2.00E+00	2.50E+00	0/12	3.80E+01	0/12	4.47E+03	12/12	3.32E+00
Zinc	2.16E+01	1.12E+02	5.51E+01	11/12	1.50E+01	2.00E+01	4/12	6.50E+01	0/12	1.00E+05	0/12	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.20E-01	1.26E+01	1.62E+00	54/85	6.00E-02	1.30E-01	n/a	n/a	0/85	4.25E+01	47/85	1.99E-01
PCB-1254	1.20E-01	6.99E+00	1.82E+00	23/86	6.00E-02	1.02E-01	n/a	n/a	0/86	1.82E+01	22/86	1.99E-01
PCB-1260	1.00E-01	5.65E+00	8.63E-01	53/86	9.00E-02	1.02E-01	n/a	n/a	0/86	4.25E+01	46/86	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.86E+00	1.52E+01	8.76E+00	10/10	7.60E-01	1.20E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.83E+00	3.78E+01	1.49E+01	10/10	9.20E-01	6.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-3.50E-01	1.48E+00	2.10E-01	74/83	1.68E-02	2.02E+00	23/83	4.90E-01	0/83	8.58E+00	46/83	8.58E-02
Neptunium-237	4.31E-02	5.84E-02	5.08E-02	2/11	2.00E-02	4.00E-02	0/11	1.00E-01	0/11	2.71E+01	0/11	2.71E-01
Plutonium-239/240	6.99E-02	6.99E-02	6.99E-02	1/11	1.00E-02	4.23E-02	n/a	n/a	0/11	1.15E+03	0/11	1.15E+01
Technetium-99	3.80E+00	2.58E+01	9.24E+00	7/12	2.64E+00	4.63E+00	7/12	2.50E+00	0/12	3.62E+04	0/12	3.62E+02
Thorium-228	1.85E-01	5.24E-01	3.30E-01	11/11	6.00E-02	1.50E-01	0/11	1.60E+00	0/11	2.80E+00	11/11	2.80E-02
Thorium-230	2.11E-01	2.98E+00	6.62E-01	10/11	1.90E-01	2.20E-01	1/11	1.50E+00	0/11	1.49E+03	0/11	1.49E+01
Thorium-232	2.01E-01	5.46E-01	3.60E-01	11/11	3.00E-02	7.00E-02	0/11	1.50E+00	0/11	1.35E+03	0/11	1.35E+01
Uranium-234	2.04E-01	4.40E+00	1.16E+00	9/11	8.00E-02	3.33E-01	1/11	2.50E+00	0/11	1.98E+03	0/11	1.98E+01
Uranium-235	2.90E-02	2.28E-01	9.58E-02	7/12	2.00E-02	1.80E+00	2/12	1.40E-01	0/12	3.95E+01	0/12	3.95E-01
Uranium-238	-1.08E+01	1.83E+01	3.94E+00	82/82	4.00E-02	1.35E+01	55/82	1.20E+00	0/82	1.71E+02	54/82	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.18. Summary of Surface and Subsurface Historical Data at SWMU 227 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Semivolatiles (mg/kg)												
Benz(a)anthracene	1.18E-01	7.50E-01	4.34E-01	2/13	4.60E-01	5.00E-01	n/a	n/a	0/13	2.08E+02	1/13	2.12E-01
Benzo(a)pyrene	2.77E-01	8.40E-01	5.59E-01	2/13	4.60E-01	5.00E-01	n/a	n/a	0/13	2.08E+01	2/13	2.12E-02
Benzo(b)fluoranthene	2.84E-01	1.70E+00	8.78E-01	3/13	4.60E-01	5.00E-01	n/a	n/a	0/13	2.08E+02	3/13	2.12E-01
Benzo(ghi)perylene	1.17E-01	5.50E-01	3.34E-01	2/13	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.50E-01	6.30E-01	5.40E-01	2/11	4.60E-01	5.00E-01	n/a	n/a	0/11	2.08E+03	0/11	2.12E+00
Chrysene	2.17E-01	1.20E+00	6.79E-01	3/13	4.60E-01	5.00E-01	n/a	n/a	0/13	2.08E+04	0/13	2.12E+01
Di-n-butyl phthalate	7.60E-01	7.60E-01	7.60E-01	1/2	4.60E-01	5.00E-01	n/a	n/a	0/2	1.00E+05	0/2	2.13E+03
Fluoranthene	2.49E-01	2.40E+00	1.12E+00	4/11	4.60E-01	5.00E-01	n/a	n/a	0/11	6.50E+04	0/11	2.21E+02
Indeno(1,2,3-cd)pyrene	1.59E-01	5.50E-01	3.55E-01	2/13	4.60E-01	5.00E-01	n/a	n/a	0/13	2.08E+02	1/13	2.12E-01
Phenanthrene	6.40E-01	1.10E+00	8.70E-01	2/13	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	2.69E-01	1.90E+00	8.72E-01	4/13	4.60E-01	5.00E-01	n/a	n/a	0/13	4.87E+04	0/13	1.65E+02
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	1.10E+04	1.10E+04	1.10E+04	1/1	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.85E+03	1.17E+04	8.47E+03	8/8	2.00E+01	2.00E+01	0/8	1.20E+04	0/8	1.00E+05	8/8	4.64E+03
Arsenic	2.30E+00	4.60E+00	3.30E+00	4/8	6.00E-01	5.00E+00	0/8	7.90E+00	0/8	3.15E+02	4/8	5.23E-01
Barium	2.17E+01	1.97E+02	6.36E+01	8/8	1.00E+00	1.00E+00	1/8	1.70E+02	0/8	1.00E+05	0/8	2.29E+02
Beryllium	5.00E-01	9.00E-01	5.84E-01	7/8	4.00E-01	5.00E-01	1/8	6.90E-01	0/8	1.28E+03	0/8	9.48E-01
Calcium	6.04E+02	1.49E+04	3.31E+03	8/8	1.00E+02	1.00E+02	1/8	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.18E+01	2.30E+01	1.57E+01	8/8	2.00E+00	2.00E+00	3/8	4.30E+01	n/a	n/a	0/8	3.56E+02
Cobalt	2.73E+00	8.70E+00	4.87E+00	7/8	2.00E+00	3.00E+00	0/8	1.30E+01	0/8	1.00E+05	0/8	1.92E+03
Copper	4.90E+00	1.13E+01	6.72E+00	8/8	2.00E+00	2.00E+00	0/8	2.50E+01	0/8	1.00E+05	0/8	4.93E+02
Iron	9.14E+03	1.59E+04	1.19E+04	8/8	5.00E+00	5.00E+00	0/8	2.80E+04	0/8	1.00E+05	8/8	2.07E+03
Lead	4.20E+00	1.28E+01	8.68E+00	4/8	2.00E+01	2.00E+01	0/8	2.30E+01	0/8	1.25E+03	0/8	5.00E+01
Magnesium	3.60E+02	2.37E+03	1.03E+03	8/8	1.50E+01	1.50E+01	1/8	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.10E+01	1.09E+03	2.70E+02	8/8	1.00E+01	1.00E+01	1/8	8.20E+02	0/8	4.64E+04	8/8	4.52E+01
Nickel	7.20E+00	2.18E+01	1.08E+01	6/8	5.00E+00	6.80E+00	1/8	2.20E+01	0/8	9.30E+04	0/8	2.42E+02
Potassium	2.15E+02	7.18E+02	3.81E+02	6/8	1.00E+02	4.04E+02	0/8	9.50E+02	n/a	n/a	n/a	n/a
Sodium	5.19E+01	2.75E+02	1.78E+02	7/8	2.00E+02	2.00E+02	0/8	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.81E+01	3.92E+01	2.67E+01	8/8	2.00E+00	2.00E+00	1/8	3.70E+01	0/8	4.47E+03	8/8	3.32E+00
Zinc	9.90E+00	4.83E+01	2.39E+01	6/8	2.00E+01	2.00E+01	0/8	6.00E+01	0/8	1.00E+05	0/8	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.50E+00	1.12E+01	4.33E+00	8/8	8.00E-01	1.58E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.40E+00	9.58E+00	5.71E+00	8/8	3.70E-01	8.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Semivolatiles (mg/kg)												
2,3-Dimethylheptane	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3-Methyloctane	2.10E-01	2.10E-01	2.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	3.80E-01	3.80E-01	3.80E-01	1/8	3.20E-01	6.50E-01	n/a	n/a	0/8	7.40E+03	0/8	8.84E+00
Di-n-butyl phthalate	7.40E-01	1.50E+00	1.01E+00	4/8	3.80E-01	4.70E-01	n/a	n/a	0/8	1.00E+05	0/8	2.13E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.18. Summary of Surface and Subsurface Historical Data at SWMU 227 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Volatiles (mg/kg)												
2,5-Dimethylheptane	1.70E-01	1.70E-01	1.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	1.30E-02	1.30E-02	1.30E-02	1/8	1.00E-02	9.30E+00	n/a	n/a	0/8	1.91E+04	0/8	3.58E+02
Benzene	9.80E-01	9.80E-01	9.80E-01	1/8	6.00E-03	7.40E-01	n/a	n/a	0/8	7.45E+01	0/8	1.13E+00
Toluene	3.40E-01	3.60E-01	3.50E-01	2/10	6.00E-03	7.40E-01	n/a	n/a	0/10	7.28E+03	0/10	2.11E+02
Trichloroethene	1.10E-03	3.80E-03	2.73E-03	4/13	1.00E-03	7.40E-01	n/a	n/a	0/13	2.98E+02	0/13	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

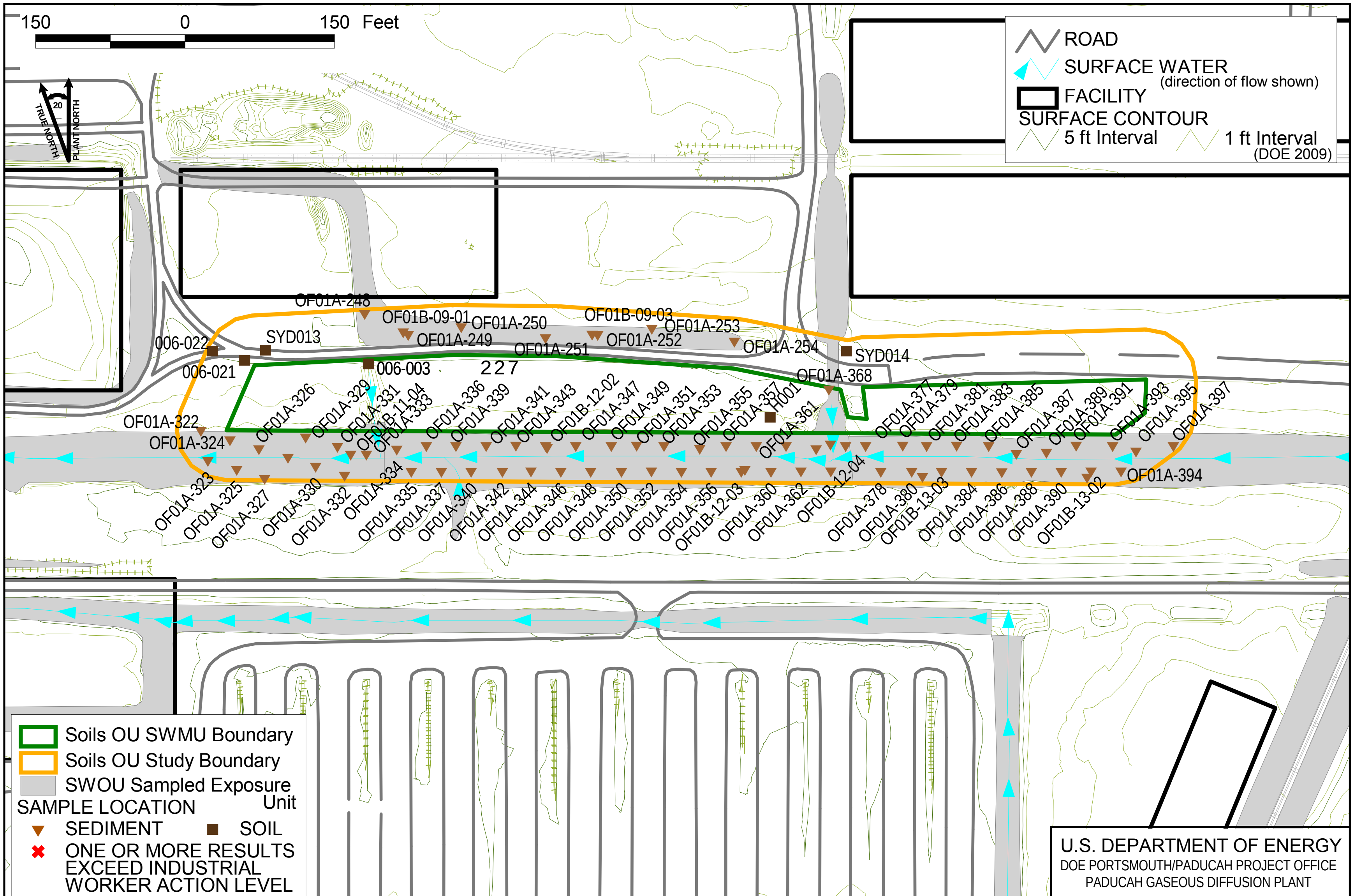


Figure 5.26. Soils Operable Unit: SWMU 227

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 228 (DMSA OS-17)

Area description

DMSA OS-17 (SWMU 228) is located west of C-747-B in the northwest portion of the plant site. SWMU 228 is approximately 10,800 ft^2.

Process history

SWMU 228 has been used for the storage of excess mobile industrial equipment, which originally was slated for auction. Equipment at this location includes forklifts, tow motors and miniature pump trucks, and concrete culverts. The equipment has remained in storage at this location since the termination of off-site property sales around 1985. The exact operational dates for this site are unknown, although the last equipment was probably placed in this area in 1996.

Previous investigation results

This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2004f).

Table 5.19 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.27).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA, and none pass within the boundary of the SWMU. An abandoned sanitary water line lies within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.19. Summary of Surface and Subsurface Historical Data at SWMU 228

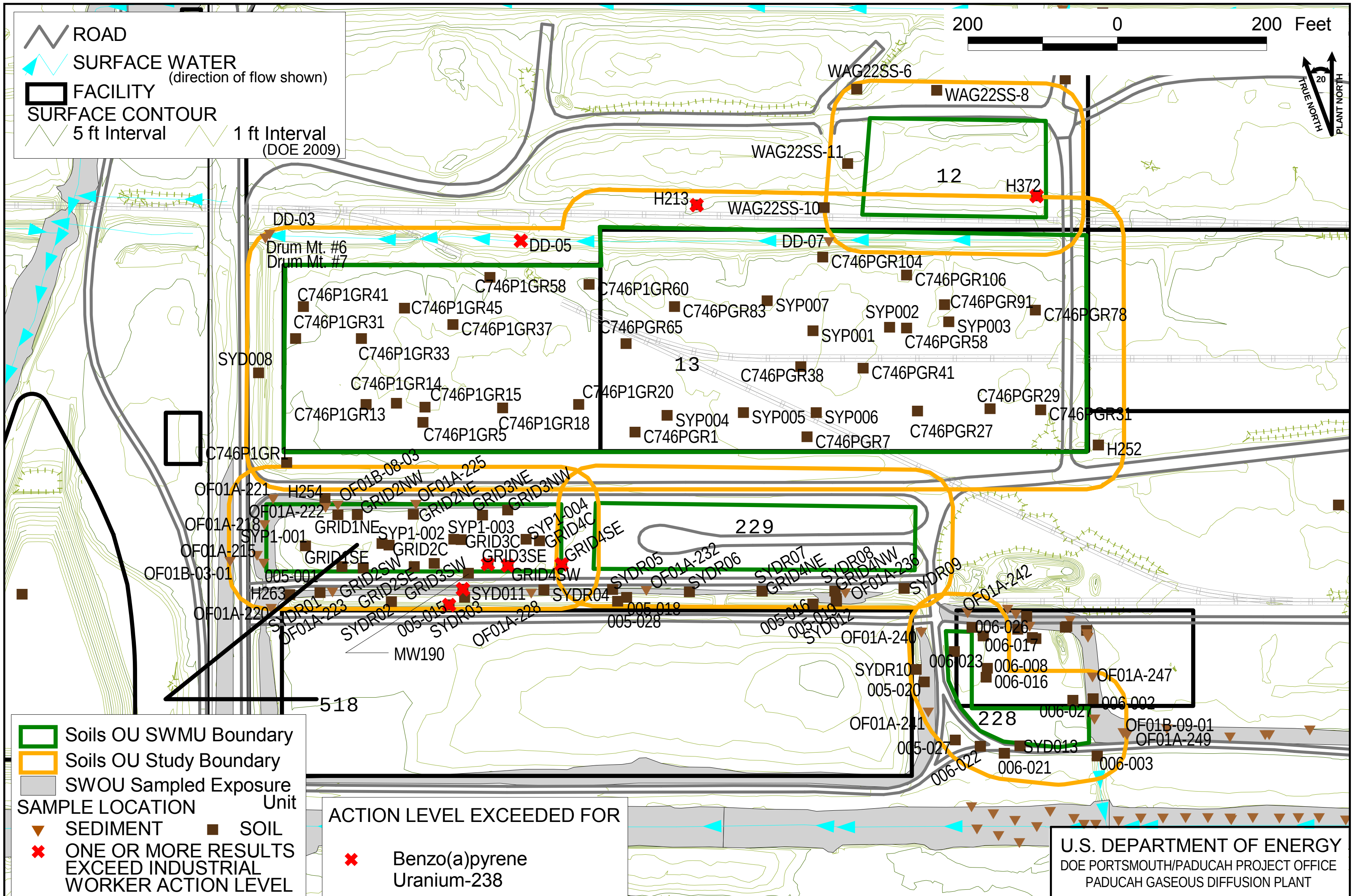
	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
					Surface Soils							
Metals (mg/kg)												
Aluminum	5.01E+03	1.04E+04	7.79E+03	8/8	1.90E+01	2.00E+01	0/8	1.30E+04	0/8	1.00E+05	8/8	4.64E+03
Arsenic	4.47E+00	5.13E+00	4.80E+00	2/8	9.90E-01	5.00E+00	0/8	1.20E+01	0/8	3.15E+02	2/8	5.23E-01
Barium	5.14E+01	9.32E+01	7.76E+01	8/8	1.00E+00	5.00E+00	0/8	2.00E+02	0/8	1.00E+05	0/8	2.29E+02
Beryllium	5.40E-01	7.30E-01	6.18E-01	4/8	4.70E-01	5.00E-01	1/8	6.70E-01	0/8	1.28E+03	0/8	9.48E-01
Calcium	2.58E+03	8.09E+04	4.02E+04	8/8	5.00E+01	5.00E+02	6/8	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.38E+00	1.35E+01	9.77E+00	8/8	2.00E+00	2.50E+00	0/8	1.60E+01	n/a	n/a	0/8	3.56E+02
Cobalt	2.61E+00	6.85E+00	5.16E+00	7/8	1.00E+00	2.50E+00	0/8	1.40E+01	0/8	1.00E+05	0/8	1.92E+03
Copper	6.39E+00	1.03E+01	8.06E+00	8/8	2.00E+00	2.50E+00	0/8	1.90E+01	0/8	1.00E+05	0/8	4.93E+02
Iron	6.08E+03	1.96E+04	1.23E+04	8/8	5.00E+00	2.00E+01	0/8	2.80E+04	0/8	1.00E+05	8/8	2.07E+03
Magnesium	7.00E+02	3.05E+03	2.02E+03	8/8	4.74E+00	1.50E+01	4/8	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.81E+02	6.64E+02	3.59E+02	8/8	1.00E+00	1.00E+01	0/8	1.50E+03	0/8	4.64E+04	8/8	4.52E+01
Nickel	6.58E+00	2.07E+01	1.19E+01	7/8	4.74E+00	5.00E+00	0/8	2.10E+01	0/8	9.30E+04	0/8	2.42E+02
Potassium	2.18E+02	8.21E+02	5.31E+02	7/7	9.48E+01	1.00E+02	0/7	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.37E+00	1.37E+00	1.37E+00	1/8	1.00E+00	1.99E+01	1/8	8.00E-01	0/8	2.56E+04	0/8	9.49E+01
Sodium	2.02E+02	2.34E+02	2.19E+02	4/7	9.48E+01	2.00E+02	0/7	3.20E+02	n/a	n/a	n/a	n/a
Uranium	2.02E+00	8.56E+00	4.63E+00	3/5	1.30E-01	2.00E+02	1/5	4.90E+00	0/5	3.34E+03	0/5	2.02E+01
Vanadium	1.04E+01	2.78E+01	2.01E+01	8/8	2.00E+00	2.50E+00	0/8	3.80E+01	0/8	4.47E+03	8/8	3.32E+00
Zinc	2.16E+01	6.37E+01	4.95E+01	7/8	1.50E+01	2.00E+01	1/8	6.50E+01	0/8	1.00E+05	0/8	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	5.24E+00	1.86E+01	1.38E+01	7/7	1.39E+00	1.20E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.68E+00	3.78E+01	2.12E+01	7/7	1.17E+00	6.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-8.00E-02	2.70E-01	6.02E-02	6/13	1.68E-02	2.20E+00	0/13	4.90E-01	0/13	8.58E+00	1/13	8.58E-02
Technetium-99	6.47E+00	1.88E+01	1.16E+01	4/8	2.64E+00	5.77E+00	4/8	2.50E+00	0/8	3.62E+04	0/8	3.62E+02
Thorium-228	2.29E-01	3.63E-01	3.14E-01	3/3	6.44E-02	1.50E-01	0/3	1.60E+00	0/3	2.80E+00	3/3	2.80E-02
Thorium-230	2.11E-01	5.41E-01	3.76E-01	2/3	1.90E-01	2.00E-01	0/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	3.41E-01	3.54E-01	3.49E-01	3/3	3.00E-02	4.44E-02	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Uranium-234	3.14E-01	4.15E-01	3.65E-01	2/3	8.00E-02	2.77E-01	0/3	2.50E+00	0/3	1.98E+03	0/3	1.98E+01
Uranium-235	2.90E-02	4.28E-02	3.59E-02	2/8	2.00E-02	7.60E+00	0/8	1.40E-01	0/8	3.95E+01	0/8	3.95E-01
Uranium-238	5.07E-01	4.91E+00	1.95E+00	8/8	4.00E-02	4.24E+00	4/8	1.20E+00	0/8	1.71E+02	3/8	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	1.18E-01	1.10E+00	6.09E-01	2/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+02	1/10	2.12E-01
Benzo(a)pyrene	2.77E-01	6.50E-01	4.64E-01	2/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+01	2/10	2.12E-02
Benzo(b)fluoranthene	2.84E-01	8.00E-01	5.42E-01	2/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+02	2/10	2.12E-01
Benzo(ghi)perylene	1.17E-01	1.17E-01	1.17E-01	1/10	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.50E-01	4.50E-01	4.50E-01	1/8	4.60E-01	5.00E-01	n/a	n/a	0/8	2.08E+03	0/8	2.12E+00
Chrysene	2.17E-01	1.40E+00	8.09E-01	2/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+04	0/10	2.12E+01
Di-n-butyl phthalate	7.60E-01	7.60E-01	7.60E-01	1/6	4.60E-01	5.00E-01	n/a	n/a	0/6	1.00E+05	0/6	2.13E+03
Fluoranthene	2.49E-01	2.49E-01	2.49E-01	1/8	4.60E-01	5.00E-01	n/a	n/a	0/8	6.50E+04	0/8	2.21E+02
Indeno(1,2,3-cd)pyrene	1.59E-01	1.59E-01	1.59E-01	1/10	4.60E-01	5.00E-01	n/a	n/a	0/10	2.08E+02	0/10	2.12E-01
Phenanthrene	1.90E+00	1.90E+00	1.90E+00	1/10	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.19. Summary of Surface and Subsurface Historical Data at SWMU 228 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Pyrene	2.69E-01	1.70E+00	9.85E-01	2/10	4.60E-01	5.00E-01	n/a	n/a	0/10	4.87E+04	0/10	1.65E+02
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	6.10E+03	1.10E+04	8.55E+03	2/2	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.51E+03	1.05E+04	7.51E+03	24/24	1.83E+01	2.00E+01	0/24	1.20E+04	0/24	1.00E+05	21/24	4.64E+03
Arsenic	1.10E+00	6.19E+00	3.22E+00	9/24	9.15E-01	5.00E+00	0/24	7.90E+00	0/24	3.15E+02	9/24	5.23E-01
Barium	1.27E+01	9.75E+01	5.29E+01	24/24	1.00E+00	2.47E+00	0/24	1.70E+02	0/24	1.00E+05	0/24	2.29E+02
Beryllium	5.00E-01	1.51E+00	7.69E-01	10/24	4.57E-01	5.00E-01	5/24	6.90E-01	0/24	1.28E+03	2/24	9.48E-01
Calcium	2.64E+02	1.49E+04	2.23E+03	24/24	5.00E+01	1.00E+02	2/24	6.10E+03	n/a	n/a	n/a	n/a
Chromium	4.32E+00	8.39E+01	2.01E+01	24/24	2.00E+00	2.47E+00	6/24	4.30E+01	n/a	n/a	0/24	3.56E+02
Cobalt	1.96E+00	7.53E+00	3.51E+00	23/24	1.00E+00	2.47E+00	0/24	1.30E+01	0/24	1.00E+05	0/24	1.92E+03
Copper	2.02E+00	2.09E+01	6.03E+00	23/24	2.00E+00	2.47E+00	1/24	2.50E+01	0/24	1.00E+05	0/24	4.93E+02
Iron	4.16E+03	5.87E+04	1.29E+04	24/24	5.00E+00	5.00E+01	1/24	2.80E+04	0/24	1.00E+05	24/24	2.07E+03
Lead	5.91E+00	9.08E+00	7.38E+00	7/24	9.15E-01	2.00E+01	0/24	2.30E+01	0/24	1.25E+03	0/24	5.00E+01
Magnesium	1.96E+02	2.37E+03	8.71E+02	24/24	4.57E+00	1.50E+01	1/24	2.10E+03	n/a	n/a	n/a	n/a
Manganese	3.48E+01	3.09E+02	1.62E+02	24/24	1.00E+00	1.00E+01	0/24	8.20E+02	0/24	4.64E+04	23/24	4.52E+01
Nickel	6.42E+00	4.07E+01	1.53E+01	20/24	4.57E+00	5.00E+00	5/24	2.20E+01	0/24	9.30E+04	0/24	2.42E+02
Potassium	1.12E+02	4.07E+02	2.73E+02	15/17	1.00E+02	1.00E+02	0/17	9.50E+02	n/a	n/a	n/a	n/a
Sodium	1.40E+02	1.18E+03	4.11E+02	18/24	9.15E+01	2.00E+02	6/24	3.40E+02	n/a	n/a	n/a	n/a
Uranium	1.02E+00	1.02E+00	1.02E+00	1/7	9.15E-01	9.89E-01	0/7	4.60E+00	0/7	3.34E+03	0/7	2.02E+01
Vanadium	5.94E+00	7.91E+01	2.61E+01	24/24	2.00E+00	2.47E+00	4/24	3.70E+01	0/24	4.47E+03	24/24	3.32E+00
Zinc	1.68E+01	4.83E+01	2.62E+01	15/24	1.50E+01	2.00E+01	0/24	6.00E+01	0/24	1.00E+05	0/24	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	2.48E+00	2.38E+01	7.65E+00	21/22	7.23E-01	9.60E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.24E+00	2.34E+01	9.82E+00	22/22	3.70E-01	7.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-228	3.03E-01	5.06E-01	3.64E-01	7/7	9.18E-02	2.28E-01	0/7	1.60E+00	0/7	2.80E+00	7/7	2.80E-02
Thorium-230	2.00E-01	3.41E-01	2.68E-01	5/7	1.06E-01	2.57E-01	0/7	1.40E+00	0/7	1.49E+03	0/7	1.49E+01
Thorium-232	2.75E-01	4.02E-01	3.28E-01	7/7	5.52E-02	1.32E-01	0/7	1.50E+00	0/7	1.35E+03	0/7	1.35E+01
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	7.20E-01	5.30E+00	1.68E+00	7/18	4.60E-01	5.00E-01	n/a	n/a	0/18	1.00E+05	0/18	2.13E+03
Volatiles (mg/kg)												
Acetone	1.30E-02	1.30E-02	1.30E-02	1/18	1.00E-02	1.00E-02	n/a	n/a	0/18	1.91E+04	0/18	3.58E+02
Trichloroethene	1.10E-03	3.80E-03	2.73E-03	4/39	1.00E-03	6.17E-01	n/a	n/a	0/39	2.98E+02	0/39	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure 5.27. Soils Operable Unit: SWMUs 12, 13, 228, 229, and 518

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 229 (DMSA OS-18)

Area description

DMSA OS-18 (SWMU 229) is located in the north of C-746-F in the northwest portion of the plant site. SWMU 229 is approximately 35,112 ft^2.

Process history

This area was established soon after plant construction to store excess railroad supplies, parts, components, etc. Later it became an area in which to store various excess material. Material found to have been stored within the SWMU includes scrap metal, concrete, fireproof safes, portable work platform, empty trash cans, empty 55-gal drums, miscellaneous equipment and parts, road signs, manhole covers, scaffolding, railroad ties, fans, chain link fencing, two small buildings, parts from railroad cars, oils, light bulbs, circuit boards, fuses, and batteries.

Previous investigation results

In 2001, DOE began characterization and remediation of the materials in the DMSAs. RCRA-regulated items have been removed from the SWMU and placed in proper storage. This DMSA now qualifies as a Phase 3 DMSA because it has been fully characterized and contains no fissionable material (DOE 2003a).

Table 5.20 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.28).

Area utilities

No current recirculating water lines or sewers are associated with this DMSA and none pass within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.20. Summary of Surface and Subsurface Historical Data at SWMU 229

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	2.43E+03	4.83E+03	3.63E+03	2/2	2.00E+01	2.00E+01	0/2	1.30E+04	0/2	1.00E+05	1/2	4.64E+03
Arsenic	7.01E+00	7.01E+00	7.01E+00	1/2	5.00E+00	5.00E+00	0/2	1.20E+01	0/2	3.15E+02	1/2	5.23E-01
Barium	3.83E+01	4.49E+01	4.16E+01	2/2	1.00E+00	5.00E+00	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Beryllium	7.40E-01	7.40E-01	7.40E-01	1/2	5.00E-01	5.00E-01	1/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Calcium	2.10E+04	4.27E+04	3.19E+04	2/2	2.00E+02	5.00E+02	2/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.29E+00	1.13E+01	9.30E+00	2/2	2.00E+00	2.50E+00	0/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	5.91E+00	5.91E+00	5.91E+00	1/2	1.00E+00	2.50E+00	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	2.66E+00	1.01E+01	6.38E+00	2/2	2.00E+00	2.50E+00	0/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	8.34E+03	2.69E+04	1.76E+04	2/2	2.00E+01	5.00E+01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Magnesium	1.36E+03	2.59E+03	1.98E+03	2/2	1.50E+01	1.50E+01	1/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.37E+02	3.95E+02	2.66E+02	2/2	1.00E+00	1.00E+01	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	9.72E+00	9.72E+00	9.72E+00	1/2	5.00E+00	5.00E+00	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Potassium	2.92E+02	2.92E+02	2.92E+02	1/1	1.00E+02	1.00E+02	0/1	1.30E+03	n/a	n/a	n/a	n/a
Vanadium	1.45E+01	1.47E+01	1.46E+01	2/2	2.00E+00	2.50E+00	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	5.97E+01	5.97E+01	5.97E+01	1/2	1.50E+01	2.00E+01	0/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Radionuclides (pCi/g)												
Beta activity	1.72E+01	1.72E+01	1.72E+01	1/1	7.70E+00	7.70E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	7.13E-02	4.60E-01	2.70E-01	3/4	1.53E-02	7.70E-01	1/4	4.90E-01	0/4	8.58E+00	2/4	8.58E-02
Technetium-99	7.85E+00	7.85E+00	7.85E+00	1/2	2.64E+00	4.52E+00	1/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-228	3.36E-01	3.36E-01	3.36E-01	1/1	6.80E-02	6.80E-02	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	7.28E-01	7.28E-01	7.28E-01	1/1	1.91E-01	1.91E-01	0/1	1.50E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	3.20E-01	3.20E-01	3.20E-01	1/1	4.84E-02	4.84E-02	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium-235	6.66E-02	6.66E-02	6.66E-02	1/2	2.77E-02	3.80E+00	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	9.30E-01	1.68E+00	1.24E+00	3/3	5.51E-01	3.29E+00	1/3	1.20E+00	0/3	1.71E+02	0/3	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	6.00E-01	3.10E+01	6.95E+00	5/10	4.60E-01	2.40E+00	n/a	n/a	0/10	6.67E+04	0/10	3.16E+02
Anthracene	7.10E-01	4.00E+01	8.85E+00	5/10	4.60E-01	2.40E+00	n/a	n/a	0/10	1.00E+05	0/10	3.79E+03
Benz(a)anthracene	7.78E-01	1.10E+02	1.82E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	0/10	2.08E+02	7/10	2.12E-01
Benzo(a)pyrene	3.89E-01	8.00E+01	1.35E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	1/10	2.08E+01	7/10	2.12E-02
Benzo(b)fluoranthene	1.80E+00	1.70E+02	2.77E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	0/10	2.08E+02	7/10	2.12E-01
Benzo(ghi)perylene	6.19E-01	2.80E+01	4.95E+00	7/10	4.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.79E-01	4.79E-01	4.79E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+03	0/1	2.12E+00
Bis(2-ethylhexyl)phthalate	4.70E+00	5.70E+00	5.03E+00	3/10	4.60E-01	2.40E+00	n/a	n/a	0/10	7.40E+03	0/10	8.84E+00
Carbazole	5.50E-01	3.70E+01	1.30E+01	3/10	4.60E-01	2.40E+00	n/a	n/a	0/10	1.28E+04	1/10	2.15E+01
Chrysene	1.07E+00	9.50E+01	1.66E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	0/10	2.08E+04	1/10	2.12E+01
Di-n-butyl phthalate	1.70E+00	1.70E+00	1.70E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	1.00E+05	0/1	2.13E+03
Fluoranthene	1.35E+00	1.35E+00	1.35E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	6.50E+04	0/1	2.21E+02
Fluorene	5.90E-01	2.70E+01	7.35E+00	4/10	4.60E-01	2.40E+00	n/a	n/a	0/10	7.09E+04	0/10	3.39E+02
Indeno(1,2,3-cd)pyrene	6.55E-01	3.70E+01	6.44E+00	7/10	4.60E-01	2.40E+00	n/a	n/a	0/10	2.08E+02	7/10	2.12E-01
Pentachlorophenol	3.57E-01	3.57E-01	3.57E-01	1/10	4.60E-01	2.40E+00	n/a	n/a	0/10	2.56E+03	0/10	2.12E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.20. Summary of Surface and Subsurface Historical Data at SWMU 229 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Phenanthrene	2.24E-01	4.70E+01	1.13E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	5.30E-01	1.50E+02	2.59E+01	7/10	4.60E-01	2.40E+00	n/a	n/a	0/10	4.87E+04	0/10	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.72E+03	1.18E+04	8.12E+03	5/5	2.00E+01	2.00E+01	0/5	1.20E+04	0/5	1.00E+05	4/5	4.64E+03
Arsenic	5.04E+00	5.64E+00	5.34E+00	2/5	5.00E+00	5.00E+00	0/5	7.90E+00	0/5	3.15E+02	2/5	5.23E-01
Barium	1.84E+01	7.60E+01	4.92E+01	5/5	1.00E+00	1.00E+00	0/5	1.70E+02	0/5	1.00E+05	0/5	2.29E+02
Beryllium	7.40E-01	9.60E-01	8.65E-01	4/5	5.00E-01	5.00E-01	4/5	6.90E-01	0/5	1.28E+03	1/5	9.48E-01
Calcium	9.53E+02	1.23E+03	1.06E+03	5/5	5.00E+01	1.00E+02	0/5	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.46E+01	3.40E+01	2.06E+01	5/5	2.00E+00	2.00E+00	3/5	4.30E+01	n/a	n/a	0/5	3.56E+02
Cobalt	2.04E+00	6.68E+00	4.51E+00	5/5	1.00E+00	2.00E+00	0/5	1.30E+01	0/5	1.00E+05	0/5	1.92E+03
Copper	2.14E+00	7.23E+00	4.55E+00	5/5	2.00E+00	2.00E+00	0/5	2.50E+01	0/5	1.00E+05	0/5	4.93E+02
Iron	9.44E+03	3.29E+04	1.83E+04	5/5	5.00E+00	5.00E+01	1/5	2.80E+04	0/5	1.00E+05	5/5	2.07E+03
Magnesium	2.90E+02	1.18E+03	8.07E+02	5/5	1.50E+01	1.50E+01	0/5	2.10E+03	n/a	n/a	n/a	n/a
Manganese	2.46E+01	2.89E+02	1.44E+02	5/5	1.00E+00	1.00E+01	0/5	8.20E+02	0/5	4.64E+04	4/5	4.52E+01
Nickel	6.97E+00	1.33E+01	1.05E+01	3/5	5.00E+00	5.00E+00	0/5	2.20E+01	0/5	9.30E+04	0/5	2.42E+02
Potassium	1.19E+02	3.63E+02	2.25E+02	5/5	1.00E+02	1.00E+02	0/5	9.50E+02	n/a	n/a	n/a	n/a
Sodium	2.18E+02	3.89E+02	2.70E+02	4/5	2.00E+02	2.00E+02	1/5	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.65E+01	4.24E+01	3.12E+01	5/5	2.00E+00	2.00E+00	1/5	3.70E+01	0/5	4.47E+03	5/5	3.32E+00
Zinc	1.58E+01	3.28E+01	2.45E+01	4/5	1.50E+01	2.00E+01	0/5	6.00E+01	0/5	1.00E+05	0/5	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	3.61E+00	1.83E+01	1.04E+01	5/5	1.23E+00	8.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.63E+00	1.78E+01	1.07E+01	5/5	4.00E-01	7.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	6.40E-01	6.40E-01	6.40E-01	1/5	4.60E-01	5.00E-01	n/a	n/a	0/5	7.40E+03	0/5	8.84E+00
Di-n-butyl phthalate	1.00E+00	5.40E+00	3.20E+00	2/5	4.60E-01	5.00E-01	n/a	n/a	0/5	1.00E+05	0/5	2.13E+03
Fluoranthene	2.02E-01	2.02E-01	2.02E-01	1/5	4.60E-01	5.00E-01	n/a	n/a	0/5	6.50E+04	0/5	2.21E+02
Volatiles (mg/kg)												
Trichloroethene	2.60E-03	2.60E-03	2.60E-03	1/10	1.20E-03	3.87E-01	n/a	n/a	0/10	2.98E+02	0/10	2.51E+00
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	5.90E+02	5.90E+02	5.90E+02	1/2	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

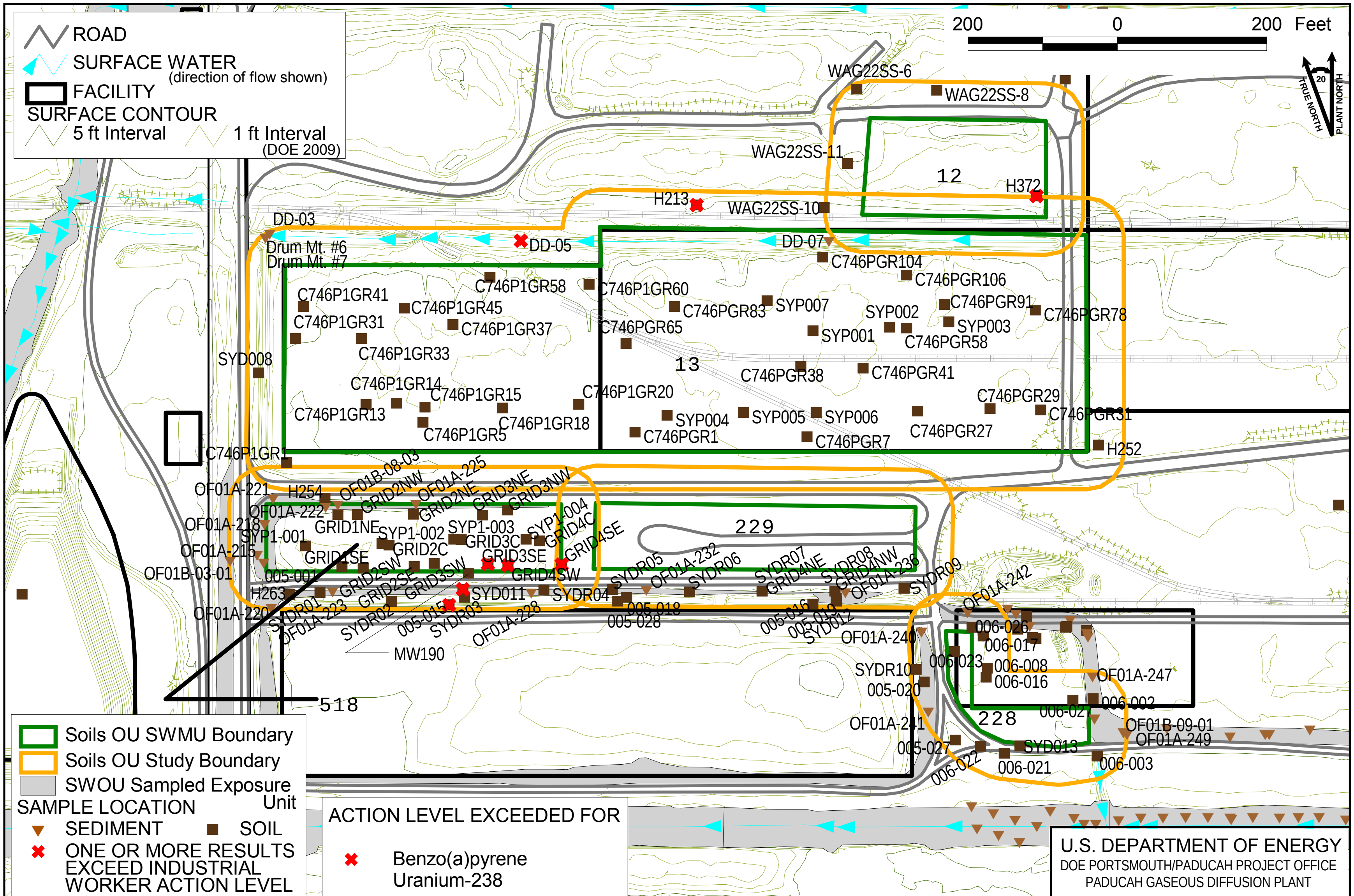


Figure 5.28. Soils Operable Unit: SWMUs 12, 13, 228, 229, and 518

Figure No. \SoilsOU\SOU_SWMUsR5.apr
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5.1.3 Group 2–Underground/Tank

SWMU 11 (C-400 Trichloroethene Leak Site, Southeast of C-400 Building)

Area description

The C-400 TCE Leak Site (SWMU 11) is located at the southeast corner of C-400, near the central portion of the plant. This SWMU is part of the SOU and the GWOU.

Process history

A leak of TCE from the sump in the C-400 degreaser area to the storm sewer was discovered in 1986. TCE was released at various times through broken pipes and joints in a leaking underground storm sewer pipe from the C-400 Building. It had not been known previously that the sump discharged to the sewer. After the leak was discovered, discharge lines from the sump in the basement of C-400 were disconnected from the storm sewer. TCE-contaminated soils were excavated from the area of the leak.

Previous investigation results

TCE concentrations as high as 700,000 μg/kg were reported in soil samples collected adjacent to and below the storm sewer line during removal of the contaminated soil in 1986 (EDGe 1988). Approximately 9,200 ft^3 of contaminated soil and bedding material were excavated, containerized, and stored as hazardous waste for future treatment and disposal. Some of the contaminated soil is known to have been left in place because of concerns about the structural integrity of 11th Street and the TCE Tank Pad, located to the west between the spill site and the C-400 Building (CH2M HILL 1992). The excavated area was backfilled with clean fill material and capped with a layer of clay after excavation activities were completed.

The Trichloroethlene Leak Site (SWMU 11) was investigated under the Phase I and Phase II SIs. The analytical results for the soil samples collected from the deep boring showed that TCE was detected in the soils at concentrations throughout the interval sampled (4 to 93 ft bgs) (DOE 1999b).

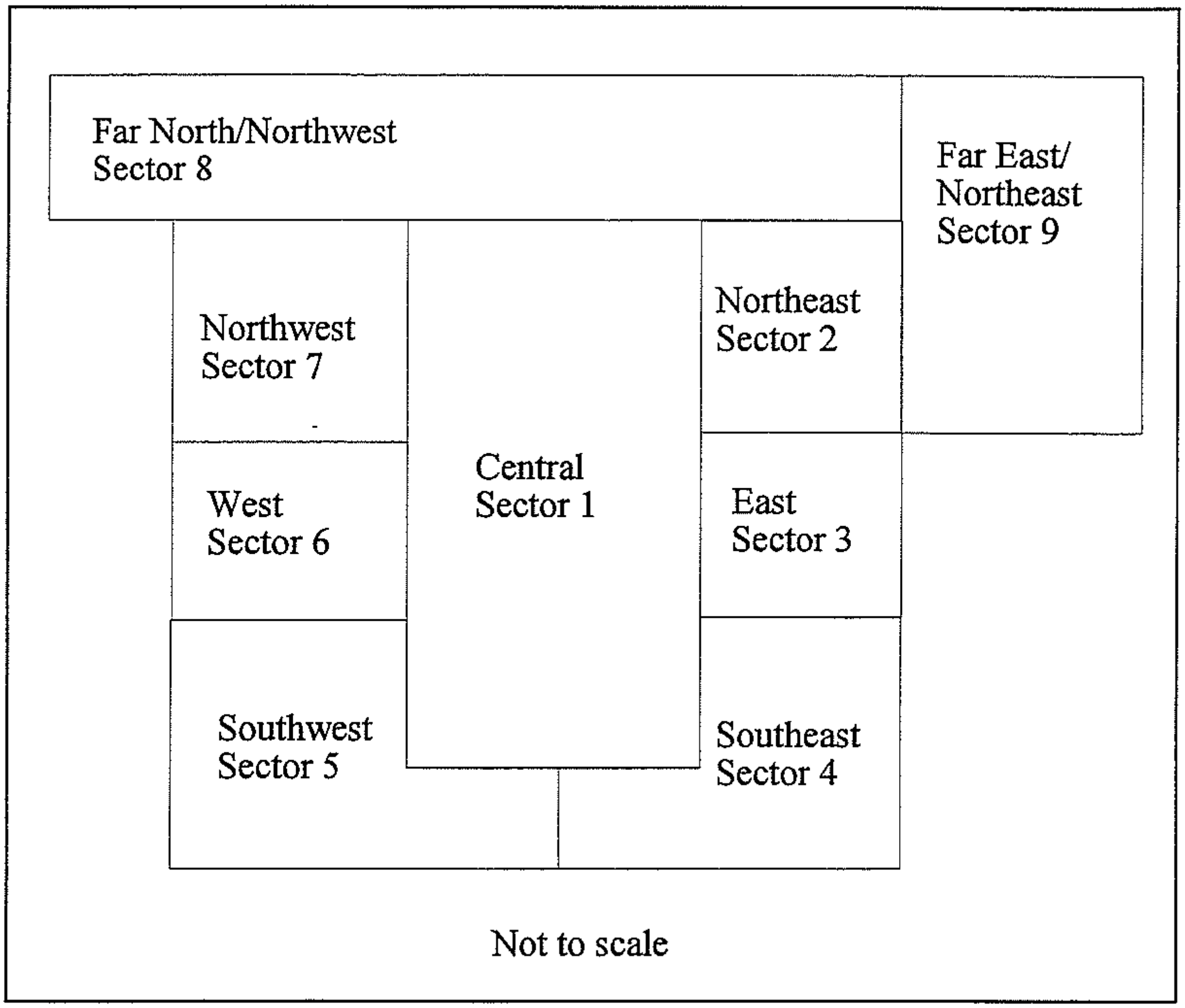
The WAG 6 RI (DOE 1999b) placed SWMU 11 in Sector 4 of its investigation. The conclusions of the WAG 6 RI are presented using geographically related sectors. The sectors and their definitions are as follows:

- Sector 1–the area under the C-400 Building.
- Sector 2–the area to the northeast of C-400 Building. This Sector contains the Neutralization Tank (SWMU 40).
- Sector 3– the area to the east of the C-400 Building. This Sector does not contain a SWMU.
- Sector 4–the area to the southeast of the C-400 Building. This Sector contains the Trichloroethene Leak Site (SWMU 11) and a TCE off-loading pump station.
- Sector 5–the area to the southwest of C-400 Building. This Sector does not contain a SWMU.
- Sector 6–the area to the west of C-400 Building. This Sector contains the Technetium Storage Tank (SWMU 47).

- Sector 7–the area to the northwest of the C-400 Building. This Sector contains the Waste Discard Sump (SWMU 203).

- Sector 8–the area to the far north and far northeast of the C-400 Building. This Sector contains the C-401 Transfer Line (SWMU 26).

- Sector 9–the area to the far east and far northeast of the C-400 Building. This Sector does not contain a SWMU.



Major borders of Sector 4 are formed by the East Sector (Sector 3) on the north, by 11th Street on the east, by Tennessee Avenue on the south, and by the C-400 Building on the west. In addition to SWMU 11, which is composed of an underground discharge line running from the C-400 Building and the associated soils, the Southeast Sector also contains the TCE Truck Unloading Pumps and storage tank, a parking lot, and a cylinder storage and handling area.

WAG 6 found a widespread TCE-impacted area located primarily between C-400 Building and 11th Street and north of Tennessee Avenue. In that area, a large zone of shallow soil contains greater than 225,000 μg/kg (5–9 ft bgs) TCE, indicating that the chlorinated solvent is present as a dense nonaqueous-phase liquid in the UCRS soil. The highest concentrations were found below the backfilled excavation at

SWMU 11 [8,208,600 µg/kg (28–31.5 ft bgs)] and adjacent to the TCE off-loading pumps [11,055,000 µg/kg (5–9 ft bgs)]. The high TCE concentrations in the shallow zone of soil that extends south of the off-loading pumps probably are due to migration of TCE along the bedding material of the utility line that runs north-south through SWMU 11. Other WAG 6 COCs were arsenic, beryllium, dichloroethene, PAHs, PCBs, vinyl chloride, cesium-137, aluminum, antimony, chromium, iron, manganese, and vanadium.

Summary table from the BRA for WAG 6 (Table 6.1 of the WAG 6 document) follows:

Table 6.1. Scenarios for which human health risk exceeds *de minimis* levels

		Location (Sector Number)								
Scenairo	WAG 6	1	2	3	4	5	6	7	8	9
Results for ELCR										
Current Industrial Worker	X	–	X	X	X	X	X	X	X	X
Future Industrial Worker		–	X	X	X	X	X	X	X	X
Exposure to Soil	X									
Exposure to Water[a]	X									
Future Excavation Worker	X	X	X	X	X	X	X	X	X	X
Future Recreational User	X	–	–	X	–	X	X	–	X	–
Future On-site Resident		–	X	X	X	X	X	X	X	X
Exposure to Soil	X									
Exposure to Water[a]	X									
Results for systemic toxicity[b]										
Current Industrial Worker	X	–	–	–	–	X	X	X	–	X
Future Industrial Worker		–	–	–	–	X	X	X	–	X
Exposure to Soil	X									
Exposure to Water[a]	X									
Future Excavation Worker	X	X	X	–	X	X	X	X	X	X
Future Recreational User	–	–	–	–	–	–	–	–	–	–
Future On-site Resident		–	X	X	X	X	X	X	X	X
Exposure to Soil	X									
Exposure to Water[a]	X									

[a] In the BHHRA, the risk from exposure to water was assessed on a WAG 6 area basis; therefore, these risks are not summed with those from exposure to soil. Additionally, in the BHHRA, risks associated with use of water drawn from the RGA were assessed separately from risks associated with use of water drawn from the McNairy Formation. The value reported here is for use of water drawn from the RGA.

[b] For the future recreational user and the future on-site resident scenarios, the results for child exposure are presented.

Notes: Scenarios in which risk exceeded *de minimis* levels are marked with an "X". Scenarios in which risk did not exceed *de minimis* levels are marked with a "–".

Table 5.21 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.29).

Area utilities

A storm sewer is associated with this leak site. Approximate depth to the sewer is 13 ft bgs.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.21. Summary of Surface and Subsurface Historical Data at SWMU 11

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	2.20E-03	2.20E-03	2.20E-03	1/1	n/a	n/a	n/a	n/a	0/1	6.19E-01	0/1	6.19E-03
Metals (mg/kg)												
Aluminum	1.42E+03	2.27E+03	1.85E+03	2/2	n/a	n/a	0/2	1.30E+04	0/2	1.00E+05	0/2	4.64E+03
Arsenic	1.80E+00	2.20E+00	2.00E+00	2/2	n/a	n/a	0/2	1.20E+01	0/2	3.15E+02	2/2	5.23E-01
Barium	1.93E+01	3.48E+01	2.71E+01	2/2	n/a	n/a	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Beryllium	2.40E-01	3.40E-01	2.90E-01	2/2	n/a	n/a	0/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Cadmium	8.70E-01	1.20E+00	1.04E+00	2/2	n/a	n/a	2/2	2.10E-01	0/2	7.05E+01	0/2	2.13E+01
Calcium	1.11E+05	2.00E+05	1.56E+05	2/2	n/a	n/a	2/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	9.50E+00	1.84E+01	1.40E+01	2/2	n/a	n/a	1/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	2.60E+00	4.30E+00	3.45E+00	2/2	n/a	n/a	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.46E+01	2.10E+01	1.78E+01	2/2	n/a	n/a	1/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	7.76E+03	7.85E+03	7.81E+03	2/2	n/a	n/a	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	3.87E+01	5.20E+01	4.54E+01	2/2	n/a	n/a	2/2	3.60E+01	0/2	1.25E+03	1/2	5.00E+01
Magnesium	3.02E+03	5.04E+03	4.03E+03	2/2	n/a	n/a	2/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.13E+02	2.06E+02	1.60E+02	2/2	n/a	n/a	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	1.17E+01	2.15E+01	1.66E+01	2/2	n/a	n/a	1/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Sodium	1.37E+02	2.05E+02	1.71E+02	2/2	n/a	n/a	0/2	3.20E+02	n/a	n/a	n/a	n/a
Vanadium	1.10E+01	1.15E+01	1.13E+01	2/2	n/a	n/a	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	1.97E+02	3.87E+02	2.92E+02	2/2	n/a	n/a	2/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB-1260	1.20E+01	1.20E+01	1.20E+01	1/2	1.70E+00	1.70E+00	n/a	n/a	0/2	4.25E+01	1/2	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	6.73E+00	1.80E+01	1.15E+01	3/3	7.62E+00	7.62E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.58E+01	6.70E+01	4.19E+01	3/3	1.76E+01	1.76E+01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	2.50E-01	5.40E-01	3.95E-01	2/2	n/a	n/a	2/2	1.00E-01	0/2	2.71E+01	1/2	2.71E-01
Plutonium-239	4.20E-01	5.70E-01	4.95E-01	2/2	n/a	n/a	2/2	2.50E-02	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	4.30E+01	6.50E+01	5.40E+01	2/2	n/a	n/a	2/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-230	2.50E+00	3.60E+00	3.05E+00	2/2	n/a	n/a	2/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium-234	7.80E+00	1.00E+01	8.90E+00	2/2	n/a	n/a	2/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	2.60E-01	4.20E-01	3.40E-01	2/2	n/a	n/a	2/2	1.40E-01	0/2	3.95E+01	1/2	3.95E-01
Uranium-238	1.10E+01	1.40E+01	1.25E+01	2/2	n/a	n/a	2/2	1.20E+00	0/2	1.71E+02	2/2	1.71E+00
Semivolatiles (mg/kg)												
2,4-Dimethylphenol	1.80E-01	2.20E-01	2.00E-01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	4.51E+04	0/2	2.25E+02
2-Methylnaphthalene	6.30E+00	1.00E+01	8.15E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
2-Methylphenol	9.90E-02	9.90E-02	9.90E-02	1/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	5.62E+02
4-Methylphenol	2.20E-01	2.30E-01	2.25E-01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.32E+04	0/2	7.18E+01
Acenaphthene	9.30E+00	1.70E+01	1.32E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	6.67E+04	0/2	3.16E+02
Acenaphthylene	2.60E+00	3.60E+00	3.10E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	6.10E+00	2.30E+01	1.46E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	3.79E+03
Benz(a)anthracene	1.60E+01	2.80E+01	2.20E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.21. Summary of Surface and Subsurface Historical Data at SWMU 11 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Benzo(a)pyrene	1.60E+01	2.90E+01	2.25E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	1/2	2.08E+01	2/2	2.12E-02
Benzo(b)fluoranthene	8.50E+00	1.60E+01	1.23E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01
Benzo(ghi)perylene	3.40E+00	1.30E+01	8.20E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.10E+01	1.90E+01	1.50E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+03	2/2	2.12E+00
Chrysene	1.70E+01	2.90E+01	2.30E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+04	1/2	2.12E+01
Dibenz(a,h)anthracene	1.50E+00	4.30E+00	2.90E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+01	2/2	2.12E-02
Dibenzofuran	5.90E+00	9.10E+00	7.50E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	9.02E+03	0/2	1.86E+01
Dimethylnaphthalene	3.00E+00	7.00E+00	4.75E+00	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoranthene	3.50E+01	6.00E+01	4.75E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	6.50E+04	0/2	2.21E+02
Fluorene	8.70E+00	1.70E+01	1.29E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	7.09E+04	0/2	3.39E+02
Indeno(1,2,3-cd)pyrene	3.80E+00	1.20E+01	7.90E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01
Methylphenanthrene	9.00E+00	1.00E+01	9.50E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Naphthalene	5.80E+00	1.60E+01	1.09E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	7.66E+02	0/2	2.36E+01
Phenanthrene	4.70E+01	6.30E+01	5.50E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	3.60E+01	4.10E+01	3.85E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	4.87E+04	0/2	1.65E+02
Pyrene,1-methyl	9.00E+00	1.00E+01	9.50E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Trimethylnaphthalene	8.00E+00	1.00E+01	9.00E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.00E-03	1.00E-03	1.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	9.38E+03	0/2	1.56E+02
Tetrachloroethene	3.00E-03	3.00E-03	3.00E-03	1/9	6.00E-03	6.00E-03	n/a	n/a	0/9	1.46E+03	0/9	3.90E+00
Toluene	3.00E-03	3.00E-03	3.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	7.28E+03	0/2	2.11E+02
Trichloroethene	8.00E-04	1.72E+01	4.84E+00	8/9	1.00E-03	1.00E-03	n/a	n/a	0/9	2.98E+02	4/9	2.51E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	2.54E+03	2.03E+04	9.02E+03	282/282	1.00E+01	1.00E+02	45/282	1.20E+04	0/282	1.00E+05	264/282	4.64E+03
Antimony	6.00E-01	1.70E+00	9.45E-01	11/38	6.00E-01	5.00E+00	11/38	2.10E-01	0/38	4.63E+02	11/38	3.79E-01
Arsenic	1.36E+00	2.29E+01	5.35E+00	63/282	7.00E-02	2.00E+01	7/282	7.90E+00	0/282	3.15E+02	63/282	5.23E-01
Barium	1.37E+01	1.62E+03	7.34E+01	282/282	2.00E-02	2.50E+00	11/282	1.70E+02	0/282	1.00E+05	3/282	2.29E+02
Beryllium	2.20E-01	8.50E-01	5.34E-01	38/38	1.00E-02	1.00E-02	4/38	6.90E-01	0/38	1.28E+03	0/38	9.48E-01
Cadmium	2.00E-02	1.10E+00	2.55E-01	22/38	2.00E-02	7.50E-01	7/38	2.10E-01	0/38	7.05E+01	0/38	2.13E+01
Calcium	2.40E+02	2.52E+05	5.16E+03	282/282	1.00E-01	2.00E+03	26/282	6.10E+03	n/a	n/a	n/a	n/a
Chromium	3.50E+00	1.17E+02	1.52E+01	281/282	8.00E-02	2.50E+00	77/282	4.30E+01	n/a	n/a	0/282	3.56E+02
Cobalt	1.05E+00	1.61E+01	5.00E+00	38/38	9.00E-02	1.00E-01	2/38	1.30E+01	0/38	1.00E+05	0/38	1.92E+03
Copper	2.70E+00	1.44E+01	8.52E+00	38/38	1.00E-01	1.00E-01	0/38	2.50E+01	0/38	1.00E+05	0/38	4.93E+02
Iron	2.46E+03	5.51E+04	1.35E+04	282/282	7.00E+00	1.00E+02	6/282	2.80E+04	0/282	1.00E+05	282/282	2.07E+03
Lead	4.50E+00	1.07E+02	1.34E+01	43/282	2.00E-01	2.00E+01	5/282	2.30E+01	0/282	1.25E+03	1/282	5.00E+01
Magnesium	1.16E+02	7.84E+03	1.15E+03	282/282	1.00E-01	5.00E+00	12/282	2.10E+03	n/a	n/a	n/a	n/a
Manganese	4.60E+00	3.05E+03	2.46E+02	282/282	2.00E-02	5.00E+00	10/282	8.20E+02	0/282	4.64E+04	211/282	4.52E+01
Mercury	9.50E-03	5.70E-01	4.30E-02	25/282	8.60E-03	2.00E-01	1/282	1.30E-01	0/282	8.25E+02	0/282	9.82E-01
Nickel	2.30E+00	7.36E+01	9.49E+00	160/282	1.00E-01	5.00E+00	2/282	2.20E+01	0/282	9.30E+04	0/282	2.42E+02
Potassium	8.10E+01	1.07E+03	3.72E+02	263/282	2.00E+00	2.00E+02	2/282	9.50E+02	n/a	n/a	n/a	n/a
Selenium	2.00E-01	1.84E+00	1.17E+00	23/282	1.30E-01	2.00E+01	21/282	7.00E-01	0/282	2.56E+04	0/282	9.49E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.21. Summary of Surface and Subsurface Historical Data at SWMU 11 (Continued)

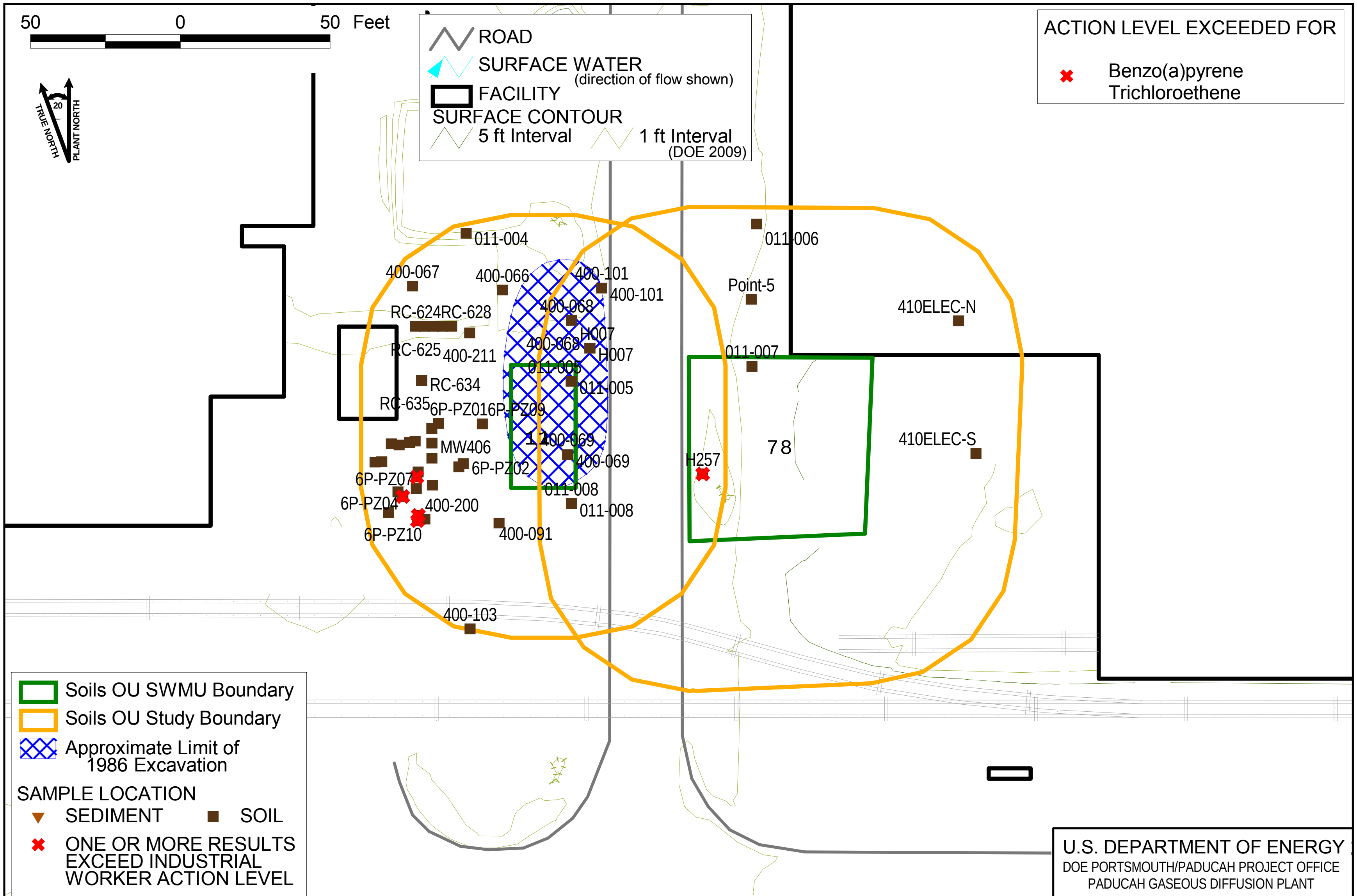
Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Silver	1.80E-01	8.00E-01	4.60E-01	3/38	8.00E-02	2.70E+00	0/38	2.70E+00	0/38	2.07E+04	0/38	4.11E+01
Sodium	3.10E+00	3.47E+03	3.58E+02	180/282	1.00E+00	2.50E+02	92/282	3.40E+02	n/a	n/a	n/a	n/a
Thallium	6.00E-01	1.10E+00	8.67E-01	3/38	1.80E-01	1.21E+00	3/38	3.40E-01	n/a	n/a	n/a	n/a
Uranium	1.02E+02	3.40E+02	1.64E+02	37/244	1.00E+02	1.00E+03	37/244	4.60E+00	0/244	3.34E+03	37/244	2.02E+01
Vanadium	5.26E+00	7.24E+01	2.31E+01	281/282	1.00E-01	2.50E+00	24/282	3.70E+01	0/282	4.47E+03	281/282	3.32E+00
Zinc	5.73E+00	4.94E+01	2.65E+01	38/38	8.00E-02	1.00E-01	0/38	6.00E+01	0/38	1.00E+05	0/38	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	7.30E-01	7.30E-01	7.30E-01	1/42	2.00E-02	1.00E+00	n/a	n/a	0/42	4.25E+01	1/42	1.99E-01
PCB-1254	7.30E-01	7.30E-01	7.30E-01	1/19	1.90E-02	2.10E-01	n/a	n/a	0/19	1.82E+01	1/19	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.51E-01	3.52E+01	7.20E+00	309/322	1.35E-01	1.42E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	2.00E-01	1.23E-01	31/281	5.79E-02	3.01E-01	n/a	n/a	0/281	5.16E+02	0/281	5.16E+00
Beta activity	1.53E-01	4.56E+01	7.63E+00	309/322	1.05E-01	1.97E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.50E-02	5.00E-01	1.48E-01	49/281	1.48E-02	1.04E-01	10/281	2.80E-01	0/281	8.58E+00	38/281	8.58E-02
Neptunium-237	1.00E-01	5.00E-01	1.99E-01	39/281	2.77E-02	1.62E-01	n/a	n/a	0/281	2.71E+01	12/281	2.71E-01
Plutonium-239	1.00E-01	2.00E-01	1.05E-01	37/37	n/a	n/a	n/a	n/a	0/37	1.15E+03	0/37	1.15E+01
Plutonium-239/240	5.94E-02	2.49E-01	9.97E-02	7/244	5.00E-02	7.31E-02	n/a	n/a	0/244	1.15E+03	0/244	1.15E+01
Technetium-99	2.00E-01	1.53E+01	2.27E+00	45/283	5.00E-01	4.76E+00	20/283	2.80E+00	0/283	3.62E+04	0/283	3.62E+02
Thorium-230	1.07E-01	1.85E+00	4.63E-01	255/281	8.52E-02	4.18E-01	8/281	1.40E+00	0/281	1.49E+03	0/281	1.49E+01
Uranium	7.00E-01	9.40E+00	1.98E+00	37/37			n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.00E-01	3.50E+00	1.23E+00	50/281	6.10E-02	1.80E+00	6/281	2.40E+00	0/281	1.98E+03	0/281	1.98E+01
Uranium-235	1.64E-02	2.01E-01	6.62E-02	222/281	1.49E-02	1.03E-01	12/281	1.40E-01	0/281	3.95E+01	0/281	3.95E-01
Uranium-238	3.00E-01	6.75E+00	1.28E+00	203/281	8.90E-03	2.34E+00	75/281	1.20E+00	0/281	1.71E+02	37/281	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	4.00E-01	3.00E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,3,3-Trimethylhexane	1.70E-01	1.70E-01	1.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-methylheptane	2.10E-01	2.10E-01	2.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	1.40E-01	1.40E-01	1.40E-01	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	6.67E+04	0/55	3.16E+02
Anthracene	2.90E-01	2.90E-01	2.90E-01	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	1.00E+05	0/55	3.79E+03
Benz(a)anthracene	5.00E-02	2.30E+00	6.35E-01	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+02	1/55	2.12E-01
Benzo(a)pyrene	5.00E-02	2.40E+00	6.73E-01	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+01	4/55	2.12E-02
Benzo(b)fluoranthene	8.00E-02	2.90E+00	1.04E+00	3/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+02	1/55	2.12E-01
Benzo(ghi)perylene	6.50E-02	1.00E+00	4.05E-01	3/55	3.80E-01	8.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.00E-02	1.20E+00	3.65E-01	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+03	0/55	2.12E+00
Bis(2-ethylhexyl)phthalate	4.00E-02	4.47E-01	9.75E-02	20/55	3.80E-01	8.00E+00	n/a	n/a	0/55	7.40E+03	0/55	8.84E+00
Chrysene	5.00E-02	2.60E+00	7.15E-01	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+04	0/55	2.12E+01
Dibenz(a,h)anthracene	4.60E-01	4.60E-01	4.60E-01	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	2.08E+01	1/55	2.12E-02
Dibenzofuran	4.00E-02	4.00E-02	4.00E-02	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	9.02E+03	0/55	1.86E+01
Diethyl phthalate	5.00E-02	4.90E+00	1.33E+00	6/55	3.80E-01	8.00E+00	n/a	n/a	0/55	1.00E+05	0/55	1.55E+04
Di-n-butyl phthalate	6.20E-02	1.77E+00	6.80E-01	14/55	3.80E-01	8.00E+00	n/a	n/a	0/55	1.00E+05	0/55	2.13E+03
Fluoranthene	9.00E-02	4.00E+00	1.11E+00	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	6.50E+04	0/55	2.21E+02
Fluorene	9.00E-02	9.00E-02	9.00E-02	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	7.09E+04	0/55	3.39E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.21. Summary of Surface and Subsurface Historical Data at SWMU 11 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Indeno(1,2,3-cd)pyrene	1.30E-01	1.10E+00	6.15E-01	2/55	6.60E-02	8.00E+00	n/a	n/a	0/55	2.08E+02	1/55	2.12E-01
N-Nitroso-di-n-propylamine	4.47E-01	4.47E-01	4.47E-01	1/55	3.80E-01	8.00E+00	n/a	n/a	0/55	1.84E+01	1/55	2.31E-02
Phenanthrene	4.00E-02	1.50E+00	5.43E-01	3/55	3.80E-01	8.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	8.00E-02	3.30E+00	9.30E-01	4/55	3.80E-01	8.00E+00	n/a	n/a	0/55	4.87E+04	0/55	1.65E+02
Volatiles (mg/kg)												
1,1,1-Trichloroethane	3.30E-03	2.40E+00	6.09E-01	4/285	6.00E-03	1.20E+02	n/a	n/a	0/285	9.38E+03	0/285	1.56E+02
1,1,2-Trichloroethane	3.10E-03	5.30E-01	9.87E-02	6/285	6.00E-03	1.20E+02	n/a	n/a	0/285	1.69E+02	0/285	1.18E+00
1,1-Dichloroethene	1.50E-03	9.50E-01	1.41E-01	7/322	6.00E-03	6.32E+02	n/a	n/a	0/322	1.21E+01	1/322	9.59E-02
1,2-Dichloroethene	2.30E-01	2.00E+01	4.73E+00	11/119	6.00E-03	2.40E+02	n/a	n/a	0/119	2.66E+04	0/119	6.60E+01
2,5-Dimethylhexane	1.60E-01	1.60E-01	1.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Hexanone	8.40E-03	8.40E-03	8.40E-03	1/285	1.00E-02	1.20E+02	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	9.50E-03	4.60E-01	5.82E-02	60/285	1.00E-02	1.20E+02	n/a	n/a	0/285	1.91E+04	0/285	3.58E+02
Benzene	1.70E-02	1.70E-02	1.70E-02	1/285	6.00E-03	1.20E+02	n/a	n/a	0/285	7.45E+01	0/285	1.13E+00
Carbon tetrachloride	2.00E-03	7.10E-01	1.87E-01	4/285	6.00E-03	1.20E+02	n/a	n/a	0/285	2.31E+01	1/285	4.08E-01
Chloroform	1.50E-03	1.80E-02	6.00E-03	5/285	6.00E-03	1.20E+02	n/a	n/a	0/285	3.70E+00	0/285	1.23E-01
cis-1,2-Dichloroethene	1.40E-03	2.50E+00	4.10E-01	36/204	1.33E-03	6.32E+02	n/a	n/a	0/204	4.63E+02	0/204	1.34E+01
Methylene chloride	1.30E-03	1.80E+00	4.47E-01	40/285	6.00E-03	1.20E+02	n/a	n/a	0/285	2.16E+03	0/285	1.34E+01
Tetrachloroethene	1.30E-03	6.90E-01	1.23E-01	6/293	6.00E-03	1.20E+02	n/a	n/a	0/293	1.46E+03	0/293	3.90E+00
Toluene	1.00E-03	1.90E+00	2.17E-01	9/285	6.00E-03	1.20E+02	n/a	n/a	0/285	7.28E+03	0/285	2.11E+02
trans-1,2-Dichloroethene	2.10E-03	1.02E+02	1.89E+01	12/204	6.00E-03	6.32E+02	n/a	n/a	0/204	7.43E+02	4/204	2.20E+01
Trichloroethene	6.00E-04	1.11E+04	9.79E+01	249/337	1.00E-03	6.32E+02	n/a	n/a	9/337	2.98E+02	119/337	2.51E+00
Trichlorofluoromethane	1.70E-03	1.70E-03	1.70E-03	1/37	6.00E-03	3.00E-02	n/a	n/a	0/37	4.73E+03	0/37	1.28E+02
Vinyl chloride	3.40E-03	2.90E+01	1.94E+00	17/323	1.00E-03	6.32E+02	n/a	n/a	0/323	4.14E+01	3/323	1.34E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

Figure 5.29. Soils Operable Unit: SWMUs 11 and 78

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 26 (C-400 to C-404 4-inch Underground Transfer Line, 1,500 ft long)

Area description

The C-400 to C-404 Underground Transfer Line (SWMU 26) is located in the central portion of the plant site. SWMU 26 is a 4-inch steel line, approximately 1,500 ft long.

Process history

From 1951 to 1956, SWMU 26 was used to transfer uranium-contaminated solutions from C-400 to C-404 for settling prior to discharge. The transfer line was abandoned in 1957.

Previous investigation results

The area surrounding the line was sampled during the Phase II SI (CH2M HILL 1992) and the WAG 6 RI (DOE 1999b), which located SWMU 26 in Sector 8 (refer to Section 5.1.3, SWMU 11, *"Previous Investigation Results"*). Results of the investigation indicate metals, PAHs, and radionuclide contamination occurred from leaks in the pipeline.

Metals and radiological contaminants were found in high concentrations in soil samples collected directly beneath the pipeline, and nickel and copper were detected in a soil sample collected at 7.5 ft bgs in a boring adjacent to the excavated pipeline area. A shallow soil sample (4 to 8 ft bgs) at the western most boring exhibited an isolated occurrence of TCE and its degradation product, *cis*-1,2 dichloroethene, at a low concentration and high radioactivity. The surface soil did not contain elevated radionuclide activity, which implies that the impact may be the result of a subsurface release.

The summary table from the BRA for WAG 6, showing which human health risks exceed *de minimis*, is located in the *"Previous Investigation Results"* of Section 5.1.3.

Table 5.22 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.30).

Area utilities

The SWMU itself was a utility. No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU. The underground transfer line ranged from about 2 ft bgs to 5 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, only additional, pipeline samples are needed at this location because this SWMU is a pipeline.

Table 5.22. Summary of Surface and Subsurface Historical Data at SWMU 26

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	2.99E+03	3.46E+04	1.04E+04	21/21	1.71E+01	3.57E+02	5/21	1.30E+04	0/21	1.00E+05	19/21	4.64E+03
Antimony	6.00E-01	1.40E+00	1.00E+00	2/21	5.00E-01	2.00E+01	2/21	2.10E-01	0/21	4.63E+02	2/21	3.79E-01
Arsenic	4.66E+00	1.30E+02	3.56E+01	16/32	6.00E-02	2.00E+01	13/32	1.20E+01	0/32	3.15E+02	16/32	5.23E-01
Barium	3.13E+01	8.15E+02	2.04E+02	32/32	2.00E-02	3.57E+02	9/32	2.00E+02	0/32	1.00E+05	8/32	2.29E+02
Beryllium	4.20E-01	1.57E+01	2.15E+00	16/21	1.00E-02	8.90E+00	7/21	6.70E-01	0/21	1.28E+03	4/21	9.48E-01
Cadmium	5.00E-02	2.50E+00	1.66E+00	6/32	2.00E-02	8.90E+00	5/32	2.10E-01	0/32	7.05E+01	0/32	2.13E+01
Calcium	1.47E+03	4.16E+04	1.27E+04	11/11	1.00E-01	8.92E+03	7/11	2.00E+05	n/a	n/a	n/a	n/a
Chromium	4.85E+00	1.32E+02	2.87E+01	32/32	7.00E-02	1.79E+01	20/32	1.60E+01	n/a	n/a	0/32	3.56E+02
Cobalt	2.74E+00	9.05E+01	1.67E+01	11/11	9.00E-02	8.92E+01	4/11	1.40E+01	0/11	1.00E+05	0/11	1.92E+03
Copper	7.55E+00	4.14E+02	6.04E+01	21/21	1.00E-01	4.46E+01	11/21	1.90E+01	0/21	1.00E+05	0/21	4.93E+02
Iron	8.06E+03	8.51E+04	1.72E+04	21/21	1.71E+01	1.79E+02	1/21	2.80E+04	0/21	1.00E+05	21/21	2.07E+03
Lead	9.40E+00	4.11E+02	6.87E+01	11/32	2.00E-01	2.00E+01	9/32	3.60E+01	0/32	1.25E+03	4/32	5.00E+01
Lithium	5.03E+00	2.24E+01	1.10E+01	5/5	5.00E+00	5.00E+00	n/a	n/a	0/5	1.00E+05	0/5	6.41E+02
Magnesium	6.34E+02	3.66E+03	1.39E+03	11/11	1.00E-01	8.92E+03	1/11	7.70E+03	n/a	n/a	n/a	n/a
Manganese	8.75E+01	1.20E+03	4.16E+02	21/21	2.00E-02	2.68E+01	2/21	1.50E+03	0/21	4.64E+04	21/21	4.52E+01
Mercury	2.06E-02	9.00E-01	3.57E-01	10/32	8.30E-03	2.00E-01	7/32	2.00E-01	0/32	8.25E+02	0/32	9.82E-01
Molybdenum	6.01E+00	9.40E+00	7.71E+00	2/4	4.27E+00	7.14E+01	n/a	n/a	0/4	2.50E+04	0/4	8.30E+01
Nickel	5.90E+00	2.55E+02	3.71E+01	29/29	1.00E-01	7.14E+01	15/29	2.10E+01	0/29	9.30E+04	1/29	2.42E+02
Potassium	2.14E+02	4.77E+02	3.40E+02	5/6	2.00E+00	8.92E+03	0/6	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.00E-01	1.36E+01	5.95E+00	10/32	2.00E-01	2.68E+01	9/32	8.00E-01	0/32	2.56E+04	0/32	9.49E+01
Silicon	2.42E+03	2.42E+03	2.42E+03	1/1	8.92E+02	8.92E+02	n/a	n/a	n/a	n/a	n/a	n/a
Silver	1.00E-01	8.33E+01	3.32E+01	8/32	7.00E-02	1.79E+01	6/32	2.30E+00	0/32	2.07E+04	2/32	4.11E+01
Sodium	1.23E+02	3.54E+02	2.56E+02	5/6	1.00E+00	8.92E+03	1/6	3.20E+02	n/a	n/a	n/a	n/a
Thallium	6.00E-01	1.39E+01	7.25E+00	2/25	5.00E-01	2.00E+01	2/25	2.10E-01	n/a	n/a	n/a	n/a
Uranium	6.49E+00	3.00E+03	5.44E+02	30/36	1.20E-01	8.92E+02	25/36	4.90E+00	0/36	3.34E+03	21/36	2.02E+01
Vanadium	1.31E+01	1.06E+02	2.81E+01	21/21	1.00E-01	3.57E+01	3/21	3.80E+01	0/21	4.47E+03	21/21	3.32E+00
Zinc	1.97E+01	8.00E+02	1.17E+02	11/11	9.00E-02	3.57E+01	4/11	6.50E+01	0/11	1.00E+05	0/11	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.20E-01	1.10E+01	2.11E+00	48/156	1.80E-02	1.00E+00	n/a	n/a	0/156	4.25E+01	43/156	1.99E-01
PCB-1248	3.10E-01	4.90E-01	3.80E-01	3/141	1.80E-02	2.50E+00	n/a	n/a	0/141	4.25E+01	3/141	1.99E-01
PCB-1254	7.10E-02	5.43E+00	7.55E-01	26/141	1.80E-02	5.00E+00	n/a	n/a	0/141	1.82E+01	23/141	1.99E-01
PCB-1260	4.40E-02	1.10E+01	9.14E-01	33/141	1.80E-02	1.00E-01	n/a	n/a	0/141	4.25E+01	24/141	1.99E-01
Radionuclides (pCi/g)												
Actinium-228	1.69E+00	1.69E+00	1.69E+00	1/1	6.60E-01	6.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Alpha activity	7.60E+00	6.90E+01	2.33E+01	15/19	1.37E+00	1.14E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	8.81E-01	3.66E-01	6/24	2.00E-02	3.89E-01	n/a	n/a	0/24	5.16E+02	0/24	5.16E+00
Beta activity	5.44E+00	2.40E+02	4.87E+01	17/19	1.07E+00	1.93E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-1.10E-01	2.05E+01	3.34E+00	54/63	1.00E-02	1.95E+00	40/63	4.90E-01	8/63	8.58E+00	46/63	8.58E-02
Lead-212	1.88E+00	1.88E+00	1.88E+00	1/1	4.40E-01	4.40E-01	n/a	n/a	n/a	n/a	n/a	n/a
Lead-214	2.60E+00	2.60E+00	2.60E+00	1/1	2.80E-01	2.80E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.22. Summary of Surface and Subsurface Historical Data at SWMU 26 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Mass of U-235 (mg/kg)	1.25E-02	9.07E-01	3.12E-01	3/3	1.88E-03	2.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237 (mg/kg)	5.10E-02	1.85E-01	1.07E-01	10/14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	5.20E-02	5.50E+01	1.00E+01	10/26	2.00E-02	5.00E-01	8/26	1.00E-01	2/26	2.71E+01	5/26	2.71E-01
Plutonium-239	2.00E-01	4.00E-01	3.30E-01	3/4	1.00E-03	1.00E-01	3/4	2.50E-02	0/4	1.15E+03	0/4	1.15E+01
Plutonium-239 (mg/kg)	9.80E-04	4.46E-03	1.97E-03	10/14	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Plutonium-239/240	7.10E-02	2.42E+00	1.03E+00	9/22	1.00E-02	6.00E-02	n/a	n/a	0/22	1.15E+03	0/22	1.15E+01
Potassium-40	1.37E+01	1.37E+01	1.37E+01	1/1	1.90E+00	1.90E+00	0/1	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-234m	7.90E+01	7.90E+01	7.90E+01	1/1	2.50E+01	2.50E+01	n/a	n/a	n/a	n/a	n/a	n/a
Radium-228	1.69E+00	1.69E+00	1.69E+00	1/1	6.60E-01	6.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99 (mg/kg)	0.00E+00	2.23E+00	7.88E-01	12/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	3.10E+00	6.60E+02	9.47E+01	20/28	5.00E-01	3.26E+00	20/28	2.50E+00	0/28	3.62E+04	2/28	3.62E+02
Thallium-208	8.20E-01	8.20E-01	8.20E-01	1/1	1.60E-01	1.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-228	1.55E-01	1.81E+00	5.64E-01	9/12	2.69E-02	5.00E-01	1/12	1.60E+00	0/12	2.80E+00	9/12	2.80E-02
Thorium-230 (mg/kg)	0.00E+00	8.32E-03	4.82E-03	12/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	2.81E-01	1.59E+01	3.17E+00	24/26	5.00E-02	3.02E-01	12/26	1.50E+00	0/26	1.49E+03	2/26	1.49E+01
Thorium-232	1.96E-01	2.03E+00	6.69E-01	11/13	3.00E-02	6.60E-01	2/13	1.50E+00	0/13	1.35E+03	0/13	1.35E+01
Thorium-234	7.48E+00	3.14E+02	9.98E+01	4/4	6.50E-01	5.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium (mg/kg)	1.50E+03	3.00E+03	2.12E+03	30/36	n/a	n/a	5/36	4.90E+00	n/a	n/a	n/a	n/a
Uranium	1.02E+00	2.36E+02	4.51E+01	15/15	2.00E-02	4.06E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.00E-01	1.40E+02	1.61E+01	25/26	1.00E-02	1.00E+01	11/26	2.50E+00	0/26	1.98E+03	4/26	1.98E+01
Uranium-235	2.70E-02	5.55E+00	1.28E+00	21/27	4.07E-03	2.00E+00	14/27	1.40E-01	0/27	3.95E+01	9/27	3.95E-01
Uranium-238	2.30E-01	1.83E+03	5.42E+01	65/66	3.28E-03	1.00E+01	58/66	1.20E+00	2/66	1.71E+02	56/66	1.71E+00
Semivolatiles (mg/kg)												
1,2,4-Trichlorobenzene	3.90E-03	3.90E-03	3.90E-03	1/12	6.60E-03	7.30E-01	n/a	n/a	0/12	1.79E+04	0/12	8.28E+01
1,2-Dichlorobenzene	2.60E-03	2.60E-03	2.60E-03	1/12	6.60E-03	7.30E-01	n/a	n/a	0/12	1.29E+04	0/12	2.68E+02
1,3-Dichlorobenzene	2.80E-03	2.80E-03	2.80E-03	1/12	6.60E-03	7.30E-01	n/a	n/a	0/12	2.66E+03	0/12	6.60E+00
1,4-Dichlorobenzene	3.70E-03	3.70E-03	3.70E-03	1/12	6.60E-03	7.30E-01	n/a	n/a	0/12	8.30E+02	0/12	4.62E+00
2-Methylnaphthalene	9.20E-01	6.60E+00	3.76E+00	2/9	4.70E-01	7.30E-01	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	5.00E-02	5.00E-02	5.00E-02	1/28	4.00E-02	7.30E-01	n/a	n/a	0/28	6.67E+04	0/28	3.16E+02
Anthracene	1.60E-01	1.60E-01	1.60E-01	1/28	4.00E-02	7.30E-01	n/a	n/a	0/28	1.00E+05	0/28	3.79E+03
Benz(a)anthracene	3.40E-01	2.18E+00	9.65E-01	4/28	2.00E-02	7.30E-01	n/a	n/a	0/28	2.08E+02	4/28	2.12E-01
Benzo(a)pyrene	2.20E-02	1.68E+00	6.73E-01	4/28	2.00E-02	7.30E-01	n/a	n/a	0/28	2.08E+01	4/28	2.12E-02
Benzo(b)fluoranthene	3.00E-02	2.45E+00	9.03E-01	4/28	2.00E-02	7.30E-01	n/a	n/a	0/28	2.08E+02	3/28	2.12E-01
Benzo(ghi)perylene	1.30E-01	1.30E-01	1.30E-01	1/26	4.00E-02	7.30E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	2.90E-01	2.90E-01	2.90E-01	1/23	2.00E-02	7.30E-01	n/a	n/a	0/23	2.08E+03	0/23	2.12E+00
Bis(2-ethylhexyl)phthalate	8.00E-02	8.00E-02	8.00E-02	1/9	4.70E-01	7.30E-01	n/a	n/a	0/9	7.40E+03	0/9	8.84E+00
Chrysene	2.20E-02	2.42E+00	8.84E-01	5/28	2.00E-02	7.30E-01	n/a	n/a	0/28	2.08E+04	0/28	2.12E+01
Di-n-butyl phthalate	4.00E-02	4.00E-02	4.00E-02	1/4	7.09E-01	7.30E-01	n/a	n/a	0/4	1.00E+05	0/4	2.13E+03
Fluoranthene	4.00E-02	5.98E+00	1.73E+00	4/23	4.00E-02	7.30E-01	n/a	n/a	0/23	6.50E+04	0/23	2.21E+02
Fluorene	5.00E-02	5.00E-02	5.00E-02	1/28	4.00E-02	7.30E-01	n/a	n/a	0/28	7.09E+04	0/28	3.39E+02
Indeno(1,2,3-cd)pyrene	3.30E-02	5.60E-01	2.44E-01	3/28	2.00E-02	7.30E-01	n/a	n/a	0/28	2.08E+02	1/28	2.12E-01
Naphthalene	4.80E-03	4.10E+00	1.55E+00	3/31	6.60E-03	7.30E-01	n/a	n/a	0/31	7.66E+02	0/31	2.36E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.22. Summary of Surface and Subsurface Historical Data at SWMU 26 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Phenanthrene	5.60E-01	4.32E+00	1.71E+00	6/28	4.00E-02	7.30E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	5.60E-02	5.66E+00	1.75E+00	5/28	4.00E-02	7.30E-01	n/a	n/a	0/28	4.87E+04	0/28	1.65E+02
Volatiles (mg/kg)												
(1,1-Dimethylethyl)benzene	1.00E-03	1.00E-03	1.00E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	5.54E+04	0/3	7.33E+01
(1-Methylpropyl)benzene	1.40E-03	1.40E-03	1.40E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	5.54E+04	0/3	7.33E+01
1,1,1-Trichloroethane	1.20E-03	1.20E-03	1.20E-03	1/15	5.00E-03	1.10E-02	n/a	n/a	0/15	9.38E+03	0/15	1.56E+02
1,2,4-Trimethylbenzene	2.30E-03	2.30E-03	2.30E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	1.00E+05	0/3	3.67E+02
1,2-Dimethylbenzene	8.60E-04	8.60E-04	8.60E-04	1/8	6.60E-03	1.00E-02	n/a	n/a	0/8	1.00E+05	0/8	4.53E+03
1,3,5-Trimethylbenzene	1.80E-03	1.80E-03	1.80E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	1.00E+05	0/3	3.67E+02
1-Methyl-4-(1-methylethyl)benzene	1.90E-03	1.90E-03	1.90E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	5.50E-03	1.30E-02	9.25E-03	2/12	1.00E-02	3.60E-02	n/a	n/a	0/12	1.91E+04	0/12	3.58E+02
Benzene	6.30E-04	6.30E-04	6.30E-04	1/12	6.60E-03	1.10E-02	n/a	n/a	0/12	7.45E+01	0/12	1.13E+00
Butylbenzene	2.10E-03	2.10E-03	2.10E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	5.54E+04	0/3	7.33E+01
Carbon disulfide	9.80E-04	9.80E-04	9.80E-04	1/10	6.60E-03	1.10E-02	n/a	n/a	0/10	3.17E+03	0/10	1.06E+02
cis-1,2-Dichloroethene	3.10E-04	3.10E-04	3.10E-04	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	4.63E+02	0/3	1.34E+01
Ethylbenzene	1.00E-03	1.00E-03	1.00E-03	1/12	6.60E-03	1.10E-02	n/a	n/a	0/12	2.12E+03	0/12	2.12E+01
m,p-Xylene	1.90E-03	1.90E-03	1.90E-03	1/8	6.60E-03	2.00E-02	n/a	n/a	0/8	2.20E+04	0/8	7.24E+02
Methylene chloride	6.20E-02	6.20E-02	6.20E-02	1/12	6.60E-03	1.10E-02	n/a	n/a	0/12	2.16E+03	0/12	1.34E+01
Propylbenzene	2.00E-03	2.00E-03	2.00E-03	1/3	6.60E-03	8.90E-03	n/a	n/a	0/3	2.96E+04	0/3	7.33E+01
Styrene	9.90E-04	9.90E-04	9.90E-04	1/10	6.60E-03	1.10E-02	n/a	n/a	0/10	5.62E+04	0/10	8.58E+02
Toluene	7.00E-02	2.10E-01	1.40E-01	2/12	6.60E-03	1.00E-02	n/a	n/a	0/12	7.28E+03	0/12	2.11E+02
Trichloroethene	3.40E-03	3.40E-03	3.40E-03	1/15	5.00E-03	1.10E-02	n/a	n/a	0/15	2.98E+02	0/15	2.51E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	2.72E+03	1.75E+04	1.04E+04	56/56	1.94E+01	1.00E+02	20/56	1.20E+04	0/56	1.00E+05	51/56	4.64E+03
Antimony	7.00E-01	1.90E+00	1.12E+00	9/56	3.90E-01	2.00E+01	9/56	2.10E-01	0/56	4.63E+02	9/56	3.79E-01
Arsenic	4.30E-01	3.01E+01	6.42E+00	39/56	7.00E-02	2.00E+01	13/56	7.90E+00	0/56	3.15E+02	37/56	5.23E-01
Barium	1.38E+01	4.13E+02	1.01E+02	56/56	2.00E-02	2.50E+00	4/56	1.70E+02	0/56	1.00E+05	3/56	2.29E+02
Beryllium	3.40E-01	2.49E+01	2.00E+00	46/56	1.00E-02	5.00E-01	17/56	6.90E-01	0/56	1.28E+03	10/56	9.48E-01
Cadmium	3.00E-02	3.00E+00	1.33E+00	13/56	2.00E-02	2.00E+00	9/56	2.10E-01	0/56	7.05E+01	0/56	2.13E+01
Calcium	5.55E+02	1.13E+05	5.84E+03	47/47	1.00E-01	2.00E+02	9/47	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.60E+00	4.61E+02	2.78E+01	56/56	8.00E-02	2.50E+00	25/56	4.30E+01	n/a	n/a	1/56	3.56E+02
Cobalt	1.50E+00	1.62E+01	6.86E+00	44/47	9.00E-02	5.80E+00	5/47	1.30E+01	0/47	1.00E+05	0/47	1.92E+03
Copper	1.00E+00	9.52E+03	2.17E+02	56/56	1.00E-01	2.00E+01	16/56	2.50E+01	0/56	1.00E+05	2/56	4.93E+02
Iron	4.28E+03	5.17E+04	1.54E+04	56/56	8.00E+00	1.00E+02	3/56	2.80E+04	0/56	1.00E+05	56/56	2.07E+03
Lead	5.20E+00	1.19E+02	1.77E+01	39/56	2.00E-01	2.00E+01	6/56	2.30E+01	0/56	1.25E+03	2/56	5.00E+01
Lithium	5.93E+00	2.44E+01	1.09E+01	12/14	5.00E+00	5.00E+00	n/a	n/a	0/14	1.00E+05	0/14	6.41E+02
Magnesium	1.03E+02	4.09E+03	1.33E+03	47/47	1.00E-01	4.94E+00	3/47	2.10E+03	n/a	n/a	n/a	n/a
Manganese	9.40E+00	1.79E+03	3.31E+02	56/56	2.00E-02	2.50E+00	3/56	8.20E+02	0/56	4.64E+04	49/56	4.52E+01
Mercury	1.36E-02	1.23E+01	5.68E-01	25/56	8.90E-03	2.00E-01	4/56	1.30E-01	0/56	8.25E+02	1/56	9.82E-01
Nickel	2.70E+00	1.76E+04	3.84E+02	51/56	1.00E-01	1.00E+02	16/56	2.20E+01	0/56	9.30E+04	4/56	2.42E+02
Potassium	1.22E+02	1.19E+03	3.96E+02	30/31	2.00E+00	1.37E+02	4/31	9.50E+02	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.22. Summary of Surface and Subsurface Historical Data at SWMU 26 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Selenium	6.00E-01	1.63E+00	1.03E+00	5/56	2.00E-01	2.00E+01	4/56	7.00E-01	0/56	2.56E+04	0/56	9.49E+01
Silver	1.20E-01	4.46E+00	2.20E+00	8/56	8.00E-02	2.50E+00	4/56	2.70E+00	0/56	2.07E+04	0/56	4.11E+01
Sodium	1.64E+02	1.17E+03	3.41E+02	30/33	1.00E+00	3.72E+02	14/33	3.40E+02	n/a	n/a	n/a	n/a
Sulfur	4.00E-01	4.00E-01	4.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	3.00E-01	4.10E-01	3.55E-01	2/56	2.40E-01	2.00E+01	2/56	3.40E-01	n/a	n/a	n/a	n/a
Tin	1.10E+02	1.27E+02	1.16E+02	3/14	1.00E+02	1.00E+02	n/a	n/a	0/14	1.00E+05	0/14	2.79E+03
Uranium	1.78E+00	6.33E+02	2.13E+02	5/25	9.71E-01	1.00E+02	4/25	4.60E+00	0/25	3.34E+03	4/25	2.02E+01
Vanadium	8.60E+00	7.48E+01	2.51E+01	56/56	1.00E-01	3.00E+00	5/56	3.70E+01	0/56	4.47E+03	56/56	3.32E+00
Zinc	1.90E+00	1.81E+02	3.73E+01	47/47	9.00E-02	1.98E+01	7/47	6.00E+01	0/47	1.00E+05	0/47	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.20E-02	8.50E-01	2.47E-01	5/51	1.90E-02	1.00E+00	n/a	n/a	0/51	4.25E+01	1/51	1.99E-01
PCB-1254	3.20E-02	3.20E-02	3.20E-02	1/51	1.80E-02	2.10E-01	n/a	n/a	0/51	1.82E+01	0/51	1.99E-01
PCB-1260	6.30E-02	8.50E-01	3.01E-01	4/51	1.80E-02	2.10E-01	n/a	n/a	0/51	4.25E+01	1/51	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.10E+00	8.78E+02	6.16E+01	33/37	8.00E-01	1.25E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	6.00E-01	2.22E-01	9/33	2.21E-02	3.37E-01	n/a	n/a	0/33	5.16E+02	0/33	5.16E+00
Beta activity	3.49E+00	8.08E+03	3.86E+02	36/37	1.40E+00	1.92E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	3.65E-02	1.11E+01	1.13E+00	16/33	2.15E-02	4.96E-02	5/33	2.80E-01	1/33	8.58E+00	12/33	8.58E-02
Neptunium-237	1.00E-01	5.26E+01	4.35E+00	18/37	3.31E-02	9.39E-02	n/a	n/a	1/37	2.71E+01	11/37	2.71E-01
Plutonium-239	9.90E-02	1.12E+01	1.57E+00	8/12	n/a	n/a	n/a	n/a	0/12	1.15E+03	0/12	1.15E+01
Plutonium-239/240	3.99E-02	2.16E+00	3.70E-01	14/25	1.80E-02	6.08E-02	n/a	n/a	0/25	1.15E+03	0/25	1.15E+01
Technetium-99	3.00E-01	4.84E+03	2.17E+02	30/41	4.00E-01	3.26E+00	26/41	2.80E+00	0/41	3.62E+04	2/41	3.62E+02
Thorium-228	3.31E-01	6.30E-01	4.62E-01	16/16	2.75E-02	7.88E-02	0/16	1.60E+00	0/16	2.80E+00	16/16	2.80E-02
Thorium-230	8.10E-02	2.60E+01	2.88E+00	37/37	1.86E-01	2.38E-01	15/37	1.40E+00	0/37	1.49E+03	2/37	1.49E+01
Thorium-232	2.38E-01	6.81E-01	4.57E-01	16/16	5.09E-02	1.67E-01	0/16	1.50E+00	0/16	1.35E+03	0/16	1.35E+01
Uranium	6.00E-01	3.17E+02	4.05E+01	17/24	2.47E-01	2.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.90E-02	1.02E+02	8.83E+00	25/37	8.01E-02	9.76E-01	16/37	2.40E+00	0/37	1.98E+03	3/37	1.98E+01
Uranium-235	5.40E-03	4.90E+00	3.85E-01	31/37	2.08E-02	5.73E-02	15/37	1.40E-01	0/37	3.95E+01	5/37	3.95E-01
Uranium-238	2.00E-01	1.42E+02	1.14E+01	32/37	1.24E-01	1.41E+00	22/37	1.20E+00	0/37	1.71E+02	21/37	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	1.00E-01	1.00E-01	1.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,4-Dinitrotoluene	4.57E-01	4.57E-01	4.57E-01	1/60	3.60E-01	9.16E-01	n/a	n/a	0/60	4.18E+02	0/60	7.57E-01
2,6-Dinitrotoluene	4.32E-01	4.32E-01	4.32E-01	2/60	3.60E-01	9.16E-01	n/a	n/a	0/60	4.18E+02	0/60	7.57E-01
2-Methylnaphthalene	1.70E+00	1.70E+00	1.70E+00	1/60	3.60E-01	9.16E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benz(a)anthracene	8.00E-02	1.40E-01	1.10E-01	2/69	3.60E-01	9.16E-01	n/a	n/a	0/69	2.08E+02	0/69	2.12E-01
Benzo(a)pyrene	8.00E-02	1.40E-01	1.10E-01	2/69	3.60E-01	9.16E-01	n/a	n/a	0/69	2.08E+01	2/69	2.12E-02
Benzo(b)fluoranthene	7.60E-02	1.30E-01	9.87E-02	3/69	3.60E-01	9.16E-01	n/a	n/a	0/69	2.08E+02	0/69	2.12E-01
Benzo(ghi)perylene	5.50E-02	9.20E-02	7.35E-02	2/68	3.60E-01	9.16E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	7.00E-02	1.30E-01	1.00E-01	2/57	3.60E-01	9.16E-01	n/a	n/a	0/57	2.08E+03	0/57	2.12E+00
Bis(2-ethylhexyl)phthalate	4.00E-02	5.70E+00	5.51E-01	18/60	3.60E-01	9.16E-01	n/a	n/a	0/60	7.40E+03	0/60	8.84E+00
Chrysene	9.00E-02	1.40E-01	1.15E-01	2/69	3.60E-01	9.16E-01	n/a	n/a	0/69	2.08E+04	0/69	2.12E+01
Cineole	2.40E-02	2.40E-02	2.40E-02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.22. Summary of Surface and Subsurface Historical Data at SWMU 26 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Dimethyl phthalate	4.30E-01	4.30E-01	4.30E-01	1/48	3.60E-01	9.16E-01	n/a	n/a	0/48	1.00E+05	0/48	1.00E+05
Di-n-butyl phthalate	1.00E-01	1.86E+00	9.35E-01	10/48	3.60E-01	9.16E-01	n/a	n/a	0/48	1.00E+05	0/48	2.13E+03
Ethanol, 2,2'-oxybis-, diacetate	8.50E-01	2.40E+00	1.45E+00	6/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoranthene	4.40E-02	2.90E-01	1.75E-01	3/57	3.60E-01	9.16E-01	n/a	n/a	0/57	6.50E+04	0/57	2.21E+02
Indeno(1,2,3-cd)pyrene	5.00E-02	7.70E-02	6.35E-02	2/69	3.60E-01	9.16E-01	n/a	n/a	0/69	2.08E+02	0/69	2.12E-01
Naphthalene	1.10E+00	1.10E+00	1.10E+00	1/69	3.60E-01	9.16E-01	n/a	n/a	0/69	7.66E+02	0/69	2.36E+01
N-Nitrosodiphenylamine	8.23E-01	8.23E-01	8.23E-01	1/60	3.60E-01	9.16E-01	n/a	n/a	0/60	2.63E+04	0/60	3.30E+01
Pentachlorophenol	2.10E+00	2.10E+00	2.10E+00	1/60	4.10E-01	4.40E+00	n/a	n/a	0/60	2.56E+03	0/60	2.12E+00
Phenanthrene	1.10E-01	8.40E-01	3.70E-01	3/69	3.60E-01	9.16E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	6.90E-02	2.40E-01	1.53E-01	3/69	3.60E-01	9.16E-01	n/a	n/a	0/69	4.87E+04	0/69	1.65E+02
Volatiles (mg/kg)												
1,4-Cineole	3.30E-02	3.30E-02	3.30E-02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	2.10E-02	1.10E+00	1.58E-01	19/50	4.98E-03	9.00E-01	n/a	n/a	0/50	1.91E+04	0/50	3.58E+02
Carbon disulfide	1.00E-03	1.00E-03	1.00E-03	3/50	4.98E-03	4.00E-02	n/a	n/a	0/50	3.17E+03	0/50	1.06E+02
Chloroform	1.10E-02	1.10E-02	1.10E-02	1/38	4.98E-03	4.00E-02	n/a	n/a	0/38	3.70E+00	0/38	1.23E-01
cis-1,2-Dichloroethene	4.40E-03	1.50E-02	9.70E-03	2/33	4.98E-03	1.00E+00	n/a	n/a	0/33	4.63E+02	0/33	1.34E+01
Diethyl ether	1.00E-02	2.00E-02	1.50E-02	2/2	n/a	n/a	n/a	n/a	0/2	1.89E+04	0/2	4.51E+02
Methylene chloride	1.40E-03	2.40E-01	4.85E-02	22/50	4.98E-03	6.20E-02	n/a	n/a	0/50	2.16E+03	0/50	1.34E+01
Toluene	3.10E-01	3.20E-01	3.15E-01	2/50	4.98E-03	4.00E-02	n/a	n/a	0/50	7.28E+03	0/50	2.11E+02
Trichloroethene	5.00E-04	3.40E-02	7.93E-03	8/75	1.00E-03	5.00E+00	n/a	n/a	0/75	2.98E+02	0/75	2.51E+00
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	7.46E+02	7.46E+02	7.46E+02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

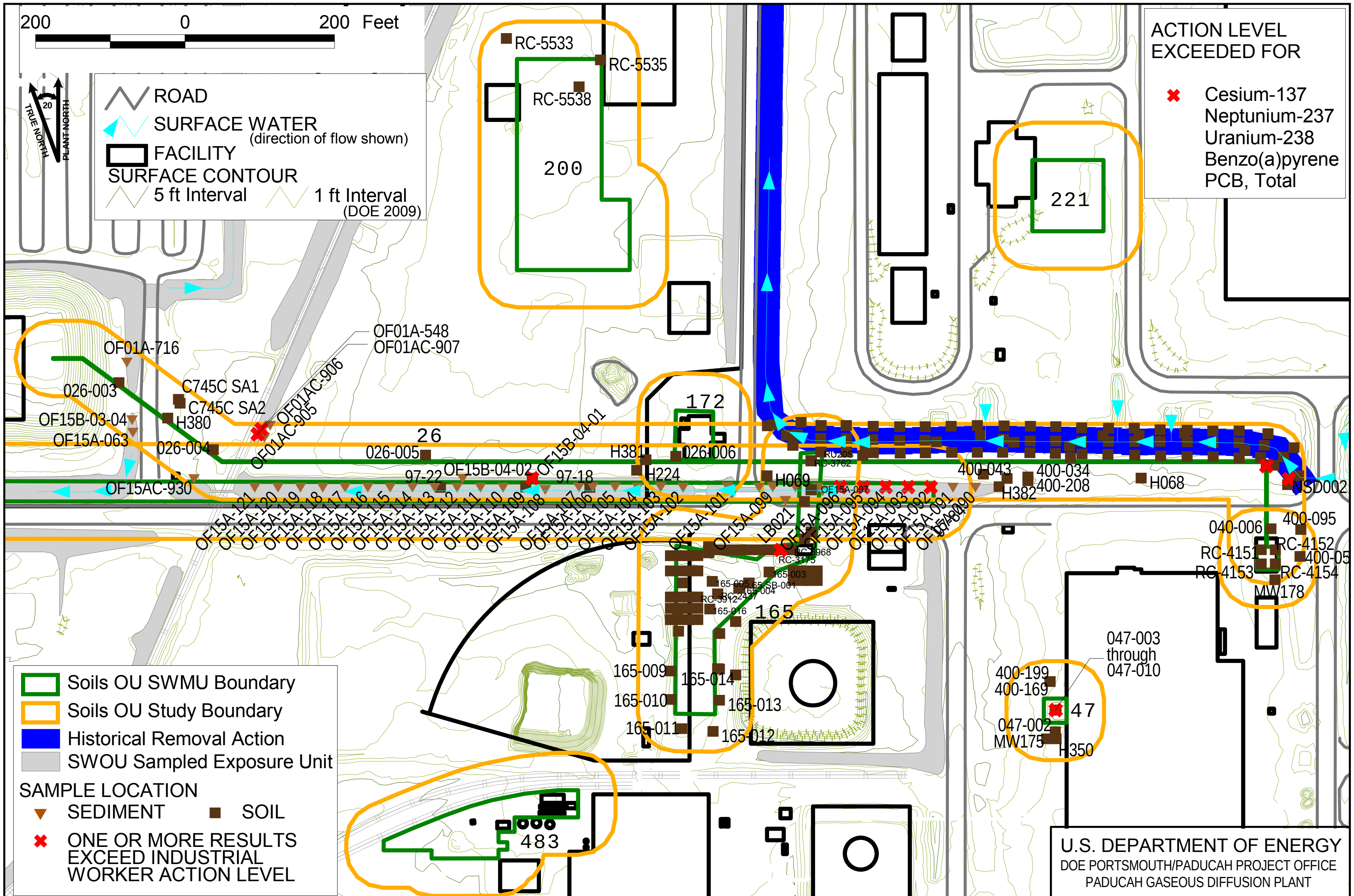


Figure 5.30. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 27 (C-722 Acid Neutralization Tank)

Area description

The C-722 Acid Neutralization Tank (SWMU 27) is an underground concrete tank lined with an acid-resistant membrane and acid brick. SWMU 27 is located at the northeast corner of the C-720 Building in the central portion of the plant site. The tank is approximately 180 ft^2.

Process history

The C-722 Acid Neutralization Tank was designed as a hold-up tank for instrument shop effluent from the 1950s. All lines were capped from the instrument shop. All sludge and water were removed after the lines were capped. Discharge to the tank was stopped in 1992.

Previous investigation results

A sludge sample from 1989 indicated a high level of mercury. The area soils were further sampled as part of the SE for WAGs 9 and 11 (DOE 1999c), and it was determined that contamination present at SWMU 27 does not present risks that exceed *de minimis* levels to industrial workers, potential residential groundwater users, or non-human receptors. Direct contact risks are *de minimis* because contaminated media are not available for direct contact at SWMU 27. Risks from use of groundwater contaminated by the migration from soil are *de minimis* because the concentrations of all contaminants in soil were below the groundwater protection screening criteria. An NFA was proposed.

Table 5.23 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.31).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, they are present within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.23. Summary of Surface and Subsurface Historical Data at SWMU 27

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Radionuclides (pCi/g)												
Alpha activity	1.04E+01	1.66E+01	1.37E+01	4/5	2.30E+00	7.43E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.93E+00	1.93E+01	9.13E+00	5/5	2.90E+00	3.53E+00	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.37E+03	8.23E+03	6.43E+03	9/9	n/a	n/a	0/9	1.20E+04	0/9	1.00E+05	8/9	4.64E+03
Arsenic	2.30E+00	4.80E+00	3.23E+00	9/9	n/a	n/a	0/9	7.90E+00	0/9	3.15E+02	9/9	5.23E-01
Barium	2.69E+01	1.10E+02	6.18E+01	9/9	n/a	n/a	0/9	1.70E+02	0/9	1.00E+05	0/9	2.29E+02
Beryllium	2.50E-01	6.60E-01	3.99E-01	9/9	n/a	n/a	0/9	6.90E-01	0/9	1.28E+03	0/9	9.48E-01
Calcium	5.93E+02	2.62E+04	9.53E+03	9/9	n/a	n/a	5/9	6.10E+03	n/a	n/a	n/a	n/a
Chromium	6.10E+00	1.32E+01	1.07E+01	9/9	n/a	n/a	0/9	4.30E+01	n/a	n/a	0/9	3.56E+02
Cobalt	2.80E+00	1.05E+01	5.70E+00	9/9	n/a	n/a	0/9	1.30E+01	0/9	1.00E+05	0/9	1.92E+03
Copper	2.20E+00	2.30E+01	8.81E+00	9/9	n/a	n/a	1/9	2.50E+01	0/9	1.00E+05	0/9	4.93E+02
Iron	7.45E+03	1.68E+04	1.01E+04	9/9	n/a	n/a	0/9	2.80E+04	0/9	1.00E+05	9/9	2.07E+03
Lead	4.70E+00	1.71E+01	7.62E+00	9/9	n/a	n/a	0/9	2.30E+01	0/9	1.25E+03	0/9	5.00E+01
Magnesium	3.38E+02	2.66E+03	1.12E+03	9/9	n/a	n/a	1/9	2.10E+03	n/a	n/a	n/a	n/a
Manganese	5.45E+01	5.19E+02	2.11E+02	9/9	n/a	n/a	0/9	8.20E+02	0/9	4.64E+04	9/9	4.52E+01
Mercury	3.20E-02	4.90E-02	4.05E-02	2/9	n/a	n/a	0/9	1.30E-01	0/9	8.25E+02	0/9	9.82E-01
Nickel	3.60E+00	3.97E+01	1.12E+01	9/9	n/a	n/a	1/9	2.20E+01	0/9	9.30E+04	0/9	2.42E+02
Potassium	1.22E+02	3.07E+02	2.33E+02	9/9	n/a	n/a	0/9	9.50E+02	n/a	n/a	n/a	n/a
Sodium	4.58E+01	1.73E+02	8.79E+01	9/9	n/a	n/a	0/9	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.35E+01	2.44E+01	1.66E+01	9/9	n/a	n/a	0/9	3.70E+01	0/9	4.47E+03	9/9	3.32E+00
Zinc	1.13E+01	4.10E+01	2.45E+01	9/9	n/a	n/a	0/9	6.00E+01	0/9	1.00E+05	0/9	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.20E-02	7.20E-02	5.20E-02	2/9	1.00E-01	1.00E-01	n/a	n/a	0/9	4.25E+01	0/9	1.99E-01
PCB-1016	1.30E-02	2.80E-02	1.90E-02	3/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	0/3	1.99E-01
PCB-1260	3.20E-02	4.40E-02	3.80E-02	2/2	n/a	n/a	n/a	n/a	0/2	4.25E+01	0/2	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.64E+00	4.64E+00	4.64E+00	1/2	4.44E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	3.53E-02	3.53E-02	3.53E-02	1/2	3.07E-02	3.18E-02	n/a	n/a	0/2	2.71E+01	0/2	2.71E-01
Technetium-99	0.00E+00	0.00E+00	0.00E+00	1/2	4.74E+00	4.74E+00	0/2	2.80E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	1.10E+00	1.72E+00	1.41E+00	2/2	2.44E-01	4.12E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.34E-01	9.00E-01	6.17E-01	2/2	7.36E-02	2.15E-01	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	7.46E-01	7.83E-01	7.65E-01	2/2	1.62E-01	1.87E-01	0/2	1.20E+00	0/2	1.71E+02	0/2	1.71E+00
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.50E-02	1.50E-02	1.50E-02	1/9	n/a	n/a	n/a	n/a	0/9	9.38E+03	0/9	1.56E+02
cis-1,2-Dichloroethene	4.00E-03	4.00E-03	4.00E-03	1/9	n/a	n/a	n/a	n/a	0/9	4.63E+02	0/9	1.34E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

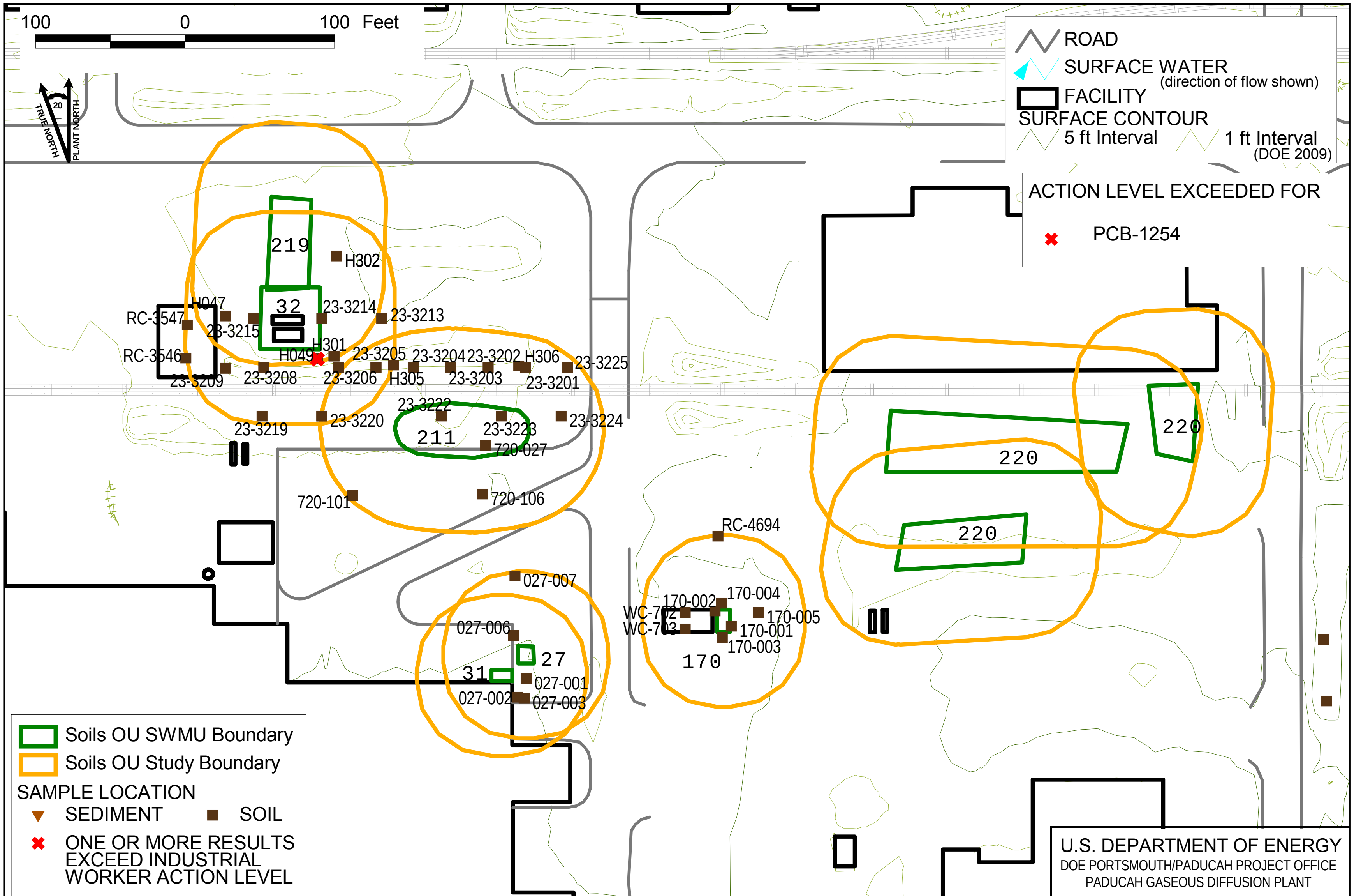


Figure 5.31. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 31 (C-720 Compressor Pit Water Storage Tank)

Area description

The C-720 Compressor Pit Water Storage Tank (SWMU 31) is located at the northeast corner of the C-720 Building in the central portion of the plant site. The tank designated as SWMU 31 was approximately 1,000 gal.

Process history

The storage tank held waste water containing uranium from C-720 Compressor Shop operations. The dates of operation are unknown. In 1985, the tank leaked when the concrete block dike was damaged and some material spilled onto the ground. The tank was removed in the early 1990s.

Previous investigation results

Historical knowledge indicates that radiological contamination of soil exists at SWMU 31.

Table 5.24 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.32).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, recirculating water lines are present within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.24. Summary of Surface and Subsurface Historical Data at SWMU 31

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Radionuclides (pCi/g)												
Alpha activity	1.04E+01	1.66E+01	1.35E+01	3/4	2.30E+00	7.43E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.93E+00	1.03E+01	6.59E+00	4/4	2.90E+00	3.53E+00	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.37E+03	8.23E+03	6.60E+03	8/8	n/a	n/a	0/8	1.20E+04	0/8	1.00E+05	7/8	4.64E+03
Arsenic	2.30E+00	4.80E+00	3.31E+00	8/8	n/a	n/a	0/8	7.90E+00	0/8	3.15E+02	8/8	5.23E-01
Barium	2.69E+01	1.10E+02	6.13E+01	8/8	n/a	n/a	0/8	1.70E+02	0/8	1.00E+05	0/8	2.29E+02
Beryllium	2.50E-01	6.60E-01	4.03E-01	8/8	n/a	n/a	0/8	6.90E-01	0/8	1.28E+03	0/8	9.48E-01
Calcium	5.93E+02	2.06E+04	7.45E+03	8/8	n/a	n/a	4/8	6.10E+03	n/a	n/a	n/a	n/a
Chromium	6.10E+00	1.32E+01	1.08E+01	8/8	n/a	n/a	0/8	4.30E+01	n/a	n/a	0/8	3.56E+02
Cobalt	2.80E+00	1.05E+01	5.83E+00	8/8	n/a	n/a	0/8	1.30E+01	0/8	1.00E+05	0/8	1.92E+03
Copper	2.20E+00	1.39E+01	7.04E+00	8/8	n/a	n/a	0/8	2.50E+01	0/8	1.00E+05	0/8	4.93E+02
Iron	7.45E+03	1.68E+04	1.02E+04	8/8	n/a	n/a	0/8	2.80E+04	0/8	1.00E+05	8/8	2.07E+03
Lead	4.70E+00	1.71E+01	7.50E+00	8/8	n/a	n/a	0/8	2.30E+01	0/8	1.25E+03	0/8	5.00E+01
Magnesium	3.38E+02	1.56E+03	9.31E+02	8/8	n/a	n/a	0/8	2.10E+03	n/a	n/a	n/a	n/a
Manganese	5.45E+01	5.19E+02	2.04E+02	8/8	n/a	n/a	0/8	8.20E+02	0/8	4.64E+04	8/8	4.52E+01
Mercury	4.90E-02	4.90E-02	4.90E-02	1/8	n/a	n/a	0/8	1.30E-01	0/8	8.25E+02	0/8	9.82E-01
Nickel	3.60E+00	1.30E+01	7.65E+00	8/8	n/a	n/a	0/8	2.20E+01	0/8	9.30E+04	0/8	2.42E+02
Potassium	1.22E+02	3.07E+02	2.29E+02	8/8	n/a	n/a	0/8	9.50E+02	n/a	n/a	n/a	n/a
Sodium	4.58E+01	1.73E+02	8.90E+01	8/8	n/a	n/a	0/8	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.35E+01	2.44E+01	1.68E+01	8/8	n/a	n/a	0/8	3.70E+01	0/8	4.47E+03	8/8	3.32E+00
Zinc	1.13E+01	4.10E+01	2.45E+01	8/8	n/a	n/a	0/8	6.00E+01	0/8	1.00E+05	0/8	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	7.20E-02	7.20E-02	7.20E-02	1/8	1.00E-01	1.00E-01	n/a	n/a	0/8	4.25E+01	0/8	1.99E-01
PCB-1016	1.30E-02	2.80E-02	1.90E-02	3/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	0/3	1.99E-01
PCB-1260	4.40E-02	4.40E-02	4.40E-02	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	0/1	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.64E+00	4.64E+00	4.64E+00	1/2	4.44E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	3.53E-02	3.53E-02	3.53E-02	1/2	3.07E-02	3.18E-02	n/a	n/a	0/2	2.71E+01	0/2	2.71E-01
Technetium-99	0.00E+00	0.00E+00	0.00E+00	1/2	4.74E+00	4.74E+00	0/2	2.80E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	1.10E+00	1.72E+00	1.41E+00	2/2	2.44E-01	4.12E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.34E-01	9.00E-01	6.17E-01	2/2	7.36E-02	2.15E-01	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	7.46E-01	7.83E-01	7.65E-01	2/2	1.62E-01	1.87E-01	0/2	1.20E+00	0/2	1.71E+02	0/2	1.71E+00
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.50E-02	1.50E-02	1.50E-02	1/8	n/a	n/a	n/a	n/a	0/8	9.38E+03	0/8	1.56E+02
cis-1,2-Dichloroethene	4.00E-03	4.00E-03	4.00E-03	1/8	n/a	n/a	n/a	n/a	0/8	4.63E+02	0/8	1.34E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

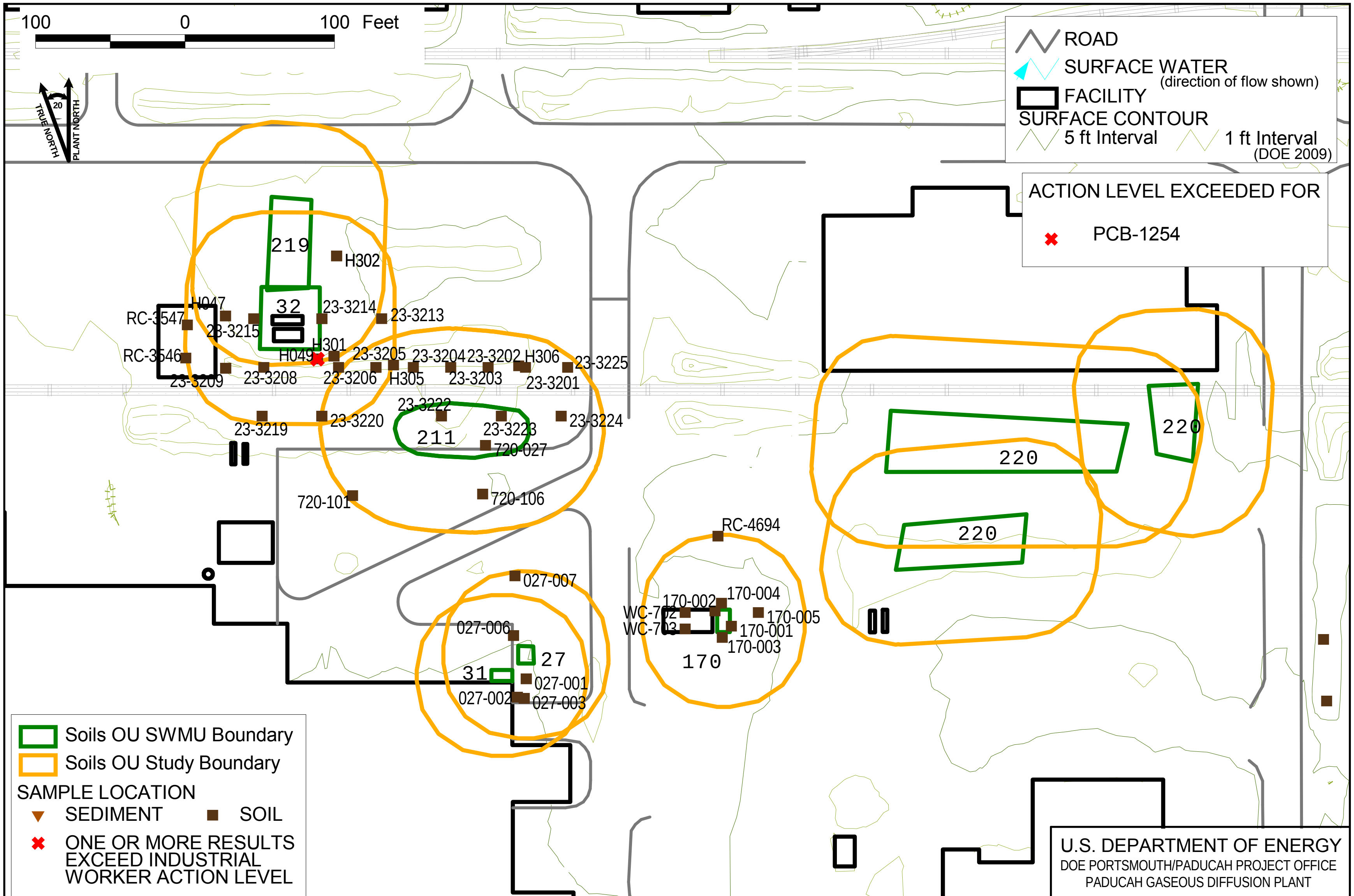


Figure 5.32. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 32 (C-728 2 Clean Waste Oil Tanks)

Area description

The C-728 Clean Waste Oil Tanks (SWMU 32) is located north of the C-720 Building in the central portion of the plant site. SWMU 32 consisted of two, aboveground tanks approximately 8,000 gal and 4,000 gal, respectively. The tanks have since been removed.

Process history

The C-728 Clean Waste Oil Tanks were used to store waste oil and motor cleaning solvents (mineral spirits).

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI Addendum (DOE 1994c). Results of these investigations indicate the presence of solvents and oil. COCs listed in the WAG 23 RI are PAHs, PCBs, dioxins, and uranium. The WAG 23 Remedial Action Report (RAR) (DOE 1998f) states that the average PCB concentration at SWMU 32 is 0.2 parts per million (ppm), and the PCB ELCR is below *de minimis* for current industrial and future industrial workers.

Table 5.25 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.33).

Area utilities

No recirculating water lines or sewers are associated with these tanks; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.25. Summary of Surface and Subsurface Historical Data at SWMU 32

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	6.10E+03	6.69E+03	6.40E+03	2/2	n/a	n/a	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Arsenic	2.00E+00	4.00E+00	3.22E+00	6/6	n/a	n/a	0/6	1.20E+01	0/6	3.15E+02	6/6	5.23E-01
Barium	9.49E+01	2.21E+02	1.68E+02	6/6	n/a	n/a	4/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	6.00E-01	8.00E-01	7.00E-01	2/2	4.00E-01	4.00E-01	1/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Calcium	3.75E+03	5.13E+03	4.44E+03	2/2	n/a	n/a	0/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.08E+01	2.87E+01	1.57E+01	6/6	n/a	n/a	1/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	5.50E+00	6.50E+00	6.00E+00	2/2	1.40E+00	1.40E+00	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	2.24E+01	4.27E+01	3.26E+01	2/2	n/a	n/a	2/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	9.58E+03	1.02E+04	9.89E+03	2/2	n/a	n/a	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	2.01E+01	3.55E+01	2.78E+01	2/6	n/a	n/a	1/6	3.60E+01	0/6	1.25E+03	0/6	5.00E+01
Magnesium	8.34E+02	9.36E+02	8.85E+02	2/2	n/a	n/a	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.15E+02	3.44E+02	2.80E+02	2/2	n/a	n/a	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	1.66E+01	2.15E+01	1.91E+01	2/6	6.80E+00	6.80E+00	1/6	2.10E+01	0/6	9.30E+04	0/6	2.42E+02
Selenium	3.20E-01	3.20E-01	3.20E-01	2/6	5.00E-01	5.00E-01	0/6	8.00E-01	0/6	2.56E+04	0/6	9.49E+01
Uranium	1.70E+00	1.10E+01	6.35E+00	4/4	n/a	n/a	2/4	4.90E+00	0/4	3.34E+03	0/4	2.02E+01
Vanadium	1.79E+01	1.85E+01	1.82E+01	2/2	n/a	n/a	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	5.16E+01	6.16E+01	5.66E+01	2/2	n/a	n/a	1/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
2,2',3,4-Tetrachlorobiphenyl	1.30E+00	1.30E+00	1.30E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1242	3.80E+01	3.80E+01	3.80E+01	1/13	9.90E-02	1.00E-01	n/a	n/a	0/13	4.25E+01	1/13	1.99E-01
PCB-1254	1.20E-02	6.60E+01	3.30E+01	2/13	2.00E-01	2.00E-01	n/a	n/a	1/13	1.82E+01	1/13	1.99E-01
PCB-1260	2.00E-02	5.55E+00	1.31E+00	5/13	2.00E-01	4.20E+00	n/a	n/a	0/13	4.25E+01	2/13	1.99E-01
Polychlorinated biphenyls 132	9.30E-01	9.30E-01	9.30E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 31	4.70E-01	4.70E-01	4.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 99	9.00E-01	9.00E-01	9.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	3.00E+00	1.64E+01	6.72E+00	12/12	1.70E+00	2.60E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.00E+00	4.15E+01	1.39E+01	12/12	1.20E+00	1.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	1.94E+01	5.69E+01	3.82E+01	2/2	1.60E+00	3.30E+00	2/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	2.50E+00	1.19E+01	4.87E+00	7/10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.66E+00	4.49E+00	3.08E+00	2/2	2.80E-01	6.40E-01	1/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	2.11E+00	7.39E+00	4.75E+00	2/2	3.10E-01	8.20E-01	2/2	1.20E+00	0/2	1.71E+02	2/2	1.71E+00
Semivolatiles (mg/kg)												
Benzo(b)fluoranthene	6.80E-01	6.80E-01	6.80E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	2.08E+02	1/3	2.12E-01
Bis(2-ethylhexyl)phthalate	3.10E-01	3.10E-01	3.10E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Fluoranthene	1.30E-01	1.30E-01	1.30E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	6.50E+04	0/3	2.21E+02
Pyrene	1.30E-01	1.30E-01	1.30E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	4.87E+04	0/3	1.65E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.25. Summary of Surface and Subsurface Historical Data at SWMU 32 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
2,2',3,4-Tetrachlorobiphenyl	4.70E-01	4.70E-01	4.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1242	2.00E+00	7.30E+00	4.10E+00	3/8	9.80E-02	1.00E-01	n/a	n/a	0/8	4.25E+01	3/8	1.99E-01
PCB-1254	4.20E+00	1.90E+01	9.67E+00	3/11	2.00E-01	2.10E-01	n/a	n/a	1/11	1.82E+01	3/11	1.99E-01
PCB-1260	6.00E-03	1.69E+00	8.49E-01	2/11	2.00E-01	4.10E+00	n/a	n/a	0/11	4.25E+01	1/11	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.10E+00	1.21E+01	6.64E+00	8/8	1.40E+00	2.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.90E+00	2.62E+01	1.01E+01	8/8	1.00E+00	1.50E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	2.00E+00	2.30E+01	1.34E+01	5/5	5.00E-01	2.20E+00	4/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Thorium-230	7.00E-02	4.90E-01	2.80E-01	2/5	3.00E-02	1.00E-01	0/5	1.40E+00	0/5	1.49E+03	0/5	1.49E+01
Uranium	2.10E+00	2.10E+00	2.10E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.10E-01	1.88E+00	1.13E+00	4/5	5.00E-02	2.60E-01	0/5	2.40E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-238	2.90E-01	3.40E+00	1.88E+00	4/5	5.00E-02	3.50E-01	3/5	1.20E+00	0/5	1.71E+02	2/5	1.71E+00
Semivolatiles (mg/kg)												
2,7,10-Trimethyldodecane	3.40E-01	3.40E-01	3.40E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3,5-Dimethyl-Octane	4.10E-01	5.80E-01	4.95E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	2.20E-01	8.80E-01	5.07E-01	3/8	4.00E-01	4.30E-01	n/a	n/a	0/8	7.40E+03	0/8	8.84E+00
trans-Decahydronaphthalene	3.90E-01	5.70E-01	4.80E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,2,4-Trimethylbenzene	4.70E-01	1.10E+00	7.95E-01	4/4	n/a	n/a	n/a	n/a	0/4	1.00E+05	0/4	3.67E+02
1,2-Diethylbenzene	3.60E-01	3.60E-01	3.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Methyl-2-propylcyclohexane	2.10E-01	7.40E-01	4.75E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Methyl-4-(1-methylethyl)benzene	3.80E-01	8.50E-01	5.83E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyldecane	7.20E-01	1.40E+00	1.06E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	5.00E-02	1.50E-01	9.24E-02	5/8	1.20E-02	1.30E-02	n/a	n/a	0/8	1.91E+04	0/8	3.58E+02
Benzene	1.60E-02	1.60E-02	1.60E-02	1/8	6.00E-03	6.00E-03	n/a	n/a	0/8	7.45E+01	0/8	1.13E+00
Cumene	3.50E-01	3.50E-01	3.50E-01	1/1	n/a	n/a	n/a	n/a	0/1	1.90E+04	0/1	3.52E+02
Ethylbenzene	4.20E-02	2.10E-01	1.26E-01	2/8	6.00E-03	6.00E-03	n/a	n/a	0/8	2.12E+03	0/8	2.12E+01
Methylmethylethylbenzene	1.00E+00	1.00E+00	1.00E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Xylene	1.40E-02	1.40E-02	1.40E-02	1/8	6.00E-03	6.00E-03	n/a	n/a	0/8	2.20E+04	0/8	7.24E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

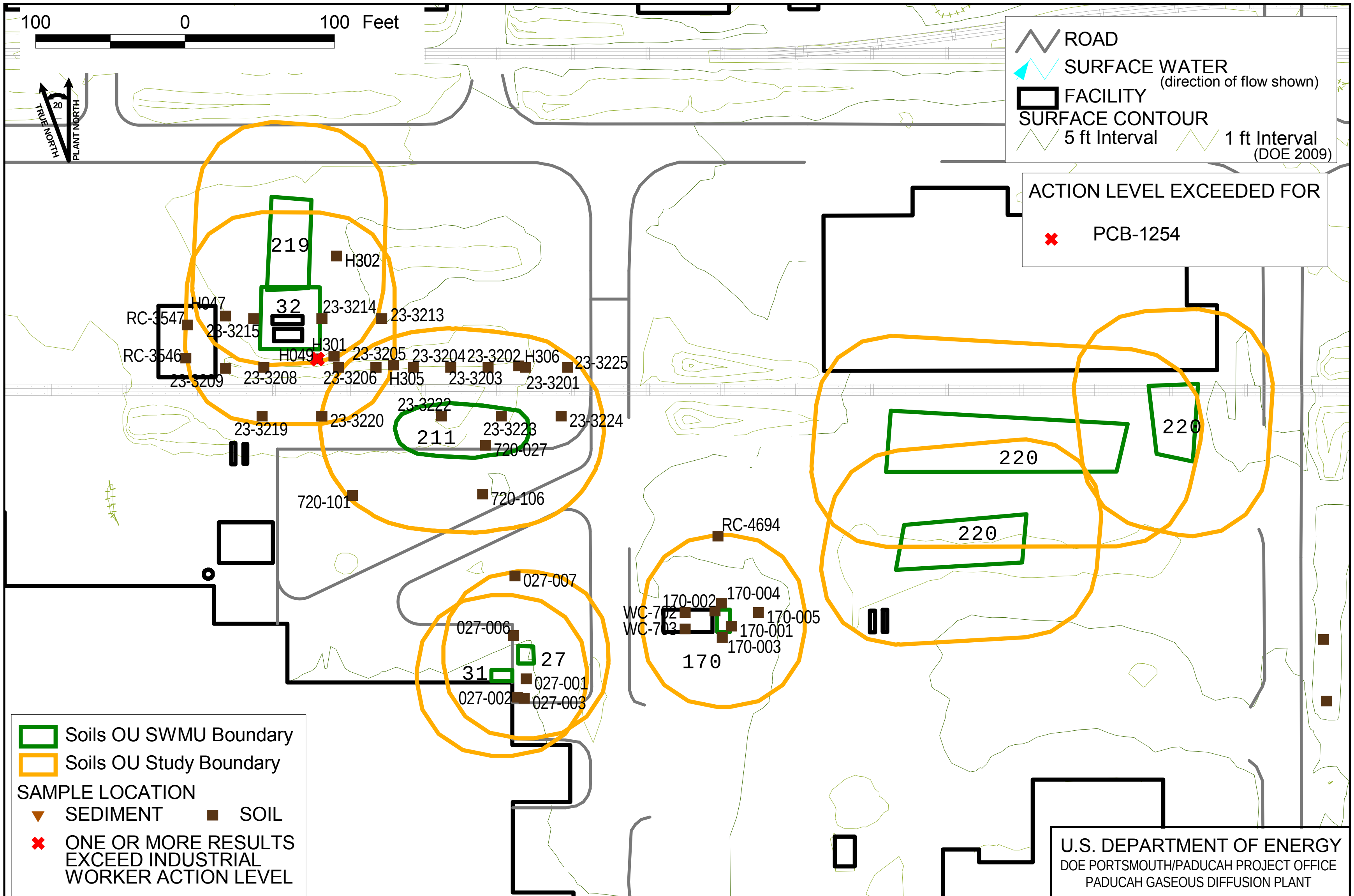


Figure 5.33. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 40 (C-403 Neutralization Tank)

Area description

The C-403 Neutralization Tank (SWMU 40) is an in-ground concrete, open-top tank lined with two layers of acid bricks located northeast of the C-400 Building in the central portion of the plant site. The tank is approximately 25 ft square by 26 ft deep. This SWMU currently is listed in the *Action Memorandum for the Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0120&D2/R1, and planned for excavation.

Process history

The C-403 Neutralization Tank received influent from the C-400 Building for the storage and treatment (i.e., neutralization) of acidic, uranium-bearing waste solutions generated during cleaning operations. During treatment, lime slurry was added to the wastewater from the C-402 Lime House to raise the pH and precipitate out the uranium in the form of a low-level radioactive sludge. Once the pH was raised to the proper level (10 to 12), the effluent was discharged to the C-404 Holding Pond where the sludge was allowed to settle out of the solution.

In 1957, the discharge from the C-403 Neutralization Tank was routed to the NSDD, where it flowed to the LBC. In the late 1970s, flow from the NSDD was routed into the C-616-F Full Flow Lagoon, and direct discharge to LBC subsequently was discontinued. Although neutralization no longer was carried out at C-403 after 1957, low-level, uranium-bearing wastewater continued to be discharged to C-403 until 1990. These discharges included UF_6 cylinder hydrostatic-test water, overflow and runoff from cleaning tanks, discharge from floor drains, and other unknown sources. After 1990, the C-403 Neutralization Tank was removed from service.

Previous investigation results

Soil boring and groundwater samples obtained during the Phase II SI (CH2M HILL 1992) and WAG 6 RI (DOE 1999b) indicate the potential for radiological, PCB, metals, and PAH contamination.

In 1993, nine water and three sediment samples were collected from the C-403 Neutralization Tank. Analytical results indicated TCE concentrations in the nine water samples, and TCE concentrations in the three sediment samples (DOE 1999b). During the WAG 6 RI, a water line located near the C-403 tank broke, and subsurface water flowed into the tank from one of the still existing fill lines. Approximately 198 m^3 (7,000 ft^3) of water accumulated in the tank. Samples of the water from the tank were analyzed in 1997 and were found to contain TCE. Resampling in 1998 indicated that TCE concentrations in water exceeded the risk-based action levels for the industrial worker exposure scenario (DOE 2000a).

The WAG 6 RI placed SWMU 40 into Sector 2 (refer to Section 5.1.3, SWMU 11, *"Previous Investigation Results"* for a definition of Sectors used in WAG 6 RI). Subsurface soil collected adjacent to the tank backfill at a depth of 30 ft bgs was found to be impacted by several radionuclides. Based upon available data, the extent of contamination around the C-403 Neutralization Tank appears to be limited to the area of the tank backfill. Elevated radioactivity also was detected at a few locations along the former storm sewer utility line that connects the C-403 Neutralization Tank to the HF Lagoon. High concentrations of two metals, silver and antimony, were associated with the area of elevated radioactivity detected along this line. Both metals were used in the plating process that was performed within the C-400 Building.

The summary table from the BRA for WAG 6, showing which human health risks exceed *de minimis*, is located in the Previous Investigation Results of Section 5.1.3.

Table 5.26 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.34).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, a recirculating water line is present within the boundary of the SWMU.

Data gap determination

This SWMU currently is listed in the *Action Memorandum for the Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0120&D2/R1, and planned for excavation; therefore, no additional samples are needed at this location.

Table 5.26. Summary of Surface and Subsurface Historical Data at SWMU 40

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	1.50E+03	3.00E+03	2.12E+03	20/20	n/a	n/a	10/20	4.90E+00	0/20	3.34E+03	10/20	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	3.40E+00	1.10E+01	6.44E+00	20/20	n/a	n/a	n/a	n/a	0/20	4.25E+01	20/20	1.99E-01
Radionuclides (pCi/g)												
Neptunium-237 (mg/kg)	5.10E-02	1.85E-01	1.07E-01	20/20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Plutonium-239 (mg/kg)	9.80E-04	4.46E-03	1.97E-03	20/20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99 (mg/kg)	1.00E-01	2.23E+00	9.46E-01	20/20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230 (mg/kg)	2.04E-03	8.32E-03	5.78E-03	20/20	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium (mg/kg)	1.50E+03	3.00E+03	2.12E+03	20/20	n/a	n/a	10/20	4.90E+00	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.58E+03	1.71E+04	9.93E+03	19/19	n/a	n/a	3/19	1.20E+04	0/19	1.00E+05	17/19	4.64E+03
Antimony	7.00E-01	1.90E+00	1.50E+00	3/19	6.00E-01	1.28E+01	3/19	2.10E-01	0/19	4.63E+02	3/19	3.79E-01
Arsenic	2.50E+00	8.83E+00	3.87E+00	19/19	n/a	n/a	2/19	7.90E+00	0/19	3.15E+02	19/19	5.23E-01
Barium	1.38E+01	1.62E+02	7.34E+01	19/19	n/a	n/a	0/19	1.70E+02	0/19	1.00E+05	0/19	2.29E+02
Beryllium	4.20E-01	7.50E-01	5.49E-01	19/19	n/a	n/a	2/19	6.90E-01	0/19	1.28E+03	0/19	9.48E-01
Cadmium	8.00E-02	3.00E+00	1.10E+00	8/19	2.00E-02	8.80E-01	4/19	2.10E-01	0/19	7.05E+01	0/19	2.13E+01
Calcium	7.80E+02	2.49E+03	1.59E+03	19/19	n/a	n/a	0/19	6.10E+03	n/a	n/a	n/a	n/a
Chromium	8.90E+00	2.20E+01	1.51E+01	19/19			6/19	4.30E+01	n/a	n/a	0/19	3.56E+02
Cobalt	1.50E+00	7.90E+00	4.52E+00	17/19	5.80E+00	5.80E+00	0/19	1.30E+01	0/19	1.00E+05	0/19	1.92E+03
Copper	3.50E+00	5.21E+01	1.67E+01	19/19	n/a	n/a	6/19	2.50E+01	0/19	1.00E+05	0/19	4.93E+02
Iron	9.84E+03	1.80E+04	1.37E+04	19/19	n/a	n/a	0/19	2.80E+04	0/19	1.00E+05	19/19	2.07E+03
Lead	5.50E+00	1.62E+01	9.99E+00	19/19	n/a	n/a	0/19	2.30E+01	0/19	1.25E+03	0/19	5.00E+01
Magnesium	3.32E+02	2.35E+03	1.29E+03	19/19	n/a	n/a	3/19	2.10E+03	n/a	n/a	n/a	n/a
Manganese	9.40E+00	4.98E+02	2.18E+02	19/19	n/a	n/a	0/19	8.20E+02	0/19	4.64E+04	12/19	4.52E+01
Mercury	1.63E-02	7.00E-02	3.48E-02	18/19	8.70E-03	8.70E-03	0/19	1.30E-01	0/19	8.25E+02	0/19	9.82E-01
Nickel	3.20E+00	2.49E+01	1.14E+01	19/19	n/a	n/a	3/19	2.20E+01	0/19	9.30E+04	0/19	2.42E+02
Potassium	1.30E+01	1.08E+03	2.84E+02	19/19			2/19	9.50E+02	n/a	n/a	n/a	n/a
Sodium	2.19E+02	6.19E+02	3.71E+02	17/19	3.72E+02	3.72E+02	12/19	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.90E+01	2.92E+01	2.49E+01	19/19	n/a	n/a	0/19	3.70E+01	0/19	4.47E+03	19/19	3.32E+00
Zinc	8.96E+00	4.31E+01	2.25E+01	19/19	n/a	n/a	0/19	6.00E+01	0/19	1.00E+05	0/19	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	4.10E+00	3.28E+01	1.45E+01	17/17	1.23E+01	1.28E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	2.00E-01	1.50E-01	4/4	n/a	n/a	n/a	n/a	0/4	5.16E+02	0/4	5.16E+00
Beta activity	8.30E+00	4.81E+01	3.17E+01	17/17	1.76E+01	1.95E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.00E-01	1.00E-01	1.00E-01	4/4	n/a	n/a	0/4	2.80E-01	0/4	8.58E+00	4/4	8.58E-02
Neptunium-237	1.00E-01	3.00E-01	1.50E-01	4/6	n/a	n/a	n/a	n/a	0/6	2.71E+01	1/6	2.71E-01
Plutonium-239	1.00E-01	1.00E-01	1.00E-01	4/6	n/a	n/a	n/a	n/a	0/6	1.15E+03	0/6	1.15E+01
Technetium-99	4.00E-01	4.00E+00	2.80E+00	3/6	n/a	n/a	2/6	2.80E+00	0/6	3.62E+04	0/6	3.62E+02
Thorium-230	8.10E-02	1.90E+00	1.01E+00	6/6	n/a	n/a	2/6	1.40E+00	0/6	1.49E+03	0/6	1.49E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.26. Summary of Surface and Subsurface Historical Data at SWMU 40 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Uranium	2.10E+00	9.80E+00	6.08E+00	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.90E-02	3.50E+00	1.39E+00	6/6	n/a	n/a	2/6	2.40E+00	0/6	1.98E+03	0/6	1.98E+01
Uranium-235	1.00E-01	2.00E-01	1.50E-01	4/6	n/a	n/a	2/6	1.40E-01	0/6	3.95E+01	0/6	3.95E-01
Uranium-238	4.00E-01	3.80E+00	2.18E+00	4/6	n/a	n/a	2/6	1.20E+00	0/6	1.71E+02	2/6	1.71E+00
Semivolatiles (mg/kg)												
2,6-Dinitrotoluene	4.32E-01	4.32E-01	4.32E-01	2/28	3.80E-01	8.40E-01	n/a	n/a	0/28	4.18E+02	0/28	7.57E-01
Bis(2-ethylhexyl)phthalate	5.00E-02	2.80E-01	1.48E-01	6/28	3.80E-01	8.40E-01	n/a	n/a	0/28	7.40E+03	0/28	8.84E+00
Di-n-butyl phthalate	5.00E-02	9.78E-01	5.17E-01	4/28	3.80E-01	8.40E-01	n/a	n/a	0/28	1.00E+05	0/28	2.13E+03
Ethanol, 2,2'-oxybis-, diacetate	8.50E-01	2.40E+00	1.45E+00	6/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
N-Nitroso-di-n-propylamine	4.84E-01	4.84E-01	4.84E-01	1/28	3.80E-01	8.40E-01	n/a	n/a	0/28	1.84E+01	1/28	2.31E-02
Volatiles (mg/kg)												
Acetone	1.80E-02	1.00E-01	5.52E-02	12/17	1.20E-02	1.00E-01	n/a	n/a	0/17	1.91E+04	0/17	3.58E+02
Methylene chloride	1.80E-03	2.40E-01	5.12E-02	15/17	6.00E-03	6.00E-03	n/a	n/a	0/17	2.16E+03	0/17	1.34E+01
Toluene	1.60E-03	2.30E-03	1.90E-03	3/17	6.00E-03	6.00E-03	n/a	n/a	0/17	7.28E+03	0/17	2.11E+02
Vinyl acetate	1.30E-03	2.80E-02	1.47E-02	2/17	1.10E-02	6.00E-02	n/a	n/a	0/17	4.42E+03	0/17	1.44E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

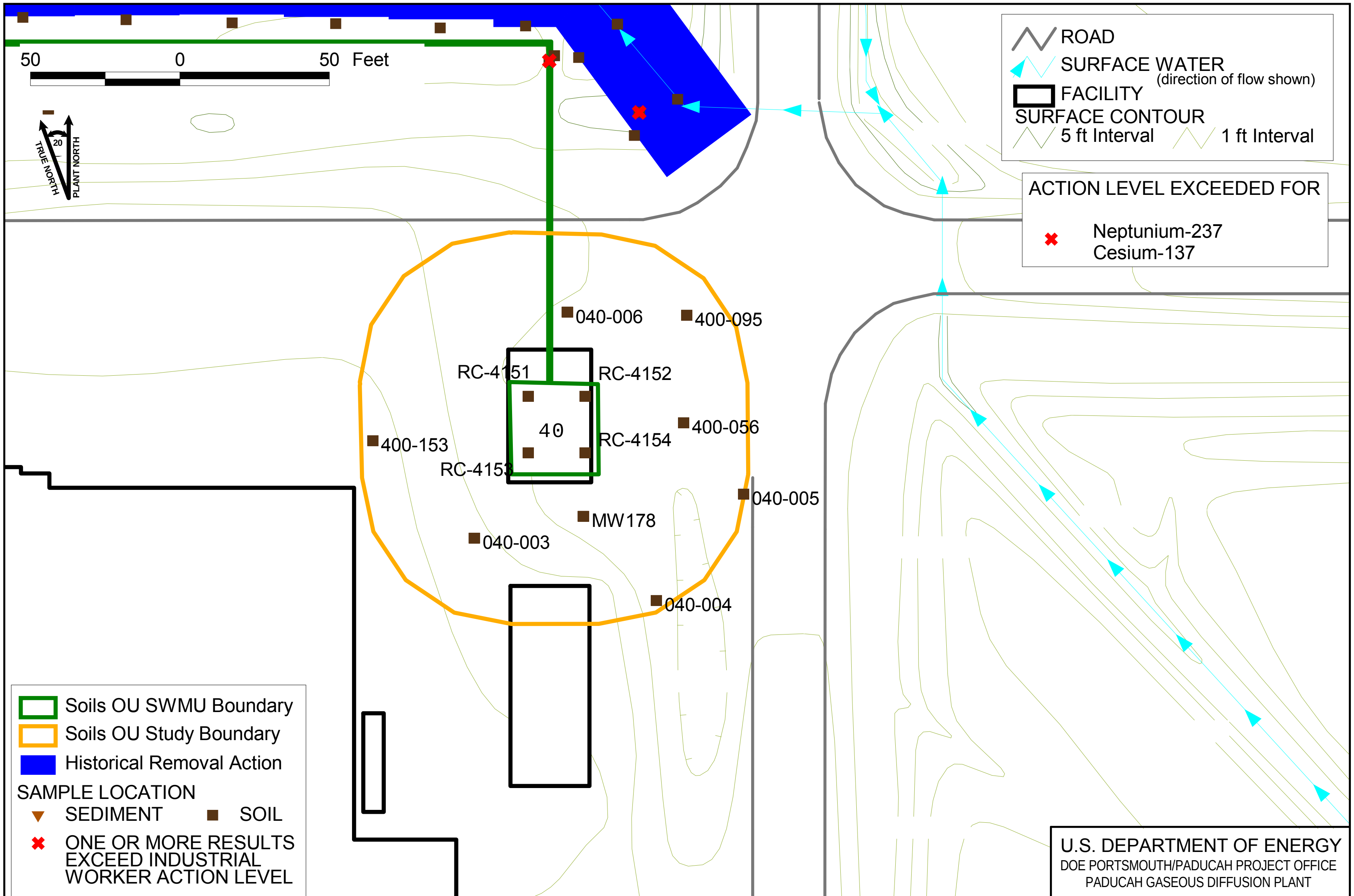


Figure 5.34. Soils Operable Unit: SWMU 40

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Figure No. \SoilsOU\sou_swmusr3.apr
DATE 08-27-09

SWMU 76 (C-632-B Sulfuric Acid Storage Tank)

Area description

The C-632-B Sulfuric Acid Storage Tank (SWMU 76) is located in the central portion of the plant site. The tank itself is empty, but the unit includes a diked area surrounding the tank. This SWMU is located on the south end of DMSA OS-11, SWMU 222.

Process history

The tank was used for the storage of sulfuric acid. Spills of sulfuric acid inside the diked area are known to have occurred.

Previous investigation results

No previous samples have been taken at this location.

Figure 5.35 shows the area historical map.

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

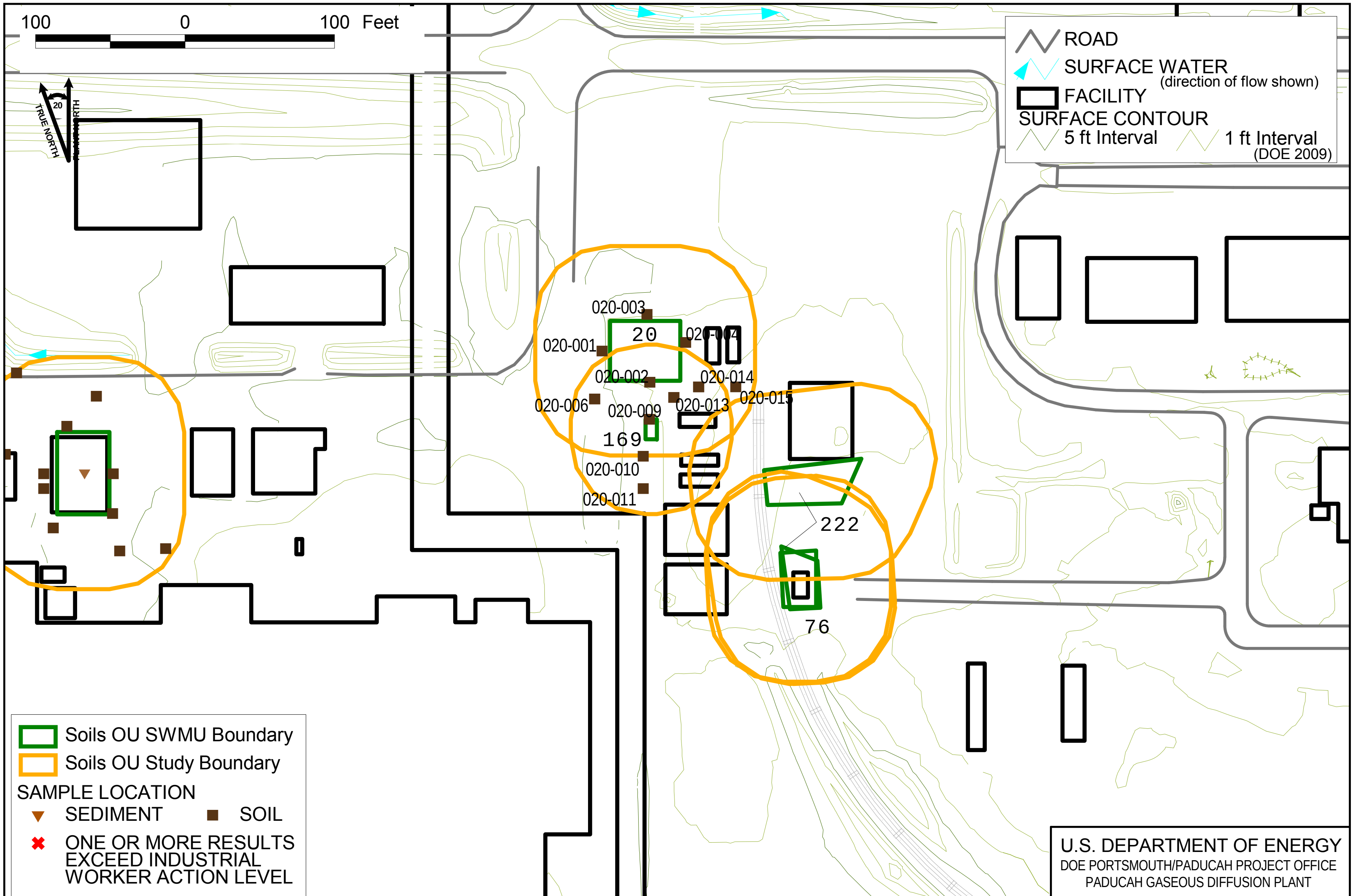

Figure 5.35. Soils Operable Unit: SWMUs 20, 76, 169, and 222

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Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 77 (C-634-B Sulfuric Acid Storage Tank)

Area description

The C-634-B Sulfuric Acid Storage Tank (SWMU 77) is located in the southeast portion of the plant site. The tank has been removed, but the concrete dike still is in place.

Process history

The tank was used for the storage of sulfuric acid. Spills and/or releases of sulfuric acid from the storage tank potentially occurred when the unit was in use.

Table 5.27 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.36).

Previous investigation results

No previous samples have been taken at this location.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

No historical data is available; therefore, samples are needed at this location. The surface, however, is covered with concrete.

Table 5.27. Summary of Surface and Subsurface Historical Data at SWMU 77

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	4.00E+00	4.00E+00	4.00E+00	1/6	n/a	n/a	n/a	n/a	0/6	4.25E+01	1/6	1.99E-01
PCB-1254	4.00E+00	4.00E+00	4.00E+00	1/1	n/a	n/a	n/a	n/a	0/1	1.82E+01	1/1	1.99E-01
Radionuclides (pCi/g)												
Americium-241	1.53E+00	1.53E+00	1.53E+00	1/6	n/a	n/a	n/a	n/a	0/6	5.16E+02	0/6	5.16E+00
Cesium-137	8.00E-02	2.26E+00	5.90E-01	5/6	n/a	n/a	1/6	4.90E-01	0/6	8.58E+00	4/6	8.58E-02
Cobalt-60	7.00E-02	1.70E+00	8.85E-01	2/6	n/a	n/a	n/a	n/a	0/6	1.77E+00	2/6	1.77E-02
Neptunium-237	3.43E+01	2.69E+02	9.08E+01	5/6	n/a	n/a	5/6	1.00E-01	5/6	2.71E+01	5/6	2.71E-01
Plutonium-239	4.70E-01	7.04E+01	1.46E+01	5/6	n/a	n/a	5/6	2.50E-02	0/6	1.15E+03	1/6	1.15E+01
Technetium-99	6.95E+02	1.94E+05	3.96E+04	5/6	n/a	n/a	5/6	2.50E+00	1/6	3.62E+04	5/6	3.62E+02
Thorium-230	8.00E-01	5.84E+01	2.03E+01	3/6	n/a	n/a	2/6	1.50E+00	0/6	1.49E+03	1/6	1.49E+01
Uranium	4.81E+02	1.12E+05	2.29E+04	5/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

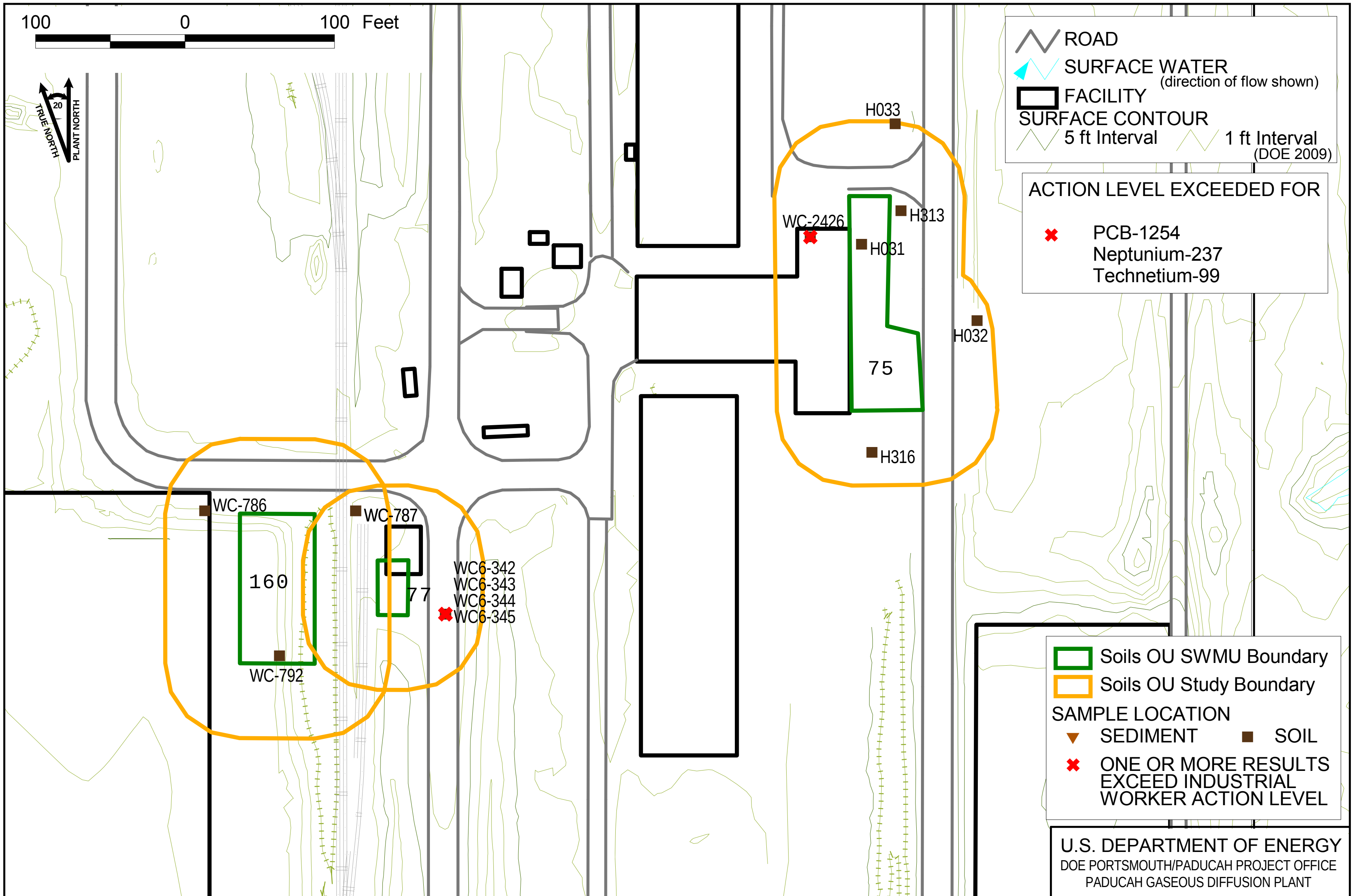

Figure 5.36. Soils Operable Unit: SWMUs 75, 77, 160

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DATE 03-05-10

SWMU 165 (C-616-L Pipeline and Vault Soil Contamination)

Area description

The C-616-L Pipeline and Vault Soil Contamination (SWMU 165) are located in the central portion of the plant site. The SWMU dimensions consist of two areas: area 1 is 105 ft wide by 210 ft long; and area 2 is 30 ft wide by 130 ft long.

Process history

The C-616-L Vault historically served as an effluent collection system. The area collects runoff from the C-600 Coal Pile. This runoff was transferred to the NSDD.

Previous investigation results

Past sampling events occurred in 1989, 1990, 1991, 1994, and 1995. Analysis of soil samples detected low-levels of PCBs and radionuclides. Subsurface soil samples also were obtained and analyzed as part of the Site Evaluation (SE) for 9 and 11 (DOE 1999c). Characterization of the area has identified elevated levels of PCBs, uranium, and technetium-99.

Summary excerpts from the SE are as follows:

> It is concluded that the contamination present at SWMU 165 does not present risks to industrial workers, potential residential groundwater users, or non-human receptors that exceed *de minimis* levels. Direct contact risks are regarded acceptably low even though a confirmatory sample determined that PAHs may be present at SWMU 165 at concentrations that exceed *de minimis* levels.
>
> None of the PAHs was detected at a concentration that exceeds the systemic toxicity RBC calculated using a hazard index (HI) or the KYDEP soil screening value. However, six PAHs were detected at a concentration that exceeds the cancer risk RBC calculated using a excess lifetime cancer risk (ELCR) of 1×10^{-7}, and five of these six PAHs were detected at a concentration that exceeds the KYDEP soil screening value. Significantly, two PAHs, benzo(a)pyrene and dibenz(a,h)anthracene, were detected at concentrations that were greater than l00X the cancer risk RBC, or at a concentration that may result in risks to an unrestricted worker that approach $1 \times l0^{-4}$. However, of these two PAHs, one, benzo(a)pyene, was reported detected at the detection limit.

Table 5.28 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.37).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, storm sewers are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.28. Summary of Surface and Subsurface Historical Data at SWMU 165

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	1.40E+00	1.40E+04	5.54E+03	5/5	1.96E+01	1.27E+04	1/5	1.30E+04	0/5	1.00E+05	3/5	4.64E+03
Antimony	2.20E+00	2.20E+00	2.20E+00	1/5	2.20E+00	2.00E+01	1/5	2.10E-01	0/5	4.63E+02	1/5	3.79E-01
Arsenic	5.50E-01	1.30E+02	4.26E+01	16/17	4.90E+00	3.95E+01	14/17	1.20E+01	0/17	3.15E+02	16/17	5.23E-01
Barium	1.10E-01	1.14E+03	4.59E+02	16/16	2.45E+00	5.10E+02	10/16	2.00E+02	0/16	1.00E+05	10/16	2.29E+02
Beryllium	1.10E-01	6.75E+00	1.71E+00	5/5	2.20E-01	5.70E+00	2/5	6.70E-01	0/5	1.28E+03	2/5	9.48E-01
Cadmium	2.20E-01	2.20E-01	2.20E-01	2/17	2.20E-01	2.00E+00	2/17	2.10E-01	0/17	7.05E+01	0/17	2.13E+01
Calcium	3.30E-01	8.30E+04	2.20E+04	4/4	2.00E+02	1.68E+05	1/4	2.00E+05	n/a	n/a	n/a	n/a
Chromium	2.20E-01	6.66E+01	2.54E+01	17/17	2.45E+00	2.36E+01	10/17	1.60E+01	n/a	n/a	0/17	3.56E+02
Cobalt	3.30E-01	2.38E+01	7.52E+00	4/4	9.70E-01	1.60E+01	1/4	1.40E+01	0/4	1.00E+05	0/4	1.92E+03
Copper	2.20E-01	1.16E+02	4.44E+01	5/5	1.60E+00	8.29E+01	3/5	1.90E+01	0/5	1.00E+05	0/5	4.93E+02
Iron	2.20E-01	1.34E+04	7.15E+03	5/5	1.96E+01	9.58E+03	0/5	2.80E+04	0/5	1.00E+05	3/5	2.07E+03
Lead	2.20E-01	5.15E+01	2.21E+01	11/17	5.60E+00	2.00E+01	5/17	3.60E+01	0/17	1.25E+03	2/17	5.00E+01
Lithium	2.24E+01	2.24E+01	2.24E+01	1/1	5.00E+00	5.00E+00	n/a	n/a	0/1	1.00E+05	0/1	6.41E+02
Magnesium	1.90E+00	4.41E+03	1.49E+03	4/4	2.50E+00	3.50E+03	1/4	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.10E-01	4.34E+02	1.61E+02	5/5	2.45E+00	1.83E+02	0/5	1.50E+03	0/5	4.64E+04	3/5	4.52E+01
Mercury	1.50E-01	9.00E-01	5.34E-01	5/16	7.00E-02	2.00E-01	5/16	2.00E-01	0/16	8.25E+02	0/16	9.82E-01
Nickel	4.40E-01	3.92E+01	2.59E+01	17/17	1.30E+00	2.59E+01	11/17	2.10E+01	0/17	9.30E+04	0/17	2.42E+02
Potassium	2.78E+01	4.99E+02	1.85E+02	3/3	8.69E+01	2.36E+03	0/3	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.10E-01	1.25E+01	3.88E+00	14/17	1.00E+00	2.00E+01	12/17	8.00E-01	0/17	2.56E+04	0/17	9.49E+01
Silver	2.20E-01	8.33E+01	3.79E+01	7/17	2.20E-01	2.50E+00	6/17	2.30E+00	0/17	2.07E+04	2/17	4.11E+01
Sodium	1.50E+00	3.33E+02	1.12E+02	3/3	6.90E+01	3.52E+02	1/3	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.10E-01	1.10E-01	1.10E-01	2/13	2.80E-01	2.00E+01	0/13	2.10E-01	n/a	n/a	n/a	n/a
Uranium	4.00E+00	1.87E+02	2.18E+01	18/19	1.20E-01	1.00E+02	12/19	4.90E+00	0/19	3.34E+03	5/19	2.02E+01
Vanadium	1.10E-01	1.06E+02	2.91E+01	5/5	2.45E+00	7.45E+01	1/5	3.80E+01	0/5	4.47E+03	3/5	3.32E+00
Zinc	1.10E-01	1.22E+02	4.55E+01	4/4	1.00E+01	3.32E+01	1/4	6.50E+01	0/4	1.00E+05	0/4	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.00E-01	5.10E+01	4.52E+00	34/207	1.00E-01	2.00E+00	n/a	n/a	1/207	4.25E+01	34/207	1.99E-01
PCB-1254	3.70E-01	3.70E-01	3.70E-01	1/22	6.00E-02	5.00E+00	n/a	n/a	0/22	1.82E+01	1/22	1.99E-01
PCB-1260	3.80E-01	1.10E+01	5.23E+00	3/22	9.00E-02	1.00E-01	n/a	n/a	0/22	4.25E+01	3/22	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	1.52E+00	6.90E+01	2.32E+01	5/5	6.92E-03	9.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.38E-01	1.38E-01	1.38E-01	1/3	2.00E-02	1.28E-01	n/a	n/a	0/3	5.16E+02	0/3	5.16E+00
Beta activity	1.68E+00	2.40E+02	6.46E+01	5/5	1.12E-02	1.00E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.13E+00	1.18E+01	5.30E+00	5/7	3.00E-02	6.40E-01	5/7	4.90E-01	1/7	8.58E+00	5/7	8.58E-02
Neptunium-237 (mg/kg)	5.00E-03	5.00E-03	5.00E-03	1/15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	6.00E-02	5.27E-01	3.13E-01	3/6	3.10E-04	5.00E-01	2/6	1.00E-01	0/6	2.71E+01	2/6	2.71E-01
Plutonium-238	1.00E-02	1.00E-02	1.00E-02	1/3	2.60E-04	1.94E-01	0/3	7.30E-02	0/3	1.17E+03	0/3	1.17E+01
Plutonium-239	3.90E-01	3.90E-01	3.90E-01	1/2	1.00E-03	1.00E-01	1/2	2.50E-02	0/2	1.15E+03	0/2	1.15E+01
Plutonium-239/240	1.01E+00	1.01E+00	1.01E+00	1/4	2.00E-02	5.96E-02	n/a	n/a	0/4	1.15E+03	0/4	1.15E+01
Plutonium-242	0.00E+00	0.00E+00	0.00E+00	1/1	1.00E-05	1.00E-05	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.28. Summary of Surface and Subsurface Historical Data at SWMU 165 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Technetium-99 (mg/kg)	0.00E+00	0.00E+00	0.00E+00	2/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	5.30E-01	6.00E+01	3.06E+01	8/9	8.30E-04	3.06E+00	7/9	2.50E+00	0/9	3.62E+04	0/9	3.62E+02
Thorium-228	2.70E-01	3.91E-01	3.46E-01	3/3	2.97E-03	1.50E-01	0/3	1.60E+00	0/3	2.80E+00	3/3	2.80E-02
Thorium-230	2.20E-01	8.73E+00	2.43E+00	6/6	3.32E-03	3.02E-01	3/6	1.50E+00	0/6	1.49E+03	0/6	1.49E+01
Thorium-230 (mg/kg)	0.00E+00	1.00E-04	8.17E-05	12/12	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-232	2.20E-01	4.15E-01	3.47E-01	3/3	3.48E-03	5.26E-02	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Uranium	3.00E+00	2.00E+01	8.48E+00	9/9	1.36E+00	1.36E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.00E-02	1.40E+02	2.47E+01	7/7	1.45E-03	1.00E+01	3/7	2.50E+00	0/7	1.98E+03	1/7	1.98E+01
Uranium-235	0.00E+00	4.70E+00	1.02E+00	7/7	1.20E-04	7.00E-01	4/7	1.40E-01	0/7	3.95E+01	3/7	3.95E-01
Uranium-238	1.00E-02	1.50E+02	2.95E+01	11/11	2.37E-03	1.00E+01	9/11	1.20E+00	0/11	1.71E+02	9/11	1.71E+00
Semivolatiles (mg/kg)												
2-Methylnaphthalene	3.70E-01	6.60E+00	3.49E+00	2/3	4.80E-01	6.20E-01	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	3.70E-01	3.70E-01	3.70E-01	1/7	1.10E-01	5.00E-01	n/a	n/a	0/7	6.67E+04	0/7	3.16E+02
Acenaphthylene	3.60E-01	3.60E-01	3.60E-01	1/7	4.30E-02	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	3.60E-01	6.30E-01	4.53E-01	3/7	9.60E-02	5.00E-01	n/a	n/a	0/7	1.00E+05	0/7	3.79E+03
Benz(a)anthracene	3.60E-01	1.50E+00	6.50E-01	5/7	2.00E-01	5.00E-01	n/a	n/a	0/7	2.08E+02	5/7	2.12E-01
Benzo(a)pyrene	3.60E-01	1.40E+00	6.50E-01	4/7	2.50E-01	5.00E-01	n/a	n/a	0/7	2.08E+01	4/7	2.12E-02
Benzo(b)fluoranthene	3.60E-01	2.40E+00	9.20E-01	4/7	2.90E-01	5.00E-01	n/a	n/a	0/7	2.08E+02	4/7	2.12E-01
Benzo(ghi)perylene	3.70E-01	9.30E-01	6.27E-01	3/7	2.70E-01	9.30E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	3.60E-01	8.40E-01	5.10E-01	4/6	1.20E-01	5.00E-01	n/a	n/a	0/6	2.08E+03	0/6	2.12E+00
Butyl benzyl phthalate	3.60E-01	3.60E-01	3.60E-01	1/3	7.10E-02	4.80E-01	n/a	n/a	0/3	1.00E+05	0/3	2.71E+03
Carbazole	3.70E-01	3.70E-01	3.70E-01	1/3	1.20E-01	4.80E-01	n/a	n/a	0/3	1.28E+04	0/3	2.15E+01
Chrysene	3.60E-01	1.90E+00	7.68E-01	5/7	1.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+04	0/7	2.12E+01
Dibenz(a,h)anthracene	9.30E-01	9.30E-01	9.30E-01	1/6	4.70E-01	9.30E-01	n/a	n/a	0/6	2.08E+01	1/6	2.12E-02
Dibenzofuran	3.70E-01	3.70E-01	3.70E-01	1/2	2.80E-01	2.80E-01	n/a	n/a	0/2	9.02E+03	0/2	1.86E+01
Di-n-butyl phthalate	3.60E-01	3.70E-01	3.65E-01	2/2	4.50E-01	9.10E-01	n/a	n/a	0/2	1.00E+05	0/2	2.13E+03
Fluoranthene	3.60E-01	4.00E+00	1.40E+00	4/6	4.70E-01	9.10E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Indeno(1,2,3-cd)pyrene	3.70E-01	9.30E-01	6.60E-01	3/7	2.30E-01	9.30E-01	n/a	n/a	0/7	2.08E+02	3/7	2.12E-01
Naphthalene	3.70E-01	4.70E+00	2.72E+00	4/7	4.70E-01	5.00E-01	n/a	n/a	0/7	7.66E+02	0/7	2.36E+01
Phenanthrene	3.60E-01	3.80E+00	2.19E+00	5/7	9.70E-02	1.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	3.60E-01	2.90E+00	1.03E+00	5/7	3.40E-01	8.20E-01	n/a	n/a	0/7	4.87E+04	0/7	1.65E+02
Volatiles (mg/kg)												
Acetone	1.10E-01	1.10E-01	1.10E-01	1/7	1.00E-02	9.10E-02	n/a	n/a	0/7	1.91E+04	0/7	3.58E+02
Methylene chloride	5.00E-03	6.00E-03	5.50E-03	2/7	8.00E-03	3.50E-02	n/a	n/a	0/7	2.16E+03	0/7	1.34E+01
Toluene	7.00E-02	2.10E-01	1.40E-01	2/7	8.00E-03	1.00E-02	n/a	n/a	0/7	7.28E+03	0/7	2.11E+02
Wetchem (mg/kg)												
Cyanide	1.00E-02	1.00E-02	1.00E-02	1/2	2.00E-02	2.00E-02	n/a	n/a	0/2	2.02E+04	0/2	7.92E+01
Subsurface Soils												
Metals (mg/kg)												
Aluminum	1.10E+00	1.75E+04	7.42E+03	20/20	2.00E+01	8.32E+03	6/20	1.20E+04	0/20	1.00E+05	13/20	4.64E+03
Antimony	2.20E+00	2.70E+00	2.40E+00	3/21	2.20E+00	2.00E+01	3/21	2.10E-01	0/21	4.63E+02	3/21	3.79E-01
Arsenic	1.10E-01	3.01E+01	5.57E+00	21/21	1.40E+00	7.10E+00	6/21	7.90E+00	0/21	3.15E+02	14/21	5.23E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.28. Summary of Surface and Subsurface Historical Data at SWMU 165 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Barium	1.10E-01	4.13E+02	9.37E+01	21/21	2.50E+00	8.78E+01	4/21	1.70E+02	0/21	1.00E+05	3/21	2.29E+02
Beryllium	1.10E-01	5.52E+00	1.07E+00	21/21	4.50E-01	7.50E-01	9/21	6.90E-01	0/21	1.28E+03	6/21	9.48E-01
Cadmium	2.20E-01	3.20E-01	2.70E-01	2/21	2.20E-01	2.00E+00	2/21	2.10E-01	0/21	7.05E+01	0/21	2.13E+01
Calcium	2.20E-01	1.59E+04	1.74E+03	21/21	2.00E+02	4.00E+04	1/21	6.10E+03	n/a	n/a	n/a	n/a
Chromium	2.20E-01	5.31E+01	1.61E+01	21/21	2.50E+00	2.23E+01	10/21	4.30E+01	n/a	n/a	0/21	3.56E+02
Cobalt	2.20E-01	1.62E+01	5.83E+00	21/21	2.50E+00	2.74E+01	4/21	1.30E+01	0/21	1.00E+05	0/21	1.92E+03
Copper	2.20E-01	1.49E+02	2.95E+01	21/21	1.10E+00	8.50E+00	5/21	2.50E+01	0/21	1.00E+05	0/21	4.93E+02
Iron	2.20E-01	3.83E+04	1.15E+04	21/21	2.00E+01	2.10E+04	2/21	2.80E+04	0/21	1.00E+05	13/21	2.07E+03
Lead	5.30E-01	2.55E+01	8.05E+00	20/21	2.70E+00	2.00E+01	2/21	2.30E+01	0/21	1.25E+03	0/21	5.00E+01
Lithium	1.11E+01	2.44E+01	1.61E+01	5/5	5.00E+00	5.00E+00	n/a	n/a	0/5	1.00E+05	0/5	6.41E+02
Magnesium	1.90E+00	2.04E+03	7.85E+02	21/21	2.50E+00	7.15E+03	0/21	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.10E-01	6.96E+02	1.96E+02	21/21	2.50E+00	4.08E+02	0/21	8.20E+02	0/21	4.64E+04	13/21	4.52E+01
Mercury	9.70E-02	3.70E-01	2.39E-01	3/21	9.00E-02	2.00E-01	2/21	1.30E-01	0/21	8.25E+02	0/21	9.82E-01
Nickel	1.10E-01	4.96E+01	1.15E+01	21/21	3.50E+00	1.01E+01	5/21	2.20E+01	0/21	9.30E+04	0/21	2.42E+02
Potassium	4.40E+00	6.30E+02	1.85E+02	16/16	1.26E+02	4.25E+02	0/16	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.10E-01	1.63E+00	8.03E-01	4/21	1.10E-01	1.00E+00	2/21	7.00E-01	0/21	2.56E+04	0/21	9.49E+01
Sodium	1.50E+00	5.73E+02	1.23E+02	16/16	6.97E+01	1.94E+02	2/16	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.10E-01	8.60E+01	2.80E+01	21/21	2.50E+00	3.22E+01	6/21	3.70E+01	0/21	4.47E+03	13/21	3.32E+00
Zinc	1.10E-01	7.38E+01	2.26E+01	19/21	6.90E+00	3.15E+01	2/21	6.00E+01	0/21	1.00E+05	0/21	2.73E+03
Pesticides/PCBs (mg/kg)												
Decachlorobiphenyl	9.49E-02	9.49E-02	9.49E-02	1/8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB, Total	3.00E-01	3.00E-01	3.00E-01	2/37	1.00E-01	1.00E-01	n/a	n/a	0/37	4.25E+01	2/37	1.99E-01
Tetrachloro-m-xylene	1.04E-01	1.04E-01	1.04E-01	1/8	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	1.05E+00	2.63E+01	5.87E+00	18/18	9.87E-04	2.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.41E+00	1.66E+01	5.73E+00	17/18	1.31E-03	1.70E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	3.65E-02	1.27E-01	8.18E-02	2/5	2.71E-02	3.87E-02	0/5	2.80E-01	0/5	8.58E+00	1/5	8.58E-02
Neptunium-237	4.34E-01	4.75E-01	4.55E-01	2/5	4.28E-02	9.39E-02	n/a	n/a	0/5	2.71E+01	2/5	2.71E-01
Plutonium-239/240	1.42E-01	2.16E+00	7.48E-01	4/5	5.70E-02	6.08E-02	n/a	n/a	0/5	1.15E+03	0/5	1.15E+01
Technetium-99	5.20E-01	1.87E+02	4.68E+01	8/23	5.00E-04	3.06E+00	6/23	2.80E+00	0/23	3.62E+04	0/23	3.62E+02
Thorium-228	4.49E-01	6.30E-01	5.60E-01	5/5	5.03E-02	5.22E-02	0/5	1.60E+00	0/5	2.80E+00	5/5	2.80E-02
Thorium-230	6.31E-01	2.60E+01	8.52E+00	5/5	2.20E-01	2.21E-01	4/5	1.40E+00	0/5	1.49E+03	1/5	1.49E+01
Thorium-232	4.70E-01	6.81E-01	5.39E-01	5/5	5.09E-02	5.20E-02	0/5	1.50E+00	0/5	1.35E+03	0/5	1.35E+01
Uranium	5.58E+00	2.38E+01	1.48E+01	5/5	1.11E+00	1.39E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-233/234	7.60E-01	1.10E+00	9.30E-01	2/2	4.10E-05	5.60E-05	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.00E-02	9.78E+00	1.71E+00	19/19	7.00E-06	5.06E-01	4/19	2.40E+00	0/19	1.98E+03	0/19	1.98E+01
Uranium-235	1.00E-02	6.15E-01	1.44E-01	16/21	2.10E-05	4.73E-02	5/21	1.40E-01	0/21	3.95E+01	2/21	3.95E-01
Uranium-238	1.00E-02	1.34E+01	2.40E+00	20/21	2.00E-05	8.68E-01	5/21	1.20E+00	0/21	1.71E+02	5/21	1.71E+00
Semivolatiles (mg/kg)												
2-Methylnaphthalene	3.70E-01	1.70E+00	8.17E-01	3/21	5.90E-02	1.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benz(a)anthracene	3.80E-01	3.80E-01	3.80E-01	1/21	4.10E-02	6.60E-01	n/a	n/a	0/21	2.08E+02	1/21	2.12E-01
Bis(2-ethylhexyl)phthalate	3.80E-01	1.10E+00	6.36E-01	5/21	8.30E-02	6.60E-01	n/a	n/a	0/21	7.40E+03	0/21	8.84E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.28. Summary of Surface and Subsurface Historical Data at SWMU 165 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Butyl benzyl phthalate	3.80E-01	3.80E-01	3.80E-01	1/21	2.80E-01	6.60E-01	n/a	n/a	0/21	1.00E+05	0/21	2.71E+03
Chrysene	3.80E-01	3.80E-01	3.80E-01	1/21	5.80E-02	6.60E-01	n/a	n/a	0/21	2.08E+04	0/21	2.12E+01
Cineole	2.40E-02	2.40E-02	2.40E-02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dibenzofuran	3.80E-01	3.80E-01	3.80E-01	1/18	7.70E-02	6.60E-01	n/a	n/a	0/18	9.02E+03	0/18	1.86E+01
Di-n-butyl phthalate	8.40E-02	4.10E-01	2.87E-01	12/18	1.00E-01	6.60E-01	n/a	n/a	0/18	1.00E+05	0/18	2.13E+03
Fluoranthene	3.70E-01	3.80E-01	3.75E-01	2/18	4.80E-02	6.60E-01	n/a	n/a	0/18	6.50E+04	0/18	2.21E+02
Naphthalene	3.80E-01	1.10E+00	7.40E-01	2/21	1.70E-01	6.60E-01	n/a	n/a	0/21	7.66E+02	0/21	2.36E+01
Pentachlorophenol	2.10E+00	2.10E+00	2.10E+00	1/21	4.10E-01	3.30E+00	n/a	n/a	0/21	2.56E+03	0/21	2.12E+00
Phenanthrene	3.70E-01	8.40E-01	5.30E-01	3/21	6.50E-02	6.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	3.80E-01	3.80E-01	3.80E-01	1/21	8.10E-02	6.60E-01	n/a	n/a	0/21	4.87E+04	0/21	1.65E+02
Volatiles (mg/kg)												
1,1,2-Trichloroethane	6.00E-03	6.00E-03	6.00E-03	1/21	2.00E-03	1.00E-02	n/a	n/a	0/21	1.69E+02	0/21	1.18E+00
1,4-Cineole	3.30E-02	3.30E-02	3.30E-02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Propanol	3.00E-02	1.00E-01	8.17E-02	6/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Butanone	5.00E-03	1.20E-01	6.25E-02	2/23	7.00E-03	1.30E+00	n/a	n/a	0/23	3.94E+04	0/23	1.03E+03
2-Hexanone	6.00E-02	6.10E-02	6.05E-02	2/21	1.00E-02	2.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
2-Propanol	1.00E-01	4.00E-01	2.00E-01	6/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyl-2-pentanone	6.00E-02	6.10E-02	6.05E-02	2/21	1.00E-02	1.40E-02	n/a	n/a	0/21	2.18E+03	0/21	6.51E+01
Acetone	1.80E-02	1.20E-01	8.15E-02	15/21	1.00E-02	3.50E-02	n/a	n/a	0/21	1.91E+04	0/21	3.58E+02
Carbon disulfide	6.00E-03	6.00E-03	6.00E-03	1/21	1.00E-03	1.00E-02	n/a	n/a	0/21	3.17E+03	0/21	1.06E+02
Chlorobenzene	6.00E-03	6.00E-03	6.00E-03	1/21	1.00E-03	1.00E-02	n/a	n/a	0/21	1.64E+03	0/21	2.89E+01
Ethylbenzene	6.00E-03	6.00E-03	6.00E-03	1/21	1.00E-03	1.00E-02	n/a	n/a	0/21	2.12E+03	0/21	2.12E+01
Methylene chloride	6.00E-03	7.40E-02	2.51E-02	14/21	5.00E-03	5.40E-02	n/a	n/a	0/21	2.16E+03	0/21	1.34E+01
Tetrachloroethene	6.00E-03	6.00E-03	6.00E-03	1/21	1.00E-03	1.00E-02	n/a	n/a	0/21	1.46E+03	0/21	3.90E+00
Toluene	6.00E-03	6.00E-03	6.00E-03	2/21	5.00E-03	4.30E-02	n/a	n/a	0/21	7.28E+03	0/21	2.11E+02
Total Xylene	6.00E-03	6.00E-03	6.00E-03	2/18	5.00E-03	7.00E-03	n/a	n/a	0/18	2.20E+04	0/18	7.24E+02
Trichloroethene	6.00E-03	6.00E-03	6.00E-03	2/21	2.00E-03	2.60E-02	n/a	n/a	0/21	2.98E+02	0/21	2.51E+00
Wetchem (mg/kg)												
Cyanide	5.40E-01	5.60E-01	5.50E-01	2/16	n/a	n/a	n/a	n/a	0/16	2.02E+04	0/16	7.92E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

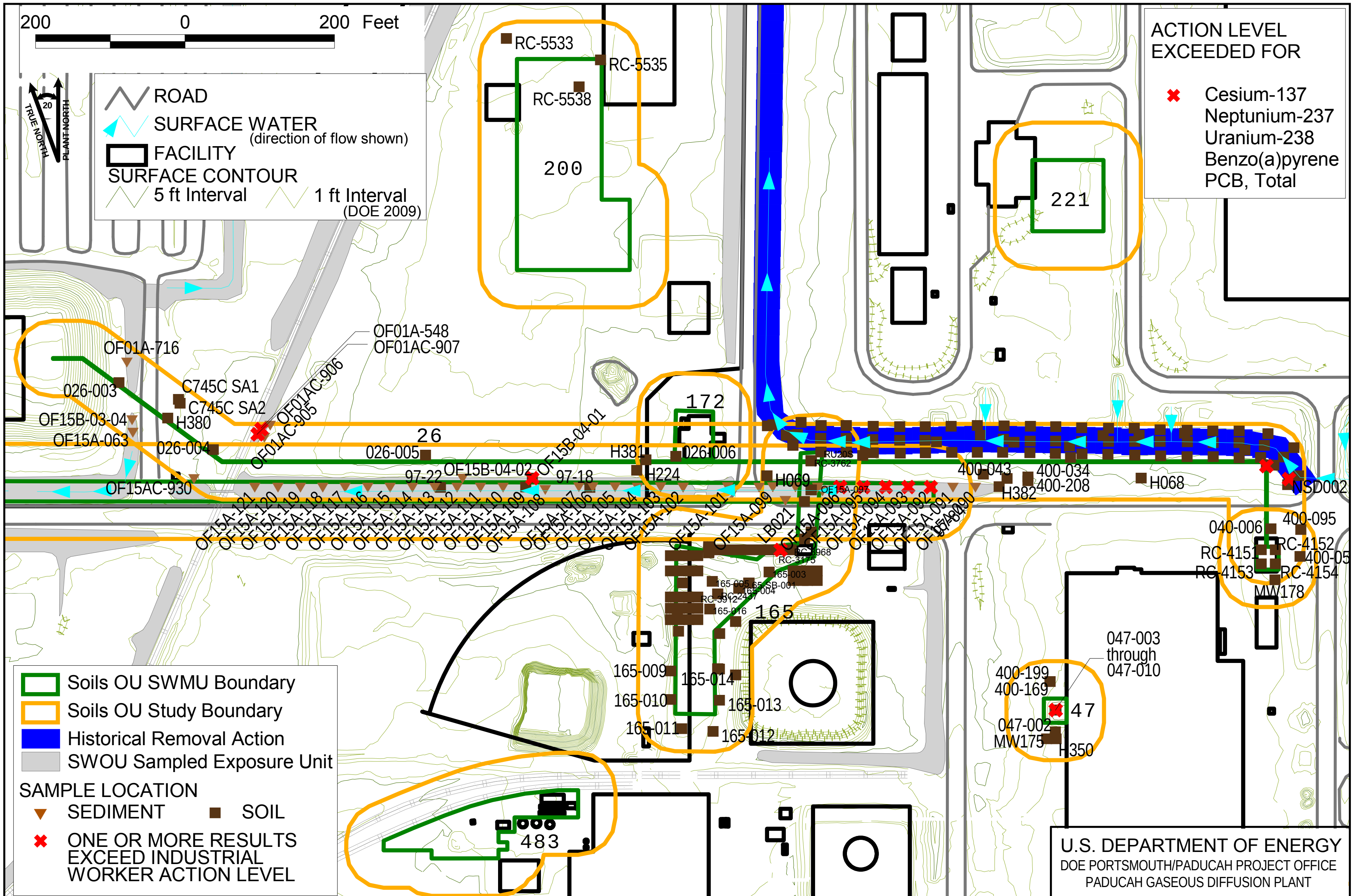

Figure 5.37. Soils Operable Unit: SWMUs 26, 47, 165, 172, 200, 221, and 483

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 170 (C-729 Acetylene Building Drain Pits)

Area description

The C-729 Acetylene Building Drain Pits (SWMU 170) is located in the central portion of the plant site. The two pits are approximately 16 ft long by 8 ft wide by 3 ft deep.

Process history

The two pits were operational from 1954 to the mid 1970s. Acetylene was generated for maintenance activities by combining calcium carbide and water. The residual from the operation drained to two outside concrete pits. Standpipes in the pits allowed sediments to settle out with the effluent draining to the storm sewer system.

Previous investigation results

A sludge sample was obtained and analyzed from each of the pits in 1993. Results indicated a high pH, volatiles, and uranium contamination. Surface and subsurface sampling results from the WAGs 9 & 11 SE (DOE 1999c) showed no VOCs present.

An excerpt from the SE is as follows:

> From the SE for SWMU 170, it is concluded that the contamination present does not present risks to industrial workers, potential residential groundwater users, and non-human receptors that exceed *de minimis* levels. Direct contact risks are *de minimis* because contaminated media are not available for direct contact at SWMU 170. Risks from the use of groundwater where contamination has migrated from soil also are regarded acceptably low, though two detections of uranium-238 exceed background. These exceedances are deemed to be of little significance because the magnitude of the exceedance is minor (i.e., 1.40 and 2.55 pCi/g verses a background of 1.20 pCi/g) and because previous work has determined that uranium has limited mobility in the subsurface at PGDP.

Table 5.29 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.38).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, storm sewers are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.29. Summary of Surface and Subsurface Historical Data at SWMU 170

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Radionuclides (pCi/g)												
Alpha activity	6.25E+00	6.25E+00	6.25E+00	1/5	5.14E+00	7.87E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.18E+00	6.03E+00	4.99E+00	3/5	2.42E+00	3.18E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	4.00E+00	4.00E+00	4.00E+00	1/5	n/a	n/a	1/5	1.50E+00	0/5	1.49E+03	0/5	1.49E+01
Uranium	2.10E+00	9.50E+00	5.73E+00	4/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Radionuclides (pCi/g)												
Alpha activity	4.77E+00	4.77E+00	4.77E+00	1/2	4.44E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.47E+00	6.66E+00	5.57E+00	2/2	3.88E+00	3.88E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.54E-01	1.54E-01	1.54E-01	1/2	2.32E-02	2.91E-02	0/2	2.80E-01	0/2	8.58E+00	1/2	8.58E-02
Neptunium-237	4.36E-02	4.36E-02	4.36E-02	1/2	4.24E-02	4.99E-02	n/a	n/a	0/2	2.71E+01	0/2	2.71E-01
Technetium-99	0.00E+00	0.00E+00	0.00E+00	2/2	4.74E+00	4.74E+00	0/2	2.80E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	2.39E+00	3.65E+00	3.02E+00	2/2	3.28E-01	4.69E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	9.38E-01	1.04E+00	9.89E-01	2/2	9.12E-02	1.83E-01	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	1.40E+00	2.55E+00	1.98E+00	2/2	2.24E-01	2.71E-01	2/2	1.20E+00	0/2	1.71E+02	1/2	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

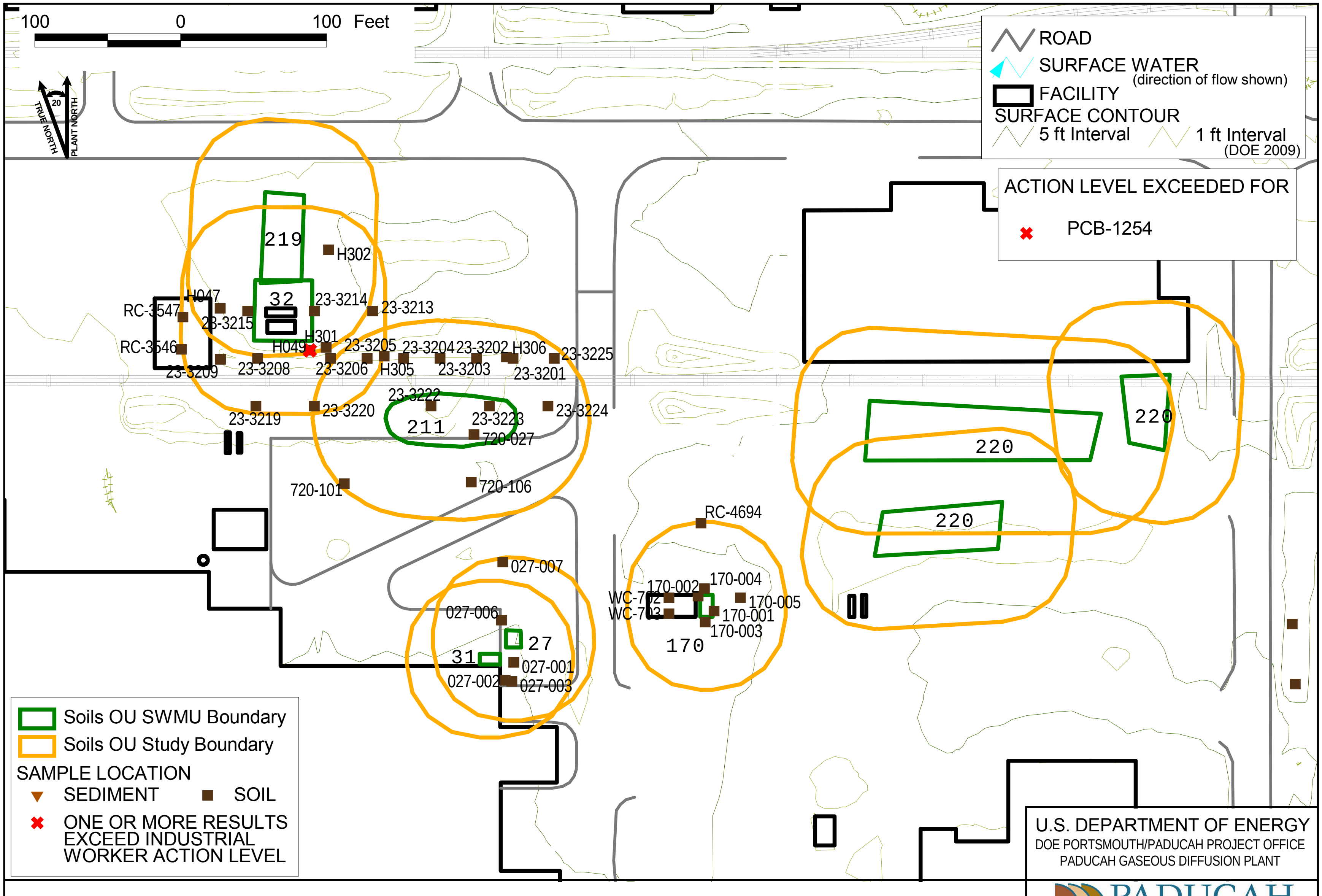

Figure 5.38. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

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5.1.5 Group 2–Chromium Areas

SWMU 158 (Chilled-Water System Leak Site)

Area description

The Chilled-Water System Leak Site (SWMU 158) is located in the central portion of the plant site, southeast of the C-720 Building. The SWMU consists of chilled waterlines located under the concrete pad near the C-720 Truck Alley. The SWMU 158 area is approximately 10 ft wide by 30 ft long.

Process history

The primary function of the system was to provide cooling water for computer systems and heating ventilation and air conditioning (HVAC) systems in various plant buildings. The site is an area where approximately 3,500 gal of chromated water from the chilled water system leaked into an adjacent electrical vault and spilled over to another connected vault. Suspected contamination is hexavalent chromium due to process knowledge.

Previous investigation results

No previous investigation results are available.

Table 5.30 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.39).

Area utilities

No current recirculating water lines or sewers are associated with this leak site; however, both recirculating water lines and sanitary sewers are present within the boundary of the SWMU. These lines are approximately 11 and 4 ft bgs, respectively.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.30. Summary of Surface and Subsurface Historical Data at SWMU 158

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.45E+03	1.21E+04	6.32E+03	5/5	1.31E+00	6.57E+00	1/5	1.20E+04	0/5	1.00E+05	3/5	4.64E+03
Arsenic	8.57E-01	5.38E+00	2.37E+00	5/5	8.27E-02	8.27E-02	0/5	7.90E+00	0/5	3.15E+02	5/5	5.23E-01
Barium	3.06E+01	8.01E+01	4.84E+01	4/5	2.00E-02	1.71E-01	0/5	1.70E+02	0/5	1.00E+05	0/5	2.29E+02
Beryllium	5.30E-02	6.10E-01	4.54E-01	5/5	1.88E-02	1.81E-01	0/5	6.90E-01	0/5	1.28E+03	0/5	9.48E-01
Cadmium	2.49E-01	2.49E-01	2.49E-01	1/5	4.89E-02	2.45E-01	1/5	2.10E-01	0/5	7.05E+01	0/5	2.13E+01
Calcium	6.14E+02	1.17E+03	8.28E+02	4/5	5.10E-01	6.63E+00	0/5	6.10E+03	n/a	n/a	n/a	n/a
Chromium	4.48E+00	7.18E+01	2.91E+01	4/5	1.33E-01	3.83E-01	3/5	4.30E+01	n/a	n/a	0/5	3.56E+02
Cobalt	1.15E+00	1.02E+01	4.83E+00	4/5	8.47E-02	3.73E-01	0/5	1.30E+01	0/5	1.00E+05	0/5	1.92E+03
Copper	3.02E+00	6.89E+00	4.82E+00	5/5	1.07E-01	2.11E-01	0/5	2.50E+01	0/5	1.00E+05	0/5	4.93E+02
Iron	6.21E+03	1.70E+04	1.27E+04	4/5	6.68E-01	2.36E+01	0/5	2.80E+04	0/5	1.00E+05	4/5	2.07E+03
Lead	3.33E+00	1.13E+01	6.87E+00	4/5	2.40E-01	2.48E+00	0/5	2.30E+01	0/5	1.25E+03	0/5	5.00E+01
Magnesium	2.91E+02	5.14E+02	4.00E+02	4/5	3.75E+00	6.79E+00	0/5	2.10E+03	n/a	n/a	n/a	n/a
Manganese	6.39E+00	1.55E+02	5.26E+01	4/5	3.00E-02	2.01E-01	0/5	8.20E+02	0/5	4.64E+04	1/5	4.52E+01
Nickel	3.93E+00	5.36E+00	4.51E+00	4/5	1.28E-01	1.28E+00	0/5	2.20E+01	0/5	9.30E+04	0/5	2.42E+02
Potassium	8.20E+01	1.73E+02	1.25E+02	4/5	2.00E+00	2.05E+00	0/5	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.02E-01	1.83E-01	1.43E-01	2/5	8.91E-02	8.91E-02	0/5	7.00E-01	0/5	2.56E+04	0/5	9.49E+01
Silver	3.45E-01	3.45E-01	3.45E-01	1/5	1.80E-01	2.91E-01	0/5	2.70E+00	0/5	2.07E+04	0/5	4.11E+01
Sodium	2.12E+02	3.27E+02	2.76E+02	4/5	2.73E+00	1.11E+01	2/5	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.12E+01	3.53E+01	2.43E+01	4/5	1.45E-01	6.02E-01	0/5	3.70E+01	0/5	4.47E+03	4/5	3.32E+00
Zinc	6.91E+00	4.46E+01	1.88E+01	4/5	8.06E-02	8.06E-02	0/5	6.00E+01	0/5	1.00E+05	0/5	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.02E+01	1.02E+01	1.02E+01	1/5	9.43E+00	9.51E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.34E+01	1.88E+01	1.54E+01	5/5	1.80E+01	1.82E+01	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
Vinyl chloride	4.00E-01	4.00E-01	4.00E-01	1/5	7.00E-01	1.00E+00	n/a	n/a	0/5	4.14E+01	1/5	1.34E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

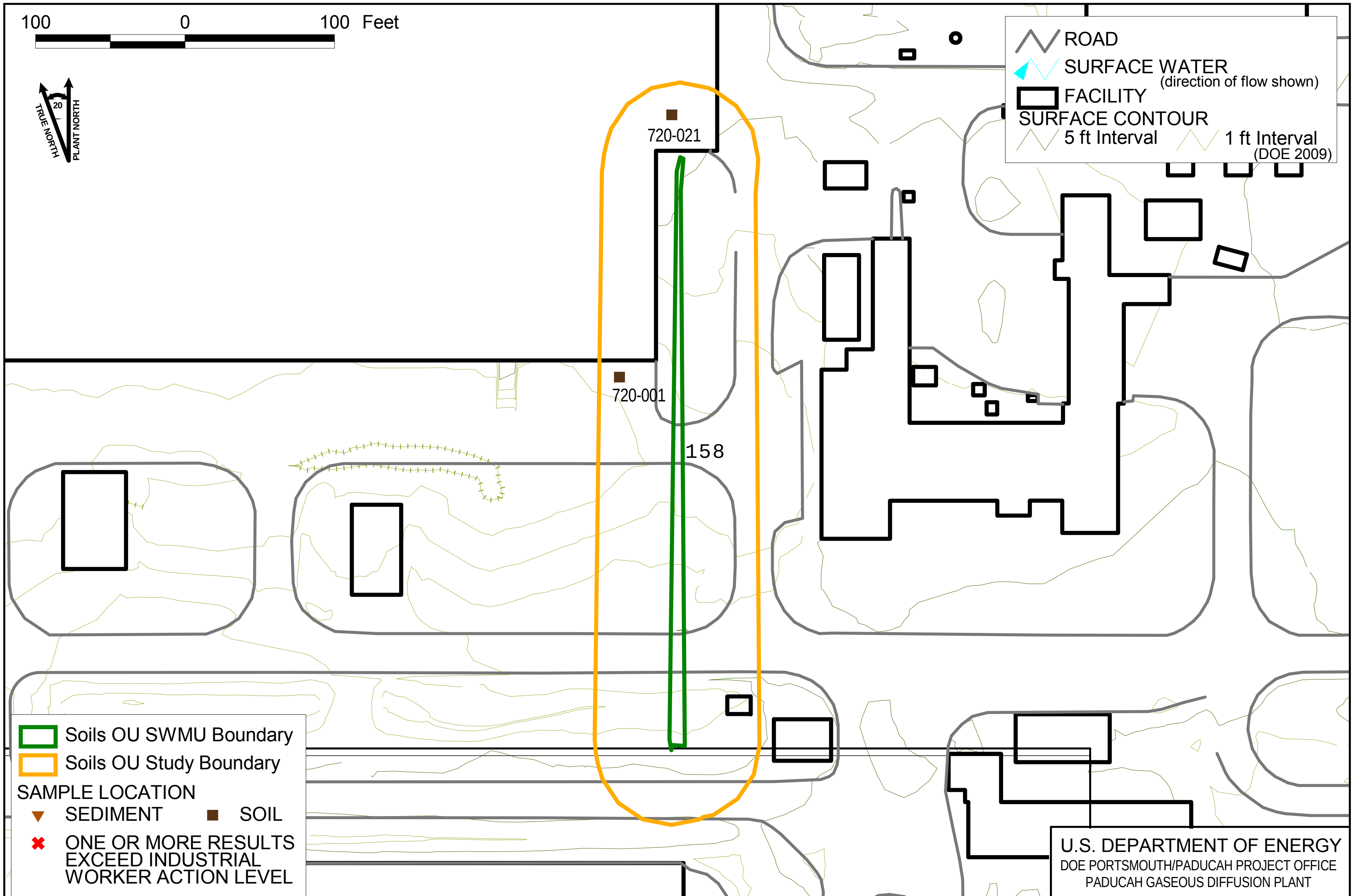

Figure 5.39. Soils Operable Unit: SWMU 158

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 169 (C-410-E HF Vent Surge Protection Tank)

Area description

The C-410-E HF Vent Surge Protection Tank (SWMU 169) is located in the east central portion of the plant site. The tank has an approximate volume of 150 gals and was operated from 1952 to 1977.

Process history

The tank is an aboveground tank that was used for surge protection. It is part of a system that produced hydrogen fluoride for the feed facility. Visual observation of staining on the ground indicated probable release of materials from the tank.

The 1992 SAR indicates that sampling of the aboveground tank found chromium present.

Previous investigation results

No previous investigations are available.

Table 5.31 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.40).

Area utilities

No recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.31. Summary of Surface and Subsurface Historical Data at SWMU 169

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	1.17E+04	1.17E+04	1.17E+04	1/1	n/a	n/a	0/1	1.30E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	5.83E+00	5.83E+00	5.83E+00	1/1	n/a	n/a	0/1	1.20E+01	0/1	3.15E+02	1/1	5.23E-01
Barium	7.17E+01	7.17E+01	7.17E+01	1/1	n/a	n/a	0/1	2.00E+02	0/1	1.00E+05	0/1	2.29E+02
Beryllium	7.60E-01	7.60E-01	7.60E-01	1/1	n/a	n/a	1/1	6.70E-01	0/1	1.28E+03	0/1	9.48E-01
Calcium	1.79E+05	1.79E+05	1.79E+05	1/1	n/a	n/a	1/1	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.80E+01	1.80E+01	1.80E+01	1/1	n/a	n/a	1/1	1.60E+01	n/a	n/a	0/1	3.56E+02
Copper	1.19E+01	1.19E+01	1.19E+01	1/1	n/a	n/a	0/1	1.90E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	1.14E+04	1.14E+04	1.14E+04	1/1	n/a	n/a	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	1.38E+01	1.38E+01	1.38E+01	1/1	n/a	n/a	0/1	3.60E+01	0/1	1.25E+03	0/1	5.00E+01
Magnesium	6.20E+03	6.20E+03	6.20E+03	1/1	n/a	n/a	1/1	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.63E+02	3.63E+02	3.63E+02	1/1	n/a	n/a	0/1	1.50E+03	0/1	4.64E+04	1/1	4.52E+01
Nickel	1.44E+01	1.44E+01	1.44E+01	1/1	n/a	n/a	0/1	2.10E+01	0/1	9.30E+04	0/1	2.42E+02
Potassium	1.47E+03	1.47E+03	1.47E+03	1/1	n/a	n/a	1/1	1.30E+03	n/a	n/a	n/a	n/a
Selenium	4.00E-01	4.00E-01	4.00E-01	1/1	n/a	n/a	0/1	8.00E-01	0/1	2.56E+04	0/1	9.49E+01
Sodium	2.17E+02	2.17E+02	2.17E+02	1/1	n/a	n/a	0/1	3.20E+02	n/a	n/a	n/a	n/a
Vanadium	2.28E+01	2.28E+01	2.28E+01	1/1	n/a	n/a	0/1	3.80E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	1.21E+02	1.21E+02	1.21E+02	1/1	n/a	n/a	1/1	6.50E+01	0/1	1.00E+05	0/1	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.20E+00	3.20E+00	3.20E+00	1/1	1.00E-01	1.00E-01	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
PCB-1254	2.70E+00	2.70E+00	2.70E+00	1/1	n/a	n/a	n/a	n/a	0/1	1.82E+01	1/1	1.99E-01
PCB-1260	5.00E-01	5.00E-01	5.00E-01	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	7.41E+00	7.97E+00	7.69E+00	2/7	5.23E+00	1.00E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.87E+00	1.30E+01	8.63E+00	3/7	3.72E+00	8.57E+00	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	5.47E+03	1.23E+04	9.29E+03	10/10	n/a	n/a	1/10	1.20E+04	0/10	1.00E+05	10/10	4.64E+03
Arsenic	2.10E+00	8.70E+00	5.51E+00	10/10	n/a	n/a	1/10	7.90E+00	0/10	3.15E+02	10/10	5.23E-01
Barium	7.86E+01	1.13E+02	9.06E+01	10/10	n/a	n/a	0/10	1.70E+02	0/10	1.00E+05	0/10	2.29E+02
Beryllium	3.00E-01	2.30E+00	6.55E-01	10/10	n/a	n/a	2/10	6.90E-01	0/10	1.28E+03	1/10	9.48E-01
Cadmium	1.80E-01	1.80E-01	1.80E-01	1/10	n/a	n/a	0/10	2.10E-01	0/10	7.05E+01	0/10	2.13E+01
Calcium	8.72E+02	1.43E+05	1.82E+04	10/10	n/a	n/a	3/10	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.05E+01	1.64E+01	1.34E+01	10/10	n/a	n/a	1/10	4.30E+01	n/a	n/a	0/10	3.56E+02
Cobalt	3.30E+00	7.30E+00	5.63E+00	8/10	n/a	n/a	0/10	1.30E+01	0/10	1.00E+05	0/10	1.92E+03
Copper	5.90E+00	1.48E+01	1.18E+01	10/10	n/a	n/a	0/10	2.50E+01	0/10	1.00E+05	0/10	4.93E+02
Iron	8.66E+03	1.88E+04	1.47E+04	10/10	n/a	n/a	0/10	2.80E+04	0/10	1.00E+05	10/10	2.07E+03
Lead	6.80E+00	1.35E+01	9.67E+00	10/10	n/a	n/a	0/10	2.30E+01	0/10	1.25E+03	0/10	5.00E+01
Magnesium	1.19E+03	4.01E+03	2.26E+03	10/10	n/a	n/a	4/10	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.71E+02	3.79E+02	2.69E+02	10/10	n/a	n/a	0/10	8.20E+02	0/10	4.64E+04	10/10	4.52E+01
Nickel	1.01E+01	1.55E+01	1.33E+01	10/10	n/a	n/a	0/10	2.20E+01	0/10	9.30E+04	0/10	2.42E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.31. Summary of Surface and Subsurface Historical Data at SWMU 169 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Potassium	2.78E+02	1.30E+03	5.74E+02	10/10	n/a	n/a	1/10	9.50E+02	n/a	n/a	n/a	n/a
Selenium	2.70E-01	3.70E-01	3.13E-01	4/10	n/a	n/a	0/10	7.00E-01	0/10	2.56E+04	0/10	9.49E+01
Sodium	6.45E+01	3.54E+02	1.86E+02	10/10	n/a	n/a	1/10	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.72E+01	2.20E+01	1.94E+01	10/10	n/a	n/a	0/10	3.70E+01	0/10	4.47E+03	10/10	3.32E+00
Zinc	1.67E+01	1.36E+02	5.12E+01	10/10	n/a	n/a	1/10	6.00E+01	0/10	1.00E+05	0/10	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-02	3.89E-01	1.39E-01	8/10	1.00E-01	1.00E-01	n/a	n/a	0/10	4.25E+01	2/10	1.99E-01
PCB-1248	7.00E-03	7.00E-03	7.00E-03	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	0/1	1.99E-01
PCB-1254	3.50E-02	3.00E-01	1.29E-01	8/8	n/a	n/a	n/a	n/a	0/8	1.82E+01	3/8	1.99E-01
PCB-1260	2.00E-02	8.90E-02	4.96E-02	7/7	n/a	n/a	n/a	n/a	0/7	4.25E+01	0/7	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	5.07E+00	7.08E+00	6.08E+00	2/2	1.64E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.53E+00	3.53E+00	3.53E+00	1/2	8.50E-01	3.88E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	3.23E-01	3.23E-01	3.23E-01	1/1	2.31E-01	2.31E-01	0/1	1.40E+00	0/1	1.49E+03	0/1	1.49E+01
Uranium	2.80E+00	4.19E+00	3.50E+00	2/2	4.65E-01	5.02E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.29E+00	1.85E+00	1.57E+00	2/2	2.05E-01	2.31E-01	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	1.45E+00	2.25E+00	1.85E+00	2/2	2.46E-01	2.57E-01	2/2	1.20E+00	0/2	1.71E+02	1/2	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

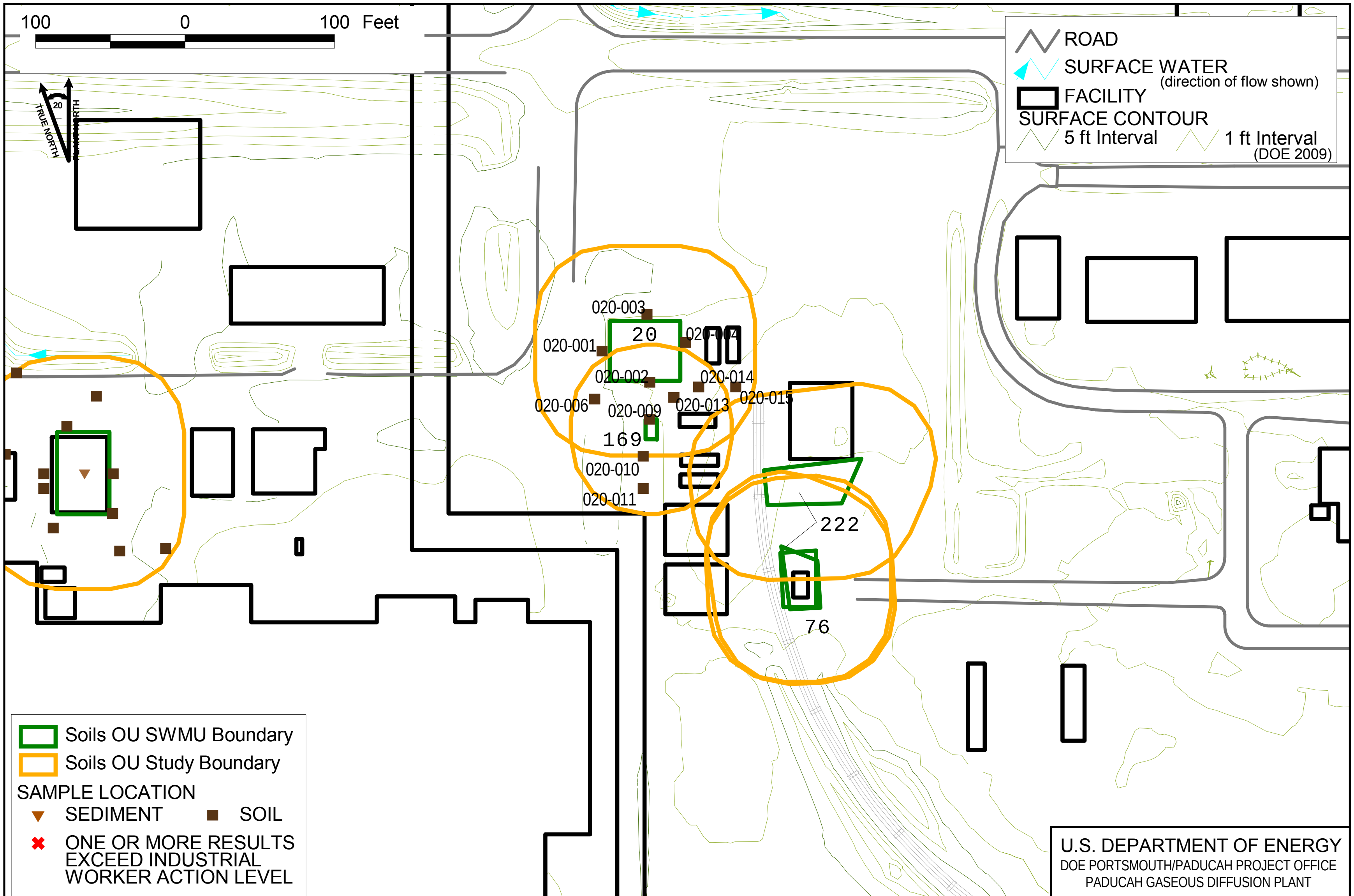

Figure 5.40. Soils Operable Unit: SWMUs 20, 76, 169, and 222

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 176 (C-331 Recirculating Water Leak Northwest NW Side)

Area description

The C-331 RCW Leak Northwest Side (SWMU 176) is located in the central portion of the plant site. The SWMU dimensions are approximately 75 ft by 75 ft.

Process history

Chromated water from the recirculating cooling water system leaked from an underground vault. In the 1990s, the chromium-based corrosion inhibitor was replaced with a phosphate-based inhibitor in the RCW. An estimated 200 gal of RCW spilled, with an estimated 0.014 lbs of hexavalent chromium being released into the environment. Sampling data indicates the presence of chromium as noted in the 1992 SAR.

Previous investigation results

No previous investigations are available.

Table 5.32 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.41).

Area utilities

A recirculating water line is associated with this leak; the line is approximately 3-6 ft bgs. Additionally, storm sewers are coincidentally located within the boundary of the SWMU. Approximate depth to the sewers is 9 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.32. Summary of Surface and Subsurface Historical Data at SWMU 176

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Metals (mg/kg)												
Uranium	3.00E+00	3.00E+00	3.00E+00	1/1	n/a	n/a	0/1	4.90E+00	0/1	3.34E+03	0/1	2.02E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

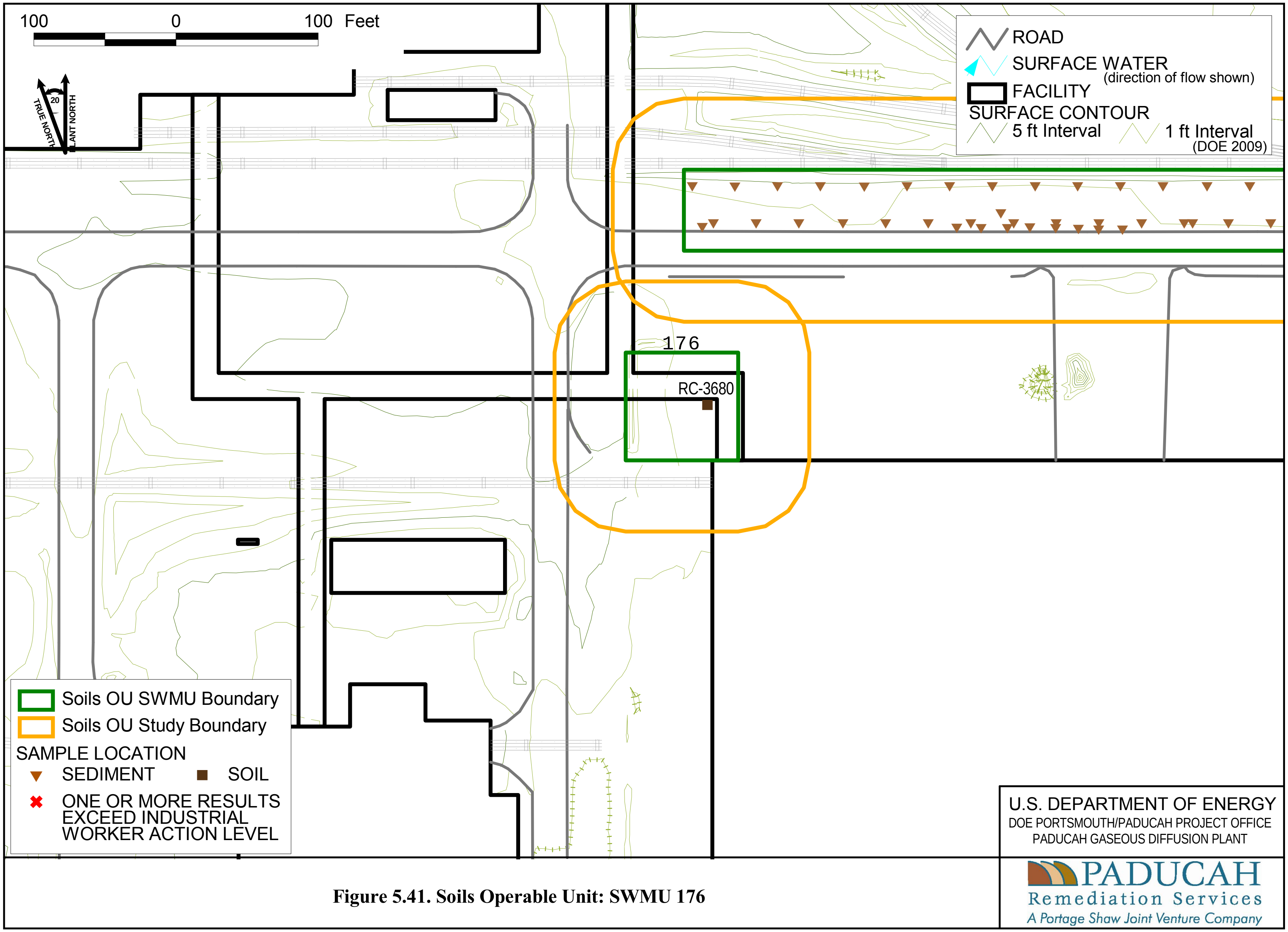

Figure 5.41. Soils Operable Unit: SWMU 176

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 177 (C-331 Leak East Side)

Area description

The C-331 Leak East Side (SWMU 177) is located in the east central portion of the plant site. The SWMU dimensions are approximately 100 ft long by 75 ft wide.

Process history

Chromated water from the RCW system leaked from an underground vault. In 1990s, the chromium-based corrosion inhibitor was replaced with a phosphate-based inhibitor in the RCW. Of the approximately 6,000 gal of RCW that was spilled, it was estimated that approximately 0.493 pounds of hexavalent chromium was released into the environment. The 1992 SAR indicates sampling that showed the presence of chromium.

Previous investigation results

No previous investigations are available.

Table 5.33 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.42).

Area utilities

A recirculating water line is associated with this leak; the line is approximately 5 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.33. Summary of Surface and Subsurface Historical Data at SWMU 177

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	2.00E+00	2.00E+00	2.00E+00	1/1	n/a	n/a	0/1	4.90E+00	0/1	3.34E+03	0/1	2.02E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

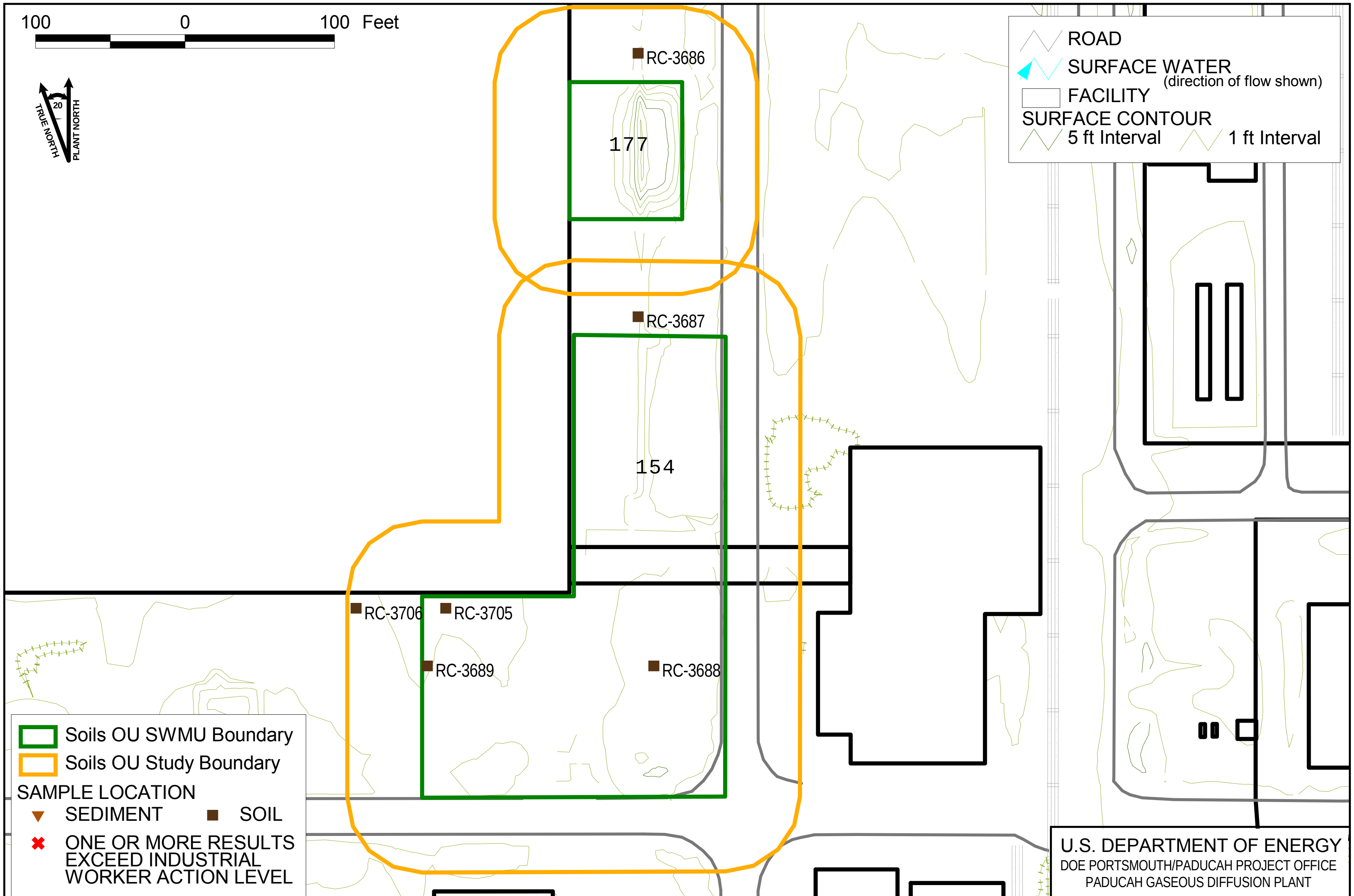

Figure 5.42. Soils Operable Unit: SWMUs 154 and 177

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

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5.1.6 Group 2–Soil/Rubble Pile

SWMU 19 (C-410-B HF Emergency Lagoon)

Area description

The C-410-B hydrogen fluoride (HF) Emergency Lagoon (SWMU 19) is a below-grade impoundment with an earth/clay floor and wire-reinforced grout walls. SWMU 19 is located north of the C-410 Building in the central portion of the plant site. SWMU 19 is approximately 1,900 ft^2 (38 ft x 51 ft) and 7 ft deep. This SWMU currently is listed in the *Action Memorandum for the Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0120&D2/R1, and is planned for excavation.

Process history

SWMU 19 received effluent from the C-410-C Neutralization Building, where lime was used for the neutralization of HF cell electrolyte from lead-acid batteries. In addition, trucks transporting fly ash to the C-746-T inert landfill were rinsed in this impoundment. All processes in the C-410 Building ceased in the late 1970s.

Previous investigation results

In 1991, the C-410-B HF Neutralization Lagoon was investigated as part of the Phase II SI, and sediment and soil samples were collected from the lagoon (CH2M HILL 1992). Analytical results indicated low-level concentrations of PAHs in soil samples from a single soil boring. TCE was detected in soil samples from the upper 15 ft of the boring. Surface water samples collected from the lagoon indicated traces of PAHs. In addition, the surface water samples contained detectable concentrations of technetium-99, uranium-235, uranium-234, uranium-238, barium, and nickel. Surface soil samples contained PAHs, as well as detectable concentrations of arsenic, chromium, mercury, selenium, barium, lead, nickel, silver, technetium-99, uranium-234, uranium-235, and uranium-238. Sludge samples taken from the C-410-B Lagoon in July 1991 for waste characterization also indicated detectable concentrations of total uranium and technetium-99.

In 1999, the C-410-B HF Neutralization Lagoon was investigated using soil borings to 15 ft bgs during the WAGs 9 and 11 SE (DOE 1999c). The SE found detected concentrations of technetium-99, uranium-234, uranium-235, and uranium-238 that were about 10 times their background concentration. The SE concluded that additional analyses (i.e., risk assessment) are necessary to determine the extent of risks to industrial workers and non-human receptors. Several organic compounds and inorganic chemicals were detected at concentrations that exceed their direct contact screening criteria.

Table 5.34 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.43).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

This SWMU currently is listed in the *Action Memorandum for the Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0120&D2/R1, and is planned for excavation. No additional samples are needed at this location.

Table 5.34. Summary of Surface and Subsurface Historical Data at SWMU 19

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	4.37E+03	9.34E+03	7.35E+03	5/5	n/a	n/a	0/5	1.30E+04	0/5	1.00E+05	4/5	4.64E+03
Arsenic	3.20E+00	2.01E+01	7.86E+00	5/7	5.00E+00	5.00E+00	1/7	1.20E+01	0/7	3.15E+02	5/7	5.23E-01
Barium	4.26E+01	4.64E+02	1.26E+02	7/7	2.50E+00	2.50E+00	1/7	2.00E+02	0/7	1.00E+05	1/7	2.29E+02
Beryllium	2.30E-01	4.40E+00	1.33E+00	5/7	5.00E-01	5.00E-01	2/7	6.70E-01	0/7	1.28E+03	2/7	9.48E-01
Cadmium	1.20E+00	1.20E+00	1.20E+00	1/7	1.35E+00	2.00E+00	1/7	2.10E-01	0/7	7.05E+01	0/7	2.13E+01
Calcium	2.09E+03	2.67E+05	1.48E+05	5/5	n/a	n/a	4/5	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.20E+01	1.93E+01	1.47E+01	6/7	2.50E+00	2.50E+00	1/7	1.60E+01	n/a	n/a	0/7	3.56E+02
Cobalt	1.56E+01	1.56E+01	1.56E+01	1/5	n/a	n/a	1/5	1.40E+01	0/5	1.00E+05	0/5	1.92E+03
Copper	5.80E+00	1.36E+02	3.87E+01	7/7	2.50E+00	2.50E+00	3/7	1.90E+01	0/7	1.00E+05	0/7	4.93E+02
Iron	3.84E+03	1.61E+04	1.13E+04	7/7	2.00E+01	2.00E+01	0/7	2.80E+04	0/7	1.00E+05	7/7	2.07E+03
Lead	9.60E+00	5.08E+01	2.24E+01	5/7	2.00E+01	2.00E+01	2/7	3.60E+01	0/7	1.25E+03	1/7	5.00E+01
Magnesium	1.18E+03	1.59E+04	6.26E+03	5/5	n/a	n/a	3/5	7.70E+03	n/a	n/a	n/a	n/a
Manganese	8.58E+01	7.23E+02	2.68E+02	5/5	n/a	n/a	0/5	1.50E+03	0/5	4.64E+04	5/5	4.52E+01
Mercury	2.30E-02	3.10E-01	1.19E-01	4/7	2.00E-01	2.00E-01	1/7	2.00E-01	0/7	8.25E+02	0/7	9.82E-01
Nickel	5.00E+00	6.88E+01	2.30E+01	5/7	5.00E+00	5.00E+00	1/7	2.10E+01	0/7	9.30E+04	0/7	2.42E+02
Potassium	4.04E+02	1.70E+03	1.05E+03	4/5	n/a	n/a	2/5	1.30E+03	n/a	n/a	n/a	n/a
Selenium	4.20E-01	1.20E+00	8.10E-01	2/7	1.00E+00	1.00E+00	1/7	8.00E-01	0/7	2.56E+04	0/7	9.49E+01
Silver	7.92E+01	7.92E+01	7.92E+01	1/7	2.50E+00	2.50E+00	1/7	2.30E+00	0/7	2.07E+04	1/7	4.11E+01
Sodium	7.69E+01	4.32E+02	2.70E+02	5/5	n/a	n/a	2/5	3.20E+02	n/a	n/a	n/a	n/a
Thallium	6.20E-01	9.80E-01	8.07E-01	3/7	1.43E+00	2.00E+01	3/7	2.10E-01	n/a	n/a	n/a	n/a
Total Metals (mg/kg)	1.53E+04	1.58E+04	1.56E+04	2/2	5.00E+02	5.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Vanadium	6.20E+00	5.72E+01	2.48E+01	5/5	n/a	n/a	1/5	3.80E+01	0/5	4.47E+03	5/5	3.32E+00
Zinc	4.70E+00	2.03E+02	7.65E+01	7/7	1.00E+01	1.00E+01	4/7	6.50E+01	0/7	1.00E+05	0/7	2.73E+03
Pesticides/PCBs (mg/kg)												
4,4'-DDT	3.20E-02	3.20E-02	3.20E-02	1/1	2.80E-02	2.80E-02	n/a	n/a	0/1	7.55E+02	0/1	3.59E+00
PCB, Total	1.20E-01	1.20E-01	1.20E-01	1/2	1.00E-01	1.00E-01	n/a	n/a	0/2	4.25E+01	0/2	1.99E-01
PCB-1254	1.20E-01	1.20E-01	1.20E-01	1/3	6.00E-02	2.80E-01	n/a	n/a	0/3	1.82E+01	0/3	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	1.14E+01	8.71E+01	3.50E+01	7/10	1.13E+00	3.71E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.31E+00	1.40E+02	4.12E+01	10/10	3.03E+00	1.41E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.90E-02	4.42E-02	3.66E-02	2/2	2.60E-02	2.66E-02	0/2	4.90E-01	0/2	8.58E+00	0/2	8.58E-02
Technetium-99	8.02E+00	2.10E+02	7.60E+01	3/3	2.68E+00	2.68E+00	3/3	2.50E+00	0/3	3.62E+04	0/3	3.62E+02
Thorium-228	4.28E-01	5.54E-01	4.91E-01	2/2	6.32E-02	6.53E-02	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	6.00E-01	7.27E-01	6.83E-01	3/3	1.88E-01	1.89E-01	0/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	4.75E-01	6.39E-01	5.57E-01	2/2	4.50E-02	4.80E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium	9.37E+00	1.72E+01	1.33E+01	2/2	1.66E+00	1.71E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.50E+01	4.50E+01	4.50E+01	1/1	n/a	n/a	1/1	2.50E+00	0/1	1.98E+03	1/1	1.98E+01
Uranium-235	2.26E-01	1.40E+00	6.75E-01	3/3	3.99E-02	4.09E-02	3/3	1.40E-01	0/3	3.95E+01	2/3	3.95E-01
Uranium-238	4.55E+00	4.80E+01	2.05E+01	3/3	8.31E-01	8.59E-01	3/3	1.20E+00	0/3	1.71E+02	3/3	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.34. Summary of Surface and Subsurface Historical Data at SWMU 19 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Semivolatiles (mg/kg)												
Acenaphthene	8.40E-02	8.40E-02	8.40E-02	1/5	6.60E-01	6.60E-01	n/a	n/a	0/5	6.67E+04	0/5	3.16E+02
Anthracene	1.40E-01	1.40E+00	7.70E-01	2/5	6.60E-01	6.60E-01	n/a	n/a	0/5	1.00E+05	0/5	3.79E+03
Benz(a)anthracene	4.80E-01	3.70E+00	1.56E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+02	5/5	2.12E-01
Benzo(a)pyrene	4.30E-01	4.00E+00	1.71E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+01	5/5	2.12E-02
Benzo(b)fluoranthene	5.40E-01	5.80E+00	2.44E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+02	5/5	2.12E-01
Benzo(ghi)perylene	2.80E-01	2.10E+00	1.08E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.20E-01	2.20E+00	1.18E+00	4/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+03	1/5	2.12E+00
Butyl benzyl phthalate	2.70E+00	2.70E+00	2.70E+00	1/1	6.60E-01	6.60E-01	n/a	n/a	0/1	1.00E+05	0/1	2.71E+03
Chrysene	5.60E-01	4.40E+00	1.86E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+04	0/5	2.12E+01
Dibenz(a,h)anthracene	8.00E-02	8.00E-02	8.00E-02	1/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+01	1/5	2.12E-02
Di-n-butyl phthalate	4.60E+00	4.60E+00	4.60E+00	1/1	6.60E-01	6.60E-01	n/a	n/a	0/1	1.00E+05	0/1	2.13E+03
Fluoranthene	9.10E-01	9.10E+00	3.40E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	6.50E+04	0/5	2.21E+02
Fluorene	6.70E-02	6.70E-02	6.70E-02	1/5	6.60E-01	6.60E-01	n/a	n/a	0/5	7.09E+04	0/5	3.39E+02
Indeno(1,2,3-cd)pyrene	2.70E-01	2.50E+00	1.13E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	2.08E+02	5/5	2.12E-01
Naphthalene	1.10E+00	1.10E+00	1.10E+00	1/5	6.60E-01	6.60E-01	n/a	n/a	0/5	7.66E+02	0/5	2.36E+01
Phenanthrene	5.80E-01	8.10E+00	2.55E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	1.10E+00	8.60E+00	3.80E+00	5/5	6.60E-01	6.60E-01	n/a	n/a	0/5	4.87E+04	0/5	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.91E+03	1.67E+04	8.48E+03	25/25	n/a	n/a	1/25	1.20E+04	0/25	1.00E+05	23/25	4.64E+03
Arsenic	5.30E-01	1.01E+01	4.99E+00	25/25	n/a	n/a	4/25	7.90E+00	0/25	3.15E+02	25/25	5.23E-01
Barium	2.82E+01	1.40E+02	7.86E+01	25/25	n/a	n/a	0/25	1.70E+02	0/25	1.00E+05	0/25	2.29E+02
Beryllium	2.70E-01	1.40E+00	5.02E-01	25/25	n/a	n/a	2/25	6.90E-01	0/25	1.28E+03	1/25	9.48E-01
Cadmium	1.70E-01	5.70E+00	2.06E+00	3/25	6.98E-01	9.00E-01	2/25	2.10E-01	0/25	7.05E+01	0/25	2.13E+01
Calcium	6.09E+02	8.48E+04	1.34E+04	25/25	n/a	n/a	9/25	6.10E+03	n/a	n/a	n/a	n/a
Chromium	4.30E+00	2.89E+01	1.30E+01	24/25	n/a	n/a	6/25	4.30E+01	n/a	n/a	0/25	3.56E+02
Cobalt	1.30E+00	1.35E+01	6.25E+00	22/25	n/a	n/a	1/25	1.30E+01	0/25	1.00E+05	0/25	1.92E+03
Copper	1.20E+00	1.80E+03	1.54E+02	25/25	n/a	n/a	4/25	2.50E+01	0/25	1.00E+05	2/25	4.93E+02
Iron	4.50E+03	1.95E+04	1.27E+04	25/25	n/a	n/a	0/25	2.80E+04	0/25	1.00E+05	25/25	2.07E+03
Lead	3.90E+00	3.31E+01	1.02E+01	25/25	n/a	n/a	1/25	2.30E+01	0/25	1.25E+03	0/25	5.00E+01
Magnesium	4.48E+02	3.40E+03	1.71E+03	25/25	n/a	n/a	7/25	2.10E+03	n/a	n/a	n/a	n/a
Manganese	6.40E+00	6.35E+02	2.82E+02	25/25	n/a	n/a	0/25	8.20E+02	0/25	4.64E+04	22/25	4.52E+01
Mercury	3.30E-02	6.90E-02	4.72E-02	5/25	1.10E-01	1.44E-01	0/25	1.30E-01	0/25	8.25E+02	0/25	9.82E-01
Nickel	1.80E+00	4.38E+02	4.51E+01	25/25	n/a	n/a	4/25	2.20E+01	0/25	9.30E+04	2/25	2.42E+02
Potassium	2.05E+02	3.39E+03	6.57E+02	18/25	1.42E+02	1.84E+02	2/25	9.50E+02	n/a	n/a	n/a	n/a
Selenium	2.40E-01	2.40E-01	2.40E-01	1/25	3.50E-01	4.93E-01	0/25	7.00E-01	0/25	2.56E+04	0/25	9.49E+01
Silver	1.10E+00	2.30E+00	1.63E+00	4/25	8.72E-01	1.12E+00	1/25	2.70E+00	0/25	2.07E+04	0/25	4.11E+01
Sodium	3.73E+01	8.90E+02	1.25E+02	25/25	n/a	n/a	1/25	3.40E+02	n/a	n/a	n/a	n/a
Thallium	4.20E-01	8.20E-01	6.04E-01	7/25	7.00E-01	9.87E-01	7/25	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	7.50E+00	3.83E+01	1.96E+01	25/25	n/a	n/a	1/25	3.70E+01	0/25	4.47E+03	25/25	3.32E+00
Zinc	2.20E+00	2.41E+02	3.66E+01	25/25	n/a	n/a	4/25	6.00E+01	0/25	1.00E+05	0/25	2.73E+03

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.34. Summary of Surface and Subsurface Historical Data at SWMU 19 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Radionuclides (pCi/g)												
Alpha activity	5.55E+00	7.75E+01	1.91E+01	8/9	1.25E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.70E-01	1.70E-01	1.70E-01	1/7	1.10E-01	1.78E-01	n/a	n/a	0/7	5.16E+02	0/7	5.16E+00
Beta activity	3.75E+00	1.39E+02	2.93E+01	8/9	8.50E-01	3.88E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	3.73E-02	3.73E-02	3.73E-02	1/7	2.10E-02	2.68E-02	0/7	2.80E-01	0/7	8.58E+00	0/7	8.58E-02
Technetium-99	0.00E+00	2.09E+01	5.41E+00	5/9	1.72E+00	4.74E+00	2/9	2.80E+00	0/9	3.62E+04	0/9	3.62E+02
Thorium-230	7.90E-01	1.40E+00	1.10E+00	2/2	n/a	n/a	1/2	1.40E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium	2.40E+00	5.64E+01	1.51E+01	7/7	3.11E-01	5.41E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.60E-01	2.67E+01	5.72E+00	9/9	1.00E-01	3.14E-01	3/9	2.40E+00	0/9	1.98E+03	1/9	1.98E+01
Uranium-238	1.40E-01	2.84E+01	5.83E+00	9/9	1.99E-01	2.35E-01	7/9	1.20E+00	0/9	1.71E+02	4/9	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	3.00E-01	2.17E-01	6/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	3.60E-01	3.60E-01	3.60E-01	1/25	4.10E-01	4.50E-01	n/a	n/a	0/25	6.67E+04	0/25	3.16E+02
Anthracene	1.80E-01	5.10E-01	3.45E-01	2/25	4.10E-01	4.50E-01	n/a	n/a	0/25	1.00E+05	0/25	3.79E+03
Benz(a)anthracene	4.20E-02	1.10E+00	5.72E-01	5/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+02	3/25	2.12E-01
Benzo(a)pyrene	8.10E-01	9.80E-01	9.13E-01	3/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+01	3/25	2.12E-02
Benzo(b)fluoranthene	1.50E-01	1.40E+00	1.01E+00	4/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+02	3/25	2.12E-01
Benzo(ghi)perylene	3.90E-01	6.70E-01	5.70E-01	3/25	4.10E-01	4.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.00E-01	6.80E-01	5.97E-01	3/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+03	0/25	2.12E+00
Bis(2-ethylhexyl)phthalate	9.90E-02	2.70E-01	1.62E-01	6/7	4.10E-01	4.50E-01	n/a	n/a	0/7	7.40E+03	0/7	8.84E+00
Butyl benzyl phthalate	7.50E-02	7.80E-02	7.65E-02	2/7	4.10E-01	4.50E-01	n/a	n/a	0/7	1.00E+05	0/7	2.71E+03
Chrysene	4.40E-02	1.10E+00	6.45E-01	5/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+04	0/25	2.12E+01
Dibenz(a,h)anthracene	1.60E-01	1.70E-01	1.65E-01	2/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+01	2/25	2.12E-02
Di-n-butyl phthalate	9.80E-02	1.40E-01	1.18E-01	5/7	4.10E-01	4.50E-01	n/a	n/a	0/7	1.00E+05	0/7	2.13E+03
Fluoranthene	4.50E-02	2.70E+00	5.63E-01	14/25	4.10E-01	4.50E-01	n/a	n/a	0/25	6.50E+04	0/25	2.21E+02
Fluorene	3.30E-01	3.30E-01	3.30E-01	1/25	4.10E-01	4.50E-01	n/a	n/a	0/25	7.09E+04	0/25	3.39E+02
Indeno(1,2,3-cd)pyrene	4.00E-01	7.80E-01	6.00E-01	3/25	4.10E-01	4.50E-01	n/a	n/a	0/25	2.08E+02	3/25	2.12E-01
Phenanthrene	4.40E-02	1.30E+00	5.56E-01	7/25	4.10E-01	4.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Phenol	4.70E-02	5.60E-02	5.15E-02	2/7	4.10E-01	4.50E-01	n/a	n/a	0/7	1.00E+05	0/7	1.16E+04
Pyrene	1.40E-01	2.60E+00	6.72E-01	13/25	4.10E-01	4.50E-01	n/a	n/a	0/25	4.87E+04	0/25	1.65E+02
Volatiles (mg/kg)												
1,2-Dichloroethene	5.00E-03	1.40E-02	9.50E-03	2/7	6.00E-03	6.00E-03	n/a	n/a	0/7	2.66E+04	0/7	6.60E+01
Acetone	1.70E-02	3.70E-02	2.67E-02	6/7	1.90E-02	1.90E-02	n/a	n/a	0/7	1.91E+04	0/7	3.58E+02
Methylene chloride	3.90E-02	6.00E-02	5.45E-02	6/7	5.80E-02	5.80E-02	n/a	n/a	0/7	2.16E+03	0/7	1.34E+01
Trichloroethene	2.00E-03	2.60E-02	1.13E-02	3/25	1.00E-03	5.00E-03	n/a	n/a	0/25	2.98E+02	0/25	2.51E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

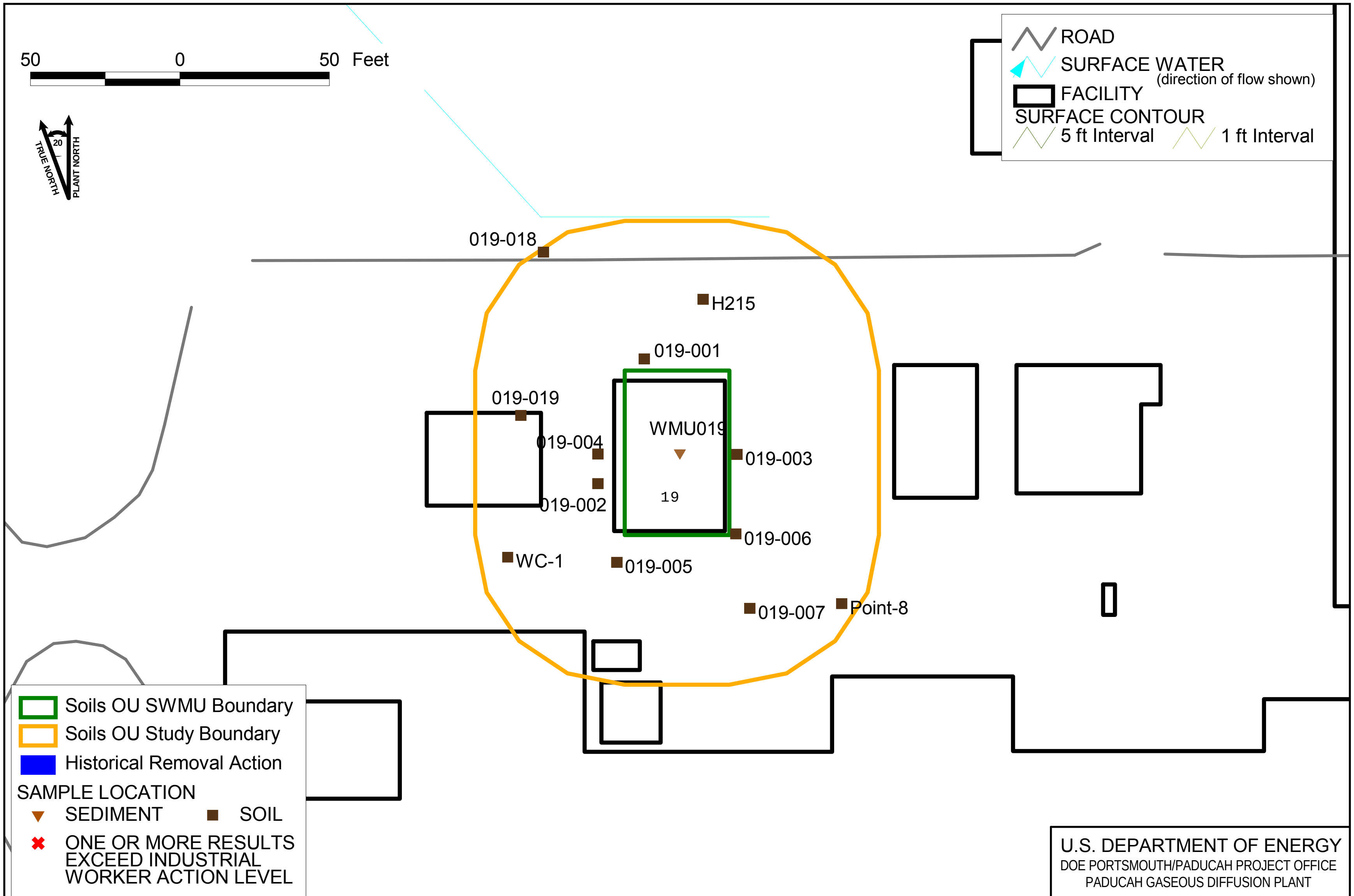

Figure 5.43. Soils Operable Unit: SWMU 19

Figure No. \SoilsOU\sou_swmusr3.apr
DATE 08-27-09

SWMU 20 (C-410-E Emergency Holding Pond)

Area description

The C-410-E HF Emergency Lagoon (SWMU 20) has grout and wire-reinforced walls and floor. SWMU 20 is located east of the C-410 Building in the central portion of the plant site and is approximately 600 ft^2 (20 ft x 30 ft) and 7-ft deep.

Process history

The lagoon was constructed to contain possible releases for the HF tank farm, though none occurred. A scrubber located near the pond sprayed continuously during normal operations to dilute any possible release and discharged to this holding pond. The lagoon discharged to the site storm drainage system. The lagoon currently discharges storm water to the NSDD.

Previous investigation results

SWMU 20 was investigated and results are included in WAGs 9 and 11 SE (DOE 1999c). The SE determined that constituents that exceeded their systemic toxicity or cancer risk based screening value are aluminum, arsenic, beryllium, chromium, iron, manganese, vanadium, PCB-1254, PCB-1260, and Total PCBs.

The inorganic chemicals of Be and Cr were detected only at slightly above background concentrations (0.92 mg/kg versus 0.67 mg/kg, respectively, for Be; 28.8 mg/kg versus 16.0 mg/kg, respectively, for Cr). Of the organic compounds, the maximum cancer risk-based screening value to an unprotected industrial worker is between 1×10^{-6} and 1×10^{-5}.

A sample of sludge from the bottom of the pond also indicates the presence of radiological constituents, PCBs, and nickel.

The recommendation in the SE is for additional site-specific analyses (i.e., risk assessment) to determine if site risks due to direct contact really exceed *de minimis* levels.

Table 5.35 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.44).

Area utilities

No recirculating water lines or sewers are associated with this holding pond; none are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location; however, this location is covered with concrete.

Table 5.35. Summary of Surface and Subsurface Historical Data at SWMU 20

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	8.34E+03	1.27E+04	1.03E+04	4/4	n/a	n/a	1/4	1.30E+04	0/4	1.00E+05	4/4	4.64E+03
Arsenic	4.80E+00	6.70E+00	5.86E+00	4/4	n/a	n/a	0/4	1.20E+01	0/4	3.15E+02	4/4	5.23E-01
Barium	3.08E+01	8.82E+01	6.54E+01	4/4	n/a	n/a	0/4	2.00E+02	0/4	1.00E+05	0/4	2.29E+02
Beryllium	5.50E-01	9.20E-01	7.58E-01	4/4	n/a	n/a	3/4	6.70E-01	0/4	1.28E+03	0/4	9.48E-01
Cadmium	6.10E-01	6.10E-01	6.10E-01	1/4	n/a	n/a	1/4	2.10E-01	0/4	7.05E+01	0/4	2.13E+01
Calcium	3.86E+04	2.29E+05	1.55E+05	4/4	n/a	n/a	4/4	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.80E+01	2.88E+01	2.26E+01	3/4	n/a	n/a	3/4	1.60E+01	n/a	n/a	0/4	3.56E+02
Cobalt	6.30E+00	6.30E+00	6.30E+00	1/4	n/a	n/a	0/4	1.40E+01	0/4	1.00E+05	0/4	1.92E+03
Copper	9.60E+00	2.81E+02	1.01E+02	4/4	n/a	n/a	2/4	1.90E+01	0/4	1.00E+05	0/4	4.93E+02
Iron	9.87E+03	1.97E+04	1.36E+04	4/4	n/a	n/a	0/4	2.80E+04	0/4	1.00E+05	4/4	2.07E+03
Lead	1.40E+00	2.40E+01	1.57E+01	4/4	n/a	n/a	2/4	3.60E+01	0/4	1.25E+03	0/4	5.00E+01
Magnesium	2.48E+03	9.87E+03	5.38E+03	4/4	n/a	n/a	4/4	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.54E+02	3.63E+02	3.20E+02	4/4	n/a	n/a	0/4	1.50E+03	0/4	4.64E+04	4/4	4.52E+01
Nickel	9.90E+00	1.09E+02	5.08E+01	4/4	n/a	n/a	2/4	2.10E+01	0/4	9.30E+04	0/4	2.42E+02
Potassium	8.07E+02	1.53E+03	1.27E+03	4/4	n/a	n/a	3/4	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.60E-01	6.40E-01	4.67E-01	3/4	n/a	n/a	0/4	8.00E-01	0/4	2.56E+04	0/4	9.49E+01
Sodium	1.21E+02	2.64E+02	1.97E+02	4/4	n/a	n/a	0/4	3.20E+02	n/a	n/a	n/a	n/a
Thallium	4.60E-01	7.90E-01	6.25E-01	2/4	n/a	n/a	2/4	2.10E-01	n/a	n/a	n/a	n/a
Vanadium	1.61E+01	2.94E+01	2.37E+01	4/4	n/a	n/a	0/4	3.80E+01	0/4	4.47E+03	4/4	3.32E+00
Zinc	8.89E+01	2.09E+02	1.37E+02	4/4	n/a	n/a	4/4	6.50E+01	0/4	1.00E+05	0/4	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	5.00E-01	3.20E+00	1.75E+00	4/4	1.00E-01	1.00E-01	n/a	n/a	0/4	4.25E+01	4/4	1.99E-01
PCB-1254	4.00E-01	2.70E+00	1.38E+00	4/4	n/a	n/a	n/a	n/a	0/4	1.82E+01	4/4	1.99E-01
PCB-1260	1.00E-01	6.00E-01	3.75E-01	4/4	n/a	n/a	n/a	n/a	0/4	4.25E+01	3/4	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.84E+00	1.03E+01	7.37E+00	3/10	1.13E+00	1.00E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.87E+00	1.55E+01	9.48E+00	4/10	3.03E+00	8.57E+00	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	5.47E+03	2.06E+04	1.02E+04	17/17	n/a	n/a	3/17	1.20E+04	0/17	1.00E+05	17/17	4.64E+03
Arsenic	2.10E+00	8.70E+00	5.29E+00	17/17	n/a	n/a	1/17	7.90E+00	0/17	3.15E+02	17/17	5.23E-01
Barium	6.85E+01	1.62E+02	9.69E+01	17/17	n/a	n/a	0/17	1.70E+02	0/17	1.00E+05	0/17	2.29E+02
Beryllium	3.00E-01	2.30E+00	5.55E-01	17/17	n/a	n/a	2/17	6.90E-01	0/17	1.28E+03	1/17	9.48E-01
Cadmium	1.40E-01	1.80E-01	1.58E-01	4/17	n/a	n/a	0/17	2.10E-01	0/17	7.05E+01	0/17	2.13E+01
Calcium	8.97E+02	1.43E+05	1.62E+04	17/17	n/a	n/a	7/17	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.05E+01	3.31E+01	1.49E+01	17/17	n/a	n/a	3/17	4.30E+01	n/a	n/a	0/17	3.56E+02
Cobalt	3.30E+00	1.29E+01	5.87E+00	15/17	n/a	n/a	0/17	1.30E+01	0/17	1.00E+05	0/17	1.92E+03
Copper	5.90E+00	4.28E+02	3.66E+01	17/17	n/a	n/a	2/17	2.50E+01	0/17	1.00E+05	0/17	4.93E+02
Iron	8.66E+03	1.88E+04	1.37E+04	17/17	n/a	n/a	0/17	2.80E+04	0/17	1.00E+05	17/17	2.07E+03
Lead	6.80E+00	2.79E+01	1.16E+01	17/17	n/a	n/a	1/17	2.30E+01	0/17	1.25E+03	0/17	5.00E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.35. Summary of Surface and Subsurface Historical Data at SWMU 20 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Magnesium	1.19E+03	4.01E+03	2.11E+03	17/17	n/a	n/a	6/17	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.71E+02	4.27E+02	2.72E+02	17/17	n/a	n/a	0/17	8.20E+02	0/17	4.64E+04	17/17	4.52E+01
Nickel	1.01E+01	8.04E+02	5.98E+01	17/17	n/a	n/a	1/17	2.20E+01	0/17	9.30E+04	1/17	2.42E+02
Potassium	2.78E+02	5.44E+03	8.37E+02	17/17	n/a	n/a	2/17	9.50E+02	n/a	n/a	n/a	n/a
Selenium	2.70E-01	3.70E-01	3.15E-01	6/17	n/a	n/a	0/17	7.00E-01	0/17	2.56E+04	0/17	9.49E+01
Sodium	4.19E+01	1.23E+03	2.26E+02	17/17	n/a	n/a	2/17	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.60E+01	3.51E+01	2.01E+01	17/17	n/a	n/a	0/17	3.70E+01	0/17	4.47E+03	17/17	3.32E+00
Zinc	1.67E+01	1.36E+02	4.48E+01	17/17	n/a	n/a	2/17	6.00E+01	0/17	1.00E+05	0/17	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-02	7.00E-01	1.96E-01	14/17	1.00E-01	1.00E-01	n/a	n/a	0/17	4.25E+01	4/17	1.99E-01
PCB-1242	2.20E-02	2.20E-02	2.20E-02	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	0/1	1.99E-01
PCB-1248	5.00E-03	1.10E-02	7.67E-03	3/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	0/3	1.99E-01
PCB-1254	2.10E-02	5.38E-01	1.62E-01	14/14	n/a	n/a	n/a	n/a	0/14	1.82E+01	5/14	1.99E-01
PCB-1260	1.40E-02	1.90E-01	6.18E-02	12/12	n/a	n/a	n/a	n/a	0/12	4.25E+01	0/12	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	5.07E+00	8.11E+00	6.36E+00	4/4	1.64E+00	4.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.53E+00	4.89E+00	4.21E+00	2/4	8.50E-01	3.88E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	0.00E+00	0.00E+00	0.00E+00	1/4	1.72E+00	4.74E+00	0/4	2.80E+00	0/4	3.62E+04	0/4	3.62E+02
Thorium-230	2.95E-01	3.23E-01	3.09E-01	2/2	2.30E-01	2.31E-01	0/2	1.40E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium	1.15E+00	4.19E+00	2.54E+00	4/4	2.00E-01	5.02E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.20E-01	1.85E+00	8.96E-01	4/4	1.40E-02	2.31E-01	0/4	2.40E+00	0/4	1.98E+03	0/4	1.98E+01
Uranium-238	8.05E-01	2.25E+00	1.60E+00	4/4	1.84E-01	2.57E-01	3/4	1.20E+00	0/4	1.71E+02	2/4	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

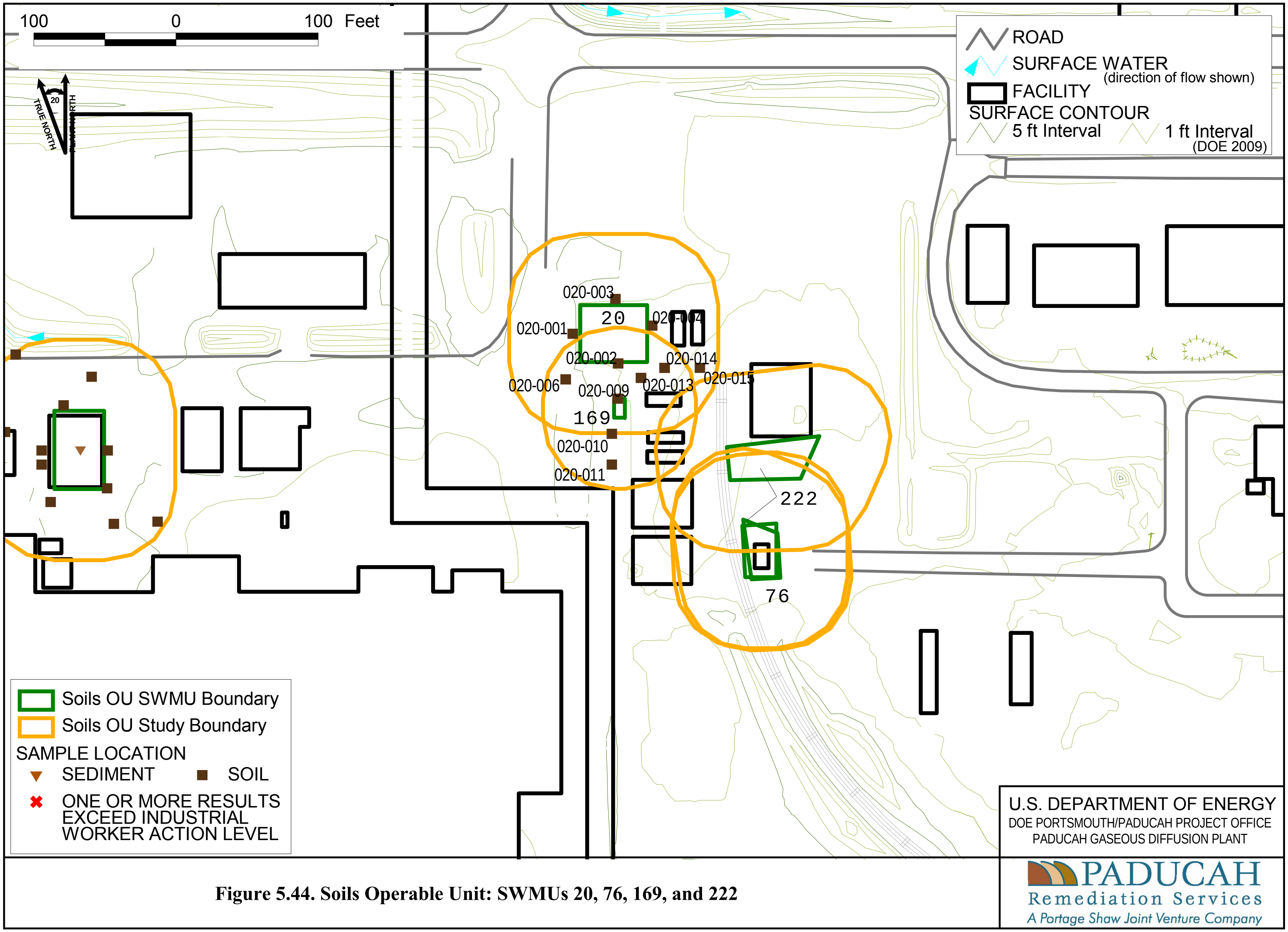

Figure 5.44. Soils Operable Unit: SWMUs 20, 76, 169, and 222

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

<u>SWMU 138 (C-100 Southside Berm)</u>

<u>Area description</u>

The C-100 Southside Berm (SWMU 138) is located south of the C-100 Building, south of the plant site. SWMU 138 consists of two soil berms, each approximately 10,000 ft^2 (200 ft x 50 ft).

<u>Process history</u>

In 1979, a landscaping project used sludge dredged from the C-611 Lagoon, the potable drinking water treatment plant, and C-615 Sewage Treatment Plant on the south side of C-100 Building to construct the berm.

<u>Previous investigation results</u>

Characterization was performed on preliminary soil samples collected in September and October 1991 for WAG 13, and a draft screening assessment was prepared showing that the primary COCs for this SWMU are PCBs, radionuclides, mercury, and lead (Jacobs EM Team 1994).

Table 5.36 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.45).

<u>Area utilities</u>

No recirculating water lines or sewers are associated with this contamination area. A sanitary sewer is coincidentally located within the boundary of the SWMU. Depth to this sewer is approximately 4 ft bgs.

<u>Data gap determination</u>

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.36. Summary of Surface and Subsurface Historical Data at SWMU 138

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Antimony	7.34E+00	7.34E+00	7.34E+00	1/13	n/a	n/a	1/13	2.10E-01	0/13	4.63E+02	1/13	3.79E-01
Arsenic	3.68E+00	8.08E+00	6.14E+00	10/10	n/a	n/a	1/10	1.20E+01	0/10	3.15E+02	10/10	5.23E-01
Barium	6.59E+01	1.69E+02	1.14E+02	12/12	n/a	n/a	0/12	2.00E+02	0/12	1.00E+05	0/12	2.29E+02
Cadmium	5.00E+00	7.30E+00	5.86E+00	3/13	n/a	n/a	3/13	2.10E-01	0/13	7.05E+01	0/13	2.13E+01
Chromium	6.46E+00	4.46E+01	2.49E+01	11/13	n/a	n/a	7/13	1.60E+01	n/a	n/a	0/13	3.56E+02
Lead	7.20E+00	2.81E+02	1.21E+02	13/13	n/a	n/a	12/13	3.60E+01	0/13	1.25E+03	9/13	5.00E+01
Mercury	2.16E+00	2.13E+01	8.18E+00	13/13	n/a	n/a	13/13	2.00E-01	0/13	8.25E+02	13/13	9.82E-01
Nickel	6.05E+00	1.86E+01	1.22E+01	9/13	n/a	n/a	0/13	2.10E+01	0/13	9.30E+04	0/13	2.42E+02
Selenium	5.48E-01	1.66E+00	9.95E-01	11/13	n/a	n/a	8/13	8.00E-01	0/13	2.56E+04	0/13	9.49E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	4.00E-01	5.00E-01	4.20E-01	5/13	n/a	n/a	n/a	n/a	0/13	4.25E+01	5/13	1.99E-01
PCB-1260	9.20E-02	9.20E-02	9.20E-02	1/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	0/3	1.99E-01
Radionuclides (pCi/g)												
Thorium-230	3.00E+00	3.00E+00	3.00E+00	1/13	n/a	n/a	1/13	1.50E+00	0/13	1.49E+03	0/13	1.49E+01
Uranium	1.60E+00	5.90E+00	2.41E+00	11/16	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

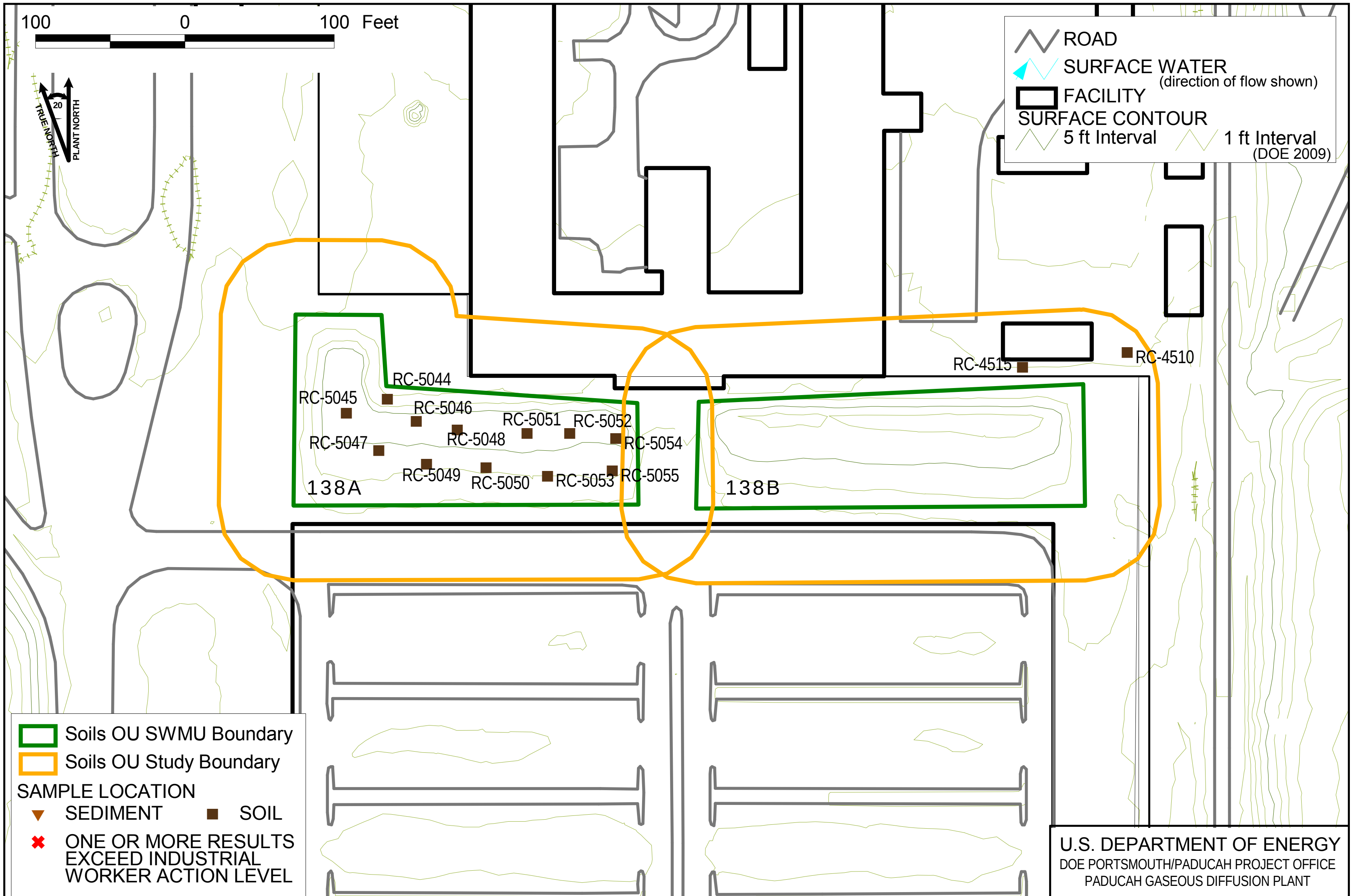

Figure 5.45. Soils Operable Unit: SWMU 138

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 180 (Outdoor Firing Range Western Kentucky Wildlife Management Area)

Area description

The Outdoor Firing Range WKWMA (SWMU 180) is located in the WKWMA, southwest of the plant site.

Process history

The Outdoor Firing Range is controlled by the WKWMA. It is used by the Kentucky State Police as a firing range. Lead bullets are present in the berm.

The unit is not used by PGDP.

Previous investigation results

No sampling data is available. Figure 5.46 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Since there are no historical data available, samples are needed at this location.

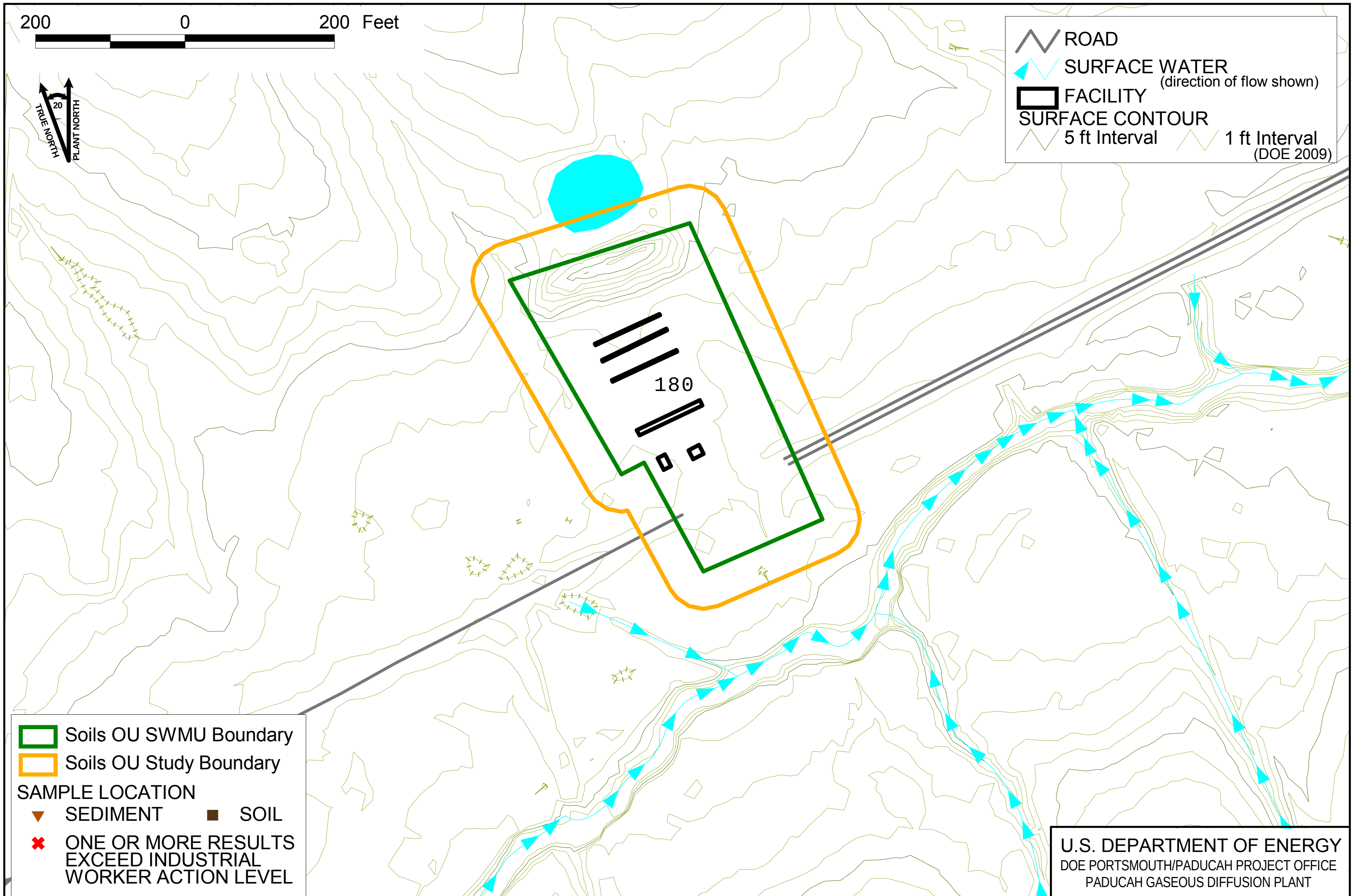

Figure 5.46. Soils Operable Unit: SWMU 180

PADUCAH
Remediation Services
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Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 181 (Outdoor Firing Range PGDP)

Area description

The Firing Range (SWMU 181) is located west of the plant site. This SWMU currently is listed in the *Action Memorandum for the Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0120&D2/R1, and contaminated soil on the berm face has been excavated in accordance with the *Removal Action Work Plan for Soils Operable Unit Inactive Facilities SWMU 19 and SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0220&D2/R1. Verification sampling results are not included in this summary. The results of this sampling will be documented in the RI Report.

Process history

SWMU 181 was operational from the early 1980s until 1992 when it was shut down and classified as a SWMU. The plant force security used the facility as a training ground for small arms target practice during the facility's operational lifetime. Suspected contaminants include lead and other potential metals.

Previous investigation results

In April of 1993, the surface soil from the Firing Range was sampled for TSCA, RCRA bulk metals, and radiological components. Bulk lead concentrations in the samples ranged from 1,774.2 mg/kg to 14,880.0 mg/kg.

Characterization of the C-218 Firing Range occurred during soil pile sampling in 2008. Soil was tested for radiological, metals, and PCBs. Ten locations were sampled based upon 50 ft centers, with one surface sample and multiple subsurface samples to be collected at three ft intervals (e.g., 1 to 4 ft) to grade. Preliminary results for surface samples show all analytes detected above background are less than there no action values; therefore, risk is <1E-06 for all receptors. Preliminary results for subsurface samples show analytes detected and above nonzero background are Ca and Mg and the Total PCB hit is near the detection limit and below 1 ppm. Pending removal of the lead contaminated soil on the berm face as part of the Soil Inactive Removal Action, the berm appears to pose no risk.

Table 5.37 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.47). These results were collected prior to excavation of the berm.

Area utilities

No recirculating water lines or sewers are associated with this facility, none are within the boundary of the SWMU.

Data gap determination

No additional samples are needed at this location. Confirmatory sampling occurred after excavation in accordance with the *Removal Action Work Plan for Soils Operable Unit Inactive Facilities SWMU 19 and SWMU 181 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0220&D2/R1.

Table 5.37. Summary of Surface and Subsurface Historical Data at SWMU 181

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Surface Soils												
Metals (mg/kg)												
Aluminum	3.70E+03	9.47E+03	7.34E+03	18/18	1.70E+01	1.99E+02	0/18	1.30E+04	0/18	1.00E+05	17/18	4.64E+03
Antimony	1.90E-01	5.00E-01	2.83E-01	6/21	1.00E+00	9.62E+00	5/21	2.10E-01	0/21	4.63E+02	1/21	3.79E-01
Arsenic	2.60E+00	7.50E+00	5.41E+00	17/21	8.52E-01	4.97E+00	0/21	1.20E+01	0/21	3.15E+02	17/21	5.23E-01
Barium	6.01E+01	1.41E+02	1.08E+02	21/21	2.10E+00	2.67E+01	0/21	2.00E+02	0/21	1.00E+05	0/21	2.29E+02
Beryllium	3.80E-01	4.80E-01	4.48E-01	6/18	1.70E-01	5.00E-01	0/18	6.70E-01	0/18	1.28E+03	0/18	9.48E-01
Cadmium	4.60E-01	6.95E-01	5.64E-01	9/21	4.26E-01	2.49E+00	9/21	2.10E-01	0/21	7.05E+01	0/21	2.13E+01
Calcium	1.64E+03	1.82E+05	1.29E+05	18/18	4.25E+02	9.94E+02	17/18	2.00E+05	n/a	n/a	n/a	n/a
Chromium	6.65E+00	3.22E+01	1.58E+01	21/21	4.20E-01	2.49E+00	6/21	1.60E+01	n/a	n/a	0/21	3.56E+02
Cobalt	3.30E+00	8.40E+00	6.99E+00	18/18	4.20E-01	5.00E+00	0/18	1.40E+01	0/18	1.00E+05	0/18	1.92E+03
Copper	6.10E+00	4.47E+01	3.07E+01	18/18	2.41E+00	1.24E+01	16/18	1.90E+01	0/18	1.00E+05	0/18	4.93E+02
Iron	8.13E+03	2.46E+04	1.82E+04	18/18	1.00E+01	6.55E+01	0/18	2.80E+04	0/18	1.00E+05	18/18	2.07E+03
Lead	6.70E+00	1.49E+04	9.55E+02	20/21	3.00E-01	1.92E+01	16/21	3.60E+01	3/21	1.25E+03	3/21	5.00E+01
Magnesium	5.04E+02	4.06E+03	2.86E+03	18/18	4.26E+00	5.00E+02	17/18	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.33E+02	5.49E+02	4.40E+02	18/18	4.20E-01	2.49E+00	0/18	1.50E+03	0/18	4.64E+04	18/18	4.52E+01
Mercury	4.60E-02	1.30E-01	9.26E-02	17/21	1.50E-02	8.00E-02	0/21	2.00E-01	0/21	8.25E+02	0/21	9.82E-01
Molybdenum	2.30E-01	2.48E+01	1.25E+01	2/13	4.00E+00	4.97E+00	n/a	n/a	0/13	2.50E+04	0/13	8.30E+01
Nickel	5.60E+00	1.19E+01	8.98E+00	20/21	8.50E-01	4.97E+00	0/21	2.10E+01	0/21	9.30E+04	0/21	2.42E+02
Potassium	3.02E+02	7.57E+02	6.54E+02	6/7	9.62E+01	5.00E+02	0/7	1.30E+03	n/a	n/a	n/a	n/a
Selenium	4.00E-01	4.00E-01	4.00E-01	1/21	5.00E-01	1.92E+01	0/21	8.00E-01	0/21	2.56E+04	0/21	9.49E+01
Silicon	1.60E+03	1.60E+03	1.60E+03	1/1	5.00E+01	5.00E+01	n/a	n/a	n/a	n/a	n/a	n/a
Silver	1.00E-01	2.39E+01	4.09E+00	6/21	4.20E-01	2.41E+00	1/21	2.30E+00	0/21	2.07E+04	0/21	4.11E+01
Sodium	3.09E+01	2.54E+02	1.90E+02	7/18	9.62E+01	1.09E+03	0/18	3.20E+02	n/a	n/a	n/a	n/a
Thallium	3.20E-01	6.63E+01	3.22E+01	5/21	1.00E+00	1.92E+01	5/21	2.10E-01	n/a	n/a	n/a	n/a
Uranium	2.06E+00	2.06E+00	2.06E+00	2/14	8.52E-01	5.00E+01	0/14	4.90E+00	0/14	3.34E+03	0/14	2.02E+01
Vanadium	1.15E+01	2.50E+01	1.65E+01	18/18	8.50E-01	5.00E+00	0/18	3.80E+01	0/18	4.47E+03	18/18	3.32E+00
Zinc	2.13E+01	8.55E+01	6.14E+01	18/18	1.70E+00	1.99E+01	8/18	6.50E+01	0/18	1.00E+05	0/18	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.01E+01	1.01E+01	1.01E+01	1/1	3.84E+00	3.84E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	5.94E+00	5.94E+00	5.94E+00	1/1	2.36E+00	2.36E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-2.60E-01	9.53E-02	-7.63E-03	8/27	4.67E-02	8.90E-01	0/27	4.90E-01	0/27	8.58E+00	2/27	8.58E-02
Technetium-99	7.75E-01	1.18E+00	9.31E-01	7/24	6.52E-01	3.70E+00	0/24	2.50E+00	0/24	3.62E+04	0/24	3.62E+02
Thorium-228	2.20E-01	3.79E-01	2.84E-01	12/12	6.33E-02	1.60E-01	0/12	1.60E+00	0/12	2.80E+00	12/12	2.80E-02
Thorium-230	1.87E-01	4.16E-01	2.79E-01	12/23	5.78E-02	1.90E-01	0/23	1.50E+00	0/23	1.49E+03	0/23	1.49E+01
Thorium-232	1.64E-01	3.08E-01	2.35E-01	12/12	3.60E-02	4.61E-02	0/12	1.50E+00	0/12	1.35E+03	0/12	1.35E+01
Uranium	2.56E-01	1.80E+00	8.61E-01	10/22	2.22E-01	2.37E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium (mg/kg)	1.26E+00	1.26E+00	1.26E+00	2/14	4.60E-01	4.60E-01	0/14	4.90E+00	n/a	n/a	n/a	n/a
Uranium-234	1.35E-01	1.64E+00	2.92E-01	12/13	4.00E-02	1.20E-01	0/13	2.50E+00	0/13	1.98E+03	0/13	1.98E+01
Uranium-235	1.24E-02	3.08E-02	1.88E-02	3/13	1.09E-02	9.70E-02	0/13	1.40E-01	0/13	3.95E+01	0/13	3.95E-01
Uranium-238	1.05E-01	1.56E+01	2.42E+00	15/17	8.00E-02	9.52E+00	5/17	1.20E+00	0/17	1.71E+02	5/17	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.37. Summary of Surface and Subsurface Historical Data at SWMU 181 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Semivolatiles (mg/kg)												
Anthracene	3.60E-03	5.70E-03	4.65E-03	2/6	7.80E-03	5.00E-01	n/a	n/a	0/6	1.00E+05	0/6	3.79E+03
Benz(a)anthracene	1.50E-02	3.20E-02	1.96E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Benzo(a)pyrene	1.60E-02	3.00E-02	2.12E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+01	2/6	2.12E-02
Benzo(b)fluoranthene	2.40E-02	4.10E-02	2.96E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Benzo(ghi)perylene	1.30E-02	2.00E-02	1.56E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	6.50E-03	1.20E-02	9.42E-03	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+03	0/6	2.12E+00
Chrysene	1.10E-02	2.40E-02	1.50E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+04	0/6	2.12E+01
Fluoranthene	1.70E-02	4.60E-02	2.62E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Indeno(1,2,3-cd)pyrene	1.10E-02	1.70E-02	1.40E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Naphthalene	4.50E-03	5.30E-03	4.90E-03	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	7.66E+02	0/6	2.36E+01
Phenanthrene	1.40E-02	3.30E-02	1.98E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	2.30E-02	6.00E-02	3.32E-02	5/6	7.80E-03	5.00E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	5.22E+03	1.05E+04	7.46E+03	42/42	1.78E+01	2.00E+02	0/42	1.20E+04	0/42	1.00E+05	42/42	4.64E+03
Arsenic	3.88E+00	6.99E+00	4.88E+00	32/42	9.17E-01	4.99E+00	0/42	7.90E+00	0/42	3.15E+02	32/42	5.23E-01
Barium	9.07E+01	1.14E+02	1.03E+02	42/42	2.14E+00	2.50E+00	0/42	1.70E+02	0/42	1.00E+05	0/42	2.29E+02
Beryllium	4.54E-01	5.21E-01	4.87E-01	9/42	4.28E-01	4.99E-01	0/42	6.90E-01	0/42	1.28E+03	0/42	9.48E-01
Cadmium	5.28E-01	7.07E-01	6.29E-01	15/42	4.58E-01	2.50E+00	15/42	2.10E-01	0/42	7.05E+01	0/42	2.13E+01
Calcium	7.98E+04	1.52E+05	1.29E+05	42/42	8.57E+02	9.98E+02	42/42	6.10E+03	n/a	n/a	n/a	n/a
Chromium	9.99E+00	4.79E+01	1.60E+01	42/42	2.14E+00	2.50E+00	14/42	4.30E+01	n/a	n/a	0/42	3.56E+02
Cobalt	5.81E+00	8.70E+00	7.12E+00	42/42	9.17E-01	4.99E+00	0/42	1.30E+01	0/42	1.00E+05	0/42	1.92E+03
Copper	1.88E+01	4.00E+01	2.90E+01	42/42	1.07E+01	1.25E+01	41/42	2.50E+01	0/42	1.00E+05	0/42	4.93E+02
Iron	1.36E+04	2.28E+04	1.74E+04	42/42	1.71E+01	2.00E+01	0/42	2.80E+04	0/42	1.00E+05	42/42	2.07E+03
Lead	1.92E+01	3.09E+01	2.46E+01	42/42	9.97E-01	4.99E+00	32/42	2.30E+01	0/42	1.25E+03	0/42	5.00E+01
Magnesium	2.39E+03	3.58E+03	2.95E+03	42/42	4.28E+00	4.99E+00	42/42	2.10E+03	n/a	n/a	n/a	n/a
Manganese	3.78E+02	5.51E+02	4.32E+02	42/42	2.14E+00	2.50E+00	0/42	8.20E+02	0/42	4.64E+04	42/42	4.52E+01
Mercury	7.00E-02	1.40E-01	9.52E-02	42/42	1.50E-02	1.70E-02	2/42	1.30E-01	0/42	8.25E+02	0/42	9.82E-01
Nickel	7.26E+00	1.01E+01	8.66E+00	42/42	4.28E+00	4.99E+00	0/42	2.20E+01	0/42	9.30E+04	0/42	2.42E+02
Uranium	1.05E+00	1.05E+00	1.05E+00	1/42	9.17E-01	4.99E+00	0/42	4.60E+00	0/42	3.34E+03	0/42	2.02E+01
Vanadium	1.16E+01	2.52E+01	1.55E+01	42/42	2.14E+00	2.50E+00	0/42	3.70E+01	0/42	4.47E+03	42/42	3.32E+00
Zinc	4.62E+01	7.35E+01	6.05E+01	42/42	1.71E+01	2.00E+01	25/42	6.00E+01	0/42	1.00E+05	0/42	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.70E-01	1.70E-01	1.70E-01	1/42	1.30E-01	1.30E-01	n/a	n/a	0/42	4.25E+01	0/42	1.99E-01
PCB-1260	1.10E-01	1.70E-01	1.40E-01	2/42	1.00E-01	1.00E-01	n/a	n/a	0/42	4.25E+01	0/42	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	5.81E-02	1.25E-01	9.28E-02	19/42	4.97E-02	1.07E-01	0/42	2.80E-01	0/42	8.58E+00	12/42	8.58E-02
Plutonium-239/240	1.67E-02	1.67E-02	1.67E-02	1/42	1.20E-02	1.42E-02	n/a	n/a	0/42	1.15E+03	0/42	1.15E+01
Technetium-99	6.58E-01	1.57E+00	1.01E+00	20/42	6.52E-01	6.71E-01	0/42	2.80E+00	0/42	3.62E+04	0/42	3.62E+02
Thorium-228	1.90E-01	3.69E-01	2.77E-01	42/42	6.35E-02	8.86E-02	0/42	1.60E+00	0/42	2.80E+00	42/42	2.80E-02
Thorium-230	1.61E-01	3.62E-01	2.66E-01	42/42	5.77E-02	7.31E-02	0/42	1.40E+00	0/42	1.49E+03	0/42	1.49E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.37. Summary of Surface and Subsurface Historical Data at SWMU 181 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Thorium-232	1.83E-01	3.49E-01	2.50E-01	42/42	3.54E-02	5.16E-02	0/42	1.50E+00	0/42	1.35E+03	0/42	1.35E+01
Uranium	2.39E-01	6.84E-01	3.83E-01	25/42	2.23E-01	2.42E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.19E-01	3.29E-01	2.00E-01	36/42	1.11E-01	1.16E-01	0/42	2.40E+00	0/42	1.98E+03	0/42	1.98E+01
Uranium-235	1.57E-02	1.57E-02	1.57E-02	1/42	1.16E-02	2.23E-02	0/42	1.40E-01	0/42	3.95E+01	0/42	3.95E-01
Uranium-238	1.07E-01	4.17E-01	1.75E-01	39/42	1.00E-01	1.08E-01	0/42	1.20E+00	0/42	1.71E+02	0/42	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

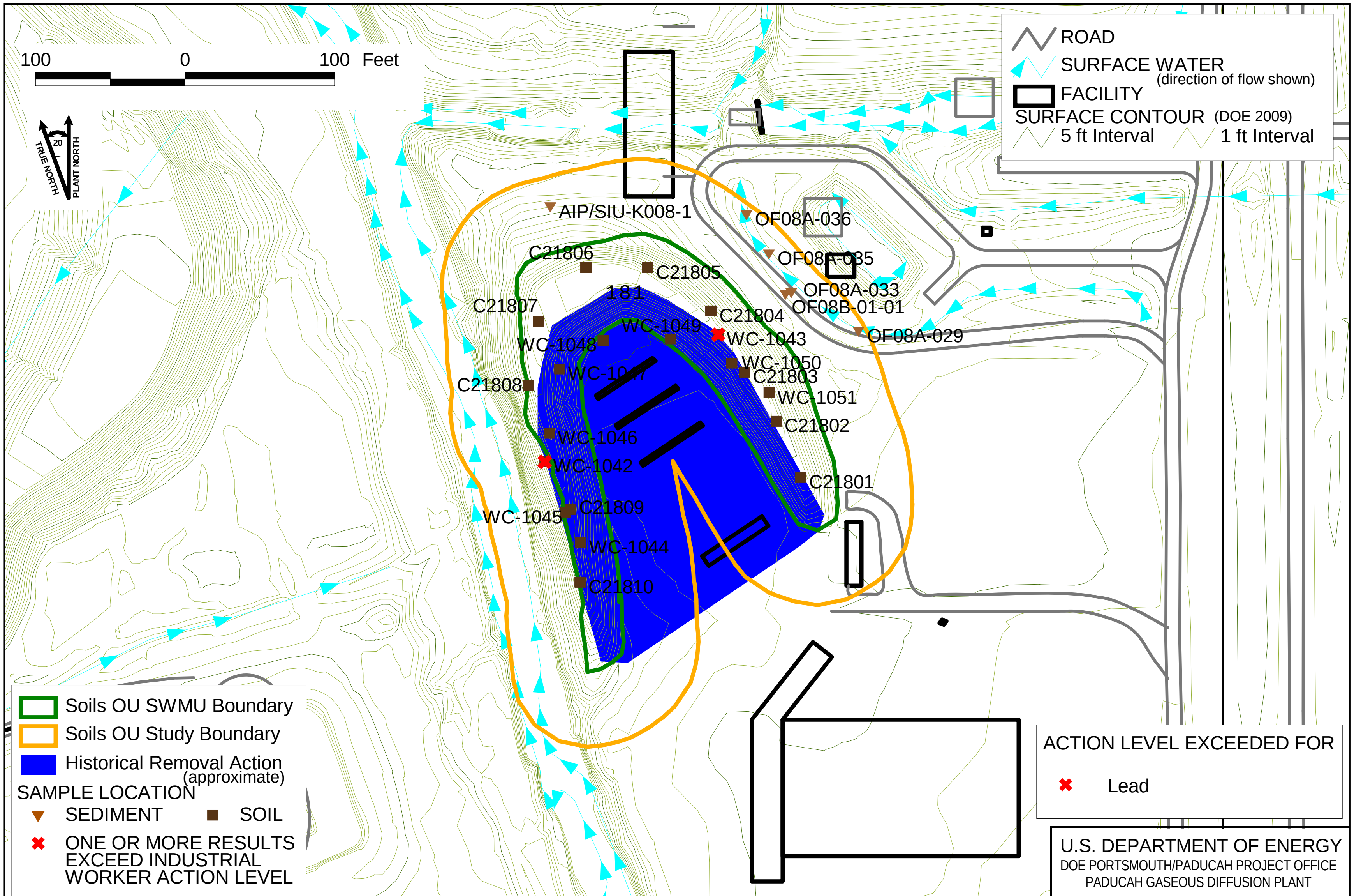


Figure 5.47. Soils Operable Unit: SWMU 181

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 02-12-2010

SWMU 195 (Curlee Road Contaminated Soil Mounds)

Area description

The Curlee Road Contaminated Soil Mounds (SWMU 195) is located in the southwest portion of the plant site. The site consists of two mounds of soil approximately 10–15 ft in height and covers 370,000 ft^2 in area. Historical knowledge indicates that potential COCs for SWMU 195 are radionuclides.

Process history

The area was created during original construction of the plant. The soil was unusable for fill due to its characteristics and was placed in this location. Some soil also came from excavation of drainage ditches and cleaning of the ditches.

Previous investigation results

No previous investigations are available.

Table 5.38 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.48).

Area utilities

No recirculating water lines or sewers are associated with these soil mounds; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.38. Summary of Surface and Subsurface Historical Data at SWMU 195

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	8.64E+03	1.29E+04	1.03E+04	3/3	n/a	n/a	1/3	1.30E+04	0/3	1.00E+05	3/3	4.64E+03
Arsenic	1.55E+00	6.89E+00	3.07E+00	24/24	n/a	n/a	0/24	1.20E+01	0/24	3.15E+02	24/24	5.23E-01
Barium	2.01E+01	3.67E+02	5.82E+01	27/27	n/a	n/a	1/27	2.00E+02	0/27	1.00E+05	1/27	2.29E+02
Beryllium	8.00E-01	8.00E-01	8.00E-01	1/3	n/a	n/a	1/3	6.70E-01	0/3	1.28E+03	0/3	9.48E-01
Cadmium	7.20E-01	1.04E+01	5.37E+00	6/27	n/a	n/a	6/27	2.10E-01	0/27	7.05E+01	0/27	2.13E+01
Calcium	2.99E+03	1.38E+04	8.35E+03	3/3	n/a	n/a	2/3	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.80E+01	7.70E+01	3.40E+01	27/27	n/a	n/a	27/27	1.60E+01	n/a	n/a	0/27	3.56E+02
Cobalt	5.80E+00	1.04E+01	7.88E+00	3/3	n/a	n/a	0/3	1.40E+01	0/3	1.00E+05	0/3	1.92E+03
Copper	1.84E+01	2.37E+01	2.19E+01	3/3	n/a	n/a	2/3	1.90E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	1.62E+04	2.07E+04	1.80E+04	3/3	n/a	n/a	0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	1.46E+00	1.89E+02	1.98E+01	19/27	n/a	n/a	1/27	3.60E+01	0/27	1.25E+03	1/27	5.00E+01
Lithium	5.20E+00	8.54E+00	6.85E+00	3/3	n/a	n/a	n/a	n/a	0/3	1.00E+05	0/3	6.41E+02
Magnesium	1.12E+03	1.44E+03	1.31E+03	3/3	n/a	n/a	0/3	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.32E+02	3.89E+02	3.58E+02	3/3	n/a	n/a	0/3	1.50E+03	0/3	4.64E+04	3/3	4.52E+01
Molybdenum	2.00E+00	2.00E+00	2.00E+00	1/3	n/a	n/a	n/a	n/a	0/3	2.50E+04	0/3	8.30E+01
Nickel	6.48E+00	2.37E+01	1.32E+01	25/27	n/a	n/a	4/27	2.10E+01	0/27	9.30E+04	0/27	2.42E+02
Potassium	4.00E+02	9.87E+02	6.91E+02	3/3	n/a	n/a	1/3	1.30E+03	n/a	n/a	n/a	n/a
Ruthenium	2.09E+01	2.09E+01	2.09E+01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	7.40E-01	2.25E+00	1.50E+00	4/24	n/a	n/a	4/24	8.00E-01	0/24	2.56E+04	0/24	9.49E+01
Silicon	1.37E+02	1.45E+03	5.98E+02	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Silver	2.40E+00	3.29E+01	1.29E+01	12/27	n/a	n/a	12/27	2.30E+00	0/27	2.07E+04	0/27	4.11E+01
Sodium	4.94E+01	1.42E+02	9.36E+01	3/3	n/a	n/a	0/3	3.20E+02	n/a	n/a	n/a	n/a
Strontium	1.42E+01	2.18E+01	1.75E+01	3/3	n/a	n/a	n/a	n/a	0/3	1.00E+05	0/3	5.45E+03
Tantalum	4.75E+00	1.34E+01	9.08E+00	2/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	8.80E+00	8.80E+00	8.80E+00	1/3	n/a	n/a	1/3	2.10E-01	n/a	n/a	n/a	n/a
Thorium	4.40E+00	1.04E+01	6.55E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Titanium	2.12E+02	2.60E+02	2.28E+02	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tungsten	8.34E+01	8.34E+01	8.34E+01	1/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	1.00E+00	1.00E+01	3.53E+00	27/27	n/a	n/a	3/27	4.90E+00	0/27	3.34E+03	0/27	2.02E+01
Zinc	5.68E+01	7.34E+01	6.71E+01	3/3	n/a	n/a	2/3	6.50E+01	0/3	1.00E+05	0/3	2.73E+03
Zirconium	5.80E+00	1.08E+01	8.70E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-01	6.00E-01	4.29E-01	7/29	n/a	n/a	n/a	n/a	0/29	4.25E+01	7/29	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	8.40E-02	2.67E-01	1.55E-01	3/3	n/a	n/a	0/3	4.90E-01	0/3	8.58E+00	2/3	8.58E-02
Cobalt-60	3.51E-02	3.51E-02	3.51E-02	1/1	n/a	n/a	n/a	n/a	0/1	1.77E+00	1/1	1.77E-02
Neptunium-237	3.24E-02	1.46E-01	7.58E-02	3/3	n/a	n/a	1/3	1.00E-01	0/3	2.71E+01	0/3	2.71E-01
Plutonium-239	6.10E-02	1.78E-01	1.12E-01	3/3	n/a	n/a	3/3	2.50E-02	0/3	1.15E+03	0/3	1.15E+01
Potassium-40	7.19E+00	9.48E+00	8.16E+00	3/3	n/a	n/a	0/3	1.60E+01	n/a	n/a	n/a	n/a
Technetium-99	3.90E+00	9.47E+00	5.81E+00	3/3	n/a	n/a	3/3	2.50E+00	0/3	3.62E+04	0/3	3.62E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.38. Summary of Surface and Subsurface Historical Data at SWMU 195 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Thorium-230	5.60E-01	2.34E+00	1.17E+00	3/3	n/a	n/a	1/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Uranium-234	1.40E+00	1.40E+00	1.40E+00	1/1	n/a	n/a	0/1	2.50E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-238	1.81E+00	1.81E+00	1.81E+00	1/1	n/a	n/a	1/1	1.20E+00	0/1	1.71E+02	1/1	1.71E+00
Wetchem (mg/kg)												
Iodide	1.18E+01	1.18E+01	1.18E+01	1/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Phosphate as Phosphorus	3.24E+02	4.32E+02	3.83E+02	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

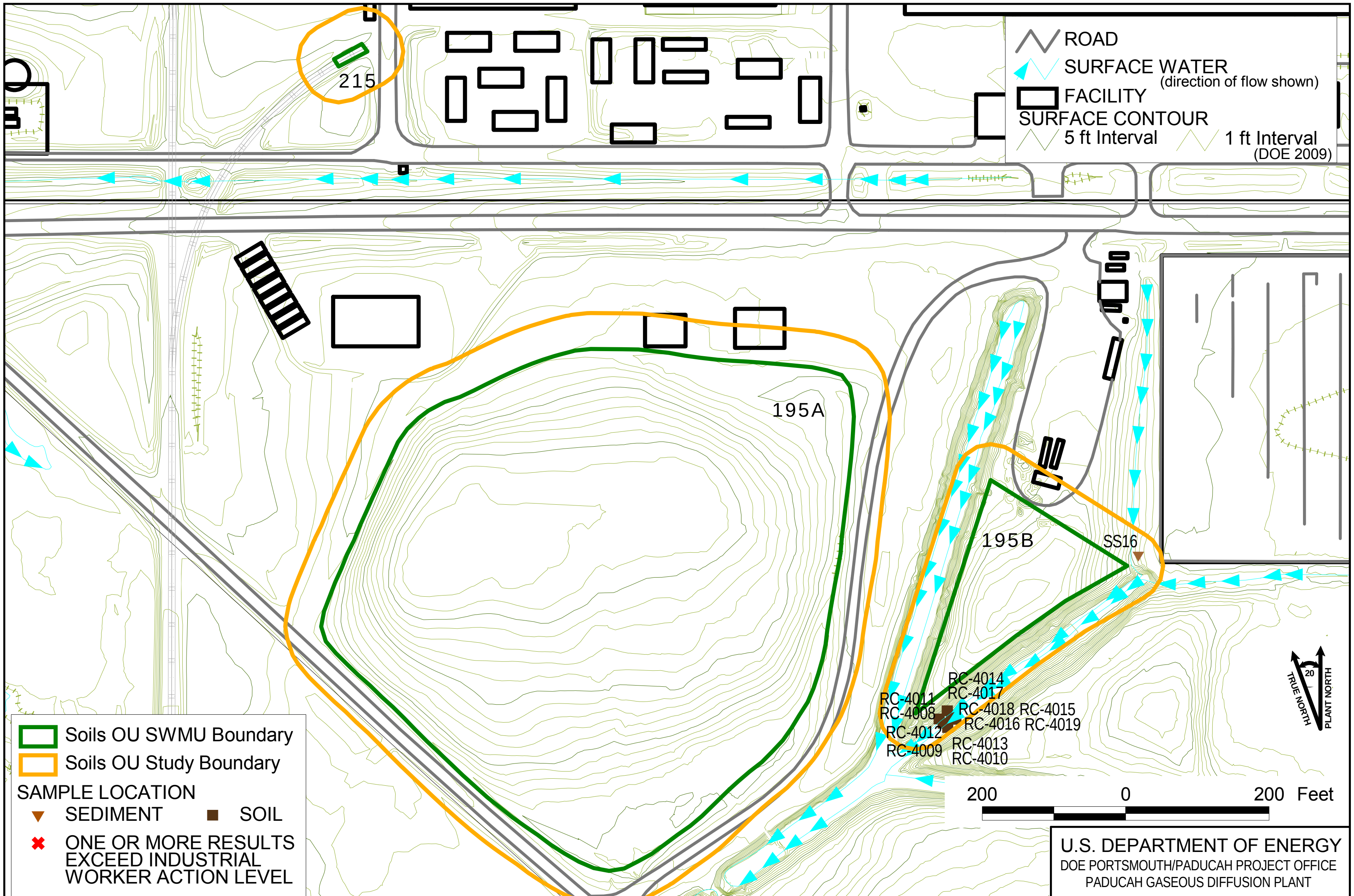


Figure 5.48. Soils Operable Unit: SWMUs 195 and 215

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

AOC 204 (Dyke Road Historical Staging Area)

Area description

The Dyke Road Historical Staging Area (AOC 204) is located between the eastern boundary of the plant and Dyke Road and between Outfalls 010 and 011. AOC 204 is a mounded area with heavy vegetation and several trees consisting of approximately 3 acres. A small ditch (approximately 4 ft wide and 3 ft deep) is situated across the mound from north to south.

Process history

During construction of the PGDP, (approximately 1951 through the mid 1950s), AOC 204 is suspected of having been a staging area or construction debris burial ground.

Previous investigation results

The types of debris identified on the mound include asphalt, concrete, telephone poles, railroad ties, and cable. Debris was not reported in subsurface samples collected during the drilling of WAG 28 (DOE 2000b) borings within the mound. A geophysical survey conducted during the SI using electromagnetometer (EM) equipment indicated four anomalies in the AOC 204 area, but not the presence of a landfill. The EM-31 and EM-61 geophysical survey results are shown on Figures 5.49 and 5.50.

The AOC was sampled during the SE (DOE 1995b) at KPDES Outfalls 010, 011, and 012 in September 1995 and again as part of the WAG 28 RI/FS in 1999, which shows TCE is of concern at this location.

A BHHRA was performed on AOC 204. It was evaluated under different scenarios for which human health risk exceeds *de minimis* levels (i.e., a cumulative human health ELCR of 1E-6 or a cumulative HI of 1). Results from the BHHRA indicated the following scenarios were exceeded: industrial worker exposure to RGA groundwater; future on-site resident exposure to RGA groundwater; off-site resident exposure to groundwater; future industrial worker exposure to RGA groundwater; industrial worker exposure to RGA groundwater resident exposure to RGA groundwater; future off-site resident exposure to groundwater; and future excavation worker exposure to soil. A BERA ecological evaluation was not required due to the potential source of contamination being contained within the subsurface.

Table 5.39 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figures 5.49 and 5.50).

Area utilities

No recirculating water lines or sewers were associated with this area. Storm sewers are coincidentally located within the boundary of the SWMU. Approximate depth to the sewers is 13-15 ft bgs.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

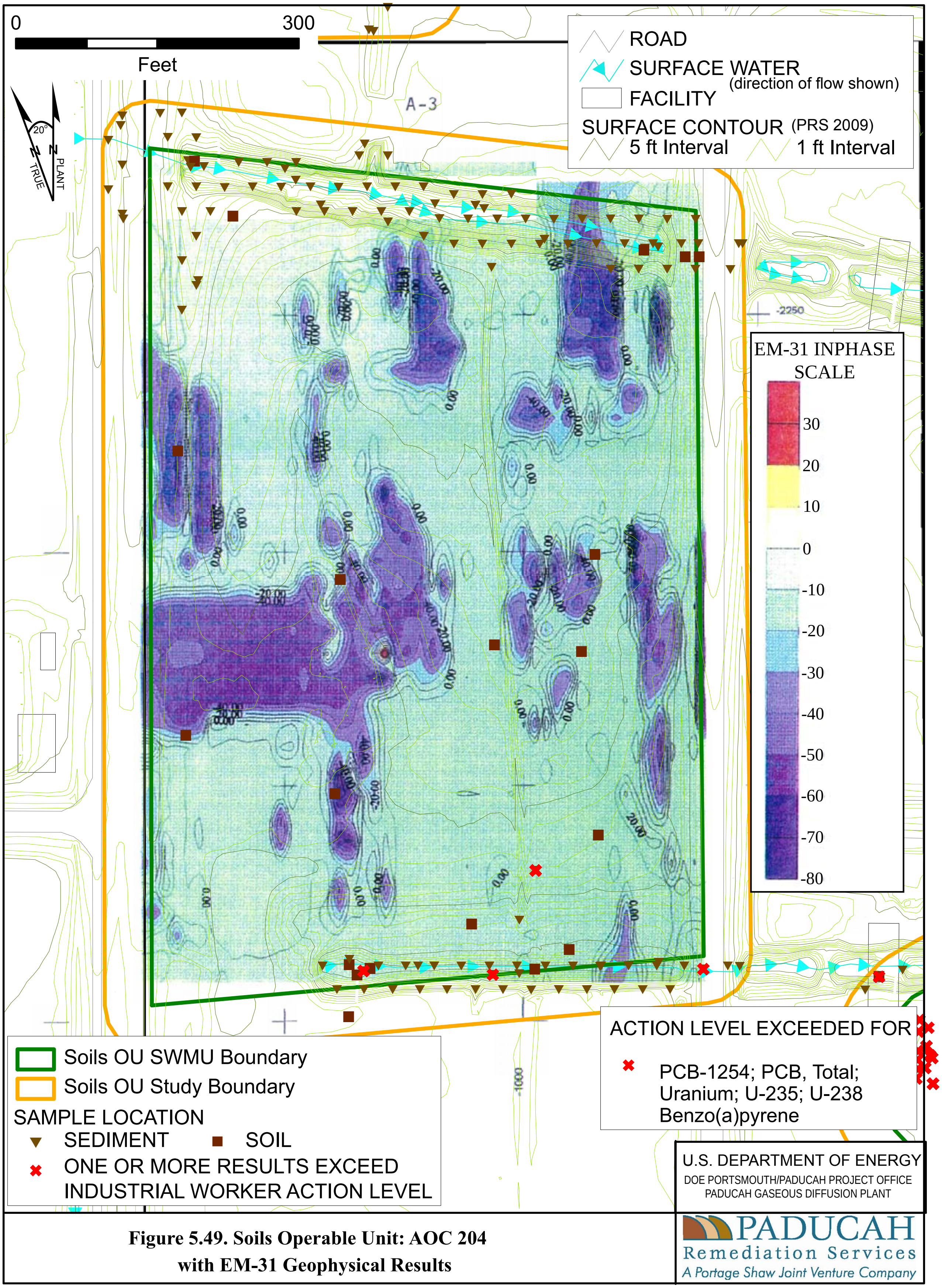


Figure 5.49. Soils Operable Unit: AOC 204 with EM-31 Geophysical Results

Figure No. SoilsOU_AOC204_HIST.mxd
DATE 01-14-10

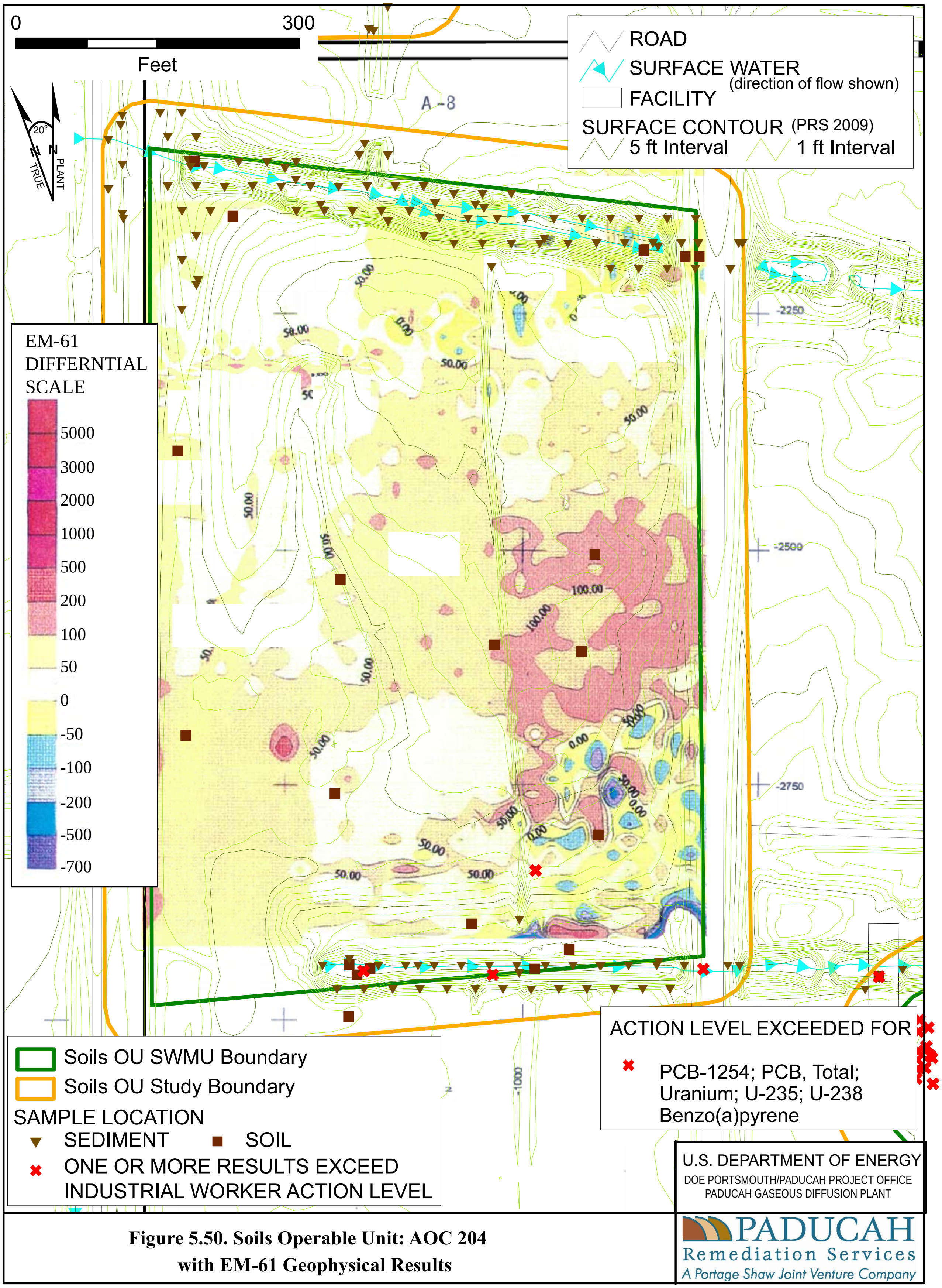


Figure 5.50. Soils Operable Unit: AOC 204 with EM-61 Geophysical Results

Figure No. SoilsOU_AOC204_HIST.mxd
DATE 01-14-10

Table 5.39. Summary of Surface and Subsurface Historical Data at AOC 204

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Surface Soils												
Metals (mg/kg)												
Aluminum	3.75E+03	1.71E+04	9.33E+03	27/27	1.80E+01	4.83E+01	5/27	1.30E+04	0/27	1.00E+05	25/27	4.64E+03
Antimony	4.00E-01	1.10E+00	8.67E-01	3/27	1.00E+00	2.00E+01	3/27	2.10E-01	0/27	4.63E+02	3/27	3.79E-01
Arsenic	2.10E+00	1.04E+01	6.43E+00	12/24	1.00E+00	5.00E+00	5/24	1.20E+01	0/24	3.15E+02	12/24	5.23E-01
Barium	2.99E+01	2.15E+02	7.90E+01	27/27	2.25E+00	4.83E+01	1/27	2.00E+02	0/27	1.00E+05	0/27	2.29E+02
Beryllium	3.00E-01	1.93E+00	8.70E-01	13/30	4.50E-01	1.20E+00	7/30	6.70E-01	0/30	1.28E+03	4/30	9.48E-01
Cadmium	5.80E-01	3.64E+00	1.68E+00	9/27	5.00E-01	2.00E+00	9/27	2.10E-01	0/27	7.05E+01	0/27	2.13E+01
Calcium	9.20E+02	1.45E+05	9.96E+03	27/27	9.00E+01	1.21E+03	8/27	2.00E+05	n/a	n/a	n/a	n/a
Chromium	8.43E+00	1.75E+02	3.41E+01	30/30	1.00E+00	2.50E+00	21/30	1.60E+01	n/a	n/a	0/30	3.56E+02
Cobalt	2.85E+00	2.51E+01	7.36E+00	26/27	2.25E+00	1.21E+01	4/27	1.40E+01	0/27	1.00E+05	0/27	1.92E+03
Copper	6.55E+00	2.02E+02	2.57E+01	27/27	2.25E+00	6.00E+00	9/27	1.90E+01	0/27	1.00E+05	0/27	4.93E+02
Iron	5.43E+03	4.48E+04	1.65E+04	27/27	1.00E+01	2.42E+01	4/27	2.80E+04	0/27	1.00E+05	27/27	2.07E+03
Lead	5.80E+00	6.20E+01	2.68E+01	11/27	3.00E-01	2.00E+01	4/27	3.60E+01	0/27	1.25E+03	1/27	5.00E+01
Lithium	8.00E+00	1.16E+01	9.33E+00	3/3	n/a	n/a	n/a	n/a	0/3	1.00E+05	0/3	6.41E+02
Magnesium	5.96E+02	2.94E+03	1.50E+03	27/27	4.50E+00	1.21E+03	5/27	7.70E+03	n/a	n/a	n/a	n/a
Manganese	5.97E+01	1.78E+03	3.87E+02	27/27	1.50E+00	1.00E+01	2/27	1.50E+03	0/27	4.64E+04	27/27	4.52E+01
Mercury	6.00E-02	1.50E-01	1.06E-01	7/30	3.30E-02	2.00E-01	1/30	2.00E-01	0/30	8.25E+02	0/30	9.82E-01
Molybdenum	3.60E-01	8.31E+00	2.06E+00	7/27	4.00E+00	9.70E+00	n/a	n/a	0/27	2.50E+04	0/27	8.30E+01
Nickel	4.97E+00	2.20E+01	1.04E+01	26/27	4.00E+00	9.70E+00	1/27	2.10E+01	0/27	9.30E+04	0/27	2.42E+02
Potassium	2.96E+02	1.40E+03	6.89E+02	27/27	9.00E+01	1.21E+03	6/27	1.30E+03	n/a	n/a	n/a	n/a
Selenium	5.10E-01	5.10E-01	5.10E-01	1/24	5.00E-01	1.98E+01	0/24	8.00E-01	0/24	2.56E+04	0/24	9.49E+01
Silicon	1.25E+02	1.51E+03	5.14E+02	8/13	5.00E+01	5.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Silver	1.60E+00	1.60E+00	1.60E+00	1/27	1.00E+00	4.00E+00	0/27	2.30E+00	0/27	2.07E+04	0/27	4.11E+01
Sodium	5.53E+01	2.24E+02	1.32E+02	18/27	9.00E+01	1.21E+03	0/27	3.20E+02	n/a	n/a	n/a	n/a
Strontium	1.90E+01	2.22E+01	2.09E+01	3/3	n/a	n/a	n/a	n/a	0/3	1.00E+05	0/3	5.45E+03
Tantalum	1.25E+01	1.46E+01	1.36E+01	2/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	2.20E-01	2.20E-01	2.20E-01	1/27	1.00E+00	2.00E+01	1/27	2.10E-01	n/a	n/a	n/a	n/a
Thorium	2.03E+01	3.66E+01	2.94E+01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Titanium	2.43E+02	3.06E+02	2.69E+02	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tungsten	1.09E+02	1.09E+02	1.09E+02	1/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	1.14E+00	1.31E+04	5.23E+02	31/35	5.20E-02	5.00E+01	22/35	4.90E+00	1/35	3.34E+03	8/35	2.02E+01
Vanadium	8.11E+00	7.55E+01	2.67E+01	25/27	2.25E+00	1.21E+01	5/27	3.80E+01	0/27	4.47E+03	25/27	3.32E+00
Zinc	2.71E+01	7.64E+02	1.11E+02	27/27	2.00E+00	2.00E+01	12/27	6.50E+01	0/27	1.00E+05	0/27	2.73E+03
Zirconium	9.20E+00	1.74E+01	1.33E+01	2/2			n/a	n/a	n/a	n/a	n/a	n/a
Pesticides/PCBs (mg/kg)												
PCB, Total	1.00E-01	7.90E+01	5.23E+00	29/128	1.00E-01	2.70E+00	n/a	n/a	1/128	4.25E+01	24/128	1.99E-01
PCB-1242	2.80E+01	2.80E+01	2.80E+01	1/127	4.40E-02	2.70E+00	n/a	n/a	0/127	4.25E+01	1/127	1.99E-01
PCB-1248	1.63E+00	1.63E+00	1.63E+00	1/127	4.40E-02	1.00E-01	n/a	n/a	0/127	4.25E+01	1/127	1.99E-01
PCB-1254	4.20E-02	2.40E+01	3.03E+00	14/145	4.40E-02	2.70E+00	n/a	n/a	1/145	1.82E+01	11/145	1.99E-01
PCB-1260	9.00E-02	2.70E+01	2.36E+00	32/145	4.40E-02	2.70E+00	n/a	n/a	0/145	4.25E+01	23/145	1.99E-01
PCB-1268	1.00E+00	1.00E+00	1.00E+00	1/127	4.40E-02	1.00E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.39. Summary of Surface and Subsurface Historical Data at AOC 204 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Radionuclides (pCi/g)												
Actinium-228	8.42E-01	9.79E-01	9.11E-01	2/3	1.17E-01	4.58E-01	n/a	n/a	n/a	n/a	n/a	n/a
Alpha activity	2.27E+00	4.30E+03	2.34E+02	20/22	6.30E-01	4.81E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.86E+00	7.71E+03	3.90E+02	22/22	8.80E-01	5.18E+00	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-212	8.07E-01	8.13E-01	8.10E-01	2/3	2.62E-01	1.36E+00	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-214	7.39E-01	1.04E+00	9.00E-01	3/3	6.13E-02	3.06E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-4.30E-01	1.38E+00	1.81E-01	108/117	3.88E-02	1.46E+00	24/117	4.90E-01	0/117	8.58E+00	74/117	8.58E-02
Cobalt-60	3.51E-02	3.51E-02	3.51E-02	1/18	2.66E-02	1.10E-01	n/a	n/a	0/18	1.77E+00	1/18	1.77E-02
Lead-212	7.16E-01	7.68E-01	7.40E-01	3/3	4.93E-02	2.35E-01	n/a	n/a	n/a	n/a	n/a	n/a
Lead-214	8.32E-01	8.65E-01	8.48E-01	2/3	5.79E-02	2.84E-01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	-1.20E-02	6.10E-02	2.64E-02	4/23	8.00E-03	2.64E-01	0/23	1.00E-01	0/23	2.71E+01	0/23	2.71E-01
Plutonium-239	0.00E+00	3.50E-03	1.83E-03	3/3			0/3	2.50E-02	0/3	1.15E+03	0/3	1.15E+01
Plutonium-239/240	3.44E-02	9.80E-02	6.39E-02	3/25	8.00E-03	9.00E-02	n/a	n/a	0/25	1.15E+03	0/25	1.15E+01
Potassium-40	2.68E+00	1.40E+01	9.29E+00	6/6	2.84E-01	7.96E-01	0/6	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-231	3.65E+01	3.65E+01	3.65E+01	1/3	3.34E-01	2.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Protactinium-234m	8.13E+00	4.38E+03	8.87E+02	5/7	5.33E-01	5.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Radium-228	9.62E-01	9.62E-01	9.62E-01	1/3	2.85E-01	3.79E-01	n/a	n/a	n/a	n/a	n/a	n/a
Strontium-90	4.70E+00	4.70E+00	4.70E+00	1/3	1.00E+00	1.30E+00	0/3	4.70E+00	0/3	7.44E+02	0/3	7.44E+00
Technetium-99	8.20E-01	1.03E+01	4.69E+00	16/25	2.96E-01	4.25E+00	12/25	2.50E+00	0/25	3.62E+04	0/25	3.62E+02
Thallium-208	2.34E-01	2.34E-01	2.34E-01	1/3	3.27E-02	1.71E-01	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-228	1.94E-01	4.43E-01	3.21E-01	17/20	4.00E-02	2.52E-01	0/20	1.60E+00	0/20	2.80E+00	17/20	2.80E-02
Thorium-230	2.40E-01	1.60E+00	6.14E-01	16/20	1.30E-01	2.10E-01	2/20	1.50E+00	0/20	1.49E+03	0/20	1.49E+01
Thorium-232	1.60E-01	5.15E-01	3.22E-01	18/20	3.00E-02	1.80E-01	0/20	1.50E+00	0/20	1.35E+03	0/20	1.35E+01
Thorium-234	2.14E+00	1.01E+01	5.20E+00	4/7	3.25E-01	1.68E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	1.45E+01	3.68E+03	1.24E+03	3/3	1.43E+00	1.19E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.20E-01	4.45E+02	2.99E+01	25/26	4.35E-03	7.10E+00	4/26	2.50E+00	0/26	1.98E+03	2/26	1.98E+01
Uranium-235	3.22E-02	5.70E+01	2.94E+00	20/23	5.85E-03	1.50E+00	5/23	1.40E-01	1/23	3.95E+01	1/23	3.95E-01
Uranium-238	-1.65E+01	4.39E+03	7.33E+01	121/122	4.33E-03	1.69E+01	95/122	1.20E+00	2/122	1.71E+02	85/122	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	2.80E+00	5.30E+00	4.05E+00	2/14	4.60E-01	5.60E-01	n/a	n/a	0/14	6.67E+04	0/14	3.16E+02
Acenaphthylene	4.60E-01	4.60E-01	4.60E-01	1/14	4.60E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	5.90E+00	1.10E+01	8.45E+00	2/14	4.60E-01	5.60E-01	n/a	n/a	0/14	1.00E+05	0/14	3.79E+03
Benz(a)anthracene	1.30E+00	3.90E+01	1.67E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+02	4/14	2.12E-01
Benzo(a)pyrene	1.20E+00	4.00E+01	1.72E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	2/14	2.08E+01	4/14	2.12E-02
Benzo(b)fluoranthene	2.40E+00	6.70E+01	3.12E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+02	4/14	2.12E-01
Benzo(ghi)perylene	8.00E+00	1.80E+01	1.30E+01	2/14	4.60E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.00E+00	2.50E+01	1.08E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+03	2/14	2.12E+00
Chrysene	1.60E+00	4.10E+01	1.74E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+04	2/14	2.12E+01
Dibenz(a,h)anthracene	2.50E+00	5.30E+00	3.90E+00	2/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+01	2/14	2.12E-02
Fluoranthene	3.20E+00	5.20E+01	2.49E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	6.50E+04	0/14	2.21E+02
Fluorene	2.50E+00	4.40E+00	3.45E+00	2/14	4.60E-01	5.60E-01	n/a	n/a	0/14	7.09E+04	0/14	3.39E+02
Indeno(1,2,3-cd)pyrene	5.80E-01	2.00E+01	7.77E+00	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	2.08E+02	4/14	2.12E-01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.39. Summary of Surface and Subsurface Historical Data at AOC 204 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Naphthalene	8.80E-01	2.80E+00	1.84E+00	2/14	4.60E-01	5.60E-01	n/a	n/a	0/14	7.66E+02	0/14	2.36E+01
Phenanthrene	1.90E+00	5.30E+01	2.17E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	2.40E+00	1.30E+02	4.91E+01	4/14	4.60E-01	5.60E-01	n/a	n/a	0/14	4.87E+04	0/14	1.65E+02
Volatiles (mg/kg)												
Tetrachloroethene	8.00E-03	8.00E-03	8.00E-03	1/7	n/a	n/a	n/a	n/a	0/7	1.46E+03	0/7	3.90E+00
Trichloroethene	1.50E-02	5.34E+00	2.68E+00	2/21	5.00E-03	5.00E-03	n/a	n/a	0/21	2.98E+02	1/21	2.51E+00
Wetchem (mg/kg)												
Iodide	2.60E+01	2.60E+01	2.60E+01	1/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Phosphate as Phosphorus	9.80E+02	1.11E+03	1.03E+03	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.18E+03	1.70E+04	8.22E+03	8/8	2.00E+01	3.24E+01	1/8	1.20E+04	0/8	1.00E+05	6/8	4.64E+03
Antimony	1.72E+01	3.03E+01	2.22E+01	3/8	1.39E+01	2.00E+01	3/8	2.10E-01	0/8	4.63E+02	3/8	3.79E-01
Arsenic	6.89E+00	8.05E+00	7.47E+00	2/8	5.00E+00	3.90E+01	1/8	7.90E+00	0/8	3.15E+02	2/8	5.23E-01
Barium	1.40E+01	1.56E+02	8.51E+01	8/8	7.53E-01	1.00E+00	0/8	1.70E+02	0/8	1.00E+05	0/8	2.29E+02
Beryllium	4.77E-01	7.28E-01	5.83E-01	6/8	1.84E-01	5.00E-01	1/8	6.90E-01	0/8	1.28E+03	0/8	9.48E-01
Calcium	7.26E+02	9.07E+04	2.96E+04	8/8	1.52E+01	5.00E+01	3/8	6.10E+03	n/a	n/a	n/a	n/a
Chromium	5.24E+00	2.13E+01	1.35E+01	8/8	2.00E+00	4.35E+00	3/8	4.30E+01	n/a	n/a	0/8	3.56E+02
Cobalt	1.20E+00	6.36E+00	3.71E+00	7/8	1.00E+00	4.09E+00	0/8	1.30E+01	0/8	1.00E+05	0/8	1.92E+03
Copper	5.37E+00	1.63E+01	1.01E+01	6/8	2.00E+00	3.09E+00	0/8	2.50E+01	0/8	1.00E+05	0/8	4.93E+02
Iron	3.07E+03	2.05E+04	1.21E+04	8/8	3.49E+00	5.00E+00	0/8	2.80E+04	0/8	1.00E+05	8/8	2.07E+03
Lithium	5.29E+00	1.27E+01	8.09E+00	6/8	1.44E+00	2.00E+00	n/a	n/a	0/8	1.00E+05	0/8	6.41E+02
Magnesium	3.72E+02	7.15E+03	2.71E+03	8/8	1.50E+01	3.11E+01	4/8	2.10E+03	n/a	n/a	n/a	n/a
Manganese	7.07E+00	5.54E+02	2.49E+02	8/8	6.94E-01	1.00E+00	0/8	8.20E+02	0/8	4.64E+04	6/8	4.52E+01
Nickel	1.57E+01	2.19E+01	1.78E+01	3/8	5.00E+00	9.66E+00	1/8	2.20E+01	0/8	9.30E+04	0/8	2.42E+02
Potassium	1.19E+02	1.04E+03	4.20E+02	5/5	1.00E+02	1.00E+02	1/5	9.50E+02	n/a	n/a	n/a	n/a
Sodium	3.09E+02	3.09E+02	3.09E+02	1/5	2.00E+02	2.00E+02	0/5	3.40E+02	n/a	n/a	n/a	n/a
Strontium	3.22E+00	2.17E+01	1.07E+01	5/5	2.00E+00	2.00E+00	n/a	n/a	0/5	1.00E+05	0/5	5.45E+03
Tin	2.03E+01	2.03E+01	2.03E+01	1/3	1.31E+01	1.31E+01	n/a	n/a	0/3	1.00E+05	0/3	2.79E+03
Uranium	1.88E+00	2.04E+00	1.97E+00	3/3	6.08E-02	2.51E-01	0/3	4.60E+00	0/3	3.34E+03	0/3	2.02E+01
Vanadium	3.66E+00	3.13E+01	2.01E+01	8/8	2.00E+00	3.09E+00	0/8	3.70E+01	0/8	4.47E+03	8/8	3.32E+00
Zinc	1.87E+01	6.86E+01	4.49E+01	6/8	1.69E+00	1.50E+01	1/8	6.00E+01	0/8	1.00E+05	0/8	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	7.92E+00	2.14E+01	1.54E+01	17/18	6.23E+00	9.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.02E-01	1.02E-01	1.02E-01	1/19	9.38E-02	9.20E+00	n/a	n/a	0/19	5.16E+02	0/19	5.16E+00
Beta activity	9.22E+00	2.91E+01	1.84E+01	17/18	3.90E+00	8.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	2.42E-01	3.58E-01	2.91E-01	3/19	9.86E-02	4.77E+00	0/19	2.80E+00	0/19	3.62E+04	0/19	3.62E+02
Thorium-228	4.50E-01	8.02E-01	6.72E-01	3/3	1.20E-01	1.94E-01	0/3	1.60E+00	0/3	2.80E+00	3/3	2.80E-02
Thorium-230	5.63E-01	8.31E-01	6.71E-01	3/3	1.08E-01	1.98E-01	0/3	1.40E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	5.91E-01	7.46E-01	6.70E-01	3/3	7.65E-02	8.66E-02	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Uranium-233/234	5.67E-01	6.59E-01	5.98E-01	3/3	5.06E-02	1.02E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-235	3.89E-02	3.89E-02	3.89E-02	1/19	2.11E-02	9.00E+00	0/19	1.40E-01	0/19	3.95E+01	0/19	3.95E-01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.39. Summary of Surface and Subsurface Historical Data at AOC 204 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Uranium-235 (mg/kg)	1.80E-02	1.80E-02	1.80E-02	1/3	9.75E-03	3.24E-02	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-238	6.26E-01	6.82E-01	6.58E-01	3/3	1.71E-02	7.33E-02	0/3	1.20E+00	0/3	1.71E+02	0/3	1.71E+00
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	1.40E+00	1.40E+00	1.40E+00	1/6	4.30E-01	5.00E-01	n/a	n/a	0/6	1.00E+05	0/6	2.13E+03
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.10E-02	2.40E-02	1.64E-02	10/101	2.00E-03	1.20E+00	n/a	n/a	0/101	9.38E+03	0/101	1.56E+02
Acetone	2.80E-01	5.50E-01	4.15E-01	2/22	1.00E-02	1.20E+00	n/a	n/a	0/22	1.91E+04	0/22	3.58E+02
cis-1,2-Dichloroethene	3.70E-01	3.70E-01	3.70E-01	1/48	1.00E-02	1.20E+00	n/a	n/a	0/48	4.63E+02	0/48	1.34E+01
Tetrachloroethene	5.00E-03	5.00E-03	5.00E-03	1/89	2.00E-03	1.20E+00	n/a	n/a	0/89	1.46E+03	0/89	3.90E+00
Trichloroethene	2.10E-02	8.80E+00	1.73E+00	8/118	2.00E-03	1.20E+00	n/a	n/a	0/118	2.98E+02	2/118	2.51E+00
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	3.30E+02	3.30E+02	3.30E+02	1/1	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

SWMU 486 (Rubble Pile WKWMA)

Area description

The rubble pile is on the west side of Rice Springs Road, approximately 116 ft off the roadside. It is in the vicinity of C-611-M in the Kentucky Ordnance Works area. It is approximately 55 ft by 55 ft.

Process history

The history of this site is unknown, but may have been used as a disposal area for waste material or a storage location for equipment during plant construction.

Previous investigation results

In April of 2001, a radiological survey of the area and materials was performed. Results of the survey indicate no radiological contamination is present.

No sampling data are available in Paducah OREIS. Figure 5.51 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

No samples are needed at this location.

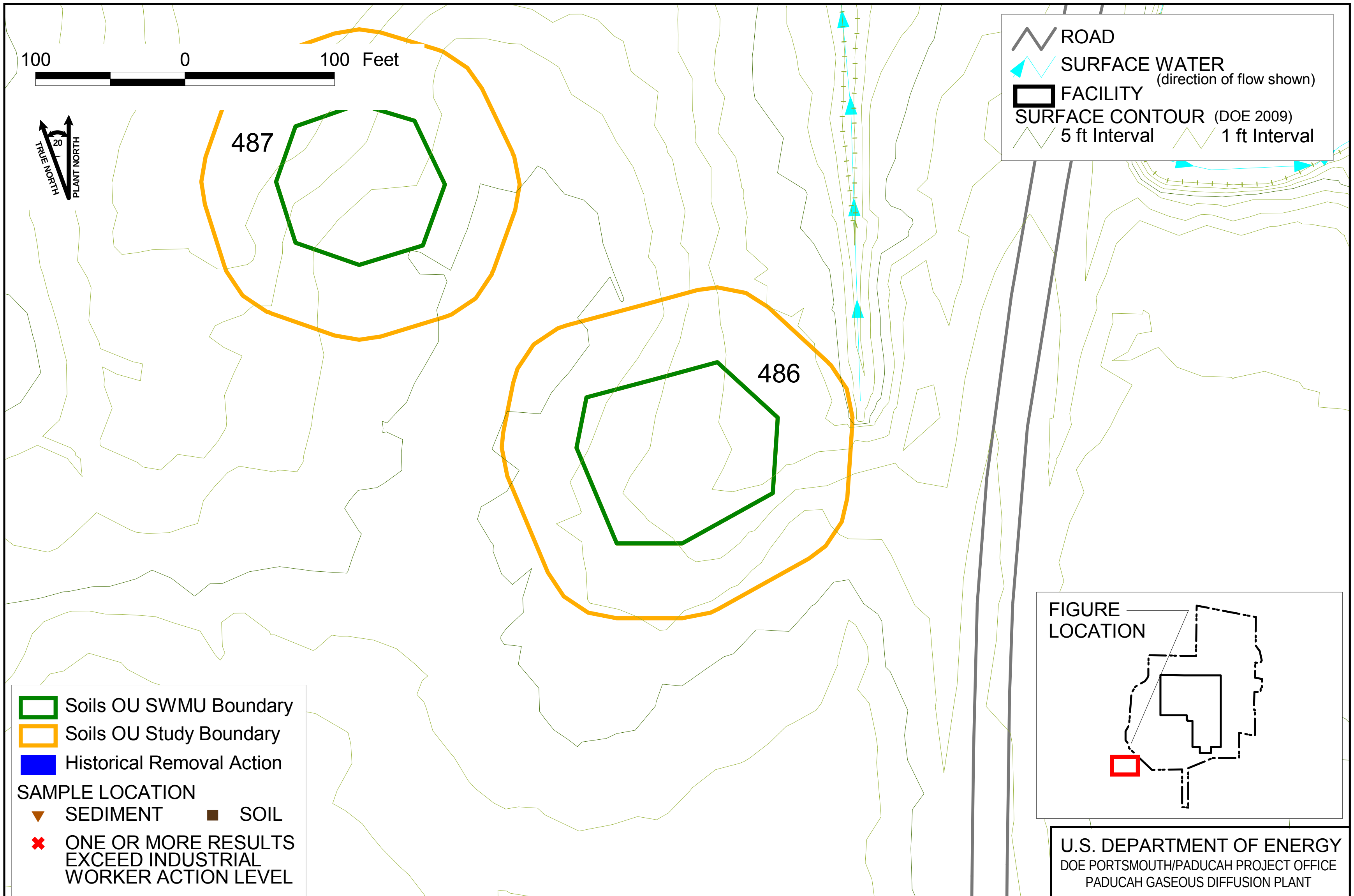


Figure 5.51. Soils Operable Unit: SWMU 486

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\sou_swmus486-487.apr
DATE 03-05-2010

SWMU 487 (Rubble Pile WKWMA)

Area description

The rubble pile is on the west side of Rice Spring Road and is approximately 483 ft off the roadside. The pile is in the vicinity of C-611-M and is in the Kentucky Ordnance Works. The pile is approximately 80 ft by 80 ft.

Process history

The history of this site is unknown, but may have been used as a disposal area for waste material or a storage location for equipment during plant construction.

Previous investigation results

In April of 2001, a radiological survey of the area and materials was performed. Results of the survey indicate no radiological contamination is present.

No sampling data is available in Paducah OREIS. Figure 5.52 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

No samples are needed at this location.

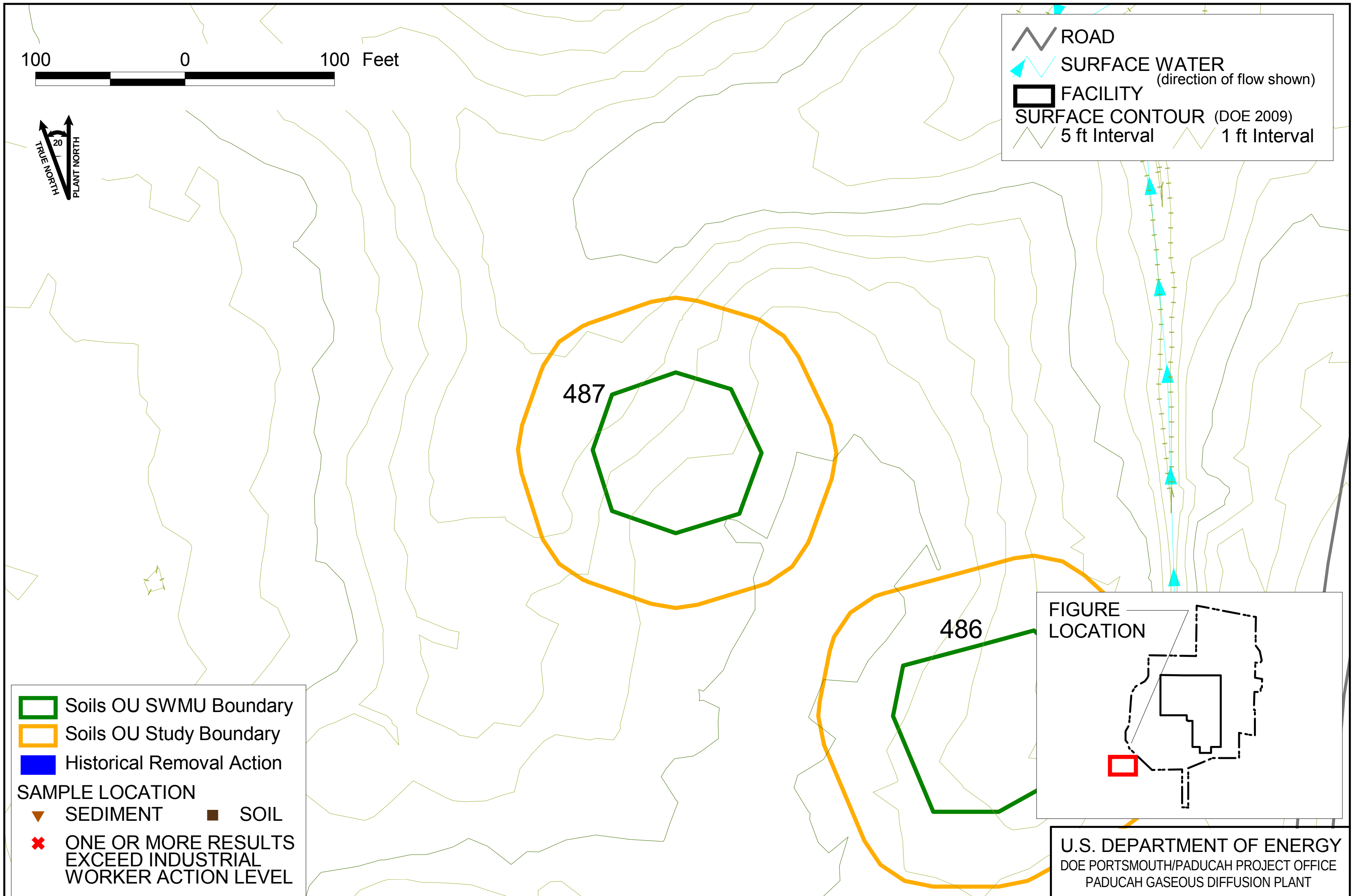


Figure 5.52. Soils Operable Unit: SWMU 487

Figure No. \SoilsOU\sou_swmus486-487.apr
DATE 03-05-2010

AOC 492 (Contaminated Soil Area, North of Outfall 10)

Area description

The contaminated soil area, north of Outfall 11 (AOC 492) is located east of the plant site. AOC 492 is approximately 450 ft^2 (15 ft x 30 ft).

Process history

AOC 492 was discovered during routine radiological surveys in support of sampling activities. This area likely was generated from past plant maintenance activities.

Previous investigation results

An area with elevated radiological readings was detected on July 30, 2001. This area was sampled (surface) and analytical results received on August 29, 2001, indicated the presence of elevated levels of PCBs and radiological constituents. Data from three locations sampled in the AOC were evaluated. Analytical results indicate the presence of metals (chromium); PCBs; and radionuclides (uranium-238). The area also was sampled in 2008 by the Kentucky Research Consortium for Energy and Environment and as part of the *Addendum I-B to the Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant,* DOE/LX/07-0015/B.

During the Addendum I-B Site Evaluation, AOC 492 was sampled using a systematic approach using a grid spacing of 10 ft. This approach was designed to ensure sampling results were sufficient to determine the concentration and distribution of constituents throughout the study area. Findings for AOC 492 from the Addendum I-B sampling were similar to the findings from a 2002 soil sampling effort to initially assess site conditions. The results of the initial sampling effort indicated detections of PCBs and uranium above background.

Also of note is that Kentucky Research Consortium for Energy and Environment performed a real-time demonstration of *in situ* analysis and field testing at AOC 492 during 2008 that included removal of approximately 18 yd^3 of soil.

Table 5.40 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.53).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.40. Summary of Surface and Subsurface Historical Data at AOC 492

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	3.04E+03	9.92E+03	6.07E+03	13/14	2.00E+01	2.00E+01	0/14	1.30E+04	0/14	1.00E+05	10/14	4.64E+03
Arsenic	5.07E+00	1.47E+01	8.94E+00	6/13	5.00E+00	2.00E+01	3/13	1.20E+01	0/13	3.15E+02	6/13	5.23E-01
Barium	3.53E+01	1.02E+02	5.74E+01	13/13	2.50E+00	5.00E+00	0/13	2.00E+02	0/13	1.00E+05	0/13	2.29E+02
Beryllium	5.07E-01	1.04E+01	2.39E+00	11/17	5.00E-01	5.00E-01	5/17	6.70E-01	0/17	1.28E+03	4/17	9.48E-01
Cadmium	3.00E-02	3.14E+00	1.69E+00	7/16	2.00E+00	2.00E+00	6/16	2.10E-01	0/16	7.05E+01	0/16	2.13E+01
Calcium	5.30E+02	2.49E+03	1.24E+03	14/14	1.00E+02	2.00E+02	0/14	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.25E+01	1.04E+03	1.22E+02	15/16	2.00E+00	2.50E+00	12/16	1.60E+01	n/a	n/a	1/16	3.56E+02
Cobalt	2.93E+00	1.07E+01	5.54E+00	14/14	2.50E+00	2.50E+00	0/14	1.40E+01	0/14	1.00E+05	0/14	1.92E+03
Copper	3.34E+00	8.47E+01	1.69E+01	14/16	2.00E+00	5.00E+00	3/16	1.90E+01	0/16	1.00E+05	0/16	4.93E+02
Iron	5.56E+03	1.69E+04	1.04E+04	14/14	1.00E+01	2.00E+01	0/14	2.80E+04	0/14	1.00E+05	14/14	2.07E+03
Lead	4.05E+00	2.80E+01	1.42E+01	6/16	2.00E+01	2.00E+01	2/16	3.60E+01	0/16	1.25E+03	0/16	5.00E+01
Magnesium	3.21E+02	1.25E+03	6.03E+02	14/14	2.50E+00	1.50E+01	0/14	7.70E+03	n/a	n/a	n/a	n/a
Manganese	5.92E+01	4.26E+02	2.01E+02	14/14	2.50E+00	1.00E+01	0/14	1.50E+03	0/14	4.64E+04	14/14	4.52E+01
Nickel	6.52E+00	2.71E+01	1.15E+01	12/17	5.00E+00	5.00E+00	1/17	2.10E+01	0/17	9.30E+04	0/17	2.42E+02
Potassium	1.47E+02	5.24E+02	2.69E+02	14/14	1.00E+02	2.00E+02	0/14	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.40E-01	6.50E-01	4.95E-01	2/9	1.00E+00	2.00E+01	0/9	8.00E-01	0/9	2.56E+04	0/9	9.49E+01
Silver	1.20E-01	1.26E-01	1.23E-01	2/17	1.30E+00	4.00E+00	0/17	2.30E+00	0/17	2.07E+04	0/17	4.11E+01
Sodium	4.04E+01	3.05E+02	1.76E+02	3/13	2.52E+01	3.00E+02	0/13	3.20E+02	n/a	n/a	n/a	n/a
Uranium	1.17E+01	1.77E+03	3.14E+02	9/20	1.00E-01	2.00E+02	9/20	4.90E+00	0/20	3.34E+03	7/20	2.02E+01
Vanadium	1.09E+01	4.32E+01	2.24E+01	13/13	2.00E+00	2.50E+00	1/13	3.80E+01	0/13	4.47E+03	13/13	3.32E+00
Zinc	1.23E+01	6.62E+02	8.38E+01	16/16	1.00E+01	2.00E+01	3/16	6.50E+01	0/16	1.00E+05	0/16	2.73E+03
Pesticides/PCBs (mg/kg)												
2,4'-DDE	1.50E-02	1.50E-02	1.50E-02	1/5	2.10E-03	9.80E-03	n/a	n/a	n/a	n/a	n/a	n/a
4,4'-DDD	2.80E-03	3.50E-03	3.15E-03	2/7	1.10E-02	5.00E-02	n/a	n/a	0/7	1.07E+03	0/7	5.09E+00
4,4'-DDE	1.40E-03	6.20E-03	4.43E-03	3/7	1.10E-02	5.00E-02	n/a	n/a	0/7	7.55E+02	0/7	3.59E+00
4,4'-DDT	2.20E-02	2.20E-02	2.20E-02	1/7	1.10E-02	5.00E-02	n/a	n/a	0/7	7.55E+02	0/7	3.59E+00
alpha-Chlordane	4.90E-03	4.90E-03	4.90E-03	2/7	1.10E-02	1.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
delta-BHC	1.50E-03	7.50E-03	4.50E-03	2/7	1.00E-02	5.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Dieldrin	2.50E-02	2.50E-02	2.50E-02	1/7	1.10E-02	5.00E-02	n/a	n/a	0/7	1.32E+01	1/7	1.97E-02
Endosulfan I	1.70E-03	1.70E-03	1.70E-03	1/7	1.00E-02	5.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan II	1.90E-03	3.10E-03	2.50E-03	2/7	1.10E-02	5.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Endosulfan sulfate	6.50E-03	1.00E-02	8.25E-03	2/7	1.10E-02	5.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
PCB, Total	2.00E-01	4.41E+01	7.41E+00	12/15	9.00E-02	9.00E-01	n/a	n/a	1/15	4.25E+01	12/15	1.99E-01
PCB-1242	2.00E-01	2.00E-01	2.00E-01	1/14	6.00E-02	1.00E-01	n/a	n/a	0/14	4.25E+01	1/14	1.99E-01
PCB-1248	1.00E-02	1.87E+01	2.76E+00	15/23	8.00E-02	8.00E-01	n/a	n/a	0/23	4.25E+01	8/23	1.99E-01
PCB-1254	5.00E-03	1.54E+01	1.50E+00	14/25	6.00E-02	6.00E-01	n/a	n/a	0/25	1.82E+01	9/25	1.99E-01
PCB-1260	2.00E-03	1.00E+01	1.44E+00	19/25	9.00E-02	9.00E-01	n/a	n/a	0/25	4.25E+01	11/25	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	1.40E-02	3.46E-01	1.16E-01	7/12	8.15E-03	6.91E-02	2/12	4.90E-01	0/12	8.58E+00	2/12	8.58E-02
Neptunium-237	2.09E-01	2.09E-01	2.09E-01	1/14	1.55E-02	1.05E-01	1/14	1.00E-01	0/14	2.71E+01	0/14	2.71E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.40. Summary of Surface and Subsurface Historical Data at AOC 492 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Plutonium-239/240	3.23E-02	5.31E-02	4.27E-02	2/12	7.66E-03	1.23E-02	n/a	n/a	0/12	1.15E+03	0/12	1.15E+01
Potassium-40	1.55E+00	7.76E+00	3.70E+00	12/12	6.65E-02	4.22E-01	0/12	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-234m	1.92E+02	5.37E+02	3.65E+02	2/2	4.25E+00	5.44E+00	n/a	n/a	n/a	n/a	n/a	n/a
Radium-226	5.74E-01	5.74E-01	5.74E-01	1/2	1.40E-01	2.58E-01	0/2	1.50E+00	0/2	2.56E+00	1/2	2.56E-02
Technetium-99	1.76E-01	6.91E+00	1.05E+00	11/14	1.10E-01	1.92E-01	1/14	2.50E+00	0/14	3.62E+04	0/14	3.62E+02
Thorium-228	6.64E-01	7.38E-01	7.01E-01	2/2	9.84E-03	1.29E-02	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	2.00E-01	9.71E-01	3.29E-01	14/14	1.75E-02	6.00E-02	0/14	1.50E+00	0/14	1.49E+03	0/14	1.49E+01
Thorium-232	6.37E-01	7.03E-01	6.70E-01	2/2	1.34E-02	1.40E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Thorium-234	1.32E+02	3.75E+02	2.54E+02	2/2	9.18E-01	1.56E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.62E-01	1.56E+00	8.15E-01	8/14	2.25E-01	4.92E-01	0/14	2.50E+00	0/14	1.98E+03	0/14	1.98E+01
Uranium-235	4.30E-02	5.72E+00	8.61E-01	10/14	5.39E-02	8.14E-02	5/14	1.40E-01	0/14	3.95E+01	2/14	3.95E-01
Uranium-238	3.91E+00	3.83E+02	6.10E+01	10/14	1.99E+00	3.49E+00	10/14	1.20E+00	1/14	1.71E+02	10/14	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.30E-02	1.30E-02	1.30E-02	1/12	2.80E-02	4.90E-01	n/a	n/a	0/12	6.67E+04	0/12	3.16E+02
Anthracene	1.30E-02	1.90E-02	1.60E-02	2/12	2.80E-02	4.90E-01	n/a	n/a	0/12	1.00E+05	0/12	3.79E+03
Benz(a)anthracene	2.70E-02	1.20E-01	7.70E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
Benzo(a)pyrene	4.00E-02	1.20E-01	6.66E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+01	5/12	2.12E-02
Benzo(b)fluoranthene	6.30E-02	1.60E-01	1.17E-01	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
Benzo(e)pyrene	2.10E-02	1.40E-01	7.64E-02	5/5	2.80E-02	6.50E-02	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(ghi)perylene	2.80E-02	3.80E-02	3.30E-02	2/12	2.80E-02	4.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.40E-02	1.10E-01	7.58E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+03	0/12	2.12E+00
Chrysene	3.00E-02	1.10E-01	7.14E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+04	0/12	2.12E+01
Di-n-butyl phthalate	1.20E+00	1.20E+00	1.20E+00	1/7	4.10E-01	4.90E-01	n/a	n/a	0/7	1.00E+05	0/7	2.13E+03
Docosane	1.00E-02	2.20E-02	1.63E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Dotriacontane	4.20E-02	1.30E-01	9.73E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Eicosane	4.00E-03	1.00E-02	7.67E-03	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Fluoranthene	6.60E-02	2.20E-01	1.57E-01	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	6.50E+04	0/12	2.21E+02
Fluorene	1.10E-02	1.10E-02	1.10E-02	1/12	2.80E-02	4.90E-01	n/a	n/a	0/12	7.09E+04	0/12	3.39E+02
Henicosane	7.00E-03	1.90E-02	1.40E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
heptacosane	8.70E-02	1.10E+00	4.89E-01	5/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Heptadecane	9.00E-03	2.00E-02	1.40E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Hexacosane	3.80E-02	1.10E-01	6.63E-02	4/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Hexadecane	6.00E-03	1.70E-02	1.10E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Indeno(1,2,3-cd)pyrene	1.40E-02	4.70E-02	3.38E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	2.08E+02	0/12	2.12E-01
n-Hentriacontane	4.20E-01	3.90E+00	2.27E+00	5/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
n-Octacosane	3.70E-02	1.80E-01	9.52E-02	5/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Nonacosane	3.80E-01	3.60E+00	2.10E+00	5/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Nonadecane	6.00E-03	2.50E-02	1.67E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
n-Pentacosane	8.80E-02	2.60E-01	1.47E-01	4/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
n-Tetracosane	2.60E-02	5.00E-02	3.57E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
n-Triacontane	5.20E-02	2.60E-01	1.41E-01	4/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
n-Tricosane	3.40E-02	8.00E-02	5.05E-02	4/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.40. Summary of Surface and Subsurface Historical Data at AOC 492 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
n-Tritriacontane	8.50E-02	6.70E-01	3.55E-01	5/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Octadecane	7.00E-03	1.40E-02	1.00E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Perylene	9.00E-03	3.80E-02	2.12E-02	5/5	2.80E-02	6.50E-02	n/a	n/a	n/a	n/a	n/a	n/a
Phenanthrene	3.80E-02	1.50E-01	9.94E-02	5/12	2.80E-02	4.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.20E-02	1.80E-01	1.12E-01	5/12	2.80E-02	4.90E-01	n/a	n/a	0/12	4.87E+04	0/12	1.65E+02
Tetradecane	6.00E-03	1.10E-02	8.33E-03	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Tetratriacontane	9.00E-03	9.00E-03	9.00E-03	1/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Semivolatiles (mg/kg)												
Pentadecane	5.00E-03	1.40E-02	1.07E-02	3/5	2.80E-01	7.50E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

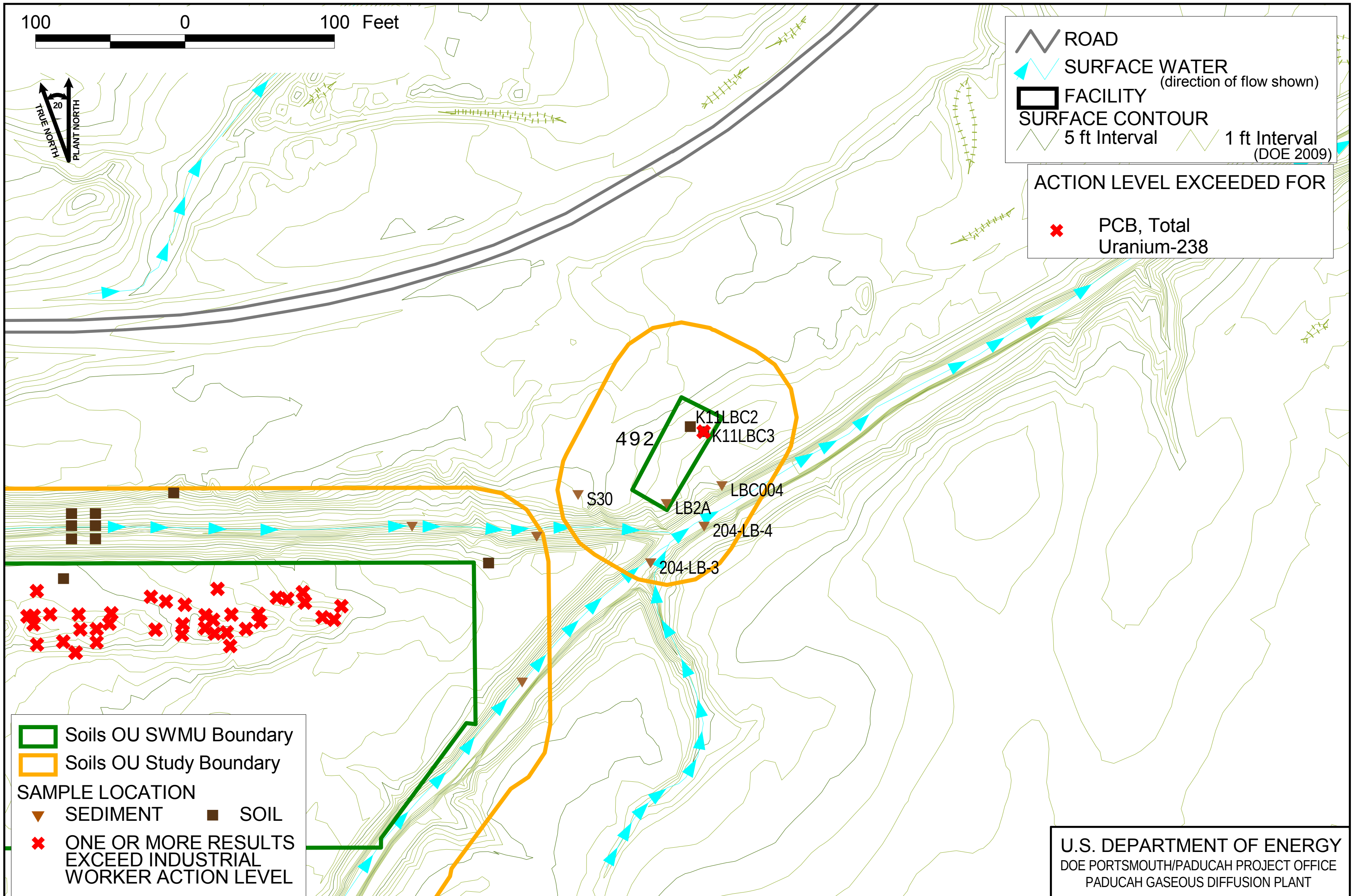


Figure 5.53. Soils Operable Unit: AOC 492

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 493 (Concrete Rubble Piles Near Outfall 001)

Area description

The concrete rubble piles near Outfall 001 (SWMU 493) are two concrete rubble piles located west of the plant site. The two piles making up SWMU 493 are approximately 450 ft^2 and 270 ft^2, respectively.

Process history

Two concrete rubble piles were found during a site inspection for the construction of the Scrap Yard Infrastructure Storm Water Collection Basin in November 2001. The concrete rubble piles appear to have been placed along the bank for erosion control. It is unknown where the concrete originated, but it is assumed to be from the PGDP.

Previous investigation results

After being surveyed by HP, the concrete debris and soil near the concrete debris were found to be clean. In order for construction of the Scrap Yard Infrastructure Storm Water Collection Basin to continue, the concrete was relocated to SWMU 474. Per a request from Kentucky, the first ft of soil under the concrete was excavated, relocated to SWMU 474, and placed on plastic. After removal of the concrete, excavation and relocation of the first ft of soil began; the excavated soil was surveyed routinely throughout the excavation. Pieces of metal shavings and filings, such as that from a machine shop, and other pieces of scrap metal, along with a few gaskets and litter, were discovered in the relocated soil. Some fixed radiological activity was present on these materials, but was below release limits. These items were surveyed, packaged, and placed into proper storage. As a result of this discovery, the excavation of the area was discontinued and the site inspected visually. Minute amounts of metal shavings, filings, and litter were observed on the ground. In addition, a valve cap was discovered at this location during this inspection. Fixed radiological contamination was detected on the valve cap. The valve cap was removed from the area, packaged, and placed into proper storage. The area was radiologically posted.

Data obtained during a preliminary soil sampling event from locations near the SWMU did not indicate the presence of any contamination by hazardous or radiological constituents. After discovery of the concrete rubble piles, the piles were radiologically scanned and determined to be clean prior to removal to SWMU 474. Other materials found were radiologically surveyed, removed, and placed in appropriate storage.

Table 5.41 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary of SWMU 493 (Figure 5.54). Figure 5.54 also shows the location of SWMU 474.

Area utilities

No recirculating water lines or sewers are associated with these piles; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.41. Summary of Surface and Subsurface Historical Data at SWMU 493

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	4.82E+03	1.44E+04	9.51E+03	22/22	1.75E+01	2.00E+01	3/22	1.30E+04	0/22	1.00E+05	22/22	4.64E+03
Arsenic	1.06E+00	1.18E+01	7.32E+00	12/22	9.40E-01	5.00E+00	5/22	1.20E+01	0/22	3.15E+02	12/22	5.23E-01
Barium	4.05E+01	4.04E+02	9.00E+01	22/22	2.19E+00	5.00E+00	1/22	2.00E+02	0/22	1.00E+05	1/22	2.29E+02
Beryllium	5.22E-01	9.91E-01	7.19E-01	9/22	4.30E-01	5.00E-01	4/22	6.70E-01	0/22	1.28E+03	2/22	9.48E-01
Calcium	1.15E+03	1.56E+05	2.41E+04	22/22	8.77E+01	2.00E+03	9/22	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.38E+00	6.61E+01	1.57E+01	22/22	2.19E+00	2.50E+00	4/22	1.60E+01	n/a	n/a	0/22	3.56E+02
Cobalt	2.61E+00	3.79E+01	5.72E+00	21/22	2.19E+00	2.50E+00	1/22	1.40E+01	0/22	1.00E+05	0/22	1.92E+03
Copper	4.41E+00	9.87E+01	1.29E+01	22/22	2.19E+00	2.50E+00	2/22	1.90E+01	0/22	1.00E+05	0/22	4.93E+02
Iron	5.78E+03	2.41E+04	1.27E+04	22/22	1.75E+01	2.00E+01	0/22	2.80E+04	0/22	1.00E+05	22/22	2.07E+03
Lead	3.61E+01	4.79E+01	4.20E+01	2/22	1.75E+01	2.00E+02	2/22	3.60E+01	0/22	1.25E+03	0/22	5.00E+01
Lithium	7.03E+00	1.42E+01	9.24E+00	10/20	5.00E+00	1.00E+01	n/a	n/a	0/20	1.00E+05	0/20	6.41E+02
Magnesium	7.65E+02	8.60E+03	1.77E+03	22/22	2.50E+00	1.50E+01	4/22	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.13E+01	3.55E+03	4.29E+02	22/22	2.19E+00	1.00E+01	1/22	1.50E+03	0/22	4.64E+04	21/22	4.52E+01
Mercury	2.60E-01	2.60E-01	2.60E-01	1/22	9.00E-02	2.00E-01	1/22	2.00E-01	0/22	8.25E+02	0/22	9.82E-01
Nickel	4.49E+00	2.13E+02	2.24E+01	22/22	4.39E+00	5.00E+00	2/22	2.10E+01	0/22	9.30E+04	0/22	2.42E+02
Potassium	4.25E+02	4.39E+02	4.32E+02	2/2	8.77E+01	9.49E+01	0/2	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.06E+00	1.31E+00	1.15E+00	5/22	1.00E+00	1.90E+01	5/22	8.00E-01	0/22	2.56E+04	0/22	9.49E+01
Sodium	1.79E+02	1.93E+02	1.86E+02	2/2	8.77E+01	9.49E+01	0/2	3.20E+02	n/a	n/a	n/a	n/a
Uranium	1.21E+00	6.44E+00	3.56E+00	4/24	4.80E-01	2.00E+03	2/24	4.90E+00	0/24	3.34E+03	0/24	2.02E+01
Vanadium	9.37E+00	4.05E+01	2.36E+01	22/22	2.19E+00	2.50E+00	1/22	3.80E+01	0/22	4.47E+03	22/22	3.32E+00
Zinc	2.02E+01	7.59E+01	3.62E+01	19/22	1.00E+01	2.00E+02	1/22	6.50E+01	0/22	1.00E+05	0/22	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.80E-01	2.60E-01	2.20E-01	2/27	6.00E-02	1.30E-01	n/a	n/a	0/27	4.25E+01	1/27	1.99E-01
PCB-1248	1.10E-01	1.10E-01	1.10E-01	1/27	8.00E-02	1.00E-01	n/a	n/a	0/27	4.25E+01	0/27	1.99E-01
PCB-1254	7.00E-02	2.60E-01	1.65E-01	2/27	6.00E-02	9.00E-02	n/a	n/a	0/27	1.82E+01	1/27	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.40E+00	4.52E+00	3.46E+00	2/2	7.20E-01	7.40E-01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.40E+00	1.51E+01	9.25E+00	2/2	9.10E-01	9.20E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-2.00E-01	9.60E-01	1.32E-01	23/26	1.94E-02	1.24E+00	3/26	4.90E-01	0/26	8.58E+00	9/26	8.58E-02
Plutonium-239/240	4.00E-02	4.31E-02	4.16E-02	2/15	1.00E-02	4.36E-02	n/a	n/a	0/15	1.15E+03	0/15	1.15E+01
Technetium-99	3.22E+00	3.86E+01	9.71E+00	7/15	3.05E+00	3.62E+00	7/15	2.50E+00	0/15	3.62E+04	0/15	3.62E+02
Thorium-228	1.74E-01	4.19E-01	3.43E-01	15/15	3.02E-02	7.00E-02	0/15	1.60E+00	0/15	2.80E+00	15/15	2.80E-02
Thorium-230	3.15E-01	5.55E-01	3.90E-01	14/15	1.40E-01	2.30E-01	0/15	1.50E+00	0/15	1.49E+03	0/15	1.49E+01
Thorium-232	2.11E-01	4.74E-01	3.52E-01	15/15	4.00E-02	1.10E-01	0/15	1.50E+00	0/15	1.35E+03	0/15	1.35E+01
Uranium	8.03E+00	8.03E+00	8.03E+00	1/13	2.33E-01	1.14E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.17E-01	2.37E+00	1.36E+00	3/15	6.93E-02	5.58E-01	0/15	2.50E+00	0/15	1.98E+03	0/15	1.98E+01
Uranium-235	2.62E-02	1.65E-01	6.01E-02	14/15	2.27E-02	3.35E-02	1/15	1.40E-01	0/15	3.95E+01	0/15	3.95E-01
Uranium-238	-1.04E+01	1.51E+01	2.34E+00	26/26	1.32E-01	5.10E+00	18/26	1.20E+00	0/26	1.71E+02	10/26	1.71E+00
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	7.80E-01	9.80E-01	8.80E-01	4/10	4.60E-01	5.00E-01	n/a	n/a	0/10	1.00E+05	0/10	2.13E+03

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.41. Summary of Surface and Subsurface Historical Data at SWMU 493 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Volatiles (mg/kg)												
Methylene chloride	3.20E-02	3.20E-02	3.20E-02	1/13	1.00E-02	1.00E-02	n/a	n/a	0/13	2.16E+03	0/13	1.34E+01
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.62E+03	6.62E+03	6.62E+03	1/1	1.87E+01	1.87E+01	0/1	1.20E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	2.55E+01	2.55E+01	2.55E+01	1/1	4.69E+00	4.69E+00	1/1	7.90E+00	0/1	3.15E+02	1/1	5.23E-01
Barium	1.45E+02	1.45E+02	1.45E+02	1/1	2.34E+00	2.34E+00	0/1	1.70E+02	0/1	1.00E+05	0/1	2.29E+02
Beryllium	1.41E+00	1.41E+00	1.41E+00	1/1	4.60E-01	4.60E-01	1/1	6.90E-01	0/1	1.28E+03	1/1	9.48E-01
Cadmium	3.60E+00	3.60E+00	3.60E+00	1/1	1.87E+00	1.87E+00	1/1	2.10E-01	0/1	7.05E+01	0/1	2.13E+01
Calcium	1.32E+03	1.32E+03	1.32E+03	1/1	9.37E+01	9.37E+01	0/1	6.10E+03	n/a	n/a	n/a	n/a
Chromium	2.00E+01	2.00E+01	2.00E+01	1/1	2.34E+00	2.34E+00	1/1	4.30E+01	n/a	n/a	0/1	3.56E+02
Cobalt	2.89E+01	2.89E+01	2.89E+01	1/1	2.34E+00	2.34E+00	1/1	1.30E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	1.78E+01	1.78E+01	1.78E+01	1/1	2.34E+00	2.34E+00	0/1	2.50E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	3.31E+04	3.31E+04	3.31E+04	1/1	1.87E+01	1.87E+01	1/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	3.01E+01	3.01E+01	3.01E+01	1/1	1.87E+01	1.87E+01	1/1	2.30E+01	0/1	1.25E+03	0/1	5.00E+01
Magnesium	7.16E+02	7.16E+02	7.16E+02	1/1	4.69E+00	4.69E+00	0/1	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.61E+02	8.61E+02	8.61E+02	1/1	2.34E+00	2.34E+00	1/1	8.20E+02	0/1	4.64E+04	1/1	4.52E+01
Nickel	2.25E+01	2.25E+01	2.25E+01	1/1	4.69E+00	4.69E+00	1/1	2.20E+01	0/1	9.30E+04	0/1	2.42E+02
Potassium	4.32E+02	4.32E+02	4.32E+02	1/1	9.37E+01	9.37E+01	0/1	9.50E+02	n/a	n/a	n/a	n/a
Sodium	2.22E+02	2.22E+02	2.22E+02	1/1	9.37E+01	9.37E+01	0/1	3.40E+02	n/a	n/a	n/a	n/a
Uranium	6.44E+00	1.51E+01	1.08E+01	2/2	4.90E-01	9.30E-01	2/2	4.60E+00	0/2	3.34E+03	0/2	2.02E+01
Vanadium	5.95E+01	5.95E+01	5.95E+01	1/1	2.34E+00	2.34E+00	1/1	3.70E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	2.98E+01	2.98E+01	2.98E+01	1/1	1.87E+01	1.87E+01	0/1	6.00E+01	0/1	1.00E+05	0/1	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	6.46E+00	6.46E+00	6.46E+00	1/1	7.40E-01	7.40E-01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.56E+01	1.56E+01	1.56E+01	1/1	9.20E-01	9.20E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	9.49E-02	9.49E-02	9.49E-02	1/1	7.00E-02	7.00E-02	0/1	2.80E-01	0/1	8.58E+00	1/1	8.58E-02
Neptunium-237	5.99E-02	5.99E-02	5.99E-02	1/1	3.00E-02	3.00E-02	n/a	n/a	0/1	2.71E+01	0/1	2.71E-01
Plutonium-239/240	2.43E-02	2.43E-02	2.43E-02	1/1	1.00E-02	1.00E-02	n/a	n/a	0/1	1.15E+03	0/1	1.15E+01
Technetium-99	5.50E+00	5.50E+00	5.50E+00	1/1	3.08E+00	3.08E+00	1/1	2.80E+00	0/1	3.62E+04	0/1	3.62E+02
Thorium-228	2.04E-01	2.04E-01	2.04E-01	1/1	6.00E-02	6.00E-02	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	3.66E-01	3.66E-01	3.66E-01	1/1	2.20E-01	2.20E-01	0/1	1.40E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	2.46E-01	2.46E-01	2.46E-01	1/1	4.00E-02	4.00E-02	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium-234	3.01E+00	3.01E+00	3.01E+00	1/1	1.40E-01	1.40E-01	1/1	2.40E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	1.85E-01	1.85E-01	1.85E-01	1/1	3.00E-02	3.00E-02	1/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	5.04E+00	5.04E+00	5.04E+00	1/1	1.60E-01	1.60E-01	1/1	1.20E+00	0/1	1.71E+02	1/1	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

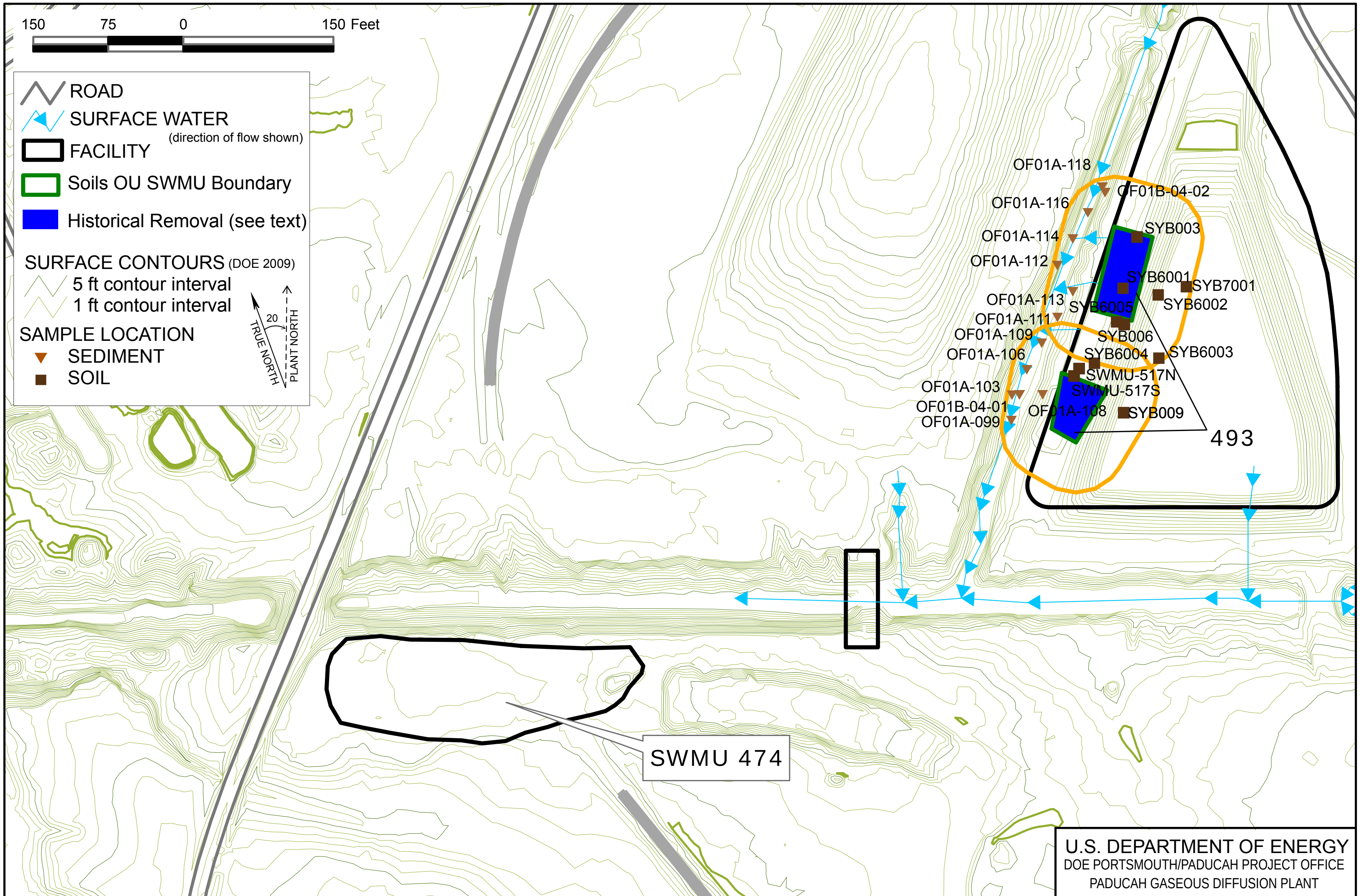


Figure 5.54. Soils Operable Unit: SWMU 493

Figure No. SoilsOU_SWMU493Historical.mxd
DATE 03-11-10

SWMU 517 (Rubble and Debris Erosion Control Fill Area)

Area description

The rubble and debris erosion control fill area (SWMU 517) is a rubble pile located west of the plant site. SWMU 517 is approximately 653 ft^2.

Process history

The fill area is believed to have used rubble and debris for erosion control.

Previous investigation results

Prior to the beginning of construction of the Scrap Yard Infrastructure Storm Water Collection Basin, a magnetometer survey was performed via a metal detector, which resulted in the discovery of several anomalies at the construction site. A drainage pipe excavation was to be performed at the location of one of the anomalies, now identified as SWMU 517. During the excavation of this area, concrete rubble was found. The concrete rubble was surveyed by HP and was determined to be uncontaminated. In accordance with a request by DOE that was approved by Kentucky, the concrete was to be excavated, relocated to SWMU 474, and placed on plastic. After removal of the concrete, excavation of the area continued. During removal of the first bucket of the second truckload, additional concrete debris was discovered. The soil and debris were surveyed by HP and were found to be contaminated. Small pieces of radiologically contaminated concrete and soil were removed from the SWMU by HP personnel and placed in appropriate storage. The remaining soil and debris in the bucket were placed back in the SWMU. The excavation was discontinued. The area was graded and backfilled with gravel before being posted as radiological and covered with plastic.

Data obtained during a preliminary soil sampling event from locations near the SWMU did not indicate the presence of any contamination of hazardous or radiological constituents. Additional surface sampling of the excavated soils occurred on February 9, 2002. The sampling analyses from this event indicated four COCs [nickel, zinc, neptunium-237, and uranium-238] greater than twice background that may pose some risk.

Table 5.42 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.55).

Area utilities

No recirculating water lines or sewers are associated with this pile; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.42. Summary of Surface and Subsurface Historical Data at SWMU 517

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	5.19E+03	1.20E+04	9.27E+03	6/6	1.90E+01	2.00E+01	0/6	1.30E+04	0/6	1.00E+05	6/6	4.64E+03
Arsenic	6.47E+00	2.22E+01	1.18E+01	3/6	4.75E+00	5.00E+00	1/6	1.20E+01	0/6	3.15E+02	3/6	5.23E-01
Barium	5.90E+01	1.13E+02	8.68E+01	6/6	2.37E+00	5.00E+00	0/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	5.04E-01	7.39E-01	5.94E-01	3/6	4.70E-01	5.00E-01	1/6	6.70E-01	0/6	1.28E+03	0/6	9.48E-01
Calcium	1.70E+03	5.61E+04	1.50E+04	6/6	2.00E+02	9.49E+02	3/6	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.32E+01	4.91E+01	2.11E+01	6/6	2.37E+00	2.50E+00	2/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	3.52E+00	5.33E+00	4.25E+00	6/6	2.37E+00	2.50E+00	0/6	1.40E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	8.17E+00	3.37E+01	1.40E+01	6/6	2.37E+00	2.50E+00	1/6	1.90E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	6.00E+03	2.08E+04	1.33E+04	6/6	1.90E+01	2.00E+01	0/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	3.22E+01	3.22E+01	3.22E+01	1/6	1.90E+01	2.00E+01	1/6	3.60E+01	0/6	1.25E+03	0/6	5.00E+01
Lithium	6.55E+00	1.19E+01	9.50E+00	4/5	5.00E+00	1.00E+01	n/a	n/a	0/5	1.00E+05	0/5	6.41E+02
Magnesium	8.76E+02	3.10E+03	1.63E+03	6/6	2.50E+00	1.50E+01	1/6	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.16E+02	5.13E+02	3.23E+02	6/6	2.37E+00	1.00E+01	0/6	1.50E+03	0/6	4.64E+04	6/6	4.52E+01
Molybdenum	2.12E+01	2.12E+01	2.12E+01	1/1	4.75E+00	4.75E+00	n/a	n/a	0/1	2.50E+04	0/1	8.30E+01
Nickel	1.43E+01	1.72E+02	4.82E+01	5/6	4.75E+00	5.00E+00	2/6	2.10E+01	0/6	9.30E+04	0/6	2.42E+02
Potassium	3.72E+02	3.72E+02	3.72E+02	1/1	9.49E+01	9.49E+01	0/1	1.30E+03	n/a	n/a	n/a	n/a
Sodium	2.65E+02	2.65E+02	2.65E+02	1/1	9.49E+01	9.49E+01	0/1	3.20E+02	n/a	n/a	n/a	n/a
Uranium	1.38E+00	1.38E+00	1.38E+00	1/7	4.90E-01	2.00E+02	0/7	4.90E+00	0/7	3.34E+03	0/7	2.02E+01
Vanadium	1.17E+01	2.72E+01	2.39E+01	6/6	2.37E+00	2.50E+00	0/6	3.80E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	3.22E+01	1.25E+03	2.72E+02	6/6	1.00E+01	2.00E+01	4/6	6.50E+01	0/6	1.00E+05	0/6	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.30E-01	5.00E-01	3.65E-01	2/15	6.00E-02	1.30E-01	n/a	n/a	0/15	4.25E+01	2/15	1.99E-01
PCB-1254	5.00E-01	5.00E-01	5.00E-01	1/15	6.00E-02	9.00E-02	n/a	n/a	0/15	1.82E+01	1/15	1.99E-01
PCB-1260	2.30E-01	2.30E-01	2.30E-01	1/15	9.00E-02	1.00E-01	n/a	n/a	0/15	4.25E+01	1/15	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	7.10E+00	7.10E+00	7.10E+00	1/1	3.04E+00	3.04E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.05E+00	6.05E+00	6.05E+00	1/1	2.15E+00	2.15E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-1.20E-01	5.00E-01	1.32E-01	15/15	2.26E-02	8.10E-01	2/15	4.90E-01	0/15	8.58E+00	8/15	8.58E-02
Neptunium-237	1.07E+00	1.07E+00	1.07E+00	1/6	3.00E-02	4.79E-02	1/6	1.00E-01	0/6	2.71E+01	1/6	2.71E-01
Plutonium-239/240	2.85E-02	1.78E-01	1.03E-01	2/6	1.00E-02	4.37E-02	n/a	n/a	0/6	1.15E+03	0/6	1.15E+01
Technetium-99	4.33E+00	8.32E+01	2.43E+01	4/6	3.05E+00	3.62E+00	4/6	2.50E+00	0/6	3.62E+04	0/6	3.62E+02
Thorium-228	2.02E-01	4.19E-01	3.17E-01	6/6	2.92E-02	8.00E-02	0/6	1.60E+00	0/6	2.80E+00	6/6	2.80E-02
Thorium-230	3.85E-01	6.26E-01	4.56E-01	6/6	1.38E-01	2.50E-01	0/6	1.50E+00	0/6	1.49E+03	0/6	1.49E+01
Thorium-232	3.14E-01	4.77E-01	3.72E-01	5/6	4.14E-02	1.60E-01	0/6	1.50E+00	0/6	1.35E+03	0/6	1.35E+01
Uranium	6.52E+00	6.52E+00	6.52E+00	1/5	6.23E-01	1.24E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.87E-01	2.48E+00	1.38E+00	2/6	1.40E-01	4.68E-01	1/6	2.50E+00	0/6	1.98E+03	0/6	1.98E+01
Uranium-235	3.07E-02	1.60E-01	6.48E-02	5/6	2.35E-02	3.69E-02	1/6	1.40E-01	0/6	3.95E+01	0/6	3.95E-01
Uranium-238	-9.22E+00	5.63E+00	1.59E+00	15/15	1.60E-01	7.81E+00	9/15	1.20E+00	0/15	1.71E+02	6/15	1.71E+00
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	1.20E+00	2.00E+00	1.60E+00	2/4	4.70E-01	4.90E-01	n/a	n/a	0/4	1.00E+05	0/4	2.13E+03

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.42. Summary of Surface and Subsurface Historical Data at SWMU 517 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Fluoranthene	6.70E-01	6.70E-01	6.70E-01	1/5	4.70E-01	4.90E-01	n/a	n/a	0/5	6.50E+04	0/5	2.21E+02
Pyrene	5.40E-01	5.40E-01	5.40E-01	1/6	4.70E-01	4.90E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	1.10E-02	1.10E-02	1.10E-02	1/5	1.00E-02	1.00E-02	n/a	n/a	0/5	2.16E+03	0/5	1.34E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

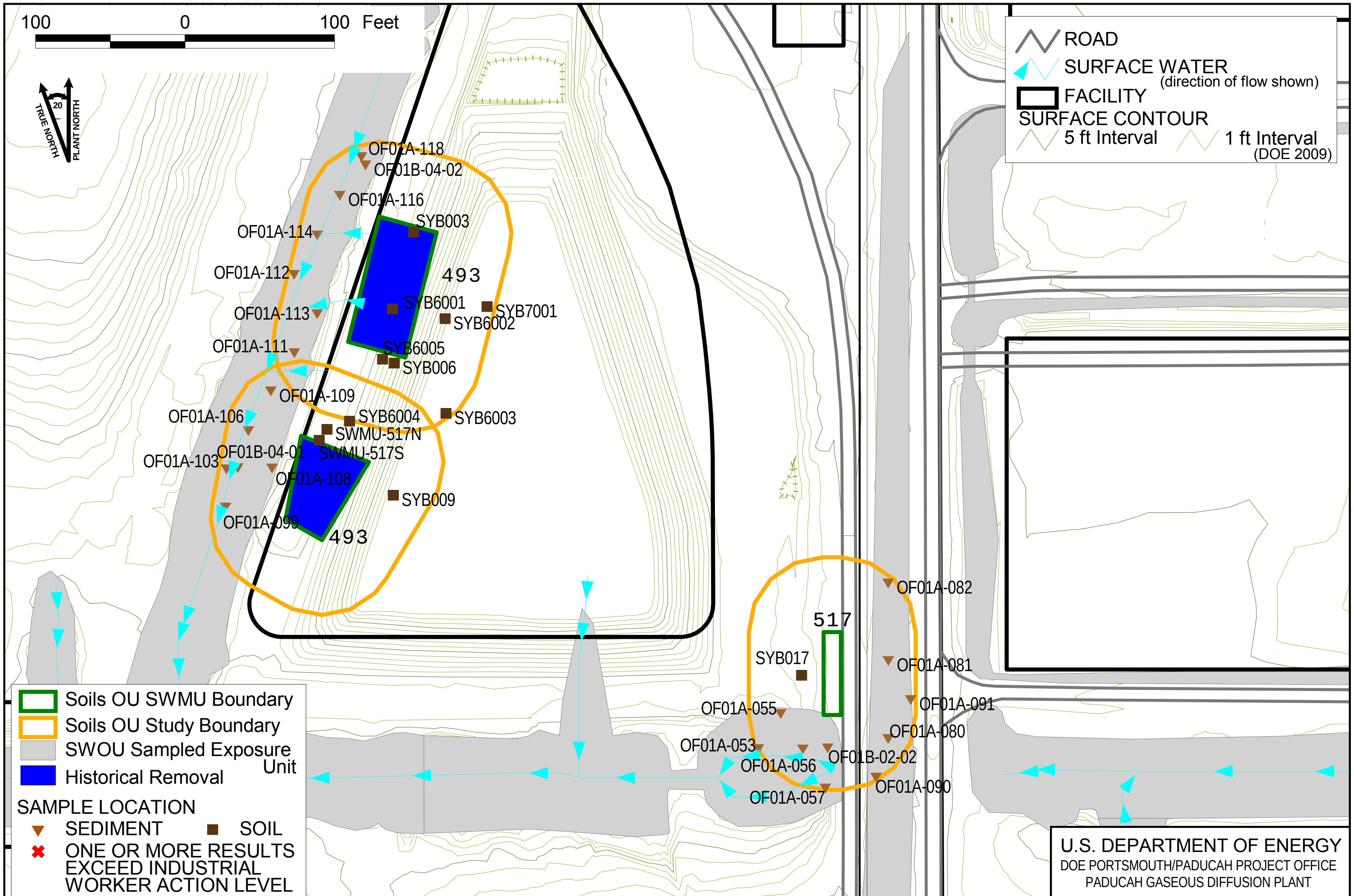


Figure 5.55. Soils Operable Unit: SWMUs 493 and 517

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

AOC 541 (Contaminated Area by Outfall 011)

Area description

The Contaminated Soil Area South of Outfall 011 (AOC 541) is located in an area of heavy undergrowth, approximately 75 ft from the south bank of Outfall 011. AOC 541 is located east of PGDP, is outside of the secure area, and is approximately 100,800 ft^2 (480 ft x 210 ft).

Process history

AOC 541 was discovered during routine radiological surveys in support of sampling activities. The area contained soil piles that likely were generated as a result of past maintenance activities.

Previous investigation results

This area was sampled in September 2002. Analytical results indicate the presence of sampled metals (chromium); PCBs; semivolatiles; and radionuclides (uranium-238). The area also was sampled during the winter of 2008, with findings presented in *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1. Findings were summarized in the SAR as follows:

During 2002, the area was surveyed upon initial discovery. Fixed beta/gamma measurements ranging from approximately 26,000 dpm/100 cm^2 to over 300,000 dpm/100 cm^2 were recorded. Highest readings were obtained in a significantly small, localized area (approximately 1 acre) with several small mounds of soil. Data from locations sampled in the AOC were reviewed. Metals, PCBs, semivolatiles, volatiles, and radionuclides were analyzed in soils. Analytical results indicate the presence of metals, PCBs, semivolatiles, and radionuclides. No metals results exceeded the RCRA Metals levels (401 *KAR* 31:030 Section 4 incorporating 40 *CFR* § 261.24). All samples had detectable PCB. Some sampling points exceeded 50 ppm. Significant levels of uranium (greater than 1,000 pCi/g) were measured at five sampling points. All other sampling points showed uranium greater than background. There were some points with detectable technetium-99, plutonium-239/240, and radium-226. There were no RCRA issues identified with the semivolatile results.

In December 2008, 242 soil samples were collected for field screening, with 24 samples being sent to a fixed-base laboratory for analysis. As a result of the 2008 sampling event, additional areas within the AOC were determined to have similar levels of PCBs and uranium, as did the original five sample results collected in 2002. The most elevated Total PCB concentration was 38.2 mg/kg from the subsurface sample at location LBCSOOB162. The surface soil sample with the most elevated concentration of Total PCBs (31.1 mg/kg) was from location LBCSOOB55.The most elevated concentration of uranium in a surface soil sample (3,600 mg/kg as a metal and 1,020 pCi/g as uranium-238) was from location LBCSOOB169 and the most elevated concentration of uranium in a subsurface soil sample (3,430 mg/kg as a metal and 1,660 pCi/g as uranium-238) was from location LBCSOOB162.

Table 5.43 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.56).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.43. Summary of Surface and Subsurface Historical Data at AOC 541

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	4.91E+02	1.92E+04	9.42E+03	62/62	1.70E+01	1.99E+02	23/62	1.30E+04	0/62	1.00E+05	48/62	4.64E+03
Arsenic	5.21E-01	1.25E+01	5.14E+00	42/59	8.48E-01	5.00E+00	4/59	1.20E+01	0/59	3.15E+02	40/59	5.23E-01
Barium	5.57E+00	5.48E+02	2.78E+02	287/304	1.00E+00	2.50E+00	208/304	2.00E+02	0/304	1.00E+05	189/304	2.29E+02
Beryllium	1.80E-01	7.40E+00	1.06E+00	26/62	4.24E-01	5.00E-01	10/62	6.70E-01	0/62	1.28E+03	6/62	9.48E-01
Bismuth	1.32E+01	1.32E+01	1.32E+01	2/13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cadmium	5.02E-01	2.75E+00	1.06E+00	18/62	4.24E-01	2.49E+00	18/62	2.10E-01	0/62	7.05E+01	0/62	2.13E+01
Calcium	7.90E+01	2.38E+04	2.45E+03	60/62	5.00E+01	2.00E+02	3/62	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.40E+00	3.35E+03	1.27E+02	192/304	2.00E+00	2.50E+00	170/304	1.60E+01	n/a	n/a	14/304	3.56E+02
Cobalt	1.10E+00	1.57E+01	6.32E+00	50/62	8.48E-01	4.97E+00	1/62	1.40E+01	0/62	1.00E+05	0/62	1.92E+03
Copper	1.00E-01	1.61E+02	2.24E+01	51/62	2.00E+00	1.25E+01	15/62	1.90E+01	0/62	1.00E+05	0/62	4.93E+02
Iron	1.44E+03	2.96E+04	1.16E+04	62/62	5.00E+00	2.00E+01	2/62	2.80E+04	0/62	1.00E+05	58/62	2.07E+03
Lead	5.91E+00	1.11E+02	1.71E+01	264/304	8.48E-01	2.00E+01	29/304	3.60E+01	0/304	1.25E+03	9/304	5.00E+01
Lithium	9.80E-01	1.30E+01	5.39E+00	14/16	5.00E+00	5.00E+00	n/a	n/a	0/16	1.00E+05	0/16	6.41E+02
Magnesium	4.99E+01	4.42E+03	1.38E+03	60/62	2.50E+00	1.50E+01	9/62	7.70E+03	n/a	n/a	n/a	n/a
Manganese	3.33E+01	8.21E+02	2.91E+02	62/62	1.00E+00	2.50E+00	1/62	1.50E+03	0/62	4.64E+04	60/62	4.52E+01
Mercury	1.60E-02	2.30E-01	4.36E-02	22/62	1.20E-02	2.00E-01	2/62	2.00E-01	0/62	8.25E+02	0/62	9.82E-01
Molybdenum	4.00E-01	3.98E+00	2.19E+00	4/35	4.24E+00	5.00E+00	n/a	n/a	0/35	2.50E+04	0/35	8.30E+01
Nickel	1.20E+00	5.72E+01	1.21E+01	50/62	4.24E+00	5.00E+00	6/62	2.10E+01	0/62	9.30E+04	0/62	2.42E+02
Niobium	8.00E-01	8.00E-01	8.00E-01	2/11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Phosphorous	1.67E+02	3.29E+02	2.24E+02	6/6	n/a	n/a	n/a	n/a	6/6	8.58E+01	6/6	1.82E-01
Potassium	9.04E+01	1.78E+03	6.95E+02	25/33	1.00E+02	2.00E+02	7/33	1.30E+03	n/a	n/a	n/a	n/a
Ruthenium	3.10E+01	2.39E+02	1.70E+02	3/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Selenium	1.70E-01	2.00E+00	1.26E+00	10/49	1.60E-01	4.97E+00	9/49	8.00E-01	0/49	2.56E+04	0/49	9.49E+01
Silicon	4.38E+01	1.03E+03	3.27E+02	11/11			n/a	n/a	n/a	n/a	n/a	n/a
Silver	2.42E+01	2.42E+01	2.42E+01	2/62	1.40E+00	4.00E+00	2/62	2.30E+00	0/62	2.07E+04	0/62	4.11E+01
Sodium	6.46E+01	2.63E+02	1.47E+02	11/57	1.70E+02	2.50E+02	0/57	3.20E+02	n/a	n/a	n/a	n/a
Strontium	2.60E+00	3.00E+01	1.16E+01	9/11	n/a	n/a	n/a	n/a	0/11	1.00E+05	0/11	5.45E+03
Tantalum	2.94E+00	1.52E+01	9.07E+00	2/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thallium	2.00E+01	3.66E+01	3.11E+01	3/62	2.80E-01	2.00E+01	3/62	2.10E-01	n/a	n/a	n/a	n/a
Thorium	8.20E+00	2.12E+01	1.24E+01	5/9			n/a	n/a	n/a	n/a	n/a	n/a
Tin	2.00E+01	1.63E+02	1.00E+02	7/18	1.00E+02	1.00E+02	n/a	n/a	0/18	1.00E+05	0/18	2.79E+03
Titanium	6.25E+01	3.68E+02	1.60E+02	11/11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Tungsten	4.32E+00	1.93E+01	1.10E+01	5/11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	3.10E-01	2.02E+04	7.53E+02	298/340	8.89E-01	2.14E+02	276/340	4.90E+00	14/340	3.34E+03	255/340	2.02E+01
Vanadium	2.84E+00	4.97E+01	2.34E+01	53/61	2.00E+00	2.50E+00	4/61	3.80E+01	0/61	4.47E+03	51/61	3.32E+00
Zinc	2.20E+00	1.09E+03	1.11E+02	56/62	1.00E+01	2.00E+01	21/62	6.50E+01	0/62	1.00E+05	0/62	2.73E+03
Zirconium	3.44E+00	1.80E+01	8.12E+00	9/11	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Pesticides/PCBs (mg/kg)												
PCB, Total	1.00E-01	9.40E+01	1.62E+01	113/410	9.00E-02	6.50E-01	n/a	n/a	21/410	4.25E+01	110/410	1.99E-01
PCB-1242	6.00E-01	1.00E+00	8.00E-01	4/55	6.00E-02	5.60E-01	n/a	n/a	0/55	4.25E+01	4/55	1.99E-01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.43. Summary of Surface and Subsurface Historical Data at AOC 541 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
PCB-1248	1.60E-01	1.40E+01	4.11E+00	33/61	8.00E-02	6.00E-01	n/a	n/a	0/61	4.25E+01	31/61	1.99E-01
PCB-1254	1.60E-02	4.60E+01	4.31E+00	60/76	6.00E-02	1.10E+00	n/a	n/a	2/76	1.82E+01	56/76	1.99E-01
PCB-1260	1.20E-01	4.80E+01	4.61E+00	59/72	9.00E-02	1.10E+00	n/a	n/a	1/72	4.25E+01	57/72	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	5.74E-01	2.08E+03	1.30E+02	94/100	7.36E-01	6.74E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	0.00E+00	7.18E+03	4.41E+02	64/100	7.73E-01	2.52E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-2.00E-03	2.33E+00	2.10E-01	194/313	7.78E-03	5.30E-01	34/313	4.90E-01	0/313	8.58E+00	162/313	8.58E-02
Cobalt-60	-5.40E-03	-5.40E-03	-5.40E-03	1/34	9.01E-03	1.06E-01	n/a	n/a	0/34	1.77E+00	0/34	1.77E-02
Neptunium-237	-3.10E-02	2.70E-02	4.17E-03	7/86	2.00E-02	3.61E-01	0/86	1.00E-01	0/86	2.71E+01	0/86	2.71E-01
Plutonium-239	-4.00E-03	2.79E-02	8.56E-03	9/39	4.93E-03	1.33E-02	2/39	2.50E-02	0/39	1.15E+03	0/39	1.15E+01
Plutonium-239/240	1.09E-02	1.56E-01	5.75E-02	9/47	9.97E-03	7.77E-02	n/a	n/a	0/47	1.15E+03	0/47	1.15E+01
Potassium-40	3.20E-01	1.17E+01	5.87E+00	31/31	7.00E-02	1.01E+00	0/31	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-234m	5.12E+01	6.83E+03	1.41E+03	12/12	2.92E+00	1.53E+01	n/a	n/a	n/a	n/a	n/a	n/a
Radium-226	6.14E-01	9.50E-01	7.82E-01	2/12	1.75E-01	7.63E-01	0/12	1.50E+00	0/12	2.56E+00	2/12	2.56E-02
Technetium-99	1.39E-01	3.65E+01	4.06E+00	59/88	1.40E-01	3.87E+00	18/88	2.50E+00	0/88	3.62E+04	0/88	3.62E+02
Thorium-228	3.03E-01	7.56E-01	4.67E-01	41/41	4.12E-02	2.08E-01	0/41	1.60E+00	0/41	2.80E+00	41/41	2.80E-02
Thorium-230 (mg/kg)	6.00E-05	6.00E-05	6.00E-05	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	2.72E-02	2.40E+00	3.81E-01	76/86	2.00E-02	2.43E-01	1/86	1.50E+00	0/86	1.49E+03	0/86	1.49E+01
Thorium-232	2.69E-02	7.28E-01	4.23E-01	45/45	3.73E-02	1.31E-01	0/45	1.50E+00	0/45	1.35E+03	0/45	1.35E+01
Thorium-234	3.63E+01	4.36E+03	9.46E+02	12/12	7.24E-01	7.37E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	2.10E+00	5.32E+03	3.79E+02	49/55	2.33E-01	1.53E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium (mg/kg)	6.30E+01	1.03E+03	2.40E+02	298/340	1.00E+00	1.00E+00	12/340	4.90E+00	n/a	n/a	n/a	n/a
Uranium-234	6.20E-02	7.13E+02	4.39E+01	51/52	1.02E-01	2.05E+00	33/52	2.50E+00	0/52	1.98E+03	14/52	1.98E+01
Uranium-235	3.00E-03	6.51E+01	5.41E+00	49/51	1.21E-02	2.33E-01	36/51	1.40E-01	2/51	3.95E+01	29/51	3.95E-01
Uranium-238	7.00E-02	5.57E+03	2.95E+02	257/294	1.07E-01	1.31E+01	248/294	1.20E+00	86/294	1.71E+02	248/294	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	2.50E-01	2.00E+00	9.13E-01	4/45	4.60E-01	5.20E-01	n/a	n/a	0/45	6.67E+04	0/45	3.16E+02
Anthracene	4.60E-01	2.60E+00	1.12E+00	6/45	4.60E-01	5.20E-01	n/a	n/a	0/45	1.00E+05	0/45	3.79E+03
Benz(a)anthracene	2.40E-01	6.40E+00	2.06E+00	12/45	4.60E-01	5.20E-01	n/a	n/a	0/45	2.08E+02	12/45	2.12E-01
Benzo(a)pyrene	1.70E-01	5.10E+00	1.99E+00	11/45	4.60E-01	5.20E-01	n/a	n/a	0/45	2.08E+01	11/45	2.12E-02
Benzo(b)fluoranthene	1.90E-01	1.10E+01	3.14E+00	12/45	4.60E-01	9.70E-01	n/a	n/a	0/45	2.08E+02	11/45	2.12E-01
Benzo(ghi)perylene	4.60E-01	1.80E+00	1.06E+00	9/45	4.60E-01	5.20E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.30E-01	3.90E+00	2.01E+00	10/40	4.60E-01	5.20E-01	n/a	n/a	0/40	2.08E+03	5/40	2.12E+00
Carbazole	3.00E-01	1.00E+00	6.47E-01	3/20	4.60E-01	5.00E-01	n/a	n/a	0/20	1.28E+04	0/20	2.15E+01
Chrysene	2.50E-01	6.70E+00	2.41E+00	12/45	4.60E-01	5.20E-01	n/a	n/a	0/45	2.08E+04	0/45	2.12E+01
Dibenz(a,h)anthracene	5.20E-01	5.20E-01	5.20E-01	1/45	4.60E-01	5.20E-01	n/a	n/a	0/45	2.08E+01	1/45	2.12E-02
Dibenzofuran	1.50E-01	6.00E-01	3.75E-01	2/17	4.60E-01	5.20E-01	n/a	n/a	0/17	9.02E+03	0/17	1.86E+01
Di-n-butyl phthalate	6.40E-01	1.87E+01	4.82E+00	9/16	4.60E-01	5.20E-01	n/a	n/a	0/16	1.00E+05	0/16	2.13E+03
Fluoranthene	4.60E-01	2.40E+01	4.57E+00	15/40	4.60E-01	1.90E+00	n/a	n/a	0/40	6.50E+04	0/40	2.21E+02
Fluorene	2.40E-01	1.50E+00	8.50E-01	3/45	4.60E-01	5.20E-01	n/a	n/a	0/45	7.09E+04	0/45	3.39E+02
Indeno(1,2,3-cd)pyrene	5.30E-01	2.30E+00	1.29E+00	9/45	4.60E-01	5.20E-01	n/a	n/a	0/45	2.08E+02	9/45	2.12E-01
Naphthalene	2.10E-01	1.80E+00	9.10E-01	3/45	4.60E-01	5.20E-01	n/a	n/a	0/45	7.66E+02	0/45	2.36E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.43. Summary of Surface and Subsurface Historical Data at AOC 541 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Phenanthrene	4.60E-01	1.90E+01	4.02E+00	13/45	4.60E-01	9.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Polycyclic aromatic hydrocarbons (PAH)	2.00E-05	1.45E+00	4.28E-01	26/242	2.00E-01	2.00E-01	n/a	n/a	0/242	2.08E+01	24/242	2.12E-02
Pyrene	4.80E-01	1.40E+01	3.98E+00	13/45	4.60E-01	9.70E-01	n/a	n/a	0/45	4.87E+04	0/45	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	9.00E-03	1.30E-02	1.13E-02	4/14	7.00E-03	1.00E-02	n/a	n/a	0/14	2.16E+03	0/14	1.34E+01
Wetchem (mg/kg)												
Iodide	2.20E+01	2.20E+01	2.20E+01	1/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Organic Carbon (TOC)	2.40E+02	2.50E+03	1.32E+03	4/6	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Phosphate as Phosphorus	1.26E+02	5.49E+02	3.17E+02	5/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	8.59E+03	1.58E+04	1.28E+04	26/26	1.71E+01	1.97E+02	17/26	1.20E+04	0/26	1.00E+05	26/26	4.64E+03
Arsenic	1.87E+00	2.33E+01	6.56E+00	22/26	8.53E-01	5.00E+00	4/26	7.90E+00	0/26	3.15E+02	22/26	5.23E-01
Barium	4.44E+01	5.15E+02	2.84E+02	186/201	2.13E+00	2.50E+00	144/201	1.70E+02	0/201	1.00E+05	128/201	2.29E+02
Beryllium	4.60E-01	9.57E-01	6.57E-01	11/26	4.27E-01	5.00E-01	5/26	6.90E-01	0/26	1.28E+03	1/26	9.48E-01
Cadmium	4.96E-01	9.90E-01	7.18E-01	14/26	4.27E-01	2.46E+00	14/26	2.10E-01	0/26	7.05E+01	0/26	2.13E+01
Calcium	6.82E+02	5.92E+04	4.76E+03	26/26	8.53E+01	8.77E+02	2/26	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.60E+01	2.96E+03	1.42E+02	140/201	2.13E+00	2.50E+00	139/201	4.30E+01	n/a	n/a	8/201	3.56E+02
Cobalt	3.26E+00	1.08E+01	6.00E+00	26/26	8.53E-01	4.92E+00	0/26	1.30E+01	0/26	1.00E+05	0/26	1.92E+03
Copper	8.34E+00	3.46E+01	1.62E+01	26/26	2.13E+00	1.23E+01	7/26	2.50E+01	0/26	1.00E+05	0/26	4.93E+02
Iron	9.91E+03	2.87E+04	1.45E+04	26/26	1.71E+01	2.00E+01	1/26	2.80E+04	0/26	1.00E+05	26/26	2.07E+03
Lead	7.05E+00	7.34E+01	1.71E+01	187/201	8.53E-01	2.00E+01	28/201	2.30E+01	0/201	1.25E+03	5/201	5.00E+01
Magnesium	9.98E+02	2.28E+03	1.55E+03	26/26	2.50E+00	4.99E+00	3/26	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.04E+02	6.38E+02	2.94E+02	26/26	2.13E+00	2.50E+00	0/26	8.20E+02	0/26	4.64E+04	26/26	4.52E+01
Mercury	1.70E-02	6.70E-01	5.43E-02	21/26	1.10E-02	2.00E-01	1/26	1.30E-01	0/26	8.25E+02	0/26	9.82E-01
Molybdenum	5.62E+00	5.62E+00	5.62E+00	1/22	4.27E+00	4.99E+00	n/a	n/a	0/22	2.50E+04	0/22	8.30E+01
Nickel	7.40E+00	1.53E+01	1.00E+01	26/26	4.27E+00	5.00E+00	0/26	2.20E+01	0/26	9.30E+04	0/26	2.42E+02
Potassium	6.52E+02	9.55E+02	7.47E+02	4/4	2.00E+02	2.00E+02	1/4	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.08E+00	1.10E+00	1.09E+00	2/26	8.53E-01	4.92E+00	2/26	7.00E-01	0/26	2.56E+04	0/26	9.49E+01
Uranium	1.17E+01	8.52E+03	7.77E+02	190/201	9.51E-01	2.43E+02	190/201	4.60E+00	10/201	3.34E+03	178/201	2.02E+01
Vanadium	1.63E+01	5.17E+01	2.79E+01	26/26	2.13E+00	2.50E+00	4/26	3.70E+01	0/26	4.47E+03	26/26	3.32E+00
Zinc	2.36E+01	1.82E+02	6.83E+01	26/26	1.00E+01	2.00E+01	10/26	6.00E+01	0/26	1.00E+05	0/26	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	5.10E-01	5.00E+01	2.97E+01	48/201	1.00E-01	1.29E+00	n/a	n/a	25/201	4.25E+01	48/201	1.99E-01
PCB-1248	1.50E-01	2.05E+01	2.96E+00	19/26	1.00E-01	1.00E+00	n/a	n/a	0/26	4.25E+01	18/26	1.99E-01
PCB-1254	1.60E-01	1.12E+01	2.73E+00	23/26	9.00E-02	9.00E-01	n/a	n/a	0/26	1.82E+01	22/26	1.99E-01
PCB-1260	2.00E-01	1.26E+01	2.37E+00	23/26	1.00E-01	1.00E+00	n/a	n/a	0/26	4.25E+01	23/26	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	6.21E+01	4.90E+02	2.20E+02	4/4	9.95E-01	9.95E-01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.03E+02	8.67E+02	4.20E+02	4/4	7.73E-01	7.73E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	0.00E+00	7.20E-01	1.76E-01	111/202	1.38E-03	1.82E-01	15/202	2.80E-01	0/202	8.58E+00	92/202	8.58E-02
Plutonium-239/240	1.57E-02	1.84E-02	1.74E-02	3/26	1.22E-02	5.53E-02	n/a	n/a	0/26	1.15E+03	0/26	1.15E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.43. Summary of Surface and Subsurface Historical Data at AOC 541 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Potassium-40	8.81E+00	1.02E+01	9.53E+00	4/4	1.82E-01	3.59E-01	0/4	1.60E+01	n/a	n/a	n/a	n/a
Protactinium-234m	7.47E+01	7.19E+02	2.82E+02	4/4	2.75E+00	5.66E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	5.98E-01	4.80E+00	1.84E+00	20/26	5.36E-01	3.13E+00	5/26	2.80E+00	0/26	3.62E+04	0/26	3.62E+02
Thorium-228	3.57E-01	9.08E-01	5.12E-01	26/26	4.00E-02	2.08E-01	0/26	1.60E+00	0/26	2.80E+00	26/26	2.80E-02
Thorium-230	3.05E-01	7.58E-01	4.44E-01	26/26	6.19E-02	2.26E-01	0/26	1.40E+00	0/26	1.49E+03	0/26	1.49E+01
Thorium-232	3.74E-01	8.73E-01	4.88E-01	26/26	3.78E-02	1.31E-01	0/26	1.50E+00	0/26	1.35E+03	0/26	1.35E+01
Thorium-234	4.90E+01	5.08E+02	1.91E+02	4/4	6.05E-01	1.68E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	6.23E+00	1.79E+03	1.90E+02	21/26	2.37E-01	4.41E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.09E-01	7.96E+01	1.27E+01	22/26	1.02E-01	4.73E-01	16/26	2.40E+00	0/26	1.98E+03	3/26	1.98E+01
Uranium-235	1.06E-01	5.48E+01	4.04E+00	25/26	1.37E-02	9.19E-02	22/26	1.40E-01	1/26	3.95E+01	20/26	3.95E-01
Uranium-238	0.00E+00	4.49E+03	3.16E+02	179/202	1.07E-01	3.84E+00	178/202	1.20E+00	69/202	1.71E+02	177/202	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	9.30E-01	9.30E-01	9.30E-01	1/26	4.60E-01	5.00E-01	n/a	n/a	0/26	6.67E+04	0/26	3.16E+02
Anthracene	1.40E+00	1.40E+00	1.40E+00	1/26	4.60E-01	5.00E-01	n/a	n/a	0/26	1.00E+05	0/26	3.79E+03
Benz(a)anthracene	6.20E-01	4.40E+00	1.82E+00	4/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+02	4/26	2.12E-01
Benzo(a)pyrene	7.20E-01	3.70E+00	1.84E+00	3/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+01	3/26	2.12E-02
Benzo(b)fluoranthene	8.40E-01	7.10E+00	2.71E+00	4/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+02	4/26	2.12E-01
Benzo(ghi)perylene	5.30E-01	1.20E+00	8.65E-01	2/26	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.00E-01	2.10E+00	1.30E+00	4/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+03	0/26	2.12E+00
Chrysene	8.20E-01	4.70E+00	2.11E+00	4/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+04	0/26	2.12E+01
Di-n-butyl phthalate	7.80E-01	1.20E+00	9.90E-01	2/4	4.90E-01	5.00E-01	n/a	n/a	0/4	1.00E+05	0/4	2.13E+03
Fluoranthene	9.10E-01	1.20E+01	4.14E+00	5/26	4.60E-01	5.00E-01	n/a	n/a	0/26	6.50E+04	0/26	2.21E+02
Fluorene	5.50E-01	5.50E-01	5.50E-01	1/26	4.60E-01	5.00E-01	n/a	n/a	0/26	7.09E+04	0/26	3.39E+02
Indeno(1,2,3-cd)pyrene	7.00E-01	1.60E+00	1.15E+00	2/26	4.60E-01	5.00E-01	n/a	n/a	0/26	2.08E+02	2/26	2.12E-01
Naphthalene	5.00E-01	5.00E-01	5.00E-01	1/26	4.60E-01	5.00E-01	n/a	n/a	0/26	7.66E+02	0/26	2.36E+01
Phenanthrene	6.70E-01	7.40E+00	2.71E+00	5/26	4.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Polycyclic aromatic hydrocarbons (PAH)	3.00E-05	4.34E+00	5.79E-01	24/175	2.00E-01	2.00E-01	n/a	n/a	0/175	2.08E+01	20/175	2.12E-02
Pyrene	5.30E-01	9.90E+00	3.21E+00	5/26	4.60E-01	5.00E-01	n/a	n/a	0/26	4.87E+04	0/26	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	1.00E-02	1.20E-02	1.10E-02	4/4	1.00E-02	1.00E-02	n/a	n/a	0/4	2.16E+03	0/4	1.34E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

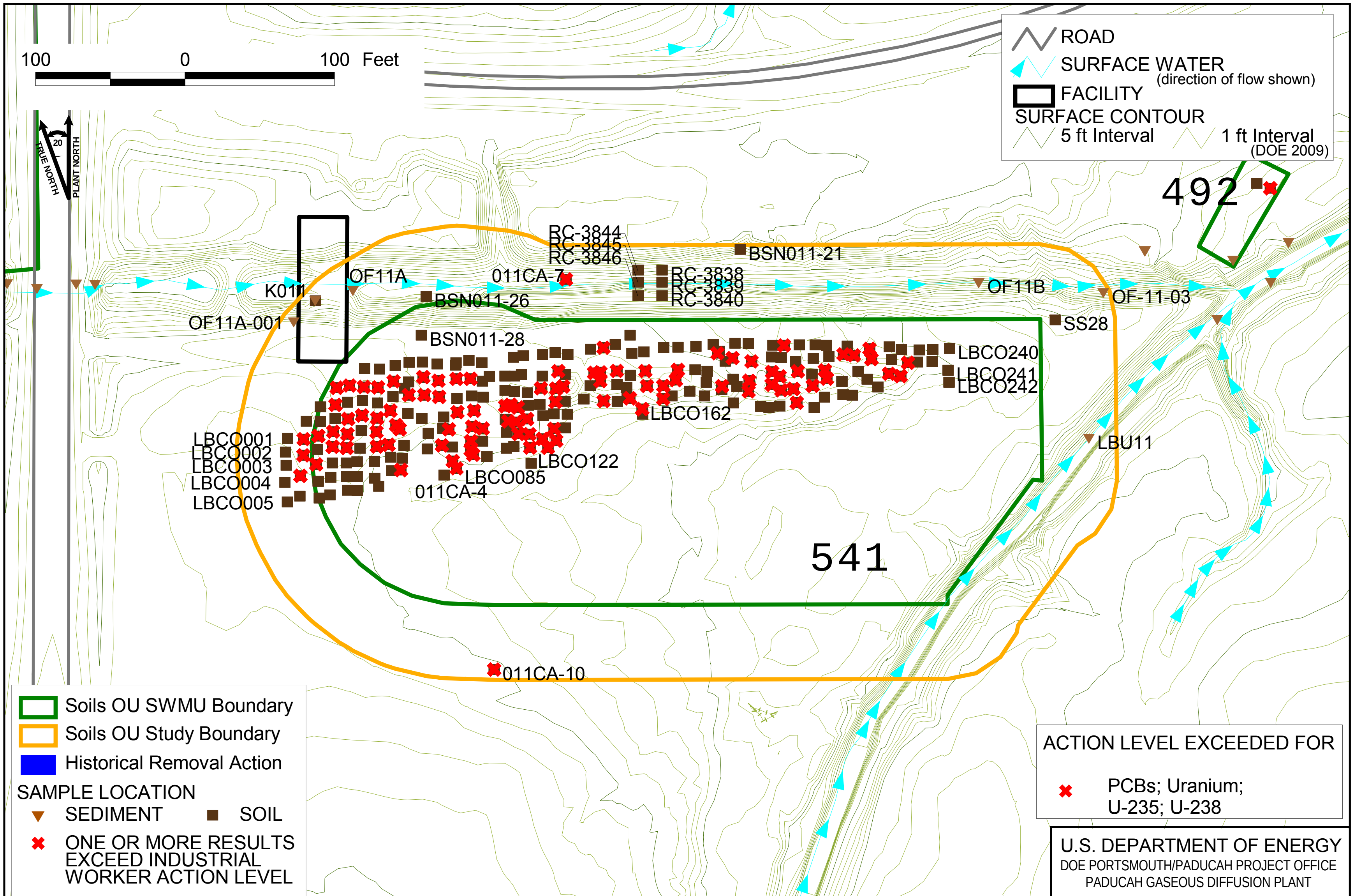


Figure 5.56. Soils Operable Unit: AOC 541

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 03-05-2010

SWMU 561 (Soil Pile I)

Area description

This SWMU was identified on November 2, 2006, as noted in the SWMU notification letter dated February 16, 2007. This SWMU is located east of the PGDP fence and is adjacent to LBC between McCaw Road and Outfall 002 ditch. The dimensions of this SWMU cover approximately 7 acres. The footprint of the soil piles within the 7 acre area is approximately 30 ft wide x 700 ft long by an average of 8 ft tall along Outfall ditch 002 and 30 ft wide x 700 ft long by an average of 8 ft tall along LBC for an estimated total volume of ~12,000 yd^3.

Process history

There appears to be no function for the soil piles within the SWMU; however, the piles most likely were dredged material produced as a result of maintenance activities performed within/along the ditch and creek.

A key potential source of contaminants in the PGDP surface water drainage system is the C-340 facility. Historical leaks and spills at C-340 likely resulted in releases that traveled from floor drains through the storm sewer system, into Outfall 011, and discharged to LBC. Recorded spills and releases from C-340 include COPCs such as PCB oil, as documented in Occurrence Reporting and Processing System (ORPS) reports, Plant Shift Superintendent (PSS) logs, and Annual Site Environmental Reports.

Primary processes in the C-340 Reduction and Metals Facility were the reduction of UF_6 to UF_4 and the conversion of UF_4 to metallic uranium. The facility became operational in 1956 and continued operating until 1977, when shutdown of primary processes began. After shutdown, C-340 was used as a training school, a valve test facility, a pilot plant for the study of liquid/gas scrubber systems, and a waste pilot plant for the stabilization of uranium chips. A uranium metal remolding project was conducted in the mid-1980s at C-340. The building was closed in 1991.

The following are the primary chemicals employed at C-340 during active operations: $UF_{6,}$ hydrogen, magnesium fluoride, magnesium, and TCE. PCBs were used in electrical and hydraulic systems.

Outfall 010 is likely a primary source of historical releases to LBC and may have contributed to observed conditions at Soil Pile I. Its associated ditches drain several PGDP facilities including the following: C-331 Process Building, C-531 Complex, and C-617-B Lagoon.

In general, COPCs carried through internal ditches to Outfall 010 mirror those transported throughout the PGDP surface water management system. Key COPCs include radionuclides, VOCs, SVOCs, and heavy metals.

Previous investigation results

The soil piles along LBC contain uranium and PCBs.

On November 2, 2006, Paducah Remediation Services, LLC, radiological control technicians (RCTs) observed and completed a radiological survey on Soil Pile I. Field radioactivity measurements greater than twice area background were observed in several of the soil piles, ranging from twice to more than seven times area background.

Similarly in 2006, following the discovery of the soil piles and subsequent completion of a gamma walkover survey, biased surface samples were acquired from Soil Pile I. The samples were collected from the five locations exhibiting the highest field radioactivity measurements. Initial sampling was completed in this way, to provide a “worst-case” picture of conditions at Soil Pile I.

The following are the results from the 2007 evaluation.

Distribution of constituents that can be directly attributed to PGDP processes, including the majority of the radionuclides and PCBs, is found along LBC and primarily is confined to the soil pile itself. Uranium and uranium daughters show more widespread distribution, with elevated levels along LBC. Levels at or above NALs for recreational users are generally confined to the northern half of the soil pile along LBC. Similarly, PCBs exceeding the high occupancy without restriction TSCA limit are confined to the northern half of the soil pile along LBC, with two results at the high occupancy limit in the southern third of the LBC soil pile.

At locations where COPCs were measured at levels of concern in surface samples, levels generally decrease with depth, decreasing to *de minimis* levels below the 4 ft interval in most cases. Elevated concentrations of plant-related COPCs diminish to the 1-4 ft interval and below regulatory and/or risk-based action/NALs beyond the upper 4 ft of Soil Pile I.

Table 5.44 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.57).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.44. Summary of Surface and Subsurface Historical Data at SWMU 561

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL1	Action Level1	Exceeds NAL1	No Action Level1
	Minumum	Maximum	Average		Minumum	Maximum						
Surface Soils												
Metals (mg/kg)												
Aluminum	4.47E+03	1.38E+04	8.17E+03	206/206	5.80E+00	4.68E+01	6/206	1.30E+04	0/206	1.00E+05	202/206	4.64E+03
Antimony	8.40E-02	2.20E+01	1.03E+00	184/206	5.80E-01	1.40E+01	86/206	2.10E-01	0/206	4.63E+02	37/206	3.79E-01
Arsenic	2.40E+00	4.70E+01	1.15E+01	192/206	1.20E+00	2.00E+01	92/206	1.20E+01	0/206	3.15E+02	192/206	5.23E-01
Barium	4.28E+01	7.04E+02	3.28E+02	878/879	2.25E+00	4.68E+01	673/879	2.00E+02	0/879	1.00E+05	654/879	2.29E+02
Beryllium	2.60E-01	1.50E+00	5.47E-01	188/206	1.20E-01	1.20E+00	27/206	6.70E-01	0/206	1.28E+03	5/206	9.48E-01
Boron	2.90E+00	7.10E+00	4.72E+00	18/34	2.39E+01	4.68E+01	n/a	n/a	0/34	1.00E+05	0/34	1.74E+03
Cadmium	2.10E-02	1.20E+00	1.08E-01	172/206	5.80E-02	2.00E+00	13/206	2.10E-01	0/206	7.05E+01	0/206	2.13E+01
Calcium	1.37E+02	2.31E+03	9.92E+02	206/206	5.83E+01	1.17E+03	0/206	2.00E+05	n/a	n/a	n/a	n/a
Chromium	6.20E+00	1.37E+03	1.20E+02	211/879	1.20E+00	2.49E+00	154/879	1.60E+01	n/a	n/a	14/879	3.56E+02
Cobalt	3.00E+00	3.10E+01	7.36E+00	206/206	2.30E-01	1.17E+01	11/206	1.40E+01	0/206	1.00E+05	0/206	1.92E+03
Copper	5.20E+00	6.25E+01	1.37E+01	206/206	1.20E+00	5.90E+00	32/206	1.90E+01	0/206	1.00E+05	0/206	4.93E+02
Iron	6.38E+03	4.85E+04	1.41E+04	206/206	5.80E+00	2.34E+01	1/206	2.80E+04	0/206	1.00E+05	206/206	2.07E+03
Lead	8.50E+00	2.25E+02	2.36E+01	550/879	3.50E-01	2.00E+01	143/879	3.60E+01	0/879	1.25E+03	32/879	5.00E+01
Magnesium	4.92E+02	1.98E+03	1.06E+03	206/206	4.51E+00	1.17E+03	0/206	7.70E+03	n/a	n/a	n/a	n/a
Manganese	6.33E+01	5.23E+03	6.30E+02	206/206	2.40E-01	3.50E+00	36/206	1.50E+03	0/206	4.64E+04	206/206	4.52E+01
Mercury	8.60E-03	9.20E-02	3.61E-02	171/206	3.70E-02	9.70E-02	0/206	2.00E-01	0/206	8.25E+02	0/206	9.82E-01
Molybdenum	2.20E-01	2.40E+00	7.16E-01	158/188	5.80E-01	9.40E+00	n/a	n/a	0/188	2.50E+04	0/188	8.30E+01
Nickel	4.50E+00	2.07E+01	9.30E+00	206/206	5.80E-01	9.40E+00	0/206	2.10E+01	0/206	9.30E+04	0/206	2.42E+02
Potassium	3.50E+02	7.19E+02	5.60E+02	48/52	9.02E+01	1.17E+03	0/52	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.60E-01	1.10E+00	4.27E-01	137/206	5.80E-01	2.00E+01	8/206	8.00E-01	0/206	2.56E+04	0/206	9.49E+01
Silicon	6.97E+02	1.66E+03	1.18E+03	34/34	5.97E+01	1.17E+02	n/a	n/a	n/a	n/a	n/a	n/a
Silver	3.20E-02	2.54E+00	8.51E-02	156/206	2.30E-01	2.49E+00	2/206	2.30E+00	0/206	2.07E+04	0/206	4.11E+01
Sodium	1.45E+01	2.23E+02	3.22E+01	181/206	2.33E+01	1.17E+03	0/206	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.00E-01	1.20E+00	2.94E-01	170/206	2.30E-01	2.00E+01	87/206	2.10E-01	0/206	3.43E+02	8/206	7.27E-01
Total Uranium	3.30E+00	3.74E+00	3.52E+00	12/12	1.00E-02	7.00E-02	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	9.50E-01	6.41E+03	3.13E+02	336/879	1.20E-01	1.17E+02	261/879	4.90E+00	8/879	3.34E+03	238/879	2.02E+01
Vanadium	1.31E+01	8.69E+01	2.76E+01	206/206	1.20E+00	4.70E+00	29/206	3.80E+01	0/206	4.47E+03	206/206	3.32E+00
Zinc	1.76E+01	1.13E+03	1.14E+02	206/206	2.30E+00	2.00E+01	70/206	6.50E+01	0/206	1.00E+05	0/206	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	5.00E-02	7.90E+01	9.22E+00	56/848	4.00E-02	1.28E+00	n/a	n/a	6/848	4.25E+01	35/848	1.99E-01
PCB-1248	4.90E-02	5.70E+01	8.36E+00	58/218	3.70E-02	2.10E+00	n/a	n/a	2/218	4.25E+01	44/218	1.99E-01
PCB-1254	4.90E-02	1.60E+01	2.83E+00	81/218	3.70E-02	2.10E+00	n/a	n/a	0/218	1.82E+01	57/218	1.99E-01
PCB-1260	4.50E-02	6.40E+00	1.19E+00	107/214	3.70E-02	2.10E+00	n/a	n/a	0/214	4.25E+01	63/214	1.99E-01
Radionuclides (pCi/g)												
Actinium-228	7.00E-01	1.41E+00	9.41E-01	32/32	1.40E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Alpha activity	2.61E+00	9.87E+02	6.96E+01	186/186	1.10E+00	6.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.12E-02	3.40E-02	2.05E-02	6/166	9.80E-03	1.04E+00	n/a	n/a	0/166	5.16E+02	0/166	5.16E+00
Beta activity	3.28E+00	2.49E+03	1.45E+02	186/186	1.25E+00	4.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-212	5.90E-01	9.80E-01	7.96E-01	10/10	5.60E-01	8.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-214	8.00E-01	1.46E+00	9.74E-01	32/32	1.10E-01	2.70E-01	n/a	n/a	n/a	n/a	n/a	n/a

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.44. Summary of Surface and Subsurface Historical Data at SWMU 561 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minumum	Maximum	Average	of Detection	Minumum	Maximum	Bkgd	Value	AL1	Level1	NAL1	Level1
Cesium-137	9.77E-04	1.01E+00	2.72E-01	669/858	6.96E-04	7.61E-01	263/858	0.49	0/858	8.58E+00	656/858	8.58E-02
Lead-210	3.00E+00	4.20E+00	3.60E+00	4/6	2.00E+00	2.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Lead-212	1.13E+00	1.86E+00	1.39E+00	32/32	1.00E-01	2.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Lead-214	8.20E-01	1.37E+00	1.06E+00	32/32	1.20E-01	2.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	2.32E-02	1.90E-01	8.21E-02	15/190	1.10E-02	1.41E+00	4/190	0.1	0/190	2.71E+01	0/190	2.71E-01
Plutonium-238	1.90E-02	1.90E-02	1.90E-02	2/186	9.74E-03	4.16E-01	0/186	0.073	0/186	1.17E+03	0/186	1.17E+01
Plutonium-239/240	9.73E-03	5.10E-02	2.65E-02	19/186	8.95E-03	4.11E-01	n/a	n/a	0/186	1.15E+03	0/186	1.15E+01
Potassium-40	6.00E+00	1.38E+01	9.44E+00	40/50	3.00E-01	1.05E+01	0/50	16	n/a	n/a	n/a	n/a
Protactinium-234m	1.90E+01	1.02E+02	7.03E+01	12/12	1.30E+01	1.50E+01	n/a	n/a	n/a	n/a	n/a	n/a
Radium-226	5.47E-01	1.46E+00	8.66E-01	150/150	1.14E-02	3.34E-01	0/150	1.5	0/150	2.56E+00	150/150	2.56E-02
Technetium-99	7.70E-01	8.38E+00	1.30E+00	66/182	4.90E-01	2.70E+00	1/182	2.5	0/182	3.62E+04	0/182	3.62E+02
Thallium-208	2.60E-01	5.00E-01	3.95E-01	32/32	6.40E-02	1.50E-01	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-228	1.90E-01	1.12E+00	4.13E-01	148/148	2.00E-02	6.78E-02	0/148	1.6	0/148	2.80E+00	148/148	2.80E-02
Thorium-230	1.13E-01	2.23E+00	4.13E-01	152/166	3.00E-03	1.93E+00	4/166	1.5	0/166	1.49E+03	0/166	1.49E+01
Thorium-232	2.29E-01	1.09E+00	4.26E-01	148/148	4.00E-03	5.90E-02	0/148	1.5	0/148	1.35E+03	0/148	1.35E+01
Thorium-234	1.04E+00	1.55E+03	3.96E+01	172/174	4.00E-03	8.31E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	3.00E-01	1.49E+03	1.09E+02	136/154	1.34E-01	1.11E+02	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.07E-01	1.36E+02	1.34E+01	210/210	1.00E-02	2.48E+01	64/210	2.5	0/210	1.98E+03	47/210	1.98E+01
Uranium-235	1.93E-02	1.96E+01	2.85E+00	149/206	1.26E-02	3.56E+01	95/206	0.14	0/206	3.95E+01	63/206	3.95E-01
Uranium-235/236	3.40E-02	6.90E-02	5.78E-02	12/12	6.00E-03	1.70E-02	n/a	n/a	0/12	3.95E+01	0/12	3.95E-01
Uranium-238	0.00E+00	2.18E+03	1.11E+02	318/890	4.00E-03	8.99E+01	241/890	1.2	57/890	1.71E+02	234/890	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.10E-01	2.70E+00	1.84E+00	6/162	3.80E-01	4.90E-01	n/a	n/a	0/162	6.67E+04	0/162	3.16E+02
Anthracene	2.00E-01	4.90E+00	3.33E+00	6/162	3.80E-01	4.90E-01	n/a	n/a	0/162	1.00E+05	0/162	3.79E+03
Benz(a)anthracene	4.30E-02	1.00E+01	2.47E+00	19/162	3.80E-01	4.90E-01	n/a	n/a	0/162	2.08E+02	13/162	2.12E-01
Benzo(a)pyrene	5.60E-02	8.80E+00	2.19E+00	19/162	3.80E-01	4.90E-01	n/a	n/a	0/162	2.08E+01	19/162	2.12E-02
Benzo(b)fluoranthene	5.50E-02	1.10E+01	2.77E+00	19/166	3.80E-01	4.90E-01	n/a	n/a	0/166	2.08E+02	13/166	2.12E-01
Benzo(ghi)perylene	5.80E-02	4.90E+00	1.34E+00	18/162	3.80E-01	4.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	4.60E-02	3.90E+00	1.11E+00	19/162	3.80E-01	4.90E-01	n/a	n/a	0/162	2.08E+03	4/162	2.12E+00
Benzoic acid	6.40E-01	7.30E-01	6.85E-01	8/162	4.60E-01	2.20E+00	n/a	n/a	0/162	1.00E+05	0/162	8.52E+04
Bis(2-ethylhexyl)phthalate	4.30E-02	5.50E-02	5.13E-02	4/154	3.80E-01	4.40E-01	n/a	n/a	0/154	7.40E+03	0/154	8.84E+00
Butyl benzyl phthalate	5.90E-02	5.90E-02	5.90E-02	2/154	3.80E-01	4.40E-01	n/a	n/a	0/154	1.00E+05	0/154	2.71E+03
Carbazole	1.40E+00	1.40E+00	1.40E+00	4/8	4.90E-01	4.90E-01	n/a	n/a	0/8	1.28E+04	0/8	2.15E+01
Chrysene	6.40E-02	8.80E+00	2.25E+00	19/162	3.80E-01	4.90E-01	n/a	n/a	0/162	2.08E+04	0/162	2.12E+01
Dibenz(a,h)anthracene	7.10E-02	5.00E-01	2.71E-01	9/158	3.80E-01	4.90E-01	n/a	n/a	0/158	2.08E+01	9/158	2.12E-02
Dibenzofuran	5.50E-02	1.10E+00	7.52E-01	6/162	3.80E-01	4.90E-01	n/a	n/a	0/162	9.02E+03	0/162	1.86E+01
Diethyl phthalate	7.20E-02	7.20E-02	7.20E-02	1/162	3.80E-01	4.90E-01	n/a	n/a	0/162	1.00E+05	0/162	1.55E+04
Di-n-butyl phthalate	4.40E-02	1.40E+00	1.01E+00	5/162	3.80E-01	4.90E-01	n/a	n/a	0/162	1.00E+05	0/162	2.13E+03
Fluoranthene	4.60E-02	2.20E+01	4.08E+00	26/170	3.80E-01	4.90E-01	n/a	n/a	0/170	6.50E+04	0/170	2.21E+02
Fluorene	9.50E-02	2.20E+00	1.50E+00	6/162	3.80E-01	4.90E-01	n/a	n/a	0/162	7.09E+04	0/162	3.39E+02
Indeno(1,2,3-cd)pyrene	6.70E-02	5.20E+00	1.59E+00	16/162	3.80E-01	4.90E-01	n/a	n/a	0/162	2.08E+02	13/162	2.12E-01
Naphthalene	5.50E-01	5.50E-01	5.50E-01	4/162	3.80E-01	4.90E-01	n/a	n/a	0/162	7.66E+02	0/162	2.36E+01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.44. Summary of Surface and Subsurface Historical Data at SWMU 561 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minumum**	**Maximum**	**Average**	**of Detection**	**Minumum**	**Maximum**	**Bkgd**	**Value**	**AL1**	**Level1**	**NAL1**	**Level1**
Phenanthrene	1.10E-01	1.70E+01	4.28E+00	19/162	3.80E-01	4.90E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.40E-02	2.20E+01	4.25E+00	24/166	3.80E-01	4.90E-01	n/a	n/a	0/166	4.87E+04	0/166	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	3.50E-03	1.60E-02	1.27E-02	11/20	5.00E-03	5.90E-03	n/a	n/a	0/20	2.16E+03	0/20	1.34E+01
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.50E+03	1.76E+04	8.96E+03	67/67	5.50E+00	3.08E+01	8/67	1.20E+04	0/67	1.00E+05	64/67	4.64E+03
Antimony	8.00E-02	2.30E-01	1.46E-01	67/67	5.50E-01	6.20E-01	3/67	2.10E-01	0/67	4.63E+02	0/67	3.79E-01
Arsenic	2.60E+00	1.76E+01	6.63E+00	67/67	1.10E+00	1.30E+00	19/67	7.90E+00	0/67	3.15E+02	67/67	5.23E-01
Barium	4.47E+01	5.65E+02	3.21E+02	202/202	2.20E+00	1.16E+01	135/202	1.70E+02	0/202	1.00E+05	134/202	2.29E+02
Beryllium	1.20E-01	7.20E-01	4.52E-01	67/67	1.10E-01	5.90E-01	1/67	6.90E-01	0/67	1.28E+03	0/67	9.48E-01
Cadmium	1.50E-02	1.20E-01	5.81E-02	67/67	5.50E-02	6.20E-02	0/67	2.10E-01	0/67	7.05E+01	0/67	2.13E+01
Calcium	3.28E+02	1.26E+03	7.97E+02	67/67	5.53E+01	6.24E+01	0/67	6.10E+03	n/a	n/a	n/a	n/a
Chromium	7.80E+00	2.50E+02	4.58E+01	67/202	1.10E+00	5.80E+00	49/202	4.30E+01	n/a	n/a	0/202	3.56E+02
Cobalt	3.20E+00	1.84E+01	6.10E+00	67/67	2.20E-01	2.50E-01	1/67	1.30E+01	0/67	1.00E+05	0/67	1.92E+03
Copper	4.80E+00	1.92E+01	1.02E+01	67/67	1.10E+00	6.00E+00	1/67	2.50E+01	0/67	1.00E+05	0/67	4.93E+02
Iron	7.07E+03	1.98E+04	1.30E+04	67/67	5.50E+00	2.90E+01	0/67	2.80E+04	0/67	1.00E+05	67/67	2.07E+03
Lead	6.80E+00	4.07E+01	1.75E+01	124/202	3.30E-01	1.70E+00	21/202	2.30E+01	0/202	1.25E+03	0/202	5.00E+01
Magnesium	6.84E+02	2.19E+03	1.16E+03	67/67	5.53E+01	2.96E+02	2/67	2.10E+03	n/a	n/a	n/a	n/a
Manganese	3.35E+01	2.64E+03	4.84E+02	67/67	2.20E-01	1.20E+00	6/67	8.20E+02	0/67	4.64E+04	64/67	4.52E+01
Mercury	7.50E-03	1.39E-01	4.46E-02	66/67	3.33E-02	4.16E-02	1/67	1.30E-01	0/67	8.25E+02	0/67	9.82E-01
Molybdenum	2.40E-01	1.10E+00	5.48E-01	67/67	5.50E-01	6.20E-01	n/a	n/a	0/67	2.50E+04	0/67	8.30E+01
Nickel	3.00E+00	2.28E+01	1.10E+01	67/67	5.50E-01	3.00E+00	2/67	2.20E+01	0/67	9.30E+04	0/67	2.42E+02
Selenium	1.90E-01	4.50E-01	2.73E-01	29/67	5.50E-01	6.20E-01	0/67	7.00E-01	0/67	2.56E+04	0/67	9.49E+01
Silver	3.30E-02	1.10E-01	6.36E-02	65/67	2.20E-01	1.20E+00	0/67	2.70E+00	0/67	2.07E+04	0/67	4.11E+01
Sodium	2.21E+01	2.42E+02	9.38E+01	55/67	2.21E+01	1.18E+02	0/67	3.40E+02	n/a	n/a	n/a	n/a
Thallium	9.10E-02	3.10E-01	1.67E-01	62/67	2.20E-01	1.20E+00	7/67	3.40E-01	0/67	3.43E+02	0/67	7.27E-01
Uranium	5.00E-01	5.02E+02	7.13E+01	117/202	1.10E-01	6.00E-01	81/202	4.60E+00	0/202	3.34E+03	75/202	2.02E+01
Vanadium	8.60E+00	3.69E+01	2.37E+01	67/67	1.10E+00	5.90E+00	0/67	3.70E+01	0/67	4.47E+03	67/67	3.32E+00
Zinc	9.40E+00	1.23E+02	4.19E+01	67/67	2.20E+00	1.18E+01	13/67	6.00E+01	0/67	1.00E+05	0/67	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	9.60E-02	5.70E+00	9.76E-01	33/202	3.30E-01	3.70E-01	n/a	n/a	0/202	4.25E+01	25/202	1.99E-01
PCB-1248	4.60E-02	3.80E+00	6.55E-01	22/67	3.60E-02	3.80E-01	n/a	n/a	0/67	4.25E+01	13/67	1.99E-01
PCB-1254	4.70E-02	1.80E+00	4.04E-01	25/67	3.60E-02	4.10E-02	n/a	n/a	0/67	1.82E+01	15/67	1.99E-01
PCB-1260	6.60E-02	9.90E-01	2.47E-01	36/67	3.60E-02	4.10E-02	n/a	n/a	0/67	4.25E+01	16/67	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.05E+00	1.30E+02	2.05E+01	73/73	1.14E+00	1.78E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.64E+00	2.22E+02	3.19E+01	73/73	1.19E+00	1.52E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	0.00E+00	4.28E-01	1.85E-01	86/208	4.11E-04	4.95E-01	9/208	2.80E-01	0/208	8.58E+00	81/208	8.58E-02
Radium-226	7.75E-01	1.29E+00	9.45E-01	73/73	9.71E-02	1.81E-01	0/73	1.50E+00	0/73	2.56E+00	73/73	2.56E-02
Technetium-99	9.23E-01	1.85E+00	1.10E+00	18/73	8.78E-01	9.21E-01	0/73	2.80E+00	0/73	3.62E+04	0/73	3.62E+02
Thorium-228	2.78E-01	5.84E-01	4.07E-01	73/73	5.54E-02	6.42E-02	0/73	1.60E+00	0/73	2.80E+00	73/73	2.80E-02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.44. Summary of Surface and Subsurface Historical Data at SWMU 561 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minumum**	**Maximum**	**Average**	**of Detection**	**Minumum**	**Maximum**	**Bkgd**	**Value**	**AL1**	**Level1**	**NAL1**	**Level1**
Thorium-230	1.95E-01	5.70E-01	3.47E-01	73/73	6.17E-02	7.60E-02	0/73	1.40E+00	0/73	1.49E+03	0/73	1.49E+01
Thorium-232	2.99E-01	6.29E-01	4.31E-01	73/73	3.04E-02	5.08E-02	0/73	1.50E+00	0/73	1.35E+03	0/73	1.35E+01
Thorium-234	1.43E+00	1.41E+02	1.85E+01	72/73	5.82E-01	2.82E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	2.69E-01	1.49E+02	1.86E+01	65/73	1.26E-01	5.35E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.06E-01	1.48E+01	1.76E+00	73/73	6.26E-02	2.04E-01	14/73	2.40E+00	0/73	1.98E+03	0/73	1.98E+01
Uranium-235	1.56E-02	2.03E+00	3.24E-01	56/73	1.11E-02	1.68E-01	30/73	1.40E-01	0/73	3.95E+01	14/73	3.95E-01
Uranium-238	0.00E+00	1.61E+02	2.25E+01	98/208	4.37E-02	8.88E+01	58/208	1.20E+00	0/208	1.71E+02	55/208	1.71E+00
Semivolatiles (mg/kg)												
2-Methylnaphthalene	6.20E-02	6.20E-02	6.20E-02	1/67	3.60E-01	4.10E-01	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	6.10E-01	6.10E-01	6.10E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	6.67E+04	0/67	3.16E+02
Anthracene	9.10E-01	9.10E-01	9.10E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	1.00E+05	0/67	3.79E+03
Benz(a)anthracene	6.60E-02	1.90E+00	4.47E-01	5/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+02	1/67	2.12E-01
Benzo(a)pyrene	5.30E-02	1.70E+00	3.97E-01	5/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+01	5/67	2.12E-02
Benzo(b)fluoranthene	3.80E-02	1.80E+00	3.52E-01	6/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+02	1/67	2.12E-01
Benzo(ghi)perylene	5.10E-02	1.20E+00	4.34E-01	3/67	3.60E-01	4.10E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.10E-02	1.40E+00	3.33E-01	5/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+03	0/67	2.12E+00
Benzoic acid	4.70E-01	4.70E-01	4.70E-01	1/67	1.80E+00	2.00E+00	n/a	n/a	0/67	1.00E+05	0/67	8.52E+04
Bis(2-ethylhexyl)phthalate	7.20E-02	5.10E+00	1.03E+00	6/67	3.60E-01	4.10E-01	n/a	n/a	0/67	7.40E+03	0/67	8.84E+00
Butyl benzyl phthalate	1.80E-01	1.80E-01	1.80E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	1.00E+05	0/67	2.71E+03
Chrysene	3.90E-02	2.10E+00	3.22E-01	8/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+04	0/67	2.12E+01
Dibenz(a,h)anthracene	4.20E-01	4.20E-01	4.20E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+01	1/67	2.12E-02
Dibenzofuran	3.20E-01	3.20E-01	3.20E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	9.02E+03	0/67	1.86E+01
Di-n-butyl phthalate	4.40E-02	6.80E-02	5.60E-02	2/67	3.60E-01	4.10E-01	n/a	n/a	0/67	1.00E+05	0/67	2.13E+03
Fluoranthene	4.30E-02	5.30E+00	6.33E-01	10/67	3.60E-01	4.10E-01	n/a	n/a	0/67	6.50E+04	0/67	2.21E+02
Fluorene	5.20E-01	5.20E-01	5.20E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	7.09E+04	0/67	3.39E+02
Indeno(1,2,3-cd)pyrene	5.90E-02	1.20E+00	4.39E-01	3/67	3.60E-01	4.10E-01	n/a	n/a	0/67	2.08E+02	1/67	2.12E-01
Naphthalene	1.00E-01	1.00E-01	1.00E-01	1/67	3.60E-01	4.10E-01	n/a	n/a	0/67	7.66E+02	0/67	2.36E+01
Phenanthrene	4.40E-02	4.90E+00	7.88E-01	7/67	3.60E-01	4.10E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.50E-02	4.70E+00	6.07E-01	9/67	3.60E-01	4.10E-01	n/a	n/a	0/67	4.87E+04	0/67	1.65E+02
Volatiles (mg/kg)												
Acetone	7.80E-03	7.80E-03	7.80E-03	1/14	2.20E-02	2.50E-02	n/a	n/a	0/14	1.91E+04	0/14	3.58E+02
Ethylbenzene	5.70E-04	9.00E-04	7.35E-04	2/14	5.50E-03	6.20E-03	n/a	n/a	0/14	2.12E+03	0/14	2.12E+01
m,p-Xylene	1.20E-03	1.60E-03	1.40E-03	2/14	5.50E-03	6.20E-03	n/a	n/a	0/14	2.20E+04	0/14	7.24E+02
Toluene	6.10E-04	6.60E-02	1.86E-02	6/14	5.50E-03	6.20E-03	n/a	n/a	0/14	7.28E+03	0/14	2.11E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

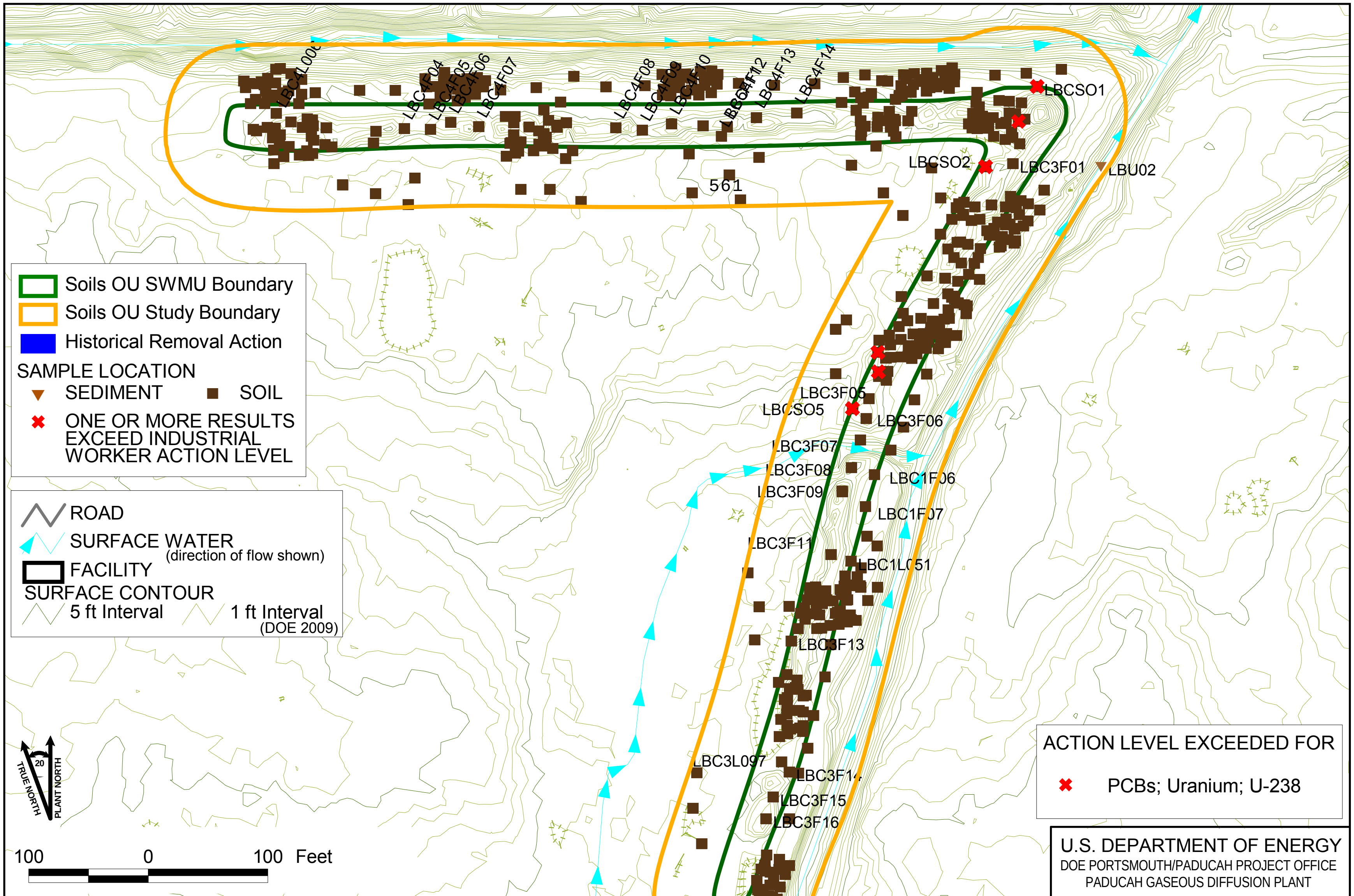


Figure 5.57. Soils Operable Unit: SWMU 561

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 03-05-2010

AOC 562 (Addendum I-B Soil Piles D, H and J)

In December 2006, initial field reconnaissance, field radioactivity measurements, and limited sampling at Addendum 1-B Soil Piles were completed. The results of these efforts indicated radioactivity exceeding background. Addendum 1-B Soil Piles include 40 discrete piles covering an approximate area of 2.3 acres. Forty piles were identified; 34 along LBC east of PGDP and 6 along the NSDD north of PGDP, and they vary in size and shape, ranging from approximately 1 to 10 ft in height. Included are AOCs 492 and 541, also known as soil piles AR and O, respectively, and K013 (for a new total of 41 piles). The field investigation was completed between October and December 2008.

Area description

Field reconnaissance of Addendum 1-B Soil Piles identified 40 piles along LBC. The majority of the soil piles are located east of PGDP industrialized area and are on DOE-owned property. The soil piles are distributed along LBC and generally are bounded by PGDP industrialized area to the west, WKWMA/DOE boundary to the east, and the DOE boundary to the north and south. The Addendum 1-B Soil Piles vary in size and shape, ranging from approximately 5 to 250 ft in length and from 1 to 10 ft in height. The soil piles are widely dispersed and often occur as clusters. Vegetative regrowth on and adjacent to the piles is very dense, indicating the soil piles have been in their present locations for years.

Process history

Historical research was performed to attempt to determine the origin of the piles. The origin of the Addendum 1-B Soil Piles remains unknown; however, available information indicates that many of the PGDP-related soil piles may have originated from excavations associated with the creation, periodic dredging, and cleanout of the outfalls, ditches, and creeks that comprise the PGDP surface water management system. The Addendum 1-B Soil Piles are not operational.

Previous investigation results

The COPCs at AOC 562 are uranium-238 at piles H, J, and K and PCBs at H, J, and D. The remaining chemicals were not recommended COPCs due to levels similar to background or the chemicals are considered ubiquitous (e.g., PAHs). None of these COPCs exceed action levels for the PGDP teen recreational user.

Table 5.45 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.58).

Area utilities

No recirculating water lines or sewers are associated with these piles; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.45. Summary of Surface and Subsurface Historical Data at AOC 562

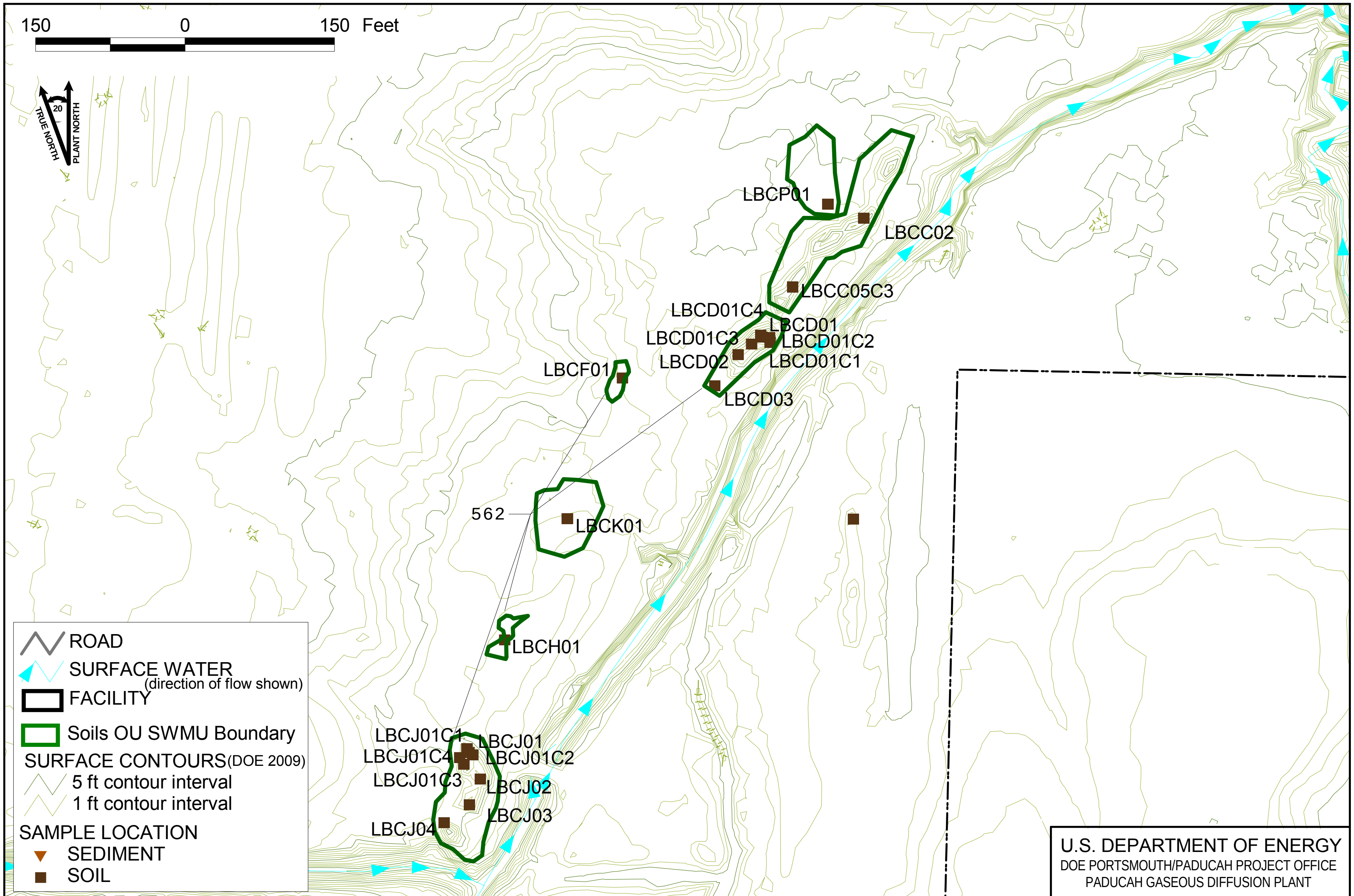
Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Metals (mg/kg)												
Aluminum	5.79E+03	7.61E+03	7.10E+03	6/6	1.79E+01	1.97E+01	0/6	1.30E+04	0/6	1.00E+05	6/6	4.64E+03
Arsenic	2.10E+00	5.77E+00	4.07E+00	6/6	8.93E-01	9.86E-01	0/6	1.20E+01	0/6	3.15E+02	6/6	5.23E-01
Barium	5.58E+01	4.11E+02	2.45E+02	20/20	2.23E+00	2.47E+00	14/20	2.00E+02	0/20	1.00E+05	14/20	2.29E+02
Cadmium	4.87E-01	4.87E-01	4.87E-01	2/6	4.46E-01	4.93E-01	2/6	2.10E-01	0/6	7.05E+01	0/6	2.13E+01
Calcium	3.79E+02	1.23E+03	9.88E+02	6/6	8.93E+01	9.86E+01	0/6	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.34E+01	1.53E+02	7.45E+01	15/20	2.23E+00	2.47E+00	14/20	1.60E+01	n/a	n/a	0/20	3.56E+02
Cobalt	3.20E+00	6.48E+00	5.09E+00	6/6	8.93E-01	9.86E-01	0/6	1.40E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	4.31E+00	1.43E+01	1.02E+01	6/6	2.23E+00	2.47E+00	0/6	1.90E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	7.43E+03	1.02E+04	9.05E+03	6/6	1.79E+01	1.97E+01	0/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	6.41E+00	1.30E+01	1.01E+01	14/20	8.93E-01	9.86E-01	0/20	3.60E+01	0/20	1.25E+03	0/20	5.00E+01
Magnesium	6.14E+02	8.12E+02	7.31E+02	6/6	4.46E+00	4.93E+00	0/6	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.21E+02	3.83E+02	3.43E+02	6/6	2.23E+00	2.47E+00	0/6	1.50E+03	0/6	4.64E+04	6/6	4.52E+01
Mercury	1.70E-02	2.40E-02	2.05E-02	4/6	1.50E-02	1.60E-02	0/6	2.00E-01	0/6	8.25E+02	0/6	9.82E-01
Nickel	4.99E+00	7.01E+00	6.23E+00	5/6	4.46E+00	4.93E+00	0/6	2.10E+01	0/6	9.30E+04	0/6	2.42E+02
Uranium	5.96E+00	2.08E+02	8.52E+01	18/20	9.48E-01	4.76E+01	18/20	4.90E+00	0/20	3.34E+03	14/20	2.02E+01
Vanadium	1.33E+01	1.79E+01	1.57E+01	6/6	2.23E+00	2.47E+00	0/6	3.80E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	2.05E+01	8.36E+01	5.16E+01	6/6	1.79E+01	1.97E+01	2/6	6.50E+01	0/6	1.00E+05	0/6	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.40E-01	9.50E-01	6.76E-01	5/20	1.30E-01	1.30E-01	n/a	n/a	0/20	4.25E+01	5/20	1.99E-01
PCB-1254	1.00E-01	6.00E-01	3.68E-01	5/6	9.00E-02	9.00E-02	n/a	n/a	0/6	1.82E+01	4/6	1.99E-01
PCB-1260	1.40E-01	3.50E-01	3.08E-01	5/6	1.00E-01	1.00E-01	n/a	n/a	0/6	4.25E+01	4/6	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	4.00E-02	1.49E-01	9.13E-02	11/20	7.12E-03	9.02E-02	0/20	4.90E-01	0/20	8.58E+00	5/20	8.58E-02
Thorium-228	1.81E-01	3.90E-01	3.06E-01	6/6	1.17E-01	1.18E-01	0/6	1.60E+00	0/6	2.80E+00	6/6	2.80E-02
Thorium-230	1.00E-01	2.54E-01	1.96E-01	6/6	8.31E-02	1.32E-01	0/6	1.50E+00	0/6	1.49E+03	0/6	1.49E+01
Thorium-232	2.54E-01	4.09E-01	3.35E-01	6/6	4.48E-02	7.60E-02	0/6	1.50E+00	0/6	1.35E+03	0/6	1.35E+01
Uranium	1.91E+00	4.68E+01	3.19E+01	6/6	1.92E-01	2.46E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.00E-01	4.10E+00	2.94E+00	6/6	7.29E-02	1.19E-01	4/6	2.50E+00	0/6	1.98E+03	0/6	1.98E+01
Uranium-235	4.18E-02	5.68E-01	4.10E-01	6/6	1.23E-02	1.82E-02	5/6	1.40E-01	0/6	3.95E+01	4/6	3.95E-01
Uranium-238	1.67E+00	5.47E+01	3.09E+01	13/20	1.01E-01	1.82E+00	13/20	1.20E+00	0/20	1.71E+02	12/20	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	5.20E-01	5.20E-01	5.20E-01	1/6	4.90E-01	5.00E-01	n/a	n/a	0/6	2.08E+02	1/6	2.12E-01
Benzo(b)fluoranthene	7.00E-01	7.30E-01	7.10E-01	3/6	4.90E-01	5.00E-01	n/a	n/a	0/6	2.08E+02	3/6	2.12E-01
Chrysene	5.00E-01	5.60E-01	5.20E-01	3/6	4.90E-01	5.00E-01	n/a	n/a	0/6	2.08E+04	0/6	2.12E+01
Fluoranthene	1.10E+00	1.50E+00	1.37E+00	3/6	4.90E-01	5.00E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Phenanthrene	5.70E-01	1.10E+00	9.23E-01	3/6	4.90E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Polycyclic aromatic hydrocarbons (PAH)	2.20E-01	2.20E-01	2.20E-01	1/14	2.00E-01	2.00E-01	n/a	n/a	0/14	2.08E+01	1/14	2.12E-02
Pyrene	9.80E-01	1.10E+00	1.02E+00	3/6	4.90E-01	5.00E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.45. Summary of Surface and Subsurface Historical Data at AOC 562 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.61E+03	9.34E+03	7.18E+03	11/11	1.83E+01	1.99E+01	0/11	1.20E+04	0/11	1.00E+05	10/11	4.64E+03
Arsenic	1.75E+00	6.65E+00	4.42E+00	11/11	9.16E-01	9.93E-01	0/11	7.90E+00	0/11	3.15E+02	11/11	5.23E-01
Barium	4.65E+01	3.86E+02	2.55E+02	45/45	2.29E+00	2.48E+00	33/45	1.70E+02	0/45	1.00E+05	33/45	2.29E+02
Cadmium	5.17E-01	6.23E-01	5.75E-01	5/11	4.58E-01	4.96E-01	5/11	2.10E-01	0/11	7.05E+01	0/11	2.13E+01
Calcium	4.97E+02	1.32E+03	9.00E+02	11/11	9.16E+01	9.93E+01	0/11	6.10E+03	n/a	n/a	n/a	n/a
Chromium	1.34E+01	1.27E+02	6.50E+01	35/45	2.29E+00	2.48E+00	34/45	4.30E+01	n/a	n/a	0/45	3.56E+02
Cobalt	3.57E+00	9.29E+00	6.15E+00	11/11	9.16E-01	9.93E-01	0/11	1.30E+01	0/11	1.00E+05	0/11	1.92E+03
Copper	4.09E+00	1.13E+01	8.76E+00	11/11	2.29E+00	2.48E+00	0/11	2.50E+01	0/11	1.00E+05	0/11	4.93E+02
Iron	7.37E+03	1.29E+04	9.81E+03	11/11	1.83E+01	1.99E+01	0/11	2.80E+04	0/11	1.00E+05	11/11	2.07E+03
Lead	6.77E+00	3.57E+01	1.27E+01	39/45	9.16E-01	9.93E-01	1/45	2.30E+01	0/45	1.25E+03	0/45	5.00E+01
Magnesium	5.47E+02	8.72E+02	7.19E+02	11/11	4.58E+00	4.96E+00	0/11	2.10E+03	n/a	n/a	n/a	n/a
Manganese	2.85E+02	4.68E+02	3.78E+02	11/11	2.29E+00	2.48E+00	0/11	8.20E+02	0/11	4.64E+04	11/11	4.52E+01
Mercury	1.60E-02	2.10E-02	1.75E-02	6/11	1.50E-02	1.70E-02	0/11	1.30E-01	0/11	8.25E+02	0/11	9.82E-01
Nickel	4.94E+00	8.77E+00	6.71E+00	9/11	4.58E+00	4.96E+00	0/11	2.20E+01	0/11	9.30E+04	0/11	2.42E+02
Uranium	4.62E+00	2.27E+02	6.01E+01	39/45	9.54E-01	4.75E+01	39/45	4.60E+00	0/45	3.34E+03	33/45	2.02E+01
Vanadium	1.02E+01	2.53E+01	1.72E+01	11/11	2.29E+00	2.48E+00	0/11	3.70E+01	0/11	4.47E+03	11/11	3.32E+00
Zinc	1.94E+01	7.96E+01	4.83E+01	11/11	1.83E+01	1.99E+01	4/11	6.00E+01	0/11	1.00E+05	0/11	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.30E-01	2.01E+00	6.66E-01	10/45	1.30E-01	1.30E-01	n/a	n/a	0/45	4.25E+01	9/45	1.99E-01
PCB-1254	1.20E-01	1.23E+00	3.69E-01	10/11	9.00E-02	9.00E-02	n/a	n/a	0/11	1.82E+01	6/11	1.99E-01
PCB-1260	1.00E-01	7.80E-01	3.30E-01	9/11	1.00E-01	1.00E-01	n/a	n/a	0/11	4.25E+01	6/11	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	6.00E-02	1.70E-01	1.03E-01	10/45	7.53E-03	9.13E-02	0/45	2.80E-01	0/45	8.58E+00	7/45	8.58E-02
Technetium-99	7.61E-01	7.61E-01	7.61E-01	2/11	6.17E-01	7.74E-01	0/11	2.80E+00	0/11	3.62E+04	0/11	3.62E+02
Thorium-228	2.45E-01	3.92E-01	2.89E-01	11/11	1.17E-01	1.18E-01	0/11	1.60E+00	0/11	2.80E+00	11/11	2.80E-02
Thorium-230	1.50E-01	3.30E-01	2.11E-01	11/11	8.41E-02	1.32E-01	0/11	1.40E+00	0/11	1.49E+03	0/11	1.49E+01
Thorium-232	2.69E-01	4.47E-01	3.34E-01	11/11	4.58E-02	7.54E-02	0/11	1.50E+00	0/11	1.35E+03	0/11	1.35E+01
Uranium	2.01E+00	4.95E+01	1.96E+01	11/11	1.84E-01	2.54E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.14E-01	4.68E+00	1.90E+00	11/11	7.06E-02	1.20E-01	3/11	2.40E+00	0/11	1.98E+03	0/11	1.98E+01
Uranium-235	4.10E-02	5.91E-01	2.56E-01	11/11	1.34E-02	2.14E-02	8/11	1.40E-01	0/11	3.95E+01	3/11	3.95E-01
Uranium-238	1.75E+00	5.32E+01	1.86E+01	31/45	9.90E-02	1.69E+00	31/45	1.20E+00	0/45	1.71E+02	31/45	1.71E+00
Semivolatiles (mg/kg)												
Fluoranthene	6.20E-01	6.20E-01	6.20E-01	2/11	4.70E-01	5.00E-01	n/a	n/a	0/11	6.50E+04	0/11	2.21E+02
Polycyclic aromatic hydrocarbons (PAH)	9.00E-05	9.00E-05	9.00E-05	1/34	2.00E-01	2.00E-01	n/a	n/a	0/34	2.08E+01	0/34	2.12E-02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure 5.58. Soils Operable Unit: AOC 562

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 03-05-10

AOC 563 (Addendum I-B Soil Piles 20 and BW)

In December 2006, initial field reconnaissance, field radioactivity measurements, and limited sampling at Addendum 1-B Soil Piles were completed. The results of these efforts indicated radioactivity exceeding background. Addendum 1-B Soil Piles include 40 discrete piles covering an approximate area of 2.3 acres. Forty piles were identified; 34 along LBC east of PGDP and 6 along the NSDD north of PGDP, and they vary in size and shape, ranging from approximately 1 to 10 ft in height. Included are AOCs 492 and 541, also known as soil piles AR and O, respectively, and K013 (for a new total of 41 piles). The field investigation was completed between October and December 2008.

Area description

Field reconnaissance of Addendum 1-B Soil Piles identified 40 piles along LBC. The majority of the soil piles are located east of PGDP industrialized area and are on DOE-owned property. The soil piles are distributed along LBC and generally are bounded by PGDP industrialized area to the west, WKWMA/DOE boundary to the east, and the DOE boundary to the north and south. The Addendum 1-B Soil Piles vary in size and shape, ranging from approximately 5 to 250 ft in length and from 1 to 10 ft in height. The soil piles are widely dispersed and often occur as clusters. Vegetative regrowth on and adjacent to the piles is very dense, indicating the soil piles have been in their present locations for years.

Process history

Historical research was performed to attempt to determine the origin of the piles. The origin of the Addendum 1-B Soil Piles remains unknown; however, available information indicates that many of the PGDP-related soil piles may have originated from excavations associated with the creation, periodic dredging, and cleanout of the outfalls, ditches, and creeks that comprise the PGDP surface water management system. The Addendum 1-B Soil Piles are not operational.

Previous investigation results

The COPC at AOC 563, chromium, was found in pile 20 and PCBs at BW. The remaining chemicals were not recommended COPC due to levels similar to background or the chemicals are considered ubiquitous (e.g., PAHs). None of these COPCs exceed action levels for the PGDP teen recreational user.

Table 5.46 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.59).

Area utilities

No recirculating water lines or sewers are associated with these piles; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.46. Summary of Surface and Subsurface Historical Data at AOC 563

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Metals (mg/kg)												
Aluminum	7.30E+03	9.50E+03	8.40E+03	2/2	1.84E+01	3.92E+01	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Arsenic	4.69E+00	7.40E+00	6.05E+00	2/2	9.20E-01	9.79E-01	0/2	1.20E+01	0/2	3.15E+02	2/2	5.23E-01
Barium	8.56E+01	3.72E+02	2.45E+02	6/6	2.30E+00	2.45E+00	4/6	2.00E+02	0/6	1.00E+05	4/6	2.29E+02
Cadmium	6.41E-01	8.96E-01	7.69E-01	2/2	4.60E-01	4.90E-01	2/2	2.10E-01	0/2	7.05E+01	0/2	2.13E+01
Calcium	1.38E+03	2.59E+03	1.99E+03	2/2	9.20E+01	9.79E+01	0/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	6.54E+01	2.85E+02	1.83E+02	5/6	2.30E+00	2.45E+00	5/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	5.08E+00	8.91E+00	7.00E+00	2/2	9.20E-01	9.79E-01	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.14E+01	1.58E+01	1.36E+01	2/2	2.30E+00	2.45E+00	0/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	1.04E+04	1.35E+04	1.20E+04	2/2	1.84E+01	1.96E+01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	1.10E+01	2.12E+01	1.56E+01	6/6	9.20E-01	4.90E+00	0/6	3.60E+01	0/6	1.25E+03	0/6	5.00E+01
Magnesium	1.01E+03	1.04E+03	1.03E+03	2/2	4.60E+00	4.90E+00	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.81E+02	5.28E+02	4.05E+02	2/2	2.30E+00	2.45E+00	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Mercury	1.80E-02	3.10E-02	2.45E-02	2/2	1.60E-02	1.70E-02	0/2	2.00E-01	0/2	8.25E+02	0/2	9.82E-01
Nickel	6.63E+00	8.85E+00	7.74E+00	2/2	4.60E+00	4.90E+00	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Uranium	6.05E+00	1.51E+01	9.70E+00	3/6	9.20E-01	9.79E-01	3/6	4.90E+00	0/6	3.34E+03	0/6	2.02E+01
Vanadium	1.54E+01	2.53E+01	2.04E+01	2/2	2.30E+00	2.45E+00	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	8.25E+01	1.98E+02	1.40E+02	2/2	1.84E+01	1.96E+01	2/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	5.90E-01	7.40E-01	6.65E-01	2/6	1.30E-01	1.30E-01	n/a	n/a	0/6	4.25E+01	2/6	1.99E-01
PCB-1254	3.60E-01	5.20E-01	4.40E-01	2/2	9.00E-02	9.00E-02	n/a	n/a	0/2	1.82E+01	2/2	1.99E-01
PCB-1260	2.20E-01	2.30E-01	2.25E-01	2/2	1.00E-01	1.00E-01	n/a	n/a	0/2	4.25E+01	2/2	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	1.30E-01	2.03E-01	1.73E-01	4/6	9.00E-03	7.15E-02	0/6	4.90E-01	0/6	8.58E+00	4/6	8.58E-02
Neptunium-237	5.94E-02	5.94E-02	5.94E-02	1/2	4.76E-02	5.14E-02	0/2	1.00E-01	0/2	2.71E+01	0/2	2.71E-01
Technetium-99	9.41E-01	9.41E-01	9.41E-01	1/2	5.37E-01	5.37E-01	0/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-228	3.30E-01	3.78E-01	3.54E-01	2/2	1.05E-01	1.05E-01	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	2.56E-01	3.21E-01	2.89E-01	2/2	1.12E-01	1.16E-01	0/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Thorium-232	3.49E-01	3.87E-01	3.68E-01	2/2	6.74E-02	7.08E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium	2.02E+00	3.70E+00	2.86E+00	2/2	2.44E-01	2.54E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	6.01E-01	8.77E-01	7.39E-01	2/2	1.21E-01	1.21E-01	0/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	3.96E-02	6.76E-02	5.36E-02	2/2	1.35E-02	2.14E-02	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	1.38E+00	2.76E+00	2.07E+00	2/6	1.10E-01	1.43E+00	2/6	1.20E+00	0/6	1.71E+02	1/6	1.71E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	7.11E+03	9.06E+03	8.02E+03	4/4	1.80E+01	2.00E+01	0/4	1.20E+04	0/4	1.00E+05	4/4	4.64E+03
Arsenic	3.42E+00	7.36E+00	5.84E+00	4/4	8.99E-01	9.98E-01	0/4	7.90E+00	0/4	3.15E+02	4/4	5.23E-01
Barium	7.60E+01	3.22E+02	1.87E+02	10/10	2.25E+00	2.50E+00	6/10	1.70E+02	0/10	1.00E+05	5/10	2.29E+02
Cadmium	6.17E-01	8.08E-01	7.25E-01	4/4	4.50E-01	4.99E-01	4/4	2.10E-01	0/4	7.05E+01	0/4	2.13E+01
Calcium	1.26E+03	2.68E+03	1.94E+03	4/4	8.99E+01	9.98E+01	0/4	6.10E+03	n/a	n/a	n/a	n/a
Chromium	4.08E+01	3.34E+02	1.63E+02	9/10	2.25E+00	2.50E+00	9/10	4.30E+01	n/a	n/a	0/10	3.56E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.46. Summary of Surface and Subsurface Historical Data at AOC 563 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Cobalt	4.18E+00	8.61E+00	6.51E+00	4/4	8.99E-01	9.98E-01	0/4	1.30E+01	0/4	1.00E+05	0/4	1.92E+03
Copper	7.94E+00	1.90E+01	1.33E+01	4/4	2.25E+00	2.50E+00	0/4	2.50E+01	0/4	1.00E+05	0/4	4.93E+02
Iron	9.01E+03	1.27E+04	1.14E+04	4/4	1.80E+01	2.00E+01	0/4	2.80E+04	0/4	1.00E+05	4/4	2.07E+03
Lead	8.71E+00	2.48E+01	1.50E+01	10/10	8.99E-01	9.98E-01	1/10	2.30E+01	0/10	1.25E+03	0/10	5.00E+01
Magnesium	8.56E+02	9.74E+02	9.08E+02	4/4	4.50E+00	4.99E+00	0/4	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.91E+02	5.80E+02	3.85E+02	4/4	2.25E+00	2.50E+00	0/4	8.20E+02	0/4	4.64E+04	4/4	4.52E+01
Mercury	1.70E-02	3.50E-02	2.77E-02	3/4	1.60E-02	1.60E-02	0/4	1.30E-01	0/4	8.25E+02	0/4	9.82E-01
Nickel	5.31E+00	8.65E+00	7.29E+00	4/4	4.50E+00	4.99E+00	0/4	2.20E+01	0/4	9.30E+04	0/4	2.42E+02
Uranium	3.03E+00	1.24E+01	7.87E+00	6/10	8.99E-01	9.98E-01	4/10	4.60E+00	0/10	3.34E+03	0/10	2.02E+01
Vanadium	1.60E+01	2.48E+01	2.06E+01	4/4	2.25E+00	2.50E+00	0/4	3.70E+01	0/4	4.47E+03	4/4	3.32E+00
Zinc	4.83E+01	2.37E+02	1.35E+02	4/4	1.80E+01	2.00E+01	2/4	6.00E+01	0/4	1.00E+05	0/4	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.20E-01	3.54E+00	1.91E+00	4/10	1.30E-01	1.30E-01	n/a	n/a	0/10	4.25E+01	4/10	1.99E-01
PCB-1248	1.78E+00	1.95E+00	1.87E+00	2/4	1.00E-01	1.00E-01	n/a	n/a	0/4	4.25E+01	2/4	1.99E-01
PCB-1254	2.00E-01	1.16E+00	6.93E-01	4/4	9.00E-02	9.00E-02	n/a	n/a	0/4	1.82E+01	4/4	1.99E-01
PCB-1260	1.20E-01	4.30E-01	2.88E-01	4/4	1.00E-01	1.00E-01	n/a	n/a	0/4	4.25E+01	2/4	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	5.00E-02	2.88E-01	2.01E-01	6/10	9.51E-03	8.48E-02	2/10	2.80E-01	0/10	8.58E+00	5/10	8.58E-02
Neptunium-237	6.59E-02	1.20E-01	9.30E-02	2/4	4.81E-02	5.03E-02	n/a	n/a	0/4	2.71E+01	0/4	2.71E-01
Plutonium-239/240	1.94E-02	3.07E-02	2.51E-02	2/4	1.21E-02	1.27E-02	n/a	n/a	0/4	1.15E+03	0/4	1.15E+01
Technetium-99	1.24E+00	3.13E+00	2.19E+00	2/4	5.37E-01	6.57E-01	1/4	2.80E+00	0/4	3.62E+04	0/4	3.62E+02
Thorium-228	3.48E-01	4.45E-01	3.94E-01	4/4	1.05E-01	1.17E-01	0/4	1.60E+00	0/4	2.80E+00	4/4	2.80E-02
Thorium-230	2.45E-01	3.46E-01	2.88E-01	4/4	1.12E-01	1.31E-01	0/4	1.40E+00	0/4	1.49E+03	0/4	1.49E+01
Thorium-232	3.19E-01	4.37E-01	3.96E-01	4/4	6.75E-02	7.46E-02	0/4	1.50E+00	0/4	1.35E+03	0/4	1.35E+01
Uranium	1.43E+00	4.06E+00	2.75E+00	4/4	2.44E-01	2.51E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	5.00E-01	1.03E+00	7.49E-01	4/4	1.19E-01	1.24E-01	0/4	2.40E+00	0/4	1.98E+03	0/4	1.98E+01
Uranium-235	3.65E-02	7.87E-02	5.43E-02	4/4	1.36E-02	1.46E-02	0/4	1.40E-01	0/4	3.95E+01	0/4	3.95E-01
Uranium-238	8.94E-01	6.70E+00	2.90E+00	5/10	1.10E-01	1.23E+00	3/10	1.20E+00	0/10	1.71E+02	3/10	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

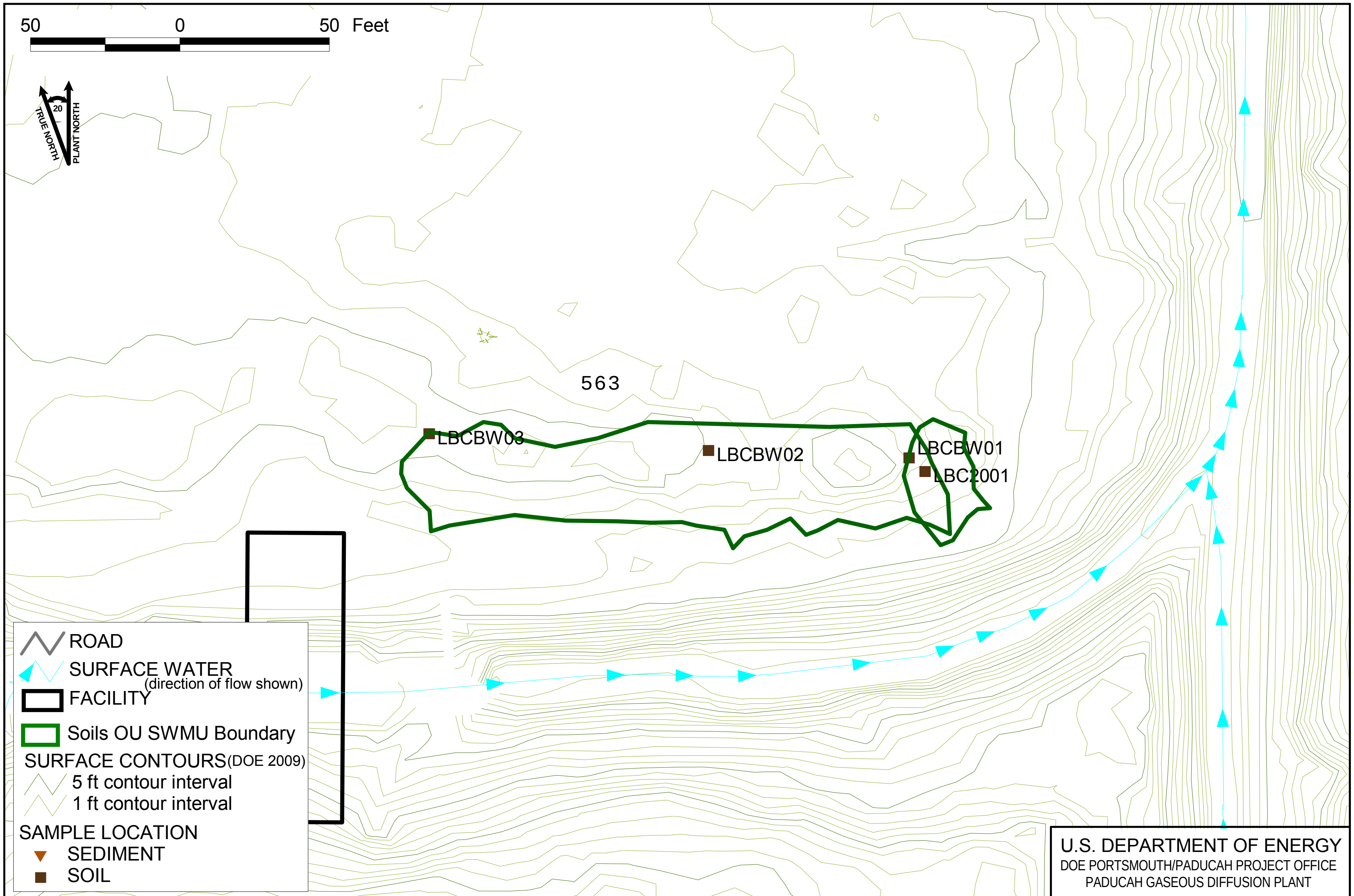


Figure 5.59. Soils Operable Unit: AOC 563

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 03-05-10

AOC 564 (Addendum I-B Soil Pile AT)

In December 2006, initial field reconnaissance, field radioactivity measurements, and limited sampling at Addendum 1-B Soil Piles were completed. The results of these efforts indicated radioactivity exceeding background. Addendum 1-B Soil Piles include 40 discrete piles covering an approximate area of 2.3 acres. Forty piles were identified; 34 along LBC east of the PGDP and 6 along the NSDD north of PGDP, and they vary in size and shape, ranging from approximately 1 to 10 ft in height. Included are AOCs 492 and 541, also known as soil piles AR and O, respectively, and K013 (for a new total of 41 piles). The field investigation was completed between October and December 2008.

Area description

Field reconnaissance of Addendum 1-B Soil Piles identified 40 piles along LBC. The majority of the soil piles are located east of PGDP industrialized area and are on DOE-owned property. The soil piles are distributed along LBC and generally are bounded by PGDP industrialized area to the west, the WKWMA/DOE boundary to the east, and the DOE boundary to the north and south. The Addendum 1-B Soil Piles vary in size and shape, ranging from approximately 5 to 250 ft in length and from 1 to 10 ft in height. The soil piles are widely dispersed and often occur as clusters. Vegetative regrowth on and adjacent to the piles is very dense, indicating the soil piles have been in their present locations for years.

Process history

Historical research was performed to attempt to determine the origin of the piles. The origin of the Addendum 1-B Soil Piles remains unknown; however, available information indicates that many of the PGDP-related soil piles may have originated from excavations associated with the creation, periodic dredging, and cleanout of the outfalls, ditches, and creeks that comprise the PGDP surface water management system. The Addendum 1-B Soil Piles are not operational.

Previous investigation results

The COPCs at AOC 564, arsenic, beryllium, vanadium, uranium-238, and PCBs, were found in pile AT. The remaining chemicals were not recommended COPCs due to levels similar to background or the chemicals are considered ubiquitous (e.g., PAHs). None of these COPCs exceed action levels for the PGDP teen recreational user.

Table 5.47 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.60).

Area utilities

No recirculating water lines or sewers are associated with these piles; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.47. Summary of Surface and Subsurface Historical Data at AOC 564

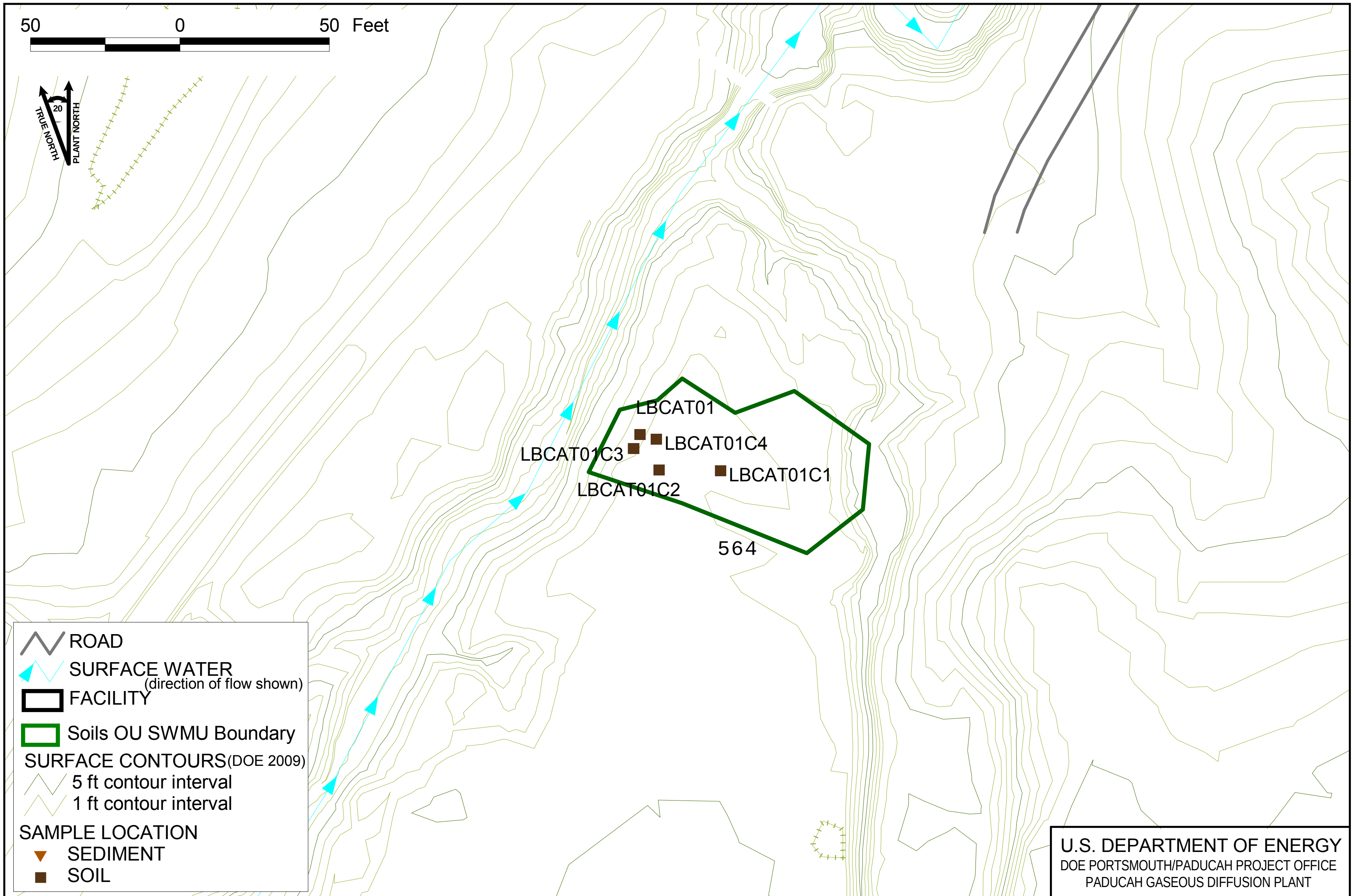
Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	7.12E+03	1.10E+04	9.06E+03	2/2	1.95E+01	1.94E+02	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Arsenic	1.83E+01	4.30E+01	3.07E+01	2/2	9.75E-01	9.70E+00	2/2	1.20E+01	0/2	3.15E+02	2/2	5.23E-01
Barium	6.27E+01	2.91E+02	2.06E+02	7/7	2.43E+00	2.44E+00	5/7	2.00E+02	0/7	1.00E+05	4/7	2.29E+02
Beryllium	1.71E+00	2.12E+00	1.92E+00	2/2	4.85E-01	4.88E-01	2/2	6.70E-01	0/2	1.28E+03	2/2	9.48E-01
Cadmium	1.40E+00	1.96E+00	1.68E+00	2/2	4.85E-01	4.88E-01	2/2	2.10E-01	0/2	7.05E+01	0/2	2.13E+01
Calcium	1.03E+03	1.95E+03	1.49E+03	2/2	9.70E+01	9.75E+01	0/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.69E+01	7.49E+01	4.61E+01	7/7	2.43E+00	2.44E+00	7/7	1.60E+01	n/a	n/a	0/7	3.56E+02
Cobalt	4.33E+00	5.54E+00	4.94E+00	2/2	9.70E-01	9.75E-01	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.81E+01	4.63E+01	3.22E+01	2/2	2.44E+00	2.43E+01	1/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	1.79E+04	2.38E+04	2.09E+04	2/2	1.94E+01	1.95E+01	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	1.58E+01	4.09E+01	2.71E+01	7/7	9.75E-01	9.70E+00	5/7	3.60E+01	0/7	1.25E+03	0/7	5.00E+01
Magnesium	4.10E+02	7.45E+02	5.78E+02	2/2	4.85E+00	4.88E+00	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.58E+02	3.51E+02	3.05E+02	2/2	2.43E+00	2.44E+00	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Mercury	2.10E-01	2.30E-01	2.20E-01	2/2	1.60E-02	1.70E-02	2/2	2.00E-01	0/2	8.25E+02	0/2	9.82E-01
Molybdenum	6.51E+00	7.84E+00	7.18E+00	2/2	4.85E+00	4.88E+00	n/a	n/a	0/2	2.50E+04	0/2	8.30E+01
Nickel	1.40E+01	1.79E+01	1.60E+01	2/2	4.85E+00	4.88E+00	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Selenium	2.18E+00	2.82E+00	2.50E+00	2/2	9.70E-01	9.75E-01	2/2	8.00E-01	0/2	2.56E+04	0/2	9.49E+01
Thallium	2.36E+00	2.36E+00	2.36E+00	1/2	1.94E+00	1.95E+00	1/2	2.10E-01	n/a	n/a	n/a	n/a
Uranium	1.75E+01	5.83E+01	3.59E+01	7/7	9.75E-01	9.70E+00	7/7	4.90E+00	0/7	3.34E+03	6/7	2.02E+01
Vanadium	5.62E+01	7.40E+01	6.51E+01	2/2	2.43E+00	2.44E+00	2/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	7.58E+01	1.06E+02	9.09E+01	2/2	1.94E+01	1.95E+01	2/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.15E+00	1.93E+00	1.54E+00	2/7	1.30E-01	1.30E-01	n/a	n/a	0/7	4.25E+01	2/7	1.99E-01
PCB-1254	1.06E+00	1.06E+00	1.06E+00	1/2	9.00E-02	9.00E-02	n/a	n/a	0/2	1.82E+01	1/2	1.99E-01
PCB-1260	8.70E-01	1.15E+00	1.01E+00	2/2	1.00E-01	1.00E-01	n/a	n/a	0/2	4.25E+01	2/2	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	1.20E-01	4.00E-01	2.65E-01	7/7	1.23E-02	1.18E-01	4/7	4.90E-01	0/7	8.58E+00	7/7	8.58E-02
Plutonium-239/240	2.09E-02	2.17E-02	2.13E-02	2/2	1.28E-02	1.43E-02	n/a	n/a	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	9.21E+00	9.21E+00	9.21E+00	1/2	6.62E-01	7.74E-01	1/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Thorium-228	3.13E-01	3.53E-01	3.33E-01	2/2	8.49E-02	1.18E-01	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	1.69E+00	1.87E+00	1.78E+00	2/2	5.55E-02	8.50E-02	2/2	1.50E+00	0/2	1.49E+03	0/2	1.49E+01
Thorium-232	3.22E-01	3.26E-01	3.24E-01	2/2	3.46E-02	4.59E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium	9.69E+00	1.52E+01	1.24E+01	2/2	1.85E-01	2.31E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.18E+00	6.58E+00	5.38E+00	2/2	7.09E-02	1.14E-01	2/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-235	2.43E-01	3.37E-01	2.90E-01	2/2	1.48E-02	1.67E-02	2/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-238	5.27E+00	8.55E+00	7.38E+00	3/7	9.92E-02	1.50E+00	3/7	1.20E+00	0/7	1.71E+02	3/7	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.47. Summary of Surface and Subsurface Historical Data at AOC 564 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Metals (mg/kg)												
Aluminum	1.08E+04	1.08E+04	1.08E+04	1/1	1.94E+02	1.94E+02	0/1	1.20E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	1.91E+01	1.91E+01	1.91E+01	1/1	9.68E-01	9.68E-01	1/1	7.90E+00	0/1	3.15E+02	1/1	5.23E-01
Barium	9.23E+01	3.80E+02	2.62E+02	6/6	2.42E+00	2.42E+00	5/6	1.70E+02	0/6	1.00E+05	4/6	2.29E+02
Beryllium	1.78E+00	1.78E+00	1.78E+00	1/1	4.84E-01	4.84E-01	1/1	6.90E-01	0/1	1.28E+03	1/1	9.48E-01
Cadmium	1.66E+00	1.66E+00	1.66E+00	1/1	4.84E-01	4.84E-01	1/1	2.10E-01	0/1	7.05E+01	0/1	2.13E+01
Calcium	1.68E+03	1.68E+03	1.68E+03	1/1	9.68E+01	9.68E+01	0/1	6.10E+03	n/a	n/a	n/a	n/a
Chromium	2.83E+01	8.32E+01	5.23E+01	4/6	2.42E+00	2.42E+00	4/6	4.30E+01	n/a	n/a	0/6	3.56E+02
Cobalt	5.84E+00	5.84E+00	5.84E+00	1/1	9.68E-01	9.68E-01	0/1	1.30E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	4.42E+01	4.42E+01	4.42E+01	1/1	2.42E+01	2.42E+01	1/1	2.50E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	2.51E+04	2.51E+04	2.51E+04	1/1	1.94E+01	1.94E+01	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	1.19E+01	4.01E+01	2.41E+01	6/6	9.68E+00	9.68E+00	2/6	2.30E+01	0/6	1.25E+03	0/6	5.00E+01
Magnesium	7.51E+02	7.51E+02	7.51E+02	1/1	4.84E+00	4.84E+00	0/1	2.10E+03	n/a	n/a	n/a	n/a
Manganese	4.10E+02	4.10E+02	4.10E+02	1/1	2.42E+00	2.42E+00	0/1	8.20E+02	0/1	4.64E+04	1/1	4.52E+01
Mercury	1.70E-01	1.70E-01	1.70E-01	1/1	1.60E-02	1.60E-02	1/1	1.30E-01	0/1	8.25E+02	0/1	9.82E-01
Molybdenum	6.29E+00	6.29E+00	6.29E+00	1/1	4.84E+00	4.84E+00	n/a	n/a	0/1	2.50E+04	0/1	8.30E+01
Nickel	1.74E+01	1.74E+01	1.74E+01	1/1	4.84E+00	4.84E+00	0/1	2.20E+01	0/1	9.30E+04	0/1	2.42E+02
Selenium	2.74E+00	2.74E+00	2.74E+00	1/1	9.68E-01	9.68E-01	1/1	7.00E-01	0/1	2.56E+04	0/1	9.49E+01
Uranium	1.57E+01	5.45E+01	3.05E+01	5/6	9.68E+00	9.68E+00	5/6	4.60E+00	0/6	3.34E+03	3/6	2.02E+01
Vanadium	6.39E+01	6.39E+01	6.39E+01	1/1	2.42E+00	2.42E+00	1/1	3.70E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	9.70E+01	9.70E+01	9.70E+01	1/1	1.94E+01	1.94E+01	1/1	6.00E+01	0/1	1.00E+05	0/1	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	7.40E-01	7.40E-01	7.40E-01	1/6	1.30E-01	1.30E-01	n/a	n/a	0/6	4.25E+01	1/6	1.99E-01
PCB-1260	7.40E-01	7.40E-01	7.40E-01	1/1	1.00E-01	1.00E-01	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
Radionuclides (pCi/g)												
Cesium-137	7.00E-02	4.75E-01	2.59E-01	5/6	8.80E-03	1.38E-01	2/6	2.80E-01	0/6	8.58E+00	4/6	8.58E-02
Plutonium-239/240	2.06E-02	2.06E-02	2.06E-02	1/1	1.29E-02	1.29E-02	n/a	n/a	0/1	1.15E+03	0/1	1.15E+01
Thorium-228	3.39E-01	3.39E-01	3.39E-01	1/1	8.54E-02	8.54E-02	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	1.39E+00	1.39E+00	1.39E+00	1/1	5.93E-02	5.93E-02	0/1	1.40E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	3.63E-01	3.63E-01	3.63E-01	1/1	3.72E-02	3.72E-02	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium	1.56E+01	1.56E+01	1.56E+01	1/1	2.29E-01	2.29E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	6.70E+00	6.70E+00	6.70E+00	1/1	1.14E-01	1.14E-01	1/1	2.40E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	3.48E-01	3.48E-01	3.48E-01	1/1	1.57E-02	1.57E-02	1/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	6.38E+00	8.54E+00	7.65E+00	4/6	9.99E-02	1.35E+00	4/6	1.20E+00	0/6	1.71E+02	4/6	1.71E+00

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



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PADUCAH GASEOUS DIFFUSION PLANT

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Figure 5.60. Soils Operable Unit: AOC 564

Figure No. \SoilsOU\sou_swmusr6.apr
DATE 03-05-10

AOC 565 (Along Bayou Creek north of C-611 Water Treatment Plant. Rubble Area K-19)

Area description

This rubble area is used for erosion control along the north wall of Bayou Creek, north of the C-611 Water Treatment Plant and is approximately 60 ft by 30 ft.

Process history

This area was discovered in November 2006, during walkover/radiological surveys after soil and rubble areas were found along Little Bayou and Bayou Creeks. This rubble area was designated as Rubble Area KY-19. The readings collected in November 2006 were unfiltered 200 counts per minute (background is ~ 50 cpm), fixed contamination, and no measurable dose for KY-19. The area was immediately posted. This area was further visited on February 17, 2009; however, it was unaccessible due to limbs fallen from the January 2009 ice storm that damaged many trees in the western Kentucky area. The area was cleared and revisited on March 25, 2009, at which time only the top of the creek bank was accessible due to water in the creek.

Previous investigation results

During the March 25, 2009, visit, the following information was gathered: 1) the area can be accessed by a vehicle, but the material is very large and cannot be picked up by hand; 2) the rubble is difficult to access once on-site due to the steep incline of the creek bank; 3) there are no markings indicating where the rubble may have originated; 4) there are no visible oil stains on the rubble; 5) the material is serving a beneficial function (erosion control of the creek bank); 6) the radiological readings obtained during March 2009 on top of the creek bank were background. Radiological readings obtained on an accessible concrete slab within the creek bank during November 2006 indicated 200 counts per minute fixed readings, no measurable dose; and 7) GPS readings were collected. Investigation results can be found in the *Site Evaluation Report for Rubble Area at the Paducah Gaseous Diffusion Plant,* DOE/LX/07-0227&D2/R1.

Table 5.48 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.61).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.48. Summary of Surface and Subsurface Historical Data at SWMU 565

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minumum	Maximum	Average	of Detection	Minumum	Maximum	Bkgd	Value	AL1	Level1	NAL1	Level1
Surface Soils												
Metals (mg/kg)												
Aluminum	1.26E+03	1.26E+03	1.26E+03	1/1	n/a	n/a	0/1	1.30E+04	0/1	1.00E+05	0/1	4.64E+03
Arsenic	5.00E+00	5.00E+00	5.00E+00	1/1	n/a	n/a	0/1	1.20E+01	0/1	3.15E+02	1/1	5.23E-01
Barium	1.39E+01	1.39E+01	1.39E+01	1/1	n/a	n/a	0/1	2.00E+02	0/1	1.00E+05	0/1	2.29E+02
Beryllium	9.80E+00	9.80E+00	9.80E+00	1/1	n/a	n/a	1/1	6.70E-01	0/1	1.28E+03	1/1	9.48E-01
Cadmium	1.10E+00	1.10E+00	1.10E+00	1/1	n/a	n/a	1/1	2.10E-01	0/1	7.05E+01	0/1	2.13E+01
Calcium	2.01E+02	2.01E+02	2.01E+02	1/1	n/a	n/a	0/1	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.63E+01	1.63E+01	1.63E+01	1/1	n/a	n/a	1/1	1.60E+01	n/a	n/a	0/1	3.56E+02
Cobalt	3.20E+00	3.20E+00	3.20E+00	1/1	n/a	n/a	0/1	1.40E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	1.90E+00	1.90E+00	1.90E+00	1/1	n/a	n/a	0/1	1.90E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	9.67E+03	9.67E+03	9.67E+03	1/1	n/a	n/a	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	6.50E+00	6.50E+00	6.50E+00	1/1	n/a	n/a	0/1	3.60E+01	0/1	1.25E+03	0/1	5.00E+01
Magnesium	1.20E+02	1.20E+02	1.20E+02	1/1	n/a	n/a	0/1	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.63E+02	2.63E+02	2.63E+02	1/1	n/a	n/a	0/1	1.50E+03	0/1	4.64E+04	1/1	4.52E+01
Nickel	6.10E+00	6.10E+00	6.10E+00	1/1	n/a	n/a	0/1	2.10E+01	0/1	9.30E+04	0/1	2.42E+02
Vanadium	3.00E+01	3.00E+01	3.00E+01	1/1	n/a	n/a	0/1	3.80E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	1.09E+01	1.09E+01	1.09E+01	1/1	n/a	n/a	0/1	6.50E+01	0/1	1.00E+05	0/1	2.73E+03
Radionuclides (pCi/g)												
Beta activity	1.80E+00	1.80E+00	1.80E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	4.70E-02	4.70E-02	4.70E-02	1/1	n/a	n/a	0/1	1.50E+00	0/1	1.49E+03	0/1	1.49E+01
Uranium-234	1.80E-01	1.80E-01	1.80E-01	1/1	n/a	n/a	0/1	2.50E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-235	1.50E-02	1.50E-02	1.50E-02	1/1	n/a	n/a	0/1	1.40E-01	0/1	3.95E+01	0/1	3.95E-01
Uranium-238	3.50E-01	3.50E-01	3.50E-01	1/1	n/a	n/a	0/1	1.20E+00	0/1	1.71E+02	0/1	1.71E+00
Volatiles (mg/kg)												
Acetone	7.30E-02	7.30E-02	7.30E-02	1/1	1.30E-02	1.30E-02	0/1		0/1	1.91E+04	0/1	3.58E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

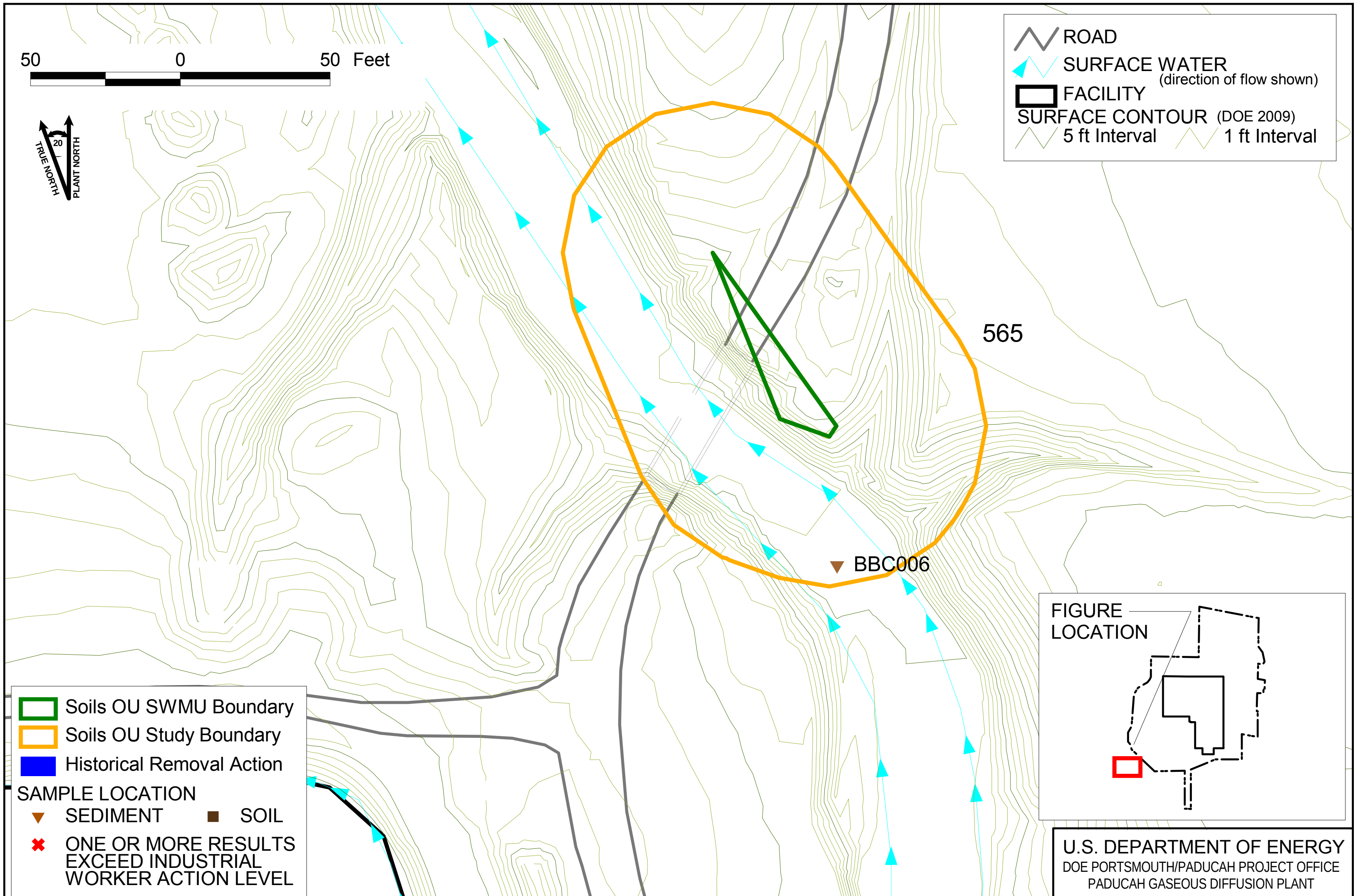

Figure 5.61. Soils Operable Unit: AOC 565

PADUCAH Remediation Services
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Figure No. \SoilsOU\sou_swmus486-487.apr
DATE 03-05-2010

AOC 567 (Contaminated Soil Area K013)

Area description

This SWMU/AOC encompasses five individual soil piles located near Outfall 013. The soils piles vary in size and are approximately 3 ft high.

Process history

This area was discovered in June 2008, when a sampling and analysis plan (SAP) for other soil piles in the area was approved. The area contained soil piles that likely were generated as a result of past construction activities at PGDP. This area was characterized with the other soil piles in the area in October 2008 during the Soil Pile Addendum 1-B Site Evaluation. The soil piles are not grouped with other soil piles because they are not in close proximity to other piles.

Previous investigation results

As a result of the December 2008 sampling event, risk screening determined uranium-238 to be a COPC in the soil piles (DOE 2009b).

Historical data will be summarized in the RI. Historical sample locations are shown in Figure 5.62.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the AOC.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

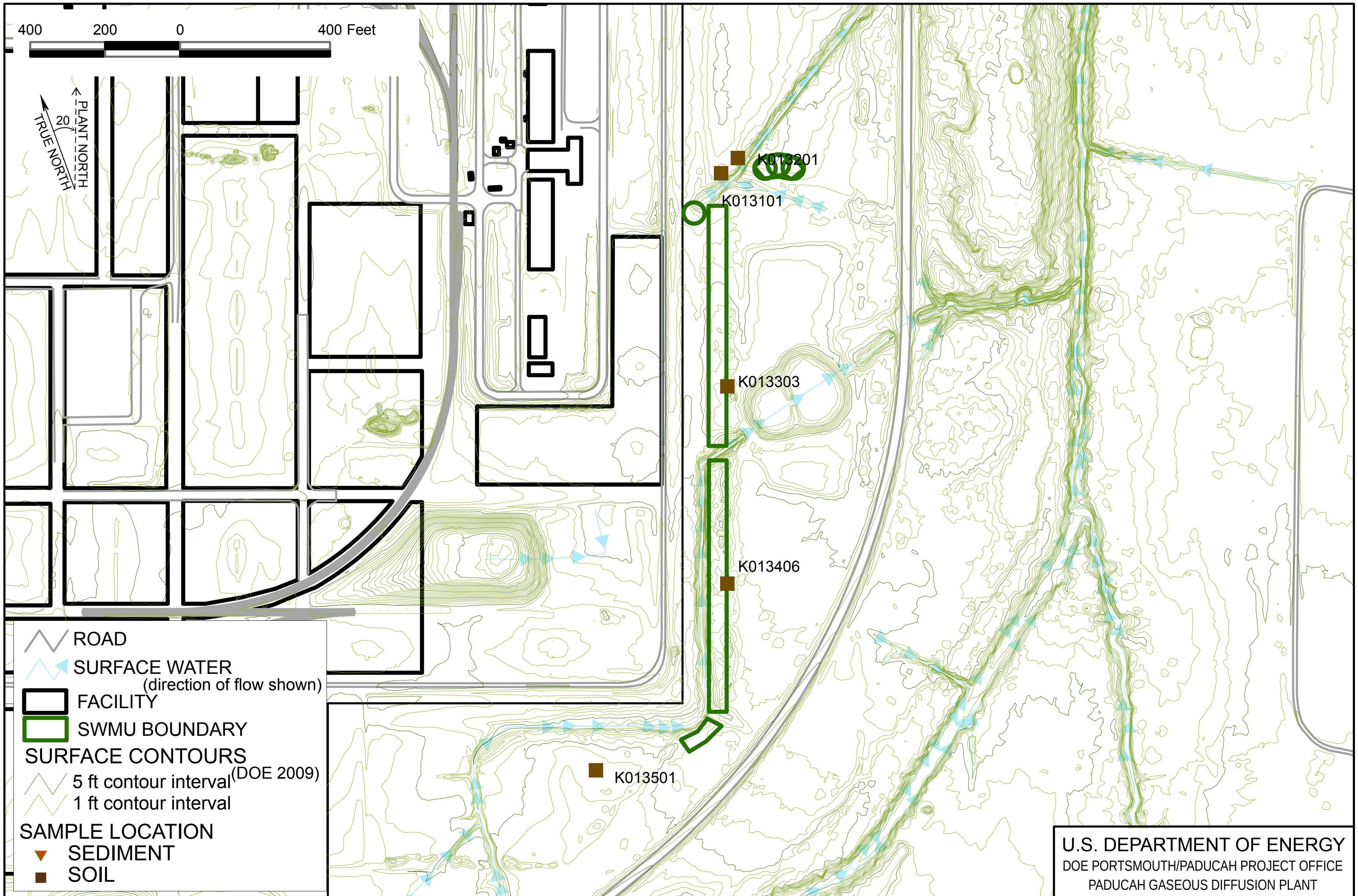

Figure 5.62. Soils Operable Unit: AOC 567

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Figure No. SoilsOU_AOC567.mxd
DATE 03-06-10

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5.1.8 Group 3–Scrap Yard

SWMU 12 (C-747-A UF4 Drum Yard)

Area description

The C-747-A UF_4 Drum Yard (SWMU 12) is located in the northwest corner of the plant. SWMU 12, formerly known as "Drum Mountain," is approximately 20,000 ft^2. SWMU 12 also is sited within C-747-A Burial Ground (SWMU 7); therefore, any scrap metal identified by the SOU RI found to be 10 ft bgs or below will be investigated under the BGOU.

Process history

Between 1978 and 2000, the C-747-A UF_4 Drum Yard was used for the storage of UF_4 drums generated in the pulverizer and screener operation at C-400. These drums had been emptied, rinsed, and frequently crushed prior to storage.

The UF_4 drum pile was placed over Pit G and was reported to contain noncombustible, contaminated, and uncontaminated trash and equipment of the SWMU 7 burial grounds.

These storage yards were emptied, as specified by the *Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant* (DOE 2001a) and documented in the *Removal Action Report for the Scrap Metal Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2008a).

Previous investigation results

"Drum Mountain" was sampled in 1996 and 2000 for various constituents, such as metals, volatiles, semivolatiles, and radionuclides. The area also was investigated as part of the BGOU RI (January–May 2007). The results of the BGOU investigation concluded that metal exists to a depth of 16 ft bgs.

Table 5.49 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.63).

Area utilities

No recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.49. Summary of Surface and Subsurface Historical Data at SWMU 12

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Anions (mg/kg)												
Chloride	2.20E+00	3.80E+00	3.07E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoride	5.50E+00	8.10E+00	6.77E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Nitrate/Nitrite	3.50E+00	7.10E+00	5.67E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sulfate	4.90E+00	8.00E+00	6.77E+00	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	4.60E+03	1.48E+04	9.02E+03	6/6	n/a	n/a	1/6	1.30E+04	0/6	1.00E+05	5/6	4.64E+03
Antimony	5.40E-01	9.00E-01	6.73E-01	4/6	3.30E-01	3.30E-01	4/6	2.10E-01	0/6	4.63E+02	4/6	3.79E-01
Arsenic	4.40E+00	1.60E+01	6.87E+00	6/6	n/a	n/a	1/6	1.20E+01	0/6	3.15E+02	6/6	5.23E-01
Barium	2.10E+01	8.90E+01	5.61E+01	6/6	n/a	n/a	0/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	4.80E-01	2.44E+01	7.54E+00	6/6	n/a	n/a	3/6	6.70E-01	0/6	1.28E+03	3/6	9.48E-01
Cadmium	1.20E-01	3.30E+00	1.54E+00	4/6	n/a	n/a	2/6	2.10E-01	0/6	7.05E+01	0/6	2.13E+01
Calcium	2.38E+03	5.40E+03	4.39E+03	6/6	n/a	n/a	0/6	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.80E+01	4.04E+01	2.84E+01	6/6	n/a	n/a	6/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	5.00E+00	9.60E+00	7.27E+00	6/6	n/a	n/a	0/6	1.40E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	6.10E+00	2.48E+01	1.57E+01	6/6	n/a	n/a	1/6	1.90E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	1.40E+04	2.80E+04	2.07E+04	6/6	n/a	n/a	0/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	4.70E+00	2.40E+01	1.75E+01	6/6	n/a	n/a	1/6	3.60E+01	0/6	1.25E+03	0/6	5.00E+01
Magnesium	3.80E+02	1.10E+03	7.96E+02	6/6	n/a	n/a	0/6	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.60E+02	4.70E+02	3.00E+02	6/6	n/a	n/a	0/6	1.50E+03	0/6	4.64E+04	6/6	4.52E+01
Mercury	5.20E-02	8.30E-02	7.07E-02	3/6	1.00E-01	1.00E-01	0/6	2.00E-01	0/6	8.25E+02	0/6	9.82E-01
Nickel	7.10E+00	2.10E+01	1.46E+01	6/6	n/a	n/a	0/6	2.10E+01	0/6	9.30E+04	0/6	2.42E+02
Potassium	2.15E+02	5.83E+02	3.99E+02	2/6	n/a	n/a	0/6	1.30E+03	n/a	n/a	n/a	n/a
Selenium	6.30E-01	8.80E-01	7.55E-01	2/6	1.10E-01	1.10E-01	1/6	8.00E-01	0/6	2.56E+04	0/6	9.49E+01
Silver	1.80E-01	1.60E+00	8.90E-01	2/6	1.10E+00	1.10E+00	0/6	2.30E+00	0/6	2.07E+04	0/6	4.11E+01
Sodium	2.10E+01	7.10E+01	4.44E+01	3/6	n/a	n/a	0/6	3.20E+02	n/a	n/a	n/a	n/a
Thallium	2.80E-01	2.00E+00	1.28E+00	5/6	2.20E-01	2.20E-01	5/6	2.10E-01	n/a	n/a	n/a	n/a
Tin	3.30E+00	7.20E+00	5.43E+00	3/4	n/a	n/a	n/a	n/a	0/4	1.00E+05	0/4	2.79E+03
Uranium	9.40E+01	3.80E+02	1.69E+02	4/4	n/a	n/a	4/4	4.90E+00	0/4	3.34E+03	4/4	2.02E+01
Vanadium	1.90E+01	5.20E+01	2.88E+01	6/6	n/a	n/a	1/6	3.80E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	2.60E+01	1.00E+02	5.44E+01	6/6	n/a	n/a	2/6	6.50E+01	0/6	1.00E+05	0/6	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB-1260	2.70E-02	3.90E-01	1.95E-01	4/6	1.70E-01	1.80E-01	n/a	n/a	0/6	4.25E+01	2/6	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	9.17E+00	2.01E+02	9.23E+01	9/10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.56E+00	6.90E+02	2.39E+02	9/10	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	9.00E-02	4.76E-01	2.12E-01	4/6	n/a	n/a	3/6	1.00E-01	0/6	2.71E+01	1/6	2.71E-01
Plutonium-239	1.30E-01	2.30E+00	7.94E-01	5/6	n/a	n/a	5/6	2.50E-02	0/6	1.15E+03	0/6	1.15E+01
Technetium-99	1.54E+00	1.80E+01	6.41E+00	6/6	n/a	n/a	2/6	2.50E+00	0/6	3.62E+04	0/6	3.62E+02
Thorium-230	8.30E-01	1.40E+01	4.12E+00	6/6	n/a	n/a	4/6	1.50E+00	0/6	1.49E+03	0/6	1.49E+01
Uranium-234	8.92E+00	1.10E+02	4.31E+01	6/6	n/a	n/a	6/6	2.50E+00	0/6	1.98E+03	3/6	1.98E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.49. Summary of Surface and Subsurface Historical Data at SWMU 12 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Uranium-235	4.50E+00	8.00E+00	6.25E+00	2/2	n/a	n/a	2/2	1.40E-01	0/2	3.95E+01	2/2	3.95E-01
Uranium-235/236	1.35E+00	4.87E+00	2.39E+00	4/4	n/a	n/a	n/a	n/a	0/4	3.95E+01	4/4	3.95E-01
Uranium-238	3.60E+01	5.30E+02	1.86E+02	6/6	n/a	n/a	6/6	1.20E+00	2/6	1.71E+02	6/6	1.71E+00
Semivolatiles (mg/kg)												
Benz(a)anthracene	2.60E-02	5.20E-02	3.90E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Benzo(a)pyrene	2.00E-02	7.50E-02	5.18E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+01	3/6	2.12E-02
Benzo(b)fluoranthene	3.40E-02	1.00E-01	6.98E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Benzo(ghi)perylene	7.60E-02	7.60E-02	7.60E-02	1/6	3.60E-01	3.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	2.20E-02	4.40E-02	3.67E-02	3/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+03	0/6	2.12E+00
Chrysene	1.80E-02	4.50E-02	3.08E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+04	0/6	2.12E+01
Fluoranthene	2.00E-02	3.90E-02	3.23E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Indeno(1,2,3-cd)pyrene	7.10E-02	7.10E-02	7.10E-02	1/6	3.60E-01	3.70E-01	n/a	n/a	0/6	2.08E+02	0/6	2.12E-01
Phenanthrene	1.50E-02	2.80E-02	2.20E-02	3/6	3.60E-01	3.70E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	3.70E-02	7.40E-02	5.83E-02	4/6	3.60E-01	3.70E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02
Volatiles (mg/kg)												
Chloroform	7.00E-03	7.00E-03	7.00E-03	1/2	5.00E-03	6.00E-03	n/a	n/a	0/2	3.70E+00	0/2	1.23E-01
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	1.90E+04	2.60E+04	2.23E+04	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.60E+03	9.02E+03	7.62E+03	5/5	1.78E+01	2.00E+01	0/5	1.20E+04	0/5	1.00E+05	5/5	4.64E+03
Arsenic	1.59E+00	6.22E+00	2.98E+00	5/5	8.92E-01	9.99E-01	0/5	7.90E+00	0/5	3.15E+02	5/5	5.23E-01
Barium	5.01E+01	9.55E+01	7.05E+01	5/5	2.23E+00	2.50E+00	0/5	1.70E+02	0/5	1.00E+05	0/5	2.29E+02
Calcium	6.37E+02	1.28E+03	9.26E+02	5/5	8.92E+01	9.99E+01	0/5	6.10E+03	n/a	n/a	n/a	n/a
Chromium	7.71E+00	1.21E+01	1.03E+01	5/5	2.23E+00	2.50E+00	0/5	4.30E+01	n/a	n/a	0/5	3.56E+02
Cobalt	2.41E+00	6.41E+00	3.98E+00	4/5	2.23E+00	2.50E+00	0/5	1.30E+01	0/5	1.00E+05	0/5	1.92E+03
Copper	5.43E+00	1.14E+01	8.71E+00	5/5	2.23E+00	2.50E+00	0/5	2.50E+01	0/5	1.00E+05	0/5	4.93E+02
Iron	6.58E+03	1.23E+04	9.85E+03	5/5	1.78E+01	2.00E+01	0/5	2.80E+04	0/5	1.00E+05	5/5	2.07E+03
Lead	5.72E+00	1.53E+01	8.36E+00	5/5	8.92E-01	9.99E-01	0/5	2.30E+01	0/5	1.25E+03	0/5	5.00E+01
Magnesium	5.23E+02	1.33E+03	1.00E+03	5/5	4.46E+00	5.00E+00	0/5	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.92E+01	2.56E+02	1.83E+02	5/5	2.23E+00	2.50E+00	0/5	8.20E+02	0/5	4.64E+04	5/5	4.52E+01
Mercury	1.80E-02	2.80E-02	2.20E-02	3/5	1.70E-02	2.00E-02	0/5	1.30E-01	0/5	8.25E+02	0/5	9.82E-01
Nickel	5.31E+00	1.34E+01	9.24E+00	5/5	4.46E+00	5.00E+00	0/5	2.20E+01	0/5	9.30E+04	0/5	2.42E+02
Sodium	1.54E+02	1.91E+02	1.71E+02	4/5	8.92E+01	9.99E+01	0/5	3.40E+02	n/a	n/a	n/a	n/a
Uranium	9.62E-01	3.86E+00	2.41E+00	2/5	8.92E-01	9.99E-01	0/5	4.60E+00	0/5	3.34E+03	0/5	2.02E+01
Vanadium	4.50E+00	3.09E+01	1.79E+01	5/5	2.23E+00	2.50E+00	0/5	3.70E+01	0/5	4.47E+03	5/5	3.32E+00
Zinc	2.13E+01	3.36E+01	2.78E+01	4/5	1.78E+01	2.00E+01	0/5	6.00E+01	0/5	1.00E+05	0/5	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	5.40E+00	8.18E+00	6.76E+00	5/5	1.26E+00	1.92E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.38E+00	1.06E+01	5.38E+00	5/5	1.32E+00	1.79E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	2.55E+00	2.60E+00	2.58E+00	2/5	1.72E+00	1.74E+00	2/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Thorium-228	3.26E-01	5.58E-01	3.84E-01	5/5	6.66E-02	9.35E-02	0/5	1.60E+00	0/5	2.80E+00	5/5	2.80E-02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.49. Summary of Surface and Subsurface Historical Data at SWMU 12 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Thorium-230	2.99E-01	5.21E-01	3.86E-01	5/5	1.10E-01	2.48E-01	0/5	1.40E+00	0/5	1.49E+03	0/5	1.49E+01
Thorium-232	3.42E-01	4.54E-01	3.96E-01	5/5	4.87E-02	1.76E-01	0/5	1.50E+00	0/5	1.35E+03	0/5	1.35E+01
Thorium-234	2.91E+00	3.25E+00	3.08E+00	2/5	9.92E-01	1.23E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	3.98E+00	3.98E+00	3.98E+00	1/5	3.00E-01	3.22E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.20E+00	1.20E+00	1.20E+00	1/5	1.34E-01	1.41E-01	0/5	2.40E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-235	1.19E-01	1.19E-01	1.19E-01	1/5	3.66E-02	4.52E-02	0/5	1.40E-01	0/5	3.95E+01	0/5	3.95E-01
Uranium-238	1.81E-01	2.66E+00	1.03E+00	3/5	1.24E-01	1.36E-01	1/5	1.20E+00	0/5	1.71E+02	1/5	1.71E+00
Volatiles (mg/kg)												
1,1,1-Trichloroethane	6.77E-02	1.59E-01	1.13E-01	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	9.38E+03	0/5	1.56E+02
1,1,2-Trichloroethane	1.40E-01	1.49E-01	1.45E-01	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	1.69E+02	0/5	1.18E+00
1,1-Dichloroethane	3.44E-01	3.78E-01	3.61E-01	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	5.52E+03	0/5	1.55E+02
1,1-Dichloroethene	1.11E+00	1.66E+00	1.39E+00	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	1.21E+01	2/5	9.59E-02
1,2-Dichloroethane	1.50E-02	1.63E-02	1.57E-02	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	6.39E+01	0/5	5.28E-01
Acetone	1.23E-02	1.23E-02	1.23E-02	1/5	4.97E-03	5.04E-03	n/a	n/a	0/5	1.91E+04	0/5	3.58E+02
cis-1,2-Dichloroethene	8.53E-03	8.97E-03	8.75E-03	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	4.63E+02	0/5	1.34E+01
Tetrachloroethene	6.20E-03	6.20E-03	6.20E-03	1/5	4.97E-03	5.04E-03	n/a	n/a	0/5	1.46E+03	0/5	3.90E+00
Toluene	9.26E-02	9.26E-02	9.26E-02	1/5	4.97E-03	5.04E-03	n/a	n/a	0/5	7.28E+03	0/5	2.11E+02
Trichloroethene	6.87E-03	8.08E-03	7.48E-03	2/5	4.97E-03	5.04E-03	n/a	n/a	0/5	2.98E+02	0/5	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

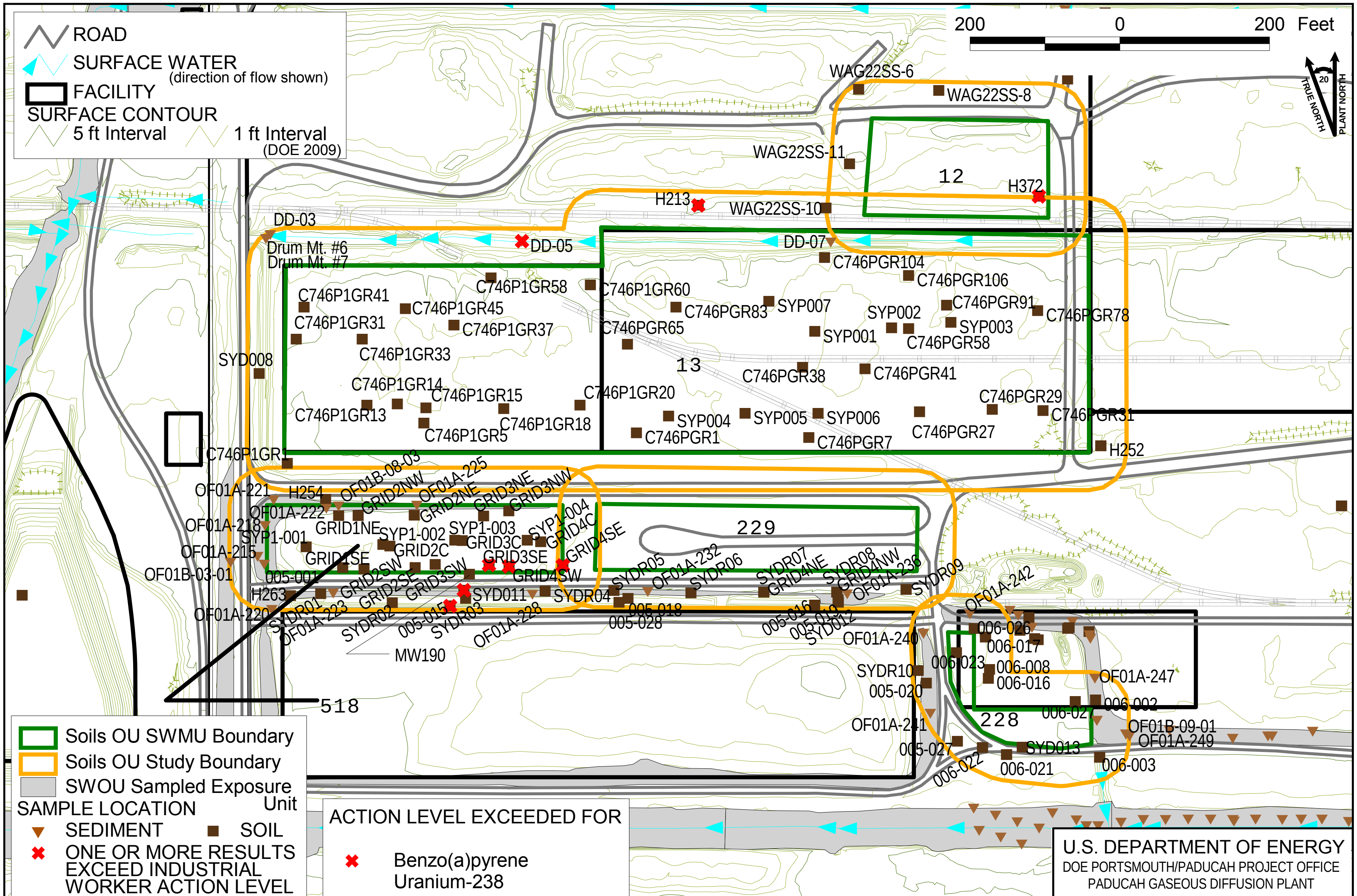


Figure 5.63. Soils Operable Unit: SWMUs 12, 13, 228, 229, and 518

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

<u>SWMU 13 (C-746 P and P1 Scrap Yards)</u>

<u>Area description</u>

The C-746-P and C-746-P1 Clean Scrap Yard (SWMU 13) are located in the northwest corner of plant site. SWMU 13 includes both scrap yards, C-746-P and C-746-P1, and is approximately 314,000 ft^2 (290 ft x 1,076 ft). This SWMU is part of the SOU and the BGOU.

<u>Process history</u>

SWMU 13, C-746-P Clean Scrap Yard, was an aboveground scrap yard used for storage from the 1950s to 2005 for clean scrap metal prior to sale to metal reclaimers. During the summer of 1989, some scrap at the yard was found to be contaminated by uranium. Based on this discovery, the site was divided into a contaminated scrap yard, comprising approximately the eastern two-thirds of the original waste management unit and designated as C-746-P, and a clean scrap yard, comprising approximately the western one-third of the original unit and designated C-746-P1. Suspected contaminants of the scrap metal include uranium and asbestos. The scrap yard also contained drums of "heels" of remnant fluids potentially contaminated by petroleum hydrocarbons and TCE.

These storage yards were emptied, as specified by the *Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant* (DOE 2001a) and documented in the *Removal Action Report for the Scrap Metal Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2008a).

<u>Previous investigation results</u>

The Phase II Site Investigation (1991) sampled shallow soils in the area. Suspected contaminants of concern for the SWMU soils include semivolatiles, metals, and radionuclides.

SWMU 13 has had geophysics performed on areas inside the C-746-P and C-746-P1 Scrap Yards as part of the BGOU RI. Geophysics was performed on these areas to assess if scrap metal was buried in them. The results of the geophysics survey indicated there was metal found in three areas. Metals were found in two locations at a depth of 2 ft bgs and in one location at a depth of 2 ft bgs with a center trough of 4 to 6 ft bgs.

Table 5.50 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.64).

<u>Area utilities</u>

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU. Only one fire water line is located with the SWMU.

<u>Data gap determination</u>

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.50. Summary of Surface and Subsurface Historical Data at SWMU 13

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Anions (mg/kg)												
Chloride	2.90E+00	2.90E+00	2.90E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoride	3.20E+01	3.20E+01	3.20E+01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Sulfate	4.40E+00	4.40E+00	4.40E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	2.58E+03	1.60E+04	8.37E+03	17/17	2.00E+01	3.43E+01	3/17	1.30E+04	0/17	1.00E+05	16/17	4.64E+03
Antimony	4.70E-01	3.00E+00	1.21E+00	5/17	3.90E-01	2.00E+01	5/17	2.10E-01	0/17	4.63E+02	5/17	3.79E-01
Arsenic	4.10E+00	8.35E+00	5.59E+00	9/17	1.50E+00	5.00E+00	1/17	1.20E+01	0/17	3.15E+02	9/17	5.23E-01
Barium	2.33E+01	1.35E+02	8.55E+01	17/17	2.50E+00	3.43E+01	0/17	2.00E+02	0/17	1.00E+05	0/17	2.29E+02
Beryllium	1.70E-01	8.40E+00	1.63E+00	7/17	5.00E-01	8.60E-01	1/17	6.70E-01	0/17	1.28E+03	1/17	9.48E-01
Cadmium	1.20E+00	2.80E+00	1.78E+00	4/17	7.20E-01	2.00E+00	4/17	2.10E-01	0/17	7.05E+01	0/17	2.13E+01
Calcium	7.81E+02	2.93E+05	2.28E+04	17/17	2.00E+02	8.56E+02	3/17	2.00E+05	n/a	n/a	n/a	n/a
Chromium	3.30E+00	2.50E+01	1.34E+01	17/17	1.50E+00	2.50E+00	4/17	1.60E+01	n/a	n/a	0/17	3.56E+02
Cobalt	3.10E+00	1.00E+01	4.89E+00	17/17	2.50E+00	8.60E+00	0/17	1.40E+01	0/17	1.00E+05	0/17	1.92E+03
Copper	4.20E+00	1.70E+02	2.98E+01	17/17	2.50E+00	4.30E+00	4/17	1.90E+01	0/17	1.00E+05	0/17	4.93E+02
Iron	4.68E+03	3.00E+04	1.24E+04	17/17	1.48E+01	2.00E+01	1/17	2.80E+04	0/17	1.00E+05	17/17	2.07E+03
Lead	6.50E+00	7.10E+01	3.01E+01	8/17	4.40E-01	2.00E+01	3/17	3.60E+01	0/17	1.25E+03	2/17	5.00E+01
Lithium	5.13E+00	8.59E+00	6.49E+00	6/9	5.00E+00	1.00E+01	n/a	n/a	0/9	1.00E+05	0/9	6.41E+02
Magnesium	4.30E+02	7.74E+03	1.41E+03	17/17	2.50E+00	8.56E+02	1/17	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.14E+02	1.12E+03	4.14E+02	17/17	2.20E+00	1.00E+01	1/17	1.50E+03	0/17	4.64E+04	17/17	4.52E+01
Mercury	3.90E-02	2.00E-01	1.20E-01	5/17	4.90E-02	2.00E-01	2/17	2.00E-01	0/17	8.25E+02	0/17	9.82E-01
Molybdenum	4.40E-01	5.50E-01	4.95E-01	2/6	5.90E+00	6.90E+00	n/a	n/a	0/6	2.50E+04	0/6	8.30E+01
Nickel	5.33E+00	5.70E+02	8.72E+01	16/17	5.00E+00	6.90E+00	6/17	2.10E+01	0/17	9.30E+04	2/17	2.42E+02
Potassium	2.00E+02	9.33E+02	5.62E+02	5/8	7.40E+02	8.56E+02	0/8	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.60E-01	1.20E+00	5.68E-01	4/17	2.80E-01	1.00E+00	1/17	8.00E-01	0/17	2.56E+04	0/17	9.49E+01
Silicon	1.81E+03	2.54E+03	2.18E+03	2/2	7.40E+01	8.56E+01	n/a	n/a	n/a	n/a	n/a	n/a
Silver	1.30E+00	1.30E+00	1.30E+00	1/17	6.20E-01	4.00E+00	0/17	2.30E+00	0/17	2.07E+04	0/17	4.11E+01
Sodium	2.02E+01	1.16E+02	6.24E+01	4/8	7.40E+02	8.56E+02	0/8	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.80E+00	1.80E+00	1.80E+00	1/17	2.60E-01	2.00E+01	1/17	2.10E-01	n/a	n/a	n/a	n/a
Tin	8.00E+00	8.00E+00	8.00E+00	1/13	1.00E+02	1.00E+02	n/a	n/a	0/13	1.00E+05	0/13	2.79E+03
Uranium	1.20E+02	5.00E+02	3.08E+02	4/13	1.00E+02	2.00E+02	4/13	4.90E+00	0/13	3.34E+03	4/13	2.02E+01
Vanadium	4.60E+00	3.64E+01	2.24E+01	17/17	2.50E+00	8.60E+00	0/17	3.80E+01	0/17	4.47E+03	17/17	3.32E+00
Zinc	1.71E+01	7.50E+02	1.38E+02	17/17	3.00E+00	2.00E+01	6/17	6.50E+01	0/17	1.00E+05	0/17	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	4.00E-01	7.00E-01	5.50E-01	2/9	9.00E-02	1.00E-01	n/a	n/a	0/9	4.25E+01	2/9	1.99E-01
PCB-1016	5.10E-02	5.10E-02	5.10E-02	1/15	6.00E-02	4.30E-01	n/a	n/a	0/15	4.25E+01	0/15	1.99E-01
PCB-1254	3.00E-01	3.00E-01	3.00E-01	1/15	6.00E-02	8.70E-01	n/a	n/a	0/15	1.82E+01	1/15	1.99E-01
PCB-1260	4.00E-01	3.10E+00	1.30E+00	5/15	9.00E-02	8.70E-01	n/a	n/a	0/15	4.25E+01	5/15	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one etection are shown.

Table 5.50. Summary of Surface and Subsurface Historical Data at SWMU 13 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Radionuclides (pCi/g)												
Alpha activity	1.70E+01	1.45E+02	1.01E+02	5/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.90E+01	2.75E+02	1.63E+02	6/9	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.86E-01	1.86E-01	1.86E-01	1/9	1.05E-02	2.39E-02	0/9	4.90E-01	0/9	8.58E+00	1/9	8.58E-02
Neptunium-237	7.00E-02	1.68E+00	8.28E-01	4/15	1.74E-02	3.83E-02	3/15	1.00E-01	0/15	2.71E+01	3/15	2.71E-01
Plutonium-239	2.00E-02	5.50E-01	1.58E-01	5/6	n/a	n/a	3/6	2.50E-02	0/6	1.15E+03	0/6	1.15E+01
Plutonium-239/240	5.37E-02	5.37E-02	5.37E-02	1/11	3.80E-02	1.60E-01	n/a	n/a	0/11	1.15E+03	0/11	1.15E+01
Technetium-99	1.27E+00	3.60E+02	9.50E+01	8/17	2.64E+00	1.20E+01	7/17	2.50E+00	0/17	3.62E+04	0/17	3.62E+02
Thorium-228	3.23E-01	5.48E-01	4.20E-01	9/9	6.28E-02	6.52E-02	0/9	1.60E+00	0/9	2.80E+00	9/9	2.80E-02
Thorium-230	2.30E-01	1.64E+00	6.62E-01	14/15	1.88E-01	1.98E-01	1/15	1.50E+00	0/15	1.49E+03	0/15	1.49E+01
Thorium-232	3.03E-01	5.11E-01	4.10E-01	9/9	4.38E-02	6.36E-02	0/9	1.50E+00	0/9	1.35E+03	0/9	1.35E+01
Uranium-234	7.20E-01	1.10E+02	5.07E+01	8/17	9.00E-02	5.05E-01	7/17	2.50E+00	0/17	1.98E+03	5/17	1.98E+01
Uranium-235	2.20E-02	5.10E+00	9.46E-01	12/13	1.33E-02	2.00E-01	3/13	1.40E-01	0/13	3.95E+01	3/13	3.95E-01
Uranium-235/236	1.53E+00	1.17E+01	6.41E+00	4/4	n/a	n/a	n/a	n/a	0/4	3.95E+01	4/4	3.95E-01
Uranium-238	9.44E-01	2.30E+02	5.06E+01	16/17	8.00E-02	5.33E-01	13/17	1.20E+00	2/17	1.71E+02	9/17	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	1.00E-02	1.00E-02	1.00E-02	1/15	3.60E-01	5.00E-01	n/a	n/a	0/15	6.67E+04	0/15	3.16E+02
Acenaphthylene	4.00E-02	9.10E-02	6.55E-02	2/15	3.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	1.50E-02	5.20E-02	3.47E-02	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	1.00E+05	0/15	3.79E+03
Benz(a)anthracene	5.60E-02	1.30E+00	8.85E-01	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	2.08E+02	2/15	2.12E-01
Benzo(a)pyrene	5.10E-02	1.70E+00	9.50E-01	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	2.08E+01	3/15	2.12E-02
Benzo(b)fluoranthene	9.60E-02	3.10E+00	1.80E+00	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	2.08E+02	2/15	2.12E-01
Benzo(ghi)perylene	5.80E-01	8.10E-01	6.95E-01	2/15	3.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	2.10E-02	9.90E-01	5.67E-01	3/6	3.60E-01	4.30E-01	n/a	n/a	0/6	2.08E+03	0/6	2.12E+00
Bis(2-ethylhexyl)phthalate	2.30E-01	6.20E-01	4.13E-01	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	7.40E+03	0/15	8.84E+00
Chrysene	6.00E-02	1.20E+00	8.20E-01	3/15	3.60E-01	5.00E-01	n/a	n/a	0/15	2.08E+04	0/15	2.12E+01
Dibenz(a,h)anthracene	1.80E-01	2.30E-01	2.05E-01	2/6	3.60E-01	4.30E-01	n/a	n/a	0/6	2.08E+01	2/6	2.12E-02
Di-n-butyl phthalate	8.70E-02	1.00E-01	9.35E-02	2/6	3.60E-01	4.30E-01	n/a	n/a	0/6	1.00E+05	0/6	2.13E+03
Fluoranthene	2.10E-02	1.10E+00	5.65E-01	4/6	3.60E-01	4.30E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Indeno(1,2,3-cd)pyrene	6.60E-01	9.90E-01	8.25E-01	2/15	3.60E-01	5.00E-01	n/a	n/a	0/15	2.08E+02	2/15	2.12E-01
Phenanthrene	4.50E-02	9.70E-02	7.53E-02	3/15	3.60E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.80E-02	2.30E+00	1.01E+00	4/15	3.60E-01	5.00E-01	n/a	n/a	0/15	4.87E+04	0/15	1.65E+02
Volatiles (mg/kg)												
Chloroform	6.00E-03	6.00E-03	6.00E-03	1/2	6.00E-03	7.00E-03	n/a	n/a	0/2	3.70E+00	0/2	1.23E-01
Methylene chloride	2.00E-03	2.00E-03	2.00E-03	1/11	7.00E-03	1.00E-02	n/a	n/a	0/11	2.16E+03	0/11	1.34E+01
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	7.70E+03	7.70E+03	7.70E+03	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	1.98E+03	1.09E+04	7.02E+03	37/37	1.72E+01	1.98E+01	0/37	1.20E+04	0/37	1.00E+05	30/37	4.64E+03
Arsenic	1.10E+00	4.70E+00	2.97E+00	7/37	1.72E+01	1.98E+01	0/37	7.90E+00	0/37	3.15E+02	7/37	5.23E-01
Barium	2.02E+01	1.89E+02	9.37E+01	37/37	2.15E+00	2.47E+00	2/37	1.70E+02	0/37	1.00E+05	0/37	2.29E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one etection are shown.

Table 5.50. Summary of Surface and Subsurface Historical Data at SWMU 13 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Beryllium	2.60E-01	9.40E-01	5.78E-01	21/37	4.30E-01	4.95E-01	6/37	6.90E-01	0/37	1.28E+03	0/37	9.48E-01
Cadmium	1.80E+00	6.78E+00	3.08E+00	8/37	7.10E-01	1.98E+00	8/37	2.10E-01	0/37	7.05E+01	0/37	2.13E+01
Calcium	5.01E+02	9.63E+04	1.77E+04	36/37	8.60E+01	1.00E+03	19/37	6.10E+03	n/a	n/a	n/a	n/a
Chromium	9.90E-01	1.64E+02	1.63E+01	36/37	5.33E-01	2.47E+00	7/37	4.30E+01	n/a	n/a	0/37	3.56E+02
Cobalt	1.70E+00	1.17E+01	5.69E+00	7/7	n/a	n/a	0/7	1.30E+01	0/7	1.00E+05	0/7	1.92E+03
Copper	1.50E+00	4.31E+01	1.09E+01	37/37	2.15E+00	2.47E+00	3/37	2.50E+01	0/37	1.00E+05	0/37	4.93E+02
Iron	3.83E+03	1.77E+04	1.10E+04	7/7	n/a	n/a	0/7	2.80E+04	0/7	1.00E+05	7/7	2.07E+03
Lead	5.50E+00	4.99E+01	1.77E+01	10/37	1.72E+01	1.98E+01	2/37	2.30E+01	0/37	1.25E+03	0/37	5.00E+01
Magnesium	2.87E+02	6.20E+03	1.96E+03	7/7	n/a	n/a	2/7	2.10E+03	n/a	n/a	n/a	n/a
Manganese	4.35E+01	8.28E+02	3.91E+02	7/7	n/a	n/a	1/7	8.20E+02	0/7	4.64E+04	6/7	4.52E+01
Nickel	2.00E+00	2.09E+01	9.10E+00	32/37	1.62E+00	4.95E+00	0/37	2.20E+01	0/37	9.30E+04	0/37	2.42E+02
Potassium	1.70E+02	1.08E+03	4.93E+02	5/7	1.45E+02	1.65E+02	1/7	9.50E+02	n/a	n/a	n/a	n/a
Silver	1.00E+00	2.81E+00	1.91E+00	2/37	6.80E-01	2.47E+00	1/37	2.70E+00	0/37	2.07E+04	0/37	4.11E+01
Sodium	8.01E+01	3.05E+02	1.87E+02	7/7	n/a	n/a	0/7	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	8.40E+00	3.93E+01	2.01E+01	36/37	2.15E+00	1.26E+01	2/37	3.70E+01	0/37	4.47E+03	36/37	3.32E+00
Zinc	7.50E+00	1.37E+02	3.84E+01	32/37	1.72E+01	1.98E+01	5/37	6.00E+01	0/37	1.00E+05	0/37	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.20E-01	9.90E-01	4.00E-01	8/30	9.00E-02	1.30E-01	n/a	n/a	0/30	4.25E+01	6/30	1.99E-01
PCB-1254	1.20E-01	9.90E-01	3.70E-01	6/37	9.00E-02	2.00E+00	n/a	n/a	0/37	1.82E+01	3/37	1.99E-01
PCB-1260	1.00E-01	4.80E-01	2.45E-01	4/37	1.00E-01	2.00E+00	n/a	n/a	0/37	4.25E+01	2/37	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	1.70E+02	1.70E+02	1.70E+02	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.10E+03	1.10E+03	1.10E+03	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	3.59E-02	5.62E-01	1.72E-01	9/30	3.11E-02	3.86E-02	2/30	2.80E-01	0/30	8.58E+00	6/30	8.58E-02
Cobalt-60	9.70E-02	9.70E-02	9.70E-02	1/30	2.90E-02	4.10E-02	n/a	n/a	0/30	1.77E+00	1/30	1.77E-02
Mass of U-235	4.83E-02	9.38E-02	6.47E-02	4/30	1.97E-02	2.15E-01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	9.33E-02	1.51E-01	1.16E-01	3/31	4.78E-02	5.88E-02	n/a	n/a	0/31	2.71E+01	0/31	2.71E-01
Plutonium-239	2.40E-01	2.40E-01	2.40E-01	1/1	n/a	n/a	n/a	n/a	0/1	1.15E+03	0/1	1.15E+01
Plutonium-239/240	8.33E-02	1.31E-01	1.07E-01	3/30	3.25E-02	9.26E-02	n/a	n/a	0/30	1.15E+03	0/30	1.15E+01
Potassium-40	6.05E+00	1.16E+01	9.89E+00	30/30	2.30E-01	3.62E-01	0/30	1.60E+01	n/a	n/a	n/a	n/a
Radium-226	3.79E-01	4.89E-01	4.34E-01	2/30	9.37E-02	1.97E-01	0/30	1.50E+00	0/30	2.56E+00	2/30	2.56E-02
Technetium-99	1.84E+00	1.81E+01	5.27E+00	11/31	1.72E+00	1.78E+00	7/31	2.80E+00	0/31	3.62E+04	0/31	3.62E+02
Thorium-230	4.87E-01	5.30E+01	4.97E+00	12/31	4.81E-01	5.09E-01	1/31	1.40E+00	0/31	1.49E+03	1/31	1.49E+01
Thorium-232	2.26E-01	8.31E-01	4.17E-01	30/30	9.80E-02	2.30E-01	0/30	1.50E+00	0/30	1.35E+03	0/30	1.35E+01
Uranium	3.16E+00	9.23E+00	6.34E+00	7/30	8.71E-02	3.49E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.48E-01	2.20E+01	2.39E+00	16/31	3.45E-02	2.48E+00	3/31	2.40E+00	0/31	1.98E+03	1/31	1.98E+01
Uranium-235	1.04E-01	1.80E+00	4.72E-01	5/31	4.25E-02	4.64E-01	2/31	1.40E-01	0/31	3.95E+01	1/31	3.95E-01
Uranium-238	3.80E-01	1.60E+02	1.23E+01	16/31	1.02E-02	5.52E-01	9/31	1.20E+00	0/31	1.71E+02	8/31	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one etection are shown.

Table 5.50. Summary of Surface and Subsurface Historical Data at SWMU 13 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	6.00E-01	4.00E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1,2-Dichlorobenzene	6.60E-02	7.90E-02	7.33E-02	4/37	4.10E-01	5.00E-01	n/a	n/a	0/37	1.29E+04	0/37	2.68E+02
Benz(a)anthracene	1.10E+00	1.10E+00	1.10E+00	1/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+02	1/37	2.12E-01
Benzo(a)pyrene	9.10E-01	9.10E-01	9.10E-01	1/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+01	1/37	2.12E-02
Benzo(b)fluoranthene	5.10E-01	1.50E+00	1.01E+00	2/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+02	2/37	2.12E-01
Benzo(k)fluoranthene	6.30E-01	1.70E+00	1.17E+00	2/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+03	0/37	2.12E+00
Chrysene	5.70E-01	1.60E+00	1.09E+00	2/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+04	0/37	2.12E+01
Di-n-butyl phthalate	4.70E-02	6.80E+00	1.71E+00	12/37	4.10E-01	5.00E-01	n/a	n/a	0/37	1.00E+05	0/37	2.13E+03
Fluoranthene	7.10E-01	1.40E+00	9.52E-01	5/37	4.10E-01	5.00E-01	n/a	n/a	0/37	6.50E+04	0/37	2.21E+02
Indeno(1,2,3-cd)pyrene	5.80E-01	5.80E-01	5.80E-01	1/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.08E+02	1/37	2.12E-01
N-Nitrosodiphenylamine	4.90E-02	6.90E-02	5.85E-02	4/37	4.10E-01	5.00E-01	n/a	n/a	0/37	2.63E+04	0/37	3.30E+01
Phenanthrene	5.40E-01	5.50E-01	5.45E-01	2/37	4.10E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	5.80E-01	1.70E+00	9.04E-01	5/37	4.10E-01	5.00E-01	n/a	n/a	0/37	4.87E+04	0/37	1.65E+02
Volatiles (mg/kg)												
2-Butanone	6.20E-03	4.20E-02	1.54E-02	22/37	5.00E-03	1.30E-02	n/a	n/a	0/37	3.94E+04	0/37	1.03E+03
Acetone	1.10E-02	9.80E-02	4.16E-02	25/37	5.00E-03	1.30E-02	n/a	n/a	0/37	1.91E+04	0/37	3.58E+02
Carbon disulfide	2.00E-03	7.60E-03	6.53E-03	32/37	5.00E-03	6.00E-03	n/a	n/a	0/37	3.17E+03	0/37	1.06E+02
Diethyl ether	7.00E-03	7.00E-03	7.00E-03	1/1	n/a	n/a	n/a	n/a	0/1	1.89E+04	0/1	4.51E+02
Methylene chloride	3.00E-03	4.70E-02	3.15E-02	6/37	5.00E-03	6.00E-03	n/a	n/a	0/37	2.16E+03	0/37	1.34E+01
Tetrachloroethene	2.00E-03	2.00E-03	2.00E-03	1/37	5.00E-03	6.00E-03	n/a	n/a	0/37	1.46E+03	0/37	3.90E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one etection are shown.

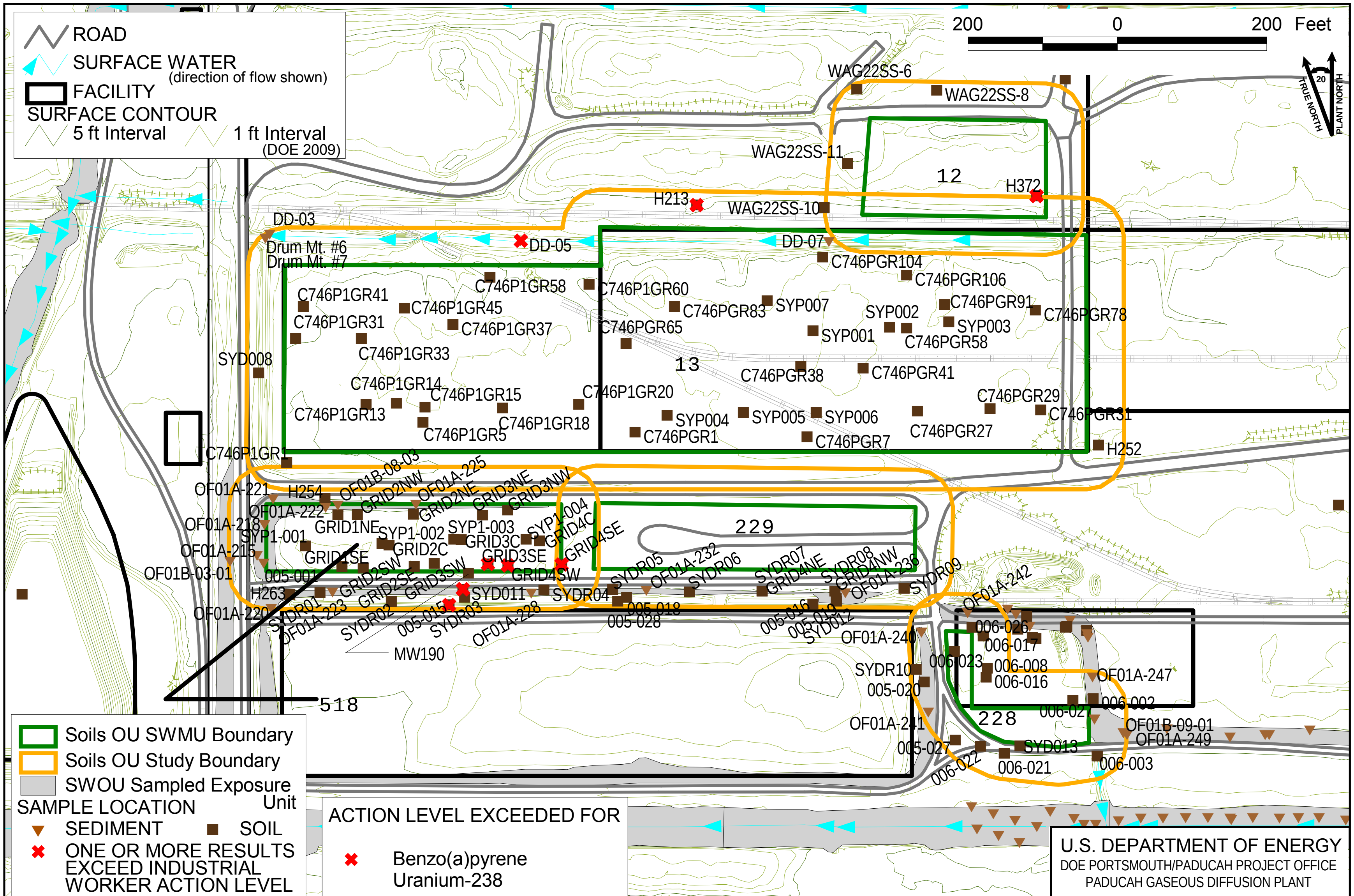


Figure 5.64. Soils Operable Unit: SWMUs 12, 13, 228, 229, and 518

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 14 (C-746-E E Scrap Yard)

Area description

The C-746-E Contaminated Scrap Yard (SWMU 14) is located in the northwest corner of plant site. SWMU 14 is approximately 265,000 ft^2.

Process history

C-746-E was used for the storage of uranium-contaminated scrap metal, including ferrous alloys, copper and copper alloys, nickel-plated steel, Monel®, and aluminum from the 1950s through 2005. In addition, Burial Pit E is located under the northeastern section of C-746-E. Burial Pit E was investigated under the BGOU in conjunction with SWMU 7.

The storage yard was emptied as specified by the *Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant* (DOE 2001a) and documented in the *Removal Action Report for the Scrap Metal Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2008a).

Previous investigation results

The Phase II SI (CH2M HILL 1992) sampled surface and shallow soils in the area. Contaminants of concern include metals and radionuclides.

Table 5.51 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.65).

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU. Only one fire water line is located with the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.51. Summary of Surface and Subsurface Historical Data at SWMU 14

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	2.58E+03	7.60E+03	4.45E+03	3/3	n/a	n/a	0/3	1.30E+04	0/3	1.00E+05	1/3	4.64E+03
Antimony	8.10E-01	8.10E-01	8.10E-01	1/3	1.60E+00	3.59E+00	1/3	2.10E-01	0/3	4.63E+02	1/3	3.79E-01
Arsenic	2.50E+00	4.80E+00	3.67E+00	3/3	n/a	n/a	0/3	1.20E+01	0/3	3.15E+02	3/3	5.23E-01
Barium	2.33E+01	7.10E+01	5.28E+01	3/3	n/a	n/a	0/3	2.00E+02	0/3	1.00E+05	0/3	2.29E+02
Beryllium	1.70E-01	2.50E-01	2.10E-01	2/3	n/a	n/a	0/3	6.70E-01	0/3	1.28E+03	0/3	9.48E-01
Calcium	2.10E+03	2.93E+05	9.93E+04	3/3	n/a	n/a	1/3	2.00E+05	n/a	n/a	n/a	n/a
Chromium	3.30E+00	4.55E+01	2.26E+01	3/3	n/a	n/a	2/3	1.60E+01	n/a	n/a	0/3	3.56E+02
Cobalt	3.30E+00	5.40E+00	4.03E+00	3/3	n/a	n/a	0/3	1.40E+01	0/3	1.00E+05	0/3	1.92E+03
Copper	4.20E+00	2.29E+01	1.20E+01	3/3	n/a	n/a	1/3	1.90E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	4.68E+03	9.30E+03	6.90E+03	3/3	n/a	n/a	0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	9.80E+00	1.98E+01	1.40E+01	3/3	n/a	n/a	0/3	3.60E+01	0/3	1.25E+03	0/3	5.00E+01
Magnesium	5.02E+02	7.74E+03	2.96E+03	3/3	n/a	n/a	1/3	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.30E+02	3.43E+02	2.26E+02	3/3	n/a	n/a	0/3	1.50E+03	0/3	4.64E+04	3/3	4.52E+01
Mercury	1.47E-01	1.47E-01	1.47E-01	1/3	1.00E-01	1.00E-01	1/3	2.00E-01	0/3	8.25E+02	0/3	9.82E-01
Nickel	6.70E+00	1.52E+01	9.90E+00	3/3	n/a	n/a	0/3	2.10E+01	0/3	9.30E+04	0/3	2.42E+02
Potassium	9.33E+02	9.33E+02	9.33E+02	1/3	2.98E+02	2.98E+02	0/3	1.30E+03	n/a	n/a	n/a	n/a
Selenium	7.40E-01	7.40E-01	7.40E-01	1/3	2.80E-01	2.80E-01	1/3	8.00E-01	0/3	2.56E+04	0/3	9.49E+01
Silver	4.40E-01	4.40E-01	4.40E-01	1/3	6.20E-01	9.60E-01	0/3	2.30E+00	0/3	2.07E+04	0/3	4.11E+01
Sodium	7.90E+01	1.16E+02	9.75E+01	2/3	5.02E+01	5.02E+01	0/3	3.20E+02	n/a	n/a	n/a	n/a
Thallium	5.20E-01	5.20E-01	5.20E-01	1/3	5.10E-01	1.09E+01	1/3	2.10E-01	n/a	n/a	n/a	n/a
Tin	8.70E+00	8.70E+00	8.70E+00	1/1	n/a	n/a	n/a	n/a	0/1	1.00E+05	0/1	2.79E+03
Vanadium	4.60E+00	1.50E+01	8.97E+00	3/3	n/a	n/a	0/3	3.80E+01	0/3	4.47E+03	3/3	3.32E+00
Zinc	2.02E+01	1.02E+02	6.47E+01	3/3	n/a	n/a	2/3	6.50E+01	0/3	1.00E+05	0/3	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	5.00E-01	5.00E-01	5.00E-01	1/1	1.00E-01	1.00E-01	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
PCB-1260	9.30E-02	5.00E-01	2.58E-01	3/4	1.00E-01	8.70E-01	n/a	n/a	0/4	4.25E+01	1/4	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	5.19E+00	7.42E+02	3.55E+02	4/6	1.89E+00	6.74E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	3.23E+00	1.03E+03	4.23E+02	5/6	8.30E-01	2.52E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	9.70E-02	9.70E-02	9.70E-02	1/1	4.45E-02	4.45E-02	0/1	4.90E-01	0/1	8.58E+00	1/1	8.58E-02
Neptunium-237	2.60E-01	2.60E-01	2.60E-01	1/4	7.92E-02	7.92E-02	1/4	1.00E-01	0/4	2.71E+01	0/4	2.71E-01
Plutonium-239	2.00E-02	5.50E-01	2.07E-01	3/3	n/a	n/a	2/3	2.50E-02	0/3	1.15E+03	0/3	1.15E+01
Plutonium-239/240	2.83E-01	2.83E-01	2.83E-01	1/1	9.84E-03	9.84E-03	n/a	n/a	0/1	1.15E+03	0/1	1.15E+01
Technetium-99	3.10E+00	4.06E+02	1.46E+02	4/4	2.33E-01	2.33E-01	4/4	2.50E+00	0/4	3.62E+04	1/4	3.62E+02
Thorium-230	3.60E-01	3.94E+00	2.49E+00	3/4	2.64E-02	2.64E-02	2/4	1.50E+00	0/4	1.49E+03	0/4	1.49E+01
Uranium	4.73E+02	4.73E+02	4.73E+02	1/1	4.49E+00	4.49E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	7.20E-01	2.16E+01	8.44E+00	3/3	n/a	n/a	2/3	2.50E+00	0/3	1.98E+03	1/3	1.98E+01
Uranium-235	2.20E-02	1.20E-01	7.10E-02	2/2	n/a	n/a	0/2	1.40E-01	0/2	3.95E+01	0/2	3.95E-01
Uranium-235/236	2.87E+00	2.87E+00	2.87E+00	1/1	n/a	n/a	n/a	n/a	0/1	3.95E+01	1/1	3.95E-01
Uranium-238	2.00E+00	3.70E+01	1.52E+01	3/3	n/a	n/a	3/3	1.20E+00	0/3	1.71E+02	3/3	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.51. Summary of Surface and Subsurface Historical Data at SWMU 14 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	1.10E-01	1.10E-01	1.10E-01	1/3	3.60E-01	5.50E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Di-n-butyl phthalate	6.80E-02	6.80E-02	6.80E-02	1/3	3.60E-01	5.50E-01	n/a	n/a	0/3	1.00E+05	0/3	2.13E+03
Volatiles (mg/kg)												
Methylene chloride	2.00E-03	2.00E-03	2.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	2.16E+03	0/2	1.34E+01
Trichloroethene	5.00E-04	5.00E-04	5.00E-04	1/2	1.00E-03	6.00E-03	n/a	n/a	0/2	2.98E+02	0/2	2.51E+00
Wetchem (mg/kg)												
Cyanide	1.80E-01	1.80E-01	1.80E-01	1/3	4.40E-01	6.48E-01	n/a	n/a	0/3	2.02E+04	0/3	7.92E+01
Subsurface Soils												
Metals (mg/kg)												
Aluminum	3.86E+03	1.23E+04	7.13E+03	12/12	1.59E+01	1.87E+01	1/12	1.20E+04	0/12	1.00E+05	9/12	4.64E+03
Arsenic	6.70E-01	1.13E+01	3.92E+00	10/12	9.11E-01	1.59E+01	1/12	7.90E+00	0/12	3.15E+02	10/12	5.23E-01
Barium	1.54E+01	1.50E+02	8.61E+01	12/12	1.99E+00	2.34E+00	0/12	1.70E+02	0/12	1.00E+05	0/12	2.29E+02
Beryllium	2.80E-01	7.20E-01	4.67E-01	7/12	3.30E-01	6.90E-01	1/12	6.90E-01	0/12	1.28E+03	0/12	9.48E-01
Cadmium	3.90E-01	1.67E+00	9.54E-01	5/12	1.90E-01	1.87E+00	5/12	2.10E-01	0/12	7.05E+01	0/12	2.13E+01
Calcium	7.10E+02	9.63E+04	2.45E+04	12/12	7.95E+01	9.35E+01	4/12	6.10E+03	n/a	n/a	n/a	n/a
Chromium	5.20E+00	2.47E+01	1.24E+01	12/12	1.99E+00	2.34E+00	2/12	4.30E+01	n/a	n/a	0/12	3.56E+02
Cobalt	1.50E+00	7.85E+00	4.63E+00	10/11	2.28E+00	2.34E+00	0/11	1.30E+01	0/11	1.00E+05	0/11	1.92E+03
Copper	3.10E+00	1.61E+01	7.99E+00	12/12	1.99E+00	2.34E+00	0/12	2.50E+01	0/12	1.00E+05	0/12	4.93E+02
Iron	5.12E+03	2.68E+04	1.09E+04	11/11	1.82E+01	1.87E+01	0/11	2.80E+04	0/11	1.00E+05	11/11	2.07E+03
Lead	4.20E+00	2.63E+01	9.76E+00	11/12	9.11E-01	1.59E+01	1/12	2.30E+01	0/12	1.25E+03	0/12	5.00E+01
Magnesium	3.74E+02	6.20E+03	1.83E+03	11/11	4.55E+00	4.67E+00	3/11	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.32E+01	8.28E+02	3.00E+02	11/11	2.28E+00	2.34E+00	1/11	8.20E+02	0/11	4.64E+04	9/11	4.52E+01
Nickel	2.90E+00	2.09E+01	9.02E+00	12/12	3.97E+00	4.67E+00	0/12	2.20E+01	0/12	9.30E+04	0/12	2.42E+02
Potassium	2.76E+02	1.08E+03	5.81E+02	5/9	1.44E+02	3.20E+02	1/9	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.50E-01	4.30E-01	2.64E-01	5/12	1.30E-01	1.59E+01	0/12	7.00E-01	0/12	2.56E+04	0/12	9.49E+01
Silver	9.60E-01	9.60E-01	9.60E-01	1/12	6.80E-01	2.34E+00	0/12	2.70E+00	0/12	2.07E+04	0/12	4.11E+01
Sodium	1.46E+02	2.47E+02	1.77E+02	4/11	6.70E+01	3.66E+02	0/11	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	6.75E+00	3.10E+01	1.75E+01	11/12	1.99E+00	2.34E+00	0/12	3.70E+01	0/12	4.47E+03	11/12	3.32E+00
Zinc	8.20E+00	4.79E+01	2.55E+01	11/12	1.59E+01	1.87E+01	0/12	6.00E+01	0/12	1.00E+05	0/12	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	2.30E+00	6.10E+00	3.99E+00	7/7	1.00E+00	1.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.78E+00	1.55E+01	8.29E+00	7/7	1.20E+00	2.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Potassium-40	9.58E+00	9.58E+00	9.58E+00	1/1	2.24E-01	2.24E-01	0/1	1.60E+01	n/a	n/a	n/a	n/a
Technetium-99	3.00E-01	2.10E+00	1.35E+00	4/5	2.00E-01	1.66E+00	0/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Thorium-228	3.57E-01	5.06E-01	4.32E-01	2/3	8.57E-02	9.84E-01	0/3	1.60E+00	0/3	2.80E+00	2/3	2.80E-02
Thorium-230	3.69E-01	7.28E-01	5.14E-01	3/3	2.41E-01	5.24E-01	0/3	1.40E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	4.73E-01	5.36E-01	5.15E-01	3/3	1.35E-01	1.67E-01	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Thorium-234	1.57E+00	1.57E+00	1.57E+00	1/2	6.69E-01	1.01E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.42E-01	3.00E-01	2.21E-01	2/3	2.48E-02	1.35E-01	0/3	2.40E+00	0/3	1.98E+03	0/3	1.98E+01
Uranium-238	3.57E-01	3.57E-01	3.57E-01	1/3	2.47E-02	1.29E-01	0/3	1.20E+00	0/3	1.71E+02	0/3	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.51. Summary of Surface and Subsurface Historical Data at SWMU 14 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	5.30E-02	1.50E-01	9.73E-02	4/12	1.10E-01	5.00E-01	n/a	n/a	0/12	7.40E+03	0/12	8.84E+00
Decanoic acid	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Diethyl phthalate	1.30E-01	1.30E-01	1.30E-01	1/12	3.70E-01	5.00E-01	n/a	n/a	0/12	1.00E+05	0/12	1.55E+04
Di-n-butyl phthalate	4.90E-02	4.90E-02	4.90E-02	1/12	3.70E-01	5.00E-01	n/a	n/a	0/12	1.00E+05	0/12	2.13E+03
Volatiles (mg/kg)												
2-Butanone	7.00E-03	1.20E-02	9.50E-03	2/12	4.97E-03	6.30E-02	n/a	n/a	0/12	3.94E+04	0/12	1.03E+03
Acetone	3.60E-02	8.30E-01	2.39E-01	5/12	4.97E-03	6.30E-02	n/a	n/a	0/12	1.91E+04	0/12	3.58E+02
Carbon disulfide	6.90E-03	6.90E-03	6.90E-03	1/12	4.97E-03	3.20E-02	n/a	n/a	0/12	3.17E+03	0/12	1.06E+02
Methylene chloride	3.00E-03	1.80E-01	7.35E-02	6/12	4.97E-03	3.20E-02	n/a	n/a	0/12	2.16E+03	0/12	1.34E+01
Trichloroethene	7.00E-04	7.00E-04	7.00E-04	1/12	1.00E-03	3.20E-02	n/a	n/a	0/12	2.98E+02	0/12	2.51E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

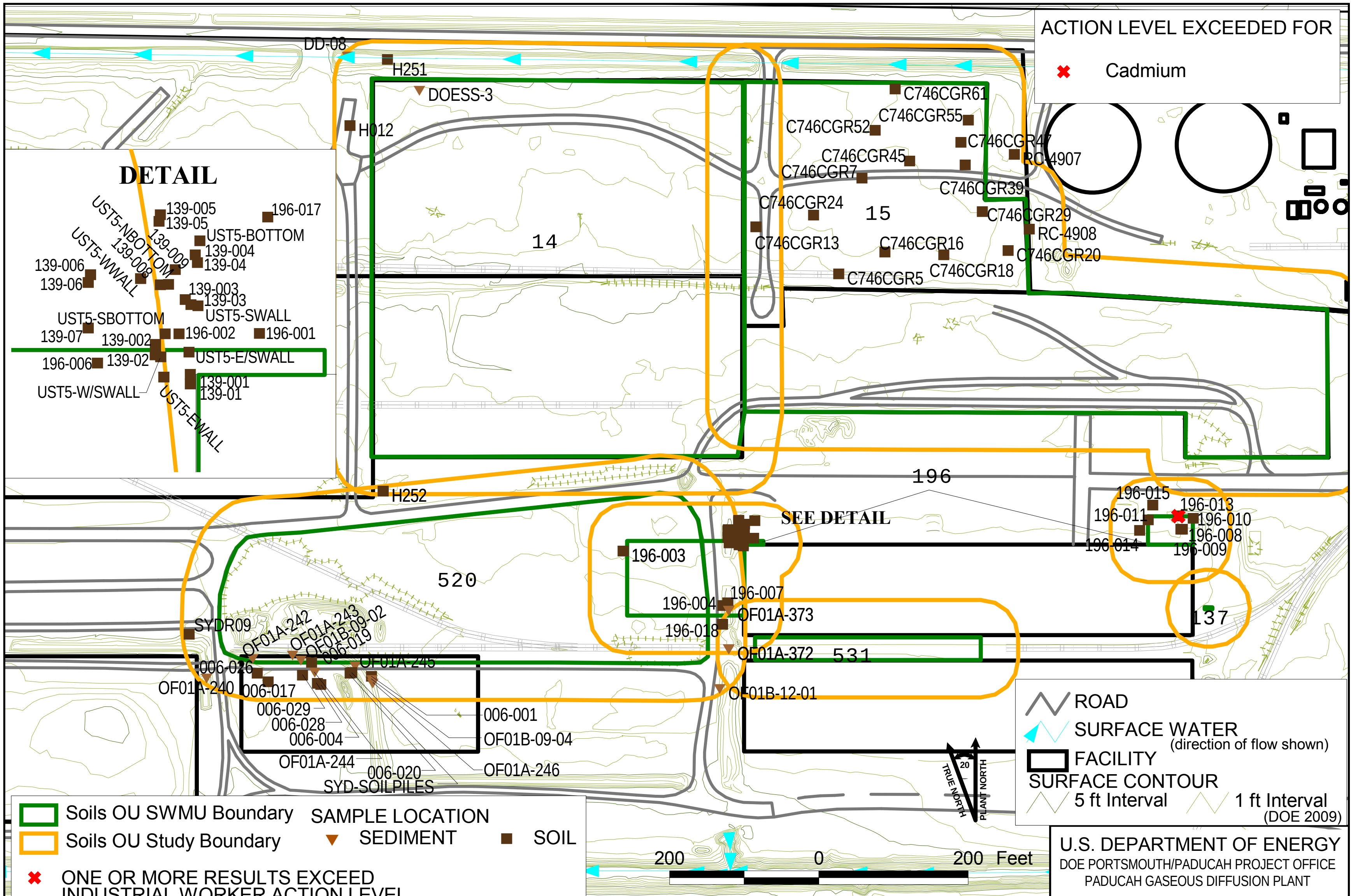


Figure 5.65. Soils Operable Unit: SWMUs 14, 15, 137, 196, 520, and 531

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 15 (C-746-C C Scrap Yard)

Area description

The C-746-C Scrap Yard (SWMU 15) is located in the northwest corner of plant site. SWMU 15 is approximately 250,000 ft^2.

Process history

The C-746-C Scrap Yard originally was used to store uncontaminated scrap metal prior to being shipped off-site; however, it subsequently was converted to long-term storage of scrap metal after off-site shipments were discontinued. It is divided into north and south areas to segregate the space into two different storage yards. A large portion of the south section was used for storage of ingots produced in C-746 smelting operations and turnings from the machine shop. Most of the north section was used in the construction of the C-616 Chromate Treatment Facility and clarifiers.

The storage yard was emptied as specified by the *Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant* (DOE 2001a) and documented in the *Removal Action Report for the Scrap Metal Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2008a).

Previous investigation results

SWMU 15 is a suspected to be a source of radiological and possibly metals contamination, though no documented release has occurred from the area.

Table 5.52 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.66).

Area utilities

No current recirculating water lines or sewers are associated with this facility. A sanitary sewer is coincidentally located within the boundary of the SWMU. Approximate depth to the sewer is 4 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.52. Summary of Surface and Subsurface Historical Data at SWMU 15

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	3.30E+00	6.20E+00	4.75E+00	2/2	n/a	n/a	n/a	n/a	0/2	4.25E+01	2/2	1.99E-01
Radionuclides (pCi/g)												
Neptunium-237	7.00E-01	7.00E-01	7.00E-01	1/2	n/a	n/a	1/2	1.00E-01	0/2	2.71E+01	1/2	2.71E-01
Technetium-99	1.80E+01	1.80E+01	1.80E+01	1/2	n/a	n/a	1/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	8.00E+00	4.10E+01	2.45E+01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.18E+03	7.34E+03	6.04E+03	15/15	1.29E+01	1.75E+01	0/15	1.20E+04	0/15	1.00E+05	14/15	4.64E+03
Barium	6.56E+01	9.37E+01	7.87E+01	15/15	1.61E+00	2.18E+00	0/15	1.70E+02	0/15	1.00E+05	0/15	2.29E+02
Beryllium	3.73E-01	5.50E-01	4.57E-01	10/15	3.22E-01	4.37E-01	0/15	6.90E-01	0/15	1.28E+03	0/15	9.48E-01
Cadmium	1.40E+00	1.89E+00	1.65E+00	6/15	1.29E+00	1.75E+00	6/15	2.10E-01	0/15	7.05E+01	0/15	2.13E+01
Calcium	9.78E+02	3.94E+03	1.50E+03	15/15	6.43E+01	8.73E+01	0/15	6.10E+03	n/a	n/a	n/a	n/a
Chromium	6.06E+00	2.95E+01	1.04E+01	15/15	1.61E+00	2.18E+00	1/15	4.30E+01	n/a	n/a	0/15	3.56E+02
Copper	4.70E+00	1.32E+01	8.60E+00	15/15	1.61E+00	2.18E+00	0/15	2.50E+01	0/15	1.00E+05	0/15	4.93E+02
Mercury	1.20E+00	1.20E+00	1.20E+00	1/15	2.00E-01	2.00E-01	1/15	1.30E-01	0/15	8.25E+02	1/15	9.82E-01
Nickel	3.87E+00	2.83E+01	7.49E+00	15/15	3.22E+00	4.37E+00	1/15	2.20E+01	0/15	9.30E+04	0/15	2.42E+02
Vanadium	1.13E+01	3.49E+01	1.73E+01	15/15	1.61E+00	2.18E+00	0/15	3.70E+01	0/15	4.47E+03	15/15	3.32E+00
Zinc	1.82E+01	5.00E+01	2.66E+01	15/15	1.29E+01	1.75E+01	0/15	6.00E+01	0/15	1.00E+05	0/15	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	3.50E-01	4.70E-01	3.97E-01	3/15	9.00E-02	1.30E-01	n/a	n/a	0/15	4.25E+01	3/15	1.99E-01
PCB-1254	2.10E-01	4.70E-01	3.50E-01	3/15	9.00E-02	9.00E-02	n/a	n/a	0/15	1.82E+01	3/15	1.99E-01
PCB-1260	1.40E-01	1.40E-01	1.40E-01	1/15	1.00E-01	1.00E-01	n/a	n/a	0/15	4.25E+01	0/15	1.99E-01
Radionuclides (pCi/g)												
Mass of U-235	1.56E-02	8.82E-02	3.72E-02	10/15	4.63E-03	2.07E-02	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	1.08E-01	5.56E-01	3.32E-01	2/15	5.17E-02	2.02E-01	n/a	n/a	0/15	2.71E+01	1/15	2.71E-01
Plutonium-239/240	7.30E-02	9.85E-02	8.58E-02	2/15	2.94E-02	8.98E-02	n/a	n/a	0/15	1.15E+03	0/15	1.15E+01
Potassium-40	8.70E+00	1.13E+01	9.97E+00	15/15	1.77E-01	2.33E-01	0/15	1.60E+01	n/a	n/a	n/a	n/a
Radium-226	6.93E-01	7.49E-01	7.19E-01	4/15	1.06E-01	1.93E-01	0/15	1.50E+00	0/15	2.56E+00	4/15	2.56E-02
Technetium-99	2.10E+00	1.83E+02	2.82E+01	10/15	1.66E+00	1.66E+00	9/15	2.80E+00	0/15	3.62E+04	0/15	3.62E+02
Thorium-230	5.60E-01	7.28E-01	6.53E-01	3/15	5.14E-01	5.24E-01	0/15	1.40E+00	0/15	1.49E+03	0/15	1.49E+01
Thorium-232	3.05E-01	5.36E-01	4.37E-01	15/15	1.24E-01	1.35E-01	0/15	1.50E+00	0/15	1.35E+03	0/15	1.35E+01
Uranium	1.37E+00	8.13E+00	3.08E+00	10/15	3.14E-02	1.09E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	3.00E-01	3.28E+00	1.01E+00	15/15	8.65E-03	4.42E-02	1/15	2.40E+00	0/15	1.98E+03	0/15	1.98E+01
Uranium-235	3.37E-02	1.91E-01	8.03E-02	10/15	1.00E-02	4.46E-02	1/15	1.40E-01	0/15	3.95E+01	0/15	3.95E-01
Uranium-238	3.57E-01	4.66E+00	1.35E+00	15/15	8.08E-03	4.21E-02	6/15	1.20E+00	0/15	1.71E+02	4/15	1.71E+00
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	4.80E-01	4.50E+00	1.60E+00	10/15	4.80E-01	5.00E-01	n/a	n/a	0/15	1.00E+05	0/15	2.13E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.52. Summary of Surface and Subsurface Historical Data at SWMU 15 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Volatiles (mg/kg)												
1,1-Dichloroethane	6.10E-03	6.10E-03	6.10E-03	1/15	5.00E-03	5.00E-03	n/a	n/a	0/15	5.52E+03	0/15	1.55E+02
2-Butanone	5.90E-03	3.60E-02	1.27E-02	6/15	5.00E-03	5.00E-03	n/a	n/a	0/15	3.94E+04	0/15	1.03E+03
2-Hexanone	6.40E-03	6.40E-03	6.40E-03	1/15	5.00E-03	5.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	7.10E-03	3.60E-02	1.46E-02	9/15	5.00E-03	5.00E-03	n/a	n/a	0/15	1.91E+04	0/15	3.58E+02
Carbon disulfide	6.60E-03	6.90E-03	6.75E-03	15/15	5.00E-03	5.00E-03	n/a	n/a	0/15	3.17E+03	0/15	1.06E+02
Dibromochloromethane	8.30E-03	8.30E-03	8.30E-03	1/15	5.00E-03	5.00E-03	n/a	n/a	0/15	2.50E+02	0/15	1.10E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

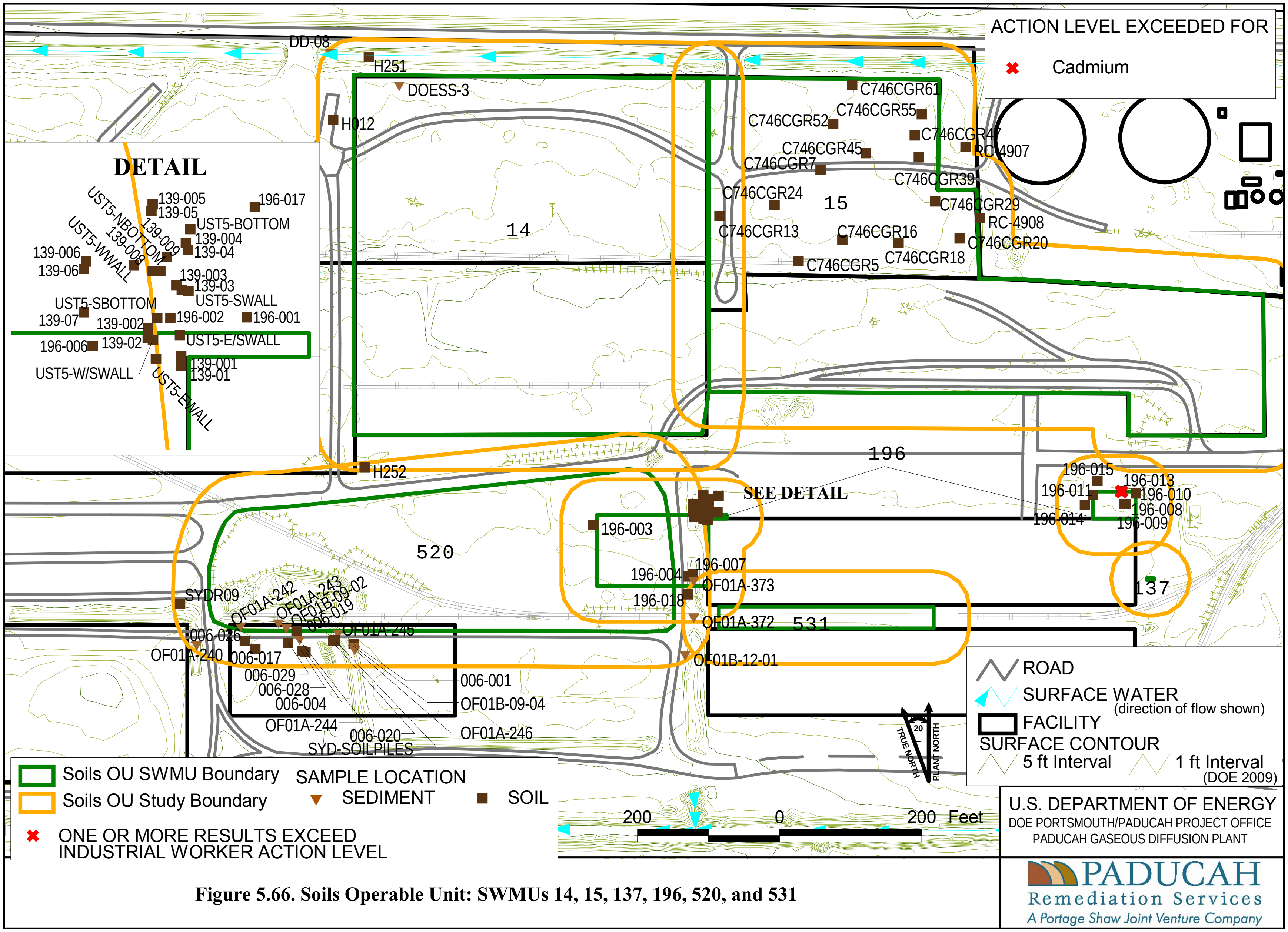


Figure 5.66. Soils Operable Unit: SWMUs 14, 15, 137, 196, 520, and 531

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 16 (C-746-D D Scrap Yard)

Area description

The C-746-D Scrap Yard (SWMU 16) is located in the east central portion of the plant site. SWMU 16 is approximately 59,400 ft^2 (180 ft x 330 ft).

Process history

The concrete pad upon which C-746-D rests originally was constructed as a cleaning facility for the construction of the plant, known as the Kellogg Building. After the Kellogg Building was removed, the concrete pad was used to store decontaminated scrap metal from the cascade operations, including steel and nickel-plated steel.

The storage yard was emptied, as specified by the *Action Memorandum for Scrap Metal Disposition at the Paducah Gaseous Diffusion Plant* (DOE 2001a) and documented in the *Removal Action Report for the Scrap Metal Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 2008a).

Previous investigation results

Process knowledge indicates radiological contaminant exists at SWMU 16. Not all process materials from the cascade buildings were fully decontaminated, and it is suspected that some process materials penetrated surface soils. The subsurface soils under the concrete pad at SWMU 16 were investigated in conjunction with SWMU 99 (that abuts SWMU 16) during the WAG 28 RI (DOE 2000b), which states: "Sampling of the soils within SWMU 99 detected a limited suite of metals above screening criteria and isolated occurrences of VOAs [volatile organic analytes] in the surface soils." Also noted in the BRA: "For all sites, the cumulative human health ELCR and systemic toxicity exceed the accepted standards of the KDEP and the EPA for one or more scenarios when assessed using default exposure parameters."

Table 5.53 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.67).

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination ; therefore, additional samples are needed at this location.

Table 5.53. Summary of Surface and Subsurface Historical Data at SWMU 16

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	1.80E+03	8.14E+03	5.33E+03	6/6	1.69E+01	2.00E+01	0/6	1.30E+04	0/6	1.00E+05	4/6	4.64E+03
Arsenic	5.55E+00	1.14E+01	7.52E+00	3/6	4.22E+00	5.00E+00	1/6	1.20E+01	0/6	3.15E+02	3/6	5.23E-01
Barium	2.08E+01	1.28E+02	6.31E+01	6/6	1.00E+00	2.39E+00	0/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	8.40E-01	8.40E-01	8.40E-01	1/6	4.20E-01	5.00E-01	1/6	6.70E-01	0/6	1.28E+03	0/6	9.48E-01
Calcium	8.76E+03	3.06E+05	1.44E+05	6/6	5.00E+01	2.50E+03	6/6	2.00E+05	n/a	n/a	n/a	n/a
Chromium	7.00E+00	2.04E+01	1.19E+01	6/6	2.00E+00	2.39E+00	1/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	1.70E+00	9.67E+00	4.68E+00	5/6	1.00E+00	2.39E+00	0/6	1.40E+01	0/6	1.00E+05	0/6	1.92E+03
Copper	4.97E+00	1.01E+01	7.29E+00	6/6	2.00E+00	2.39E+00	0/6	1.90E+01	0/6	1.00E+05	0/6	4.93E+02
Iron	2.79E+03	2.28E+04	1.05E+04	6/6	5.00E+00	1.91E+01	0/6	2.80E+04	0/6	1.00E+05	6/6	2.07E+03
Lead	2.25E+01	4.82E+01	3.54E+01	2/6	1.69E+01	2.00E+01	1/6	3.60E+01	0/6	1.25E+03	0/6	5.00E+01
Lithium	2.82E+00	4.88E+00	4.22E+00	4/4	2.00E+00	2.00E+00	n/a	n/a	0/4	1.00E+05	0/4	6.41E+02
Magnesium	1.53E+03	2.22E+04	7.78E+03	6/6	4.79E+00	7.50E+02	5/6	7.70E+03	n/a	n/a	n/a	n/a
Manganese	7.90E+01	7.36E+02	2.96E+02	6/6	1.00E+00	2.39E+00	0/6	1.50E+03	0/6	4.64E+04	6/6	4.52E+01
Molybdenum	2.00E+01	2.00E+01	2.00E+01	1/2	4.22E+00	4.79E+00	n/a	n/a	0/2	2.50E+04	0/2	8.30E+01
Nickel	6.18E+00	5.25E+01	2.35E+01	5/6	4.22E+00	5.00E+00	2/6	2.10E+01	0/6	9.30E+04	0/6	2.42E+02
Potassium	2.91E+02	9.61E+02	5.65E+02	6/6	8.43E+01	1.00E+02	1/6	1.30E+03	n/a	n/a	n/a	n/a
Sodium	2.17E+02	3.08E+02	2.63E+02	2/6	8.43E+01	2.00E+02	0/6	3.20E+02	n/a	n/a	n/a	n/a
Strontium	1.46E+01	2.69E+02	1.47E+02	4/4	2.00E+00	2.00E+00	n/a	n/a	0/4	1.00E+05	0/4	5.45E+03
Uranium	8.74E+00	1.78E+01	1.17E+01	4/4	4.90E-01	9.50E-01	4/4	4.90E+00	0/4	3.34E+03	0/4	2.02E+01
Vanadium	6.36E+00	3.55E+01	1.81E+01	6/6	2.00E+00	2.39E+00	0/6	3.80E+01	0/6	4.47E+03	6/6	3.32E+00
Zinc	1.14E+02	3.90E+02	2.05E+02	5/6	1.50E+01	1.91E+01	5/6	6.50E+01	0/6	1.00E+05	0/6	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.20E-01	1.41E+00	5.89E-01	7/16	1.00E-01	1.30E-01	n/a	n/a	0/16	4.25E+01	5/16	1.99E-01
PCB-1016	1.87E+00	1.87E+00	1.87E+00	1/22	9.00E-02	5.45E-01	n/a	n/a	0/22	4.25E+01	1/22	1.99E-01
PCB-1254	9.60E-02	1.41E+00	6.55E-01	5/22	8.00E-02	5.45E-01	n/a	n/a	0/22	1.82E+01	3/22	1.99E-01
PCB-1260	1.10E-01	4.29E-01	2.00E-01	8/22	9.00E-02	5.45E-01	n/a	n/a	0/22	4.25E+01	2/22	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	6.61E+00	1.42E+02	3.19E+01	9/10	1.44E+00	3.50E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.43E+00	2.73E+03	3.10E+02	10/10	8.80E-01	9.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-1.20E-01	4.41E+01	3.29E+00	17/22	6.00E-02	1.00E+00	11/22	4.90E-01	1/22	8.58E+00	13/22	8.58E-02
Neptunium-237	6.69E-02	1.28E+01	5.18E+00	4/4	4.00E-02	1.41E-01	3/4	1.00E-01	0/4	2.71E+01	3/4	2.71E-01
Technetium-99	7.77E+00	2.65E+03	5.15E+02	6/9	2.64E+00	4.01E+00	6/9	2.50E+00	0/9	3.62E+04	1/9	3.62E+02
Thorium-228	8.44E-02	2.77E-01	1.91E-01	3/3	4.97E-02	8.00E-02	0/3	1.60E+00	0/3	2.80E+00	3/3	2.80E-02
Thorium-230	2.79E-01	5.09E-01	3.97E-01	3/3	1.28E-01	2.30E-01	0/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Thorium-232	2.01E-01	2.23E-01	2.12E-01	2/3	4.18E-02	7.00E-02	0/3	1.50E+00	0/3	1.35E+03	0/3	1.35E+01
Thorium-234	4.47E+01	3.28E+02	1.42E+02	3/8	1.54E+00	1.90E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	6.92E+01	3.97E+02	2.33E+02	2/2	3.99E+00	4.05E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.17E+00	1.19E+02	3.44E+01	4/4	1.50E-01	1.19E+00	2/4	2.50E+00	0/4	1.98E+03	1/4	1.98E+01
Uranium-235	8.85E-02	8.23E+00	2.81E+00	3/9	3.00E-02	9.90E+00	1/9	1.40E-01	0/9	3.95E+01	1/9	3.95E-01
Uranium-238	2.00E-02	2.70E+02	2.34E+01	17/17	1.60E-01	1.73E+01	16/17	1.20E+00	1/17	1.71E+02	15/17	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).

n/a = value not available

Only analyses with at least one detection are shown.

Table 5.53. Summary of Surface and Subsurface Historical Data at SWMU 16 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Semivolatiles (mg/kg)												
Acenaphthene	3.30E-01	3.30E-01	3.30E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	0/7	6.67E+04	0/7	3.16E+02
Acenaphthylene	6.10E-01	6.10E-01	6.10E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	7.50E-01	7.50E-01	7.50E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	0/7	1.00E+05	0/7	3.79E+03
Benz(a)anthracene	2.20E-01	1.70E+00	9.60E-01	2/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+02	2/7	2.12E-01
Benzo(a)pyrene	2.10E+00	2.10E+00	2.10E+00	1/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+01	1/7	2.12E-02
Benzo(b)fluoranthene	8.00E-01	5.70E+00	3.25E+00	2/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+02	2/7	2.12E-01
Benzo(ghi)perylene	5.50E-01	5.50E-01	5.50E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.20E-01	7.90E-01	6.55E-01	2/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+03	0/7	2.12E+00
Chrysene	5.40E-01	2.10E+00	1.32E+00	2/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+04	0/7	2.12E+01
Fluoranthene	1.40E-01	2.30E+00	1.05E+00	4/7	4.80E-01	5.00E-01	n/a	n/a	0/7	6.50E+04	0/7	2.21E+02
Indeno(1,2,3-cd)pyrene	7.80E-01	7.80E-01	7.80E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	0/7	2.08E+02	1/7	2.12E-01
Phenanthrene	8.50E-01	8.50E-01	8.50E-01	1/7	4.80E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	5.90E-01	2.70E+00	1.35E+00	3/7	4.80E-01	5.00E-01	n/a	n/a	0/7	4.87E+04	0/7	1.65E+02
Subsurface Soils												
Metals (mg/kg)												
Aluminum	6.02E+03	1.41E+04	9.23E+03	18/18	2.00E+01	2.00E+01	1/18	1.20E+04	0/18	1.00E+05	18/18	4.64E+03
Arsenic	2.40E+00	6.30E+00	3.96E+00	7/18	5.00E+00	5.00E+00	0/18	7.90E+00	0/18	3.15E+02	7/18	5.23E-01
Barium	1.29E+01	2.43E+02	6.10E+01	18/18	1.00E+00	1.00E+00	2/18	1.70E+02	0/18	1.00E+05	1/18	2.29E+02
Beryllium	2.20E-01	1.23E+00	6.47E-01	13/18	5.00E-01	5.00E-01	5/18	6.90E-01	0/18	1.28E+03	1/18	9.48E-01
Cadmium	1.70E+00	1.70E+00	1.70E+00	1/18	7.50E-01	2.00E+00	1/18	2.10E-01	0/18	7.05E+01	0/18	2.13E+01
Calcium	7.86E+02	4.02E+03	1.61E+03	18/18	5.00E+01	5.00E+01	0/18	6.10E+03	n/a	n/a	n/a	n/a
Chromium	6.90E+00	2.47E+01	1.27E+01	18/18	2.00E+00	2.00E+00	2/18	4.30E+01	n/a	n/a	0/18	3.56E+02
Cobalt	2.10E+00	2.73E+01	6.50E+00	18/18	1.00E+00	1.00E+00	1/18	1.30E+01	0/18	1.00E+05	0/18	1.92E+03
Copper	2.54E+00	5.52E+01	9.02E+00	18/18	2.00E+00	2.00E+00	1/18	2.50E+01	0/18	1.00E+05	0/18	4.93E+02
Iron	5.36E+03	3.03E+04	1.42E+04	18/18	5.00E+00	2.50E+02	1/18	2.80E+04	0/18	1.00E+05	18/18	2.07E+03
Lead	7.00E+00	4.73E+01	1.85E+01	10/18	2.00E+01	2.00E+01	3/18	2.30E+01	0/18	1.25E+03	0/18	5.00E+01
Lithium	2.38E+00	7.50E+00	4.05E+00	10/11	2.00E+00	2.00E+00	n/a	n/a	0/11	1.00E+05	0/11	6.41E+02
Magnesium	3.97E+02	2.28E+03	1.04E+03	18/18	1.50E+01	1.50E+01	1/18	2.10E+03	n/a	n/a	n/a	n/a
Manganese	2.33E+01	1.46E+03	3.02E+02	18/18	1.00E+00	1.00E+00	2/18	8.20E+02	0/18	4.64E+04	11/18	4.52E+01
Mercury	2.40E-02	2.40E-02	2.40E-02	1/18	8.00E-02	2.00E-01	0/18	1.30E-01	0/18	8.25E+02	0/18	9.82E-01
Nickel	2.50E+00	2.47E+01	8.72E+00	11/18	5.00E+00	5.00E+00	1/18	2.20E+01	0/18	9.30E+04	0/18	2.42E+02
Potassium	1.46E+02	8.87E+02	3.33E+02	18/18	1.00E+02	1.00E+02	0/18	9.50E+02	n/a	n/a	n/a	n/a
Sodium	6.63E+01	3.46E+02	2.48E+02	11/18	2.00E+02	4.55E+02	1/18	3.40E+02	n/a	n/a	n/a	n/a
Strontium	3.81E+00	1.44E+01	7.77E+00	11/11	2.00E+00	2.00E+00	n/a	n/a	0/11	1.00E+05	0/11	5.45E+03
Vanadium	8.37E+00	3.88E+01	2.43E+01	18/18	2.00E+00	2.00E+00	1/18	3.70E+01	0/18	4.47E+03	18/18	3.32E+00
Zinc	5.30E+00	5.40E+01	2.35E+01	12/18	1.50E+01	1.50E+01	0/18	6.00E+01	0/18	1.00E+05	0/18	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	2.74E+00	2.37E+01	1.09E+01	19/21	6.10E-01	8.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.03E+00	2.30E+01	1.01E+01	21/21	7.90E-01	6.70E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	6.40E-01	6.70E-01	6.55E-01	2/2	n/a	n/a	0/2	1.40E+00	0/2	1.49E+03	0/2	1.49E+01
Uranium-234	1.80E-01	5.40E-01	3.60E-01	2/2	n/a	n/a	0/2	2.40E+00	0/2	1.98E+03	0/2	1.98E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.53. Summary of Surface and Subsurface Historical Data at SWMU 16 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Uranium-235	7.20E-03	4.10E-02	2.41E-02	2/13	1.80E+00	1.10E+01	0/13	1.40E-01	0/13	3.95E+01	0/13	3.95E-01
Uranium-238	2.30E-01	2.40E+00	1.32E+00	2/2	n/a	n/a	1/2	1.20E+00	0/2	1.71E+02	1/2	1.71E+00
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	8.70E-02	2.20E-01	1.47E-01	5/18	3.60E-01	5.00E-01	n/a	n/a	0/18	7.40E+03	0/18	8.84E+00
Volatiles (mg/kg)												
2-Butanone	6.00E-03	6.00E-03	6.00E-03	1/21	1.00E-02	1.20E+00	n/a	n/a	0/21	3.94E+04	0/21	1.03E+03
Acetone	1.20E-02	2.60E-02	1.77E-02	6/21	1.00E-02	1.20E+00	n/a	n/a	0/21	1.91E+04	0/21	3.58E+02
Methylene chloride	2.00E-03	7.00E+00	1.41E+00	5/21	6.00E-03	1.20E+00	n/a	n/a	0/21	2.16E+03	0/21	1.34E+01
Total Xylene	4.00E-03	4.00E-03	4.00E-03	1/7	6.00E-03	6.00E-03	n/a	n/a	0/7	2.20E+04	0/7	7.24E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

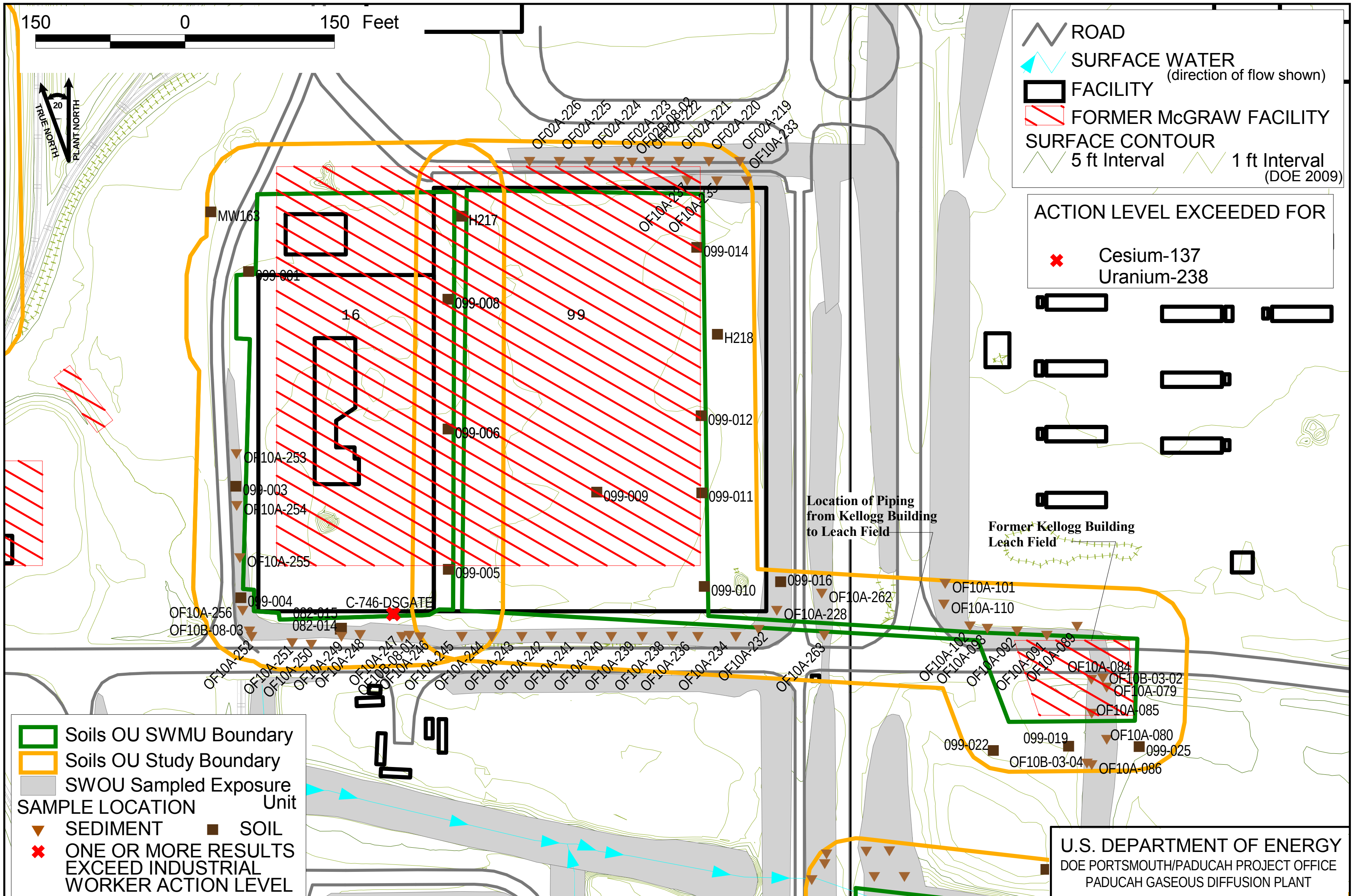


Figure 5.67. Soils Operable Unit: SWMUs 16 and 99

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 518 (Field South of C-746-P1 Clean Scrap Yard)

Area description

The field south of the C-746-P1 Clean Scrap Yard (SWMU 518) is an open field located south of the C-746-P Yard in the northwestern portion of the plant. SWMU 518 is approximately 35,000 ft^2.

Process history

The field south C-746-P1 is believed to have been used as a temporary storage area for heavy equipment.

Previous investigation results

Analytical results from pre-characterization sampling, performed by collecting subsurface composite samples within four grid areas, indicated the presence of PAHs in three of the grids. A second round of sampling was conducted by collecting grab samples within the previously discussed grids. The presence of PAHs was confirmed.

A radiological walkover survey performed in the area indicated results ranging from 15,000 to 35,000 cpm.

Table 5.54 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.68).

Area utilities

No current recirculating water lines or sewers are associated with this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.54. Summary of Surface and Subsurface Historical Data at SWMU 518

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Aluminum	3.17E+03	8.72E+03	5.81E+03	15/15	1.77E+01	2.00E+01	0/15	1.30E+04	0/15	1.00E+05	11/15	4.64E+03
Arsenic	2.79E+00	9.52E+00	4.94E+00	7/15	9.60E-01	5.00E+00	2/15	1.20E+01	0/15	3.15E+02	7/15	5.23E-01
Barium	3.33E+01	1.30E+02	7.11E+01	15/15	1.00E+00	5.00E+00	0/15	2.00E+02	0/15	1.00E+05	0/15	2.29E+02
Beryllium	3.50E-01	5.50E-01	4.53E-01	4/15	4.40E-01	5.00E-01	0/15	6.70E-01	0/15	1.28E+03	0/15	9.48E-01
Calcium	3.10E+03	2.07E+05	6.81E+04	15/15	5.00E+01	2.00E+03	12/15	2.00E+05	n/a	n/a	n/a	n/a
Chromium	2.70E+00	1.28E+01	8.15E+00	15/15	2.00E+00	2.50E+00	0/15	1.60E+01	n/a	n/a	0/15	3.56E+02
Cobalt	2.50E+00	1.76E+01	5.00E+00	15/15	1.00E+00	2.50E+00	1/15	1.40E+01	0/15	1.00E+05	0/15	1.92E+03
Copper	2.50E+00	1.11E+01	6.97E+00	15/15	2.00E+00	2.50E+00	0/15	1.90E+01	0/15	1.00E+05	0/15	4.93E+02
Iron	4.50E+03	1.22E+04	8.50E+03	15/15	5.00E+00	2.00E+01	0/15	2.80E+04	0/15	1.00E+05	15/15	2.07E+03
Lead	6.90E+00	3.19E+01	1.86E+01	6/15	1.77E+01	2.00E+02	1/15	3.60E+01	0/15	1.25E+03	0/15	5.00E+01
Magnesium	6.31E+02	4.78E+03	2.25E+03	15/15	4.43E+00	1.50E+01	8/15	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.35E+02	5.67E+02	3.37E+02	15/15	1.00E+00	1.00E+01	0/15	1.50E+03	0/15	4.64E+04	15/15	4.52E+01
Nickel	5.80E+00	2.48E+01	1.02E+01	15/15	4.43E+00	5.00E+00	1/15	2.10E+01	0/15	9.30E+04	0/15	2.42E+02
Potassium	2.13E+02	5.67E+02	4.16E+02	8/8	8.85E+01	1.00E+02	0/8	1.30E+03	n/a	n/a	n/a	n/a
Selenium	1.06E+00	1.06E+00	1.06E+00	1/15	2.90E-01	1.99E+01	1/15	8.00E-01	0/15	2.56E+04	0/15	9.49E+01
Sodium	4.31E+01	2.76E+02	1.54E+02	5/8	8.85E+01	2.00E+02	0/8	3.20E+02	n/a	n/a	n/a	n/a
Uranium	5.48E+00	2.17E+02	3.72E+01	7/13	1.30E-01	2.00E+03	7/13	4.90E+00	0/13	3.34E+03	1/13	2.02E+01
Vanadium	6.80E+00	2.31E+01	1.50E+01	15/15	2.00E+00	2.50E+00	0/15	3.80E+01	0/15	4.47E+03	15/15	3.32E+00
Zinc	2.41E+01	7.61E+01	4.36E+01	10/15	1.50E+01	2.00E+02	3/15	6.50E+01	0/15	1.00E+05	0/15	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.60E-01	1.64E+00	8.38E-01	4/19	1.00E-01	1.30E-01	n/a	n/a	0/19	4.25E+01	4/19	1.99E-01
PCB-1260	6.80E-02	1.64E+00	5.86E-01	6/24	9.00E-02	8.20E-01	n/a	n/a	0/24	4.25E+01	4/24	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.20E+00	1.82E+01	9.20E+00	6/7	1.22E+00	9.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.05E+01	4.14E+01	1.83E+01	7/7	1.13E+00	7.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	-1.80E-01	5.63E-01	1.44E-01	17/20	1.01E-02	7.40E-01	6/20	4.90E-01	0/20	8.58E+00	7/20	8.58E-02
Neptunium-237	5.17E-02	6.36E-02	5.77E-02	2/12	2.14E-02	3.68E-02	0/12	1.00E-01	0/12	2.71E+01	0/12	2.71E-01
Plutonium-239	7.50E-03	3.90E-01	1.99E-01	2/2	n/a	n/a	1/2	2.50E-02	0/2	1.15E+03	0/2	1.15E+01
Plutonium-239/240	7.13E-02	9.19E-02	8.16E-02	2/10	2.00E-02	4.50E-02	n/a	n/a	0/10	1.15E+03	0/10	1.15E+01
Technetium-99	3.26E+00	1.73E+01	7.94E+00	5/14	2.64E+00	4.52E+00	5/14	2.50E+00	0/14	3.62E+04	0/14	3.62E+02
Thorium-228	2.13E-01	4.22E-01	2.95E-01	9/10	6.46E-02	1.60E-01	0/10	1.60E+00	0/10	2.80E+00	9/10	2.80E-02
Thorium-230	2.35E-01	6.70E-01	3.81E-01	11/12	1.26E-01	2.10E-01	0/12	1.50E+00	0/12	1.49E+03	0/12	1.49E+01
Thorium-232	1.64E-01	3.82E-01	3.01E-01	10/10	4.00E-02	6.52E-02	0/10	1.50E+00	0/10	1.35E+03	0/10	1.35E+01
Uranium	1.32E+00	1.32E+00	1.32E+00	1/7	5.33E-01	1.02E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	4.70E-01	2.06E+00	8.52E-01	6/12	8.00E-02	4.99E-01	0/12	2.50E+00	0/12	1.98E+03	0/12	1.98E+01
Uranium-235	1.60E-02	9.25E-02	4.12E-02	12/14	1.00E-02	5.50E+00	0/14	1.40E-01	0/14	3.95E+01	0/14	3.95E-01
Uranium-238	6.30E-01	1.09E+01	1.95E+00	20/20	4.00E-02	3.05E+00	11/20	1.20E+00	0/20	1.71E+02	8/20	1.71E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.54. Summary of Surface and Subsurface Historical Data at SWMU 518 (Continued)

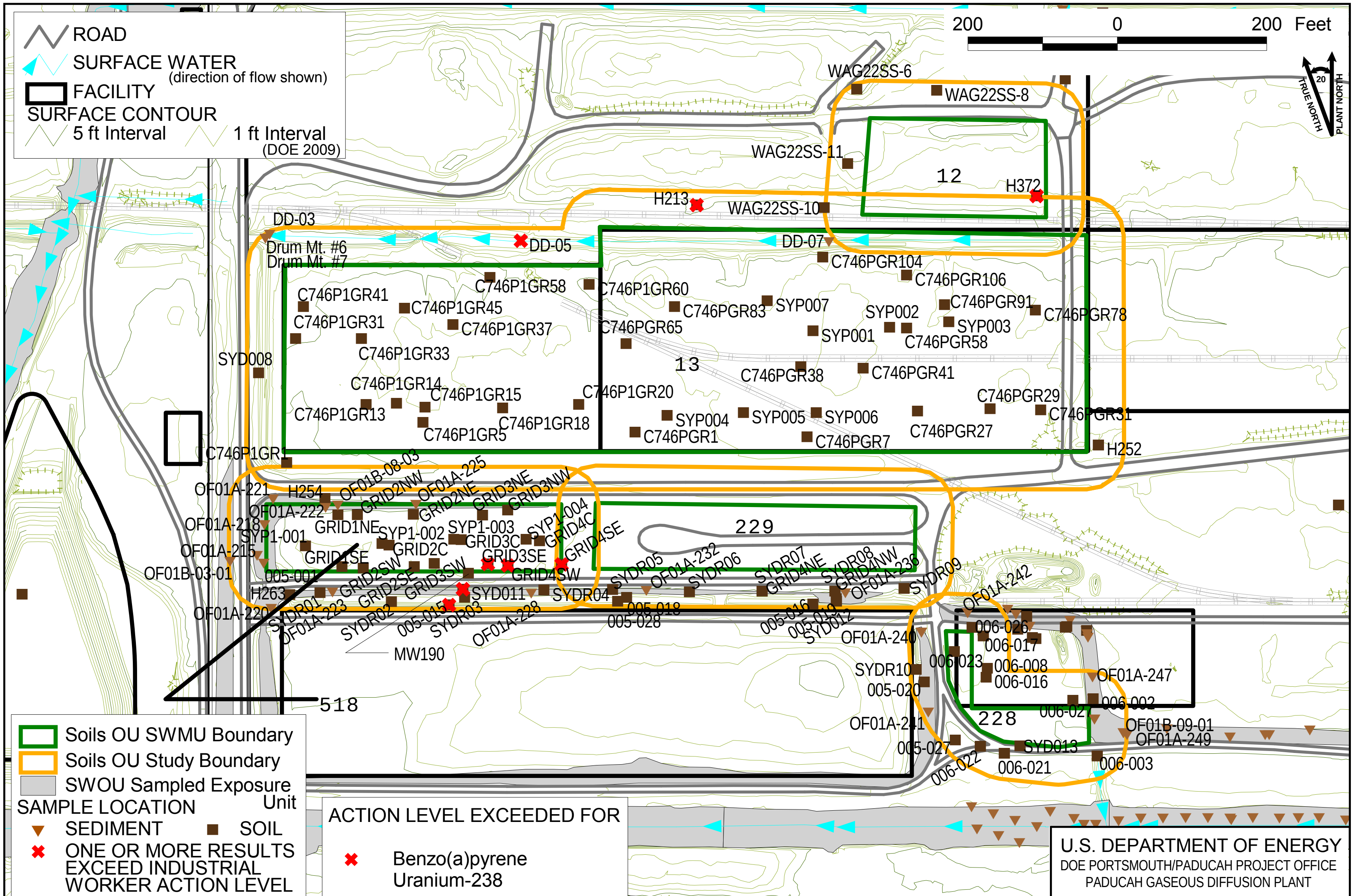
Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Semivolatiles (mg/kg)												
2-Methylnaphthalene	1.50E-01	7.30E+00	2.74E+00	3/33	3.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
3-Nitrobenzenamine	9.45E+00	9.45E+00	9.45E+00	1/33	4.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
Acenaphthene	4.90E-01	3.20E+01	7.40E+00	13/36	3.60E-01	2.40E+00	n/a	n/a	0/36	6.67E+04	0/36	3.16E+02
Acenaphthylene	1.20E+00	9.45E+00	5.33E+00	2/36	3.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	5.50E-01	4.00E+01	7.95E+00	14/36	3.60E-01	2.00E+01	n/a	n/a	0/36	1.00E+05	0/36	3.79E+03
Benz(a)anthracene	6.00E-02	1.30E+02	1.70E+01	24/36	3.60E-01	2.40E+00	n/a	n/a	0/36	2.08E+02	23/36	2.12E-01
Benzo(a)pyrene	6.70E-02	8.00E+01	1.33E+01	24/36	3.60E-01	2.40E+00	n/a	n/a	6/36	2.08E+01	24/36	2.12E-02
Benzo(b)fluoranthene	8.20E-02	1.70E+02	2.10E+01	24/36	3.60E-01	2.40E+00	n/a	n/a	0/36	2.08E+02	23/36	2.12E-01
Benzo(ghi)perylene	6.10E-02	2.80E+01	5.45E+00	20/37	3.60E-01	2.40E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.10E-02	1.17E+01	3.72E+00	6/8	3.60E-01	5.00E-01	n/a	n/a	0/8	2.08E+03	3/8	2.12E+00
Bis(2-ethylhexyl)phthalate	4.40E+00	5.70E+00	4.93E+00	16/33	3.60E-01	2.40E+00	n/a	n/a	0/33	7.40E+03	0/33	8.84E+00
Carbazole	5.90E-01	7.10E+01	1.57E+01	9/30	4.60E-01	2.40E+00	n/a	n/a	0/30	1.28E+04	2/30	2.15E+01
Chrysene	6.70E-02	9.50E+01	1.20E+01	24/36	3.60E-01	2.40E+00	n/a	n/a	0/36	2.08E+04	5/36	2.12E+01
Dibenz(a,h)anthracene	1.60E+00	1.60E+00	1.60E+00	1/8	3.60E-01	5.00E-01	n/a	n/a	0/8	2.08E+01	1/8	2.12E-02
Dibenzofuran	8.30E-01	3.52E+00	2.00E+00	3/5	3.60E-01	5.00E-01	n/a	n/a	0/5	9.02E+03	0/5	1.86E+01
Fluoranthene	1.30E-01	5.33E+01	1.25E+01	6/8	3.60E-01	5.00E-01	n/a	n/a	0/8	6.50E+04	0/8	2.21E+02
Fluorene	6.60E-01	2.80E+01	7.80E+00	12/36	3.60E-01	2.40E+00	n/a	n/a	0/36	7.09E+04	0/36	3.39E+02
Indeno(1,2,3-cd)pyrene	5.40E-02	3.70E+01	6.51E+00	20/36	3.60E-01	2.40E+00	n/a	n/a	0/36	2.08E+02	19/36	2.12E-01
Naphthalene	1.90E-01	1.60E+01	4.41E+00	4/36	3.60E-01	2.40E+00	n/a	n/a	0/36	7.66E+02	0/36	2.36E+01
Phenanthrene	8.50E-02	6.40E+01	1.37E+01	24/36	3.60E-01	2.00E+01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	9.80E-02	1.50E+02	1.86E+01	27/36	3.60E-01	2.40E+00	n/a	n/a	0/36	4.87E+04	0/36	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	5.00E-03	6.00E-03	5.50E-03	2/11	6.00E-03	1.30E-02	n/a	n/a	0/11	2.16E+03	0/11	1.34E+01
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	7.80E+03	7.80E+03	7.80E+03	1/1	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	5.44E+03	1.17E+04	8.00E+03	7/7	2.00E+01	2.00E+01	0/7	1.20E+04	0/7	1.00E+05	7/7	4.64E+03
Arsenic	1.90E+00	9.30E+00	5.01E+00	6/7	5.00E+00	5.00E+00	1/7	7.90E+00	0/7	3.15E+02	6/7	5.23E-01
Barium	2.38E+01	2.50E+02	1.43E+02	7/7	1.00E+00	1.00E+00	3/7	1.70E+02	0/7	1.00E+05	2/7	2.29E+02
Beryllium	4.90E-01	1.40E+00	9.48E-01	5/7	3.20E-02	5.00E-01	3/7	6.90E-01	0/7	1.28E+03	2/7	9.48E-01
Calcium	6.62E+02	2.84E+03	1.64E+03	7/7	5.00E+01	5.00E+01	0/7	6.10E+03	n/a	n/a	n/a	n/a
Chromium	5.70E+00	3.41E+01	1.42E+01	7/7	2.00E+00	2.00E+00	1/7	4.30E+01	n/a	n/a	0/7	3.56E+02
Cobalt	3.50E+00	2.47E+01	9.09E+00	7/7	1.00E+00	1.00E+00	1/7	1.30E+01	0/7	1.00E+05	0/7	1.92E+03
Copper	3.54E+00	3.71E+01	1.43E+01	7/7	2.00E+00	2.00E+00	1/7	2.50E+01	0/7	1.00E+05	0/7	4.93E+02
Iron	8.70E+03	3.31E+04	1.90E+04	7/7	5.00E+00	5.00E+00	2/7	2.80E+04	0/7	1.00E+05	7/7	2.07E+03
Lead	4.20E+00	1.71E+01	1.22E+01	6/7	2.00E+01	2.00E+01	0/7	2.30E+01	0/7	1.25E+03	0/7	5.00E+01
Magnesium	4.41E+02	1.81E+03	1.21E+03	7/7	1.50E+01	1.50E+01	0/7	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.17E+02	1.12E+03	5.41E+02	7/7	1.00E+00	1.00E+00	3/7	8.20E+02	0/7	4.64E+04	7/7	4.52E+01
Mercury	5.70E-02	6.20E-02	5.95E-02	2/7	1.00E-01	2.00E-01	0/7	1.30E-01	0/7	8.25E+02	0/7	9.82E-01
Nickel	6.10E+00	3.39E+01	1.70E+01	7/7	5.00E+00	5.00E+00	3/7	2.20E+01	0/7	9.30E+04	0/7	2.42E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.54. Summary of Surface and Subsurface Historical Data at SWMU 518 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Potassium	7.86E+01	4.99E+02	3.38E+02	7/7	1.00E+02	1.00E+02	0/7	9.50E+02	n/a	n/a	n/a	n/a
Silver	2.70E+00	2.80E+00	2.75E+00	2/7	6.60E-01	4.00E+00	2/7	2.70E+00	0/7	2.07E+04	0/7	4.11E+01
Sodium	9.37E+01	3.83E+02	2.40E+02	7/7	2.00E+02	2.00E+02	2/7	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	1.71E+01	4.14E+01	2.83E+01	7/7	2.00E+00	2.00E+00	1/7	3.70E+01	0/7	4.47E+03	7/7	3.32E+00
Zinc	1.73E+01	1.90E+02	5.33E+01	7/7	1.50E+01	1.50E+01	1/7	6.00E+01	0/7	1.00E+05	0/7	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.89E+01	2.10E+01	2.00E+01	2/2	8.50E+00	9.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.34E+01	1.69E+01	1.52E+01	2/2	7.20E+00	7.90E+00	n/a	n/a	n/a	n/a	n/a	n/a
Semivolatiles (mg/kg)												
Acenaphthene	5.60E-02	2.20E-01	1.45E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	6.67E+04	0/6	3.16E+02
Anthracene	8.30E-02	3.10E-01	2.11E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	1.00E+05	0/6	3.79E+03
Benz(a)anthracene	1.90E-01	5.00E-01	3.73E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+02	2/6	2.12E-01
Benzo(a)pyrene	1.40E-01	4.40E-01	3.30E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+01	3/6	2.12E-02
Benzo(b)fluoranthene	1.40E-01	5.40E-01	3.50E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+02	2/6	2.12E-01
Benzo(ghi)perylene	2.60E-01	2.60E-01	2.60E-01	2/6	4.00E-01	4.40E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.60E-01	5.80E-01	3.07E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+03	0/6	2.12E+00
Bis(2-ethylhexyl)phthalate	1.00E+00	1.50E+00	1.25E+00	2/6	4.00E-01	4.40E-01	n/a	n/a	0/6	7.40E+03	0/6	8.84E+00
Bis(2-methoxyethyl)phthalate	1.70E-01	1.70E-01	1.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Chrysene	2.10E-01	5.60E-01	4.20E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+04	0/6	2.12E+01
Dibenz(a,h)anthracene	5.60E-02	5.60E-02	5.60E-02	1/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+01	1/6	2.12E-02
Dibenzofuran	8.40E-02	8.70E-02	8.55E-02	2/6	4.00E-01	4.40E-01	n/a	n/a	0/6	9.02E+03	0/6	1.86E+01
Dioctyl hexanedioate	5.60E-01	5.60E-01	5.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Ethanol, 2,2'-oxybis-, diacetate	1.80E+00	1.80E+00	1.80E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoranthene	4.80E-01	1.30E+00	9.93E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	6.50E+04	0/6	2.21E+02
Fluorene	1.40E-01	1.90E-01	1.65E-01	2/6	4.00E-01	4.40E-01	n/a	n/a	0/6	7.09E+04	0/6	3.39E+02
Indeno(1,2,3-cd)pyrene	2.30E-01	2.70E-01	2.50E-01	2/6	4.00E-01	4.40E-01	n/a	n/a	0/6	2.08E+02	2/6	2.12E-01
Phenanthrene	4.30E-01	1.30E+00	9.43E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.70E-01	1.30E+00	8.90E-01	3/6	4.00E-01	4.40E-01	n/a	n/a	0/6	4.87E+04	0/6	1.65E+02
Volatiles (mg/kg)												
Acetone	4.30E-02	1.30E-01	8.10E-02	3/9	6.00E-03	1.30E-02	n/a	n/a	0/9	1.91E+04	0/9	3.58E+02
Methylene chloride	3.00E-03	5.40E-02	2.28E-02	4/9	6.00E-03	1.30E-02	n/a	n/a	0/9	2.16E+03	0/9	1.34E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.



U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure 5.68. Soils Operable Unit: SWMUs 12, 13, 228, 229, and 518

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 520 (Scrap Material West of C-746-A)

Area description

The Scrap Material west of C-746-A (SWMU 520) is located in the northwestern portion of PGDP. SWMU 520 is approximately 152,000 ft^2.

Process history

The area west of C-746-A has been used as a storage area for old equipment and materials since the 1970s. Material stored in this area include old pallets, old equipment, (such as tow motors, forklifts, welding rigs and fixtures, vehicles, and vehicle trailers), and wooden saddles from the cylinder yards.

Previous investigation results

Annual surveys of the perimeter of this area are performed. The area currently is posted as a radioactive materials area, although no known releases have occurred.

Table 5.55 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.69).

Area utilities

No current recirculating water lines or sewers are associated with this facility. Utilities within the boundary are associated with SWMU 196. Additional information is found in Section 9.3.1.70.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.55. Summary of Surface and Subsurface Historical Data at SWMU 520

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Metals (mg/kg)												
Aluminum	2.58E+03	1.13E+04	7.45E+03	15/15	1.63E+00	2.00E+01	0/15	1.30E+04	0/15	1.00E+05	12/15	4.64E+03
Antimony	2.92E-01	3.74E-01	3.33E-01	2/15	2.30E-01	2.00E+01	2/15	2.10E-01	0/15	4.63E+02	0/15	3.79E-01
Arsenic	1.81E+00	6.38E+00	4.18E+00	7/18	8.27E-02	5.00E+00	0/18	1.20E+01	0/18	3.15E+02	7/18	5.23E-01
Barium	2.33E+01	1.57E+02	8.36E+01	18/18	1.71E-01	2.50E+00	0/18	2.00E+02	0/18	1.00E+05	0/18	2.29E+02
Beryllium	1.70E-01	7.30E-01	4.92E-01	7/15	1.81E-01	5.00E-01	1/15	6.70E-01	0/15	1.28E+03	0/15	9.48E-01
Cadmium	1.83E+00	2.53E+00	2.18E+00	2/18	2.45E-01	2.00E+00	2/18	2.10E-01	0/18	7.05E+01	0/18	2.13E+01
Calcium	9.32E+02	2.93E+05	4.84E+04	15/15	6.63E+00	2.00E+03	11/15	2.00E+05	n/a	n/a	n/a	n/a
Chromium	3.30E+00	2.07E+01	1.07E+01	18/18	3.83E-01	2.50E+00	3/18	1.60E+01	n/a	n/a	0/18	3.56E+02
Cobalt	2.49E+00	6.53E+00	4.18E+00	15/15	3.73E-01	2.50E+00	0/15	1.40E+01	0/15	1.00E+05	0/15	1.92E+03
Copper	4.20E+00	2.13E+01	1.04E+01	15/15	2.11E-01	2.50E+00	2/15	1.90E+01	0/15	1.00E+05	0/15	4.93E+02
Iron	4.68E+03	1.96E+04	1.07E+04	15/15	6.68E-01	1.86E+02	0/15	2.80E+04	0/15	1.00E+05	15/15	2.07E+03
Lead	1.23E+01	2.49E+01	1.99E+01	4/18	2.48E+00	2.00E+01	2/18	3.60E+01	0/18	1.25E+03	0/18	5.00E+01
Lithium	5.53E+00	8.08E+00	6.59E+00	6/6	5.00E+00	5.00E+00	n/a	n/a	0/6	1.00E+05	0/6	6.41E+02
Magnesium	3.89E+02	7.74E+03	2.20E+03	15/15	2.50E+00	1.50E+01	5/15	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.74E+02	5.34E+02	3.25E+02	15/15	2.01E-01	2.50E+00	0/15	1.50E+03	0/15	4.64E+04	15/15	4.52E+01
Mercury	4.13E-02	5.21E-02	4.67E-02	2/18	7.80E-03	2.00E-01	0/18	2.00E-01	0/18	8.25E+02	0/18	9.82E-01
Nickel	6.07E+00	7.36E+01	1.76E+01	14/15	1.28E+00	5.00E+00	4/15	2.10E+01	0/15	9.30E+04	0/15	2.42E+02
Potassium	1.66E+02	9.33E+02	5.57E+02	9/9	9.30E+01	1.07E+02	0/9	1.30E+03	n/a	n/a	n/a	n/a
Selenium	3.52E-01	3.52E-01	3.52E-01	1/18	8.91E-02	1.99E+01	0/18	8.00E-01	0/18	2.56E+04	0/18	9.49E+01
Sodium	1.16E+02	4.23E+02	2.54E+02	6/9	1.11E+01	2.00E+02	2/9	3.20E+02	n/a	n/a	n/a	n/a
Thallium	1.47E-01	1.57E-01	1.52E-01	2/15	1.16E-01	2.00E+01	0/15	2.10E-01	n/a	n/a	n/a	n/a
Uranium	2.86E+00	1.14E+02	2.60E+01	5/12	1.30E-01	1.00E+03	3/12	4.90E+00	0/12	3.34E+03	1/12	2.02E+01
Vanadium	4.60E+00	2.48E+01	1.83E+01	15/15	6.02E-01	2.50E+00	0/15	3.80E+01	0/15	4.47E+03	15/15	3.32E+00
Zinc	1.94E+01	2.22E+02	6.13E+01	14/15	1.44E-01	1.99E+01	3/15	6.50E+01	0/15	1.00E+05	0/15	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.40E-01	1.51E+00	8.25E-01	2/22	1.00E-01	1.30E-01	n/a	n/a	0/22	4.25E+01	1/22	1.99E-01
PCB-1254	1.40E-01	1.06E+00	6.00E-01	2/26	6.00E-02	8.70E-01	n/a	n/a	0/26	1.82E+01	1/26	1.99E-01
PCB-1260	4.50E-01	4.50E-01	4.50E-01	1/26	9.00E-02	8.70E-01	n/a	n/a	0/26	4.25E+01	1/26	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.70E+00	2.07E+01	1.15E+01	12/13	1.08E+00	1.05E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.82E+00	9.74E+01	2.85E+01	13/13	1.09E+00	1.86E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.76E-02	3.70E-01	1.12E-01	17/22	1.66E-02	3.20E+00	1/22	4.90E-01	0/22	8.58E+00	8/22	8.58E-02
Neptunium-237	4.40E-02	6.80E-01	2.72E-01	3/12	2.00E-02	4.83E-02	1/12	1.00E-01	0/12	2.71E+01	1/12	2.71E-01
Plutonium-239	5.50E-01	5.50E-01	5.50E-01	1/1	n/a	n/a	1/1	2.50E-02	0/1	1.15E+03	0/1	1.15E+01
Plutonium-239/240	3.70E-01	3.70E-01	3.70E-01	1/11	1.00E-02	7.24E-02	n/a	n/a	0/11	1.15E+03	0/11	1.15E+01
Technetium-99	3.10E+00	3.34E+01	1.08E+01	6/15	2.57E+00	5.77E+00	6/15	2.50E+00	0/15	3.62E+04	0/15	3.62E+02
Thorium-228	2.23E-01	4.06E-01	3.13E-01	9/9	6.00E-02	1.60E-01	0/9	1.60E+00	0/9	2.80E+00	9/9	2.80E-02
Thorium-230	2.21E-01	5.60E-01	3.76E-01	10/12	1.72E-01	3.01E-01	0/12	1.50E+00	0/12	1.49E+03	0/12	1.49E+01
Thorium-232	1.86E-01	4.57E-01	3.22E-01	9/9	4.00E-02	1.98E-01	0/9	1.50E+00	0/9	1.35E+03	0/9	1.35E+01
Uranium	3.90E+00	5.00E+00	4.45E+00	2/8	3.98E-01	1.59E+00	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.55. Summary of Surface and Subsurface Historical Data at SWMU 520 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Uranium-234	1.40E-01	1.80E+00	9.30E-01	6/12	8.00E-02	9.20E-01	0/12	2.50E+00	0/12	1.98E+03	0/12	1.98E+01
Uranium-235	2.20E-02	1.03E-01	5.34E-02	11/15	2.00E-02	6.80E+00	0/15	1.40E-01	0/15	3.95E+01	0/15	3.95E-01
Uranium-238	-7.10E-01	4.50E+00	1.40E+00	19/20	4.00E-02	6.57E+00	9/20	1.20E+00	0/20	1.71E+02	7/20	1.71E+00
Semivolatiles (mg/kg)												
Anthracene	1.56E-01	1.56E-01	1.56E-01	1/21	1.70E-01	5.60E-01	n/a	n/a	0/21	1.00E+05	0/21	3.79E+03
Benz(a)anthracene	2.55E-01	1.20E+00	7.28E-01	2/21	1.50E-01	5.60E-01	n/a	n/a	0/21	2.08E+02	2/21	2.12E-01
Benzo(a)pyrene	4.02E-01	1.00E+00	7.01E-01	2/21	1.70E-01	5.60E-01	n/a	n/a	0/21	2.08E+01	2/21	2.12E-02
Benzo(b)fluoranthene	5.00E-01	1.80E+00	1.15E+00	2/21	1.70E-01	5.60E-01	n/a	n/a	0/21	2.08E+02	2/21	2.12E-01
Benzo(ghi)perylene	1.24E-01	8.00E-01	4.62E-01	2/17	1.70E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	5.00E-01	5.00E-01	5.00E-01	1/14	1.70E-01	5.60E-01	n/a	n/a	0/14	2.08E+03	0/14	2.12E+00
Bis(2-ethylhexyl)phthalate	4.20E-01	4.20E-01	4.20E-01	1/12	3.60E-01	5.00E-01	n/a	n/a	0/12	7.40E+03	0/12	8.84E+00
Chrysene	4.17E-01	2.00E+00	1.21E+00	2/21	1.70E-01	5.60E-01	n/a	n/a	0/21	2.08E+04	0/21	2.12E+01
Di-n-butyl phthalate	1.70E+00	1.70E+00	1.70E+00	1/5	3.60E-01	5.00E-01	n/a	n/a	0/5	1.00E+05	0/5	2.13E+03
Fluoranthene	6.36E-01	6.36E-01	6.36E-01	1/14	1.70E-01	5.60E-01	n/a	n/a	0/14	6.50E+04	0/14	2.21E+02
Indeno(1,2,3-cd)pyrene	1.38E-01	9.10E-01	5.24E-01	2/21	1.70E-01	5.60E-01	n/a	n/a	0/21	2.08E+02	1/21	2.12E-01
Phenanthrene	4.61E-01	6.10E-01	5.36E-01	2/21	1.70E-01	5.60E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	6.63E-01	2.40E+00	1.53E+00	2/21	1.70E-01	5.60E-01	n/a	n/a	0/21	4.87E+04	0/21	1.65E+02
Volatiles (mg/kg)												
Methylene chloride	2.00E-03	2.00E-03	2.00E-03	1/8	1.00E-02	1.00E-02	n/a	n/a	0/8	2.16E+03	0/8	1.34E+01
Wetchem (mg/kg)												
Total Organic Carbon (TOC)	1.10E+04	1.10E+04	1.10E+04	1/1	3.00E+02	3.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Metals (mg/kg)												
Aluminum	2.20E+03	1.65E+04	8.68E+03	39/39	1.31E+00	2.70E+01	7/39	1.20E+04	0/39	1.00E+05	36/39	4.64E+03
Antimony	9.00E-01	9.80E+00	2.93E+00	5/39	5.22E-01	2.00E+01	5/39	2.10E-01	0/39	4.63E+02	5/39	3.79E-01
Arsenic	1.26E-01	7.99E+00	3.60E+00	25/39	8.27E-02	1.74E+01	1/39	7.90E+00	0/39	3.15E+02	24/39	5.23E-01
Barium	1.41E+01	1.94E+02	8.15E+01	39/39	2.42E-02	2.39E+00	3/39	1.70E+02	0/39	1.00E+05	0/39	2.29E+02
Beryllium	1.66E-01	2.62E+00	6.48E-01	29/38	1.88E-02	5.00E-01	7/38	6.90E-01	0/38	1.28E+03	4/38	9.48E-01
Cadmium	5.50E-02	4.09E+00	1.19E+00	7/39	4.89E-02	2.21E+00	4/39	2.10E-01	0/39	7.05E+01	0/39	2.13E+01
Calcium	2.57E+02	9.63E+04	6.68E+03	38/38	5.10E-01	1.00E+02	7/38	6.10E+03	n/a	n/a	n/a	n/a
Chromium	4.93E+00	6.60E+01	1.78E+01	39/39	1.33E-01	3.52E+00	17/39	4.30E+01	n/a	n/a	0/39	3.56E+02
Cobalt	4.57E-01	1.79E+01	5.12E+00	38/38	8.47E-02	2.39E+00	2/38	1.30E+01	0/38	1.00E+05	0/38	1.92E+03
Copper	6.94E-01	2.52E+01	8.34E+00	37/38	1.07E-01	2.39E+00	2/38	2.50E+01	0/38	1.00E+05	0/38	4.93E+02
Iron	2.58E+03	5.87E+04	1.58E+04	38/38	6.68E-01	5.00E+01	3/38	2.80E+04	0/38	1.00E+05	38/38	2.07E+03
Lead	1.32E+00	3.54E+01	1.05E+01	26/39	2.40E-01	2.00E+01	2/39	2.30E+01	0/39	1.25E+03	0/39	5.00E+01
Magnesium	1.16E+02	6.20E+03	1.44E+03	39/39	3.75E+00	4.02E+01	11/39	2.10E+03	n/a	n/a	n/a	n/a
Manganese	8.29E+00	1.55E+03	3.16E+02	38/38	3.00E-02	1.00E+01	3/38	8.20E+02	0/38	4.64E+04	36/38	4.52E+01
Mercury	9.60E-03	4.50E-02	2.62E-02	20/39	7.80E-03	2.00E-01	0/39	1.30E-01	0/39	8.25E+02	0/39	9.82E-01
Nickel	1.74E+00	5.44E+01	1.39E+01	32/39	1.28E-01	5.00E+00	3/39	2.20E+01	0/39	9.30E+04	0/39	2.42E+02
Potassium	1.12E+02	1.09E+03	4.10E+02	35/36	2.05E+00	1.00E+02	2/36	9.50E+02	n/a	n/a	n/a	n/a
Selenium	1.20E-01	3.05E-01	2.08E-01	7/39	8.00E-04	3.58E+01	0/39	7.00E-01	0/39	2.56E+04	0/39	9.49E+01
Sodium	9.41E+01	1.18E+03	3.18E+02	37/38	2.73E+00	2.00E+02	11/38	3.40E+02	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.55. Summary of Surface and Subsurface Historical Data at SWMU 520 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Thallium	1.35E-01	5.74E-01	3.52E-01	4/38	1.16E-01	1.50E+01	2/38	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	5.10E+00	7.91E+01	2.49E+01	38/38	1.45E-01	2.39E+00	4/38	3.70E+01	0/38	4.47E+03	38/38	3.32E+00
Zinc	5.35E+00	2.60E+02	4.42E+01	36/39	8.06E-02	2.00E+01	5/39	6.00E+01	0/39	1.00E+05	0/39	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	1.63E+00	2.11E+01	1.05E+01	43/44	6.75E-01	1.06E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.73E+00	5.44E+01	2.30E+01	44/44	3.40E-01	1.87E+01	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	6.00E-02	6.00E-02	6.00E-02	1/10	4.01E-02	8.03E-02	n/a	n/a	0/10	2.71E+01	0/10	2.71E-01
Radium-226	7.10E-01	7.41E-01	7.26E-01	2/4	3.35E-01	5.80E-01	0/4	1.50E+00	0/4	2.56E+00	2/4	2.56E-02
Thorium-228	2.33E-01	3.38E-01	2.86E-01	2/2	9.20E-02	9.56E-02	0/2	1.60E+00	0/2	2.80E+00	2/2	2.80E-02
Thorium-230	1.45E-01	5.90E-01	3.48E-01	5/6	1.06E-01	1.12E-01	0/6	1.40E+00	0/6	1.49E+03	0/6	1.49E+01
Thorium-232	2.49E-01	3.73E-01	3.11E-01	2/2	5.49E-02	6.29E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium	1.60E+00	3.90E+00	2.75E+00	2/10	2.88E-01	7.68E-01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	5.00E-01	2.00E+00	1.25E+00	2/10	1.28E-01	3.45E-01	0/10	2.40E+00	0/10	1.98E+03	0/10	1.98E+01
Uranium-235	3.04E-02	9.55E-02	6.30E-02	2/18	3.56E-02	1.00E+01	0/18	1.40E-01	0/18	3.95E+01	0/18	3.95E-01
Uranium-238	1.00E+00	1.90E+00	1.45E+00	2/10	1.24E-01	3.79E-01	1/10	1.20E+00	0/10	1.71E+02	1/10	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	8.10E-01	1.50E+00	1.16E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	0/17	6.67E+04	0/17	3.16E+02
Acenaphthylene	4.30E-01	4.30E-01	4.30E-01	1/17	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	8.50E-01	2.90E+00	1.88E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	0/17	1.00E+05	0/17	3.79E+03
Benz(a)anthracene	2.20E-01	6.90E+00	3.17E+00	3/17	1.50E-01	5.00E-01	n/a	n/a	0/17	2.08E+02	3/17	2.12E-01
Benzo(a)pyrene	2.40E-01	7.00E+00	3.25E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+01	3/17	2.12E-02
Benzo(b)fluoranthene	3.40E-01	8.70E+00	4.21E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+02	3/17	2.12E-01
Benzo(ghi)perylene	1.10E+00	4.40E+00	2.75E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.30E+00	3.10E+00	2.20E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+03	1/17	2.12E+00
Chrysene	2.50E-01	7.50E+00	3.45E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+04	0/17	2.12E+01
Dibenz(a,h)anthracene	2.10E-01	2.10E-01	2.10E-01	1/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+01	1/17	2.12E-02
Di-n-butyl phthalate	6.70E-01	6.70E-01	6.70E-01	1/13	4.10E-01	5.00E-01	n/a	n/a	0/13	1.00E+05	0/13	2.13E+03
Fluoranthene	6.60E-01	1.80E+01	8.82E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	0/17	6.50E+04	0/17	2.21E+02
Fluorene	1.20E+00	1.30E+00	1.25E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	0/17	7.09E+04	0/17	3.39E+02
Indeno(1,2,3-cd)pyrene	1.30E+00	4.40E+00	2.85E+00	2/17	1.70E-01	5.00E-01	n/a	n/a	0/17	2.08E+02	2/17	2.12E-01
Naphthalene	1.10E+00	1.10E+00	1.10E+00	1/17	1.70E-01	5.00E-01	n/a	n/a	0/17	7.66E+02	0/17	2.36E+01
Phenanthrene	3.60E-01	1.40E+01	7.05E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	4.20E-01	1.60E+01	7.14E+00	3/17	1.70E-01	5.00E-01	n/a	n/a	0/17	4.87E+04	0/17	1.65E+02
Volatiles (mg/kg)												
2-Butanone	7.00E-03	7.00E-03	7.00E-03	1/19	1.00E-02	1.20E-02	n/a	n/a	0/19	3.94E+04	0/19	1.03E+03
Acetone	1.10E-02	1.10E-02	1.10E-02	1/19	1.00E-02	1.20E-02	n/a	n/a	0/19	1.91E+04	0/19	3.58E+02
Methylene chloride	3.00E-03	5.00E-03	4.00E-03	2/19	6.00E-03	1.00E-02	n/a	n/a	0/19	2.16E+03	0/19	1.34E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

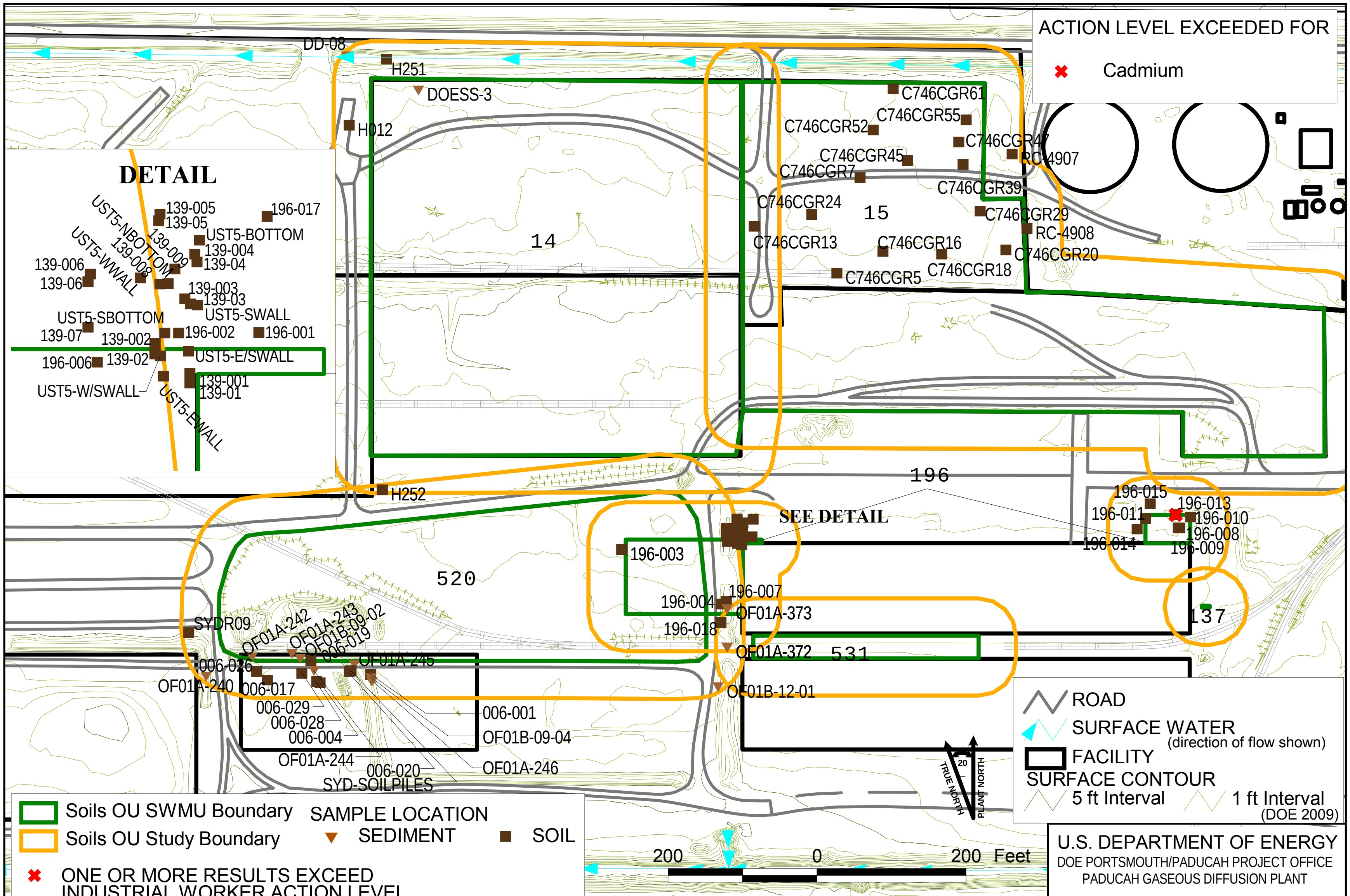


Figure 5.69. Soils Operable Unit: SWMUs 14, 15, 37, 196, 520, and 531

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

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5.1.10 Group 3–PCBs

SWMU 56 (C-540-A PCB Staging Area)

Area description

The C-540-A PCB Staging Area (SWMU 56) is located in the west central portion of the plant site.

Process history

SWMU 56 is made up of leaks and spills of oils containing PCBs as a result of past operations that contaminated the soils.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). Results of these investigations indicate the presence of PCBs.

In 1997, as part of the WAG 23 (DOE 1998f) non-time-critical removal action, 23 yd^3 of soil contaminated with dioxins and 72 yd^3 of soil contaminated with PCBs were excavated for SWMUs 56 and 80. A summary of conclusions from the WAG 23 RAR, based on the future use scenario of unrestricted industrial, is as follows:

> Following the removal action at WAG 23 sites, the residual PCB ELCR based on a 250 day/year exposure scenario is 2×10^{-6} at SWMUs 56 and 80 and below *de minimis* (i.e., 1×10^{-6}) at SWMUs 57 and 81. These risk levels are well within the EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6}, as required by the NCP.

Table 5.56 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.70).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.56. Summary of Surface and Subsurface Historical Data at SWMU 56

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.00E-05	9.00E-05	7.33E-05	6/6	1.00E-05	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2.00E-05	1.70E-04	1.02E-04	6/6	1.00E-05	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.00E-05	3.00E-05	1.83E-05	6/6	1.00E-05	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzofuran	1.00E-05	1.20E-04	5.83E-05	6/6	1.00E-05	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	4.87E-06	4.00E-05	1.47E-05	5/6	1.00E-05	3.50E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzofuran	2.10E-06	1.00E-05	8.64E-06	6/6	2.10E-06	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	9.10E-06	5.00E-05	2.15E-05	6/6	9.10E-06	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzofuran	2.30E-06	1.00E-05	7.52E-06	4/6	2.30E-06	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	9.15E-06	2.00E-05	1.38E-05	5/6	1.00E-05	3.70E-04	n/a	n/a	0/6	3.39E-02	0/6	5.07E-05
1,2,3,7,8-Pentachlorodibenzofuran	5.77E-06	1.00E-05	8.36E-06	4/6	4.71E-06	1.40E-04	n/a	n/a	0/6	2.81E-03	0/6	1.24E-05
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	2.50E-06	1.90E-04	4.46E-05	5/6	4.10E-06	1.90E-04	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4,6,7,8-Hexachlorodibenzofuran	1.26E-06	1.00E-05	5.56E-06	5/6	1.00E-05	3.70E-04	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4,7,8-Pentachlorodibenzofuran	3.00E-05	3.00E-05	3.00E-05	6/6	4.71E-06	1.40E-04	n/a	n/a	0/6	2.81E-02	0/6	1.24E-04
2,3,7,8-Tetrachlorodibenzofuran	2.00E-05	3.00E-05	2.17E-05	6/8	4.71E-06	1.00E-03	n/a	n/a	0/8	1.40E-02	0/8	6.19E-05
2,3,7,8-Tetrachlorodibenzo-p-dioxin	1.38E-06	1.61E-03	4.60E-04	6/8	4.71E-06	2.92E-03	n/a	n/a	2/8	6.19E-04	4/8	6.19E-06
Hexachloro-dibenzo[b,e][1,4]dioxin	3.36E-03	3.36E-03	3.36E-03	1/2	1.10E-04	1.00E-03	n/a	n/a	0/2	6.19E-03	1/2	6.19E-05
Hexachlorodibenzofuran	5.20E-03	5.20E-03	5.20E-03	1/2	9.00E-05	1.00E-03	n/a	n/a	0/2	1.40E-02	1/2	6.19E-05
Octachloro-dibenzo[b,e][1,4]dioxin	1.60E-03	1.18E-02	4.92E-03	8/8	2.00E-05	1.00E-03	n/a	n/a	0/8	6.19E-01	3/8	6.19E-03
Octachlorodibenzofuran	1.00E-04	1.71E-03	3.87E-04	7/8	2.00E-05	1.00E-03	n/a	n/a	0/8	1.40E+00	0/8	6.19E-03
Pentachloro-dibenzo[b,e][1,4]dioxin	2.49E-02	2.49E-02	2.49E-02	1/2	1.30E-04	1.00E-03	n/a	n/a	1/2	1.24E-03	1/2	1.24E-05
Pentachlorodibenzofuran	3.50E-02	3.50E-02	3.50E-02	1/2	6.00E-05	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Tetrachloro-dibenzo[b,e][1,4]dioxin	3.72E-02	3.72E-02	3.72E-02	1/2	5.00E-05	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Tetrachlorodibenzofuran	2.11E-02	2.11E-02	2.11E-02	1/2	4.00E-05	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	1.05E+04	1.05E+04	1.05E+04	1/1	n/a	n/a	0/1	1.30E+04	0/1	1.00E+05	1/1	4.64E+03
Arsenic	7.10E+00	7.10E+00	7.10E+00	1/1	n/a	n/a	0/1	1.20E+01	0/1	3.15E+02	1/1	5.23E-01
Barium	6.64E+01	6.64E+01	6.64E+01	1/1	n/a	n/a	0/1	2.00E+02	0/1	1.00E+05	0/1	2.29E+02
Beryllium	4.90E-01	7.80E-01	6.35E-01	2/2	5.00E-01	5.00E-01	1/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Cadmium	8.00E-01	8.00E-01	8.00E-01	1/1	n/a	n/a	1/1	2.10E-01	0/1	7.05E+01	0/1	2.13E+01
Calcium	4.88E+03	4.88E+03	4.88E+03	1/1	n/a	n/a	0/1	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.59E+01	1.65E+02	9.05E+01	2/2	2.00E+00	2.00E+00	1/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	6.50E+00	6.50E+00	6.50E+00	1/1	n/a	n/a	0/1	1.40E+01	0/1	1.00E+05	0/1	1.92E+03
Copper	1.31E+01	1.31E+01	1.31E+01	1/1	n/a	n/a	0/1	1.90E+01	0/1	1.00E+05	0/1	4.93E+02
Iron	1.69E+04	1.69E+04	1.69E+04	1/1	n/a	n/a	0/1	2.80E+04	0/1	1.00E+05	1/1	2.07E+03
Lead	1.22E+01	1.22E+01	1.22E+01	1/1	n/a	n/a	0/1	3.60E+01	0/1	1.25E+03	0/1	5.00E+01
Magnesium	1.39E+03	1.39E+03	1.39E+03	1/1	n/a	n/a	0/1	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.32E+02	2.32E+02	2.32E+02	1/1	n/a	n/a	0/1	1.50E+03	0/1	4.64E+04	1/1	4.52E+01
Mercury	4.50E-01	4.50E-01	4.50E-01	1/2	6.90E-02	2.00E-01	1/2	2.00E-01	0/2	8.25E+02	0/2	9.82E-01
Nickel	9.70E+00	9.70E+00	9.70E+00	1/1	n/a	n/a	0/1	2.10E+01	0/1	9.30E+04	0/1	2.42E+02
Potassium	3.70E+02	3.70E+02	3.70E+02	1/1	n/a	n/a	0/1	1.30E+03	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.56. Summary of Surface and Subsurface Historical Data at SWMU 56 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Selenium	3.40E-01	3.40E-01	3.40E-01	1/1	n/a	n/a	0/1	8.00E-01	0/1	2.56E+04	0/1	9.49E+01
Thallium	2.60E-01	2.60E-01	2.60E-01	1/1	n/a	n/a	1/1	2.10E-01	n/a	n/a	n/a	n/a
Uranium	3.80E+01	5.72E+03	1.20E+03	5/5	1.00E+01	1.00E+01	5/5	4.90E+00	1/5	3.34E+03	5/5	2.02E+01
Vanadium	2.78E+01	2.78E+01	2.78E+01	1/1	n/a	n/a	0/1	3.80E+01	0/1	4.47E+03	1/1	3.32E+00
Zinc	3.45E+01	3.45E+01	3.45E+01	1/1	n/a	n/a	0/1	6.50E+01	0/1	1.00E+05	0/1	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	1.00E-01	1.26E+01	3.17E+00	23/30	2.80E+00	2.80E+00	n/a	n/a	0/30	4.25E+01	22/30	1.99E-01
PCB-1242	1.40E+00	2.40E+00	1.77E+00	3/38	8.80E-02	7.30E+01	n/a	n/a	0/38	4.25E+01	3/38	1.99E-01
PCB-1248	4.00E+00	5.50E+01	2.02E+01	6/39	8.80E-02	3.60E+01	n/a	n/a	1/39	4.25E+01	6/39	1.99E-01
PCB-1254	4.70E-02	6.30E+00	2.77E+00	6/40	1.80E-01	3.60E+01	n/a	n/a	0/40	1.82E+01	5/40	1.99E-01
PCB-1260	2.00E-02	1.50E+02	1.29E+01	44/48	5.00E-04	2.80E+00	n/a	n/a	4/48	4.25E+01	34/48	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	2.70E+00	9.43E+02	7.30E+01	36/38	9.00E-01	1.45E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	6.80E+00	4.34E+03	1.93E+02	38/38	9.00E-01	1.08E+01	n/a	n/a	n/a	n/a	n/a	n/a
Bismuth-214	6.33E-01	6.33E-01	6.33E-01	1/1	1.37E-01	1.37E-01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.71E-01	2.71E-01	2.71E-01	1/1	7.94E-02	7.94E-02	0/1	4.90E-01	0/1	8.58E+00	1/1	8.58E-02
Neptunium-237	1.80E-01	5.05E-01	3.43E-01	2/2	3.50E-02	1.50E-01	2/2	1.00E-01	0/2	2.71E+01	1/2	2.71E-01
Plutonium-239/240	3.90E-01	4.38E-01	4.14E-01	2/2	4.95E-02	9.60E-02	n/a	n/a	0/2	1.15E+03	0/2	1.15E+01
Potassium-40	3.98E+00	3.98E+00	3.98E+00	1/1	2.90E-01	2.90E-01	0/1	1.60E+01	n/a	n/a	n/a	n/a
Radium-228	3.38E-01	3.38E-01	3.38E-01	1/1	1.69E-01	1.69E-01	n/a	n/a	n/a	n/a	n/a	n/a
Strontium-90	6.70E+00	6.70E+00	6.70E+00	1/1	5.30E-01	5.30E-01	1/1	4.70E+00	0/1	7.44E+02	0/1	7.44E+00
Technetium-99	1.90E+00	2.95E+01	1.57E+01	2/3	2.00E-01	4.07E+00	1/3	2.50E+00	0/3	3.62E+04	0/3	3.62E+02
Thorium-228	1.87E-01	1.87E-01	1.87E-01	1/2	5.32E-02	1.49E-01	0/2	1.60E+00	0/2	2.80E+00	1/2	2.80E-02
Thorium-230	4.40E+00	4.40E+00	4.40E+00	1/1	1.32E-01	1.32E-01	1/1	1.50E+00	0/1	1.49E+03	0/1	1.49E+01
Thorium-232	1.79E-01	1.79E-01	1.79E-01	1/2	8.23E-02	9.53E-02	0/2	1.50E+00	0/2	1.35E+03	0/2	1.35E+01
Uranium	6.10E+00	1.71E+03	8.58E+01	36/43	8.32E+00	8.32E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.16E+02	2.29E+02	2.23E+02	2/2	1.05E+00	5.60E+00	2/2	2.50E+00	0/2	1.98E+03	2/2	1.98E+01
Uranium-235	3.00E+01	3.00E+01	3.00E+01	1/1	3.70E+00	3.70E+00	1/1	1.40E-01	0/1	3.95E+01	1/1	3.95E-01
Uranium-238	1.47E+03	1.92E+03	1.70E+03	2/2	3.50E+00	7.12E+00	2/2	1.20E+00	2/2	1.71E+02	2/2	1.71E+00
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	7.30E+01	7.30E+01	7.30E+01	1/11	n/a	n/a	n/a	n/a	1/11	4.25E+01	1/11	1.99E-01
PCB-1260	5.00E-03	7.30E+01	9.87E+00	15/81	1.90E-01	2.00E-01	n/a	n/a	2/81	4.25E+01	7/81	1.99E-01
Alpha activity	1.10E+00	1.42E+01	6.54E+00	63/63	4.00E-01	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	8.20E-01	1.28E+01	3.78E+00	63/63	1.00E+00	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	5.00E-01	7.00E-01	6.00E-01	2/2	1.00E-01	2.00E-01	0/2	2.80E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	1.80E+00	2.30E+00	2.05E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,1,2-Trichloro-1,2,2-trifluoroethane	1.10E-02	1.10E-02	1.10E-02	1/1	n/a	n/a	n/a	n/a	0/1	1.00E+05	0/1	8.42E+03
Acetone	1.10E-01	1.10E-01	1.10E-01	1/2	1.30E-02	1.30E-02	n/a	n/a	0/2	1.91E+04	0/2	3.58E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

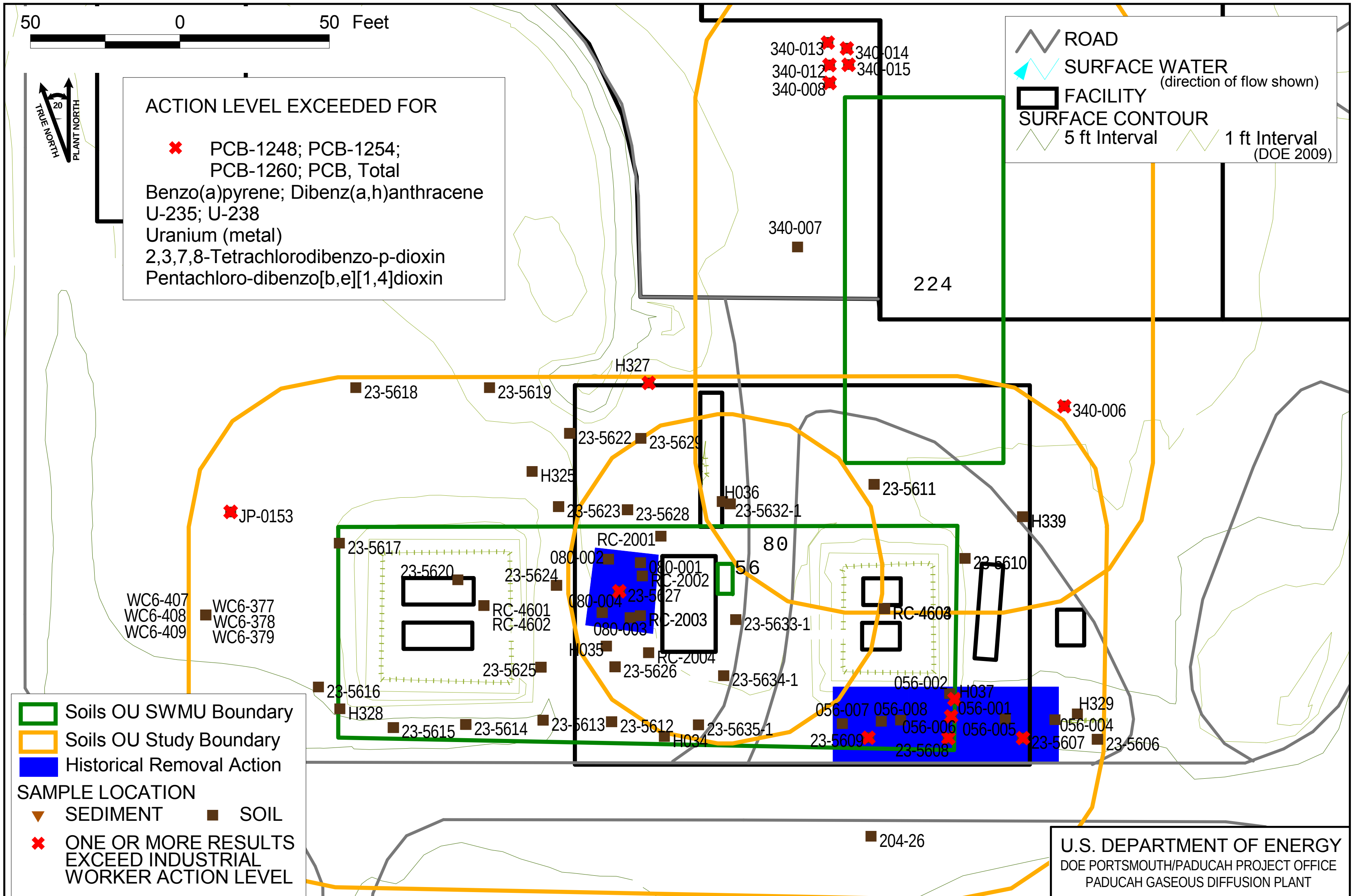

Figure 5.70. Soils Operable Unit: SWMUs 56, 80, and 224

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 57 (C-541-A PCB Waste Staging Area)

Area description

The C-541-A PCB Waste Staging Area (SWMU 57) is located in the northeast portion of the plant site.

Process history

SWMU 57 is made up of leaks and spills of oils containing PCBs as a result of past operations that contaminated the soils.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). Results of these investigations indicate the presence of PCBs.

In 1997, as part of the WAG 23 (DOE 1998f) non-time-critical removal action, 23 yd^3 of soil contaminated with dioxins and 32 yd^3 of soil contaminated with PCBs were excavated for SWMUs 57 and 81. A summary of conclusions from the WAG 23 RAR, based on the future use scenario of unrestricted industrial, is as follows:

> Following the removal action at WAG 23 sites, the residual PCB ELCR based on a 250 day/year exposure scenario is 2×10^{-6} at SWMUs 56 and 80 and below *de minimis* (i.e., 1×10^{-6}) at SWMUs 57 and 81. These risk levels are well within the EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6}, as required by the NCP.

Table 5.57 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.71).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data adequately delineate nature and extent of the contamination; therefore, only limited additional samples may be needed at this location.

Table 5.57. Summary of Surface and Subsurface Historical Data at SWMU 57

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	1.03E-04	4.19E-04	2.61E-04	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	2.03E-04	5.71E-04	3.87E-04	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	1.30E-05	1.60E-05	1.45E-05	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzofuran	2.40E-05	2.80E-05	2.60E-05	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzofuran	4.50E-05	2.37E-04	1.41E-04	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	5.40E-05	3.54E-04	2.04E-04	2/2	4.06E-04	4.06E-04	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	6.00E-06	1.50E-05	1.05E-05	2/2	4.06E-04	4.06E-04	n/a	n/a	0/2	3.39E-02	0/2	5.07E-05
1,2,3,7,8-Pentachlorodibenzofuran	5.90E-05	1.58E-04	1.09E-04	2/2	1.62E-04	1.62E-04	n/a	n/a	0/2	2.81E-03	2/2	1.24E-05
1,2,3,7,8-Pentachlorodibenzo-p-dioxin	4.39E-05	1.34E-04	8.90E-05	2/2	4.39E-05	1.62E-04	n/a	n/a	n/a	n/a	n/a	n/a
2,3,4,7,8-Pentachlorodibenzofuran	8.10E-06	8.80E-06	8.45E-06	2/2	8.10E-06	8.80E-06	n/a	n/a	0/2	2.81E-02	0/2	1.24E-04
2,3,7,8-Tetrachlorodibenzofuran	3.40E-05	6.20E-05	4.80E-05	2/2	1.62E-04	1.62E-04	n/a	n/a	0/2	1.40E-02	1/2	6.19E-05
2,3,7,8-Tetrachlorodibenzo-p-dioxin	2.38E-04	4.72E-04	3.55E-04	2/2	2.38E-04	4.72E-04	n/a	n/a	0/2	6.19E-04	2/2	6.19E-06
Octachloro-dibenzo[b,e][1,4]dioxin	2.14E-03	4.30E-03	3.05E-03	5/5	8.12E-04	1.00E-03	n/a	n/a	0/5	6.19E-01	0/5	6.19E-03
Octachlorodibenzofuran	1.88E-04	1.60E-03	8.95E-04	2/5	8.12E-04	1.00E-03	n/a	n/a	0/5	1.40E+00	0/5	6.19E-03
Metals (mg/kg)												
Aluminum	9.18E+03	1.30E+04	1.12E+04	3/3	n/a	n/a	1/3	1.30E+04	0/3	1.00E+05	3/3	4.64E+03
Arsenic	9.10E+00	1.34E+01	1.08E+01	3/3	n/a	n/a	3/3	1.20E+01	0/3	3.15E+02	3/3	5.23E-01
Barium	7.88E+01	1.06E+02	9.18E+01	3/3	n/a	n/a	0/3	2.00E+02	0/3	1.00E+05	0/3	2.29E+02
Beryllium	7.00E-01	1.00E+00	9.00E-01	3/3	4.00E-01	4.00E-01	3/3	6.70E-01	0/3	1.28E+03	2/3	9.48E-01
Calcium	3.40E+03	5.20E+03	4.53E+03	3/3	n/a	n/a	0/3	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.20E+01	1.32E+01	1.25E+01	3/3			0/3	1.60E+01	n/a	n/a	0/3	3.56E+02
Cobalt	6.20E+00	1.03E+01	7.60E+00	3/3	1.40E+00	1.40E+00	0/3	1.40E+01	0/3	1.00E+05	0/3	1.92E+03
Copper	1.50E+01	2.12E+01	1.90E+01	3/3	n/a	n/a	2/3	1.90E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	1.80E+04	2.59E+04	2.30E+04	3/3	n/a	n/a	0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	1.72E+01	2.19E+01	1.92E+01	3/3	n/a	n/a	0/3	3.60E+01	0/3	1.25E+03	0/3	5.00E+01
Magnesium	2.14E+03	2.47E+03	2.31E+03	2/3	1.80E+03	1.80E+03	2/3	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.34E+02	1.55E+02	1.45E+02	2/3	7.14E+02	7.14E+02	0/3	1.50E+03	0/3	4.64E+04	2/3	4.52E+01
Nickel	1.45E+01	1.52E+01	1.48E+01	3/3	6.80E+00	6.80E+00	0/3	2.10E+01	0/3	9.30E+04	0/3	2.42E+02
Silver	2.30E+00	2.70E+00	2.47E+00	3/3	1.80E+00	1.80E+00	3/3	2.30E+00	0/3	2.07E+04	0/3	4.11E+01
Sodium	5.78E+01	6.40E+01	6.09E+01	2/3	1.11E+02	1.11E+02	0/3	3.20E+02	n/a	n/a	n/a	n/a
Uranium	2.60E+03	6.00E+03	3.75E+03	12/12	n/a	n/a	12/12	4.90E+00	7/12	3.34E+03	12/12	2.02E+01
Vanadium	2.89E+01	2.98E+01	2.94E+01	2/3	2.74E+01	2.74E+01	0/3	3.80E+01	0/3	4.47E+03	2/3	3.32E+00
Zinc	6.68E+01	7.53E+01	7.11E+01	2/3	4.99E+01	4.99E+01	2/3	6.50E+01	0/3	1.00E+05	0/3	2.73E+03
Pesticides/PCBs (mg/kg)												
2,2',3,4',5',6-Hexachloro-1,1'-biphenyl	1.00E+00	1.00E+00	1.00E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB, Total	1.00E-01	7.00E-01	3.00E-01	3/13	n/a	n/a	n/a	n/a	0/13	4.25E+01	1/13	1.99E-01
PCB-1016	7.00E-01	7.00E-01	7.00E-01	1/9	1.00E-01	1.20E+01	n/a	n/a	0/9	4.25E+01	1/9	1.99E-01
PCB-1260	1.50E-02	3.70E+02	2.16E+01	25/25	2.00E-01	2.40E+01	n/a	n/a	2/25	4.25E+01	16/25	1.99E-01
Polychlorinated biphenyls 153	1.10E+00	1.10E+00	1.10E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 170	8.10E-01	8.10E-01	8.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.57. Summary of Surface and Subsurface Historical Data at SWMU 57 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Radionuclides (pCi/g)												
Alpha activity	2.20E+00	1.05E+01	4.85E+00	20/21	1.10E+00	2.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.00E+00	1.77E+01	6.49E+00	20/21	1.00E+00	1.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	1.83E+00	1.83E+00	1.83E+00	1/3	5.00E-02	1.30E-01	1/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Uranium	2.50E+00	4.00E+00	3.02E+00	5/13	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.30E-01	6.30E-01	4.30E-01	2/3	5.00E-02	1.30E-01	0/3	2.50E+00	0/3	1.98E+03	0/3	1.98E+01
Uranium-238	3.00E-01	1.43E+00	8.65E-01	2/3	5.00E-02	1.10E-01	1/3	1.20E+00	0/3	1.71E+02	0/3	1.71E+00
Semivolatiles (mg/kg)												
2,5-Hexanedione	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	4.50E-01	4.50E-01	4.50E-01	1/3	5.30E-01	5.90E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Hexachlorobiphenyl	7.30E-01	1.10E+00	9.13E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
Methyl Isobutyl Carbinol	2.40E-01	2.40E-01	2.40E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
2,2',3,3',5,6'-Hexachlorobiphenyl	4.20E-01	4.20E-01	4.20E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1260	7.40E-01	1.25E+01	8.20E+00	4/26	2.00E-01	2.00E-01	n/a	n/a	0/26	4.25E+01	4/26	1.99E-01
Polychlorinated biphenyls 153	3.50E-01	1.20E+00	7.75E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 171	5.10E-01	5.10E-01	5.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 174	6.10E-01	6.10E-01	6.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 180	9.50E-01	9.50E-01	9.50E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	2.00E+00	1.04E+01	5.88E+00	21/21	1.20E+00	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.66E+00	1.05E+01	4.84E+00	21/21	9.00E-01	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	8.00E-01	7.70E+00	3.20E+00	3/5	2.00E-01	6.00E+00	1/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Uranium	2.60E+00	2.60E+00	2.60E+00	1/1			n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	9.00E-02	1.70E+00	6.60E-01	4/5	5.00E-02	1.20E-01	0/5	2.40E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-238	1.50E-01	1.60E+00	5.64E-01	5/5	5.00E-02	1.20E-01	1/5	1.20E+00	0/5	1.71E+02	0/5	1.71E+00
Semivolatiles (mg/kg)												
2,3-Dimethylheptane	3.60E-01	5.10E-01	4.40E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,4-Dimethylheptane	6.80E-01	6.80E-01	6.80E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,6-Dimethylheptane	2.60E-01	3.30E-01	2.93E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyloctane	6.00E-01	6.00E-01	6.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3-Methylene-heptane	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dioctyl hexanedioate	5.70E-01	5.70E-01	5.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobiphenyl	9.80E-01	1.20E+00	1.09E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Octane	1.90E-01	1.90E-01	1.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
2,5-Dimethylheptane	6.60E-01	8.50E-01	7.53E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyl-2-heptene	1.90E-01	1.90E-01	1.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyldecane	2.50E-01	2.50E-01	2.50E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3,4-Dimethylheptane	2.20E-01	2.40E-01	2.30E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.57. Summary of Surface and Subsurface Historical Data at SWMU 57 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
4-Heptanone	3.40E-01	3.70E-01	3.55E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyl-3-penten-2-one	3.00E-01	3.40E-01	3.15E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	1.70E-01	1.70E-01	1.70E-01	1/5	9.00E-03	6.20E-02	n/a	n/a	0/5	1.91E+04	0/5	3.58E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

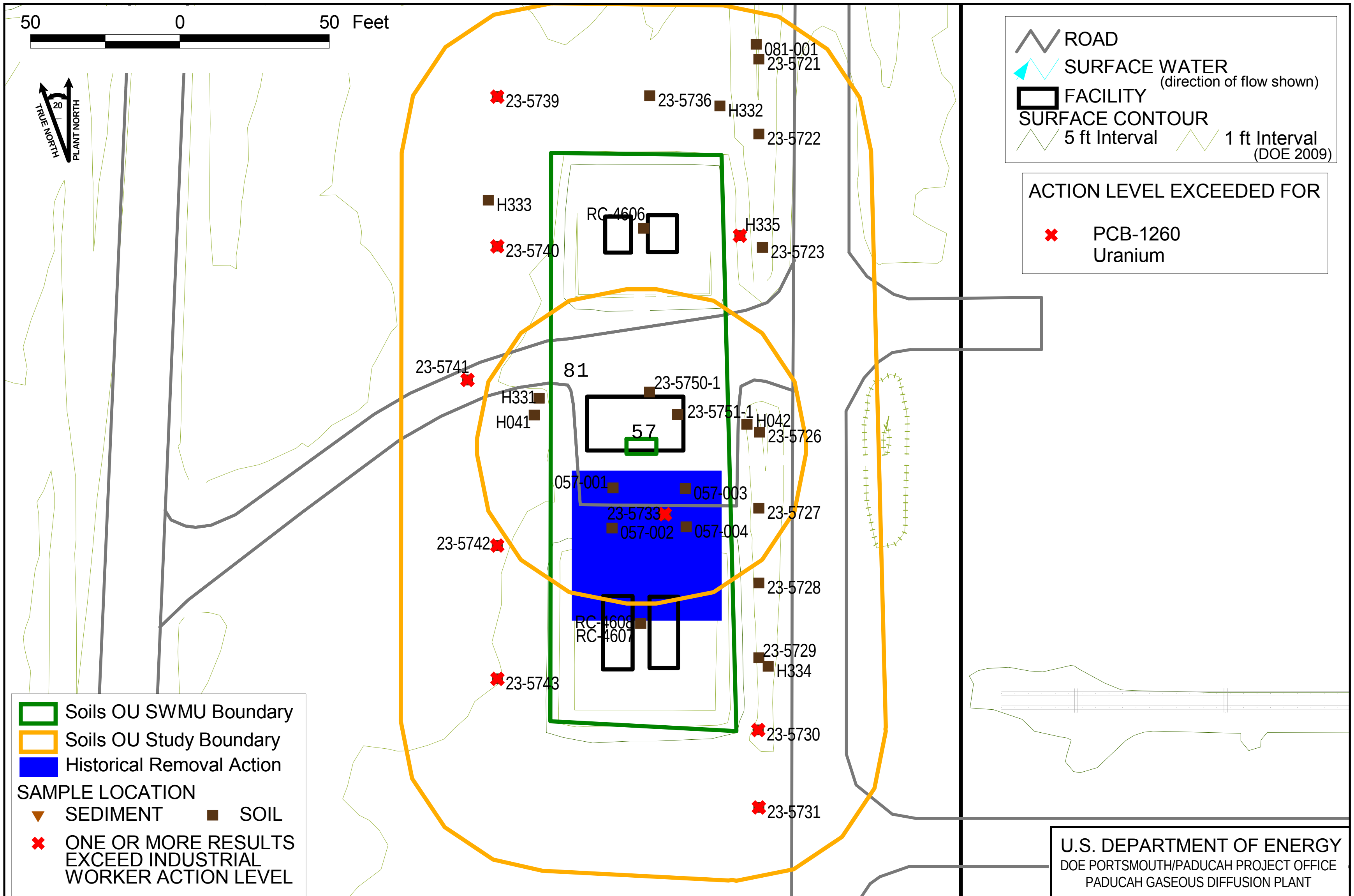

Figure 5.71. Soils Operable Unit: SWMUs 57 and 81

U.S. DEPARTMENT OF ENERGY
DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

PADUCAH
Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 74 (C-340 PCB Transformer Spill Site)

Area description

The C-340 PCB Transformer Spill Site (SWMU 74) is located in the east central portion of the plant site.

Process history

SWMU 74 is the site of a PCB transformer spill.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). The WAG 23 FS (DOE 1996a) retained, for the current and future industrial workers, no COCs, stating that neither the total pathway ELCR nor the chronic HI exceeds risk-based EPA thresholds (total pathway risk exceeding 10^{-4} ELCR or an HI of 1) at the SWMU.

Table 5.58 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.72).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.58. Summary of Surface and Subsurface Historical Data at SWMU 74

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
1,2,3,4,6,7,8-Heptachlorodibenzofuran	6.37E-05	6.37E-05	6.37E-05	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,6,7,8-Heptachlorodibenzo-p-dioxin	4.50E-04	4.50E-04	4.50E-04	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8,9-Heptachlorodibenzofuran	5.90E-06	5.90E-06	5.90E-06	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzofuran	8.56E-06	8.56E-06	8.56E-06	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,4,7,8-Hexachlorodibenzo-p-dioxin	6.60E-06	6.60E-06	6.60E-06	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzofuran	4.39E-06	4.39E-06	4.39E-06	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,6,7,8-Hexachlorodibenzo-p-dioxin	1.82E-05	1.82E-05	1.82E-05	1/1	3.04E-06	3.04E-06	n/a	n/a	n/a	n/a	n/a	n/a
1,2,3,7,8,9-Hexachlorodibenzo-p-dioxin	9.43E-06	9.43E-06	9.43E-06	1/1	3.04E-06	3.04E-06	n/a	n/a	0/1	3.39E-02	0/1	5.07E-05
2,3,4,7,8-Pentachlorodibenzofuran	1.44E-05	1.44E-05	1.44E-05	1/1	1.22E-06	1.22E-06	n/a	n/a	0/1	2.81E-02	0/1	1.24E-04
2,3,7,8-Tetrachlorodibenzofuran	1.20E-05	1.20E-05	1.20E-05	1/5	1.22E-06	4.00E-05	n/a	n/a	0/5	1.40E-02	0/5	6.19E-05
Octachloro-dibenzo[b,e][1,4]dioxin	3.40E-03	2.53E-02	1.17E-02	5/5	6.08E-06	6.08E-06	n/a	n/a	0/5	6.19E-01	3/5	6.19E-03
Octachlorodibenzofuran	1.75E-04	1.75E-04	1.75E-04	1/5	6.08E-06	6.00E-05	n/a	n/a	0/5	1.40E+00	0/5	6.19E-03
Pesticides/PCBs (mg/kg)												
PCB-1260	1.24E-01	6.00E+00	1.84E+00	7/7	1.14E-01	1.90E-01	n/a	n/a	0/7	4.25E+01	5/7	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.10E+00	1.22E+02	3.01E+01	5/5	1.20E+00	1.40E+01	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	7.10E+00	2.18E+02	5.56E+01	5/5	1.30E+00	8.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	6.00E-01	6.00E-01	6.00E-01	1/5	5.00E-01	4.90E+00	0/5	2.50E+00	0/5	3.62E+04	0/5	3.62E+02
Thorium-234	3.26E+01	1.22E+02	7.73E+01	2/2	8.31E-01	1.50E+01	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	4.67E+01	4.67E+01	4.67E+01	1/1	1.69E+00	1.69E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	7.55E+00	7.55E+00	7.55E+00	1/1	2.69E-01	2.69E-01	1/1	2.50E+00	0/1	1.98E+03	0/1	1.98E+01
Uranium-238	3.85E+01	3.85E+01	3.85E+01	1/1	1.37E+00	1.37E+00	1/1	1.20E+00	0/1	1.71E+02	1/1	1.71E+00
Semivolatiles (mg/kg)												
Acenaphthene	3.50E-01	3.50E-01	3.50E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	6.67E+04	0/1	3.16E+02
Anthracene	5.10E-01	5.10E-01	5.10E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	1.00E+05	0/1	3.79E+03
Benz(a)anthracene	1.30E+00	1.30E+00	1.30E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+02	1/1	2.12E-01
Benzo(a)pyrene	2.40E+00	2.40E+00	2.40E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+01	1/1	2.12E-02
Benzo(b)fluoranthene	5.00E+00	5.00E+00	5.00E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+02	1/1	2.12E-01
Chrysene	1.60E+00	1.60E+00	1.60E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+04	0/1	2.12E+01
Dibenzofuran	2.80E-01	2.80E-01	2.80E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	9.02E+03	0/1	1.86E+01
Fluoranthene	1.70E+00	1.70E+00	1.70E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	6.50E+04	0/1	2.21E+02
Fluorene	4.00E-01	4.00E-01	4.00E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	7.09E+04	0/1	3.39E+02
Indeno(1,2,3-cd)pyrene	1.30E+00	1.30E+00	1.30E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	2.08E+02	1/1	2.12E-01
Naphthalene	5.20E-01	5.20E-01	5.20E-01	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	7.66E+02	0/1	2.36E+01
Phenanthrene	1.20E+00	1.20E+00	1.20E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	1.70E+00	1.70E+00	1.70E+00	1/1	5.00E-01	5.00E-01	n/a	n/a	0/1	4.87E+04	0/1	1.65E+02
Volatiles (mg/kg)												
Acetone	3.40E-02	1.40E+01	5.16E+00	4/4	1.10E-02	1.20E-02	n/a	n/a	0/4	1.91E+04	0/4	3.58E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.58. Summary of Surface and Subsurface Historical Data at SWMU 74 (Continued)

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Radionuclides (pCi/g)												
Alpha activity	5.95E+00	1.92E+01	1.30E+01	3/4	1.35E+00	9.60E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.27E+00	2.32E+01	1.44E+01	4/4	9.50E-01	8.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Semivolatiles (mg/kg)												
Bis(2-ethylhexyl)phthalate	5.40E-01	5.40E-01	5.40E-01	1/4	4.60E-01	5.00E-01	n/a	n/a	0/4	7.40E+03	0/4	8.84E+00
Di-n-butyl phthalate	1.60E+00	1.60E+00	1.60E+00	1/4	4.60E-01	5.00E-01	n/a	n/a	0/4	1.00E+05	0/4	2.13E+03

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

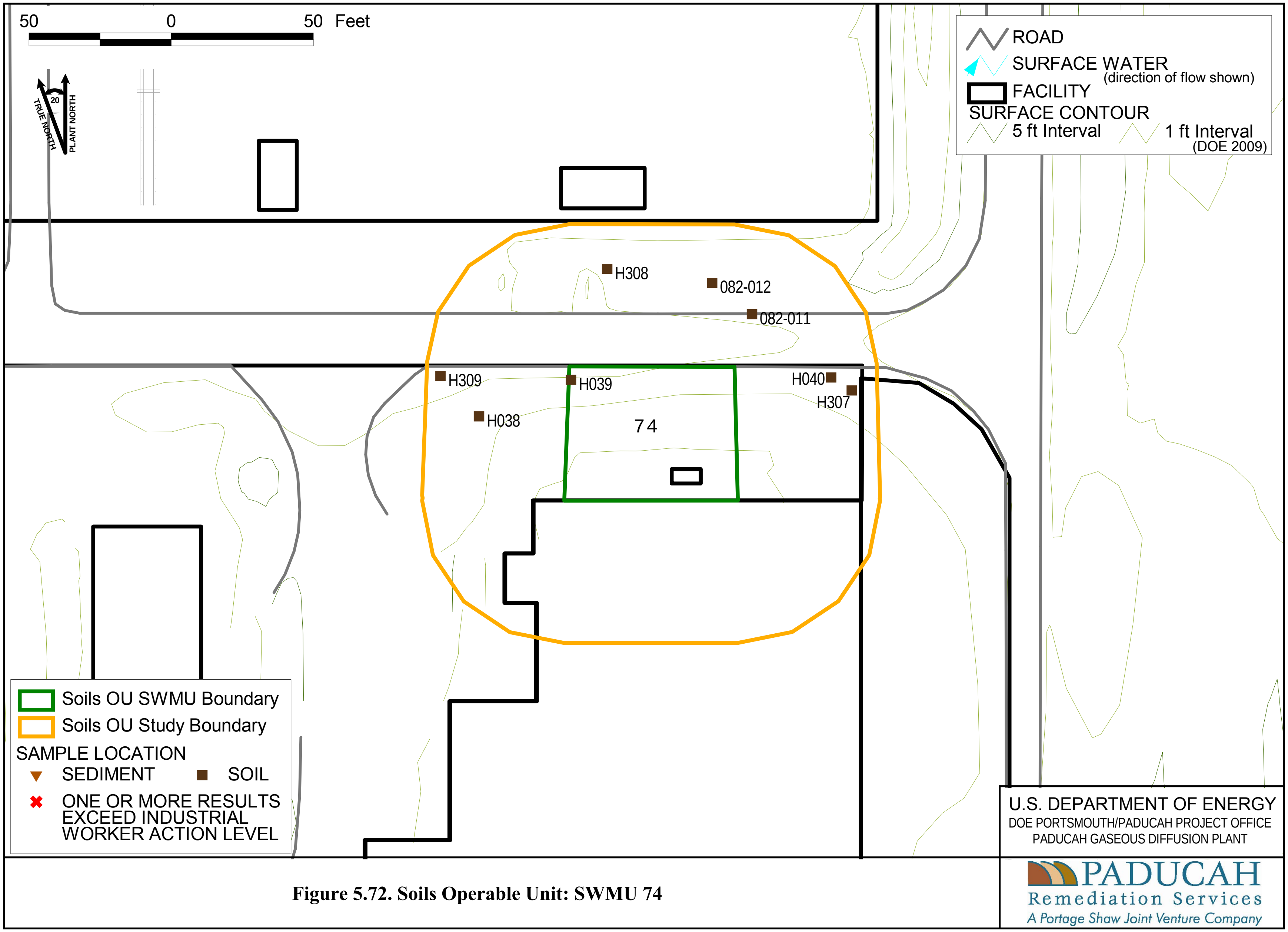

Figure 5.72. Soils Operable Unit: SWMU 74

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 75 (C-633 PCB Spill Site)

Area description

The C-633 PCB Spill Site (SWMU 75) is located in the southeast portion of the plant site.

Process history

In 1998, a release of non-PCB oil (3.8 ppm) per TSCA occurred when a transformer located in the C-633 Pump House lost an estimated 50 to 100 gal of oil. As part of the general operations at C-633, the spill area was quickly contained, and cleanup commenced through removal of all visible traces of the spill from the affected area.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992). Results of these investigations, which were conducted to assess the surface migration pathway only, indicate the presence of PCBs and oil. PCBs were detected in the surface soils at a maximum concentration of 1 ppm.

Table 5.59 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.73).

Area utilities

No recirculating water lines or sewers were associated with this spill site. A storm sewer and a recirculating/sanitary water line are coincidentally located within the boundary of the SWMU. Approximate depths to these utilities are 4 and 6 ft bgs, respectively.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.59. Summary of Surface and Subsurface Historical Data at SWMU 75

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
Heptachloro-dibenzo[b,e][1,4]dioxin	1.80E-03	5.10E-02	1.75E-02	4/4	n/a	n/a	n/a	n/a	0/4	6.19E-02	4/4	6.19E-04
Heptachlorodibenzofuran	5.30E-04	1.80E-02	5.53E-03	4/4	n/a	n/a	n/a	n/a	0/4	1.40E-01	3/4	6.19E-04
Hexachloro-dibenzo[b,e][1,4]dioxin	2.60E-04	4.30E-03	1.62E-03	3/4	7.00E-05	7.00E-05	n/a	n/a	0/4	6.19E-03	3/4	6.19E-05
Hexachlorodibenzofuran	2.30E-04	3.90E-03	1.46E-03	3/4	1.00E-04	1.00E-04	n/a	n/a	0/4	1.40E-02	3/4	6.19E-05
Octachloro-dibenzo[b,e][1,4]dioxin	9.70E-03	2.30E-01	7.04E-02	4/4	n/a	n/a	n/a	n/a	0/4	6.19E-01	4/4	6.19E-03
Octachlorodibenzofuran	3.70E-04	1.50E-02	4.33E-03	4/4	n/a	n/a	n/a	n/a	0/4	1.40E+00	1/4	6.19E-03
Pentachloro-dibenzo[b,e][1,4]dioxin	5.00E-04	5.00E-04	5.00E-04	1/4	2.00E-05	3.80E-04	n/a	n/a	0/4	1.24E-03	1/4	1.24E-05
Pentachlorodibenzofuran	5.20E-04	5.20E-04	5.20E-04	1/4	2.00E-05	3.30E-04	n/a	n/a	n/a	n/a	n/a	n/a
Tetrachlorodibenzofuran	1.40E-04	1.40E-04	1.40E-04	1/4	1.00E-05	6.00E-05	n/a	n/a	n/a	n/a	n/a	n/a
Pesticides/PCBs (mg/kg)												
PCB, Total	2.10E+01	2.10E+01	2.10E+01	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
PCB-1254	9.80E-02	2.10E+01	4.33E+00	5/6	5.00E-04	2.00E-01	n/a	n/a	1/6	1.82E+01	2/6	1.99E-01
PCB-1260	7.80E-02	7.70E-01	2.62E-01	4/5	5.00E-04	2.00E-01	n/a	n/a	0/5	4.25E+01	1/5	1.99E-01
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
PCB-1254	2.40E-02	2.40E-02	2.40E-02	1/4	5.00E-04	2.00E-01	n/a	n/a	0/4	1.82E+01	0/4	1.99E-01
PCB-1260	2.00E-02	1.10E-01	6.50E-02	2/4	5.00E-04	2.00E-01	n/a	n/a	0/4	4.25E+01	0/4	1.99E-01
Volatiles (mg/kg)												
Acetone	1.60E+01	1.60E+01	1.60E+01	1/1	n/a	n/a	n/a	n/a	0/1	1.91E+04	0/1	3.58E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

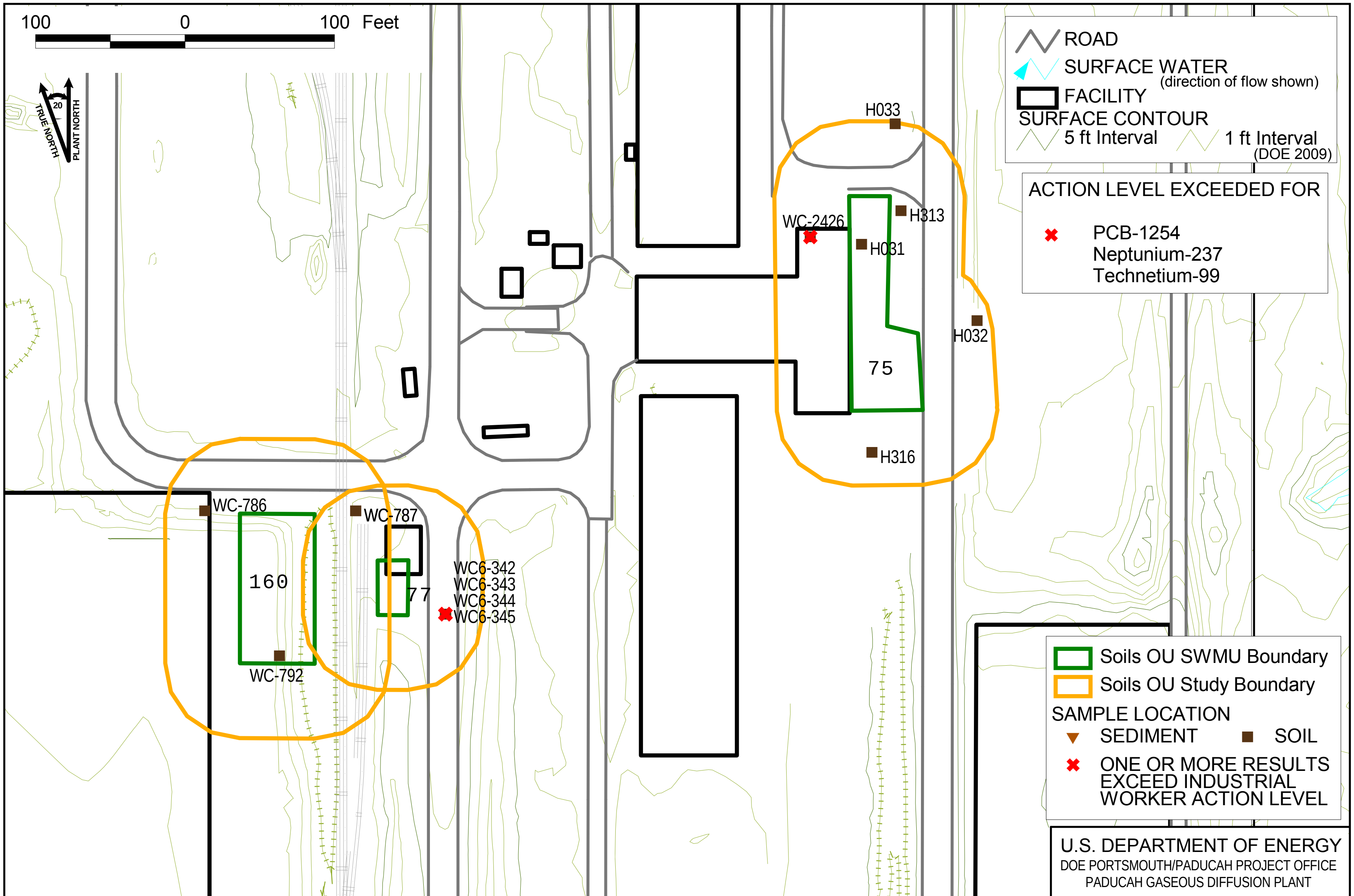

Figure 5.73. Soils Operable Unit: SWMUs 75, 77, and 160

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 78 (C-420 PCB Spill Site)

Area description

The C-420 PCB Spill Site (SWMU 78) is located in the central portion of the plant site and is approximately 5,000 ft^2.

Process history

C-420 PCB Spill Site is the result of a transformer rupture at the southwest corner of the C-420 Building in 1967. Some soils were excavated from the area at the time of the spill.

Previous investigation results

SWMU 78 was investigated as part of the Phase I and Phase II SIs (CH2M HILL 1991; 1992). Results of these investigations show PCBs were detected in the surface soils at a maximum concentration of 12 ppm. Also detected were metals, SVOCs, VOCs, and radiological constituents. The source of the SVOCs, VOCs, and radiological constituents is uncertain.

Table 5.60 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.74).

Area utilities

No recirculating water lines or sewers were associated with this spill site. A storm sewer is coincidentally located within the boundary of the SWMU. Approximate depth to the sewer is 3 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.60. Summary of Surface and Subsurface Historical Data at SWMU 78

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	2.20E-03	2.20E-03	2.20E-03	1/1	n/a	n/a	n/a	n/a	0/1	6.19E-01	0/1	6.19E-03
Metals (mg/kg)												
Aluminum	1.42E+03	2.27E+03	1.85E+03	2/2	n/a	n/a	0/2	1.30E+04	0/2	1.00E+05	0/2	4.64E+03
Arsenic	1.80E+00	2.20E+00	2.00E+00	2/6	5.00E+00	5.00E+00	0/6	1.20E+01	0/6	3.15E+02	2/6	5.23E-01
Barium	1.93E+01	9.31E+01	6.14E+01	6/6	2.50E+00	2.50E+00	0/6	2.00E+02	0/6	1.00E+05	0/6	2.29E+02
Beryllium	2.40E-01	3.40E-01	2.90E-01	2/3	5.00E-01	5.00E-01	0/3	6.70E-01	0/3	1.28E+03	0/3	9.48E-01
Cadmium	8.70E-01	2.36E+00	1.48E+00	3/6	2.00E+00	2.00E+00	3/6	2.10E-01	0/6	7.05E+01	0/6	2.13E+01
Calcium	1.11E+05	2.00E+05	1.56E+05	2/2	n/a	n/a	2/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	9.50E+00	3.75E+01	1.93E+01	6/6	2.50E+00	2.50E+00	4/6	1.60E+01	n/a	n/a	0/6	3.56E+02
Cobalt	2.60E+00	4.30E+00	3.45E+00	2/2	n/a	n/a	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	1.00E+01	2.10E+01	1.52E+01	3/3	2.50E+00	2.50E+00	1/3	1.90E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	7.76E+03	1.18E+04	9.14E+03	3/3	2.00E+01	2.00E+01	0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	3.87E+01	5.20E+01	4.54E+01	2/6	2.00E+01	2.00E+01	2/6	3.60E+01	0/6	1.25E+03	1/6	5.00E+01
Magnesium	3.02E+03	5.04E+03	4.03E+03	2/2	n/a	n/a	2/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.13E+02	2.06E+02	1.60E+02	2/2	n/a	n/a	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	5.51E+00	2.15E+01	1.29E+01	3/3	5.00E+00	5.00E+00	1/3	2.10E+01	0/3	9.30E+04	0/3	2.42E+02
Sodium	1.37E+02	2.05E+02	1.71E+02	2/2	n/a	n/a	0/2	3.20E+02	n/a	n/a	n/a	n/a
Total Metals (mg/kg)	1.19E+04	1.19E+04	1.19E+04	1/1	5.00E+02	5.00E+02	n/a	n/a	n/a	n/a	n/a	n/a
Vanadium	1.10E+01	1.15E+01	1.13E+01	2/2	n/a	n/a	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	2.01E+01	3.87E+02	2.01E+02	3/3	1.00E+01	1.00E+01	2/3	6.50E+01	0/3	1.00E+05	0/3	2.73E+03
Pesticides/PCBs (mg/kg)												
PCB, Total	2.00E-01	2.10E+00	1.15E+00	2/4	9.00E-02	1.00E-01	n/a	n/a	0/4	4.25E+01	2/4	1.99E-01
PCB-1260	2.00E-01	1.20E+01	4.77E+00	3/6	9.00E-02	1.70E+00	n/a	n/a	0/6	4.25E+01	3/6	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	9.90E+00	1.80E+01	1.40E+01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.30E+01	6.70E+01	5.50E+01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	2.70E-02	2.70E-02	2.70E-02	1/4	1.91E-02	2.10E-02	0/4	4.90E-01	0/4	8.58E+00	0/4	8.58E-02
Neptunium-237	2.50E-01	5.40E-01	3.95E-01	2/6	3.11E-02	4.01E-02	2/6	1.00E-01	0/6	2.71E+01	1/6	2.71E-01
Plutonium-239	4.20E-01	5.70E-01	4.95E-01	2/2	n/a	n/a	2/2	2.50E-02	0/2	1.15E+03	0/2	1.15E+01
Technetium-99	4.30E+01	6.50E+01	5.40E+01	2/6	2.68E+00	3.61E+00	2/6	2.50E+00	0/6	3.62E+04	0/6	3.62E+02
Thorium-228	3.38E-01	4.20E-01	3.81E-01	4/4	6.42E-02	7.49E-02	0/4	1.60E+00	0/4	2.80E+00	4/4	2.80E-02
Thorium-230	3.32E-01	3.60E+00	1.26E+00	6/6	1.22E-01	1.88E-01	2/6	1.50E+00	0/6	1.49E+03	0/6	1.49E+01
Thorium-232	4.17E-01	4.24E-01	4.20E-01	4/4	4.38E-02	5.57E-02	0/4	1.50E+00	0/4	1.35E+03	0/4	1.35E+01
Uranium	1.09E+01	1.09E+01	1.09E+01	1/1	1.41E+00	1.41E+00	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	7.80E+00	1.00E+01	8.90E+00	2/5	2.35E-01	2.95E-01	2/5	2.50E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-235	2.60E-01	4.20E-01	3.15E-01	3/3	3.53E-02	3.53E-02	3/3	1.40E-01	0/3	3.95E+01	1/3	3.95E-01
Uranium-238	1.39E+00	1.40E+01	5.83E+00	6/6	4.42E-01	6.82E-01	6/6	1.20E+00	0/6	1.71E+02	4/6	1.71E+00
Semivolatiles (mg/kg)												
2,4-Dimethylphenol	1.80E-01	2.20E-01	2.00E-01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	4.51E+04	0/2	2.25E+02
2-Methylnaphthalene	6.30E+00	1.00E+01	8.15E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.60. Summary of Surface and Subsurface Historical Data at SWMU 78 (Continued)

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
2-Methylphenol	9.90E-02	9.90E-02	9.90E-02	1/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	5.62E+02
4-Methylphenol	2.20E-01	2.30E-01	2.25E-01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.32E+04	0/2	7.18E+01
Acenaphthene	9.30E+00	1.70E+01	1.32E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	6.67E+04	0/2	3.16E+02
Acenaphthylene	2.60E+00	3.60E+00	3.10E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Anthracene	6.10E+00	2.30E+01	1.46E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	1.00E+05	0/2	3.79E+03
Benz(a)anthracene	1.60E+01	2.80E+01	2.20E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01
Benzo(a)pyrene	1.60E+01	2.90E+01	2.25E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	1/2	2.08E+01	2/2	2.12E-02
Benzo(b)fluoranthene	8.50E+00	1.60E+01	1.23E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01
Benzo(ghi)perylene	3.40E+00	1.30E+01	8.20E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	1.10E+01	1.90E+01	1.50E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+03	2/2	2.12E+00
Chrysene	1.70E+01	2.90E+01	2.30E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+04	1/2	2.12E+01
Dibenz(a,h)anthracene	1.50E+00	4.30E+00	2.90E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+01	2/2	2.12E-02
Dibenzofuran	5.90E+00	9.10E+00	7.50E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	9.02E+03	0/2	1.86E+01
Dimethylnaphthalene	3.00E+00	7.00E+00	4.75E+00	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Fluoranthene	3.50E+01	6.00E+01	4.75E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	6.50E+04	0/2	2.21E+02
Fluorene	8.70E+00	1.70E+01	1.29E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	7.09E+04	0/2	3.39E+02
Indeno(1,2,3-cd)pyrene	3.80E+00	1.20E+01	7.90E+00	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	2.08E+02	2/2	2.12E-01
Methylphenanthrene	9.00E+00	1.00E+01	9.50E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Naphthalene	5.80E+00	1.60E+01	1.09E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	7.66E+02	0/2	2.36E+01
Phenanthrene	4.70E+01	6.30E+01	5.50E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	3.60E+01	4.10E+01	3.85E+01	2/2	4.00E-01	2.00E+00	n/a	n/a	0/2	4.87E+04	0/2	1.65E+02
Pyrene,1-methyl	9.00E+00	1.00E+01	9.50E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Trimethylnaphthalene	8.00E+00	1.00E+01	9.00E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,1,1-Trichloroethane	1.00E-03	1.00E-03	1.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	9.38E+03	0/2	1.56E+02
Tetrachloroethene	3.00E-03	3.00E-03	3.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	1.46E+03	0/2	3.90E+00
Toluene	3.00E-03	3.00E-03	3.00E-03	1/2	6.00E-03	6.00E-03	n/a	n/a	0/2	7.28E+03	0/2	2.11E+02
Trichloroethene	8.00E-04	8.00E-04	8.00E-04	1/2	1.00E-03	1.00E-03	n/a	n/a	0/2	2.98E+02	0/2	2.51E+00
Subsurface Soils												
Metals (mg/kg)												
Aluminum	4.74E+03	1.93E+04	1.17E+04	21/21	2.00E+01	1.00E+02	12/21	1.20E+04	0/21	1.00E+05	21/21	4.64E+03
Antimony	8.00E-01	1.40E+00	1.00E+00	3/21	6.00E-01	5.00E+00	3/21	2.10E-01	0/21	4.63E+02	3/21	3.79E-01
Arsenic	1.70E+00	9.93E+00	3.93E+00	21/21	7.00E-02	7.00E-02	1/21	7.90E+00	0/21	3.15E+02	21/21	5.23E-01
Barium	2.09E+01	1.77E+02	8.34E+01	21/21	2.00E-02	2.00E-02	2/21	1.70E+02	0/21	1.00E+05	0/21	2.29E+02
Beryllium	3.50E-01	6.90E-01	5.69E-01	21/21	1.00E-02	1.00E-02	2/21	6.90E-01	0/21	1.28E+03	0/21	9.48E-01
Cadmium	5.00E-02	1.10E+00	3.42E-01	13/21	2.00E-02	7.50E-01	4/21	2.10E-01	0/21	7.05E+01	0/21	2.13E+01
Calcium	7.70E+02	1.11E+04	2.09E+03	21/21	1.00E-01	1.00E-01	1/21	6.10E+03	n/a	n/a	n/a	n/a
Chromium	3.50E+00	2.98E+01	1.67E+01	21/21	8.00E-02	9.00E-02	11/21	4.30E+01	n/a	n/a	0/21	3.56E+02
Cobalt	1.05E+00	1.61E+01	5.02E+00	21/21	9.00E-02	1.00E-01	2/21	1.30E+01	0/21	1.00E+05	0/21	1.92E+03
Copper	2.70E+00	1.41E+01	8.20E+00	21/21	1.00E-01	1.00E-01	0/21	2.50E+01	0/21	1.00E+05	0/21	4.93E+02
Iron	5.80E+03	2.06E+04	1.55E+04	21/21	2.00E+01	1.00E+02	0/21	2.80E+04	0/21	1.00E+05	21/21	2.07E+03
Lead	6.10E+00	1.37E+01	8.75E+00	21/21	2.00E-01	2.00E-01	0/21	2.30E+01	0/21	1.25E+03	0/21	5.00E+01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.60. Summary of Surface and Subsurface Historical Data at SWMU 78 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Magnesium	5.32E+02	2.15E+03	1.34E+03	21/21	1.00E-01	1.00E-01	1/21	2.10E+03	n/a	n/a	n/a	n/a
Manganese	9.17E+00	1.47E+03	2.72E+02	21/21	2.00E-02	2.00E-02	1/21	8.20E+02	0/21	4.64E+04	16/21	4.52E+01
Mercury	9.50E-03	3.75E-02	2.24E-02	9/21	8.60E-03	1.22E-01	0/21	1.30E-01	0/21	8.25E+02	0/21	9.82E-01
Nickel	2.40E+00	1.93E+01	9.56E+00	21/21	1.00E-01	1.00E-01	0/21	2.20E+01	0/21	9.30E+04	0/21	2.42E+02
Potassium	8.40E+01	7.37E+02	3.20E+02	21/21	2.00E+00	2.00E+00	0/21	9.50E+02	n/a	n/a	n/a	n/a
Silver	1.20E-01	1.20E-01	1.20E-01	1/21	8.00E-02	2.70E+00	0/21	2.70E+00	0/21	2.07E+04	0/21	4.11E+01
Sodium	3.10E+00	8.06E+02	4.45E+02	21/21	1.00E+00	1.00E+00	16/21	3.40E+02	n/a	n/a	n/a	n/a
Thallium	6.00E-01	7.00E-01	6.50E-01	2/21	1.80E-01	1.21E+00	2/21	3.40E-01	n/a	n/a	n/a	n/a
Vanadium	8.50E+00	3.83E+01	2.44E+01	21/21	1.00E-01	1.00E-01	1/21	3.70E+01	0/21	4.47E+03	21/21	3.32E+00
Zinc	6.40E+00	4.82E+01	2.30E+01	21/21	8.00E-02	1.00E-01	0/21	6.00E+01	0/21	1.00E+05	0/21	2.73E+03
Radionuclides (pCi/g)												
Alpha activity	2.40E+00	3.52E+01	1.73E+01	31/34	1.00E+00	1.41E+01	n/a	n/a	n/a	n/a	n/a	n/a
Americium-241	1.00E-01	2.00E-01	1.09E-01	11/15	n/a	n/a	n/a	n/a	0/15	5.16E+02	0/15	5.16E+00
Beta activity	5.80E+00	4.11E+01	2.13E+01	32/34	2.50E+00	1.95E+01	n/a	n/a	n/a	n/a	n/a	n/a
Cesium-137	1.00E-01	2.00E-01	1.14E-01	14/15	n/a	n/a	0/15	2.80E-01	0/15	8.58E+00	14/15	8.58E-02
Neptunium-237	1.00E-01	5.00E-01	2.60E-01	15/15	n/a	n/a	n/a	n/a	0/15	2.71E+01	8/15	2.71E-01
Plutonium-239	1.00E-01	1.00E-01	1.00E-01	15/15	n/a	n/a	n/a	n/a	0/15	1.15E+03	0/15	1.15E+01
Technetium-99	3.00E-01	6.60E+00	1.06E+00	13/17	5.00E-01	9.00E-01	2/17	2.80E+00	0/17	3.62E+04	0/17	3.62E+02
Thorium-230	5.00E-01	1.60E+00	1.04E+00	15/15	n/a	n/a	2/15	1.40E+00	0/15	1.49E+03	0/15	1.49E+01
Uranium	7.00E-01	9.40E+00	2.31E+00	15/15	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	7.00E-01	3.50E+00	1.03E+00	15/15	n/a	n/a	1/15	2.40E+00	0/15	1.98E+03	0/15	1.98E+01
Uranium-235	1.00E-01	1.00E-01	1.00E-01	15/15	n/a	n/a	0/15	1.40E-01	0/15	3.95E+01	0/15	3.95E-01
Uranium-238	6.00E-01	4.30E+00	1.05E+00	15/15	n/a	n/a	1/15	1.20E+00	0/15	1.71E+02	1/15	1.71E+00
Semivolatiles (mg/kg)												
1,2-Benzenedicarboxylic acid	2.00E-01	4.00E-01	3.00E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,3,3-Trimethylhexane	1.70E-01	1.70E-01	1.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-methylheptane	2.10E-01	2.10E-01	2.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Benz(a)anthracene	8.00E-02	1.20E-01	1.00E-01	2/25	3.80E-01	8.19E-01	n/a	n/a	0/25	2.08E+02	0/25	2.12E-01
Benzo(a)pyrene	9.00E-02	1.00E-01	9.50E-02	2/25	3.80E-01	8.19E-01	n/a	n/a	0/25	2.08E+01	2/25	2.12E-02
Benzo(b)fluoranthene	8.00E-02	9.00E-02	8.50E-02	2/25	3.80E-01	8.19E-01	n/a	n/a	0/25	2.08E+02	0/25	2.12E-01
Benzo(ghi)perylene	6.50E-02	6.50E-02	6.50E-02	1/25	6.30E-02	8.19E-01	n/a	n/a	n/a	n/a	n/a	n/a
Benzo(k)fluoranthene	8.00E-02	9.00E-02	8.50E-02	2/25	3.80E-01	8.19E-01	n/a	n/a	0/25	2.08E+03	0/25	2.12E+00
Bis(2-ethylhexyl)phthalate	5.00E-02	1.60E-01	9.40E-02	5/25	3.80E-01	8.19E-01	n/a	n/a	0/25	7.40E+03	0/25	8.84E+00
Chrysene	9.00E-02	1.20E-01	1.05E-01	2/25	3.80E-01	8.19E-01	n/a	n/a	0/25	2.08E+04	0/25	2.12E+01
Di-n-butyl phthalate	6.20E-02	1.23E+00	6.81E-01	3/25	3.80E-01	8.19E-01	n/a	n/a	0/25	1.00E+05	0/25	2.13E+03
Fluoranthene	7.00E-02	2.50E-01	1.63E-01	3/25	3.80E-01	8.19E-01	n/a	n/a	0/25	6.50E+04	0/25	2.21E+02
N-Nitroso-di-n-propylamine	4.47E-01	4.47E-01	4.47E-01	1/25	3.80E-01	8.19E-01	n/a	n/a	0/25	1.84E+01	1/25	2.31E-02
Phenanthrene	4.00E-02	1.90E-01	1.07E-01	3/25	3.80E-01	8.19E-01	n/a	n/a	n/a	n/a	n/a	n/a
Pyrene	6.00E-02	2.10E-01	1.40E-01	3/25	3.80E-01	8.19E-01	n/a	n/a	0/25	4.87E+04	0/25	1.65E+02
Volatiles (mg/kg)												
2,5-Dimethylhexane	1.60E-01	1.60E-01	1.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Propanol	6.00E-02	6.00E-02	6.00E-02	1/15	6.00E-02	6.00E-02	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.60. Summary of Surface and Subsurface Historical Data at SWMU 78 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Acetone	1.00E-01	1.00E-01	1.00E-01	1/21	1.20E-02	1.00E-01	n/a	n/a	0/21	1.91E+04	0/21	3.58E+02
cis-1,2-Dichloroethene	2.50E-03	5.70E-02	3.09E-02	5/30	1.40E-03	8.00E-01	n/a	n/a	0/30	4.63E+02	0/30	1.34E+01
Methylene chloride	1.40E-03	9.00E-02	4.44E-02	7/21	6.00E-03	3.90E-02	n/a	n/a	0/21	2.16E+03	0/21	1.34E+01
Tetrachloroethene	1.30E-03	4.70E-03	3.00E-03	2/21	6.00E-03	6.00E-03	n/a	n/a	0/21	1.46E+03	0/21	3.90E+00
Toluene	1.00E-03	2.50E-03	1.88E-03	4/21	6.00E-03	6.00E-03	n/a	n/a	0/21	7.28E+03	0/21	2.11E+02
Trichloroethene	6.00E-04	5.72E+01	6.79E+00	13/36	1.00E-03	8.00E-01	n/a	n/a	0/36	2.98E+02	4/36	2.51E+00
Vinyl chloride	5.10E-03	1.40E-02	9.55E-03	2/36	1.00E-03	8.00E-01	n/a	n/a	0/36	4.14E+01	0/36	1.34E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

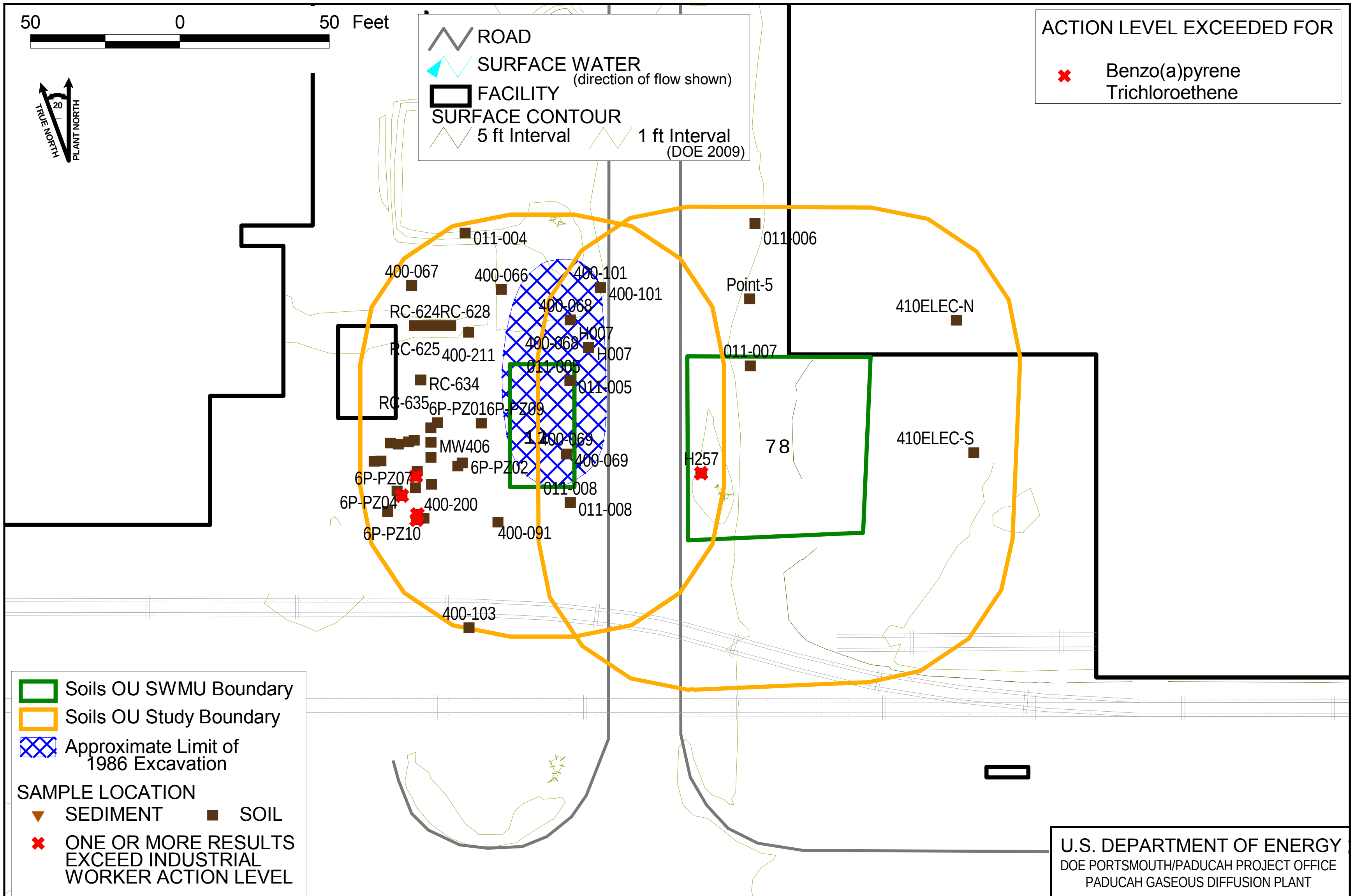

Figure 5.74. Soils Operable Unit: SWMUs 11 and 78

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 79 (C-611 PCB Spill Site)

Area description

The C-611 PCB Spill Site (SWMU 79) is located within the C-611 Water Treatment Facility, west of the plant site.

Process history

The transformer bank for the C-611 water treatment plant may have released oils containing PCBs to the soils surrounding the transformers. The oils may have migrated downhill by gravity flow or contaminated soils may have been transported downhill in surface runoff during precipitation events. Some soils may have been carried as far as Bayou Creek and deposited in the creek sediments.

Previous investigation results

The C-611 PCB Spill Site was investigated during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). The WAG 23 FS (DOE 1996a) retained for the current and future industrial workers no COCs, stating that neither the total pathway ELCR nor the chronic HI exceeds risk-based EPA thresholds (total pathway risk exceeding 10^{-4} ELCR or an HI of 1) at the SWMU.

Table 5.61 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.75).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.61. Summary of Surface and Subsurface Historical Data at SWMU 79

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB-1260	1.60E+00	1.60E+00	1.60E+00	1/1	9.30E-01	9.30E-01	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01
Subsurface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	1.53E-03	8.69E-03	4.01E-03	3/3	1.00E-03	1.00E-03	n/a	n/a	0/3	6.19E-01	1/3	6.19E-03
Metals (mg/kg)												
Aluminum	2.57E+03	9.46E+03	4.90E+03	3/3			0/3	1.20E+04	0/3	1.00E+05	1/3	4.64E+03
Arsenic	2.10E+00	6.30E+00	3.93E+00	3/3	6.00E-01	6.00E-01	0/3	7.90E+00	0/3	3.15E+02	3/3	5.23E-01
Barium	6.76E+01	2.31E+02	1.43E+02	3/3			1/3	1.70E+02	0/3	1.00E+05	1/3	2.29E+02
Calcium	7.87E+04	2.36E+05	1.53E+05	3/3			3/3	6.10E+03	n/a	n/a	n/a	n/a
Chromium	5.40E+00	2.52E+01	1.39E+01	3/3			1/3	4.30E+01	n/a	n/a	0/3	3.56E+02
Cobalt	5.20E+00	5.20E+00	5.20E+00	1/3	3.00E+00	3.20E+00	0/3	1.30E+01	0/3	1.00E+05	0/3	1.92E+03
Copper	2.90E+00	1.41E+01	9.47E+00	3/3			0/3	2.50E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	3.79E+03	1.39E+04	8.08E+03	3/3			0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	7.00E+00	8.40E+01	1.88E+01	9/9			1/9	2.30E+01	0/9	1.25E+03	1/9	5.00E+01
Magnesium	4.57E+03	1.26E+04	7.53E+03	3/3			3/3	2.10E+03	n/a	n/a	n/a	n/a
Manganese	1.53E+02	3.82E+02	2.50E+02	3/3			0/3	8.20E+02	0/3	4.64E+04	3/3	4.52E+01
Nickel	7.70E+00	1.34E+01	1.06E+01	2/3	6.80E+00	7.10E+00	0/3	2.20E+01	0/3	9.30E+04	0/3	2.42E+02
Potassium	3.77E+02	7.07E+02	5.60E+02	3/3	3.24E+02	3.24E+02	0/3	9.50E+02	n/a	n/a	n/a	n/a
Sodium	1.06E+02	1.76E+02	1.32E+02	3/3			0/3	3.40E+02	n/a	n/a	n/a	n/a
Vanadium	6.00E+00	2.42E+01	1.44E+01	3/3			0/3	3.70E+01	0/3	4.47E+03	3/3	3.32E+00
Zinc	2.90E+01	3.17E+02	1.35E+02	3/3			2/3	6.00E+01	0/3	1.00E+05	0/3	2.73E+03
Pesticides/PCBs (mg/kg)												
2,2',3,4',5',6-Hexachloro-1,1'-biphenyl	2.80E-01	2.80E-01	2.80E-01	1/1			n/a	n/a	n/a	n/a	n/a	n/a
PCB-1260	1.20E+01	1.20E+01	1.20E+01	1/13	1.70E-01	2.30E-01	n/a	n/a	0/13	4.25E+01	1/13	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	1.70E+00	1.52E+01	6.70E+00	11/13	8.00E-01	1.50E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.80E+00	2.27E+01	9.92E+00	13/13	7.00E-01	1.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Neptunium-237	5.70E-02	5.70E-02	5.70E-02	1/7	5.00E-01	5.00E+00	n/a	n/a	0/7	2.71E+01	0/7	2.71E-01
Plutonium-239	3.60E-01	3.60E-01	3.60E-01	1/7	5.00E-02	1.70E-01	n/a	n/a	0/7	1.15E+03	0/7	1.15E+01
Technetium-99	7.00E-01	1.40E+00	9.80E-01	5/12	3.00E-01	8.00E-01	0/12	2.80E+00	0/12	3.62E+04	0/12	3.62E+02
Thorium-228	9.08E-01	9.08E-01	9.08E-01	1/1	n/a	n/a	0/1	1.60E+00	0/1	2.80E+00	1/1	2.80E-02
Thorium-230	1.50E-01	8.98E-01	7.00E-01	4/7	2.00E-02	1.40E-01	0/7	1.40E+00	0/7	1.49E+03	0/7	1.49E+01
Thorium-232	8.37E-01	8.37E-01	8.37E-01	1/1	n/a	n/a	0/1	1.50E+00	0/1	1.35E+03	0/1	1.35E+01
Uranium-234	7.00E-02	9.40E-01	5.46E-01	10/12	5.00E-02	5.00E-01	0/12	2.40E+00	0/12	1.98E+03	0/12	1.98E+01
Uranium-235	2.00E-02	7.00E-02	4.60E-02	5/6	n/a	n/a	0/6	1.40E-01	0/6	3.95E+01	0/6	3.95E-01
Uranium-238	9.00E-02	1.02E+00	5.48E-01	10/12	5.00E-02	1.00E-01	0/12	1.20E+00	0/12	1.71E+02	0/12	1.71E+00
Semivolatiles (mg/kg)												
Di-n-butyl phthalate	2.40E-01	4.40E-01	3.64E-01	5/13	3.50E-01	4.20E-01	n/a	n/a	0/13	1.00E+05	0/13	2.13E+03
Hexachlorobiphenyl	2.30E-01	2.80E-01	2.55E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.61. Summary of Surface and Subsurface Historical Data at SWMU 79 (Continued)

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Volatiles (mg/kg)												
Acetone	2.60E-02	4.50E-02	3.55E-02	2/7	1.00E-02	5.90E-02	n/a	n/a	0/7	1.91E+04	0/7	3.58E+02
Benzene	4.00E-03	5.00E-03	4.75E-03	4/13	5.00E-03	2.90E-02	n/a	n/a	0/13	7.45E+01	0/13	1.13E+00

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

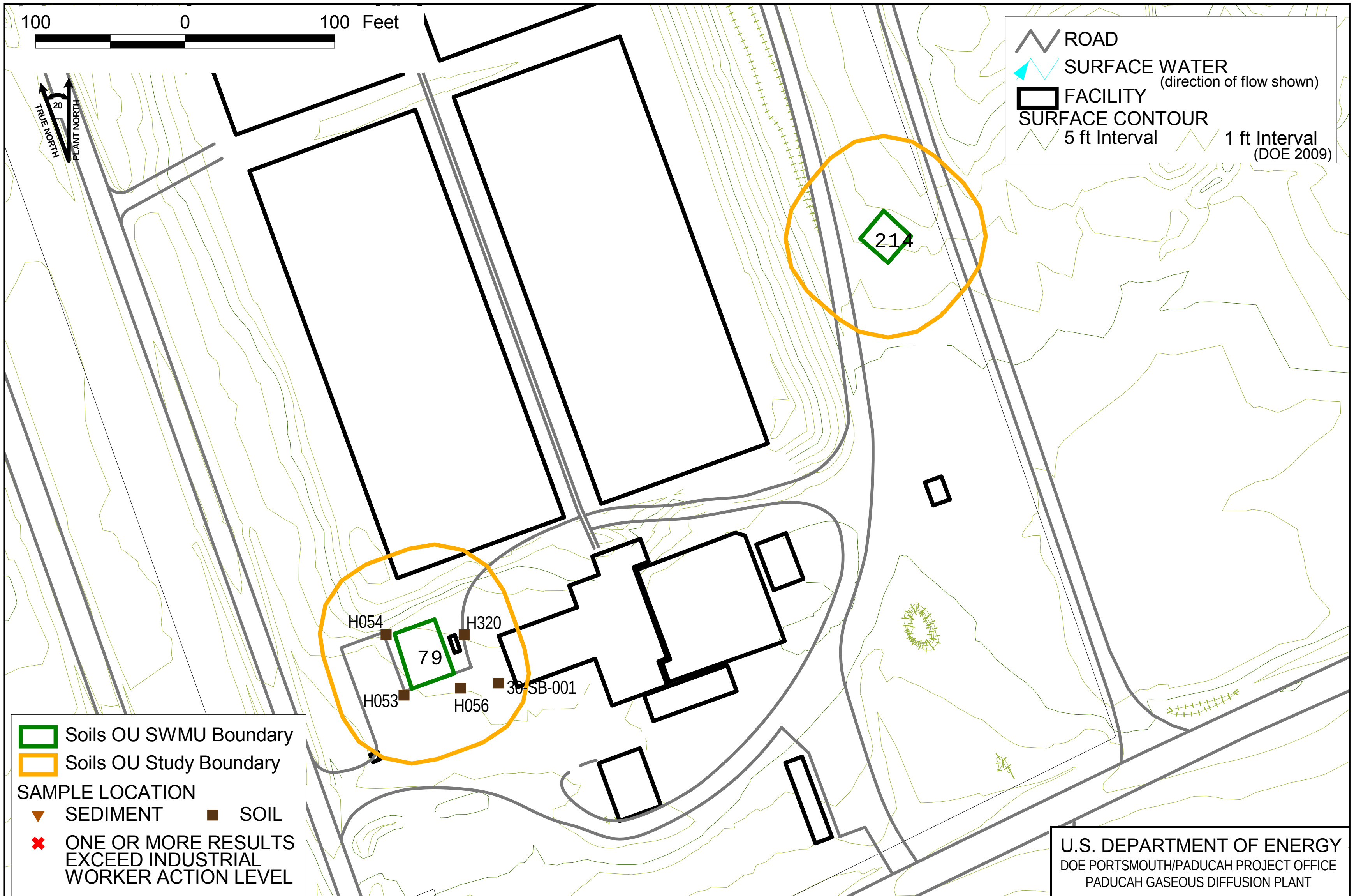

Figure 5.75. Soils Operable Unit: SWMUs 79 and 214

PADUCAH Remediation Services
A Portage Shaw Joint Venture Company

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 80 (C-540 PCB Spill Site)

Area description

The C-540 PCB Spill Site (SWMU 80) is located in the east central portion of the plant site.

Process history

SWMU 80 is made up of leaks and spills of oils containing PCBs as a result of past operations that contaminated the soils.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). Results of these investigations indicate the presence of PCBs.

In 1997, as part of the WAG 23 (1998f) non-time-critical removal action, 23 yd^3 of soil contaminated with dioxins and 72 yd^3 of soil contaminated with PCBs were excavated for SWMUs 56 and 80. A summary of conclusions from the WAG 23 RAR, based on the future use scenario of unrestricted industrial, is as follows:

> Following the removal action at WAG 23 sites, the residual PCB ELCR based on a 250 day/year exposure scenario is 2×10^{-6} at SWMUs 56 and 80 and below *de minimis* (i.e., 1×10^{-6}) at SWMUs 57 and 81. In addition, the PCB ELCR at SWMU 1 also are below *de minimis.* These risk levels are well within the EPA's acceptable risk range of 1×10^{-4} to 1×10^{-6}, as required by the NCP.

Table 5.62 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.76).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, storm sewers are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location to further delineate contamination outside the SWMU boundary.

Table 5.62. Summary of Surface and Subsurface Historical Data at SWMU 80

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	3.80E+01	9.30E+01	7.13E+01	4/4	n/a	n/a	4/4	4.90E+00	0/4	3.34E+03	4/4	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	1.00E-01	2.20E+00	1.17E+00	3/5	n/a	n/a	n/a	n/a	0/5	4.25E+01	2/5	1.99E-01
PCB-1260	1.00E-01	1.11E+02	1.52E+01	10/10	5.00E-04	5.00E-04	n/a	n/a	1/10	4.25E+01	7/10	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	1.99E+01	3.98E+01	3.02E+01	5/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.60E+01	6.60E+01	4.50E+01	5/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	1.72E+01	3.30E+01	2.56E+01	4/5	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
PCB-1260	5.00E-03	4.31E-01	1.47E-01	3/22	n/a	n/a	n/a	n/a	0/22	4.25E+01	1/22	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	4.11E+00	1.42E+01	7.26E+00	21/21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.52E+00	9.71E+00	3.59E+00	21/21	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium	1.80E+00	1.80E+00	1.80E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

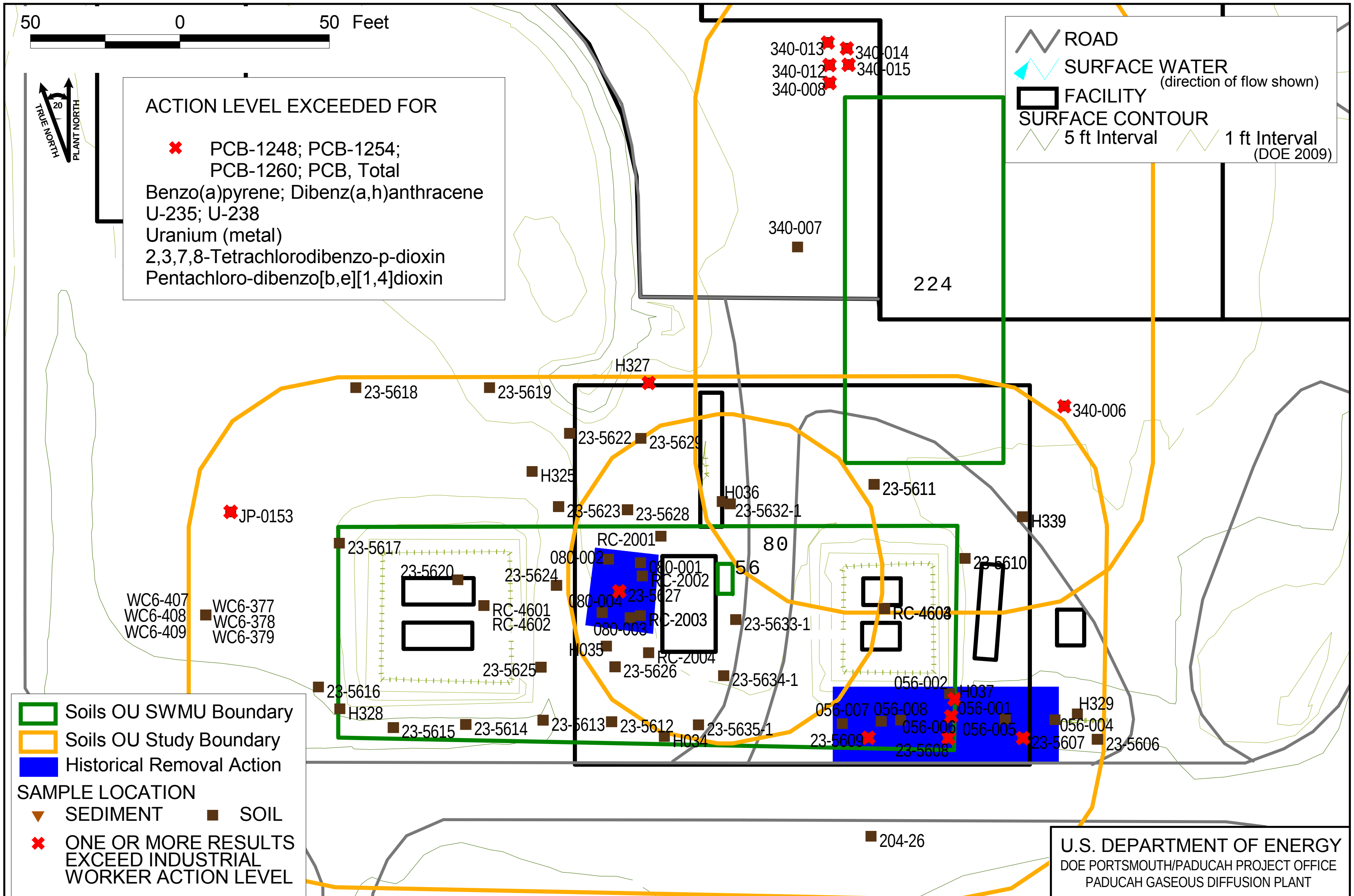

Figure 5.76. Soils Operable Unit: SWMUs 56, 80, and 224

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 81 (C-541 PCB Spill Site)

Area description

The C-541 PCB Spill Site (SWMU 81) is located in the northeast portion of the plant site.

Process history

SWMU 81 is made up of leaks and spills of oils containing PCBs as a result of past operations that contaminated the soils.

Previous investigation results

Soil boring samples were obtained during the Phase I and Phase II SIs (CH2M HILL 1991; 1992) and during the WAG 23 RI (DOE 1994c). Results of these investigations indicate the presence of PCBs.

In 1997, as part of the WAG 23 (DOE 1998f) non-time-critical removal action, 23 yds^3 of soil contaminated with dioxins and 32 yds^3 of soil contaminated with PCBs were excavated for SWMUs 57 and 81. A summary of conclusions from the WAG 23 RAR, based on the future use scenario of unrestricted industrial, is as follows:

> Following the removal action at WAG 23 sites, the residual PCB ELCR based on a 250 day/year exposure scenario is 2 x 10^{-6} at SWMUs 56 and 80 and below *de minimis* (i.e., 1 x 10^{-6}) at SWMUs 57 and 81. In addition, the PCB ELCR at SWMU 1 also are below *de minimis*. These risk levels are well within the EPA's acceptable risk range of 1 x 10^{-4} to 1 x 10^{-6}, as required by the NCP.

Table 5.63 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.77).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, storm sewers are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location to further delineate the contamination outside the SWMU boundary.

Table 5.63. Summary of Surface and Subsurface Historical Data at SWMU 81

	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
Analysis	**Minimum**	**Maximum**	**Average**	**of Detection**	**Minimum**	**Maximum**	**Bkgd**	**Value**	**AL[1]**	**Level[1]**	**NAL[1]**	**Level[1]**
Surface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	2.14E-03	4.30E-03	3.21E-03	3/3	1.00E-03	1.00E-03	n/a	n/a	0/3	6.19E-01	0/3	6.19E-03
Metals (mg/kg)												
Aluminum	9.18E+03	1.30E+04	1.12E+04	3/3	n/a	n/a	1/3	1.30E+04	0/3	1.00E+05	3/3	4.64E+03
Arsenic	9.10E+00	1.34E+01	1.08E+01	3/3	n/a	n/a	3/3	1.20E+01	0/3	3.15E+02	3/3	5.23E-01
Barium	7.88E+01	1.06E+02	9.18E+01	3/3	n/a	n/a	0/3	2.00E+02	0/3	1.00E+05	0/3	2.29E+02
Beryllium	7.00E-01	1.00E+00	9.00E-01	3/3	4.00E-01	4.00E-01	3/3	6.70E-01	0/3	1.28E+03	2/3	9.48E-01
Calcium	3.40E+03	5.20E+03	4.53E+03	3/3	n/a	n/a	0/3	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.20E+01	1.32E+01	1.25E+01	3/3	n/a	n/a	0/3	1.60E+01	n/a	n/a	0/3	3.56E+02
Cobalt	6.20E+00	1.03E+01	7.60E+00	3/3	1.40E+00	1.40E+00	0/3	1.40E+01	0/3	1.00E+05	0/3	1.92E+03
Copper	1.50E+01	2.12E+01	1.90E+01	3/3	n/a	n/a	2/3	1.90E+01	0/3	1.00E+05	0/3	4.93E+02
Iron	1.80E+04	2.59E+04	2.30E+04	3/3	n/a	n/a	0/3	2.80E+04	0/3	1.00E+05	3/3	2.07E+03
Lead	1.72E+01	2.19E+01	1.92E+01	3/3	n/a	n/a	0/3	3.60E+01	0/3	1.25E+03	0/3	5.00E+01
Magnesium	2.14E+03	2.47E+03	2.31E+03	2/3	1.80E+03	1.80E+03	2/3	7.70E+03	n/a	n/a	n/a	n/a
Manganese	1.34E+02	1.55E+02	1.45E+02	2/3	7.14E+02	7.14E+02	0/3	1.50E+03	0/3	4.64E+04	2/3	4.52E+01
Nickel	1.45E+01	1.52E+01	1.48E+01	3/3	6.80E+00	6.80E+00	0/3	2.10E+01	0/3	9.30E+04	0/3	2.42E+02
Silver	2.30E+00	2.70E+00	2.47E+00	3/3	1.80E+00	1.80E+00	3/3	2.30E+00	0/3	2.07E+04	0/3	4.11E+01
Sodium	5.78E+01	6.40E+01	6.09E+01	2/3	1.11E+02	1.11E+02	0/3	3.20E+02	n/a	n/a	n/a	n/a
Uranium	2.80E+03	3.00E+03	2.90E+03	2/2	n/a	n/a	2/2	4.90E+00	0/2	3.34E+03	2/2	2.02E+01
Vanadium	2.89E+01	2.98E+01	2.94E+01	2/3	2.74E+01	2.74E+01	0/3	3.80E+01	0/3	4.47E+03	2/3	3.32E+00
Zinc	6.68E+01	7.53E+01	7.11E+01	2/3	4.99E+01	4.99E+01	2/3	6.50E+01	0/3	1.00E+05	0/3	2.73E+03
Pesticides/PCBs (mg/kg)												
2,2',3,4',5',6-Hexachloro-1,1'-biphenyl	1.00E+00	1.00E+00	1.00E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB, Total	7.00E-01	7.00E-01	7.00E-01	1/5	n/a	n/a	n/a	n/a	0/5	4.25E+01	1/5	1.99E-01
PCB-1016	7.00E-01	7.00E-01	7.00E-01	1/4	2.00E+00	2.00E+00	n/a	n/a	0/4	4.25E+01	1/4	1.99E-01
PCB-1260	3.50E-02	1.05E+02	2.16E+01	6/6	n/a	n/a	n/a	n/a	1/6	4.25E+01	4/6	1.99E-01
Polychlorinated biphenyls 153	1.10E+00	1.10E+00	1.10E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 170	8.10E-01	8.10E-01	8.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	2.20E+00	4.80E+00	3.58E+00	6/6	1.10E+00	2.10E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	4.00E+00	1.77E+01	9.28E+00	6/6	1.00E+00	1.20E+00	n/a	n/a	n/a	n/a	n/a	n/a
Thorium-230	1.83E+00	1.83E+00	1.83E+00	1/3	5.00E-02	1.30E-01	1/3	1.50E+00	0/3	1.49E+03	0/3	1.49E+01
Uranium	2.50E+00	2.50E+00	2.50E+00	1/1	n/a		n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	2.30E-01	6.30E-01	4.30E-01	2/3	5.00E-02	n/a	0/3	2.50E+00	0/3	1.98E+03	0/3	1.98E+01
Uranium-238	3.00E-01	1.43E+00	8.65E-01	2/3	5.00E-02	1.10E-01	1/3	1.20E+00	0/3	1.71E+02	0/3	1.71E+00
Semivolatiles (mg/kg)												
2,5-Hexanedione	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	4.50E-01	4.50E-01	4.50E-01	1/3	5.30E-01	5.90E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Hexachlorobiphenyl	7.30E-01	1.10E+00	9.13E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
Methyl Isobutyl Carbinol	2.40E-01	2.40E-01	2.40E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.63. Summary of Surface and Subsurface Historical Data at SWMU 81 (Continued)

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
2,2',3,3',5,6'-Hexachlorobiphenyl	4.20E-01	4.20E-01	4.20E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1260	7.40E-01	1.25E+01	8.20E+00	4/19	2.00E-01	2.00E-01	n/a	n/a	0/19	4.25E+01	4/19	1.99E-01
Polychlorinated biphenyls 153	3.50E-01	1.20E+00	7.75E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 171	5.10E-01	5.10E-01	5.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 174	6.10E-01	6.10E-01	6.10E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 180	9.50E-01	9.50E-01	9.50E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	2.00E+00	1.04E+01	5.87E+00	14/14	1.20E+00	2.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	2.40E+00	1.05E+01	5.68E+00	14/14	9.00E-01	1.00E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	8.00E-01	7.70E+00	3.20E+00	3/5	2.00E-01	6.00E+00	1/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Uranium	2.60E+00	2.60E+00	2.60E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	9.00E-02	1.70E+00	6.60E-01	4/5	5.00E-02	1.20E-01	0/5	2.40E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-238	1.50E-01	1.60E+00	5.64E-01	5/5	5.00E-02	1.20E-01	1/5	1.20E+00	0/5	1.71E+02	0/5	1.71E+00
Semivolatiles (mg/kg)												
2,3-Dimethylheptane	3.60E-01	5.10E-01	4.40E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,4-Dimethylheptane	6.80E-01	6.80E-01	6.80E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2,6-Dimethylheptane	2.60E-01	3.30E-01	2.93E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyloctane	6.00E-01	6.00E-01	6.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3-Methylene-heptane	2.00E-01	2.00E-01	2.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Dioctyl hexanedioate	5.70E-01	5.70E-01	5.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Hexachlorobiphenyl	9.80E-01	1.20E+00	1.09E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Octane	1.90E-01	1.90E-01	1.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
2,5-Dimethylheptane	6.60E-01	8.50E-01	7.53E-01	3/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyl-2-heptene	1.90E-01	1.90E-01	1.90E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
2-Methyldecane	2.50E-01	2.50E-01	2.50E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3,4-Dimethylheptane	2.20E-01	2.40E-01	2.30E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Heptanone	3.40E-01	3.70E-01	3.55E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyl-3-penten-2-one	3.00E-01	3.40E-01	3.15E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	1.70E-01	1.70E-01	1.70E-01	1/5	9.00E-03	6.20E-02	n/a	n/a	0/5	1.91E+04	0/5	3.58E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

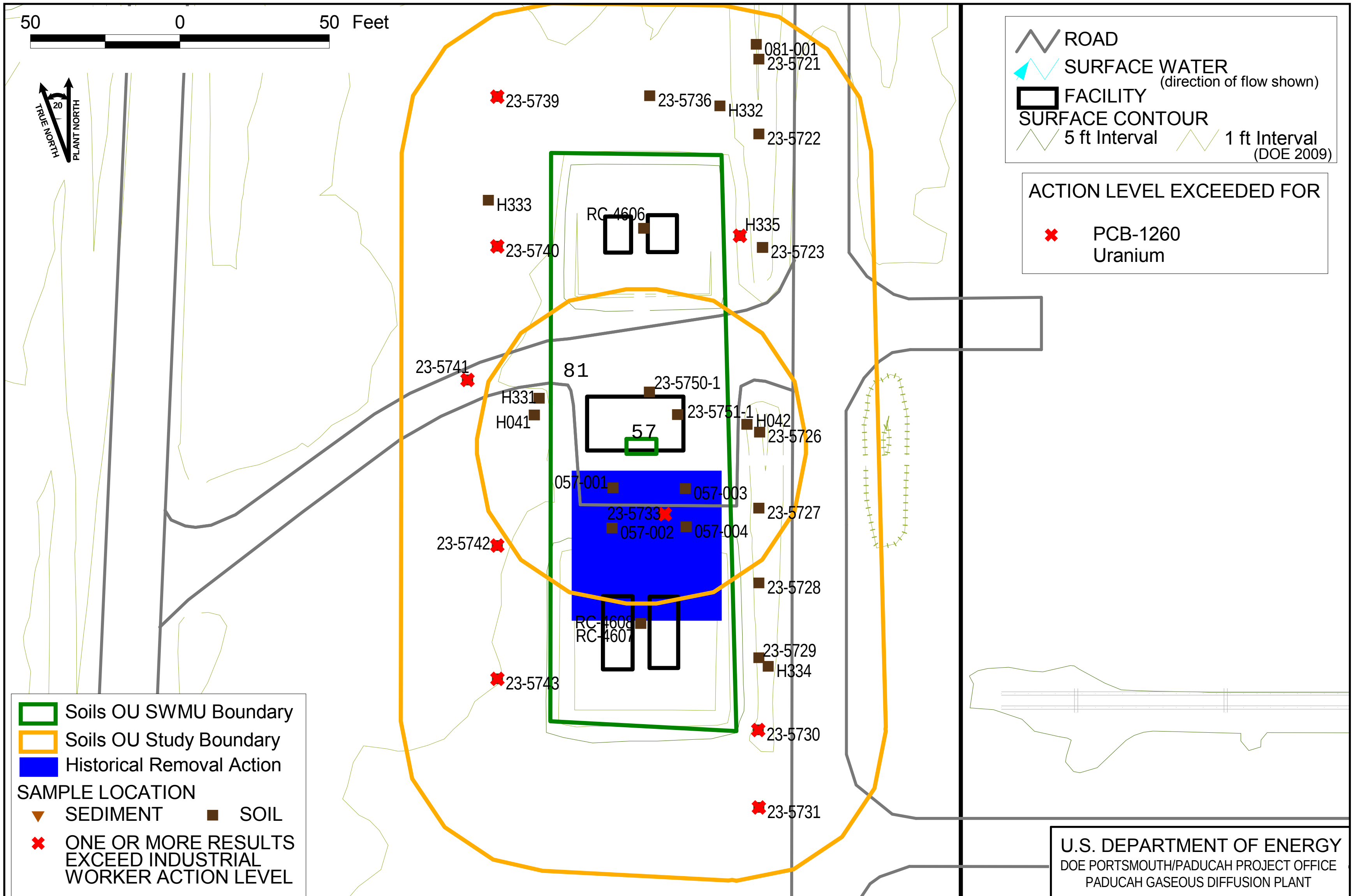

Figure 5.77. Soils Operable Unit: SWMUs 57 and 81

Figure No. \SoilsOU\SOU_SWMUsR5.apr
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SWMU 135 (C-333 PCB Soil Contamination)

Area description

The C-333 PCB Soil Contamination (SWMU 135) is located north of the C-333 Building in the east central portion of the plant site and was a dust palliative area used to reduce the amount of dust taken in by the ventilation system.

Process history

It is unknown how this area experienced a PCB spill.

Previous investigation results

Surface soil sampling prior to a pavement construction project in 1991 detected the presence of PCBs at a maximum concentration of 220 ppm in one location (DOE 1997f). Other detections include arsenic, barium, chromium, lead, nickel, and uranium.

Table 5.64 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.78).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; however, they are within the boundary of the SWMU.

Data gap determination

Samples are needed to determine the extent of contamination.

Table 5.64. Summary of Surface and Subsurface Historical Data at SWMU 135

Analysis	Detected Results			Frequency of Detection	Detection Limit		Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
	Minimum	Maximum	Average		Minimum	Maximum						
Surface Soils												
Metals (mg/kg)												
Arsenic	3.10E+00	3.70E+00	3.40E+00	2/2	n/a	n/a	0/2	1.20E+01	0/2	3.15E+02	2/2	5.23E-01
Barium	2.33E+01	3.68E+01	3.00E+01	2/2	n/a	n/a	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Chromium	9.75E+00	1.09E+01	1.03E+01	2/2	n/a	n/a	0/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Lead	9.31E+00	2.09E+01	1.51E+01	2/2	n/a	n/a	0/2	3.60E+01	0/2	1.25E+03	0/2	5.00E+01
Nickel	6.58E+00	6.67E+00	6.63E+00	2/2	n/a	n/a	0/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Uranium	1.00E+01	8.20E+01	4.60E+01	2/2	n/a	n/a	2/2	4.90E+00	0/2	3.34E+03	1/2	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-01	3.60E+02	5.80E+01	22/27	n/a	n/a	n/a	n/a	8/27	4.25E+01	22/27	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

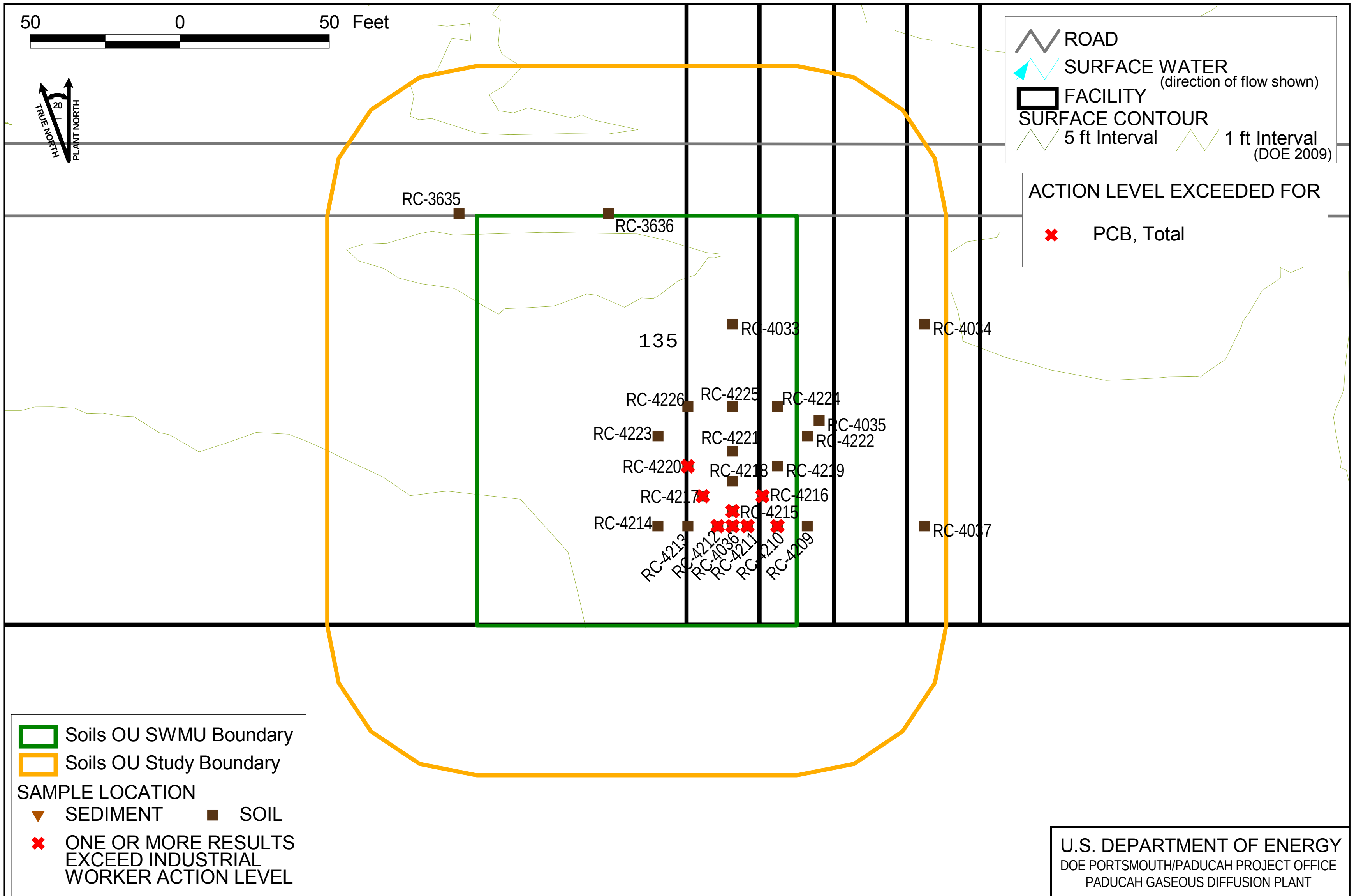

Figure 5.78. Soils Operable Unit: SWMU 135

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SWMU 137 (C-746-A Inactive PCB Area)

Area description

The C-746-A Inactive PCB Area (SWMU 137) is a sump inside a concrete dike and is located in the northwest portion of the plant site.

Process history

This concrete dike was for a transformer, which has been removed. The valve to the sump was tagged caution on September 14, 1990, to prevent any possible PCB-contaminated water from being released to the sewer system. There is no documentation of such a release.

Previous investigation results

No sample data is available for the area. Figure 5.79 shows the location of SWMU 137.

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Additional samples are needed at this location.

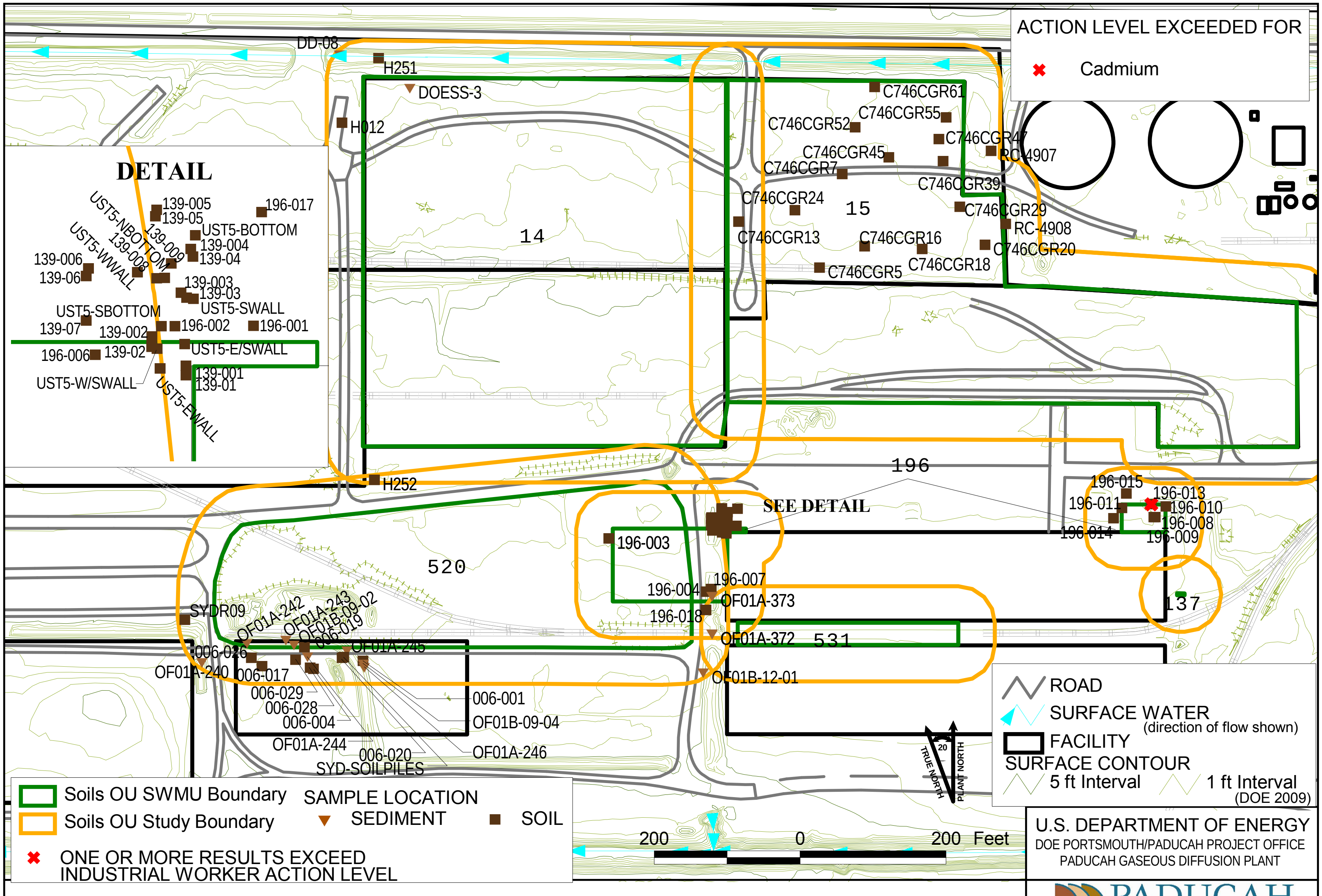

Figure 5.79. Soils Operable Unit: SWMUs 14, 15, 137, 196, 520, and 531

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 153 (C-331 PCB Soil Contamination -West)

Area description

The C-331 PCB Soil Contamination (West) (SWMU 153) is located west of the C-331 Building in the west central portion of the plant site and was a dust palliative area used to reduce the amount of dust taken in by the ventilation system. The area is approximately 100 ft wide by 420 ft long.

Process history

The SWMU was used as a dust palliative area to reduce the amount of dust taken in by the C-331 Building ventilation systems.

Previous investigation results

SWMU 153 was part of WAGs 16 and 19. Information obtained in the scoping information package for WAGs 16 and 19 project identified surface sampling that detected PCBs at a maximum concentration of 0.6 mg/kg. Uranium also was detected (DOE 1997f).

Table 5.65 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.80).

Area utilities

No recirculating water lines or sewers were associated with this soil contamination. Storm sewers are coincidentally located within the boundary of the SWMU. Approximate depth to the sewers are 2 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.65. Summary of Surface and Subsurface Historical Data at SWMU 153

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	4.00E+00	4.00E+00	4.00E+00	1/1	n/a	n/a	0/1	4.90E+00	0/1	3.34E+03	0/1	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	6.00E-01	6.00E-01	6.00E-01	1/1	n/a	n/a	n/a	n/a	0/1	4.25E+01	1/1	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

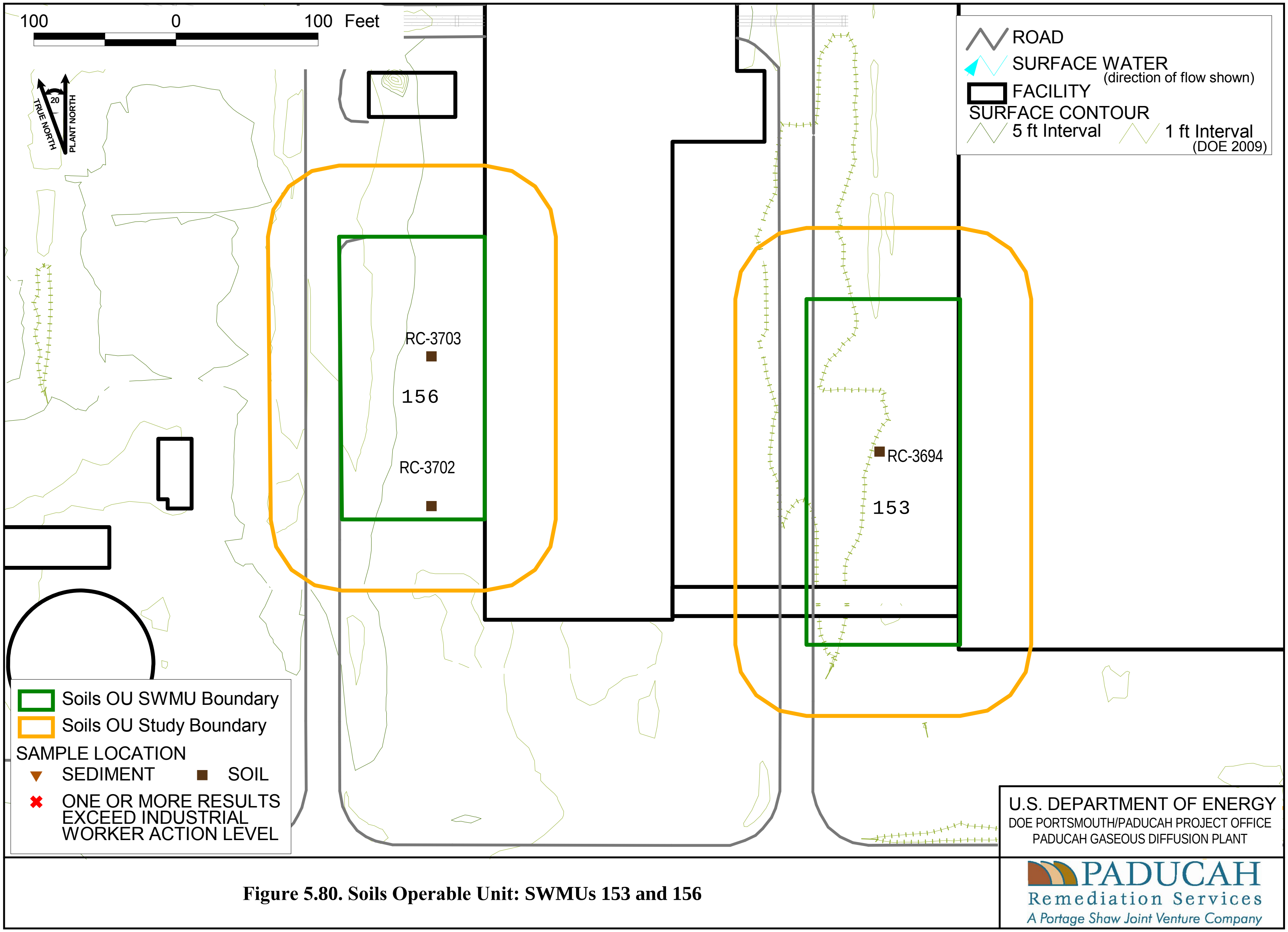

Figure 5.80. Soils Operable Unit: SWMUs 153 and 156

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 154 (C-331 PCB Soil Contamination-Southeast)

Area description

The C-331 PCB Soil Contamination (Southeast) (SWMU 154) is located southeast of the C-331 Building in the east central portion of the plant site and was a dust palliative area used to reduce the amount of dust taken in by the ventilation system. The area consists of three distinct areas: Area 1–south side, 100 ft wide by 160 ft long; Area 2–southeast corner, 100 ft wide by 160 ft long; and Area 3–east side, 100 ft wide by 210 ft long (all approximate dimensions).

Process history

The SWMU was used as a dust palliative area to reduce the amount of dust taken in by the C-331 Building ventilation systems.

Previous investigation results

SWMU 154 was part of WAGs 16 and 19. Information obtained in the scoping information package for WAGs 16 and 19 project identified surface samples detected PCBs at a maximum concentration of 3.2 mg/kg. Uranium also was detected (DOE 1997f).

Table 5.66 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.81).

Area utilities

No recirculating water lines or sewers were associated with this soil contamination. Storm sewers, sanitary sewers, and recirculating/sanitary water lines are coincidentally located within the boundary of the SWMU. Approximate depths to the utilities are 7-9 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.66. Summary of Surface and Subsurface Historical Data at SWMU 154

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	5.00E+00	1.50E+01	8.33E+00	3/3	n/a	n/a	3/3	4.90E+00	0/3	3.34E+03	0/3	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-01	3.20E+00	1.48E+00	5/5	n/a	n/a	n/a	n/a	0/5	4.25E+01	5/5	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

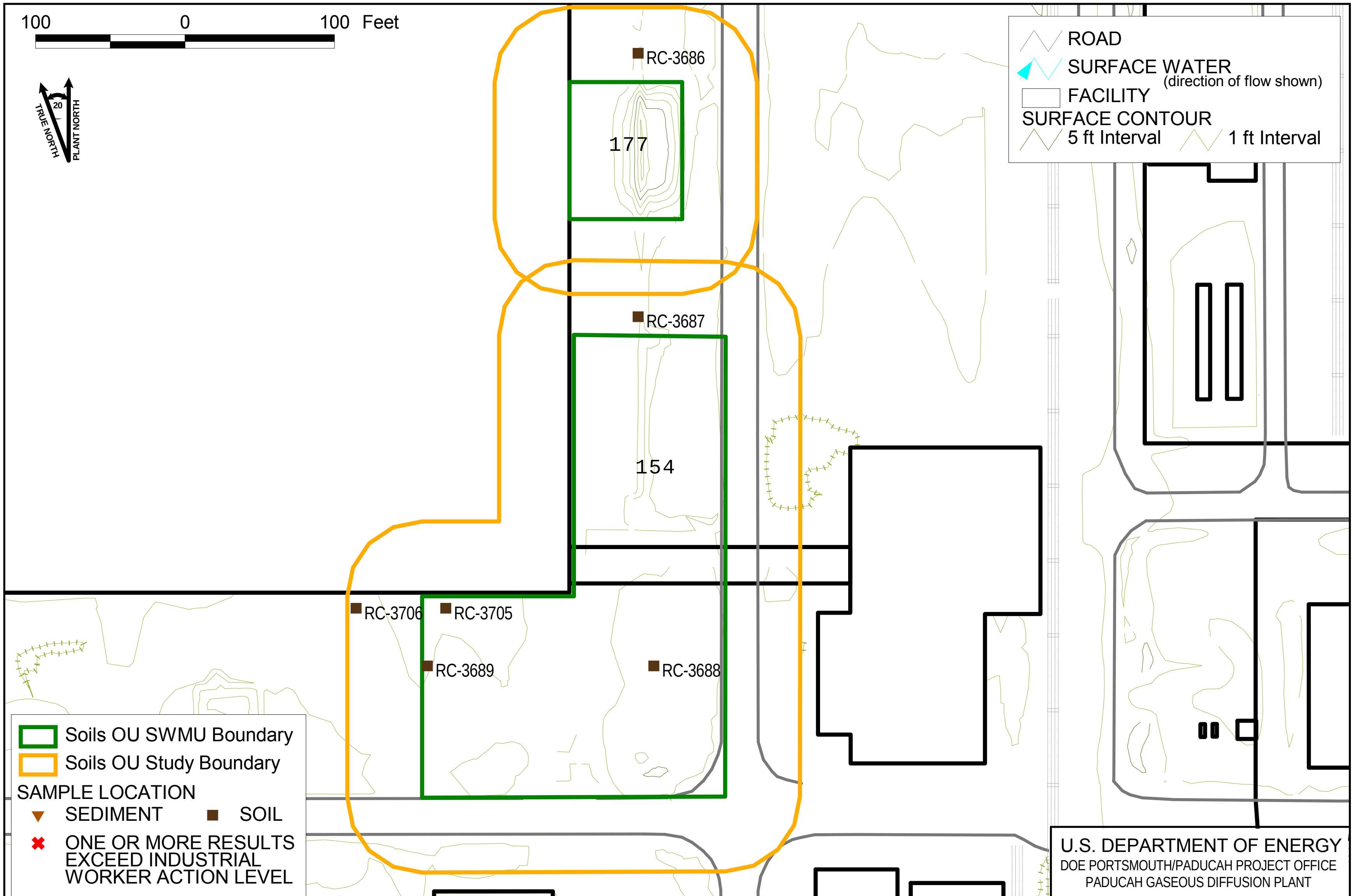

Figure 5.81. Soils Operable Unit: SWMUs 154 and 177

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SWMU 155 (C-333 PCB Soil Contamination-West)

Area description

The C-333 PCB Soil Contamination (West) (SWMU 155) is located in the south central portion of the plant site and was a dust palliative area used to reduce the amount of dust taken in by the ventilation system. SWMU 155 consists of two areas that are approximately 100 ft wide by 150 ft long each.

Process history

The area historically was used as a dust palliative area to reduce the amount of dust taken in by the C-331 Building ventilation systems.

Previous investigation results

SWMU 155 was part of WAGs 16 and 19. Information obtained in the scoping information package for WAGs 16 and 19 project identified surface samples that detected PCBs at a maximum concentration of 17 mg/kg. Uranium, arsenic, barium, chromium, lead, and nickel also were detected (DOE 1997f).

Table 5.67 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.82).

Area utilities

No recirculating water lines or sewers were associated with this soil contamination. Storm sewers are coincidentally located within the boundary of the SWMU. Approximate depths to the sewers are 5-6 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.67. Summary of Surface and Subsurface Historical Data at SWMU 155

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Surface Soils												
Metals (mg/kg)												
Antimony	5.06E+00	5.06E+00	5.06E+00	1/1	n/a	n/a	1/1	2.10E-01	0/1	4.63E+02	1/1	3.79E-01
Arsenic	1.20E+00	4.00E+00	2.98E+00	3/3	n/a	n/a	0/3	1.20E+01	0/3	3.15E+02	3/3	5.23E-01
Barium	4.60E+01	4.90E+01	4.75E+01	2/3	n/a	n/a	0/3	2.00E+02	0/3	1.00E+05	0/3	2.29E+02
Chromium	2.94E+01	3.47E+01	3.21E+01	2/3	n/a	n/a	2/3	1.60E+01	n/a	n/a	0/3	3.56E+02
Lead	5.41E+00	3.34E+01	1.94E+01	2/3	n/a	n/a	1/3	3.60E+01	0/3	1.25E+03	0/3	5.00E+01
Nickel	6.68E+00	7.95E+00	7.32E+00	2/3	n/a	n/a	0/3	2.10E+01	0/3	9.30E+04	0/3	2.42E+02
Selenium	5.00E-01	5.00E-01	5.00E-01	1/3	n/a	n/a	0/3	8.00E-01	0/3	2.56E+04	0/3	9.49E+01
Uranium	1.20E+01	1.80E+01	1.50E+01	2/2	n/a	n/a	2/2	4.90E+00	0/2	3.34E+03	0/2	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	3.50E+00	1.70E+01	1.03E+01	2/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	2/3	1.99E-01

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

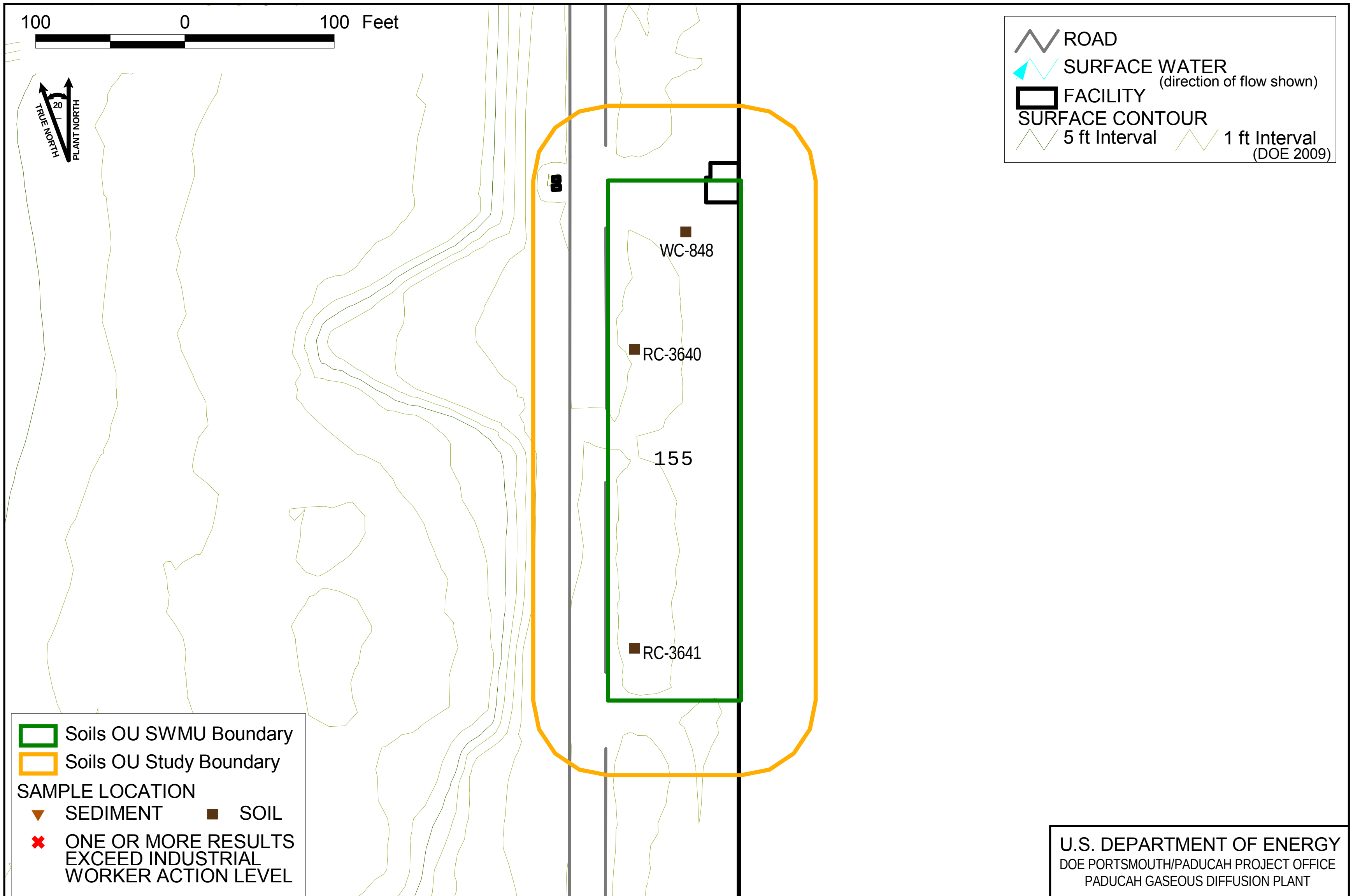

Figure 5.82. Soils Operable Unit: SWMU 155

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SWMU 156 (C-310 PCB Soil Contamination-West)

Area description

The C-310 PCB Soil Contamination (West Side) (SWMU 156) is located in the central portion of the plant site. The approximate dimension of SWMU 156 is 100 ft wide by 160 ft long.

Process history

The area historically was used as a dust palliative area to reduce the amount of dust taken in by the C-331 Building ventilation systems.

Previous investigation results

SWMU 156 was part of WAGs 16 and 19. Information obtained in the scoping information package for WAGs 16 and 19 project identified surface samples that detected PCBs at a maximum concentration of 0.3 mg/kg. Uranium also was detected (DOE 1997f).

Table 5.68 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.83).

Area utilities

No recirculating water lines or sewers were associated with this soil contamination. Storm sewers are coincidentally located within the boundary of the SWMU. Approximate depth to the sewers is 4 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.68. Summary of Surface and Subsurface Historical Data at SWMU 156

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Metals (mg/kg)												
Uranium	2.00E+00	9.00E+00	5.50E+00	2/2	n/a	n/a	1/2	4.90E+00	0/2	3.34E+03	0/2	2.02E+01
Pesticides/PCBs (mg/kg)												
PCB, Total	3.00E-01	3.00E-01	3.00E-01	1/2	n/a	n/a	n/a	n/a	0/2	4.25E+01	1/2	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

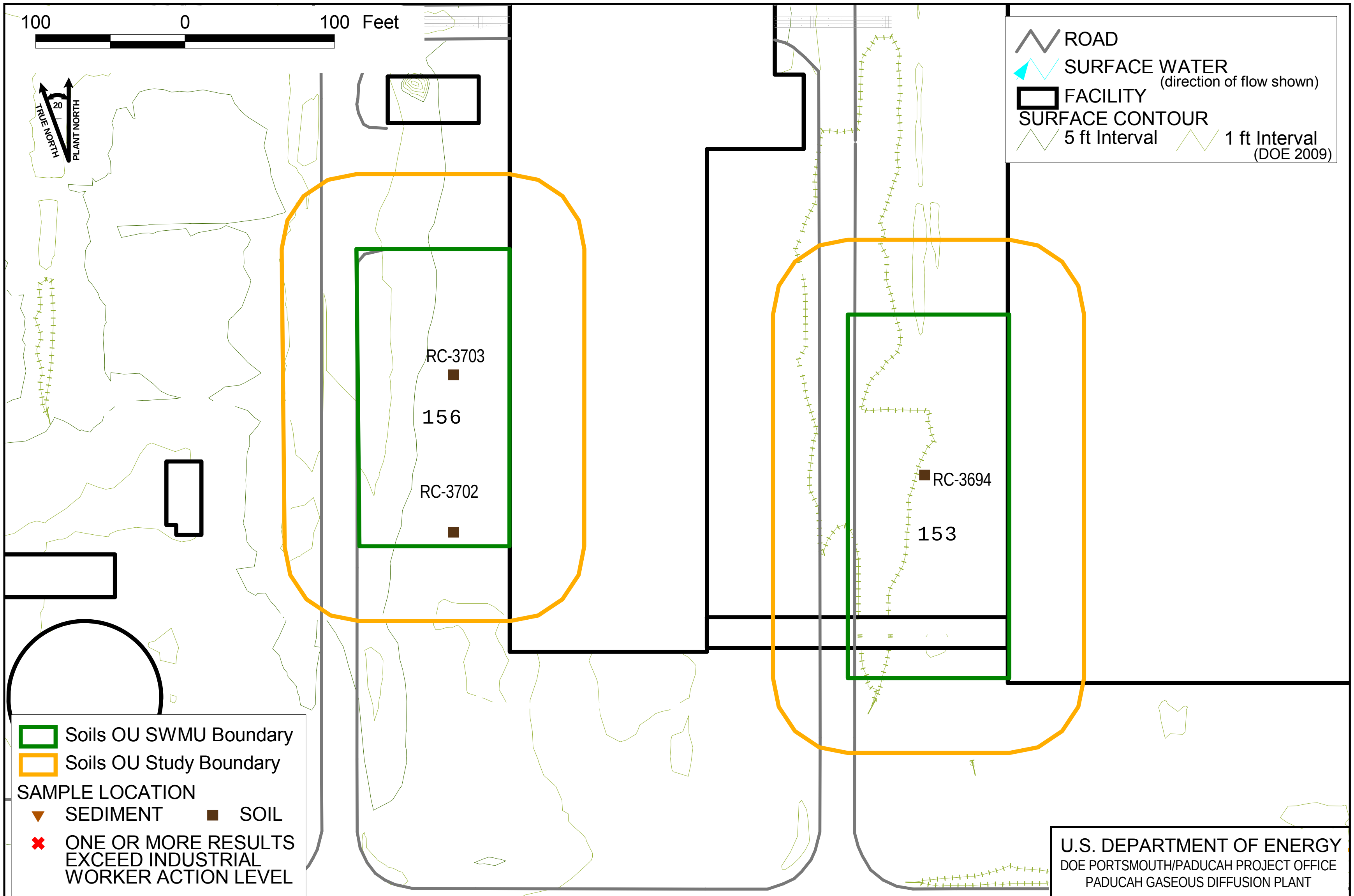

Figure 5.83. Soils Operable Unit: SWMUs 153 and 156

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SWMU 160 (C-745 Cylinder Yard Spoils-PCB Soils)

Area description

The C-745 Cylinder Yard Spoils (PCB Soils) (SWMU 160) is located in the southeast portion of the plant site. SWMU 160 is approximately 300 ft wide by 500 ft long.

Process history

Historically, this area was used as storage of excavated soils and soils for fill from other projects at PGDP.

Previous investigation results

Surface samples detected PCBs at a maximum concentration of 4 mg/kg. Uranium, arsenic, barium, chromium, lead, selenium, cadmium, thallium, and nickel also were detected (DOE 1997f).

Table 5.69 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.84).

Area utilities

No recirculating water lines or sewers are associated with the operation of this facility; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.69. Summary of Surface and Subsurface Historical Data at SWMU 160

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	4.00E+00	4.00E+00	4.00E+00	1/3	n/a	n/a	n/a	n/a	0/3	4.25E+01	1/3	1.99E-01
PCB-1254	4.00E+00	4.00E+00	4.00E+00	1/1	n/a	n/a	n/a	n/a	0/1	1.82E+01	1/1	1.99E-01
Radionuclides (pCi/g)												
Uranium	2.40E+00	3.40E+00	2.90E+00	2/3	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

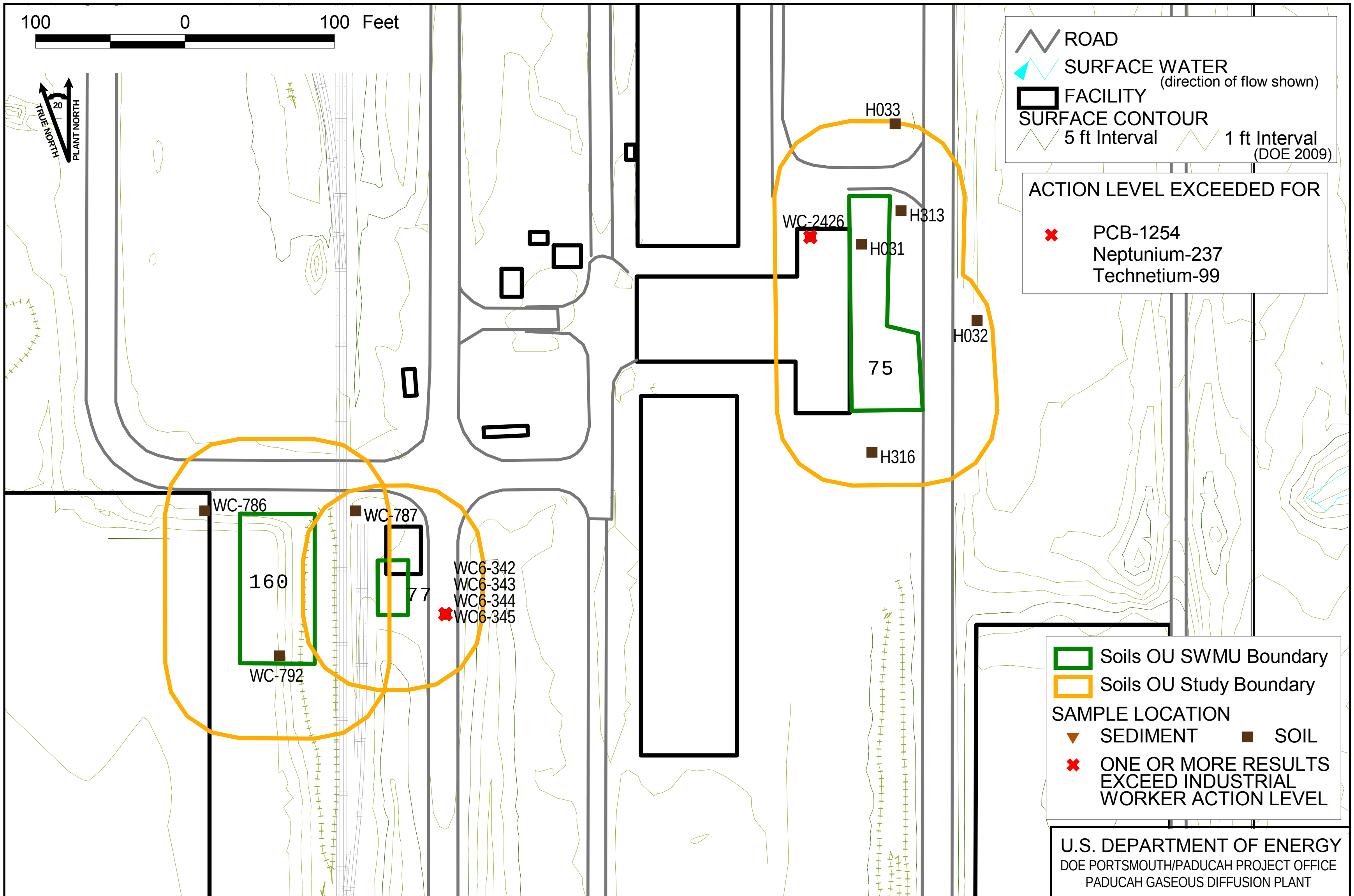


Figure 5.84. Soils Operable Unit: SWMUs 75, 77, and 160

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 163 (C-304 HVAC Piping System-Soil Backfill from C-611)

Area description

The C-304 Building/HVAC Piping System (Soil Backfill) (SWMU 163) is located in the central portion of the plant site. SWMU 163 is approximately 100 ft wide by 200 ft long.

Process history

Soils from the C-611-V Lagoon borrow area were used for fill material for C-304 construction activities. The fill material was used as a base for the HVAC piping system and as a heat sink; it is located approximately 6 ft bgs.

Previous investigation results

The borrow area itself has not been characterized, but the lagoon was sampled, resulting in the identification of PCBs to a maximum of 8.4 mg/kg, as noted in the 1998-*Sampling and Analysis, Quality Assurance, and Data Management Plan for the Site Evaluation of Waste Area Groupings 16 and 19,* DOE/OR/07-1745&D1 (DOE 1998d), and the SAR.

Figure 5.85 shows the area historical map.

Area utilities

No recirculating water lines or sewers are associated with this backfill; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

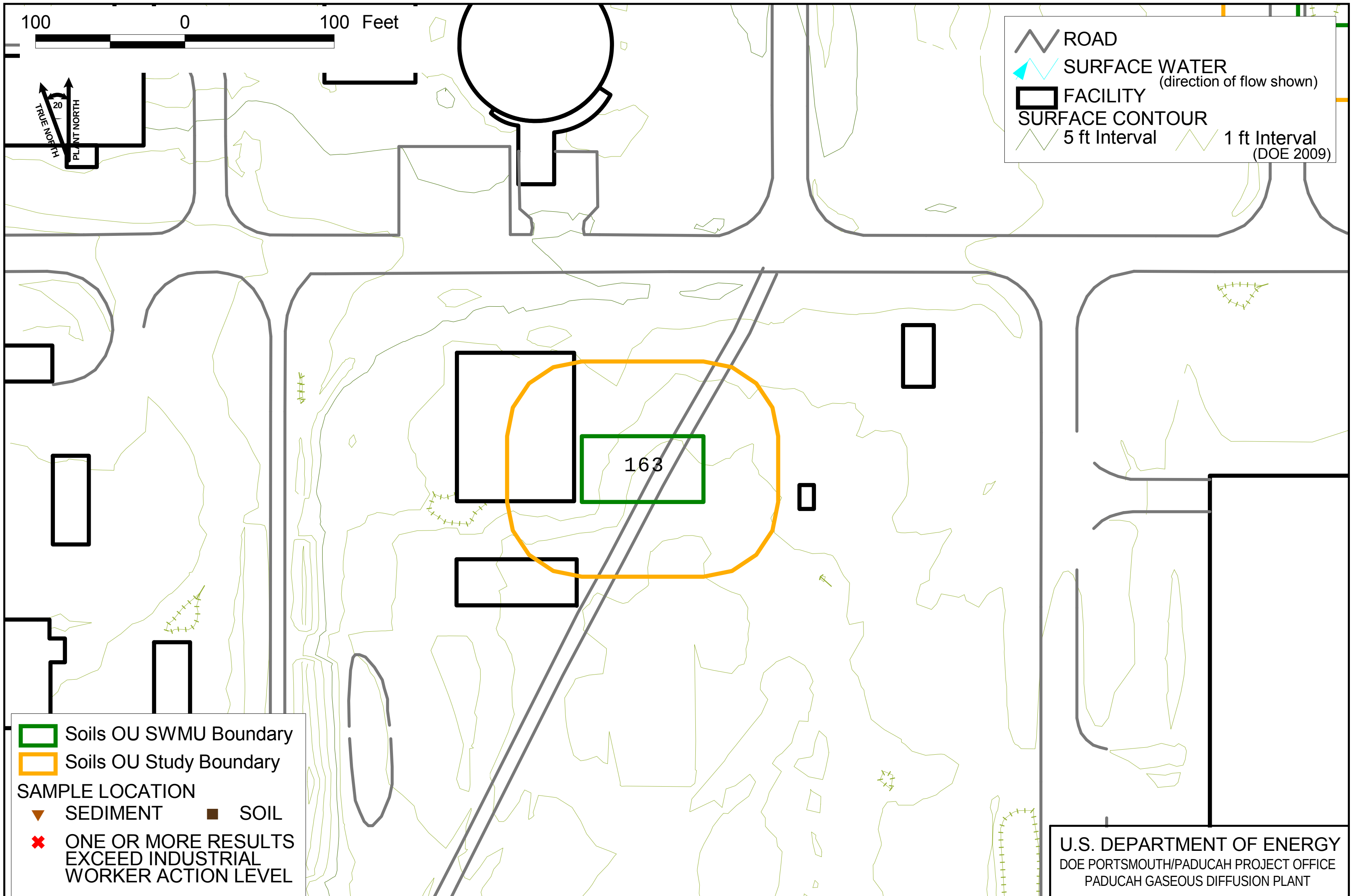


Figure 5.85. Soils Operable Unit: SWMU 163

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-06-10

SWMU 219 (DMSA OS-08)

Area description

DMSA OS-08 (SWMU 219) is located east of C-728 in the central portion of the plant site. SWMU 219 is an empty 4,722 ft^3 fiberglass tank.

Process history

DMSA OS-08 was used to store PCB contaminated water prior to disposal. PCB spill documentation indicates this tank was used to store PCB-contaminated rainwater that had collected in a pit in the C-537 Switchyard. Two transformer spills in 1989 resulted in rainwater collecting in the pit that was subject to TSCA rules. This tank was documented as leaking inside the present location, a diked area covered with hypolon, in November 1991. The water from the diked area was sampled with results of PCBs at <0.1 mg/L. The tank was drained and cleaned according to existing TSCA requirements. Additionally, personnel recall this tank possibly was used to cleanup a recirculating cooling water spill in C-333. The spill would have been subject to TSCA regulations because it came into contact with PCB troughing and gaskets.

Previous investigation results

No previous investigations are available.

Table 5.70 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.86).

Area utilities

No recirculating water lines or sewers are associated with this DMSA; none are within the boundary of the SWMU.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.70. Summary of Surface and Subsurface Historical Data at SWMU 219

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Dioxins/Furans (mg/kg)												
Octachloro-dibenzo[b,e][1,4]dioxin	1.44E-03	1.84E-03	1.64E-03	2/2	1.00E-03	1.00E-03	n/a	n/a	0/2	6.19E-01	0/2	6.19E-03
Tetrachloro-dibenzo[b,e][1,4]dioxin	2.24E-03	2.24E-03	2.24E-03	1/2	1.00E-03	1.00E-03	n/a	n/a	n/a	n/a	n/a	n/a
Metals (mg/kg)												
Aluminum	6.10E+03	6.69E+03	6.40E+03	2/2	n/a	n/a	0/2	1.30E+04	0/2	1.00E+05	2/2	4.64E+03
Arsenic	3.50E+00	3.80E+00	3.65E+00	2/2	n/a	n/a	0/2	1.20E+01	0/2	3.15E+02	2/2	5.23E-01
Barium	9.49E+01	1.03E+02	9.90E+01	2/2	n/a	n/a	0/2	2.00E+02	0/2	1.00E+05	0/2	2.29E+02
Beryllium	6.00E-01	8.00E-01	7.00E-01	2/2	4.00E-01	4.00E-01	1/2	6.70E-01	0/2	1.28E+03	0/2	9.48E-01
Calcium	3.75E+03	5.13E+03	4.44E+03	2/2	n/a	n/a	0/2	2.00E+05	n/a	n/a	n/a	n/a
Chromium	1.60E+01	2.87E+01	2.24E+01	2/2	n/a	n/a	1/2	1.60E+01	n/a	n/a	0/2	3.56E+02
Cobalt	5.50E+00	6.50E+00	6.00E+00	2/2	1.40E+00	1.40E+00	0/2	1.40E+01	0/2	1.00E+05	0/2	1.92E+03
Copper	2.24E+01	4.27E+01	3.26E+01	2/2	n/a	n/a	2/2	1.90E+01	0/2	1.00E+05	0/2	4.93E+02
Iron	9.58E+03	1.02E+04	9.89E+03	2/2	n/a	n/a	0/2	2.80E+04	0/2	1.00E+05	2/2	2.07E+03
Lead	2.01E+01	3.55E+01	2.78E+01	2/2	n/a	n/a	1/2	3.60E+01	0/2	1.25E+03	0/2	5.00E+01
Magnesium	8.34E+02	9.36E+02	8.85E+02	2/2	n/a	n/a	0/2	7.70E+03	n/a	n/a	n/a	n/a
Manganese	2.15E+02	3.44E+02	2.80E+02	2/2	n/a	n/a	0/2	1.50E+03	0/2	4.64E+04	2/2	4.52E+01
Nickel	1.66E+01	2.15E+01	1.91E+01	2/2	6.80E+00	6.80E+00	1/2	2.10E+01	0/2	9.30E+04	0/2	2.42E+02
Vanadium	1.79E+01	1.85E+01	1.82E+01	2/2	n/a	n/a	0/2	3.80E+01	0/2	4.47E+03	2/2	3.32E+00
Zinc	5.16E+01	6.16E+01	5.66E+01	2/2	n/a	n/a	1/2	6.50E+01	0/2	1.00E+05	0/2	2.73E+03
Pesticides/PCBs (mg/kg)												
2,2',3,4-Tetrachlorobiphenyl	1.30E+00	1.30E+00	1.30E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1242	3.80E+01	3.80E+01	3.80E+01	1/5	9.90E-02	1.00E-01	n/a	n/a	0/5	4.25E+01	1/5	1.99E-01
PCB-1254	6.60E+01	6.60E+01	6.60E+01	1/5	2.00E-01	2.00E-01	n/a	n/a	1/5	1.82E+01	1/5	1.99E-01
PCB-1260	8.44E-01	8.44E-01	8.44E-01	1/5	2.00E-01	4.20E+00	n/a	n/a	0/5	4.25E+01	1/5	1.99E-01
Polychlorinated biphenyls 132	9.30E-01	9.30E-01	9.30E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 31	4.70E-01	4.70E-01	4.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Polychlorinated biphenyls 99	9.00E-01	9.00E-01	9.00E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Radionuclides (pCi/g)												
Alpha activity	6.10E+00	1.64E+01	9.03E+00	4/4	1.70E+00	2.60E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	1.20E+01	4.15E+01	2.18E+01	4/4	1.20E+00	1.80E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	1.94E+01	5.69E+01	3.82E+01	2/2	1.60E+00	3.30E+00	2/2	2.50E+00	0/2	3.62E+04	0/2	3.62E+02
Uranium	3.20E+00	3.20E+00	3.20E+00	1/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Uranium-234	1.66E+00	4.49E+00	3.08E+00	2/2	2.80E-01	6.40E-01	1/2	2.50E+00	0/2	1.98E+03	0/2	1.98E+01
Uranium-238	2.11E+00	7.39E+00	4.75E+00	2/2	3.10E-01	8.20E-01	2/2	1.20E+00	0/2	1.71E+02	2/2	1.71E+00
Semivolatiles (mg/kg)												
Benzo(b)fluoranthene	6.80E-01	6.80E-01	6.80E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	2.08E+02	1/3	2.12E-01
Bis(2-ethylhexyl)phthalate	3.10E-01	3.10E-01	3.10E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	7.40E+03	0/3	8.84E+00
Fluoranthene	1.30E-01	1.30E-01	1.30E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	6.50E+04	0/3	2.21E+02
Pyrene	1.30E-01	1.30E-01	1.30E-01	1/3	4.10E-01	4.40E-01	n/a	n/a	0/3	4.87E+04	0/3	1.65E+02

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

Table 5.70. Summary of Surface and Subsurface Historical Data at SWMU 219

Analysis	Detected Results			Frequency	Detection Limit		Exceeds	Bkgd	Exceeds	Action	Exceeds	No Action
	Minimum	Maximum	Average	of Detection	Minimum	Maximum	Bkgd	Value	AL[1]	Level[1]	NAL[1]	Level[1]
Subsurface Soils												
Pesticides/PCBs (mg/kg)												
2,2',3,4-Tetrachlorobiphenyl	4.70E-01	4.70E-01	4.70E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
PCB-1242	2.00E+00	7.30E+00	4.10E+00	3/8	9.80E-02	1.00E-01	n/a	n/a	0/8	4.25E+01	3/8	1.99E-01
PCB-1254	4.20E+00	1.90E+01	9.67E+00	3/8	2.00E-01	2.10E-01	n/a	n/a	1/8	1.82E+01	3/8	1.99E-01
Radionuclides (pCi/g)												
Alpha activity	3.10E+00	1.21E+01	6.42E+00	5/5	1.40E+00	2.30E+00	n/a	n/a	n/a	n/a	n/a	n/a
Beta activity	8.80E+00	2.62E+01	1.43E+01	5/5	1.00E+00	1.50E+00	n/a	n/a	n/a	n/a	n/a	n/a
Technetium-99	2.00E+00	2.30E+01	1.34E+01	5/5	5.00E-01	2.20E+00	4/5	2.80E+00	0/5	3.62E+04	0/5	3.62E+02
Thorium-230	7.00E-02	4.90E-01	2.80E-01	2/5	3.00E-02	1.00E-01	0/5	1.40E+00	0/5	1.49E+03	0/5	1.49E+01
Uranium-234	4.10E-01	1.88E+00	1.13E+00	4/5	5.00E-02	2.60E-01	0/5	2.40E+00	0/5	1.98E+03	0/5	1.98E+01
Uranium-238	2.90E-01	3.40E+00	1.88E+00	4/5	5.00E-02	3.50E-01	3/5	1.20E+00	0/5	1.71E+02	2/5	1.71E+00
Semivolatiles (mg/kg)												
2,7,10-Trimethyldodecane	3.40E-01	3.40E-01	3.40E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
3,5-Dimethyl-Octane	4.10E-01	5.80E-01	4.95E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Bis(2-ethylhexyl)phthalate	2.20E-01	8.80E-01	5.07E-01	3/8	4.00E-01	4.30E-01	n/a	n/a	0/8	7.40E+03	0/8	8.84E+00
trans-Decahydronaphthalene	3.90E-01	5.70E-01	4.80E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Volatiles (mg/kg)												
1,2,4-Trimethylbenzene	4.70E-01	1.10E+00	7.95E-01	4/4	n/a	n/a	n/a	n/a	0/4	1.00E+05	0/4	3.67E+02
1,2-Diethylbenzene	3.60E-01	3.60E-01	3.60E-01	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Methyl-2-propylcyclohexane	2.10E-01	7.40E-01	4.75E-01	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
1-Methyl-4-(1-methylethyl)benzene	3.80E-01	8.50E-01	5.83E-01	4/4	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
4-Methyldecane	7.20E-01	1.40E+00	1.06E+00	2/2	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Acetone	5.00E-02	1.50E-01	9.24E-02	5/8	1.20E-02	1.30E-02	n/a	n/a	0/8	1.91E+04	0/8	3.58E+02
Benzene	1.60E-02	1.60E-02	1.60E-02	1/8	6.00E-03	6.00E-03	n/a	n/a	0/8	7.45E+01	0/8	1.13E+00
Cumene	3.50E-01	3.50E-01	3.50E-01	1/1	n/a	n/a	n/a	n/a	0/1	1.90E+04	0/1	3.52E+02
Ethylbenzene	4.20E-02	2.10E-01	1.26E-01	2/8	6.00E-03	6.00E-03	n/a	n/a	0/8	2.12E+03	0/8	2.12E+01
Methylmethylethylbenzene	1.00E+00	1.00E+00	1.00E+00	1/1	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a
Total Xylene	1.40E-02	1.40E-02	1.40E-02	1/8	6.00E-03	6.00E-03	n/a	n/a	0/8	2.20E+04	0/8	7.24E+02

[1] Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

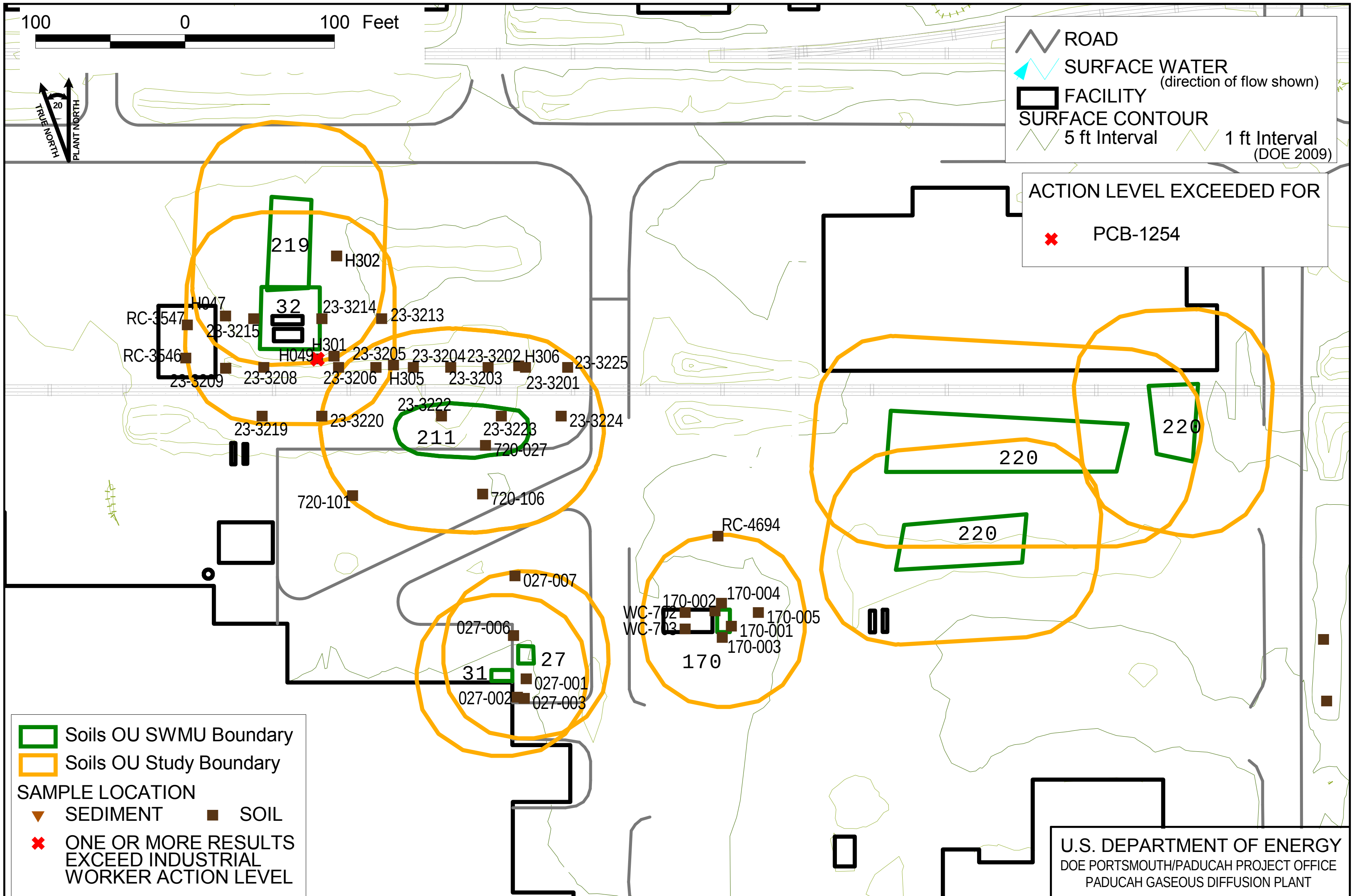


Figure 5.86. Soils Operable Unit: SWMUs 27, 31, 32, 170, 211, 219, and 220

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

SWMU 488 (PCB Contamination Area by the C-410 Trailer Complex)

Area description

The PCB Contamination Area by the C-410 Trailer Complex (SWMU 488) is a PCB soil contamination area located in a grassy drainage swale in the central portion of the plant site. SWMU 488 is approximately 25 ft^2.

Process history

It is unknown how this area experienced a PCB spill.

Previous investigation results

The contamination area was discovered as a result of a surface soil sampling and characterization event for the placement of the support trailers for the DMSA characterization/disposition activities in the field north of the C-710 Laboratory. In May 2001, radiological surveys of this area and materials were performed. Results of this survey indicate no radiological contamination is present. Soil samples were obtained as part of site characterization. The only contaminant above background detected in the soil was PCBs.

Table 5.71 is a summary of historical data followed by a map of historical sample locations within a 50-ft boundary (Figure 5.87).

Area utilities

No recirculating water lines or sewers are associated with this contamination area. A storm sewer is coincidentally located within the boundary of the SWMU. Depth to this sewer is approximately 4 ft bgs.

Data gap determination

Historical data do not fully delineate the nature and extent of contamination; therefore, additional samples are needed at this location.

Table 5.71. Summary of Surface and Subsurface Historical Data at SWMU 488

Analysis	Detected Results Minimum	Detected Results Maximum	Detected Results Average	Frequency of Detection	Detection Limit Minimum	Detection Limit Maximum	Exceeds Bkgd	Bkgd Value	Exceeds AL[1]	Action Level[1]	Exceeds NAL[1]	No Action Level[1]
Surface Soils												
Pesticides/PCBs (mg/kg)												
PCB, Total	1.03E+01	1.03E+01	1.03E+01	1/2	1.00E-01	3.00E-01	n/a	n/a	0/2	4.25E+01	1/2	1.99E-01
PCB-1254	5.40E+00	5.40E+00	5.40E+00	1/2	1.00E-01	3.00E-01	n/a	n/a	0/2	1.82E+01	1/2	1.99E-01
PCB-1260	4.90E+00	4.90E+00	4.90E+00	1/2	1.00E-01	3.00E-01	n/a	n/a	0/2	4.25E+01	1/2	1.99E-01

[1]Action level (AL) and no action level (NAL) are the Industrial Worker scenarios from the Risk Methods Document (DOE 2001d).
n/a = value not available
Only analyses with at least one detection are shown.

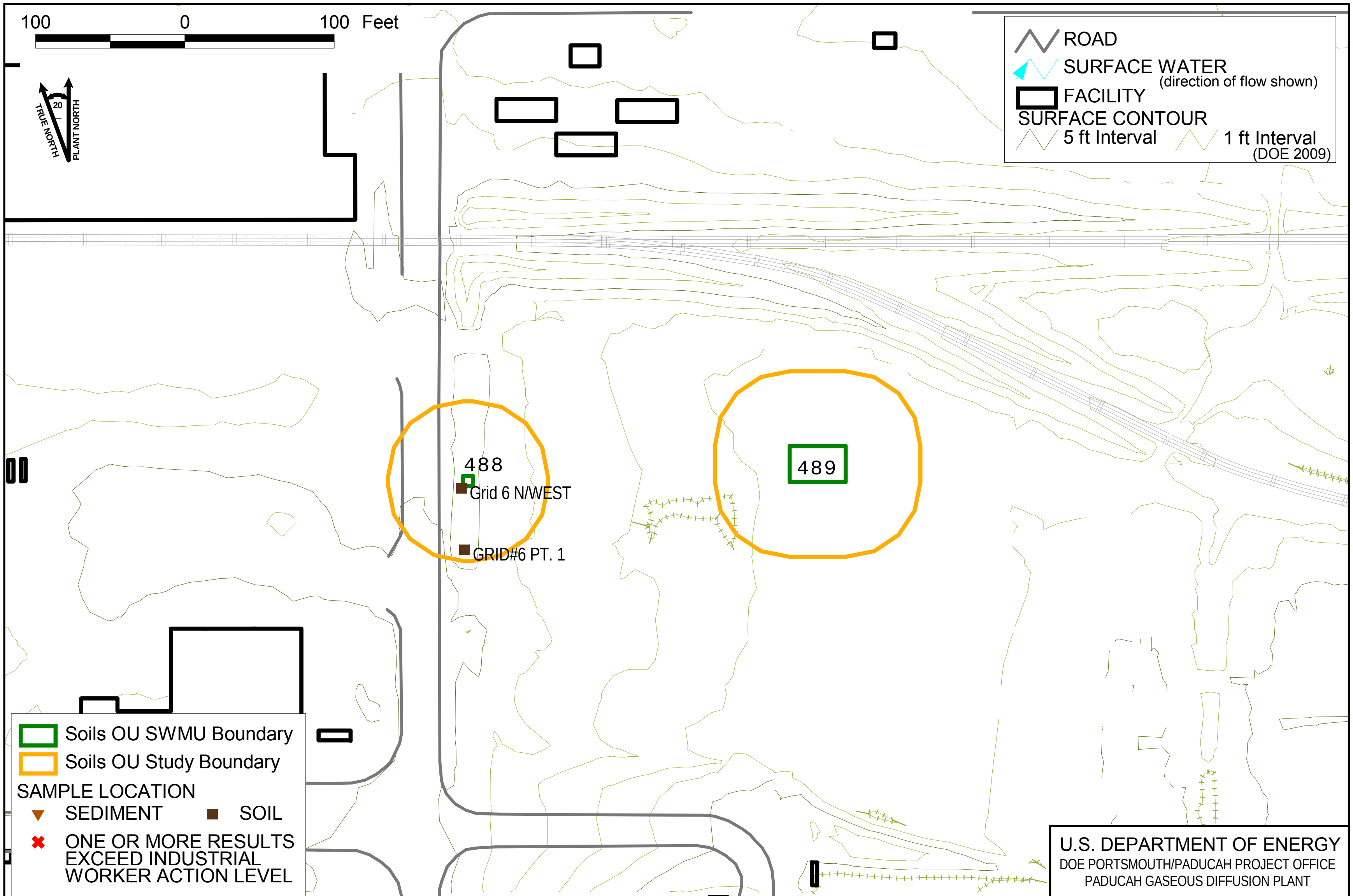


Figure 5.87. Soils Operable Unit: SWMUs 488 and 489

Figure No. \SoilsOU\SOU_SWMUsR5.apr
DATE 03-05-10

6. INITIAL EVALUATION

6.1 RISK ASSESSMENT

Using the presentations and interpretations of the results, the decision rules developed during the DQO process will be addressed, and the various statistical assumptions forming the basis of the sampling plan will be verified. Appendix B presents the general report outlines for the RI and FS.

To support the risk evaluation, and consistent with the PGDP Risk Methods Document (DOE 2001d) or the most recent, approved version, probabilistic fate and transport modeling may be employed. The use of this modeling helps account for uncertainties in the size of the source zones and transport parameters and allows an evaluation of error bounds. These modeling tools may include the Statistical Analysis and Decision Assistance (SADA); SESOIL; and Analytical Transient 1-,2-,3- Dimensional (AT123D). SADA is used to refine source zones. SESOIL is a leaching model used to estimate the time-variant contaminants loading from each source area to the RGA. AT123D is used to complete saturated flow and contaminants transport modeling.

6.1.1 Data Evaluation

When fieldwork is completed and data have been verified, validated, assessed, and evaluated (as described in Section 12), data will be screened as described in the PGDP Risk Methods Document (DOE 2001d) or most recent, approved version to determine COPCs for each unit. These COPCs will be documented in a RI report followed by a FS report. The primary purpose of the RI and FS reports will be to present the results from the field investigation and evaluate alternatives to the extent necessary to select a remedy.

Documentation for the SOU RI/FS also will include a BRA. The BRA will include, at a minimum, a complete BHHRA that is consistent with methods presented in Chapter 3 of Volume 1 of the PGDP Risk Methods Document (DOE 2001d) and a SERA consistent with methods presented in Volume 2 of the PGDP Risk Methods Document (DOE 2001d) or most recent, approved versions. The BRA will use all historical data representative of current site conditions, as well as the data collected during the field investigation described in this work plan. The objectives of the BRA will include the following:

- Evaluate the potential threat to human health in the absence of any action.
- Provide at least a preliminary evaluation of harm to ecological resources in the absence of any action.
- Provide a basis for determining if a response action is necessary or justified.
- Provide the information needed to determine what concentrations of chemicals and radionuclides are considered protective of human health and the environment.
- Provide a baseline for comparing the level of protection from various response alternatives relative to potential human health and ecological effects.

To meet these objectives, the risk assessment will identify and characterize the following items:

- Levels of hazardous substances present in relevant media, including a review of relevant biological and chemical information, and the potential changes in concentration and activities of hazardous substances in relevant media over time.

- Potential exposure pathways and routes and the extent of actual or predicted exposure.

- Potential human receptors by defining the size, characteristics, and location of human populations that may be exposed to contaminants at or migrating from the study areas.

- Extent of potential impact by quantifying potential carcinogenic risk and noncarcinogenic risk.

- Potential ecological harm within the study area from exposure to contaminants at or migrating from the study areas.

- Levels of uncertainty associated with the assessment, including a summary of the strengths and weaknesses of site characterization, toxicity assessment, exposure assessment, and health risk characterization. The summary will include a discussion of the effect of the major assumptions made during risk characterization upon the resulting risk values. Uncertainty analysis may include sensitivity or other quantitative analyses if these are deemed necessary for forthcoming response action decisions.

The BRA will include completion of fate and transport modeling consistent with the PGDP Risk Methods Document (DOE 2001d) or most recent, approved version modeling matrix and generation of information that can be incorporated in the PGDP sitewide risk assessment model (DOE 2003b).

Data Quality Analysis. The field sampling strategy for this RI includes elements of stratified sampling, systematic (or grid) sampling, adaptive cluster sampling, composite sampling, and random sampling (EPA 2002). Analysis of these samples will be a combination of field laboratory data and fixed-base laboratory data. The RI will include a data quality analysis to 1) examine differences and comparability of fixed-base laboratory data and field laboratory data generated by this RI and 2) evaluate the use of historical data for the SWMU/AOC. Some of the decision rules that will be used in the data quality analysis when determining the usability of historical data are the following:

- Historical data that has been qualified as rejected by data validation or by data assessment will not be included in the historical dataset.

- Historical data that contain units inconsistent with the sampled media or with the analysis will not be included in the historical dataset (e.g., a soil sample with analytical units reported in mg/L or a radiological result with units reported in mg/kg).

- Historical data for radionuclide results with no minimum detectable concentration recorded will not be included in the historical dataset.

- Historical data for nonradionuclide results with no reported result and no detection limit recorded will not be included in the historical dataset.

- Historical data for radionuclide results with a null or zero recorded as a counting error will not be included in the historical dataset.

- Data assessment qualifiers previously placed on the data will be noted and applied as appropriate.

- A result will be considered a nondetect if it is qualified by the reporting laboratory with the following:

  — a “U” qualifier or a “<” qualifier or
  — an “A” qualifier if the result is a radiological result analyzed by a laboratory with codes “PGDP” or “PARGN”.

- A result will be considered a nondetect if it has a “U” validation code or a “U” data assessment code.

- A radiological result may be considered a nondetect if the reported total propagated uncertainty is greater than the reported result.

Any exceptions to these rules will be documented in the data quality analysis as part of the RI.

Early Action. For certain SWMUs, early action may be appropriate per the SMP. Appendix E shows the process by which these SWMUs will be moved into early action.

Grid Sampling/Data Use. Grid sampling for the RI is set up primarily on 45-ft centers with compositing of five grab samples within each grid for two horizons: surface and subsurface (see Section 9 for additional information). This sampling will yield approximately 10 samples per horizon per half acre, on average. (One-half acre is significant because it is typically used as the size of an exposure unit for risk assessment purposes.) All of these samples will obtain field analytical data for metals and PCBs. Additionally, fixed-base analytical data will be obtained for each horizon for each unit for metals and PCBs, as well as radionuclides and SVOCs. Samples from which fixed-base analytical data will be obtained will be randomly selected among the samples on each horizon (i.e., the surface grid sample and the subsurface grid sample submitted for fixed-base laboratory analysis may not be from the same grid location). Acceptable historical data, as determined by the data quality analysis, will be assigned to an appropriate grid before beginning the data analysis described below. Exposure units also will be assigned to a collection of grids to facilitate determination of nature and extent of potential contamination.

For each grid, a detect or nondetect flag will be assigned for each analyte using field laboratory data, fixed-base laboratory data and/or historical data. A nondetect flag is set only if both field laboratory results and fixed-base results are nondetect or not available. Flags will be assigned according to the following rules:

(1) If field laboratory result is a nondetect and a fixed-base laboratory sample was not collected and an acceptable historical result is not available for the grid, then the grid is assigned a nondetect flag.

(2) If the field laboratory result is a nondetect and a fixed-base laboratory sample was collected or an acceptable historical result is available, then the fixed-base laboratory or historical result is used in assigning flag.

    (a) If the fixed-base laboratory result is a nondetect, then the grid is assigned a nondetect flag.

    (b) If the fixed-base laboratory result is a detect, then the grid is assigned a detect flag.

(3) If the field laboratory result is a detect and a fixed-base laboratory sample was not collected and no acceptable historical result is available for the grid, then the grid is assigned a detect flag.

(4) If the field laboratory result is a detect and a fixed-base laboratory sample was collected or an acceptable historical result is available, then

(a) If the fixed-base laboratory result is a nondetect, then the grid is assigned a detect flag.

(b) If the fixed-base laboratory result is a detect, then the grid is assigned a detect flag.

For each grid, a concentration for each analyte will be assigned.

(1) If the analyte has a nondetect flag for the grid, then the concentration will be set as the lower of field laboratory and lab detection limit.

(2) If the analyte has a detect flag, then the concentration will be set as the maximum detected value across field laboratory and fixed-base laboratory results.

Background values are compared on an exposure unit basis by examining the results across all the grids within the exposure unit. Nondetect results will not be considered present above background even if the detection limit for the chemical is greater than the background value. If an analyte is detected in one or more grids within the exposure unit, then the maximum detected value across all grids within the exposure unit is used for background comparison. (If the maximum detected value is greater than background, then the analyte is present above background. If the maximum detected value is less than background, then the analyte is not present above background.)

Chemicals of potential concern will be selected for each exposure unit for those analytes that are detected above background and whose maximum detected value is greater than the no action level [as defined in the Risk Methods Document (DOE 2001d) for the industrial worker scenario inside secure area and teen recreator scenario outside secure area]. For those analytes that are never detected within an exposure unit, even if the detection limit is greater than the no action level, the analyte will not be considered a COPC. (Some exceptions to this may be utilized in the BRA as deemed appropriate. For example, a unit from a PCB area may retain PCB as a COPC even if it is not detected during sampling. These are considered site-related contaminants.) QAPP Worksheets 15-1 through 15-4 compare the child resident scenario no action levels with the fixed-base laboratory detection limts and minimum detectable concentrations (MDCs). Fixed-base laboratory detection limits that are higher than no action levels will be addressed as an uncertainty in the BRA.

Exposure point calculations will be performed for each unit for those analytes that are retained as COPCs (see exception for site-related contaminants, also). For each COPC, data will be summarized within each sampling location before calculating the exposure point concentration (EPC) for the unit. This is necessary to ensure that each location is equally represented in the unit EPC calculation. The scenarios shown in Figure 6.1 illustrate each possible case that may result from implementation of the field sampling strategy for this RI and its response.

Further, in Case 1 shown in Figure 6.1, the COPC consists of all detected results, so the EPC is calculated using all results.

In Case 2, the COPC consists of nondetected results less than the maximum detected result across all grids; therefore, the EPC for the exposure unit is calculated using all results.

	RESULTS	TO REPRESENT GRID ANALYTE CONCENTRATION
Case 1: *Field laboratory results,* *Fixed-base laboratory results,* *No historical results*	Field laboratory: detect Fixed-base laboratory: nondetect	Use the field laboratory result
	Field laboratory: nondetect Fixed-base laboratory: detect	Use the fixed-base laboratory result
	Field laboratory: detect Fixed-base laboratory: detect	Use the maximum detected result
	Field laboratory: nondetect Fixed-base laboratory: nondetect	Use the smaller detection limit
Case 2: *Field laboratory results,* *No fixed-base laboratory results,* *No historical results*	Field laboratory: detect	Use the field laboratory result
	Field laboratory: nondetect	Use the field laboratory detection limit
Case 3: *Field laboratory results,* *No fixed-base laboratory results,* *Historical results*	Field laboratory: detect Historical: nondetect	Use the field laboratory result
	Field laboratory: nondetect Historical: detect	Use the historical result
	Field laboratory: detect Historical: detect	Use the maximum detected result
	Field laboratory: nondetect Historical: nondetect	Use the smaller detection limit
Case 4: *Field laboratory results,* *Fixed-base laboratory results,* *Historical results*	Field laboratory: detect Fixed-base laboratory: nondetect Historical: nondetect	Use the field laboratory result
	Field laboratory: nondetect Fixed-base laboratory: detect Historical: nondetect	Use the fixed-base laboratory result
	Field laboratory: nondetect Fixed-base laboratory: nondetect Historical: detect	Use the historical result and consider any uncertainties regarding historical data during project nature & extent scoping
	Field laboratory: detect Fixed-base laboratory: detect Historical: nondetect	Use the maximum detected result
	Field laboratory: detect Fixed-base laboratory: nondetect Historical: detect	Use the maximum detected result
	Field laboratory: nondetect Fixed-base laboratory: detect Historical: detect	Use the maximum detected result
	Field laboratory: detect Fixed-base laboratory: detect Historical: detect	Use the maximum detected result
	Field laboratory: nondetect Fixed-base laboratory: nondetect Historical: nondetect	Use the smallest detection limit

Figure 6.1. Exposure Point Concentration Calculation Scenarios

In Case 3, data for the COPC consist of some nondect results greater than the maximum detected result across all grids and some nondetect results less than maximum detected result. In this case, nondetect results greater than maximum detected result are discarded. The EPC is calculated using the remaining nondetect and detect results. It should be noted, discarding nondetect results that are greater than the maximum detected result in this manner is consistent with EPA Risk Assessment Guidance (RAGS) (EPA 1989).

In Case 4, data for the COPC consists of nondetect results greater than maximum detected result. In this case, all nondetect results are discarded and the EPC calculated using detected results only, consistent with RAGS (EPA 1989).

After the dataset is built for each analyte within the exposure unit, the rules for EPC calculation in the Risk Methods Document would be followed. These rules are as follows:

(1) If results from fewer than ten samples are available, then the EPC will be the maximum detected concentration.

(2) If results from ten or more samples are available, then a distribution check will be performed, and the EPC will be the lesser of the maximum detected concentration and the 95% upper confidence limit (UCL) on the mean of the appropriate distribution. EPA's ProUCL 4.0 software incorporates a number of different distributional tests that may be used to perform the distributional tests and calculate the most appropriate UCL (EPA 2007).

Also, after the EPCs for all analytes are calculated and the magnitude of the EPCs and their variability is understood in relation to risk-based concentrations, "like" exposure units will be grouped to lessen the number of risk characterizations to necessary to present.

Analytical results from biased radiological sampling and pipeline sampling (described in Section 9) will be considered separately from the grid sampling previously described.

6.1.2 Exposure Assessment

This section of the BRA will delineate the pathways through which the receptors may be exposed under both current and future conditions. The exposure assessment will be conducted in accordance with *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* Volume *1, Human Health, Volume 2, Ecological* (DOE 2001d) or most recent, approved version. This section will present conceptual site models and supporting text. Also, each pathway will be described in terms of source, route of exposure, exposure point, and receptor. This format will be followed, because all four must be present for a complete pathway to exist.

Exposure assessments in BHHRAs completed in the past indicate that at least 24 exposure pathways should be considered as potential pathways in all assessments (DOE 2001d). Further, exposure assessments will be performed on a range of worker exposure times if the selected exposure time deviates significantly from the assumptions in the PGDP Risk Methods Document.

6.1.3 Toxicity Assessment

The primary purpose of this section of the BHHRA will be to report the toxic effects of the COPCs on exposed populations. The toxicity assessment will be conducted in accordance with PGDP Risk Methods Document (DOE 2001d) or most recent, approved version. In addition, this section will briefly describe the methods used by EPA, and in the toxicity assessment, to develop toxicity parameters, delineate the sources used to acquire the toxicity parameters, and present tables summarizing the toxicity information used in the risk assessment.

6.1.4 Risk Characterization

The primary purpose of this section of the BHHRA will be to integrate the information developed in the exposure assessment with the effects information presented in the toxicity assessment to characterize the risks and hazards posed by environmental contamination at PGDP. The risk characterization will be conducted in accordance with Risk Methods Document (DOE 2001d) or most recent, approved version. In this section, the following items will be presented: the methods used to integrate the information to characterize risks and hazards and the tables and a narrative summarizing the risk characterization for each exposure unit under each current and potential future use scenario. This section will conclude with a listing of use scenarios of concern for each location and a listing of COCs, pathways of concern, and mediums of concern for each use scenario of concern.

6.1.5 Preliminary Remediation Goals

Chemical-specific PRGs are concentration goals for individual chemicals in specific medium and land use combinations, which are used by risk managers as long-term targets during the analysis and selection of remedial alternatives. Chemical-specific PRGs are from two general sources. These are (1) concentrations based on ARARs and (2) concentrations based on risk assessment. The chemical-specific PRGs discussed in this document are concentrations based on human health risk assessment; however, concentrations based on ARARs and ecological risk assessment are discussed and presented elsewhere within the Risk Assessment Information System.[1]

Chemical-specific PRGs also can be used as screening tools. Screening against chemical-specific PRGs and other limiting criteria is discussed in the RI Report as a preliminary step in the RI/FS process. Comparisons can be used to focus concern on a specific medium or COPC and support “no further action” recommendations. PRGs for this project will be the lesser of the no action cancer- and no action hazard-based PRGs for the appropriate future use taken from Appendix A of the most recent, approved version of the PGDP Risk Methods Document (DOE 2001b). Prior to screening, the BRA will determine the most up-to-date sources of criteria.

6.1.6 Evaluation of Uncertainties

Uncertainties are associated with each of the steps of the BRA. Following a general discussion of uncertainties in risk assessment, this section presents the uncertainties that will be addressed in BHHRAs prepared for PGDP and provides a format for summarizing this information (when a qualitative uncertainty analysis or sensitivity analysis is performed). The uncertainty evaluation will be conducted in accordance with the most recent, approved version of the PGDP Risk Methods Document (DOE 2001d).

The potential effect of the uncertainties on the final risk characterization must be considered when interpreting the results of the risk characterization, because the uncertainties directly affect the final risk estimates. The types of uncertainties that must be considered can be divided into four broad categories. These are uncertainties associated with data and data evaluation (i.e., identification of COPCs), exposure assessment, toxicity assessment, and risk characterization. Specific uncertainties under each of these

[1] The risk assessment information system is a website sponsored by the DOE Office of Environmental Management, Oak Ridge Operations Office, through a contract with Bechtel Jacobs Company LLC. The site provides risk assessment tools (guidance, toxicity values, PRGs, etc.) and is evaluated monthly to ensure that information is current. See http://rais.ornl.gov/ for additional information.

broad categories that will be addressed in the BHHRAs completed for PGDP are listed in the following material.

At minimum, all BRAs will contain a qualitative uncertainty analysis that will include a quantitative sensitivity analysis of salient uncertainties. In the qualitative uncertainty analysis, the magnitude of the uncertainty on the risk characterization will be categorized as small, moderate, or large. Uncertainties categorized as small will be those that should not cause the risk estimates to vary by more than one order of magnitude; uncertainties categorized as moderate will be those that may cause the risk estimates to vary by between one and two orders of magnitude; and, uncertainties categorized as large will be those that may cause the risk estimates to vary by more than two orders of magnitude.

In the qualitative uncertainty analysis, it will be noted that the uncertainties listed and evaluated are neither independent, nor mutually exclusive; therefore, it will be concluded that the total effect of all uncertainties upon the risk estimates is not the sum of the estimated effects of each uncertainty evaluated.

6.1.7 Ecological Assessment Methods

The SERA will quantitatively evaluate potential ecological risks using the methods presented in Volume 2 of the most recent, approved version of the PGDP Risk Methods Document (DOE 2001b). At minimum, this will include the following items:

- Identification of receptors that may be impacted by contaminants migrating from source areas;
- Discussion of the effects identified contamination may have on receptor populations;
- Summary of the threatened and endangered species known to be present at, or near, PGDP and the potential impacts upon them; and
- Comparison of medium-specific analyte concentrations and activities found at the site with ecological toxicity benchmarks.

The SERA may include additional steps of the BERA process outlined in the most recent, approved version of the PGDP Risk Methods Document, as appropriate. The level of effort for these additional steps will be dependent on the ecological information available from historical environmental monitoring activities at PGDP and on the need for derivation of cleanup criteria to be used for the protection of ecological receptors. No specific sampling has been identified to supplement ecological risk assessment process as part of this work plan.

6.2 EVALUATING EXISTING DATA AND DEVELOPING THE CONCEPTUAL SITE MODEL

Existing data and information for each SWMU/AOC form the basis for determining the amount of additional characterization data necessary to reach an action/NFA determination. In addition to analytical data, process knowledge, personnel interviews, and records/document searches, are all useful in that determination. The site conceptual model for contaminant transport determines the applicability of each type of preliminary information/data, which in turn is used in support of a risk assessment.

All existing information about the SWMU/AOC and relevant surrounding area are collected including, but not limited to, the following:

- Compiling facility records, personnel interview records, and process description information for each SWMU/AOC;

- Defining processes and materials used, where chemicals and materials were used/disposed, and where and how potential contaminants may have been introduced to the SWMU/AOC and subsequently released to the environment;

- Compiling all analytical data for the SWMU/AOC and surrounding area, including radiological surveys, geophysical surveys, sample results, geotechnical information, historical photographs, maps, and drawings; and

- Collecting and evaluating any existing computational assessments (risk assessment) or conceptual evaluations and the results and conclusions of any previous investigations.

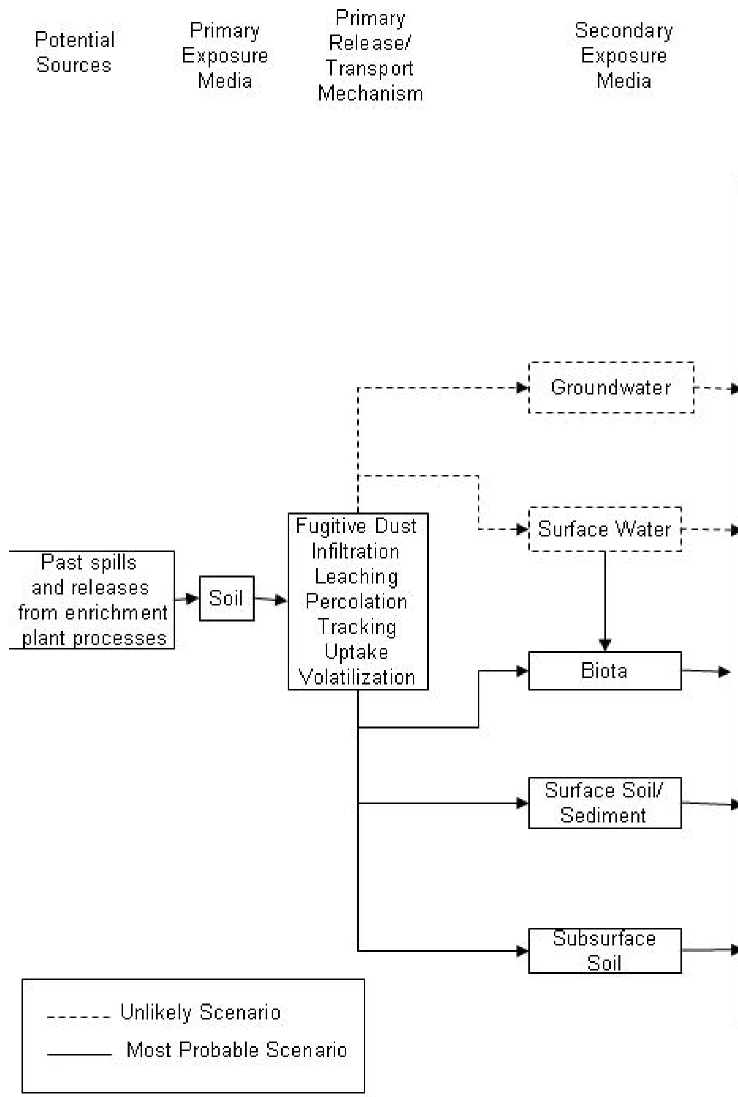
The conceptual site model (CSM) will be the working basis for planning the SWMU/AOC sampling requirements. The CSM presented in Figure 6.2 identifies the probable and potential contaminant migration and exposure pathways at SOU SWMUs/AOCs outside the secure area. Figure 6.3 identifies the probable and potential contaminant migration and exposure pathways at SOU SWMUs/AOCs inside the secure area. From the source, two probable exposure media are identified with solid lines: (1) subsurface soil, and (2) surface soil. These probable exposure media will be the focus of the investigation activities.

The CSM for this investigation identified the following as the primary sources of contamination: past spills and releases from operations. Although specific information is not available regarding all past spills or releases, the CSM assumes that the SMWU/AOC soils are contaminated. Contaminants found in soil are available for direct contact on-site through ingestion, inhalation, dermal exposure, or external exposure (for gamma-emitting radionuclides). Receptors potentially exposed to soil are workers, recreational users, trespassers, and ecological receptors. Migration of contamination from the Soils OU areas is not expected based on historical information. Contamination of surface soils at PGDP has been found to be confined to the upper 2 ft of soil. Large amounts of clay in the surface soils help to bind the contamination. Previous PCB investigations (WAG 23) of waste staging areas and spill sites at the PGDP have found that contamination is confined in the upper 1 ft of soil. Sites initially had PCBs >= 25 ppm, after removal of top 1ft of soil; confirmatory samples were at levels 2.2 ppm in dilution and less.

All receptors on-site also may be exposed to contaminants through ingestion of biota that has taken up contamination from soil. The SOU will do a SERA in accordance with the Risk Methods Document based on data collected. Exposure of ecological receptors through other media is evaluated in the appropriate OUs. The Surface Water OU will include a sitewide ecological risk assessment.

6.3 SAMPLING STRATEGY

This section describes the approach for using various characterization tools, survey methods, and sampling processes to classify and characterize residual contamination to support an action/NFA decision. Characterization approaches are included in the following discussion.



Potential Receptor and Exposure Routes/Pathways

Current Industrial Worker	Future Industrial Worker	Future Excavation Worker	Future Recreational User	Future Rural Resident	Ecological
	• Ingestion • Dermal • Inhalation	• Ingestion • Dermal • Inhalation		• Ingestion • Dermal • Inhalation	• Ingestion • Dermal • Inhalation • External Exposure
• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure
			• Ingestion	• Ingestion	• Ingestion
• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure	• Ingestion • Dermal • Inhalation • External Exposure
		• Ingestion • Dermal • Inhalation • External Exposure			

Figure 6.2. CSM Outside Secure Area

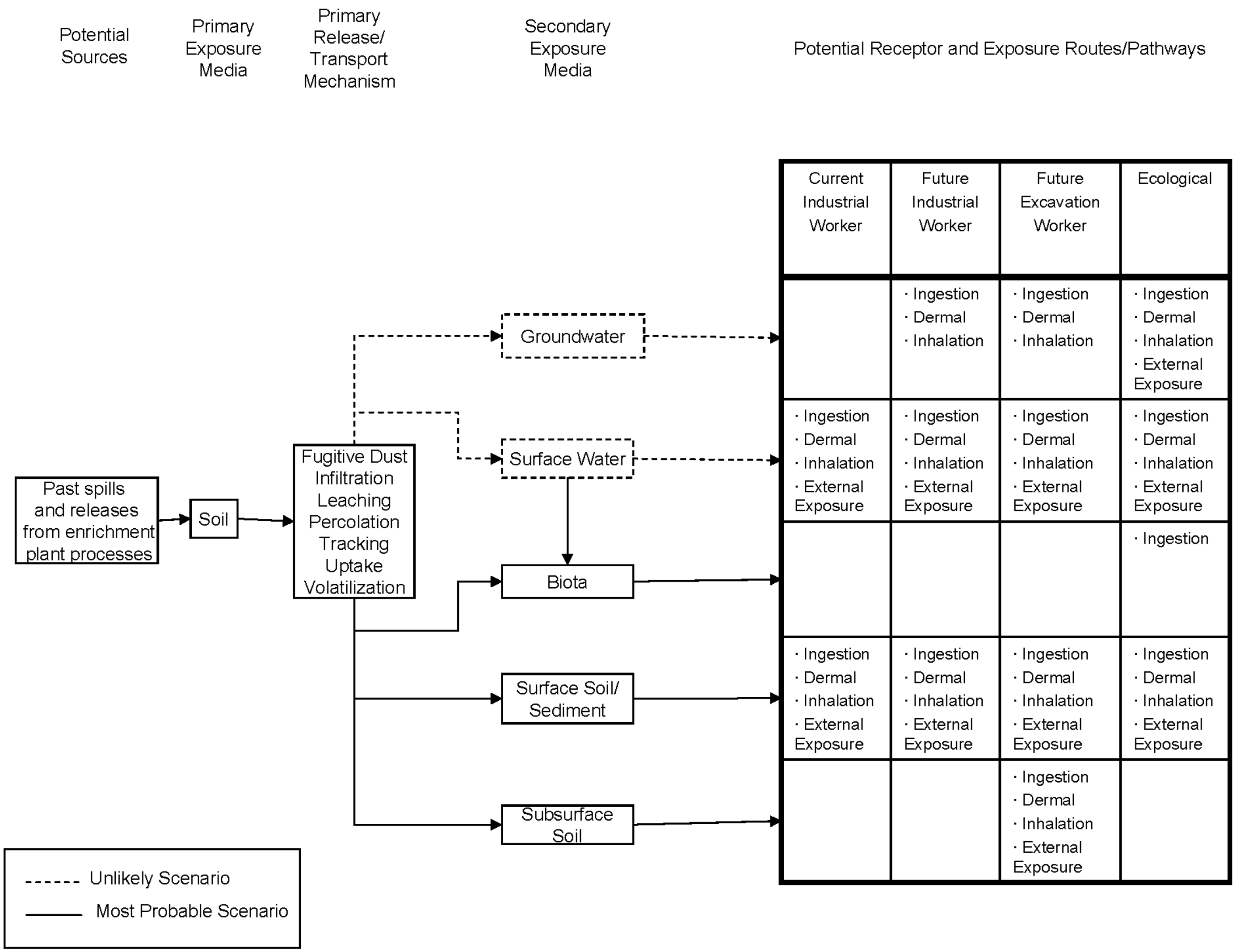


Figure 6.3. CSM Inside Secure Area

6.3.1 Identifying Data Gaps and Defining Program Requirements

Evaluation of the adequacy and representativeness of existing information is determined by the following criteria:

- Will existing data support the SWMU/AOC decision making; and

- Are data sufficient to support a risk assessment. Specifically, there must be analytical data of sufficient and appropriate quality for the full set of COCs and COPCs to determine if there is a threat to the industrial worker.

If data are not adequate and representative, the data gaps are identified and additional sampling is planned to ensure adequate, sufficient, and representative data to support the decision for action/NFA for each SWMU/AOC. QA data considerations made to ensure that data quality requirements are met include sample point density, number of samples, analyses required, locations, depth of samples, and compositing methodology. QC considerations include adherence to field and laboratory procedures/protocols and data validation/management procedures as described in the appropriate chapters.

7. TREATABILITY STUDIES

Treatability studies involve testing technologies to assess their performance on specific wastes or media. This section includes a discussion of the treatability study process. No treatability studies have been identified at this time for the SOU; however, as the RI/FS is implemented and remedial actions are evaluated, additional studies may be identified.

7.1 IDENTIFICATION OF TREATABILITY STUDIES NEEDED

Treatability studies involve testing one or more technologies to gain qualitative or quantitative information to assess their performance on specific wastes or media at the site. Treatability studies are conducted primarily to do the following:

- Provide sufficient data to allow treatment options to be fully developed and evaluated during the detailed analysis and to support the FS and remedial design of a selected action,
- Reduce cost and performance uncertainties for remedial actions to acceptable levels so that a remedy can be selected,
- Support remedy screening,
- Support remedy selection, and
- Support remedy implementation.

Treatability studies are conducted, as appropriate, to collect data on technologies identified during the development process, thus, providing additional information for their evaluation. The RI/FS contractor and DOE's project manager must review the existing site data and available information on technologies to determine if treatability investigations are needed.

The need for treatability testing should be identified as early in the RI/FS process as possible. A decision to conduct treatability testing may be made during project scoping if information indicates that such testing is desirable. The decision to conduct these activities must be made by weighing the cost and time required to complete the investigation against the potential value of the information in resolving uncertainties associated with selection of a remedial action. In some situations, a specific technology that appears to offer a substantial savings in costs or significantly greater performance capabilities may not be identified until the later phases of the RI/FS. Under such circumstances, it may be advantageous to postpone completion of the RI/FS until treatability studies can be completed. In other situations, treatability investigations may be postponed until after the remedial design phase.

The design process for treatability studies is shown, conceptually, in Figure 7.1 and consists of the following four steps:

(1) Determination of data needs;

(2) Review of existing data on the site and available literature on technologies to determine if existing data are sufficient for the evaluation of alternatives;

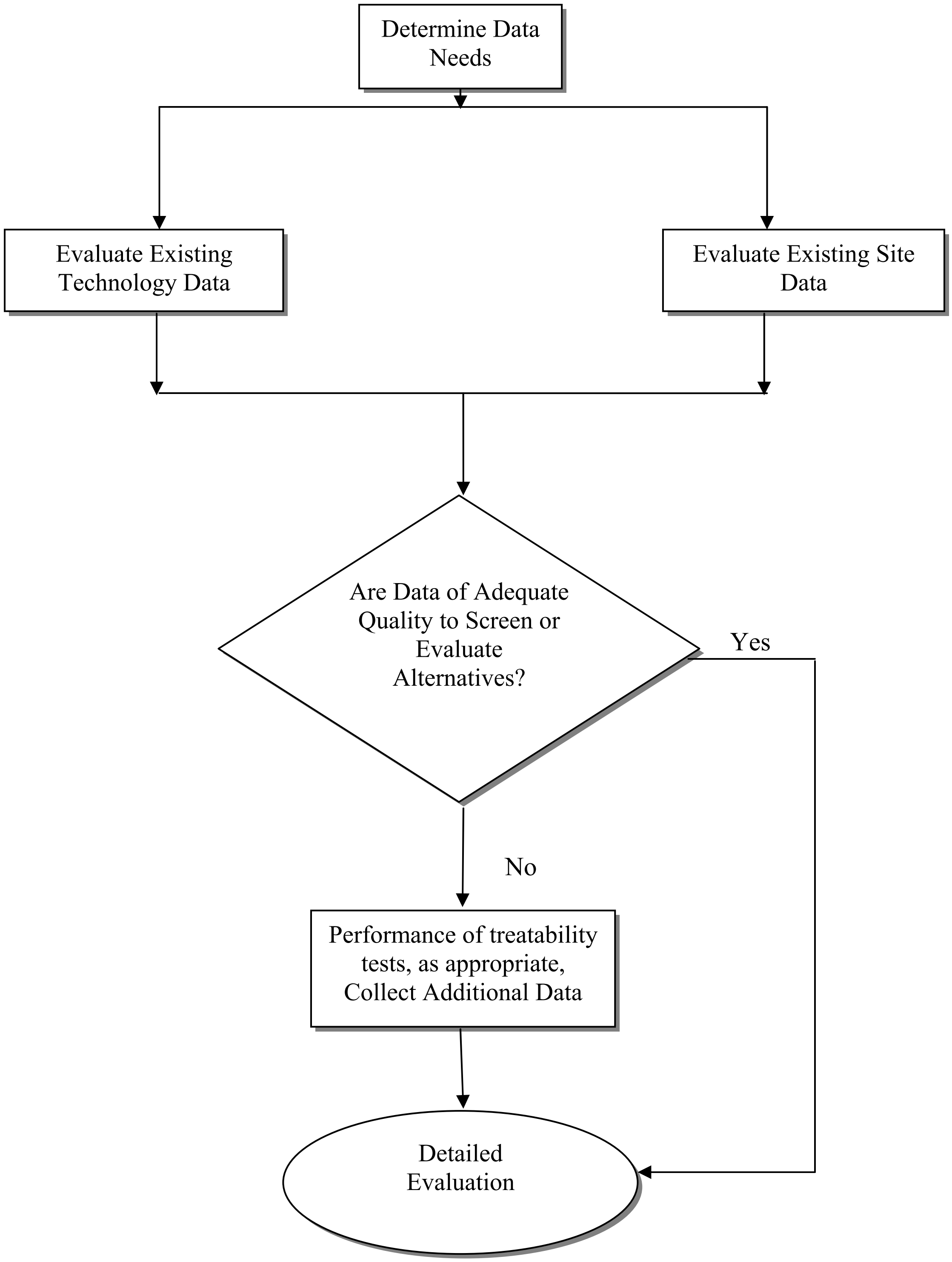


Figure 7.1. Flowchart for Treatability Study

(3) Performance of treatability tests, as appropriate, to determine performance, operating parameters, and relative costs of potential remedial technologies; and

(4) Evaluation of the treatability data to ensure that DQOs are met.

Certain technologies have been demonstrated such that site-specific information collected during the site characterization is adequate to evaluate and determine the cost of these technologies without conducting treatability testing. Situations where treatability testing may not be necessary include the following:

- A developed technology has been well proven in similar applications;

- A technology previously has been used extensively to treat well-documented waste materials (e.g., stripping or carbon adsorption for groundwater containing organic compounds for which treatment previously has proven effective); or

- Relatively low removal efficiencies are required (e.g., 50% to 90%), and data are already available.

Frequently, technologies have not been demonstrated sufficiently or characterization of the waste alone is insufficient to predict treatment performance or to estimate the size and cost of appropriate treatment units. Furthermore, some treatment processes are not understood sufficiently for performance to be predicted, even with a complete characterization of the wastes. For example, often it is difficult to predict biological toxicity in a biological treatment plant without pilot tests. When treatment performance is difficult to predict, an actual testing of the process may be the only means of obtaining the necessary data. In fact, in some situations, it may be more cost-effective to test a process on the actual waste than it would be to characterize the waste in sufficient detail to predict performance.

7.2 DESCRIPTION OF STUDY TO BE PERFORMED

Treatability testing performed during an RI/FS is used to evaluate technologies, including evaluation of performance, determination of process-sizing, and estimation of costs, in sufficient detail to support the remedy-selection process. Treatability testing can be performed using bench-scale or pilot-scale techniques that involve implementing and evaluating the performance of a small-scale system in order to determine the potential benefits in construction and operation of a large-scale system. Treatability testing in the RI/FS is not intended solely to develop detailed design or operating parameters that are more appropriately developed during the remedial design phase.

In general, treatability studies will include the following steps:

(1) Preparation of a work plan (or modification of the existing work plan) for bench or pilot studies;
(2) Performance of field sampling, bench testing, and/or pilot testing;
(3) Evaluation of data from field studies, bench testing, and/or pilot testing; and
(4) Preparation of a report documenting the test results.

7.3 ADDITIONAL SITE DATA NEEDED FOR STUDY OR EVALUATION

Before evaluation for remedy selection in the FS, sufficient data must be available to allow treatment alternatives to be fully developed and evaluated. Additional data are needed to do the following:

- Determine whether the performance of the technologies under consideration has been documented sufficiently on similar wastes, considering the scale (e.g., bench, pilot, or full) and the number of times that the technologies have been used;

- Gather information on relative costs, applicability, removal efficiencies, operation and maintenance requirements, and implementability of the candidate technologies;

- Determine site geology and geochemistry;

- Determine whether characterization of the waste is sufficient to predict treatment performance or to estimate size and cost of the appropriate treatment system; and

- Determine power needs and differences in performance among competing manufacturers.

7.4 SCHEDULE FOR SUBMISSION OF ADDITIONAL TREATABILITY STUDY WORK PLANS

Technologies that may be applicable to the SOU that require treatability studies will be identified as early as possible during the RI/FS process. When possible, treatability studies will be coordinated across the site where unit characteristics appear similar. At any time during the RI/FS process that a treatability study is determined to be necessary, the issue will be discussed with EPA and KDEP.

As the RI/FS process progresses, a determination will be made as to whether the performance of treatability studies is necessary. At this time, there is no need to perform a treatability study based on an evaluation of potential remedial alternatives and sufficient lessons learned and information available from other sites that have implemented remedial actions for soils. If the performance of treatability studies is required, a treatability study work plan will be submitted. Treatability studies generally require 6 to 24 months to complete. If the performance of treatability studies is deemed necessary, DOE will notify EPA and KDEP of the study schedule.

8. ALTERNATIVES DEVELOPMENT

This section explains the process that will be used to develop and evaluate alternatives during the SOU FS. Topics addressed in this section of the work plan include the following:

- A description of the general approach to investigating and evaluating potential remedies;
- The overall objective of the study, a discussion of preliminary identification, general response actions, and remedial technologies;
- A remedial alternatives development and screening; and
- A detailed analysis of remedial alternatives.

A discussion of the format for the FS and the schedule, or timing for conducting the study also is provided.

8.1 DESCRIPTION OF THE GENERAL APPROACH TO INVESTIGATING AND EVALUATING POTENTIAL REMEDIES

Under CERCLA, an FS is completed in conjunction with an RI. The process for conducting a CERCLA FS begins with scoping the RI/FS. Development and screening of alternatives are performed after the site characterization or RI. Treatability studies may be performed, if necessary, to evaluate adequately the alternative's effect on particular site-specific waste streams. Then, before the selection of a remedy, the alternatives undergo a detailed evaluation using the nine evaluation criteria outlined in 40 *CFR* § 300.430(e) (9) (iii).

The draft generic baseline schedule, Figure 2.2, includes an activity titled, "Prepare Draft FS Report." Five steps are identified under this report preparation activity: (1) alternatives development, (2) preliminary technology screening, (3) detailed evaluation of alternatives, (4) document consolidation, and (5) issuance of a FS report to regulators. The first three steps are intended to parallel the CERCLA FS process, and the last two lead to preparation of an FS report.

8.2 OVERALL OBJECTIVES OF THE FEASIBILITY STUDY

The primary objective of the FS is to ensure that appropriate remedial alternatives are developed and evaluated so that relevant information concerning the remedial action options can be presented to a decision maker and an appropriate remedy can be selected [40 *CFR* § 300.430(e)(1)]. This information must be adequate to ensure that an appropriate remedy can be selected and provide protection of human health and the environment by recycling waste or by eliminating, reducing, or controlling risks.

8.3 PRELIMINARY IDENTIFICATION OF GENERAL RESPONSE ACTIONS AND REMEDIAL TECHNOLOGIES

This section will summarize the identification of potential remedial technologies for the SOU. Additional technologies will be identified and screened, as necessary, during review of the RI report. In accordance with the requirements of the National Contingency Plan, DOE will consider the following remedial alternatives:

- No action
- Institutional controls
- Containment
- Treatment
- Excavation

For each general response action, technology types will be identified (Table 8.1). Potentially applicable technologies will be identified by referring to the alternatives evaluation section of the draft *Summary of Alternatives for Remediation of Off-site Contamination at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* (DOE 1991). Additionally, databases, such as the Electronic Encyclopedia of Remedial Action Options and the Vendor Information System for Innovative Treatment Technologies, will be queried to develop additional technologies. Alternatives for remediation will be developed by assembling combinations of technologies and the media to which they would be applied into alternatives that address contamination identified for the SOU. This process will consist of development of alternatives, screening of alternatives, and detailed analysis of alternatives. Tools, such as the Remedial Action Assessment System, may be used.

Table 8.1. Potential Remedial Actions for Primary Sources

Soil	
Institutional Controls	• Land use restrictions • Easements • Deed notice
Containment	• Low-permeability capping • Erosion control • Surface water control
Excavation	• Excavation/storage • Excavation/disposal
Treatment	• *In situ* physical/chemical treatment • *Ex situ* physical/chemical treatment (assumes excavation/pumping)

8.4 REMEDIAL ALTERNATIVES DEVELOPMENT AND SCREENING

The primary objective of the alternatives development and screening phase is to generate a list of potential remedial alternatives. The alternatives developed are to protect human health and the environment, to identify potentially suitable technologies (including innovative technologies), and to assemble the technologies into alternative remedial actions. These alternative remedial actions then will undergo a detailed analysis during the next phase of the FS.

Consistent with the EPA Office of Solid Waste and Emergency Response (OSWER) Directive 9355.3-01, *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*; Interim Final, NTIS PB89-184626, EPA 540-G-89-004, OSWER 9355.3-01, October (EPA 1988), the remedial alternatives development and screening phase will consist of six general steps, which follow:

(1) **Development of RAOs.** COCs, exposure pathways, PRGs and remedial goal options (RGOs) will be taken into account to allow for the development of a range of treatment and containment alternatives.

(2) **Development of general response actions.** Response actions will be identified that satisfy the remedial action objectives for the SOU sites (e.g., excavation).

(3) **Identification of volume or area.** The volume or area to which general response actions may be applied will be identified.

(4) **Identification and screening of technologies applicable to each general response action.** Those technologies that cannot be technically implemented at the site will be eliminated. Definitions of the general response also will be modified to specify remedial technology types.

(5) **Identification and evaluation with technology process options.** A representative process for each remaining technology type will be selected to represent the technology type for alternative development and evaluation.

(6) **Assembly of the selected representative technologies.** The technologies will be assembled into alternatives that represent a range of remedial options, including treatment and containment.

In addition, one or more innovative technologies will be developed for detailed evaluation, to the extent required by [40 *CFR* § 300.430(e) (5)]. A no action alternative also will be evaluated [40 *CFR* § 300.430(e) (6)].

The alternatives that are developed will undergo a screening evaluation. As appropriate, and to the extent sufficient information is available, the screening evaluation will consist of an effectiveness assessment, an implementability appraisal, and a cost evaluation [40 *CFR* § 300.430(e) (7)]. The remaining alternatives then will undergo a detailed evaluation [40 *CFR* § 300.430(e) (9)].

8.5 DETAILED ANALYSIS OF REMEDIAL ALTERNATIVES

The detailed analysis of the 1999 EPA document alternatives involves evaluating each of the alternatives remaining after the screening described in *A Guide to Preparing Superfund Proposed Plans, Records of Decision, and Other Remedy Selection Decision Documents*, OSWER 9200.1-23.P, Office of Emergency and Remedial Response, Washington, DC, using the nine evaluation criteria. The alternatives then are compared. The results of the detailed analysis will allow an appropriate remedy to be selected.

CERCLA requires that nine criteria be used to evaluate the expected performance of remedial actions. The criteria are categorized as threshold, balancing, and modifying criteria. The nine criteria are identified in the following discussion.

8.5.1 Threshold Criteria

In accordance with 40 *CFR* § 300.430(f) (1) (I) (A), these threshold criteria must be met. An alternative must allow for the following in order to be selected as the remedy.

(1) **Overall protection of human health and the environment.** This criterion requires that the alternative adequately protect human health and the environment [40 *CFR* § 300.430(e) (9) (iii) (A)].

(2) **Compliance with ARARs (unless a specific ARAR is waived).** Congress specified in CERCLA §121 that remedial actions for cleanup of hazardous substances, pollutants, or contaminants that will remain on-site must comply with requirements, criteria, standards, or limitations under federal or more stringent state environmental laws that are applicable or relevant and appropriate to the hazardous substances or circumstances at a site [40 *CFR* § 300.430(e)(9)(iii)(B)]. The potential ARARs for the SOU are presented in Appendix A.

8.5.2 Balancing Criteria

These criteria are considered in determining which alternative best achieves or comes closest to achieving the threshold criteria [40 *CFR* § 300.430(f)(1)(I)(B)]. The balancing criteria evaluate the alternatives in terms of the following five qualities.

(3) **Long-term effectiveness and permanence.** This criterion focuses on the magnitude and nature of the risks associated with untreated waste/treatment residuals. This criterion includes consideration of the adequacy and reliability of any associated engineering controls, such as monitoring and maintenance requirements [40 *CFR* § 300.430(e)(9)(iii)(C)].

(4) **Reduction of contaminant toxicity, mobility, or volume through treatment.** This criterion evaluates the degree to which the alternative employs treatment to reduce the toxicity, mobility, or volume of contamination [40 *CFR* § 300.430(e)(9)(iii)(D)].

(5) **Short-term effectiveness.** This criterion evaluates the effect of implementing the alternative relative to potential risks to the general public, potential threat to workers, and time required until protection is achieved [40 *CFR* § 300.430(e)(9)(iii)(E)].

(6) **Implementability.** This criterion reviews potential difficulties associated with implementing the alternative. These difficulties may involve technical feasibility, administrative feasibility, and availability of services and materials [40 *CFR* § 300.430(e)(9)(iii)(F)].

(7) **Cost.** This criterion weighs the capital cost, annual operation and maintenance, and the combined net present value [40 *CFR* § 300.430(e)(9)(iii)(G)].

8.5.3 Modifying Criteria

These criteria allow for the influences of the community and the state.

(8) **Community acceptance.** This criterion requires the consideration of any formal comments by the community regarding any action to be performed [40 *CFR* § 300.430(e)(9)(iii)(I)].

(9) **State acceptance.** This criterion requires the consideration of any formal comments by the state regarding any action to be performed [40 *CFR* § 300.430(e)(9)(iii)(H)].

The selections will be based on analysis of technical, human health, and environmental criteria. The remedy selection process must follow the requirements of 40 *CFR* § 300.430(e), including the proposed plan, community involvement, and preparation of a ROD.

8.6 FORMAT FOR THE FEASIBILITY STUDY REPORT

Appendix B contains the draft "Integrated FS/CMS Report" outline, as considered from Appendix D of the FFA. This outline will be the basis for the SOU FS report, the text of which will incorporate NEPA values, consistent with the DOE 1994 Secretarial Policy on NEPA.

8.7 SCHEDULE/TIMING FOR CONDUCTING THE STUDY

Feasibility studies will be conducted after the fieldwork is completed (Figure 2.2).

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9. FIELD SAMPLING PLAN

The primary focus of the SOU RI/FS will be to collect field and analytical data necessary to determine the nature and extent of soil contamination at SOU SWMUs/AOCs. Following field implementation of the SWMU/AOC Evaluation, data will be used to complete a BHHRA and SERA and evaluate appropriate remedial alternatives for each targeted area.

This section describes how each field sampling strategy will be implemented. If field conditions encountered differ from those anticipated, the sampling strategy, if appropriate, will be discussed and revisions to sampling plans will be made as needed.

9.1 SAMPLING MEDIA AND METHODS

This section identifies the different media to be sampled during the investigation and specifies methods for collecting the samples. Two types of sampling and data collection activities will be performed—nonintrusive data collection (surveys) and intrusive media sampling (surface and subsurface soil). Investigation activities will use DOE Prime Contractor-approved procedures that are consistent with EPA procedures and protocols.

9.1.1 Nonintrusive Data Collection—Surveys

Surveys to be conducted include radiological walkover, field test kits, PCB wipe, and visual inspection. Radiological walkovers and PCB wipes are further described herein.

9.1.1.1 Radiological walkover survey

The walkover of each SWMU/AOC (with the exception of SWMUs 19, 40, and 181) will be performed using a Field Instrument for the Detection of Low Energy Radiation (FIDLER) or similar instrument coupled with a GPS device. SWMUs/AOCs with concrete may be scanned with a Geiger Mueller pancake probe. The intent of the radiological walkover of the SWMUs/AOCs is for investigative purposes to indicate areas of high activity.

SWMUs 19, 40 and 181 have been or are planned for excavation in accordance with an approved Action Memorandum.

FIDLER. The FIDLER is a 5-inch diameter by 1/16-inch thick sodium iodide (NaI) scintillation probe. It is good for detecting low energy photons (10-150 keV) because photons above 150 keV are energetic enough to pass right through the scintillation material. Uranium-238 and daughters emit 13, 63, and 93 keV photons that will be easily detected. Large open areas and smooth surfaces can be scanned relatively easily. The end window is prone to damage as it is constructed of 0.001-inch thick beryllium.

Geiger Mueller Pancake Probe. Pancake probes are used to fit into tight spots (e.g., concrete rubble piles). Unlike a scintillation probe, all radiation events have the same pulse height since the probe is operated in the Geiger-Mueller region of the general gas curve (six-region curve). This means that energy discrimination is not possible. Pancake Geiger-Muellers are not very sensitive to gamma rays, usually

1-3 % efficient, but they are sensitive (10-15 %) to beta radiation. A thin plastic shield will have to be installed over the mica window to reduce the contribution from 700 keV or less beta radiation pulses entering the sensitive region of the probe. This will eliminate detection of cesium-137 and other potentially interfering energies with the detection of uranium-238. Higher energy betas from the uranium-238 daughter protactinium-234m will be easily detected.

9.1.1.2 PCB wipe

If an oil stain is found during the visual survey of locations that are concrete/asphalt covered, the stain will be tested for the presence of PCBs utilizing a PCB wipe.

9.1.2 Intrusive Sampling

Various media samples will be collected to characterize areas that have been evaluated as having data gaps. The samples will be collected using DOE Prime Contractor-approved procedures and will be analyzed using field test methods, and selected samples will be submitted to an SMO-approved, fixed-base, analytical laboratory for analysis.

The majority of intrusive sampling for the Soils OU will be comprised of composite samples. For compositing, equal volumes from each of the specified sampling location is obtained. The volume of each sample typically is at least the amount required for a single sample. Samples then are thoroughly homogenized and a subsample is collected for analysis. Prior to homogenization, sample portions for VOC analysis will be collected.

For the purposes of this investigation, field duplicate and split samples are defined as follows:

Field Duplicate—SW-846 defines a field duplicate sample as "independent samples which are collected as close as possible to the same point in space and time. They are two separate samples taken from the same source, stored in separate containers, and analyzed independently. These duplicates are useful in documenting the precision of the sampling process" (EPA 1994).

Split Sample—Aliquots of sample taken from the same container and analyzed independently. These are usually taken after mixing or compositing and are used to document intra- or interlaboratory precision (EPA 1994).

9.1.2.1 Field test kits

Field methods will include RCRA metals and uranium analysis by *ex situ* X-ray fluorescence (XRF) using a Niton analyzer (or equivalent) at the SWMUs/AOCs and PCBs by Hach (or equivalent) immunoassay/colorimetric test kits at the SWMUs/AOCs. All samples will be field scanned for alpha, beta, and gamma activity using hand held instruments as part of preparations for transport and/or shipment. Other field test kits may be utilized for the SWMU/AOC sites after being approved by DOE, EPA, and Kentucky.

To support field XRF analysis, three types of QC samples will be analyzed with each batch of 20 samples. These will include (1) blanks, (2) duplicates, and (3) standard reference materials (SRMs). The XRF blanks will be vendor-provided. Three SRMs will be analyzed daily before use and at four-hour intervals to calibrate and to monitor XRF accuracy. The SRMs represent low [National Institute of Standards and Technology (NIST) 2709], moderate (NIST 2711), and high (NIST 2710) level standards for soil analysis for metals. In the event that readings of standards exceed +/- 20 % of the true value, the detector will be recalibrated, and standards will be reanalyzed according to manufacturer's instructions.

To ensure PCB data can be fully evaluated, the system will be calibrated daily. The PCB measurements are colorimetric in nature and acquire semiquantitative results by employing a field grade photometer. As a result, calibration standards and calibration verification standards and blanks will be prepared weekly and stored in accordance with the procedure. Calibration standards and blanks will be analyzed daily or at the end of a sample group, whichever is more frequent, to monitor instrument drift during analysis. They will be analyzed sequentially: (1) calibration verification and (2) blank, and will follow the 20th natural sample analyzed or at the end of a group of samples, whichever is more frequent.

If other models, vendors, or contractor procedures are employed for field methods, the procedure for those operations will be added to the required reading for this FSP and the associated work package. All field methods shall be completed by a properly trained/qualified technician and those quantifiable (i.e., PCB test kits and XRF) will meet detection limits detailed in Section 11, QAPP Worksheets 15-6 and 15-7.

9.1.2.2 Surface/sediment soil sampling

Surface soil shall be collected at depths between 0- and 1-ft bgs with the use of a stainless-steel sampler, hand auger, spoon, trowel, spade, or scoop.

9.1.2.3 Shallow soil borings

Shallow soil borings will be collected continuously from 1 to 4 ft bgs and will be composited, except if the sample has been selected for fixed laboratory VOC analysis. The VOC sample will be collected prior to the field compositing. For shallow soil borings collected down to 10/16 ft bgs, samples will be collected from the required interval as prescribed in Section 9.3.1.

The entire length of the sample collected from the sampler will be field-screened for radioactivity using portable radiation detection instruments and visually classified. The depth interval and radiation reading in cpm will be recorded in the samplers' logbook for any portion of the sample where radiation is detected above background. If refusal is encountered prior to reaching the 10-ft depth, or 16-ft depth at infrastructure (e.g., pipelines), an alternate location will be selected at a distance not to exceed 5 ft from the original location at which refusal is met. A maximum of two alternate locations will be attempted at each sampling point. If sufficient sample quantity can be collected, samples from locations with shallow refusal may be collected at the discretion of the sampling team leader.

The specific sample equipment selected will be dependent on the drilling technology being used. Any remaining soil after samples are collected will be handled as investigation-derived waste (IDW). Upon the completion of sampling in each borehole, the field crew will abandon the boreholes by filling them with (dry) bentonite pellets (soil moisture will hydrate the pellets) or granular bentonite if the hole has not collapsed (in many cases, a hole diameter of 1 to 1 ½ inches or less may collapse).

9.2 SAMPLE ANALYSIS

Sample analysis for this investigation consists of analysis of surface and shallow soil samples and characterization of project-generated waste materials. Specific analytical requirements, methods, and procedures are described in the Quality Assurance Project Plan (QAPP), Chapter 11.

Data acquisition for all SWMUs/AOCs will rely on both field measurements and fixed laboratory data to determine if contamination exists.

Following is a summary of sampling depth intervals.

Soil Sampling Locations	Depth
All SWMUs/AOCs unless otherwise specified	
Surface	0 ft to 1 ft bgs
Subsurface[1]	1 ft to 4 ft bgs
SWMU/AOC with sewer or RCW pipeline	
Surface	0 ft to 1 ft bgs
Subsurface[2]	1 ft to 4 ft bgs
Subsurface/Shallow[2]	invert of the pipeline to 1 ft below
SWMU DOE Material Storage Area (DMSA)	
Surface	0 ft to 6 inch bgs

[1] If contamination is detected from 1 ft to 4 ft bgs, additional subsurface contingency samples will be collected below 4 ft at 3 ft intervals (e.g., 4 ft to 7 ft and 7 ft to 10 ft bgs). Only those parameters detected from 1 ft to 4 ft bgs will be analyzed.
[2] Sampling is expected not to extend past 16 ft. Shallow samples will be collected from the bottom of the pipeline/tank to 1 ft below the invert/bottom of the pipeline/tank.

9.3 SITE-SPECIFIC SAMPLING PLANS

9.3.1 SOU SWMUs/AOCs

A review of existing data for each of the SOU SWMUs/AOCs has been conducted to determine the following:

- SWMU/AOC COPCs,
- Extent and quality of existing data, and
- Sufficiency of data to support an FS for remedial options.

Where data are absent or insufficient to fully characterize the nature and extent of contamination and to support remedy selection, specific data gaps were identified. These data gaps are the basis for additional sampling under this work plan. This section addresses each SWMU/AOC individually and identifies sampling that will be utilized for this investigation. Contamination has been defined as concentrations exceeding background or any detected concentration if instrument reporting limits are higher than background values. Sampling for each SWMU/AOC will include a radiological walkover and grid-based composite sampling unless otherwise noted.

The SWMUs/AOCs have been grouped into the following seven categories to simplify the sampling approach: Former Facility Site, PCBs, Soil/Rubble Piles, Scrap Yards, Underground/Tank, Storage Areas, and Chromium Areas. Table 9.1 illustrates the categories. Utilities have been overlaid on maps for reference and planning of sample points.

For SWMUs that are proposed for additional sampling, samples will be collected as five-point composites from 45-ft grids. Collection of the five points for each composite will be as shown in Figure 9.1. Unless otherwise noted, one grab sample will be collected from the center of the grid. Four additional grab samples will be collected 15 ft from the center point in each cardinal direction (north, south, east, and west). On alternating grids, grab samples will be collected from the center of the grid, and four additional grab samples will be collected 15 ft from the center point in each secondary direction (northeast, northwest, southeast, southwest). Samples will be collected from the surface (0-1 ft bgs) and shallow subsurface (1-4 ft bgs) and composited separately (i.e., one composite sample for surface and one composite sample for shallow subsurface for each grid).

Split samples and replicates will also be obtained from the composite as necessary. Analyses for each composite sample will consist of field analysis of RCRA metals, plus uranium, by XRF and Total PCB by PCB test kits. Ten percent of the samples will have fixed-base laboratory confirmation splits, with at least one sample for surface and one shallow subsurface representing each SWMU being sampled. These fixed-base laboratory samples will be randomly selected over all sample locations within the SWMU.

The following is taken from the Risk Methods Document (DOE 2009c):

> For many sites, survey-type data such as x-ray fluorescence (XRF) data and results from polychlorinated biphenyl (PCB) field test kits are available in addition to the laboratory analytical data. The primary use of such data is for site characterization, but these survey-type data also can play a role in risk-based decision making. Survey-type data assist in determining the distribution of COPCs and can be used to identify which sets of laboratory data should be combined to develop site average contaminant concentrations. Potentially, survey-type data also could be combined with lab data in a risk assessment to determine the average concentrations for contaminants, but this would require demonstrating that the lab and survey-type data possess similar detection limits and analytical uncertainty. In addition, a DQA would need to be completed to show that both types of data sets are comparable and representative of the site conditions. This DQA either could be in the risk assessment or in a report completed prior to or in concert with the risk assessment.
>
> Finally, whenever survey-type data are used for guiding how lab data are handled or are combined with lab data, then the risk assessment would need to have an uncertainty discussion that appropriately identifies a) how the results of the risk assessment could vary if the survey type data were not used and b) how the use of the survey data increases or decreases the risk of making an incorrect risk-based decision for a location.
>
> **Survey-type data.** When XRF data are used in the derivation of exposure point concentrations, all XRF values, including negative values, will be used as reported. Other survey-type data (such as PCB field test kits) should be used in accordance with project-specific review of the data and performance of the method

All of this data (i.e., historical data, fixed-base laboratory data, and field analytical data) will be used for the BRA and nature and extent decisions in the RI, as described in Section 6.

Table 9.1. SWMU/AOC Data Groupings

Group 1	SWMU	Location	Description	Acres
Former Facility Site (9)				
	1	C-747-C	Oil Land Farm (disposal of waste oil)	2.29492
	99	C-745	Kellogg Building Site (WAG 28)	2.70631
	172	C-726	Sandblasting Facility	0.07533
	194	DUF Facility	McGraw Construction Facilities	41.69668
	196A	C-746-A	Septic System, WAG 27 proposed NFA	0.36326
	196B	C-746-A	Septic System, WAG 27 proposed NFA	0.05234
	211	C-720	TCE Spill Site Northeast, WAG 27	0.06181
	483	C-603	Was C-603 Nitrogen Facility, now concrete slab	0.26757
	489	C-710 North	Septic Tank	0.02082
	531	C-746-A south	Aluminum Slag Reacting Area	0.21037
			Total Acres:	**47.74941**
Group 1	**SWMU**	**Location**	**Description**	**Acres**
Storage Area (19)				
	47	C-400	Technetium Storage Tank Area	0.02276
	200	Central PGDP	TSCA Waste Storage Facility	0.81408
	212	C-745-A	Radiological Contamination Area	0.09263
	213A	C-745-A	DMSA OS-02	0.03582
	213B	C-745-A	DMSA OS-02	0.12676
	214	C-611	DMSA OS-03, RCRA Closure, NFA pending	0.01355
	215	C-743	DMSA OS-04, rail tank car	0.01279
	216	C-206	DMSA OS-05, RCRA Closure, NFA pending	0.02663
	217	C-740	DMSA OS-06, RCRA Closure, NFA pending	0.97704
	218	C-741	DMSA OS-07, RCRA Closure, NFA pending	0.09501
	220A	C-409	DMSA OS-09, RCRA Closure, NFA pending	0.05881
	220B	C-409	DMSA OS-09, RCRA Closure, NFA pending	0.13106
	220C	C-409	DMSA OS-09, RCRA Closure, NFA pending	0.03203
	221	C-635	DMSA OS-10	0.20831
	222A	C-410	DMSA OS-11, RCRA Closure, NFA pending	0.03439
	222B	C-410	DMSA OS-11, RCRA Closure, NFA pending	0.0184
	223	C-301	DMSA OS-12, RCRA Closure, NFA pending	0.76268
	224	C-340	DMSA OS-13, empty drum storage	0.14879

Table 9.1. SWMU/AOC Data Groupings (Continued)

Group 1	SWMU	Location	Description	Acres
	225	C-533-1	DMSA OS-14, rail cars	0.09296
	226	C-745-B	DMSA OS-15	0.31757
	227	C-746-B	DMSA OS-16, RCRA Closure, NFA pending	1.27855
	228	C-747-B	DMSA OS-17	0.23234
	229	C-746-F	DMSA OS-18	0.84898
			Total Acres:	**6.38194**
Group 2	**SWMU**	**Location**	**Description**	**Acres**
Underground/Tank (10)				
	11	C-400 (SE)	C-400 TCE Leak Site, SE of C-400 building	0.0203
	26	C-400 to C-404	4" Underground Transfer Line, 1500' long	0.0409
	27	C-722	Acid Neutralization Tank	0.00273
	31	C-720	Compressor Pit Water Storage Tank	0.00236
	32	C-720	2 (C-728) Clean Waste Oil Tanks (removed)	0.0376
	40	C-403	Neutralization Tank	0.02057
	76	C-632-B	Sulfuric Acid Storage Tank	0.01947
	77	C-634-B	Sulfuric Acid Storage Tank	0.01704
	165	C-616-L	Pipeline and Vault Soil Contamination	0.48722
	170	C-729	Acetylene Building Drain Pits	0.00293
			Total Acres:	**0.65112**
Group 2	**SWMU**	**Location**	**Description**	**Acres**
Chromium Areas (4)				
	158	C-720	Chilled Water System Leak Site	0.05785
	169	C-410-E	HF Vent Surge Protection Tank	0.00231
	176	C-331	RCW Leak NW Side	0.13764
	177	C-331	Leak East Side	0.15853
			Total Acres:	**0.35633**
Group 2	**SWMU**	**Location**	**Description**	**Acres**
Soil/Rubble Pile (12)				
	19	C-410-B	HF Emergency Lagoon	0.04419
	20	C-410-E	Emergency Lagoon	0.04316
	138A	C-100	Southside Berm	0.46358
	138B	C-100	Southside Berm	0.45396
	180	WKWMA	Outdoor Firing Range	2.2076
	181	West Side	PGDP Security Force Firing Range	0.50891
	195A	SW PGDP	Curlee Road Contaminated Soil Mounds	8.90146

Table 9.1. SWMU/AOC Data Groupings (Continued)

Group 2	SWMU	Location	Description	Acres
	195B	SW PGDP	Curlee Road Contaminated Soil Mounds	0.80822
	204	Dykes Road	Historical Staging Area, WAG 28	11.29684
	486	West of PGDP	Rubble Pile WKWMA	
	487	West of PGDP	Rubble Pile WKWMA	
	492	Outfall 011	Contaminated Soil Area	0.04664
	493A	Outfall 001	Concrete Rubble Piles	0.05079
	493B	Outfall 001	Concrete Rubble Piles	0.0787
	517	West of PGDP	Rubble and debris, erosion control fill area	0.01475
	541	Outfall 011	Contaminated Soil Area	1.99904
	561	East of PGDP	Soil Pile I	9.446
	562	North of Soil Pile I, West of LBC	Soil Piles D, H, K, and J in Subunit 1	n/a
	563	North of Outfall 12, West of LBC	Soil Piles 20 and BW in Subunit 4	n/a
	564	East of NSDD, North of P, S, and T Landfill	Soil Pile AT in Subunit 5	n/a
	565	North of C-611 WTP	Along Bayou Creek north of C-611 Water Treatment Plant. Rubble Area K-19	n/a
	567	Near Outfall 013 and west of LBC	Contaminated Soil Area K013	n/a
			Total Acres:	**36.36384**
Group 3	**SWMU**	**Location**	**Description**	**Acres**
Scrapyard (7)				
	12	C-747-A	UF4 Drum Yard (Drum Mountain)	0.71333
	13	C-746-P&P1	P&P1 Scrap Yards	6.83063
	14	C-746-E	E Scrap Yard	5.75068
	15	C-746-C	C Scrap Yard	5.28672
	16	C-746-D	D Scrap Yard	2.01491
	518	C-746-P1	Field south of P1 yard	0.81476
	520	C-746-A	Scrap Material	2.89439
			Total Acres:	**24.30542**
Group 3	**SWMU**	**Location**	**Description**	**Acres**
PCBs (18)				
	56	C-540-A	PCB Staging Area	0.00115
	57	C-541-A	PCB Waste Staging Area	0.00115
	74	C-340	Transformer Spill Site	0.06436
	75	C-633	PCB Spill Site	0.11008
	78	C-420	PCB Spill Site	0.08263
	79	C-611	PCB Spill Site	0.02592
	80	C-540	PCB Spill Site	0.34455
	81	C-541	PCB Spill Site	0.26154
	135	C-333	PCB Soil Contamination	0.33652
	137	C-746-A	Inactive PCB Area	0.00063

Table 9.1. SWMU/AOC Data Groupings (Continued)

Group 3	SWMU	Location	Description	Acres
	153	C-331	PCB Soil Contamination (west)	0.60248
	154	C-331	PCB Soil Contamination (southeast)	1.03029
	155	C-333	PCB Soil Contamination (west)	0.71102
	156	C-310	PCB Soil Contamination (west)	0.46277
	160	C-745	Cylinder Yard (PCB soils) Spoils	0.11479
	163	C-304	HVAC Piping System (soil backfill from C-611)	0.08222
	219	C-728	DMSA OS-08, empty fiberglass tank	0.03797
	488	C-410 Trailers	PCB Contamination Area	0.00106
			Total Acres :	**4.27113**

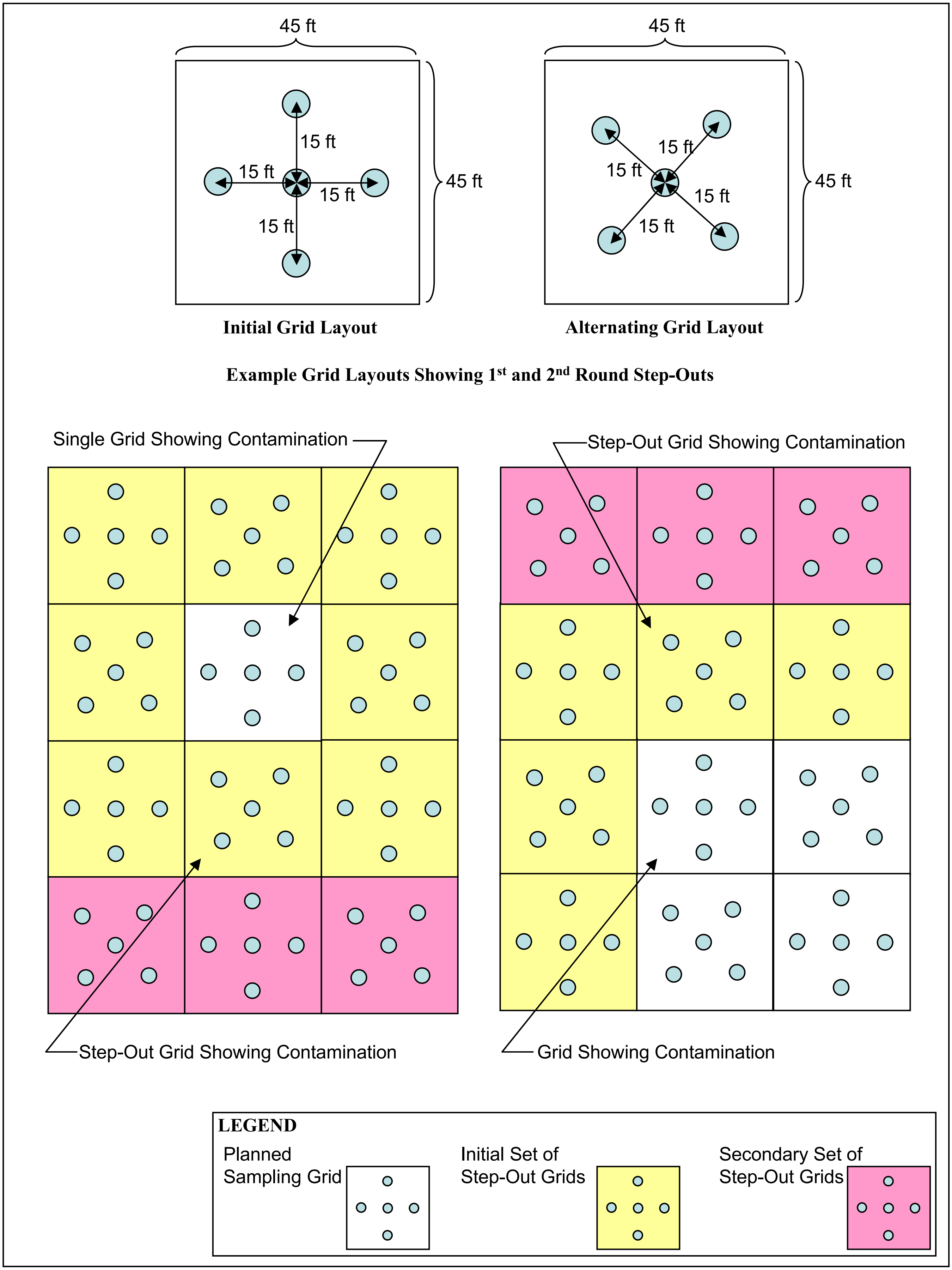

Figure 9.1. Grab Sample Locations within Each Composite Grid

Though not fully encompassing of the entire SWMU/AOC, each sample point represents a 15 ft^2 area, (roughly $25m^2$). Should any individual sample point within the grid be obstructed (such as by a building or concrete slab), then the nearest possible location will be substituted. If a suitable location (e.g., the entire quadrant of the grid) is not available, then the composite will consist of fewer than five points, as necessary. If an entire grid is obstructed, the composite sample will not be collected.

Grids will be positioned so that as much of the SWMU/AOC boundary is covered as possible or necessary. By utilizing the alternating grid pattern as shown in Figure 9.1, the maximum unsampled area for any SWMU/AOC requiring more than one grid is approximately 625 ft^2. Additional grab sample points may be collected in the field in order to obtain biased sampling based on results obtained from radiological walkovers.

Additional grids, or “step-outs” will be sampled, as explained above, if contamination is found at the boundary of a SWMU/AOC. Up to two grids will be sampled past the SWMU/AOC administrative boundary unless an anthropogenic feature (i.e., ditch, road, building, or another SWMU) is reached. An example of this method for “step-outs” is illustrated in Figure 9.1.

Composite sampling provides an average of the contamination over the grid. Although individual hot spots within the grid may not be evident, the overall benefit of the grid coverage is to provide a decrease in the uncertainty of concentrations in the area. The project action limits have been set, as shown in Table 9.2. These limits are benchmarks to determine whether step-out grid sampling is necessary for defining extent of contamination for a SWMU.

With the large number of samples required for the gridded sampling approach, the majority of the samples will be analyzed using field analytical instruments. Though the quantitation limits are higher for these instruments, the increased coverage of each unit decreases the uncertainty of the analytical precision. Trace constituents may not be determined throughout the unit, but major constituents are less likely to be missed. As noted in Table 9.2, the project action limits are set either equal to the laboratory quantitation limits or equal to the industrial worker risk limits, as appropriate. The industrial worker risk limits are used when appropriate as the project action limit for SWMUs/AOCs both inside and outside the industrial area for this project.

The averaging of the soil concentrations potentially may lead to incorrectly omitting COPCs from the unit because chemicals or radionuclides elevated only slightly above background at one or two spots may not have a concentration in the composite sample that exceeds background. This is unlikely to affect the list of COCs that require remedial action because selection of COCs is based on a significant contribution to risk and/or hazard at the site from the exposure concentration (which is generally a 95% UCL of the mean concentration).

Table 9.2. Field Analysis and Limits for Grid Sampling and Radiological Walkovers

Analyte	Project Quantitation Limit (mg/kg)	Industrial Worker ELCR = 1E-5 (mg/kg)[a]	Industrial Worker HI = 1 (mg/kg)[a]	PGDP Background (mg/kg)[b]	Project Action Limit (mg/kg)[c]
Antimony	30	n/a	3.79	0.21	30
Arsenic	11	5.23	84.1	7.9	11
Barium	100	n/a	2,290	170	170
Cadmium	12	753,000	213	0.21	12
Chromium	85	109,000	3,560	16	85
Copper	35	n/a	4,930	19	35
Iron	100	n/a	20,700	28,000	28,000
Lead	13	n/a	50[d]	23	23
Manganese	85	n/a	452	820	820
Mercury	10	n/a	9.82	0.13	10
Molybdenum	15	n/a	830	n/a	830
Nickel	65	n/a	2,420	21	65
Selenium	20	n/a	949	0.7	20
Silver	10	n/a	411	2.3	10
Uranium	20	n/a	202	4.6	20
Thallium	20	n/a	7.27	0.21	20
Vanadium	70	n/a	33.2	37	70
Zinc	25	n/a	27,300	60	60
Total PCBs	5	1.99	n/a	n/a	5
Uranium-238[e]	n/a	17.1 pCi/g	n/a	[f]	[f]

n/a = not available or not applicable.

[a] ELCR and HI values are derived from values presented in Table A.17 of the Risk Methods Document (DOE 2001b).

[b] PGDP background values are taken from Table A.12 of the Risk Methods Document (DOE 2001b), the lesser of surface and subsurface is presented, with the exception of uranium-238.

[c] The project action limit is the greater of background and the more conservative between the ELCR and the HI , unless unachievable by the quantitation limit. If unachievable, the project quantitation limit is used as the project action limit, with the exception of uranium-238.

[d] The value for lead is the no action level presented in Table A.17 of the Risk Methods Document (DOE 2001b), this value was not adjusted to ELCR=1E-5 or HI=1.

[e] Uranium-238 measurements will be collected with a FIDLER (Field Instrument for the Detection of Low Energy Radiation) connected to a Ludlum Model 2221 digital scalar and ratemeter. Ambient detector background is due to a combination of naturally occurring radionuclides, cosmic rays, electronic instrument noise, fallout from atomic weapons testing, and other components. Presently, the FIDLER/2221 combination measures average background at 11,000 cpm.

[f] Based on the 3/1/10 conference call, Project Action Limits will be set to 30 pCi/g (1,800 ncpm) for AOCs and SWMUs outside the Limited Area (plant fence) and 171 pCi/g (10,300 ncpm) for AOCs and SWMUs inside the Limited Area. Net count per minute values corresponding to Project Action Levels are developed in accordance with NURGEG-1507 methodology. These numbers are examples. Should the Project Action Limit be reached, the elevated area indicating greater than the Action Level will be bounded, one grab sample will be collected from the location representing the highest detected activity, and the sample will be analyzed by a fixed-base laboratory for radiological constituents.

Deviations:

SWMUs/AOCs that have a RCW, sanitary sewer, or storm pipeline. The pipeline will have a minimum of one shallow soil sample at a depth of 1 ft below the pipeline that will have field analysis performed. Additional depth samples will be collected every 30 ft along the pipeline within the SWMU/AOC boundary for field analysis. A minimum of 10% of the samples collected will have fixed-base laboratory analysis. Surface and shallow samples will be collected as described above,.

SWMUs that are outside DMSAs. Seventeen outside DMSAs are included with this project. There are nine DMSAs that historically have no radiological posted area, no documented spills, and no staining or other indications of contamination; therefore, one 5-point surface composite is proposed. Eight DMSAs will be sampled from 0 to 6 inch bgs based on the applied grid An NFA also is pending for 8 of the 17, which may affect the work for these SWMUs, if approved.

SWMUs/AOCs covered with concrete/asphalt. The SWMU/AOC will be visually surveyed for staining, and if staining is present, a PCB wipe will be obtained and the location of the staining will be documented. If the surface is found to be compromised is such a way to allow for a soil sample to be taken, field personnel will obtain samples per this sampling plan at the discretion of project manager.

Total number of SWMUs/AOCs	86
SWMUs/AOCs needing additional sampling	53
SWMUs/AOCs with enough data for FS	24
SWMUs/AOCs with concrete/asphalt cover	9

Table 9.3 displays the summary of sample totals. Contingency samples are not included in the sample totals. Contingency samples will equal no more than 10% of the total samples required. If more than 10% is required, DOE will notify the regulators.

Table 9.3. Summary of Sampling

	Surface Fixed-base Laboratory	Surface Field Laboratory	Subsurface/ Shallow Fixed-base Laboratory	Subsurface/ Shallow Field Laboratory
Total:	137	1,367	163*	1,576

*Number includes composite sampling plus four grab samples from two locations for VOCs only.

Total Fixed-base Laboratory Samples:	**300**
Total Field Laboratory Samples:	**2,943**

Sampling Location/ID Number	Matrix	Depth	Analytical Group	Number of Samples
Total	Soil	Surface	SVOCs	137
			PCBs	137
			Metals	137
			Radionuclides	137
			Metals by XRF	1,367
			PCBs by test kit	1,367
		Subsurface	VOCs	6
			SVOCs	138
			PCBs	138
			Metals	138
			Radionuclides	138
			Metals by XRF	1,359
			PCBs by test kit	1,359
		Shallow (pipeline)	VOCs	2
			SVOCs	21
			PCBs	21
			Metals	21
			Metals by XRF	217
			PCBs by test kit	217

Contingency samples.

(1) Sampling at a planned location fails (e.g., sample is rendered unusable while in the field by bottle breakage, equipment failure, etc.) (Note: "Failure" in this context does not indicate an exceedance of a level.). Result: collection of "replacement" sample.

(2) During field activities, an area with obvious staining is discovered, but a sample from this area is not part of the previously determined sampling plan. The Prime Contractor Project Manager (PM) will be contacted to make a determination as to whether the "stained" area should be sampled. Result: collection of additional "observation" samples (biased/judgmental) upon direction from project management.

(3) Preliminary results from field analysis of grid sampling exceed project action limits (see Table 9.2) at the surface and/or 1 ft to 4 ft bgs depth. Result: additional grids (up to two) will be placed until a boundary is reached (e.g., road, another SWMU, ditch) and collection of surface and depth samples (4 ft to 7 ft and 7 ft to 10 ft bgs) will be performed.

(4) If migratory pathways indicate potential contamination, then additional sampling will be performed to determine extent along expected contamination route (i.e., surface migration pathways).

(5) Planned contingency samples will be collected to determine extent of contamination on a SWMU by SWMU basis as indentified in each SWMU figure in this chapter. Additional locations (planned contingencies) have been identified based upon historical data to determine lateral extent of contamination.

(6) Radiological walkover exceeds project action limits (see Table 9.2). Result: one grab sample per SWMU/AOC will be collected, if necessary, at the location of the highest reading for fixed-base laboratory analysis of radiological constituents. This grab sample is independent of the grid sampling.

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9.3.1.1 Former facility site group

The following are the units and areas comprising the former facility sites grouping.

SWMU	Description
1	C-747-C Oil Land Farm (disposal of waste oil)[p]
99	C-745 Kellogg Building Site (WAG 28)[p]
172	C-726 Sandblasting Facility[a]
194	DUF Facility McGraw Construction Facilities
196	C-746-A Septic System, WAG 27 proposed NFA[b]
211	C-720 TCE Spill Site Northeast, WAG 27[p]
483	C-603 Nitrogen Facility concrete slab[a]
489	C-710 North Septic Tank
531	C-746-A South Aluminum Slag Reacting Area

A large portion of SWMU 194 was not included in the sampling because the DUF_6 Facility was being constructed at this location. Part of SWMU 483 will not be sampled due to the remaining concrete slab; it will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

No samples will be collected from SWMUs 1 or 172.

SWMU 172 has a concrete surface and will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected.

SWMU 1 has been evaluated under another investigation and has enough data to proceed to an FS.

The grid locations are displayed in Figures 9.2 through 9.8. Section 9.3 provides information on sampling depths.

SWMU 1

Based on previous investigations, additional sampling is not needed to support the scope of this project. The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

SWMU 99

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.2 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 51 grid sample locations for both surface and subsurface planned for the unit; five of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

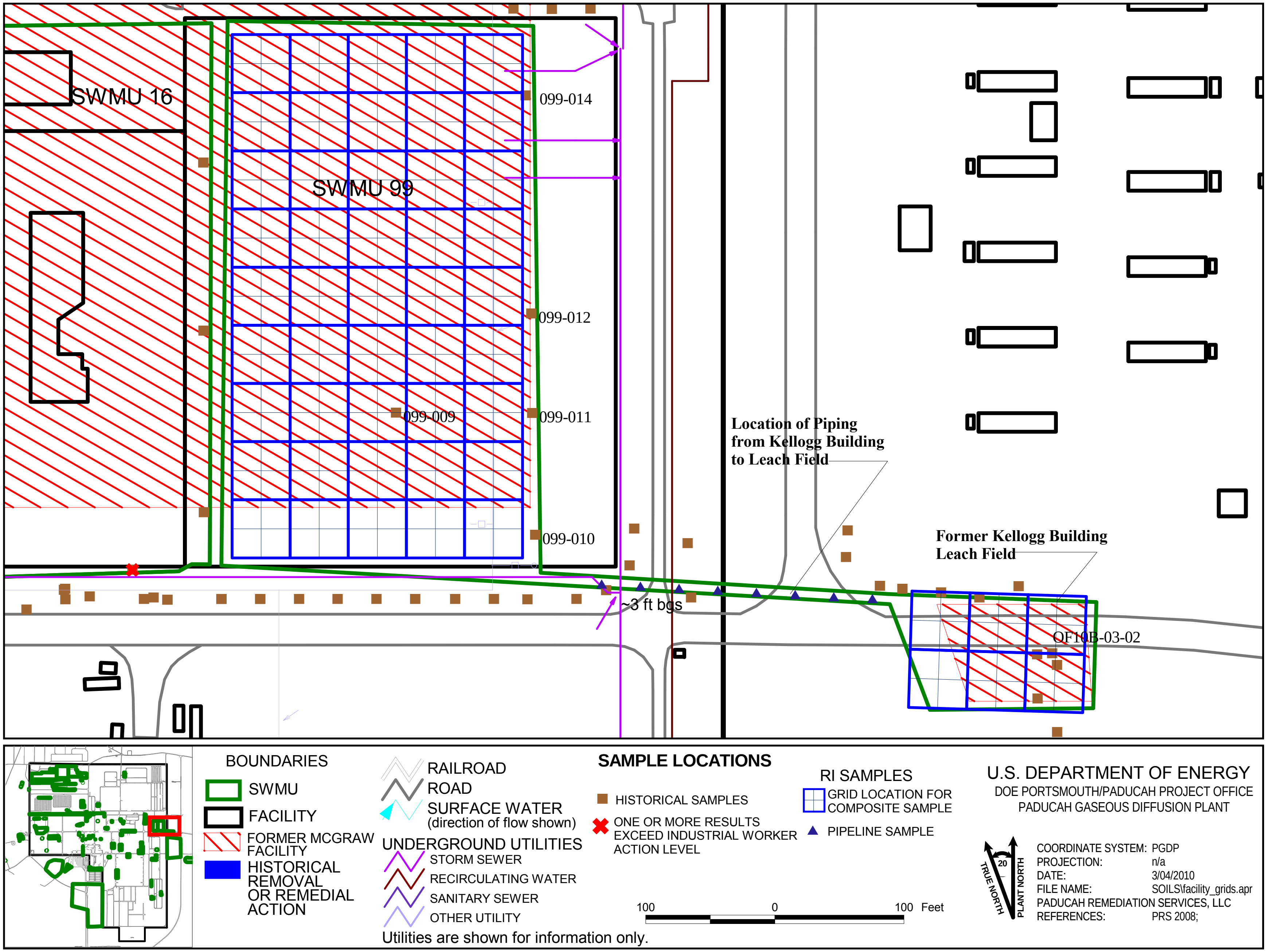

Figure 9.2. SOU RI Samples for SWMU 99

SWMU 172

SWMU 172 has a concrete surface underneath the existing building; therefore a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the front line manager (FLM). This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 194

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.3 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 394 grid sample locations for both surface and subsurface planned for the unit; 30 of these in the surface and 35 in the subsurface will be randomly selected and submitted for fixed-base laboratory analysis.

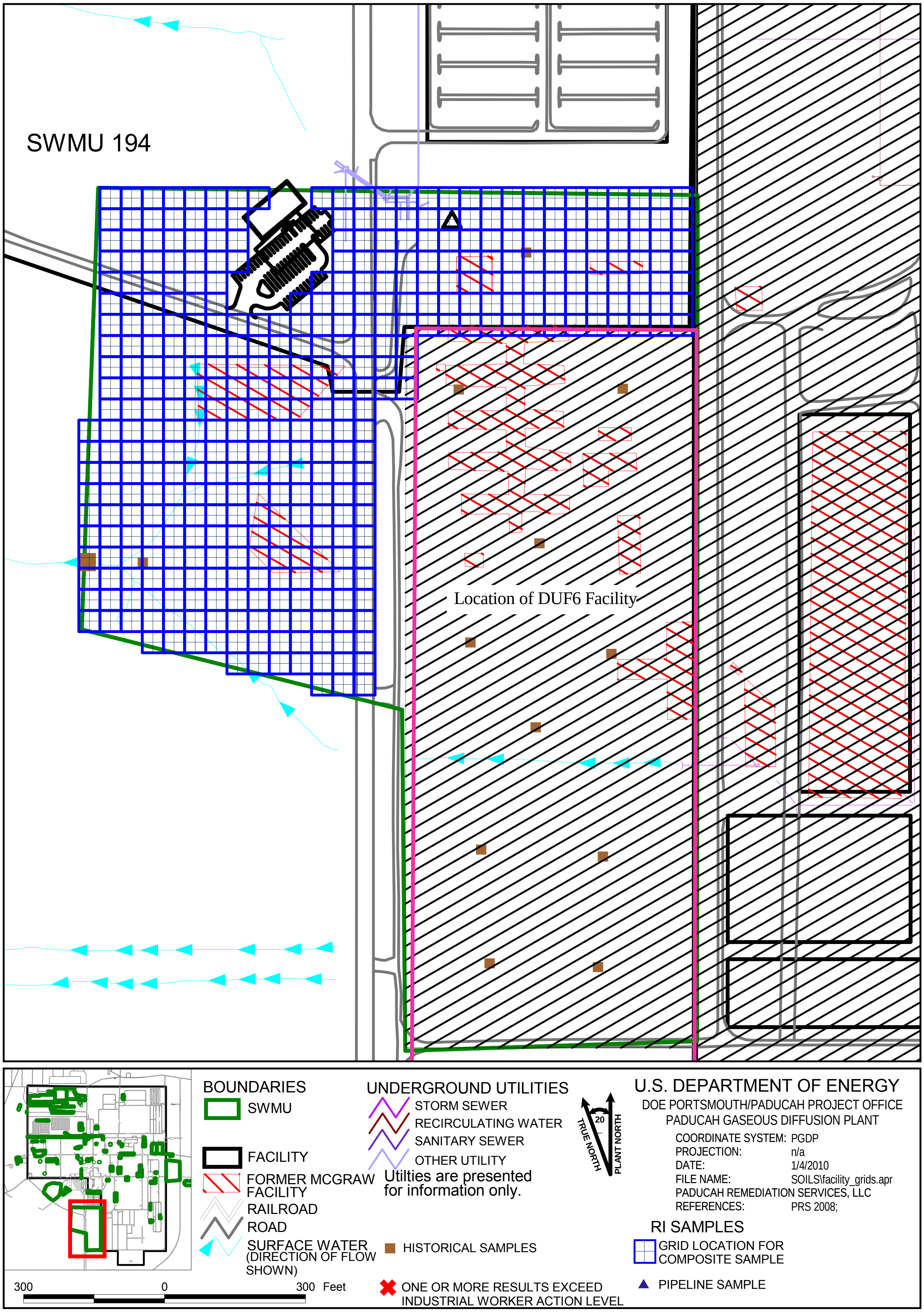

Figure 9.3. SOU RI Samples for SWMU 194

SWMU 196

Based on previous investigations, additional sampling is needed to support the scope of this project to further delineate the contamination on the north side of the northeast portion of the SWMU. The western portion of the SWMU will be investigated as part of the sampling for SWMU 520 within this work plan. Figure 9.4 shows a map of the sampling locations.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

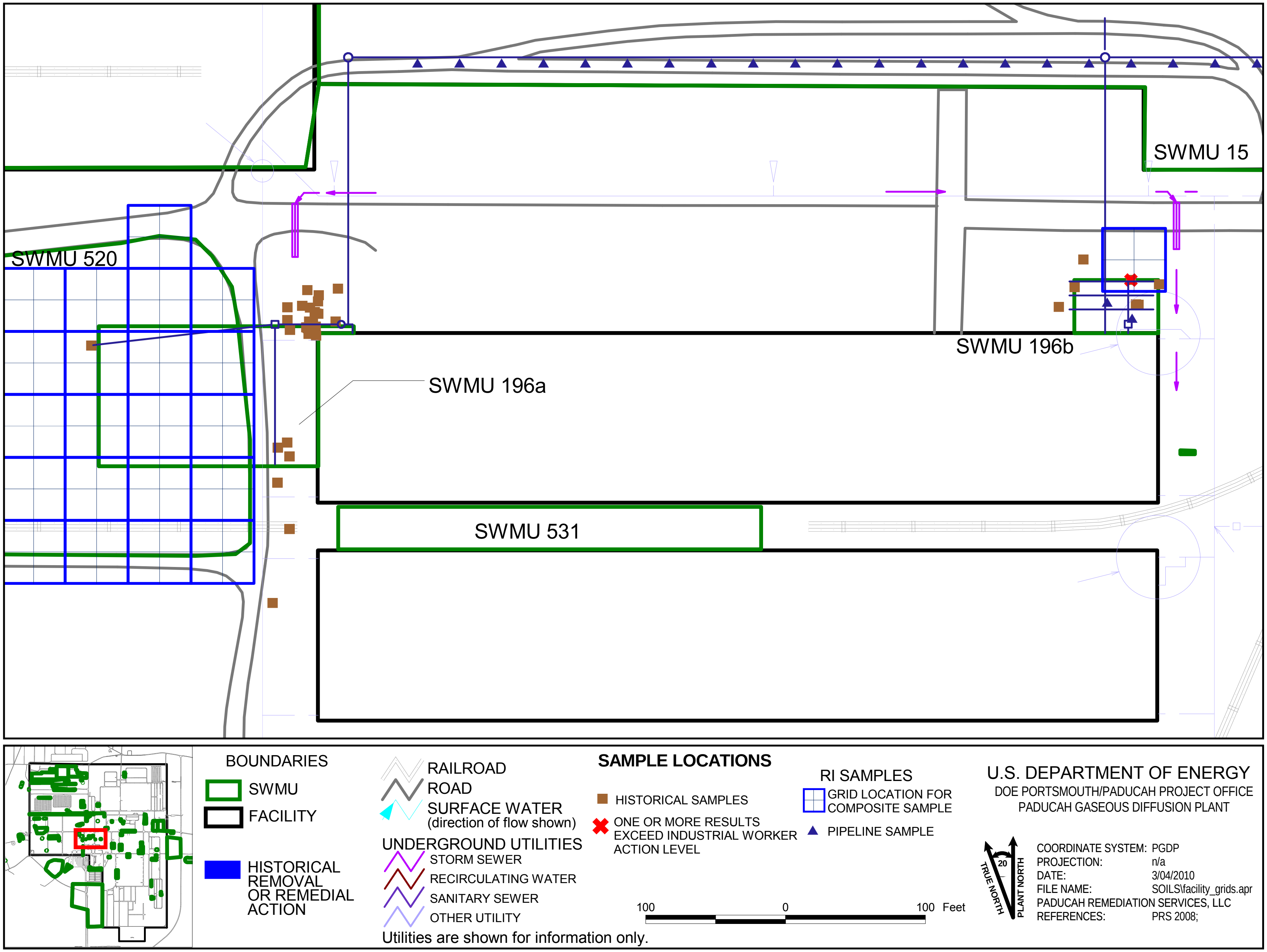

Figure 9.4. SOU RI Samples for SWMU196

SWMU 211

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.5 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate. Pipeline sampling at this unit will include VOCs. Additionally, prior to compositing, the grab sample from the center location of each subsurface grid will undergo VOC sampling.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are two grid sample locations for both surface and subsurface planned for the unit; one of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

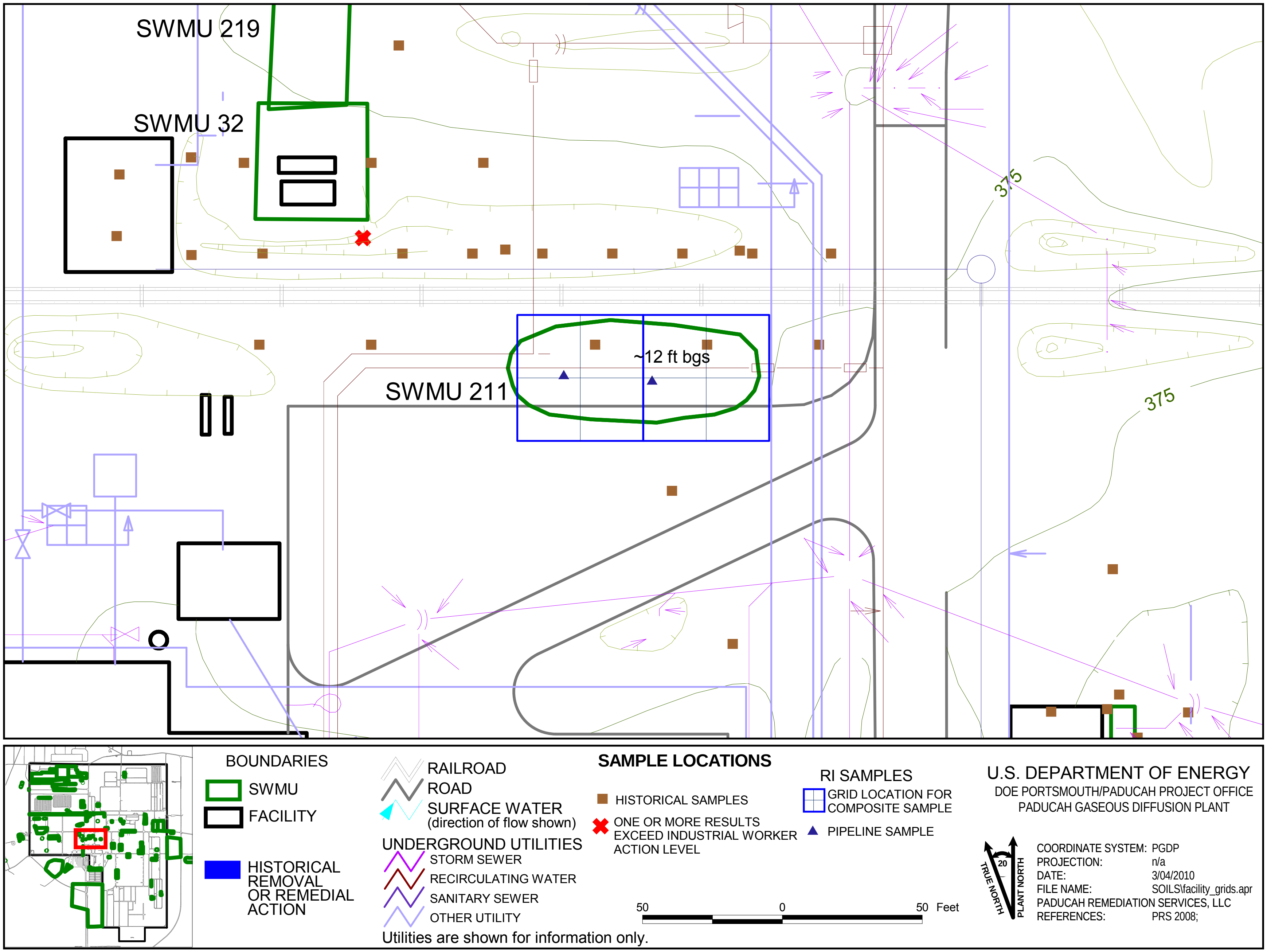

Figure 9.5. SOU RI Samples for SWMU 211

SWMU 483

SWMU 483 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the FLM.

Figure 9.6 shows a map of the sampling locations within the SWMU surrounding the concrete surface. Grid sampling within this SWMU is targeted on the soils immediately surrounding the location of the former facility; therefore, the grids for SWMU 483 do not fully encompass the SWMU. There are five grid sample locations for both surface and subsurface planned for the unit; one of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

This SWMU will be addressed as a final action as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

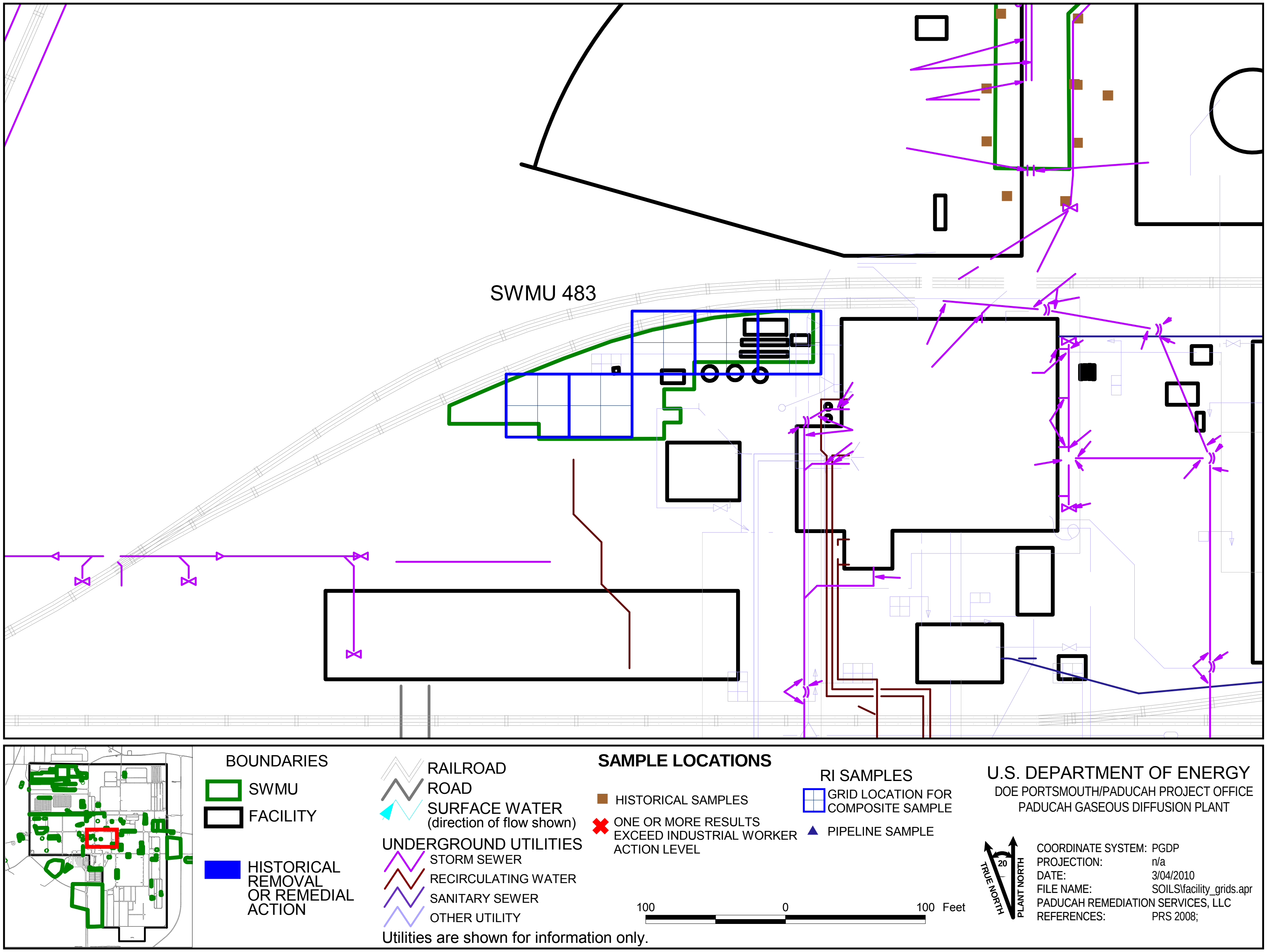

Figure 9.6. SOU RI Samples for SWMU 483

SWMU 489

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.7 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

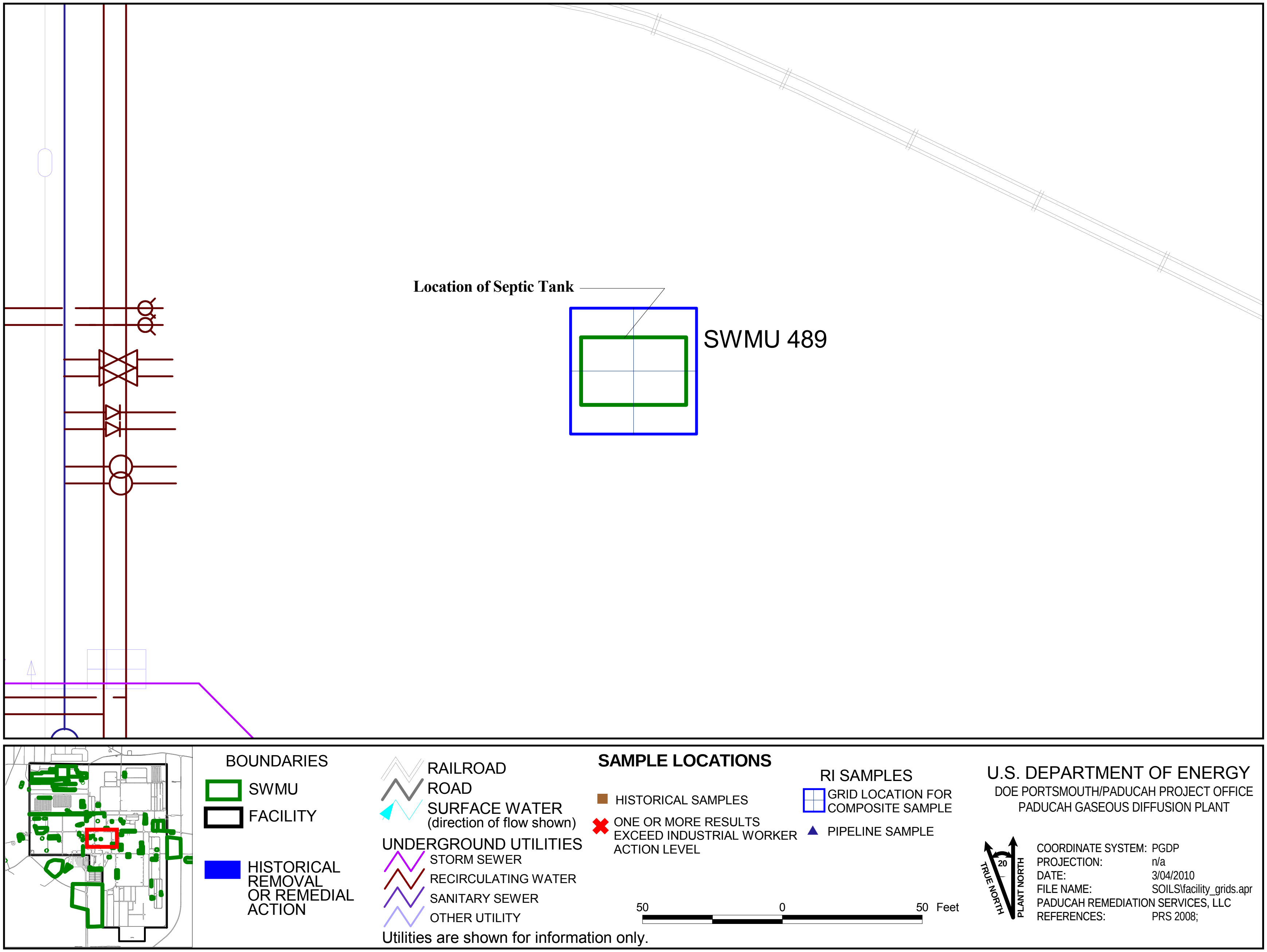

Figure 9.7. SOU RI Samples for SWMU 489

SWMU 531

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.8 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Seven grid sample locations for both surface and subsurface are planned for the unit; additionally, one location from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

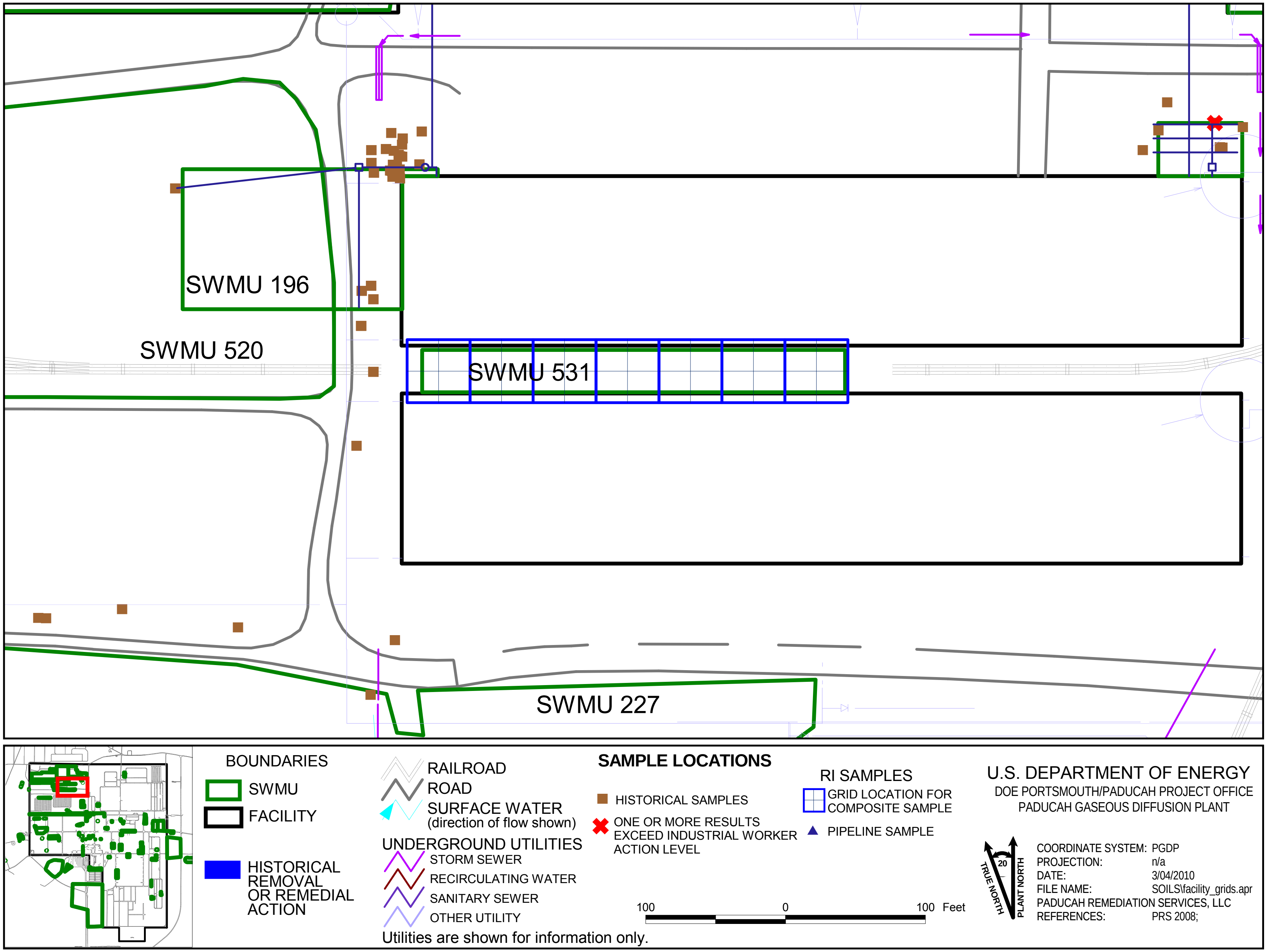

Figure 9.8. SOU RI Samples for SWMU 531

9.3.1.2 Storage Area Group

The following are the units and areas comprising the storage area grouping.

SWMU	Location	Description
47	C-400	Technetium Storage Tank Area
200	Central PGDP	TSCA Waste Storage Facility
212	C-745-A	Radiological Contamination Area
213A	C-745-A	DMSA OS-02
213B	C-745-A	DMSA OS-02
214	C-611	DMSA OS-03, RCRA Closure, NFA pending
215	C-743	DMSA OS-04, rail tank car
216	C-206	DMSA OS-05, RCRA Closure, NFA pending
217	C-740	DMSA OS-06, RCRA Closure, NFA pending
218	C-741	DMSA OS-07, RCRA Closure, NFA pending
220A	C-409	DMSA OS-09, RCRA Closure, NFA pending
220B	C-409	DMSA OS-09, RCRA Closure, NFA pending
220C	C-409	DMSA OS-09, RCRA Closure, NFA pending
221	C-635	DMSA OS-10
222A	C-410	DMSA OS-11, RCRA Closure, NFA pending
222B	C-410	DMSA OS-11, RCRA Closure, NFA pending
223	C-301	DMSA OS-12, RCRA Closure, NFA pending
224	C-340	DMSA OS-13, Empty Drum Storage
225	C-533-1	DMSA OS-14, Rail Cars
226	C-745-B	DMSA OS-15
227	C-746-B	DMSA OS-16, RCRA Closure, NFA pending
228	C-747-B	DMSA OS-17
229	C-746-F	DMSA OS-18

SWMUs 218, 220 and 223 will not be sampled due to having a concrete surface; therefore, a RAD evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected at each SWMU. These SWMUs will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMUs 213, 214, 215, 216, 221, 222, 224, and 225 are DMSAs requiring one five-point composite sample of surface soil at each unit.

The locations are displayed in Figures 9.9 through 9.24. Section 9.3 provides information on sampling depths.

SWMU 47

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.9 shows a map of the sampling locations with utilities overlaid and additional sampling points for the pipeline, as appropriate. One grid location, in addition to two subsurface grab samples, is planned for SWMU 47. The two subsurface grab samples will include analyses for VOCs.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Additionally, the grid sample locations for both surface and subsurface will be submitted for fixed-base laboratory analysis.

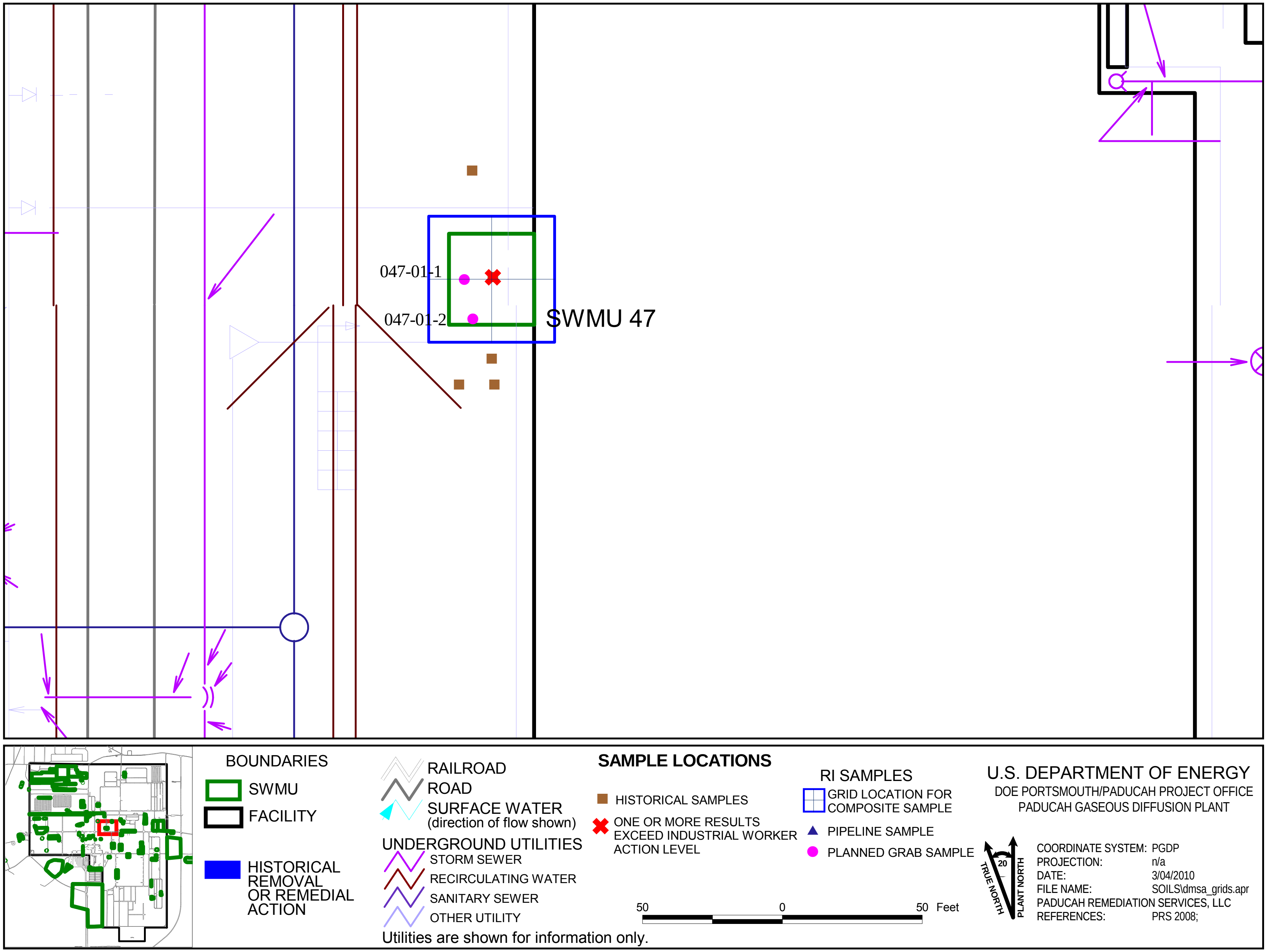

Figure 9.9. SOU RI Samples for SWMU 47

SWMU 200

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.10 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Fourteen grid sample locations for both surface and subsurface are planned for the unit; additionally, one location from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

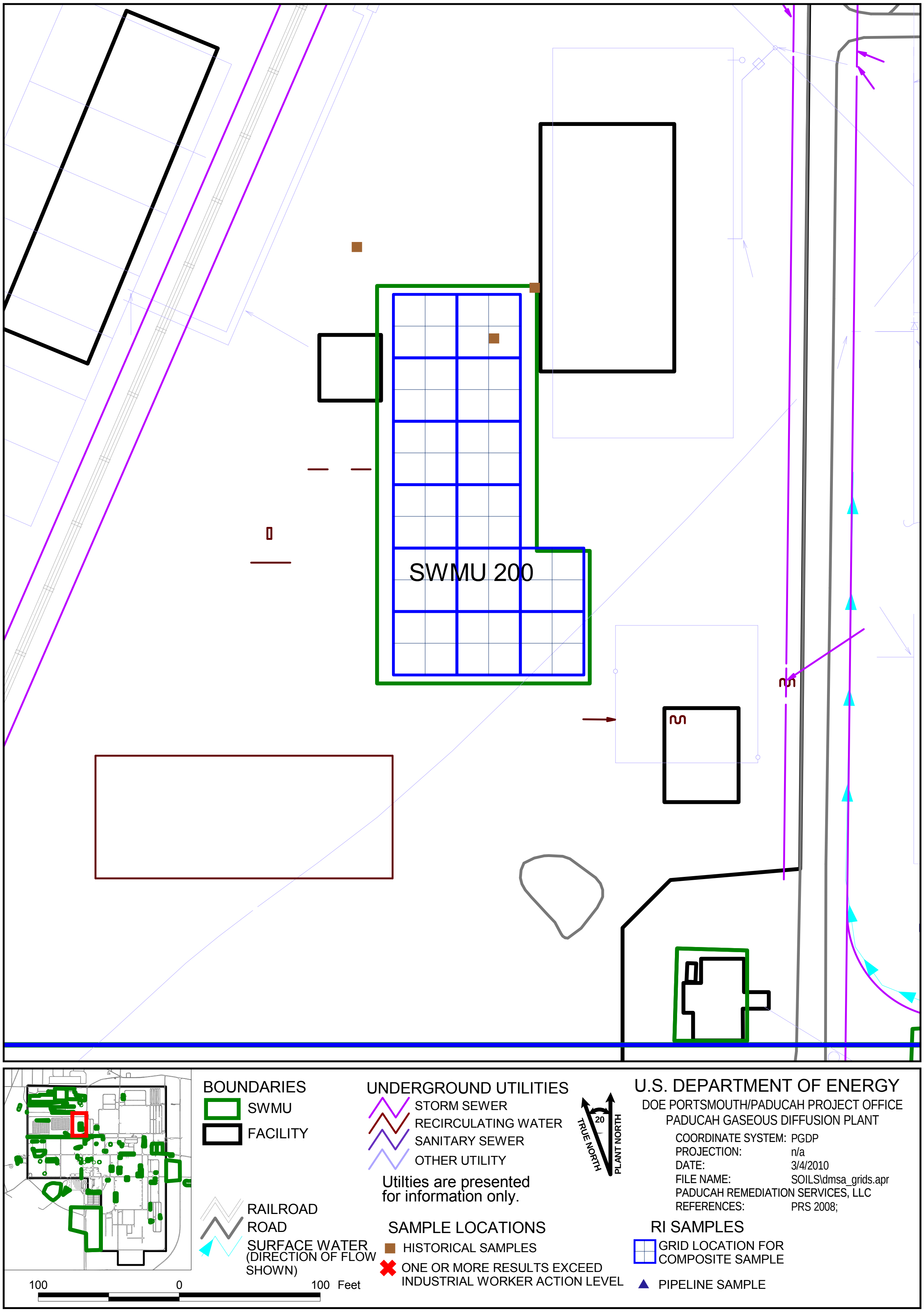

Figure 9.10. SOU RI Samples for SWMU 200

SWMU 212

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.11 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one location from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

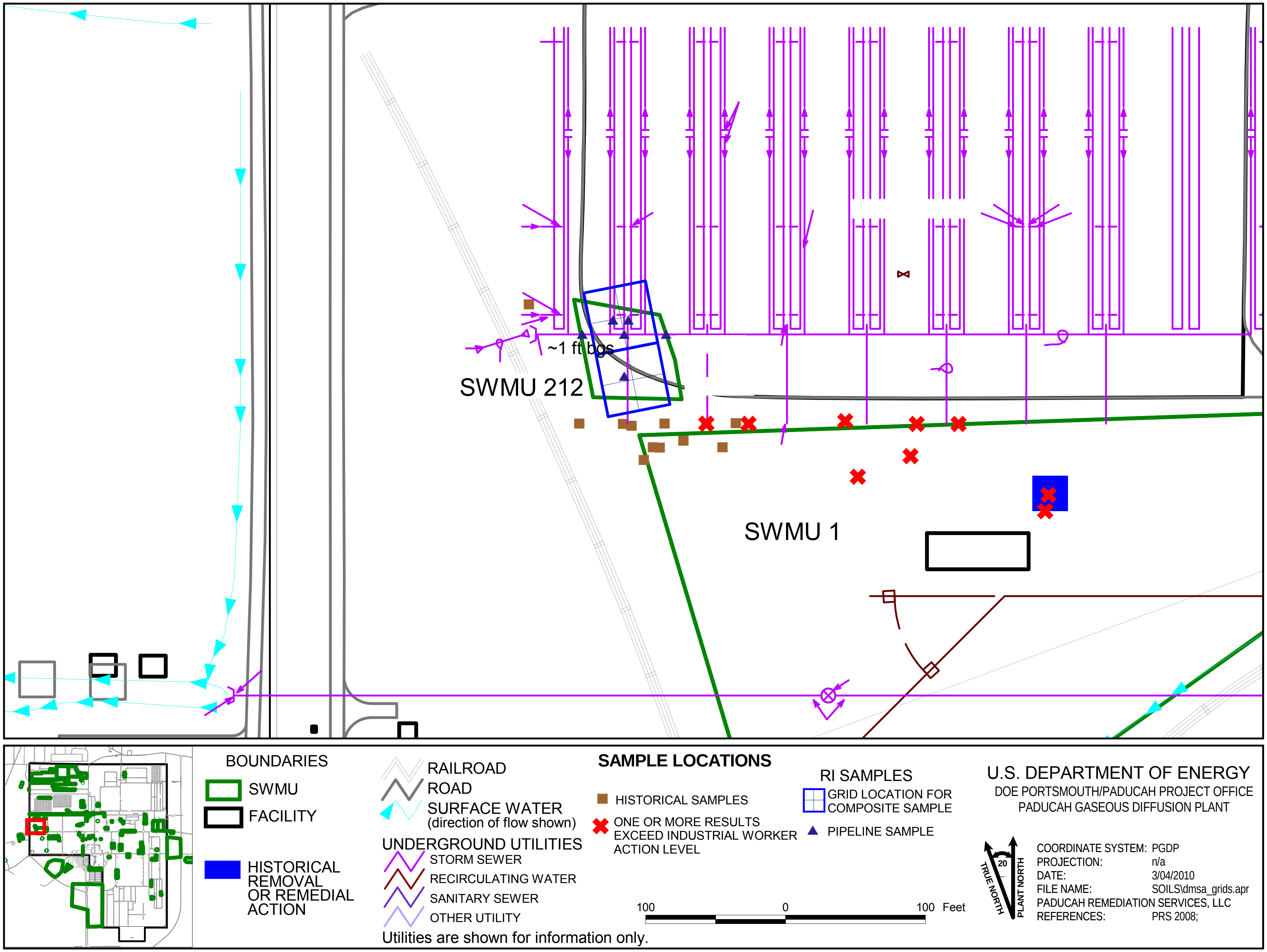

Figure 9.11. SOU RI Samples for SWMU 211

SWMU 213

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.12 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

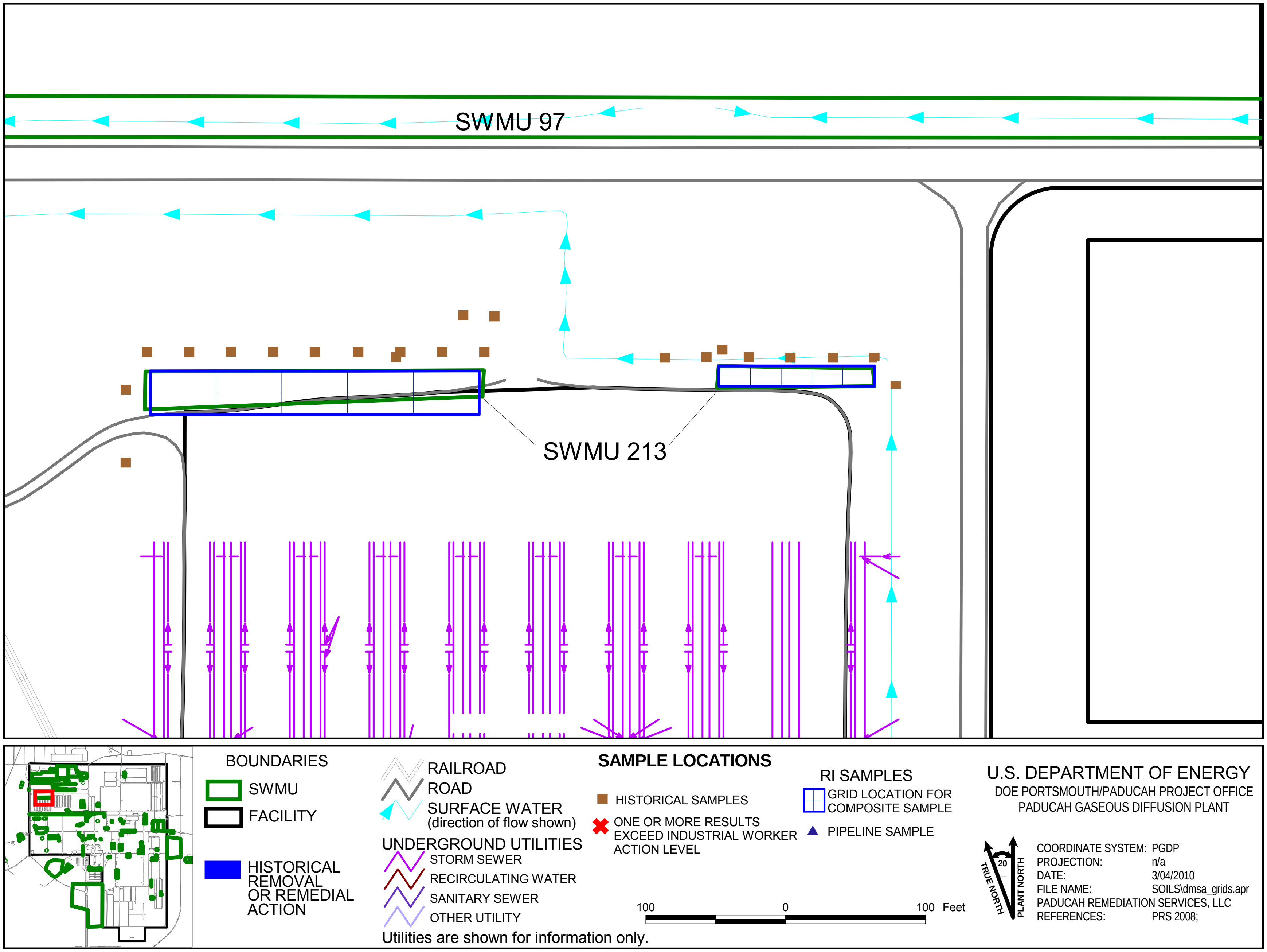

Figure 9.12. SOU RI Samples for SWMU 213

SWMU 214

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.13 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

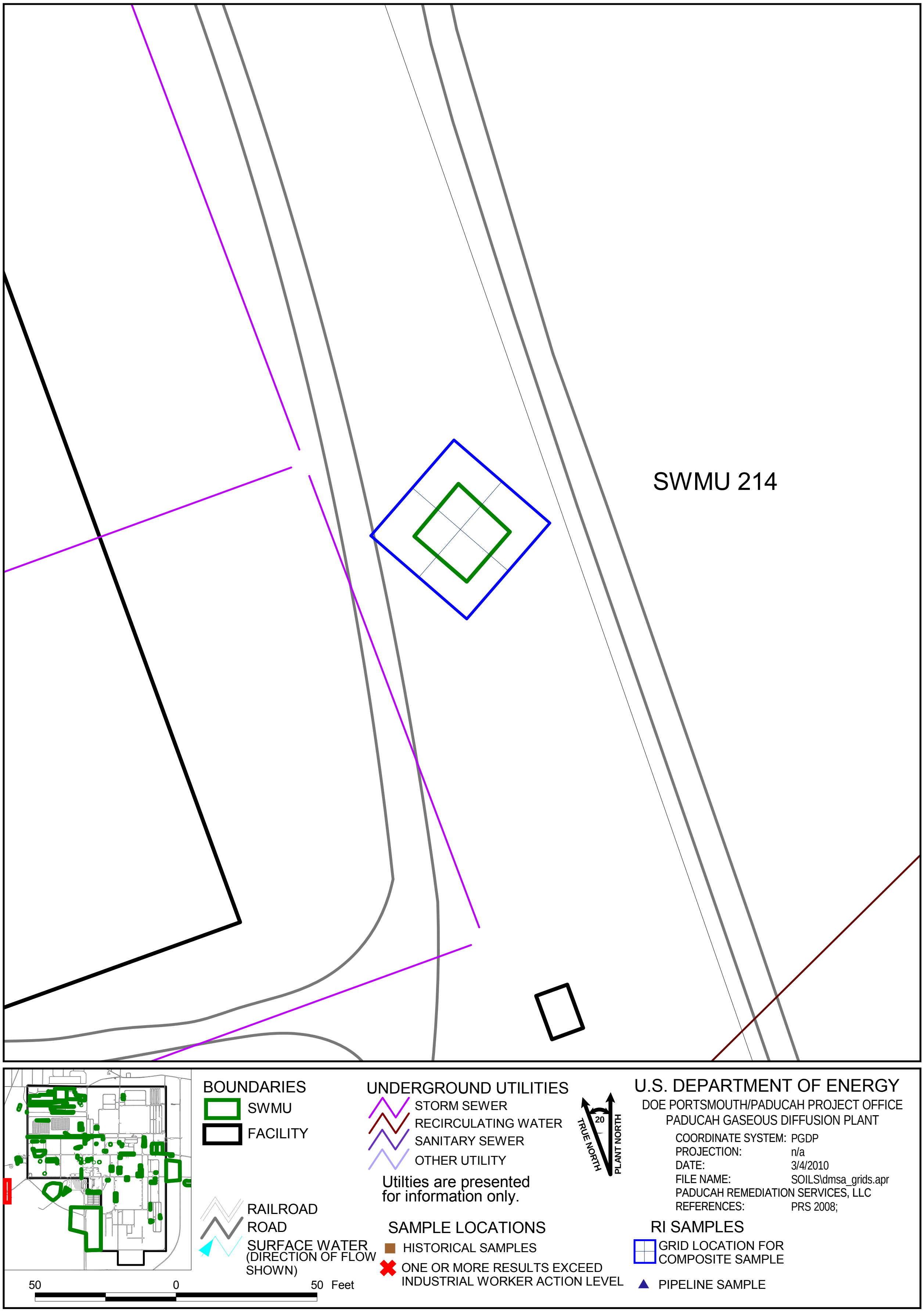

Figure 9.13. SOU RI Samples for SWMU 214

SWMU 215

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.14 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

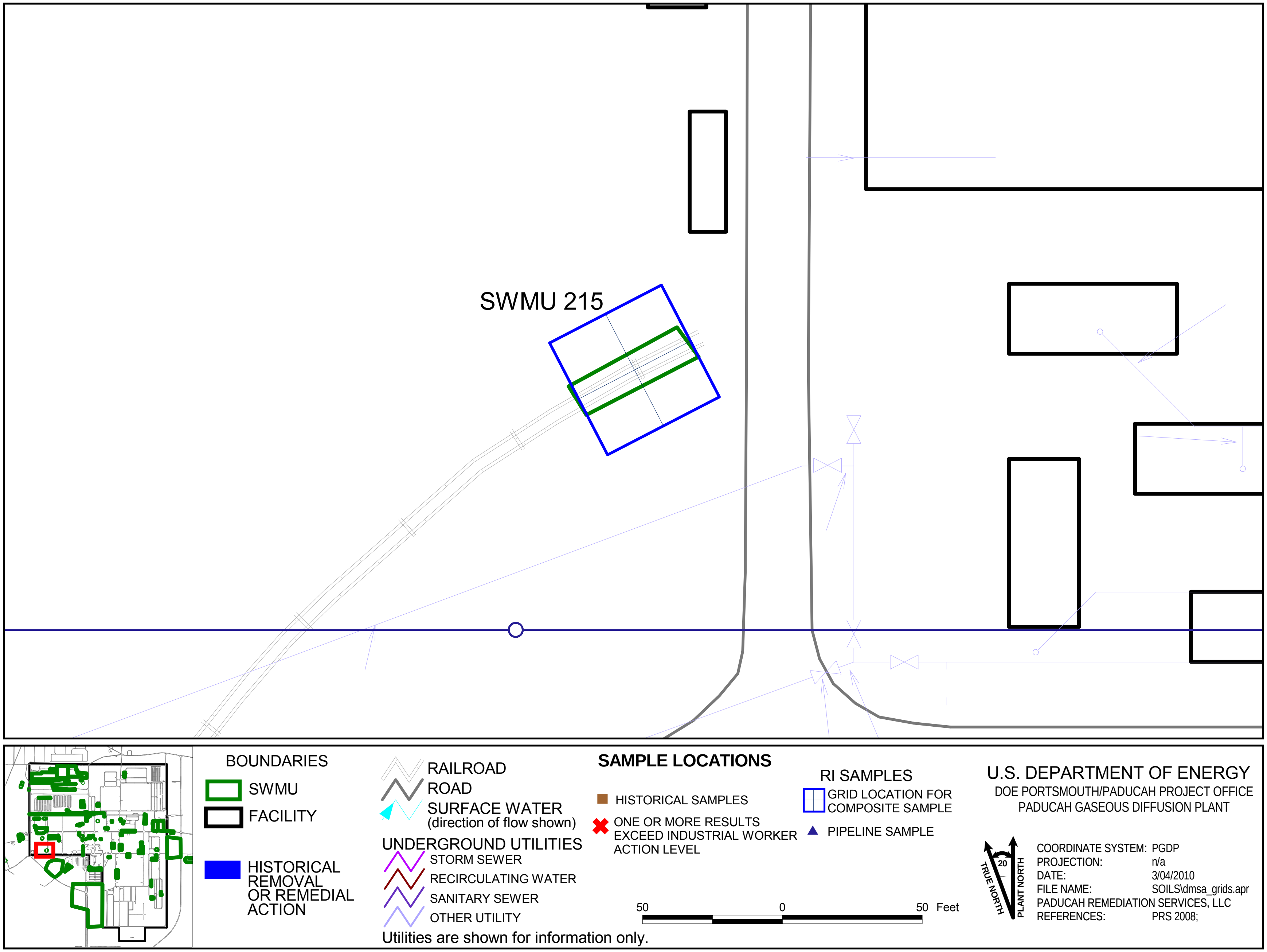

Figure 9.14. SOU RI Samples for SWMU 215

SWMU 216

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.15 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

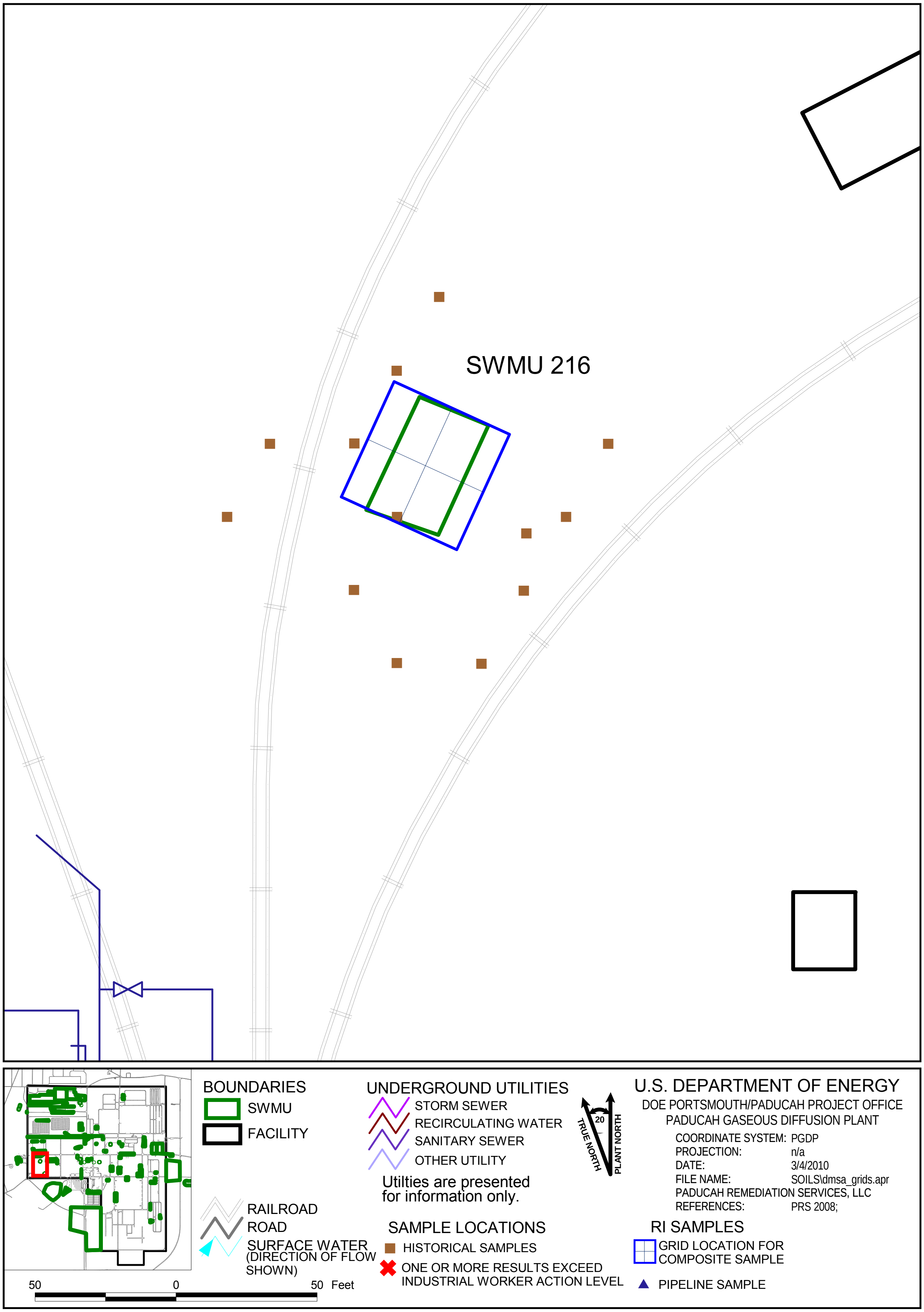

Figure 9.15. SOU RI Samples for SWMU 216

SWMU 217

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.16 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 18 grid sample locations for both surface and subsurface planned for the unit; two of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

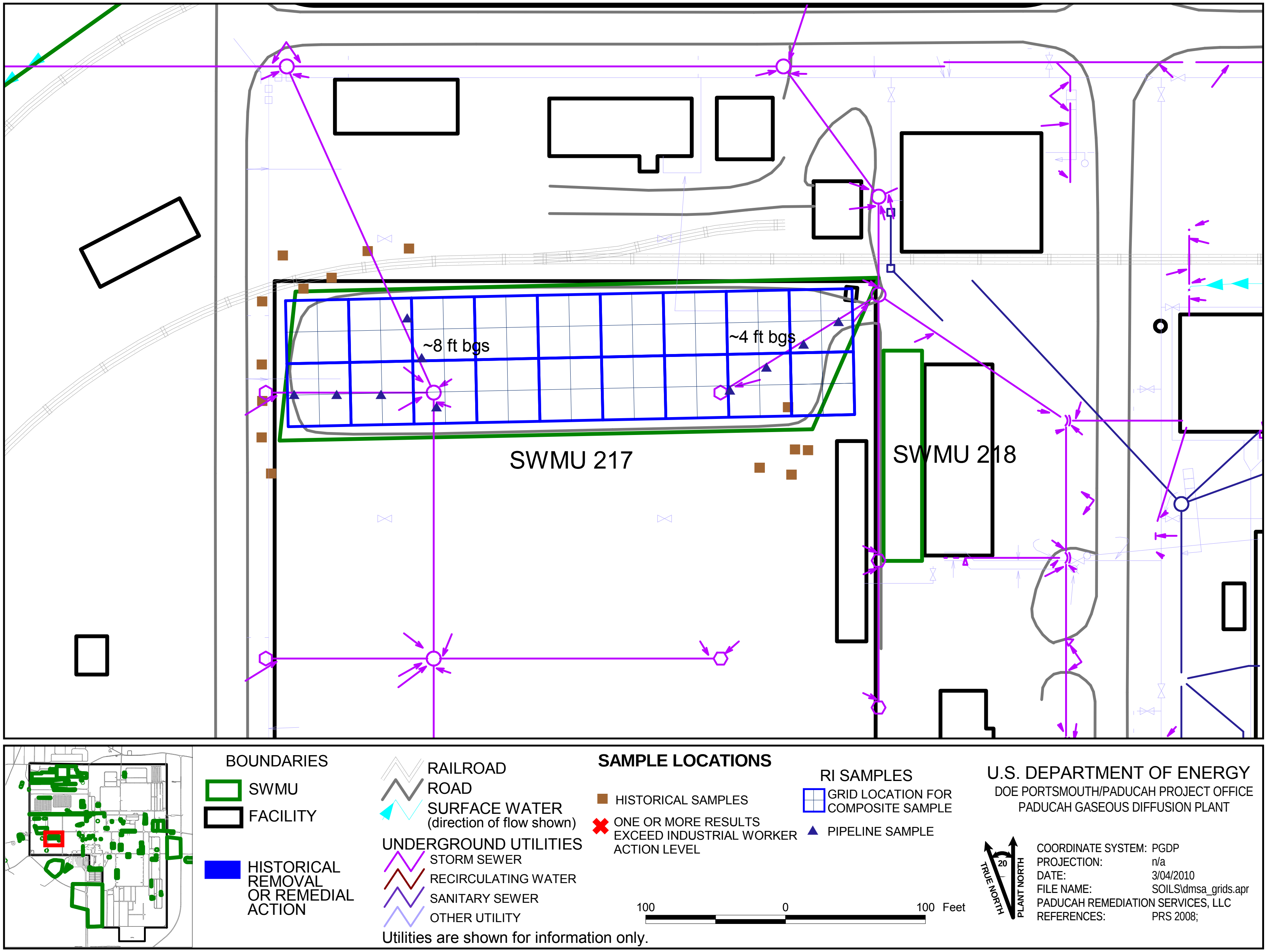

Figure 9.16. SOU RI Samples for SWMU 217

SWMU 218

SWMU 218 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 220

SWMU 220 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 221

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.17 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

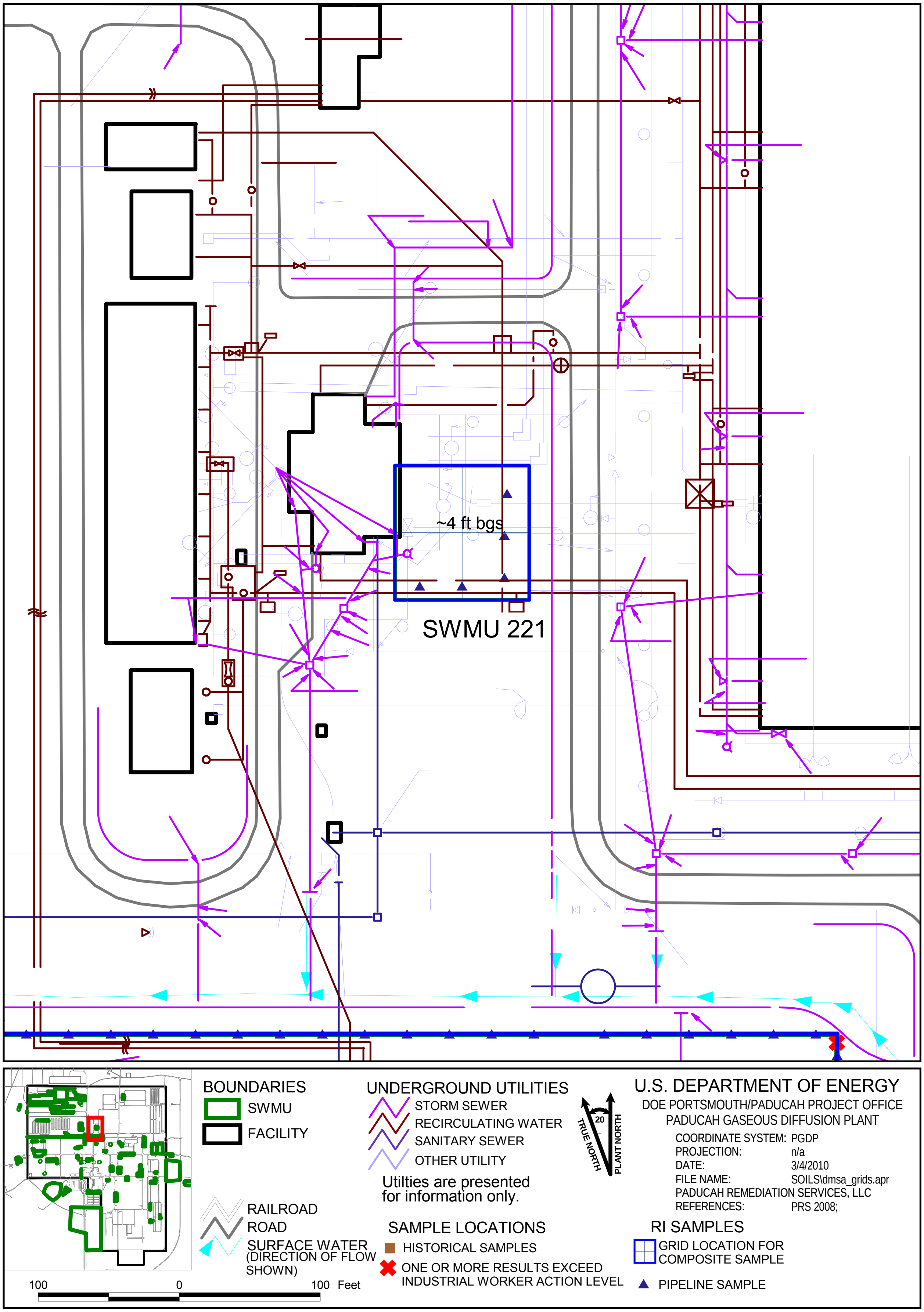

Figure 9.17. SOU RI Samples for SWMU 221

SWMU 222

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.18 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

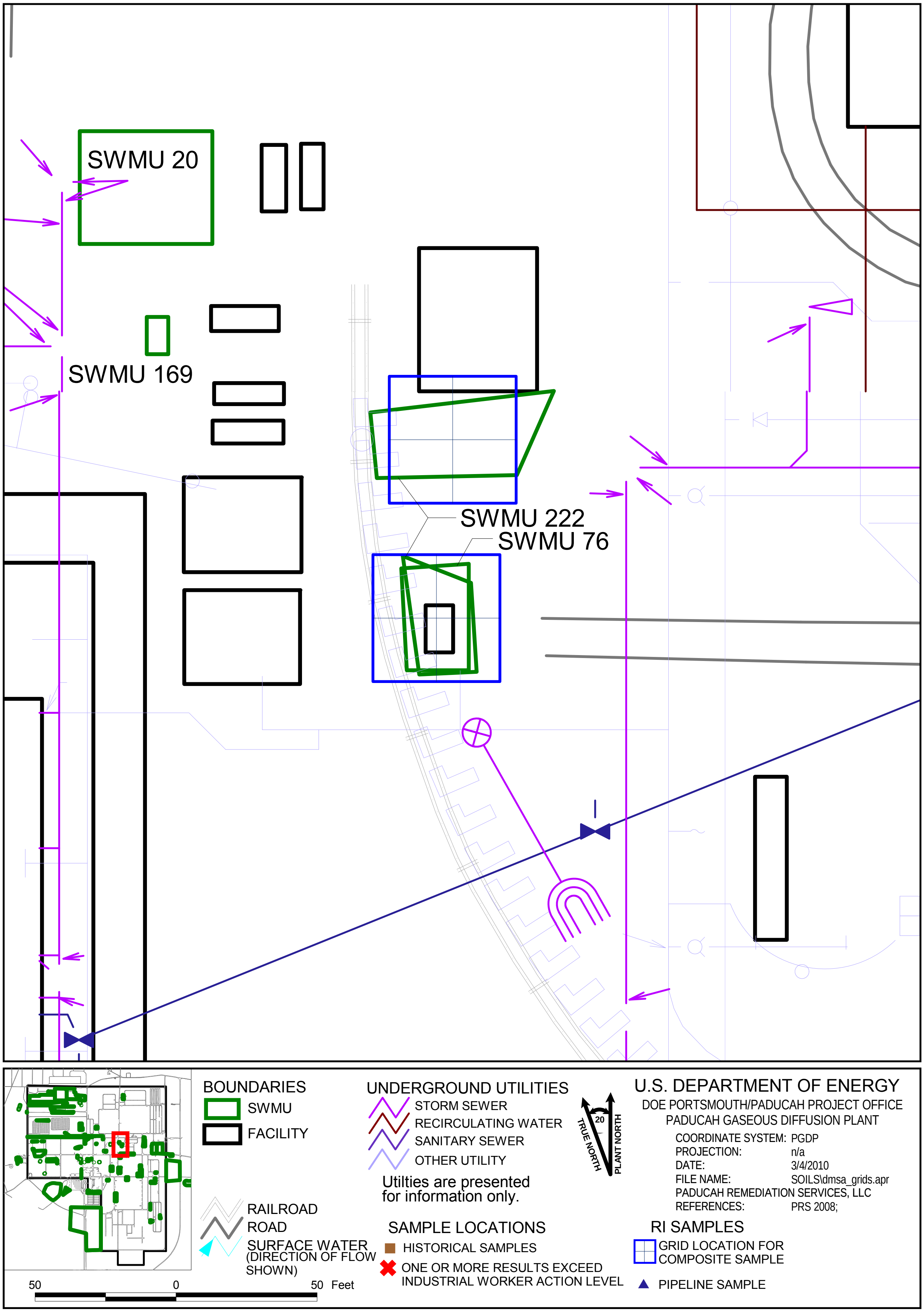

Figure 9.18. SOU RI Samples for SWMU 222

SWMU 223

SWMU 223 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 224

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.19 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

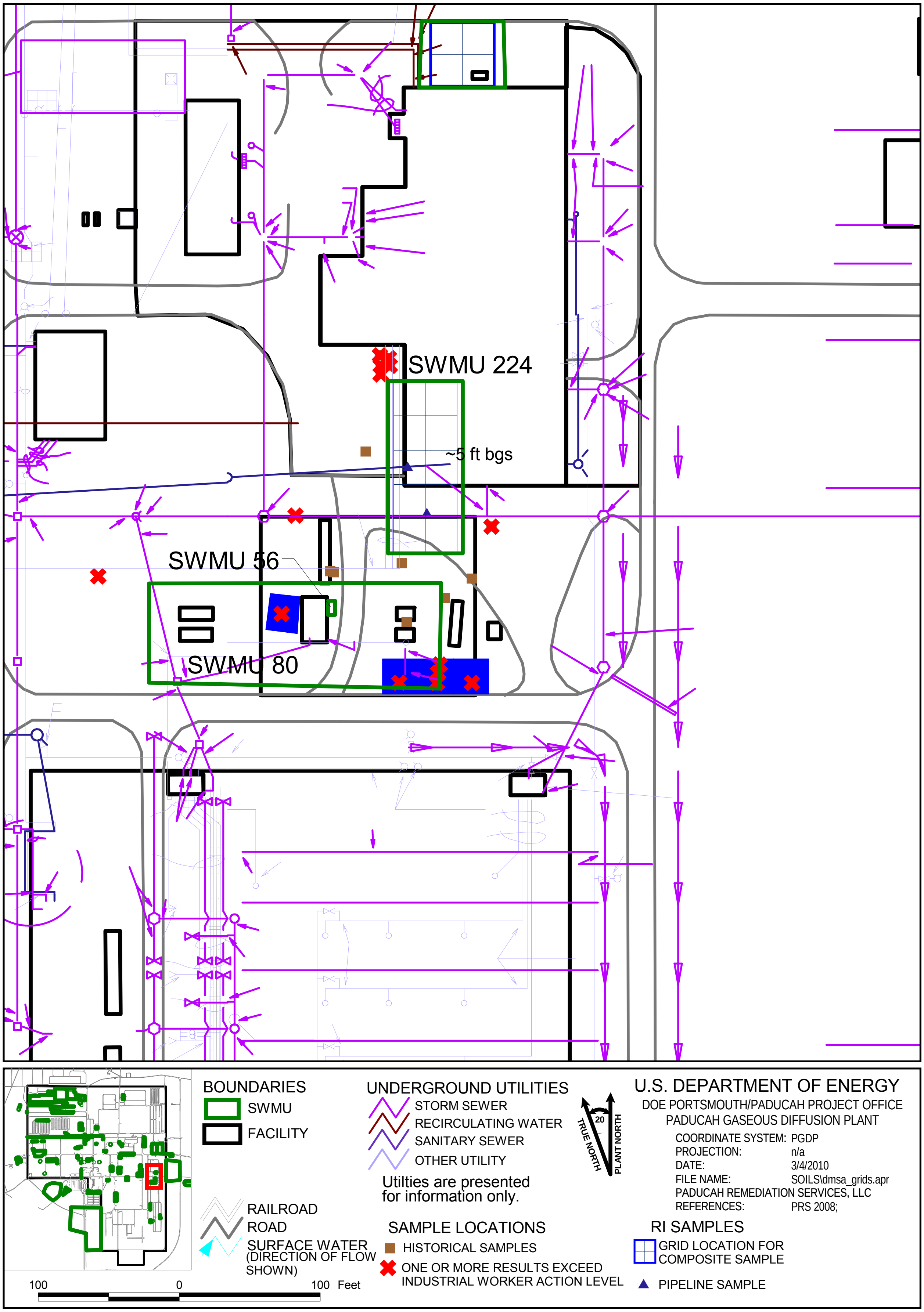

Figure 9.19. SOU RI Samples for SWMU 224

SWMU 225

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.20 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate. The grid sampling for this SWMU deviates from the originally planned five-point composite. The five-point composite grid for this SWMU is laid in a straight line along the length of the SWMU.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One five-point composite sample for the surface only is planned for the unit; additionally, that sample will be submitted for fixed-base laboratory analysis.

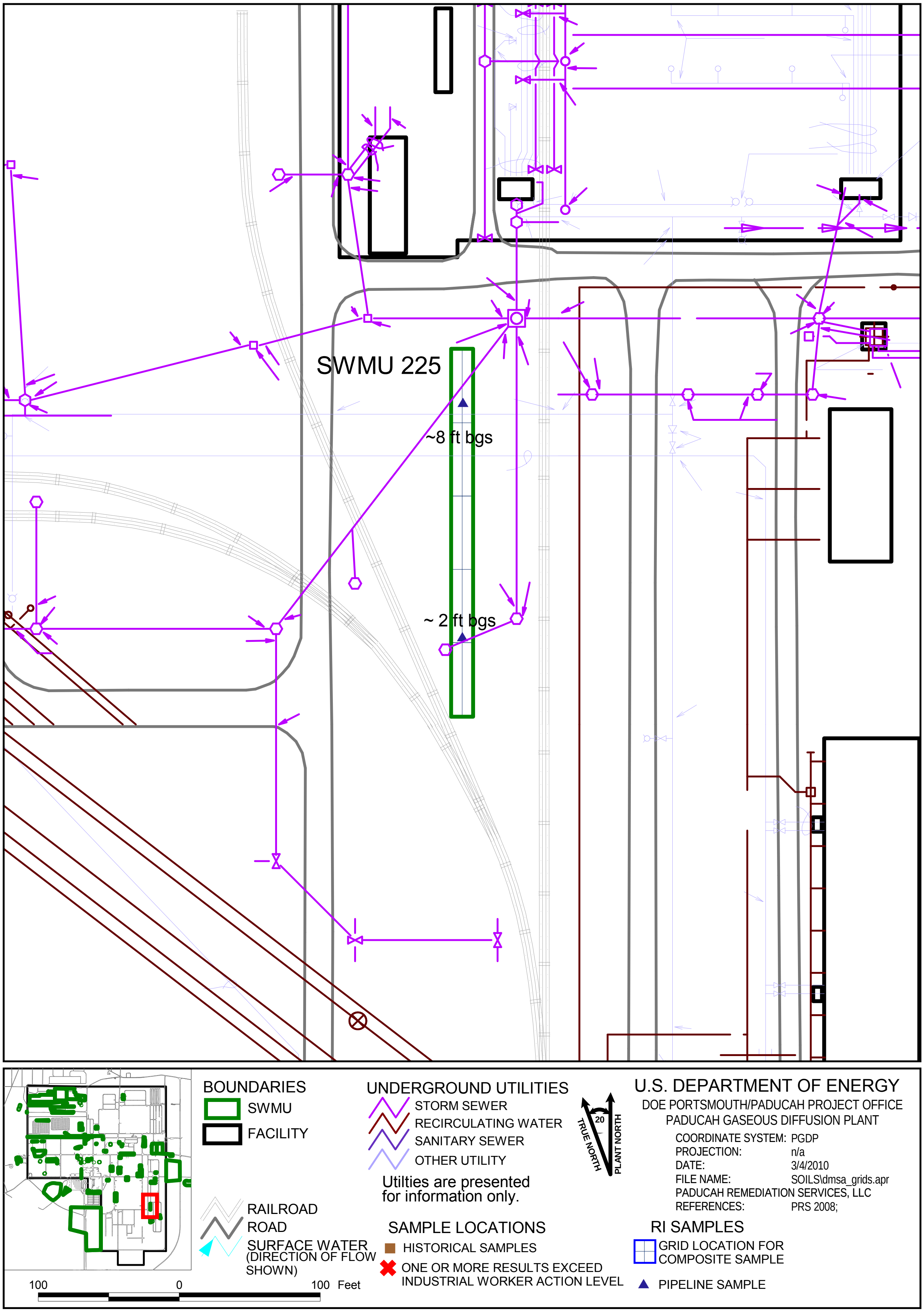

Figure 9.20. SOU RI Samples for SWMU 225

SWMU 226

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.21 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 11 grid sample locations for both surface and subsurface planned for the unit; one of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

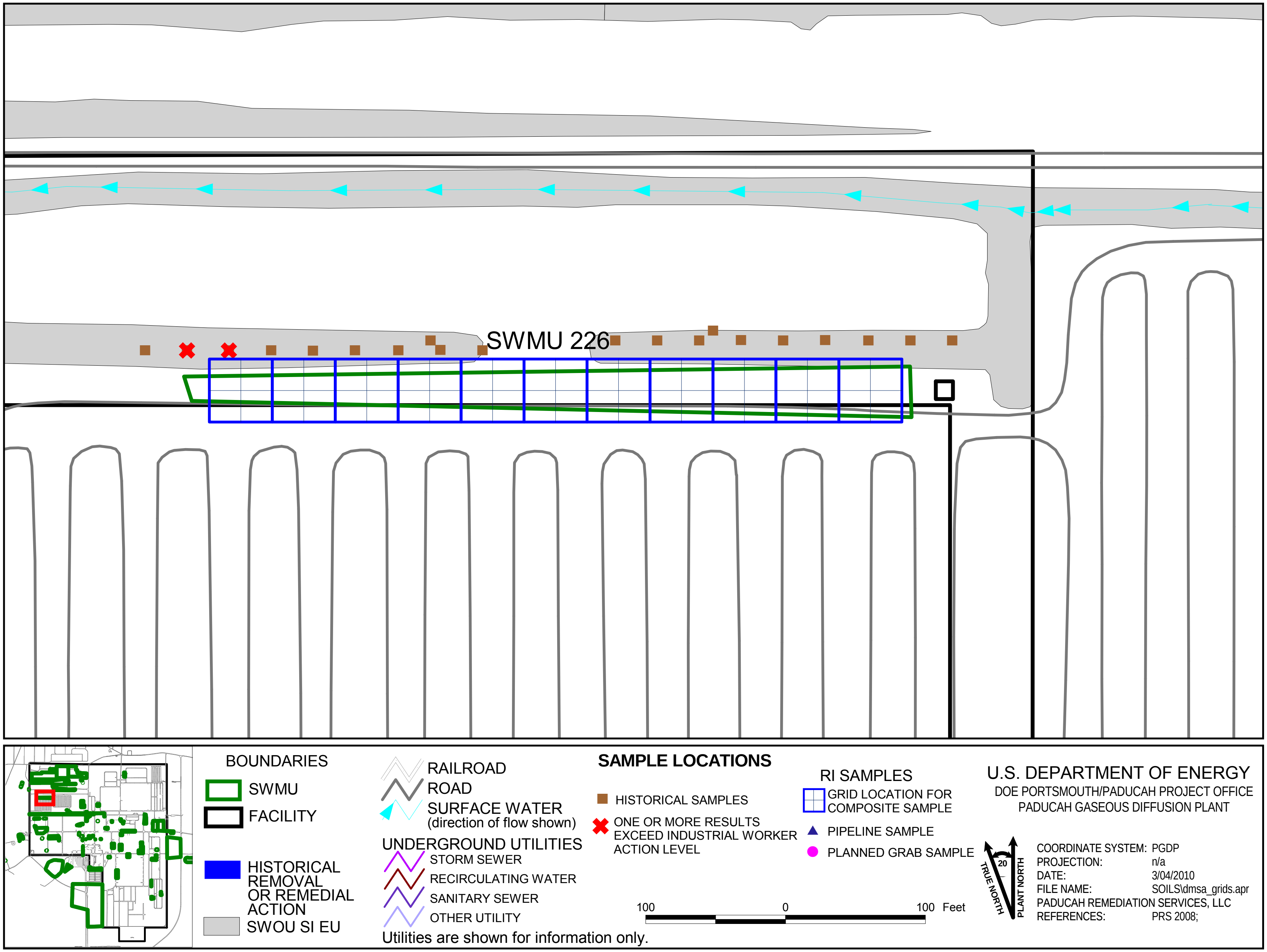

Figure 9.21. SOU RI Samples for SWMU 226

SWMU 227

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.22 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 27 grid sample locations for both surface and subsurface planned for the unit; two of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

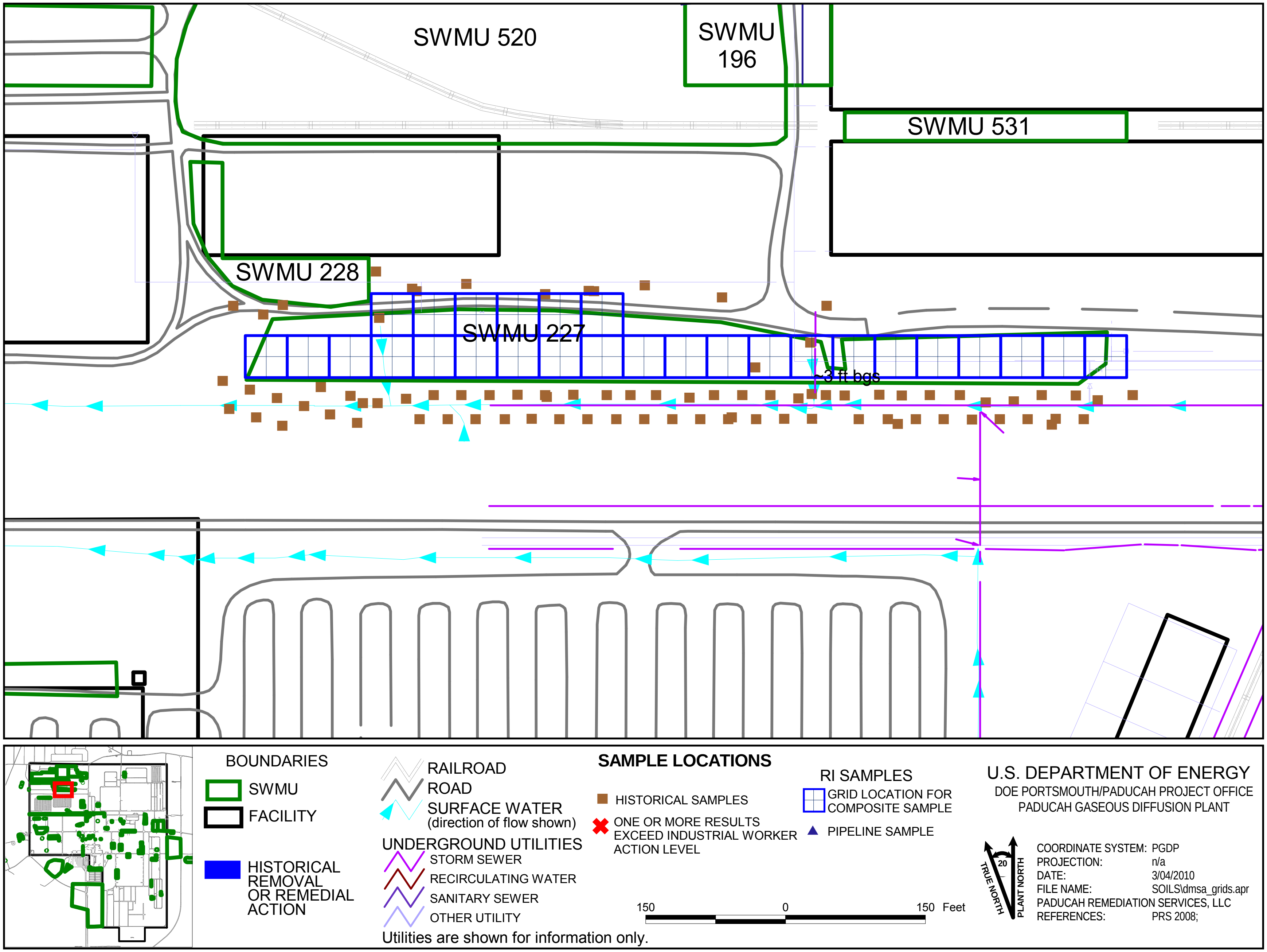

Figure 9.22. SOU RI Samples for SWMU 227

SWMU 228

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.23 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are five grid sample locations for both surface and subsurface planned for the unit; one of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

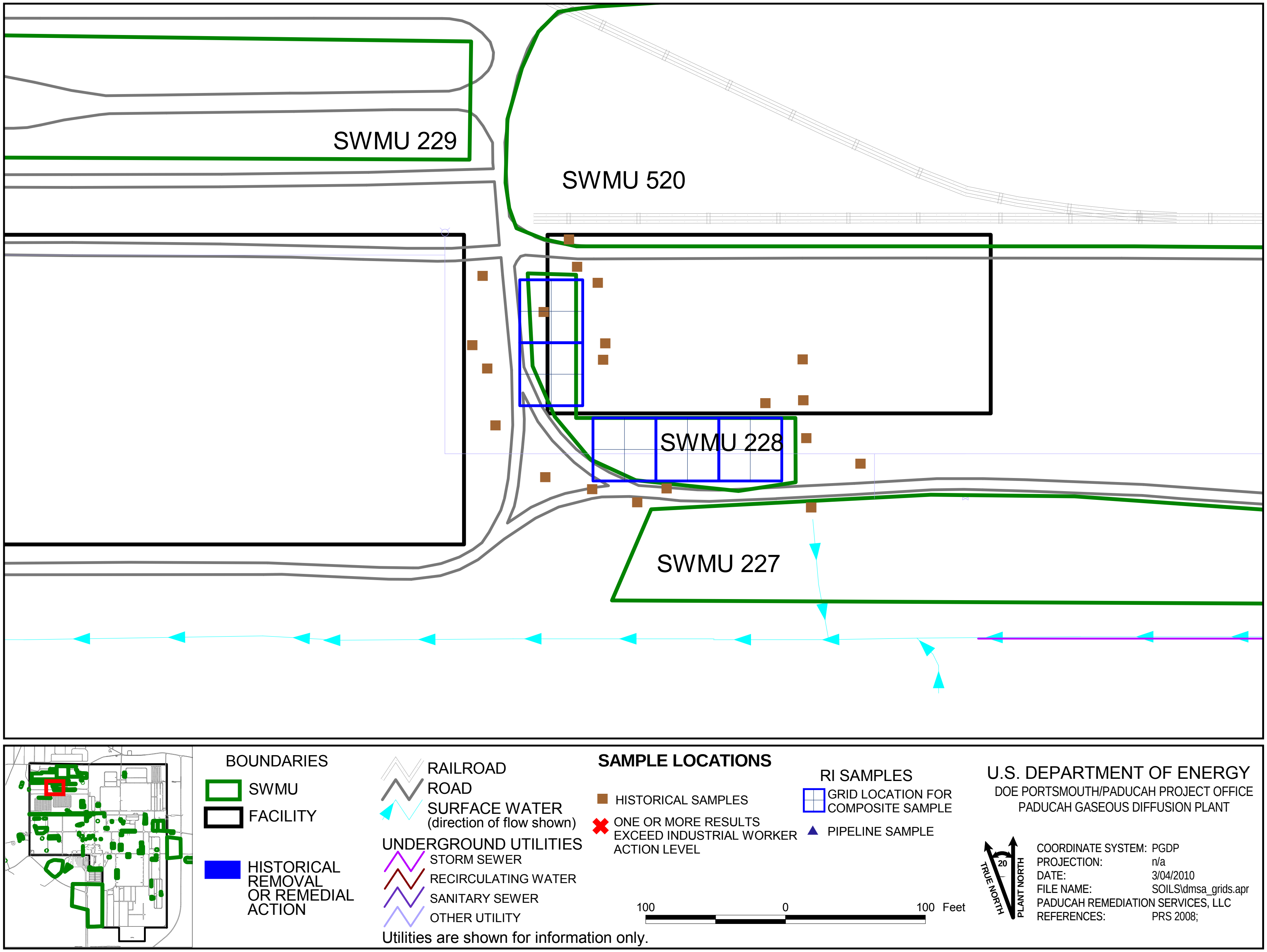

Figure 9.23. SOU RI Samples for SWMU 228

SWMU 229

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.24 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 18 grid sample locations for both surface and subsurface planned for the unit; two of these in each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

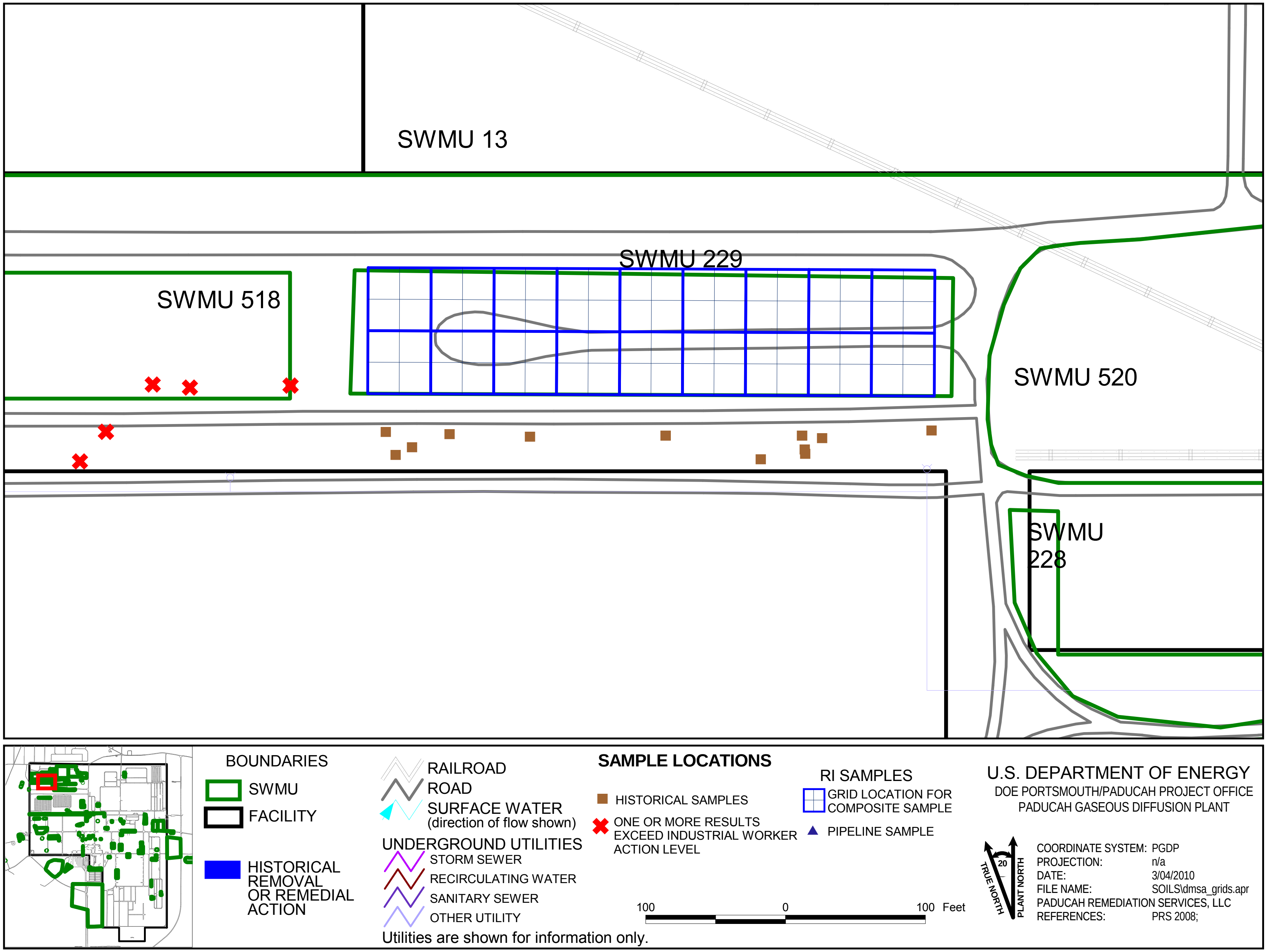

Figure 9.24. SOU RI Samples for SWMU 229

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9.3.1.3 Underground/Tank Group

The units and areas comprising the Underground/Tank are listed below. These SWMUs are part of Group 2 for data submission.

SWMU	Location	Description
11	C-400 (SE)	C-400 TCE Leak Site, SE of C-400 building
26	C-400 to C-404	4" Underground Transfer Line, 1500' long
27	C-722	Acid Neutralization Tank
31	C-720	Compressor Pit Water Storage Tank
32	C-720	2 (C-728) Clean Waste Oil Tanks (removed)
40	C-403	Neutralization Tank
76	C-632-B	Sulfuric Acid Storage Tank
77	C-634-B	Sulfuric Acid Storage Tank
165	C-616-L	Pipeline and Vault Soil Contamination
170	C-729	Acetylene Building Drain Pits

SWMUs 11, 27, 31, 32, 40, 77, 165, and 170 will not be sampled.

SWMUs 31 and 32 both have a concrete surface; therefore, a RAD evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected at each SWMU. These SWMUs will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 77 has a concrete surface and may be holding water; therefore, a water sample will be taken and characterized for disposal, then the water removed. Then a rad evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMUs 11, 27, 165, and 170 have been previously investigated and have enough data to proceed to a FS.

SWMU 40 is part of the SOU Inactive Facilities and is listed for a removal action.

The locations are displayed below in Figures 9.25 and 9.26. Section 9.3 provides information on sampling depths.

SWMU 11

Based on previous investigations, additional sampling is not needed to support the scope of this project. The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

SWMU 26

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.25 shows a map of the sampling locations with utilities overlaid and any sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. There are 64 subsurface grab sample locations planned for the unit; six of these will be randomly selected and submitted for fixed-base laboratory analysis.

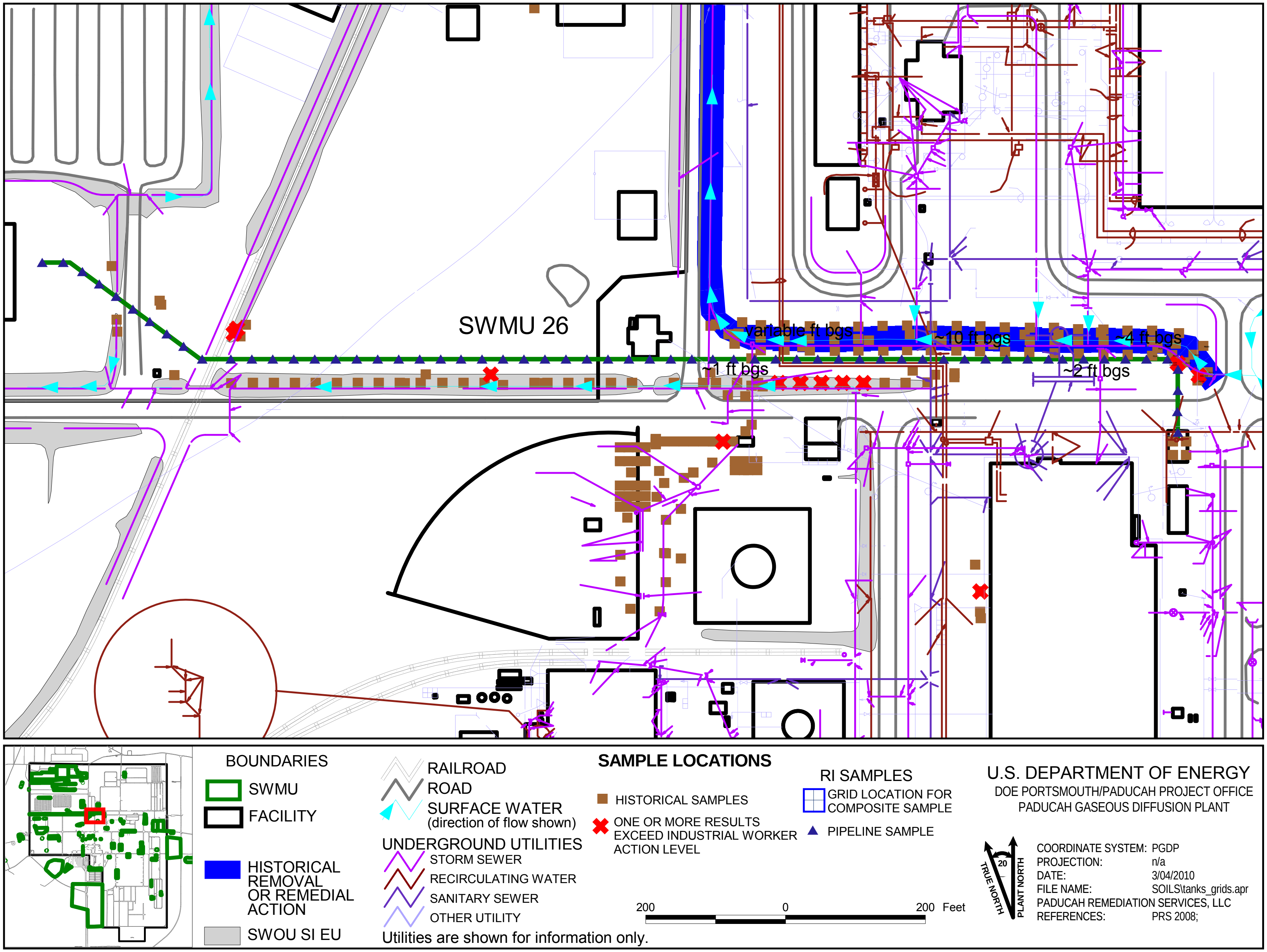

Figure 9.25. SOU RI Samples for SWMU 26

SWMU 27

Based on previous investigations, additional sampling is not needed to support the scope of this project. This SWMU was investigated and results proposing an NFA were presented in the SE for WAGs 9 and 11. The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

SWMU 31

SWMU 31 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be collected or areas of gravel/grass exist adjacent to the concrete pad, then a soil sample will be collected at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 32

SWMU 32 has a concrete surface;, therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be collected, then a soil sample will be collected at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 40

SWMU 40 is part of the Soils OU Inactive Facilities Removal Action; therefore, no additional samples are required during this investigation (Soils OU RI). Samples will be collected at SWMU 40 after the removal action (by Inactive Facilities Removal Action). The results of these samples will be evaluated to determine if contamination has been removed or if further remediation is needed.

Due to an active 30-inch water line, which is critical to plant operations, the removal action for SWMU 40 will occur when the water line no longer is required for plant operations. According to a DOE Memorandum entitled, "Change in Schedule for the C-403 Neutralization Tank [Solid Waste Management Unit 40] of the Soil Operable Unit Inactive Facilities Non-Time-Critical Removal Action at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky," PPPO-02-113-10 (DOE 2009d).

SWMU 76

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.26 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

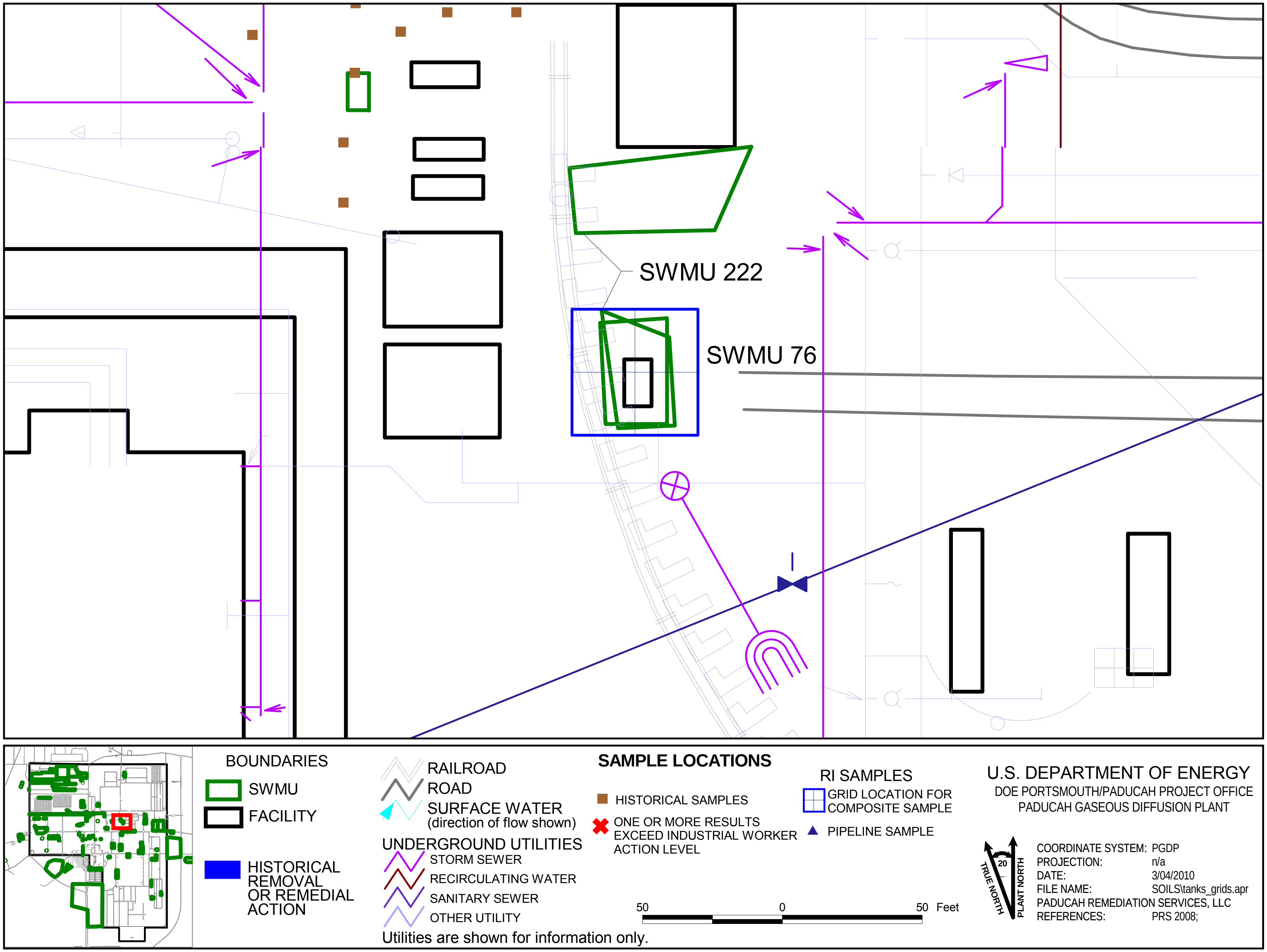

Figure 9.26. SOU RI Samples for SWMU 76

SWMU 77

SWMU 77 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be collected, then a soil sample will be collected at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 165

Based on previous investigations, additional sampling is not needed to support the scope of this project. This SWMU has been characterized and the summary of the findings are presented in the SE for WAGs 9 and 11.

SWMU 170

Based on previous investigations, additional sampling is not needed to support the scope of this project. This SWMU has been characterized and the summary of the findings are presented in the SE for WAGs 9 and 11.

9.3.1.4 Chromium Area Group

The following are the units and areas comprising the chromium spill grouping.

SWMU	Location	Description
158	C-720	Chilled Water System Leak Site
169	C-410-E	HF Vent Surge Protection Tank
176	C-331	RCW Leak NW Side
177	C-331	Leak East Side

The locations are displayed below in Figures 9.27 through 9.30. Section 9.3 provides information on sampling depths.

SWMU 158

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.27 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate. The grid sampling for this SWMU deviates from the originally planned five-point composite. The five-point composite grid for this SWMU is laid in a straight line along the length of the SWMU. Additionally, samples from this grid will not be composited, but submitted individually for analysis. Five grid sample locations for both surface and subsurface are planned for the unit, which will result in 25 grab samples for collection. Additionally, three samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

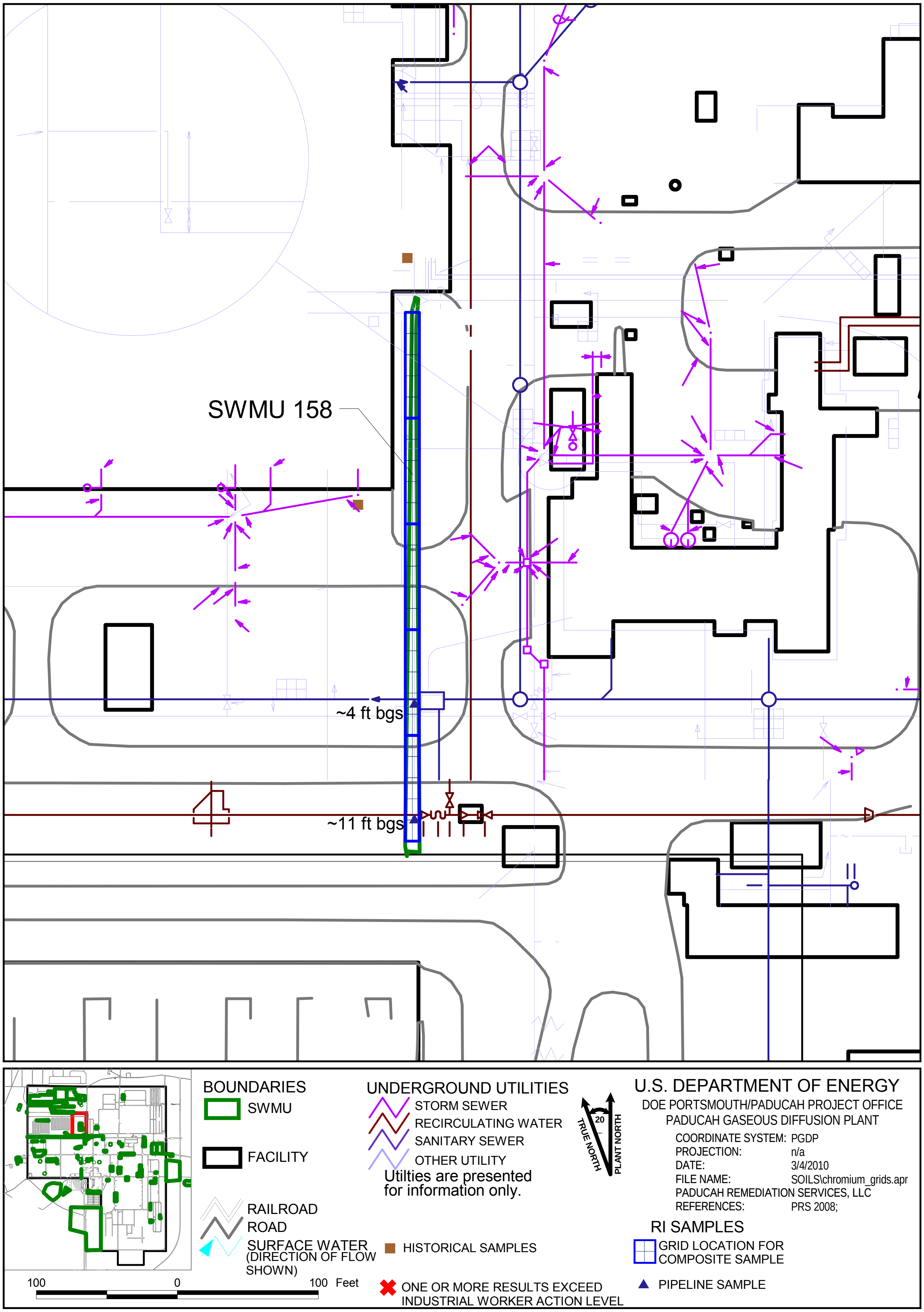

Figure 9.27. SOU RI Samples for SWMU 158

SWMU 169

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.28 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

Samples from this grid will not be composited, but submitted individually for analysis. One grid sample location for both surface and subsurface is planned for the unit, which will result in five grab samples for collection. One sample from each horizon additionally will be randomly selected and submitted for fixed-base laboratory analysis.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

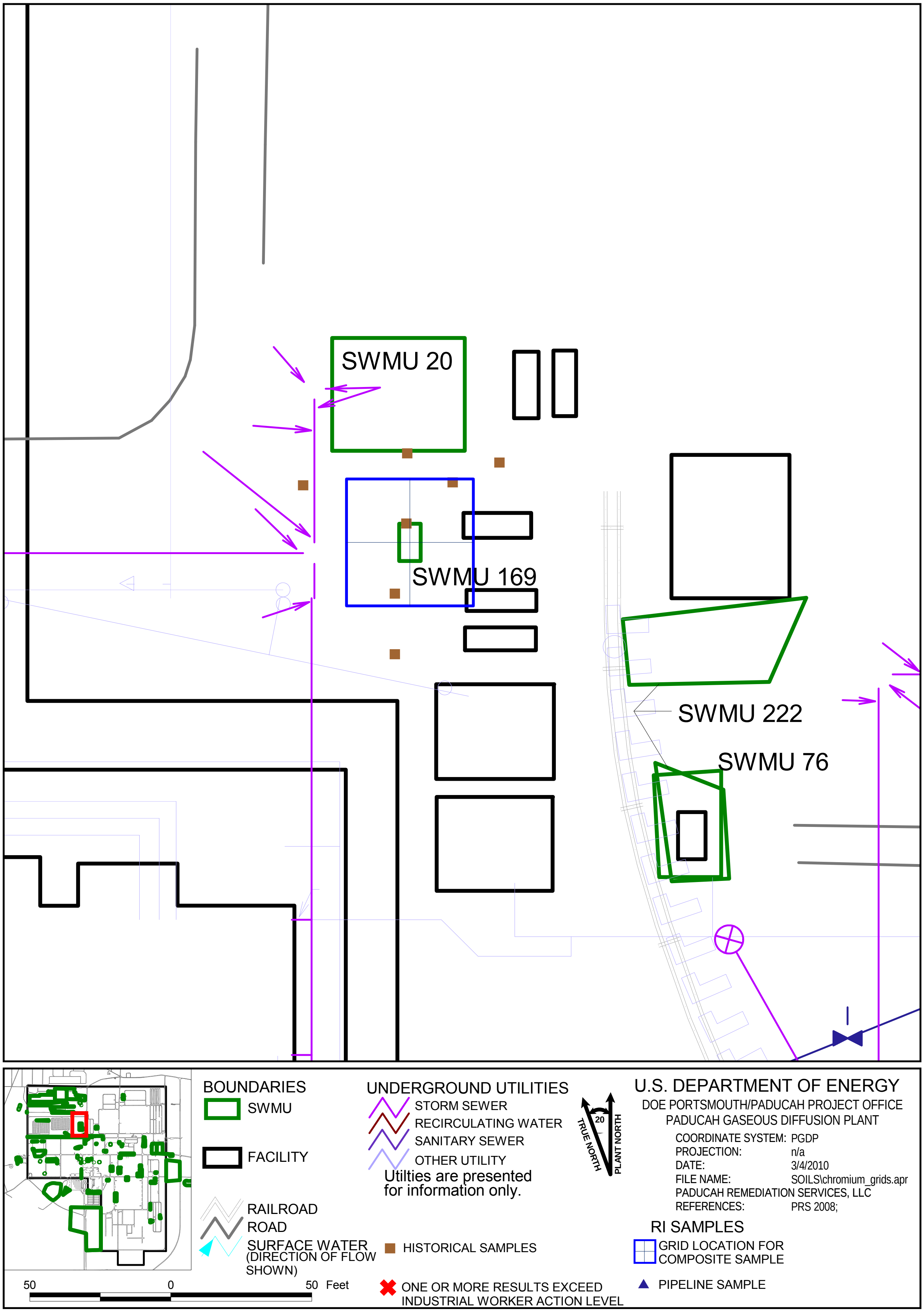

Figure 9.28. SOU RI Samples for SWMU 169

SWMU 176

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.29 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

Samples from this grid will not be composited, but submitted individually for analysis. Four grid sample locations for both surface and subsurface are planned for the unit, which will result in 20 grab samples for collection. Two samples from each horizon additionally will be randomly selected and submitted for fixed-base laboratory analysis.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

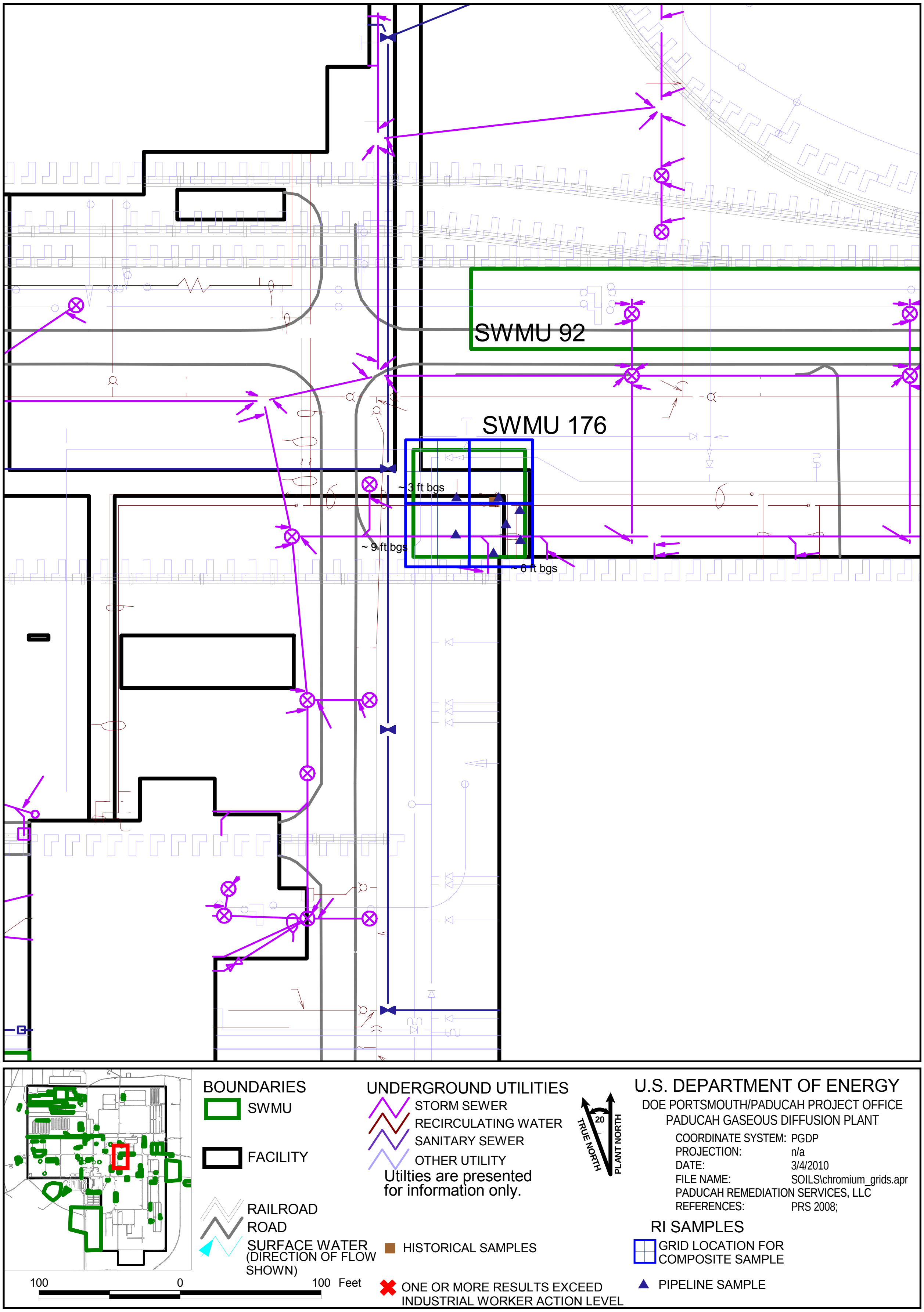

Figure 9.29. SOU RI Samples for SWMU 176

SWMU 177

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.30 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

Samples from this grid will not be composited, but submitted individually for analysis. Four grid sample locations for both surface and subsurface are planned for the unit, which will result in 20 grab samples for collection. Two samples from each horizon additionally will be randomly selected and submitted for fixed-base laboratory analysis.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded.

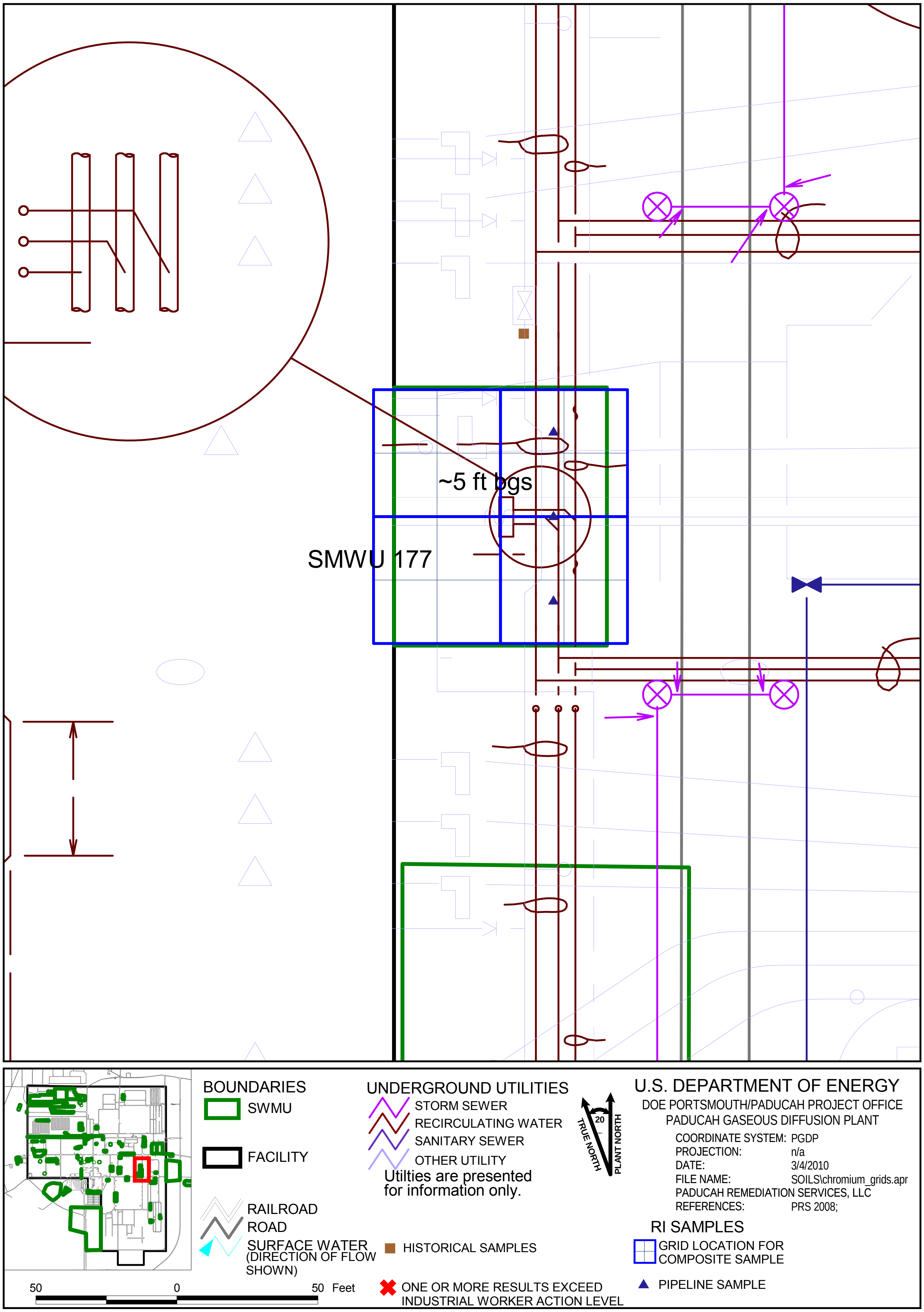

Figure 9.30. SOU RI Samples for SWMU 177

9.3.1.5 Soil/Rubble Pile

The following are the units and areas comprising the soil and rubble piles grouping.

SWMU/ AOC	Location	Description
19	C-410-B	HF Emergency Lagoon
20	C-410-E	Emergency Lagoon
138	C-100	Southside Berm
180	WKWMA	Outdoor Firing Range
181	West Side	PGDP Security Force Firing Range
195	SW PGDP	Curlee Road Contaminated Soil Mounds
204	Dykes Road	Historical Staging Area, WAG 28
486	West of PGDP	Rubble Pile WKWMA
487	West of PGDP	Rubble Pile WKWMA
492	Outfall 011	Contaminated Soil Area
493	Outfall 001	Concrete Rubble Piles
517	West of PGDP	Rubble and debris, erosion control fill area
541	Outfall 011	Contaminated Soil Area
561	East of PGDP	Soil Pile I
562	North of Soil Pile I, West of LBC	Soil Piles D, H and J in Subunit 1
563	North of Outfall 12, West of LBC	Soil Piles 20 and BW in Subunit 4
564	East of NSDD, North of P, S, and T Landfill	Soils Pile AT in Subunit 5
565	North of C-611 WTP	Along Bayou Creek north of C-611 Water Treatment Plant. Rubble Area K-19
567	Near Outfall 013 and west of LBC	Contaminated Soil Area K013

SWMUs/AOCs 19, 20, 181, 204, 486, 487, 492, 541, 561, 562, 563, 564, 565, and 567 will not be sampled.

SWMUs 19 and 181 are part of the SOU Inactive Facilities and are listed for a removal action.

SWMU 20 has a concrete surface; therefore, a RAD evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected at each SWMU. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMUs/AOCs 204, 492, 541, 561, 562, 563, 564, 565, and 567 have been previously investigated and have enough data to proceed to a FS. Radiological walkovers are proposed for these units to more fully address the extent of surface radiological contamination, if present, and a biased sample will be taken as described in the Section 9.

The locations are displayed below in Figures 9.31 through 9.35. Section 9.3 provides information on sampling depths.

SWMU 19

SWMU 19 is part of the Soils OU Inactive Facilities Removal Action and therefore no additional samples are required during this investigation. Samples will be collected at SWMU 19 after the removal action. The results of these samples will be evaluated to determine if contamination has been removed or if further remediation is needed.

SWMU 20

SWMU 20 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 138

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.31 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Twenty-four grid sample locations for both surface and subsurface are planned for the unit; additionally, two samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

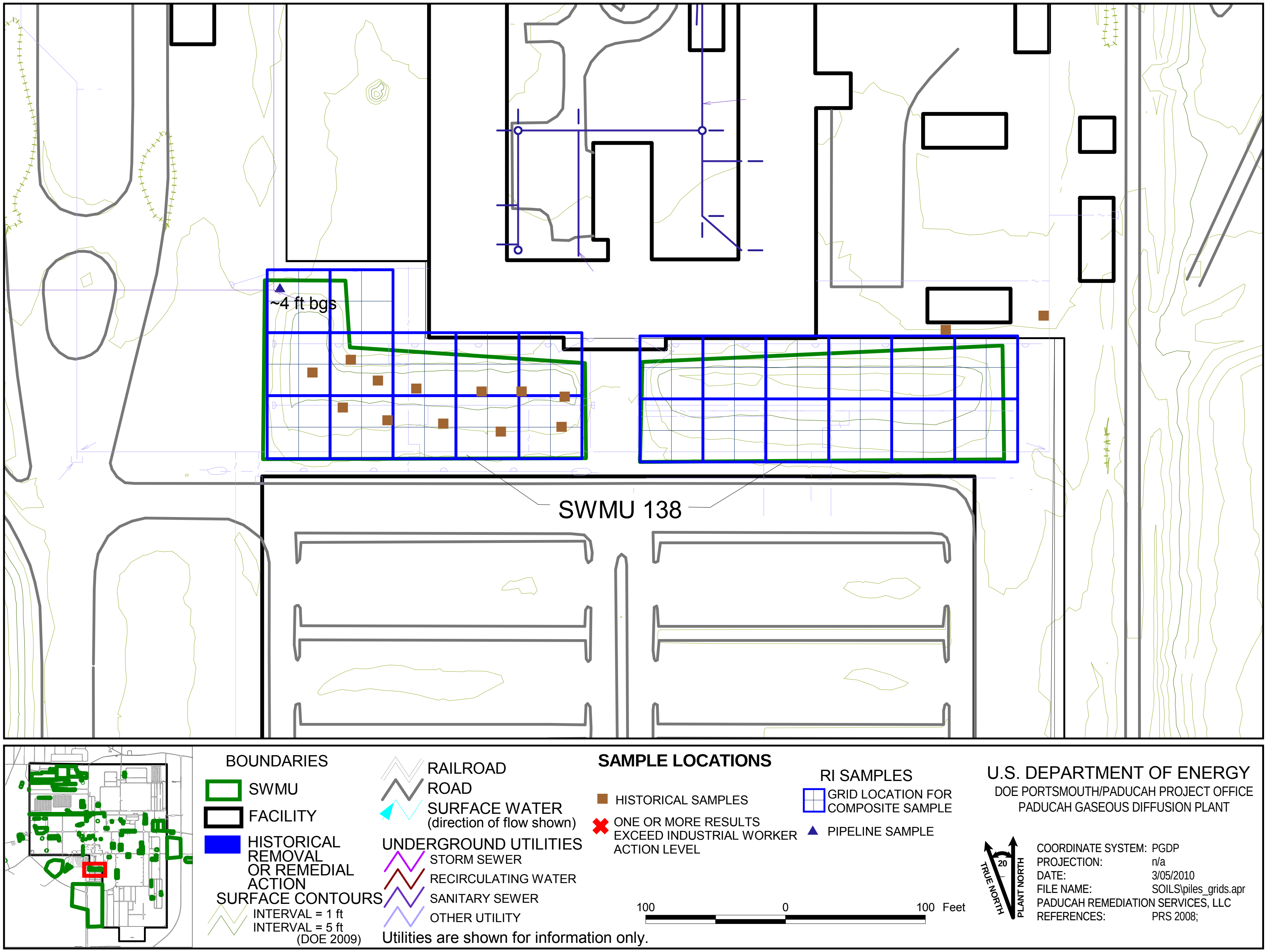

Figure 9.31. SOU RI Samples for SWMU 138

SWMU 180

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.32 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Forty-six grid sample locations for both surface and subsurface are planned for the unit; additionally, four samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

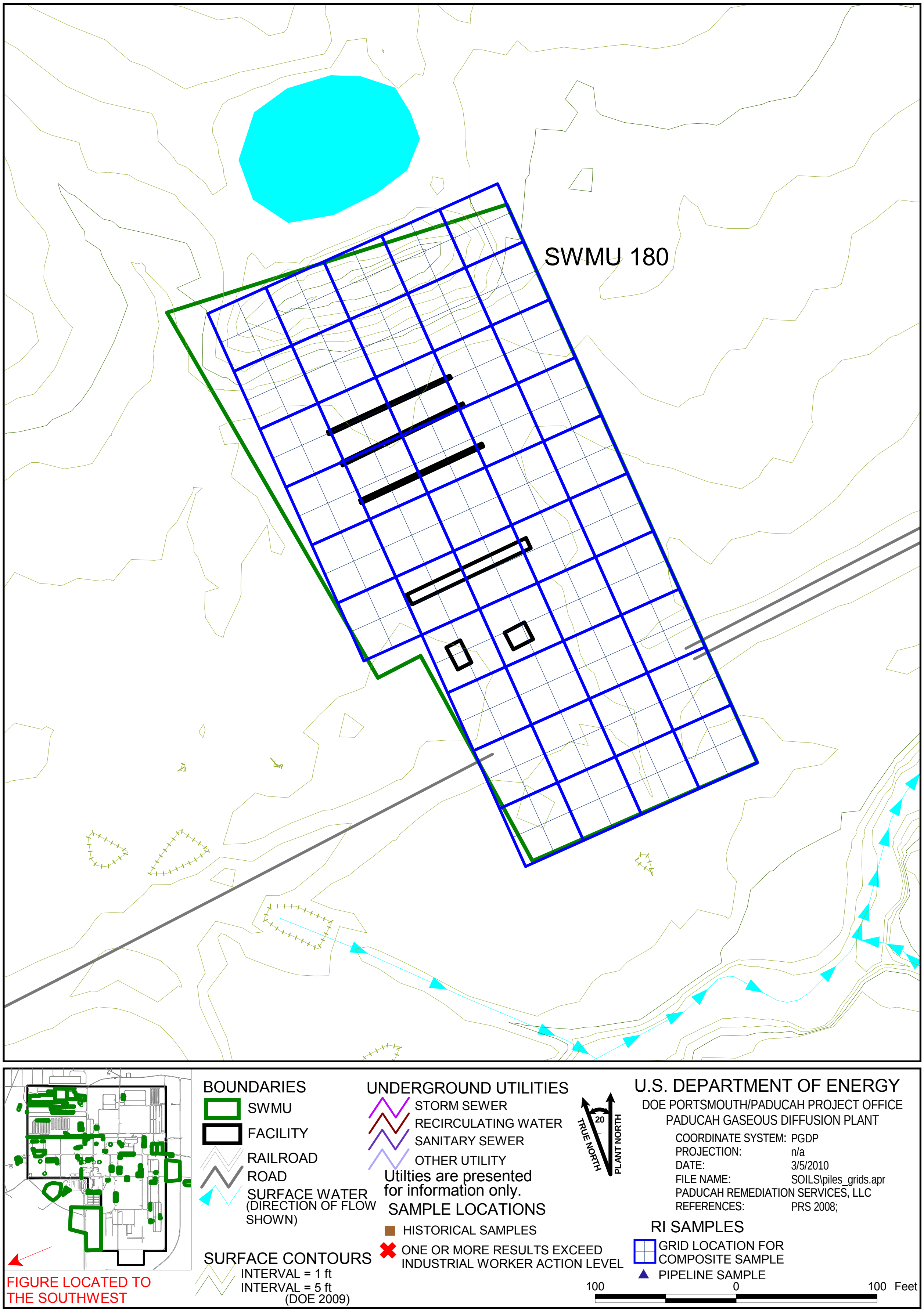

Figure 9.32. SOU RI Samples for SWMU 180

SWMU 181

SWMU 181 is part of the Soils OU Inactive Facilities Removal Action and therefore no additional samples are required during this investigation. Samples were collected at SWMU 181 after the removal action. The results of these confirmatory samples will be documented in the RI Report.

SWMU 195

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.33 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two hundred nine grid sample locations for both surface and subsurface are planned for the unit. Fifteen surface samples and 18 subsurface samples additionally will be randomly selected and submitted for fixed-base laboratory analysis.

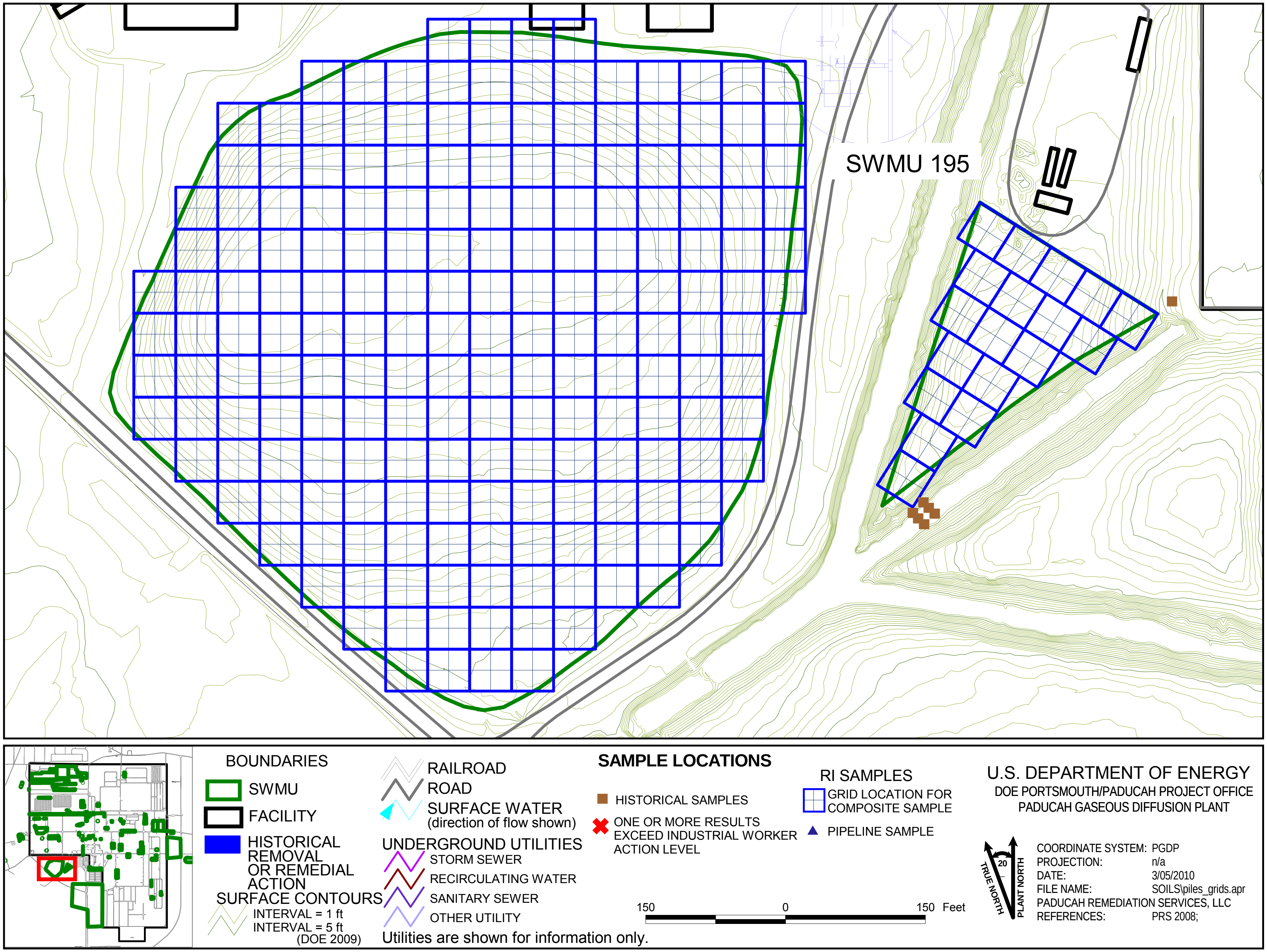

Figure 9.33. SOU RI Samples for SWMU 195

AOC 204

Based on previous investigations, additional sampling is not needed to support the scope of this project.

SWMU 486

Additional sampling is not needed to support the scope of this project.

SWMU 487

Additional sampling is not needed to support the scope of this project.

AOC 492

Based on previous investigations, additional sampling is not needed to support the scope of this project. This AOC has been characterized and the summary of the findings are presented in the *Addendum I-B to the Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant*, DOE/LX/07-0015/B.

SWMU 493

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.34 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

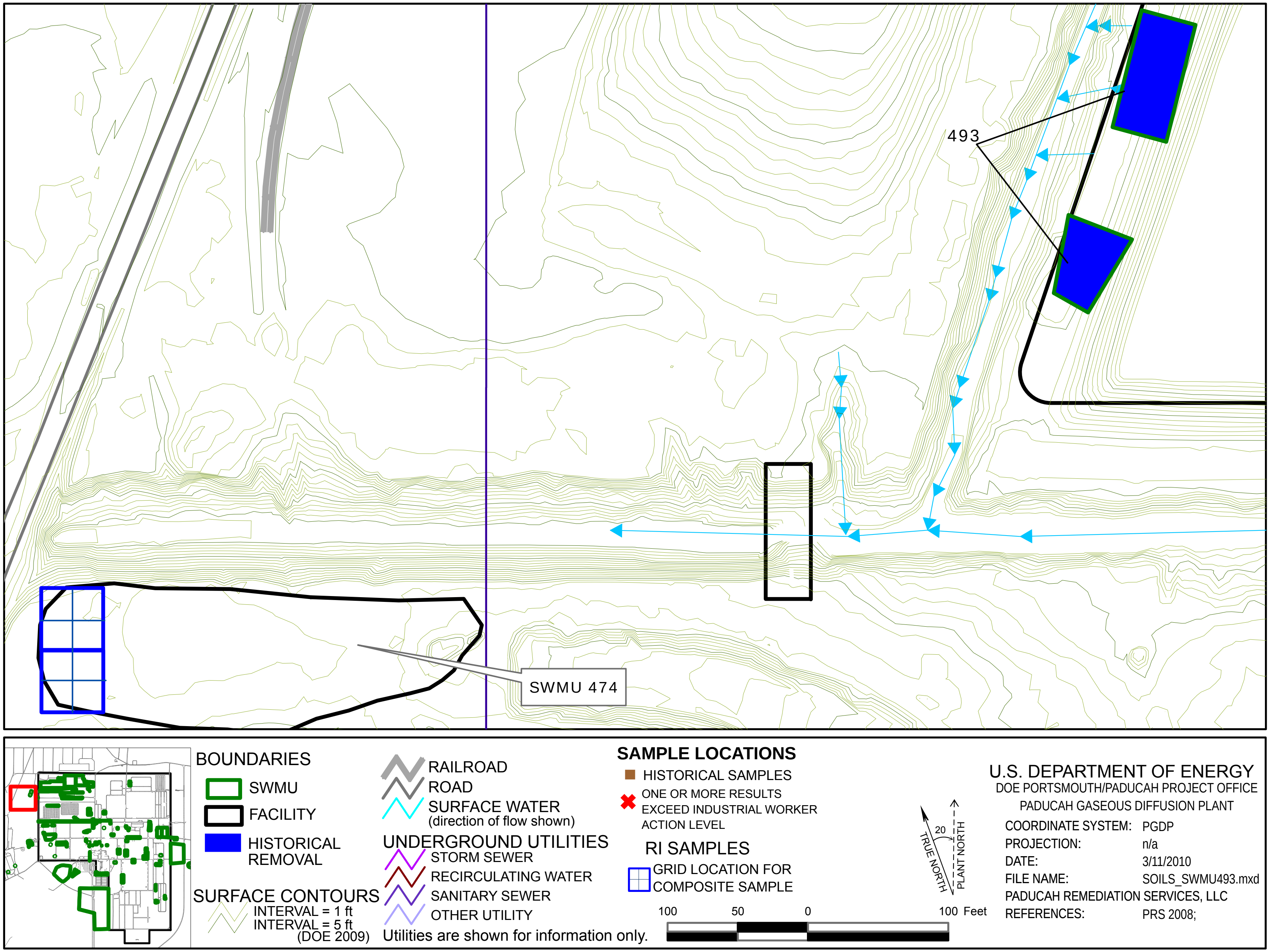

Figure 9.34. SOU RI Samples for SWMU 493

SWMU 517

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.35 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

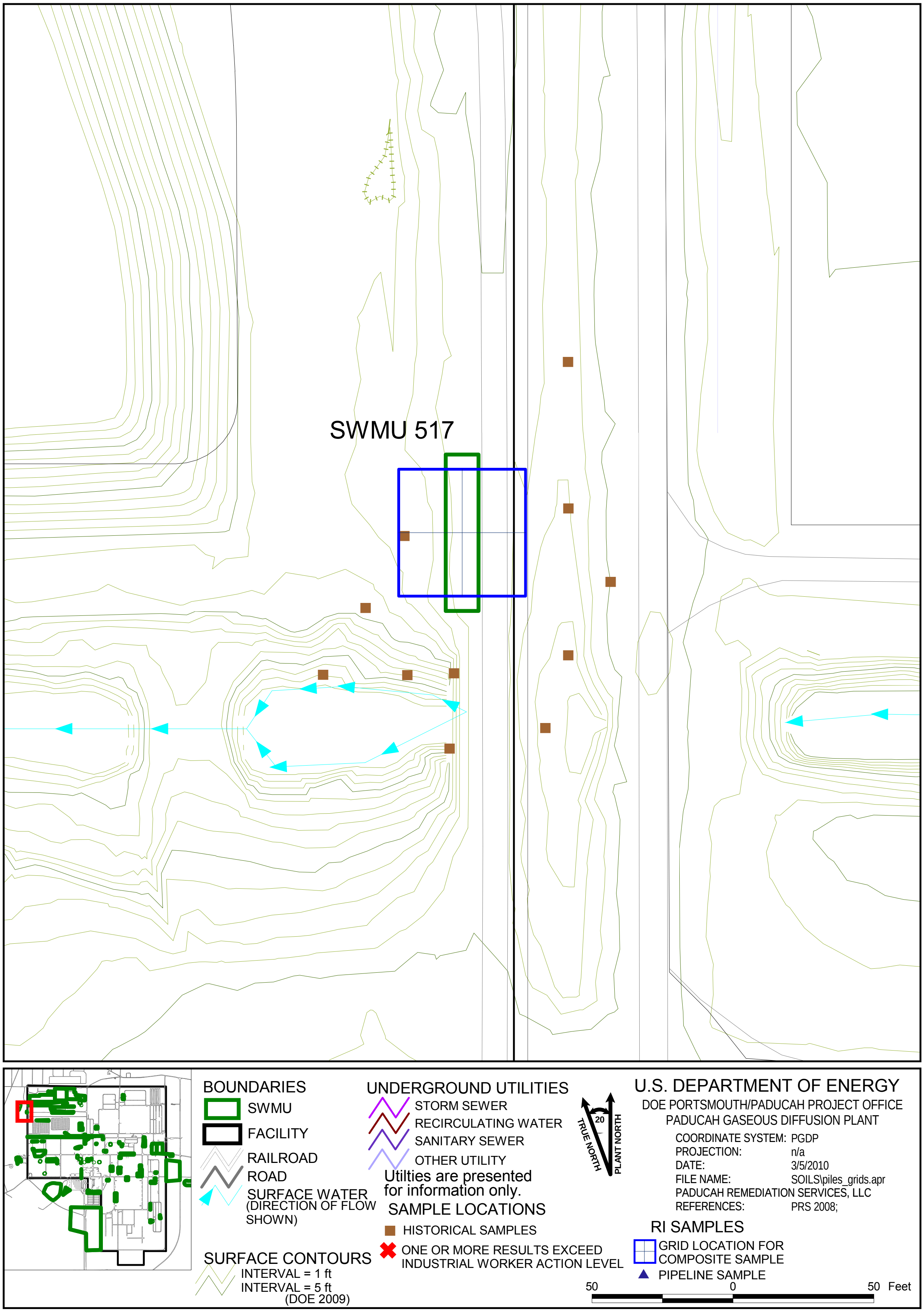

Figure 9.35. SOU RI Samples for SWMU 517

AOC 541

Based on previous investigations, additional sampling is not needed to support the scope of this project. This AOC was sampled in September 2002 and the samples collected meet the DQOs for this project.

SWMU 561

Based on previous investigations, additional sampling is not needed to support the scope of this project, existing samples meet the DQOs for this project. This SWMU has been characterized and the summary of the findings is presented in the *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2 (DOE 2008b).

AOC 562

Based on previous investigations, additional sampling is not needed to support the scope of this project; existing samples meet the DQOs for this project. This AOC has been characterized and the summary of the findings is presented in the *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1 (DOE 2009b).

AOC 563

Based on previous investigations, additional sampling is not needed to support the scope of this project, existing samples meet the DQOs for this project. This AOC has been characterized and the summary of the findings is presented in the *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1 (DOE 2009b).

AOC 564

Based on previous investigations, additional sampling is not needed to support the scope of this project, existing samples meet the DQOs for this project. This AOC has been characterized and the summary of the findings is presented in the *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1 (DOE 2009b).

AOC 565

Based on previous investigations, additional sampling is not needed to support the scope of this project. This AOC has been characterized, and the summary of the findings is presented in the *Site Evaluation Report for Rubble Area at the Paducah Gaseous Diffusion Plant,* DOE/LX/07-0227&D2/R1.

AOC 567

Based on previous investigations, additional sampling is not needed to support the scope of this project; existing samples meet the DQOs for this project. This AOC has been characterized, and the summary of the findings is presented in the *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1 (DOE 2009b).

9.3.1.6 Scrap Yards

The following are the units and areas comprising the scrap yards grouping.

SWMU	Location	Description
12	C-747-A	UF4 Drum Yard (Drum Mountain)
13	C-746-P&P1	P&P1 Scrap Yards
14	C-746-E	E Scrap Yard
15	C-746-C	C Scrap Yard
16	C-746-D	D Scrap Yard
518	C-746-P1	Field south of P1 yard
520	C-746-A	Scrap Material

The locations are displayed below in Figures 9.36 through 9.40. Section 9.3 provides information on sampling depths.

SWMUs 13 and 518 have previously been investigated and have enough data to proceed to a FS.

SWMU 12

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.36 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Fifteen grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

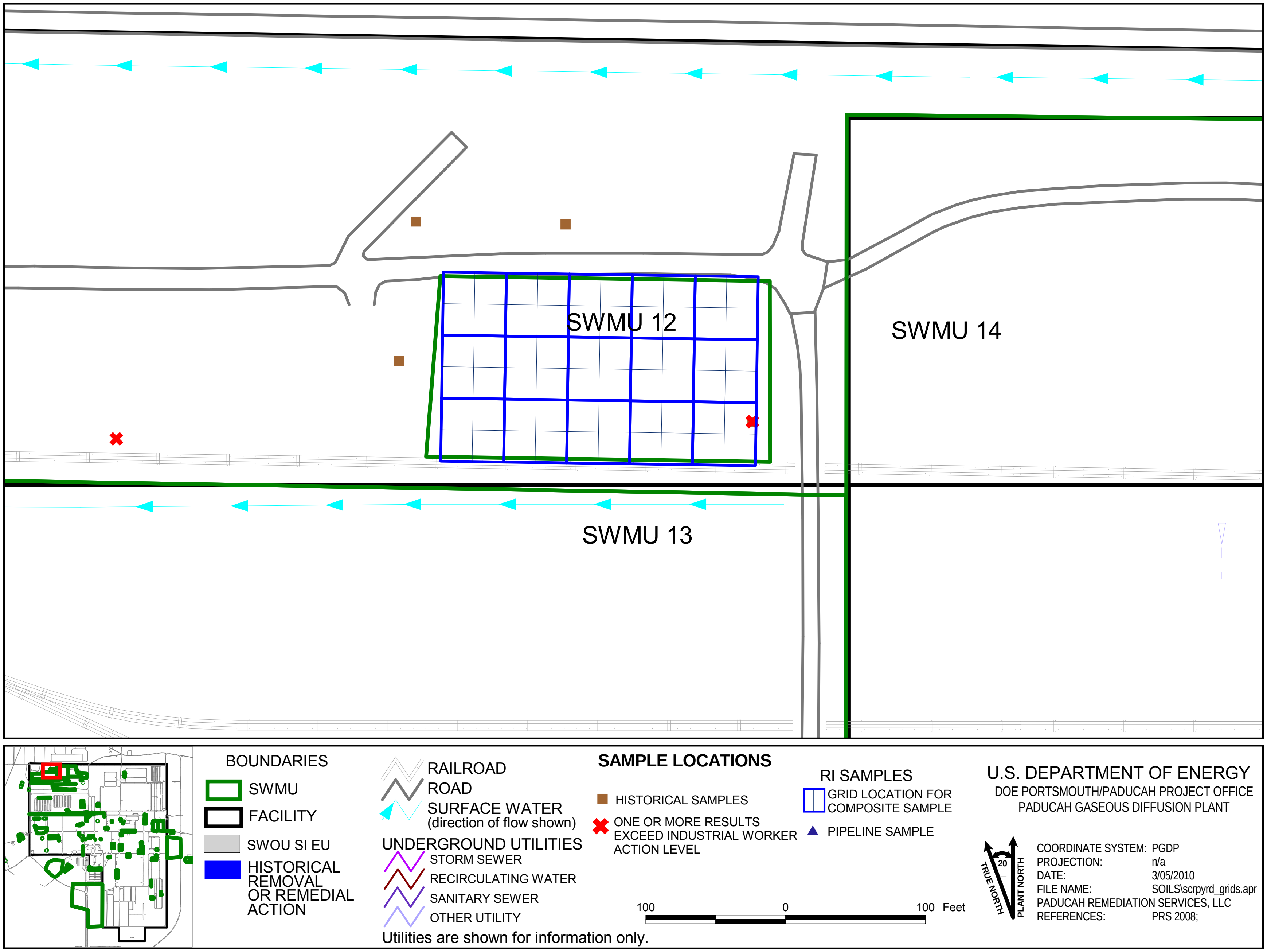

Figure 9.36. SOU RI Samples for SWMU 12

SWMU 13

Based on previous investigations, additional sampling is not needed to support the scope of this project.

SWMU 14

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.37 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One hundred twenty-one grid sample locations for both surface and subsurface are planned for the unit; additionally, 10 samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

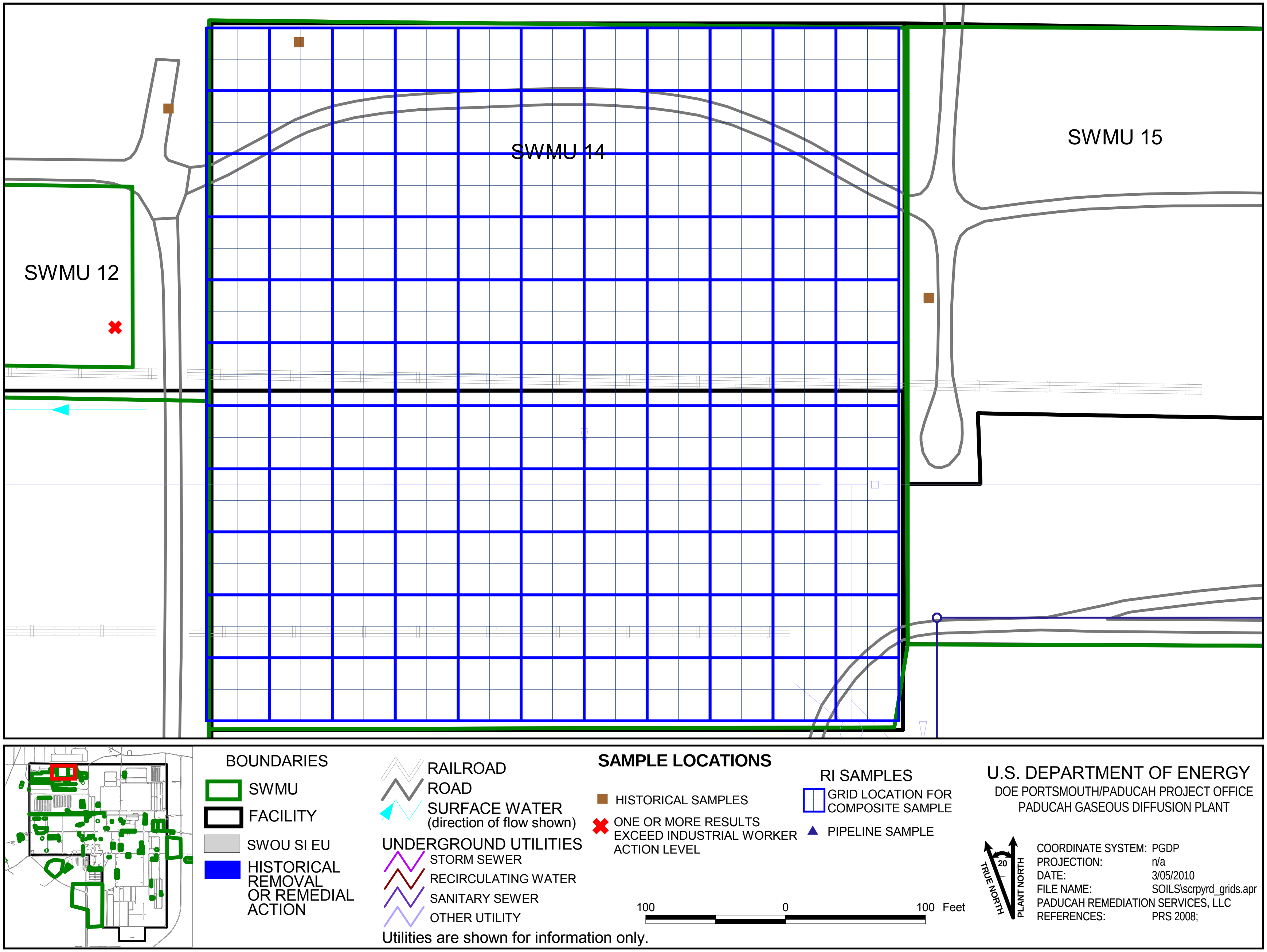

Figure 9.37. SOU RI Samples for SWMU 14

SWMU 15

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.38 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One hundred seventeen grid sample locations for both surface and subsurface are planned for the unit; additionally, 10 samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

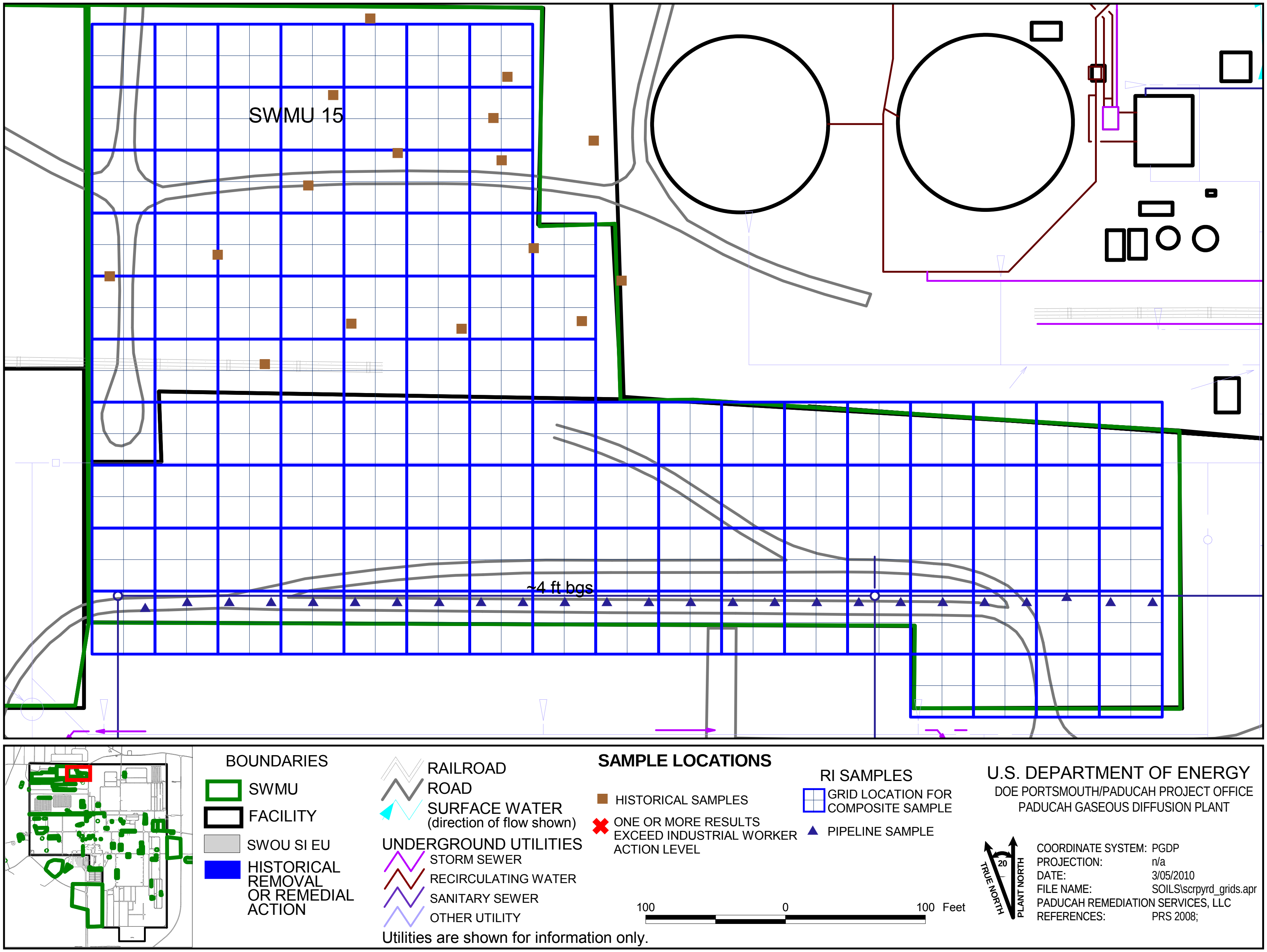

Figure 9.38. SOU RI Samples for SWMU 15

SWMU 16

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.39 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Forty-five grid sample locations for both surface and subsurface are planned for the unit; additionally, four samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

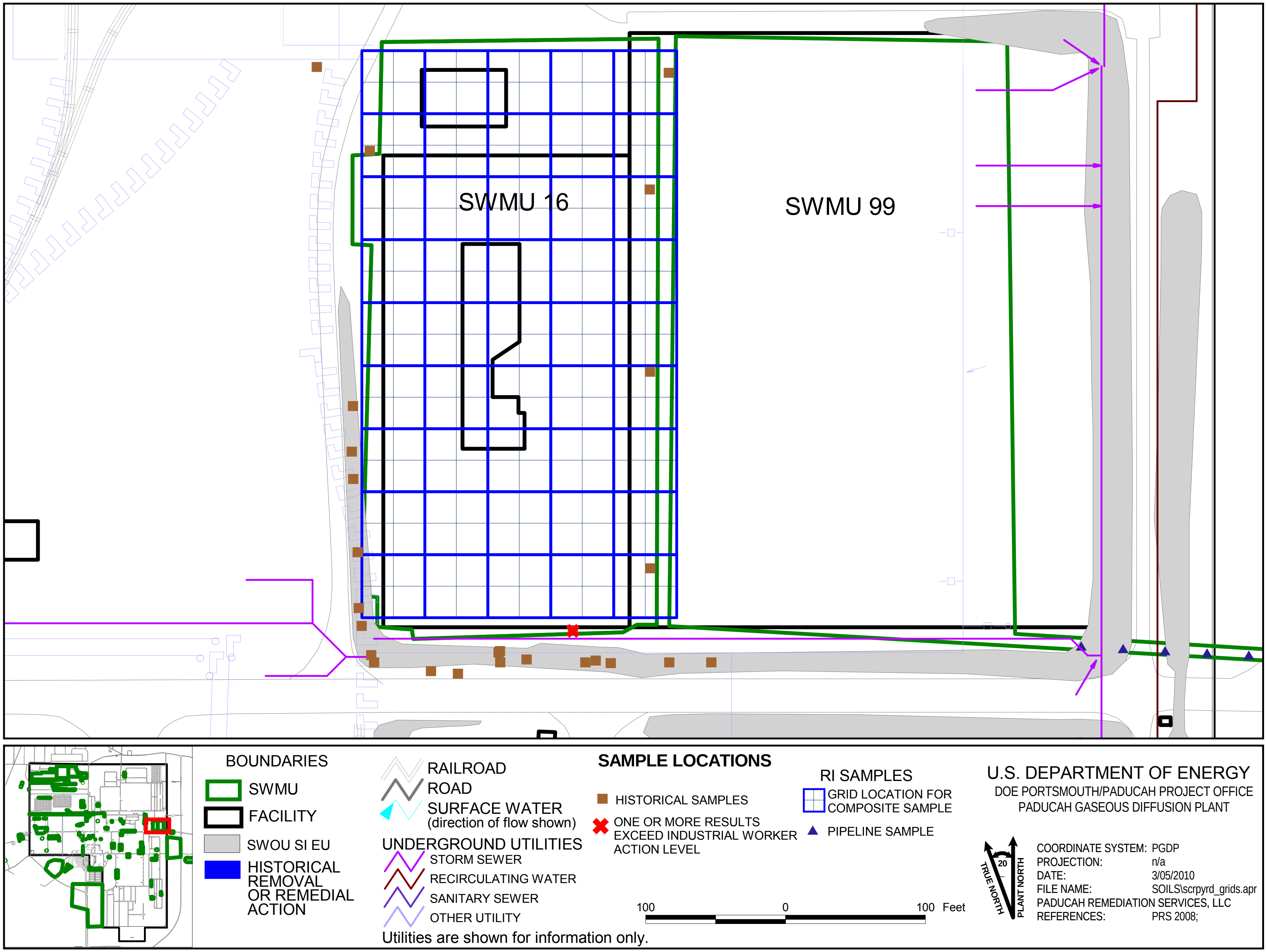

Figure 9.39. SOU RI Samples for SWMU 16

SWMU 518

Based on previous investigations, additional sampling is not needed to support the scope of this project.

SWMU 520

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.40 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Seventy grid sample locations for both surface and subsurface are planned for the unit; additionally, five samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

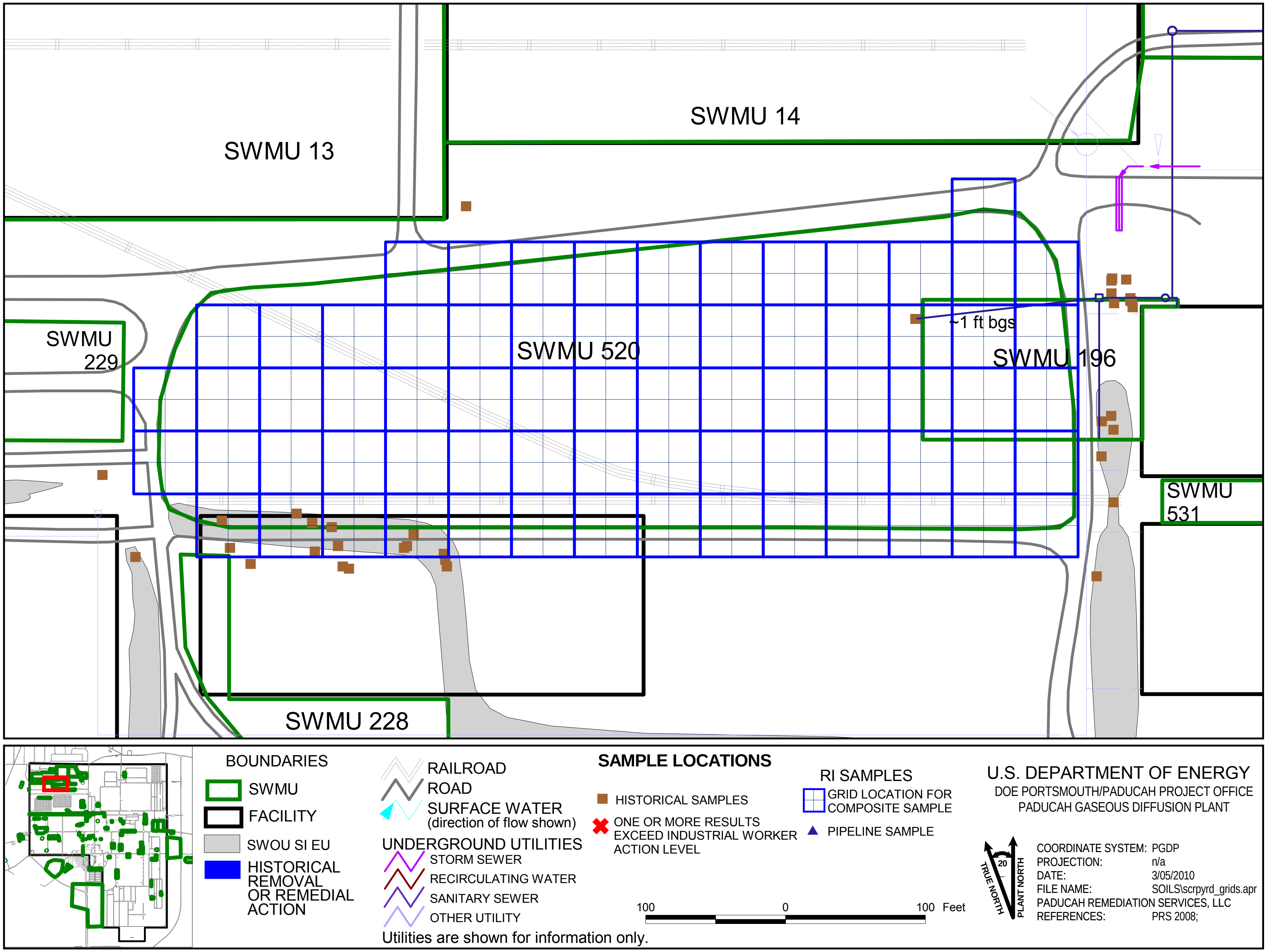

Figure 9.40. SOU RI Samples for SWMU 520

9.3.1.7 PCBs

The following are the units and areas comprising the PCBs grouping.

SWMU	Location	Description
56	C-540-A	PCB Staging Area
57	C-541-A	PCB Waste Staging Area
74	C-340	Transformer Spill Site
75	C-633	PCB Spill Site
78	C-420	PCB Spill Site
79	C-611	PCB Spill Site
80	C-540	PCB Spill Site
81	C-541	PCB Spill Site
135	C-333	PCB Soil Contamination
137	C-746-A	Inactive PCB Area
153	C-331	PCB Soil Contamination (west)
154	C-331	PCB Soil Contamination (southeast)
155	C-333	PCB Soil Contamination (west)
156	C-310	PCB Soil Contamination (west)
160	C-745	Cylinder Yard (PCB soils) Spoils
163	C-304	HVAC Piping System (soil backfill from C-611)
219	C-728	DMSA OS-08, empty fiberglass tank
488	C-410 Trailers	PCB Contamination Area

SWMUs 56, 57, and 137 will not be sampled.

SWMU 137 has a concrete surface; therefore, a RAD evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected at each SWMU. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMUs 56, 57, 80, and 81 have been previously investigated and have enough data to proceed to a FS; however, additional composite sampling is planned for SWMUs 80 and 81.

The locations are displayed below in Figures 9.41 through 9.55. Section 9.3 provides information on sampling depths.

SWMU 56

Based on previous investigations, additional sampling is not needed to support the scope of this project. This SWMU has been characterized and the summary of the findings are presented in the WAG 23 RAR.

SWMU 57

Based on previous investigations, additional sampling is not needed to support the scope of this project. This SWMU has been characterized and the summary of the findings are presented in the WAG 23 RAR.

SWMU 74

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.41 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

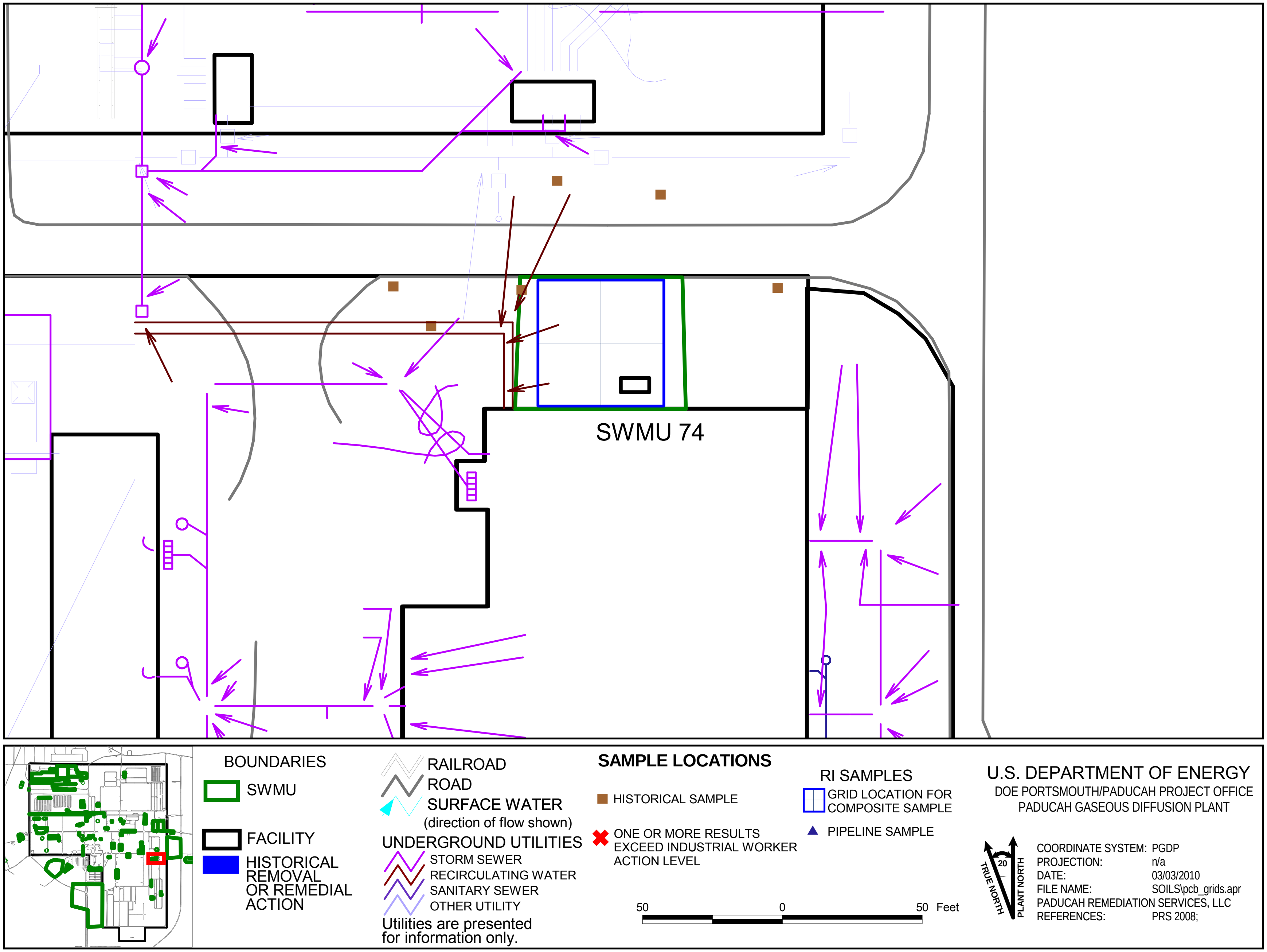

Figure 9.41. SOU RI Samples for SWMU 74

SWMU 75

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.42 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The sample location WC-2426 is within 50 ft of the SWMU boundary for SWMU 75 (see in Figures 5.72 and 9.42) and demonstrates an exceedance of an action level for PCB-1254. This location, however, is within a diked area in the cooling tower pump house. Since this is an operating facility, the contamination found at location WC-2426 will be addressed during post-GDP shutdown activities

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Three grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

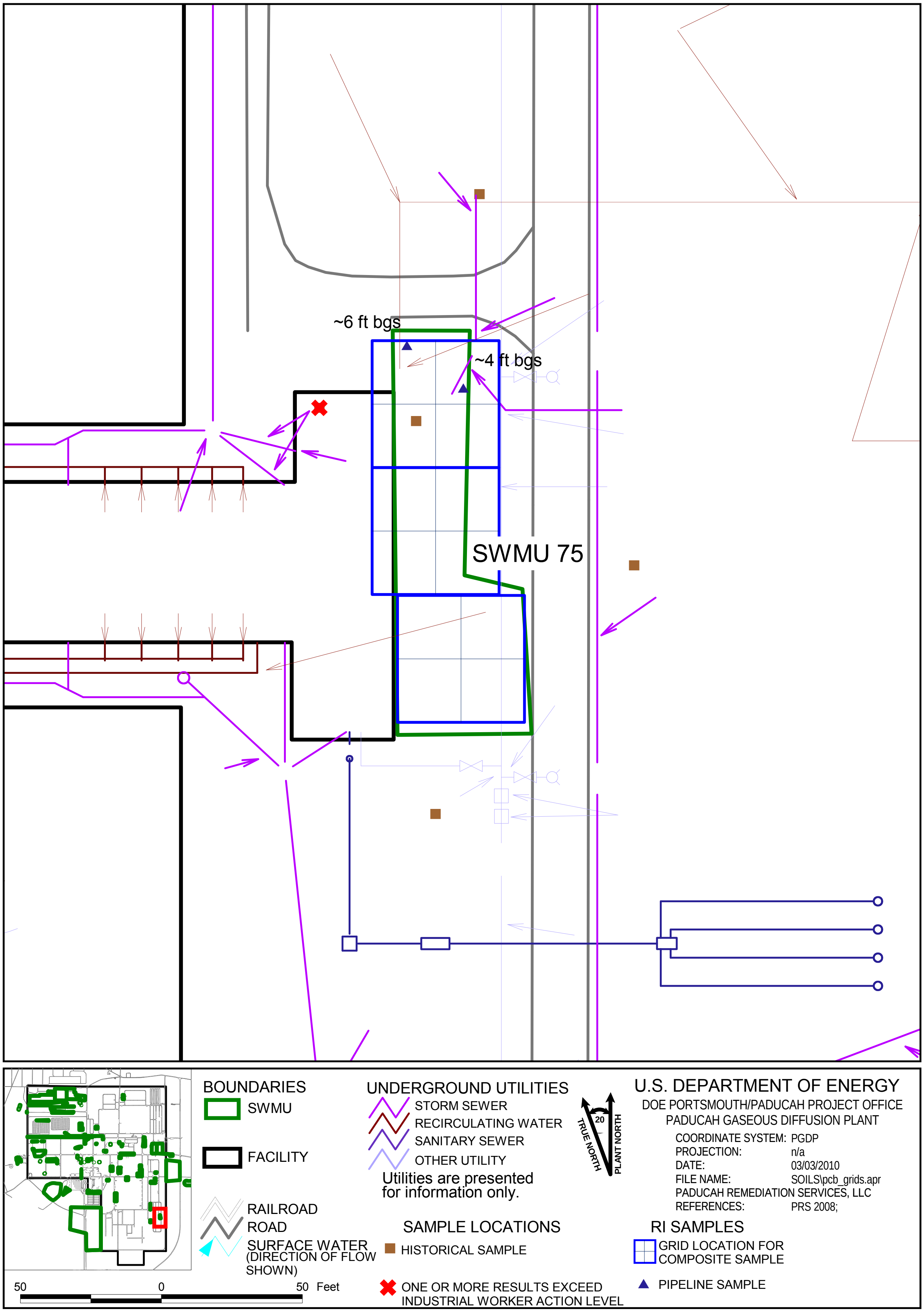

Figure 9.42. SOU RI Samples for SWMU 75

SWMU 78

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.43 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

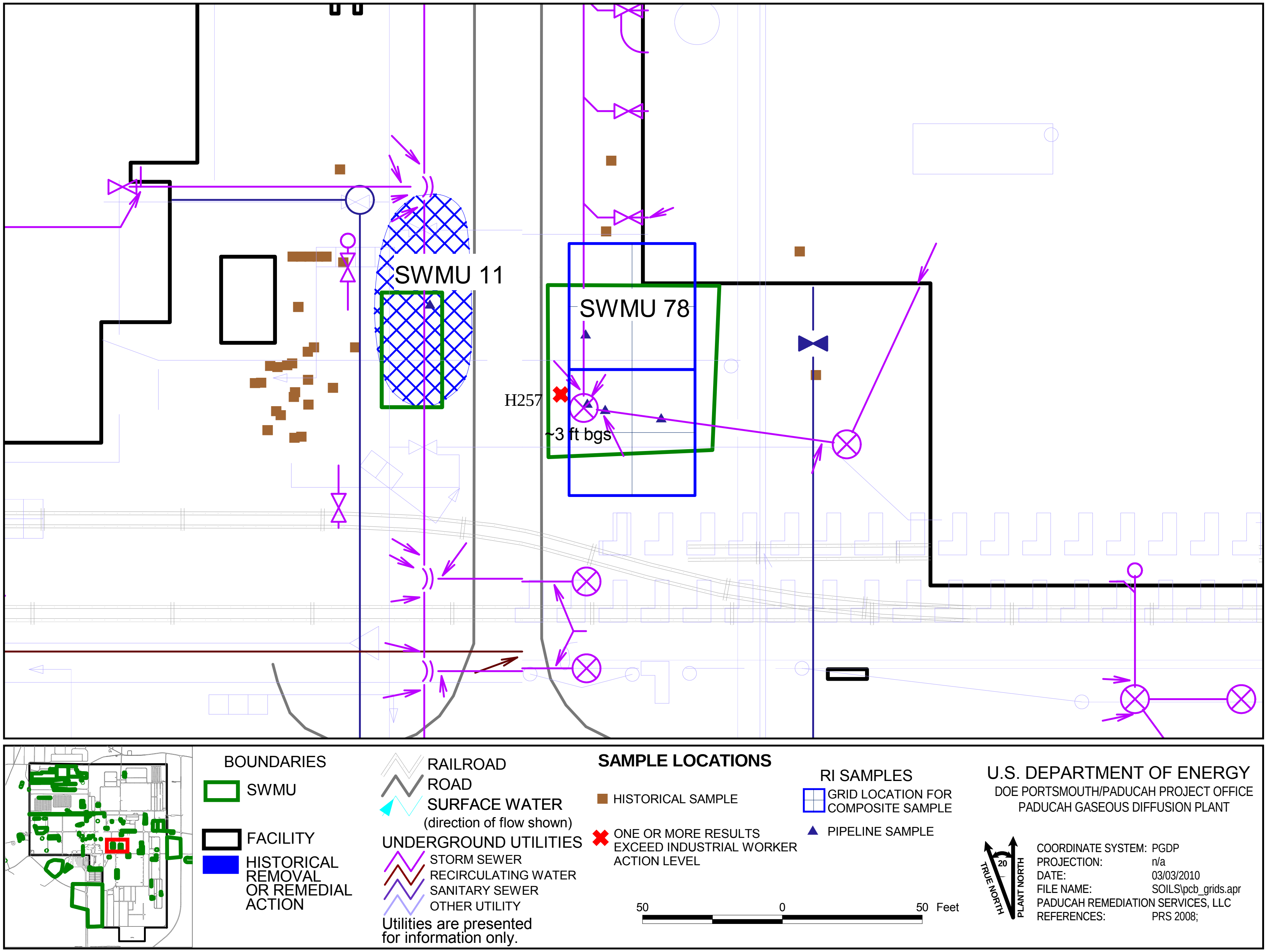

Figure 9.43. SOU RI Samples for SWMU 78

SWMU 79

Based on previous investigations, additional sampling is needed to support the scope of this project Figure 9.44 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

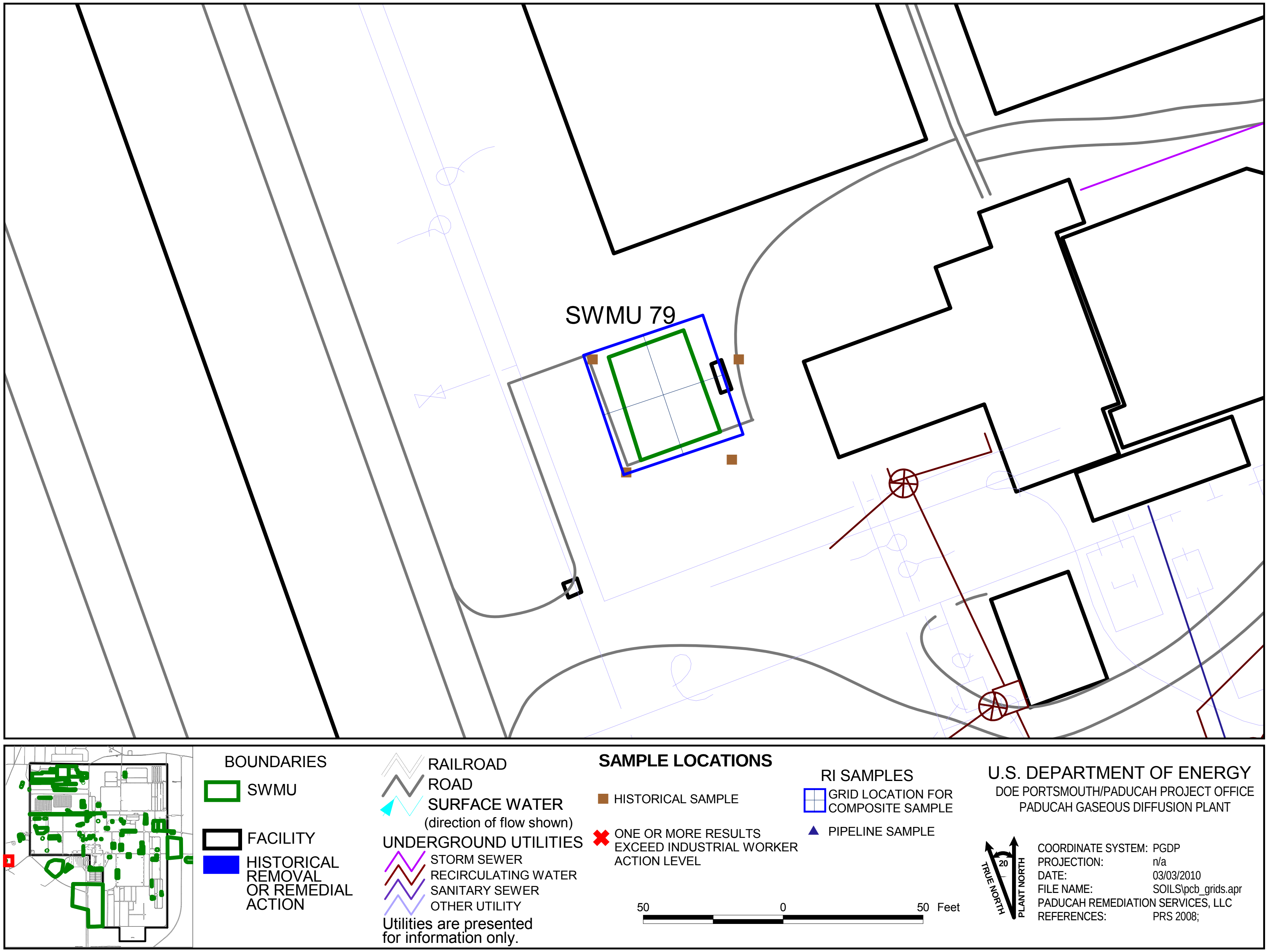

Figure 9.44. SOU RI Samples for SWMU 79

SWMU 80

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.45 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

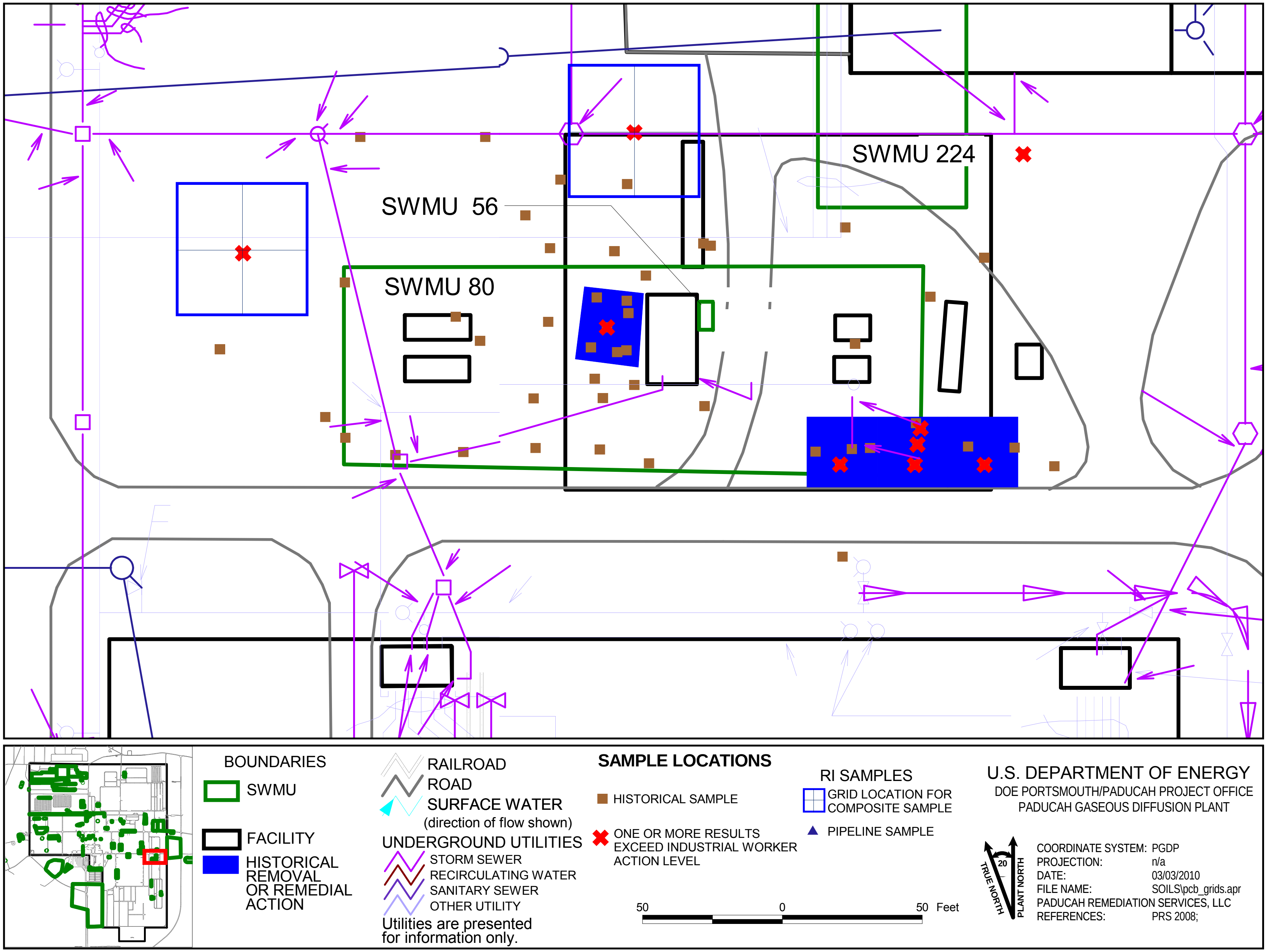

Figure 9.45. SOU RI Samples for SWMU 80

SWMU 81

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.46 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate. Portions of the grid sampling for this SWMU deviate from the originally planned five-point composite. One five-point composite grid for this SWMU is laid in a straight line along the length of the SWMU.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Eight grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

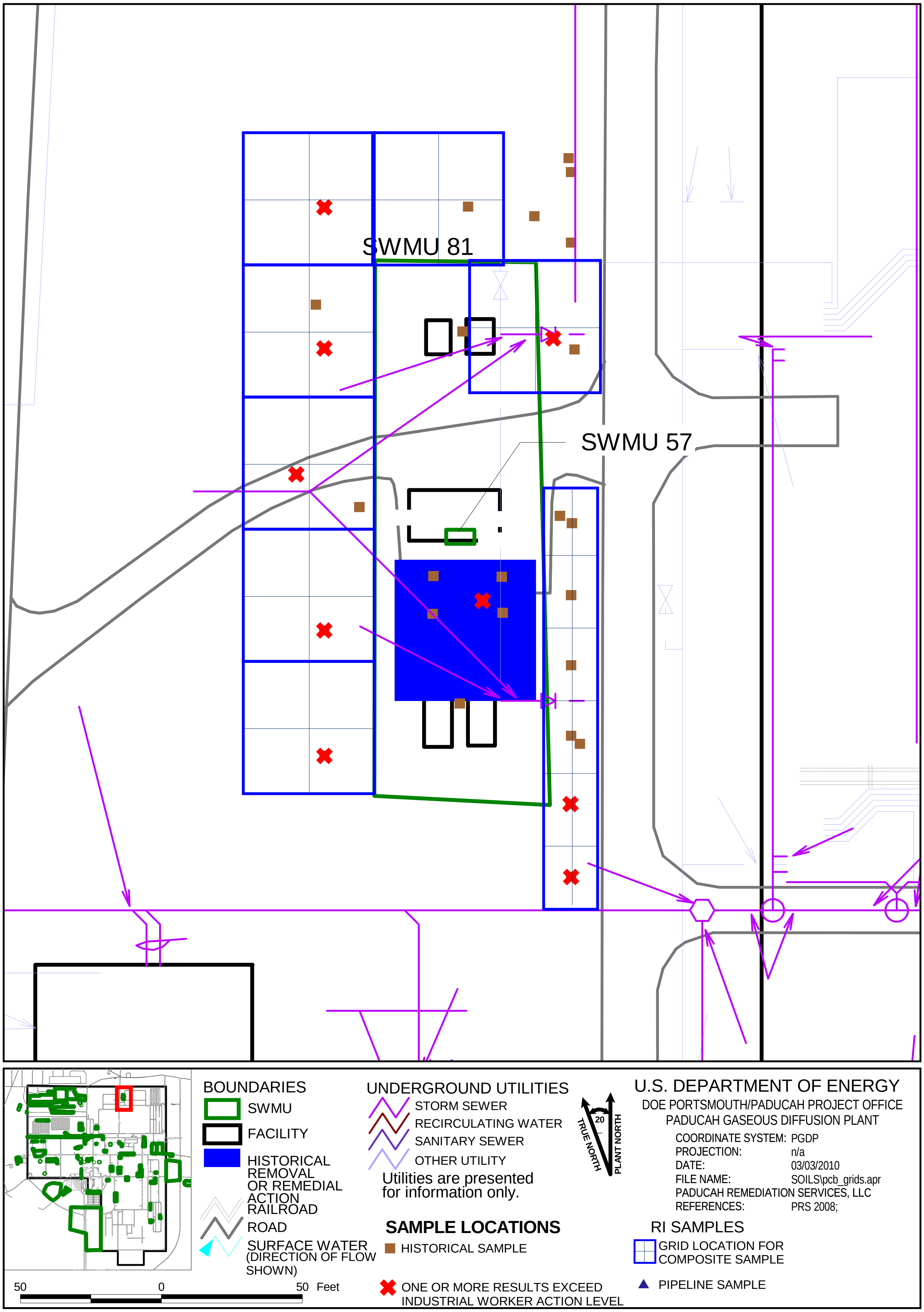

Figure 9.46. SOU RI Samples for SWMU 81

SWMU 135

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.47 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline as needed.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for surface only are planned for the unit; additionally, one sample from the surface will be randomly selected and submitted for fixed-base laboratory analysis.

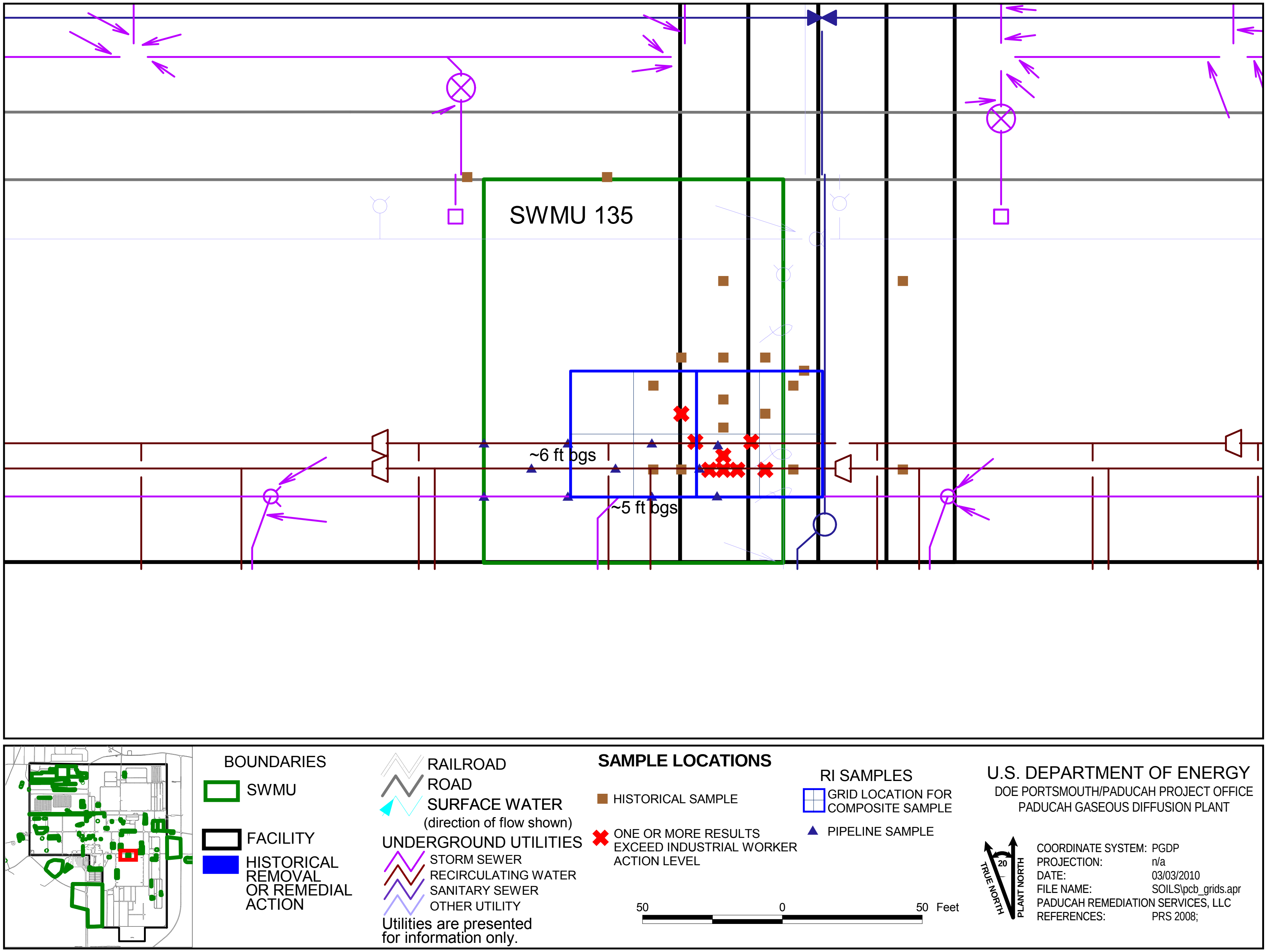

Figure 9.47. SOU RI Samples for SWMU 135

SWMU 137

SWMU 137 has a concrete surface; therefore, a radiation evaluation and a visual inspection for oil staining will occur. If staining is present, then a wipe sample will be collected. If the integrity of the concrete is such that would allow for a soil sample to be taken, then a soil sample will be taken at the direction of the FLM. This SWMU will be addressed as part of the Soils and Slabs OU, which is scheduled to occur during post-GDP shutdown activities.

SWMU 153

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.48 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Ten grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

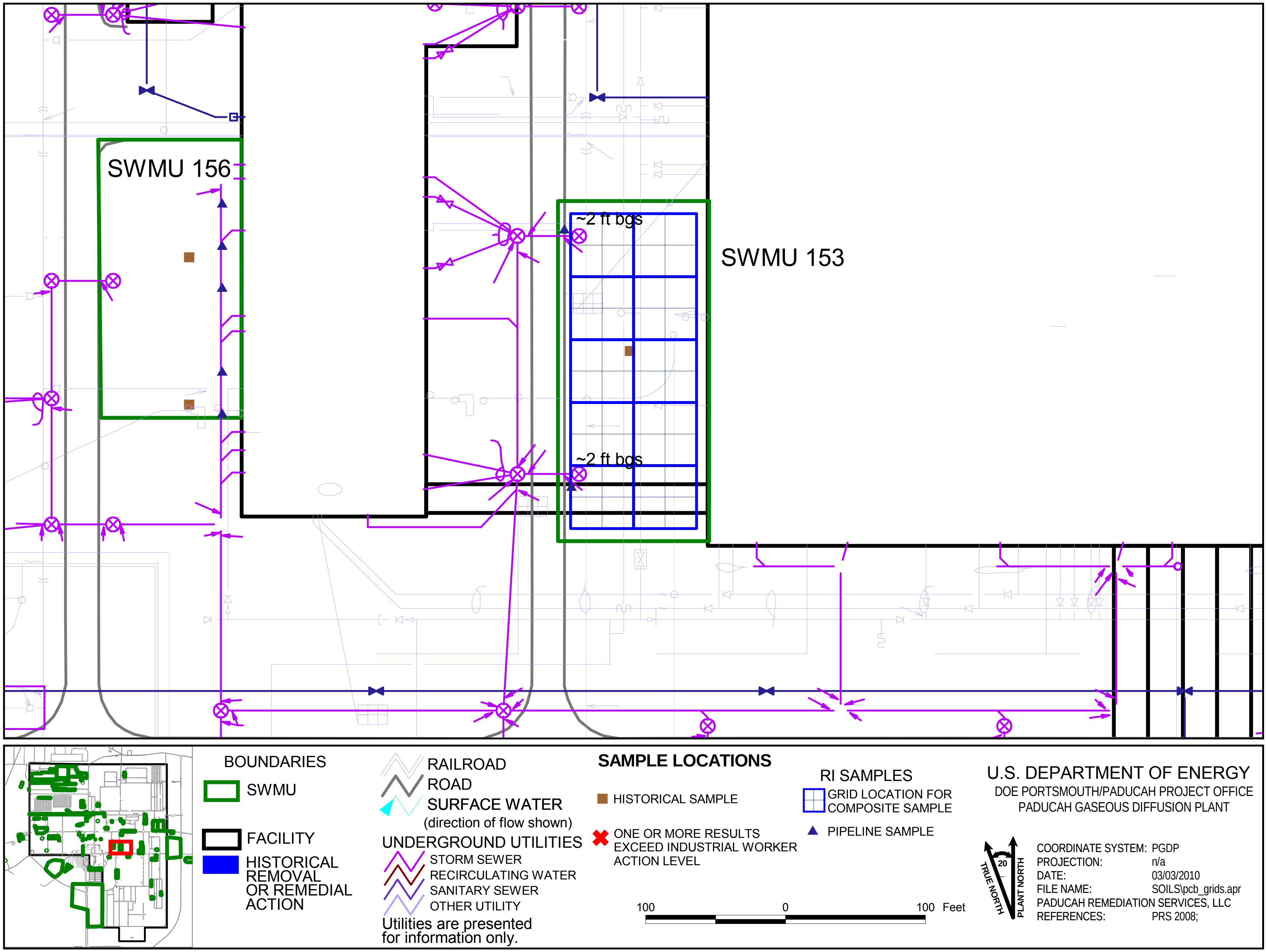

Figure 9.48. SOU RI Samples for SWMU153

SWMU 154

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.49 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Twenty grid sample locations for both surface and subsurface are planned for the unit; additionally, two samples from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

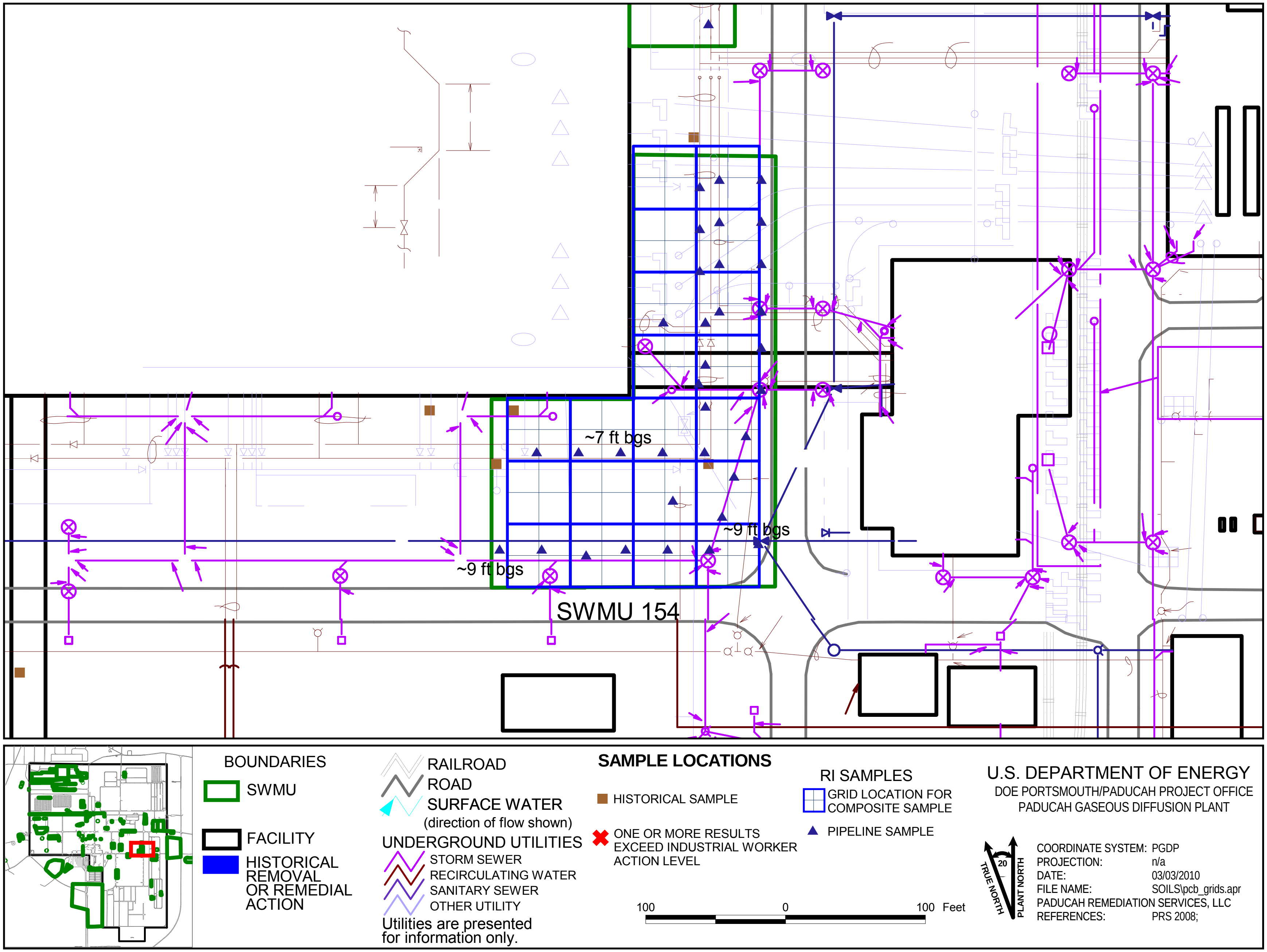

Figure 9.49. SOU RI Samples for SWMU 154

SWMU 155

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.50 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Sixteen grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

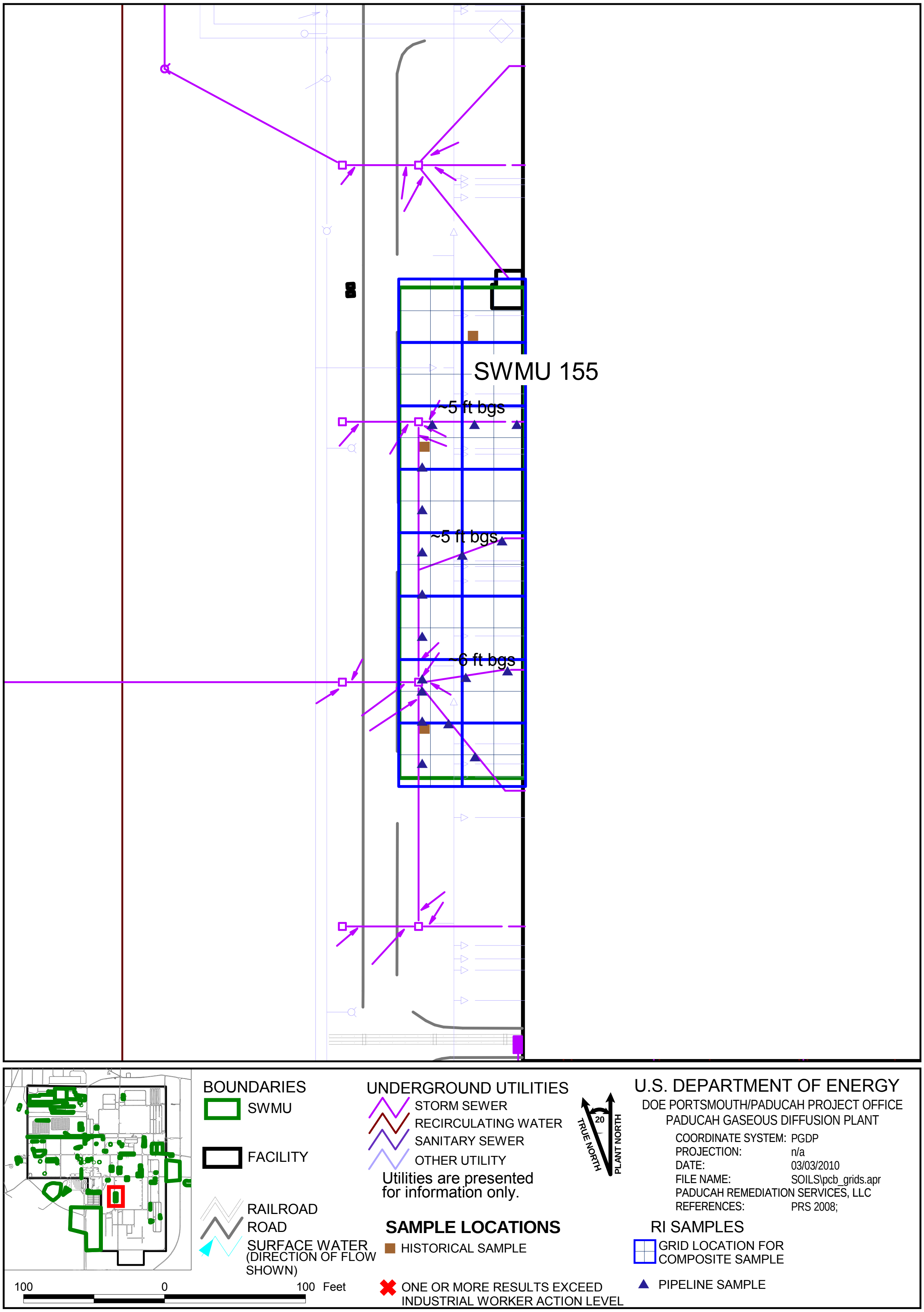

Figure 9.50. SOU RI Samples for SWMU 155

SWMU 156

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.51 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Ten grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

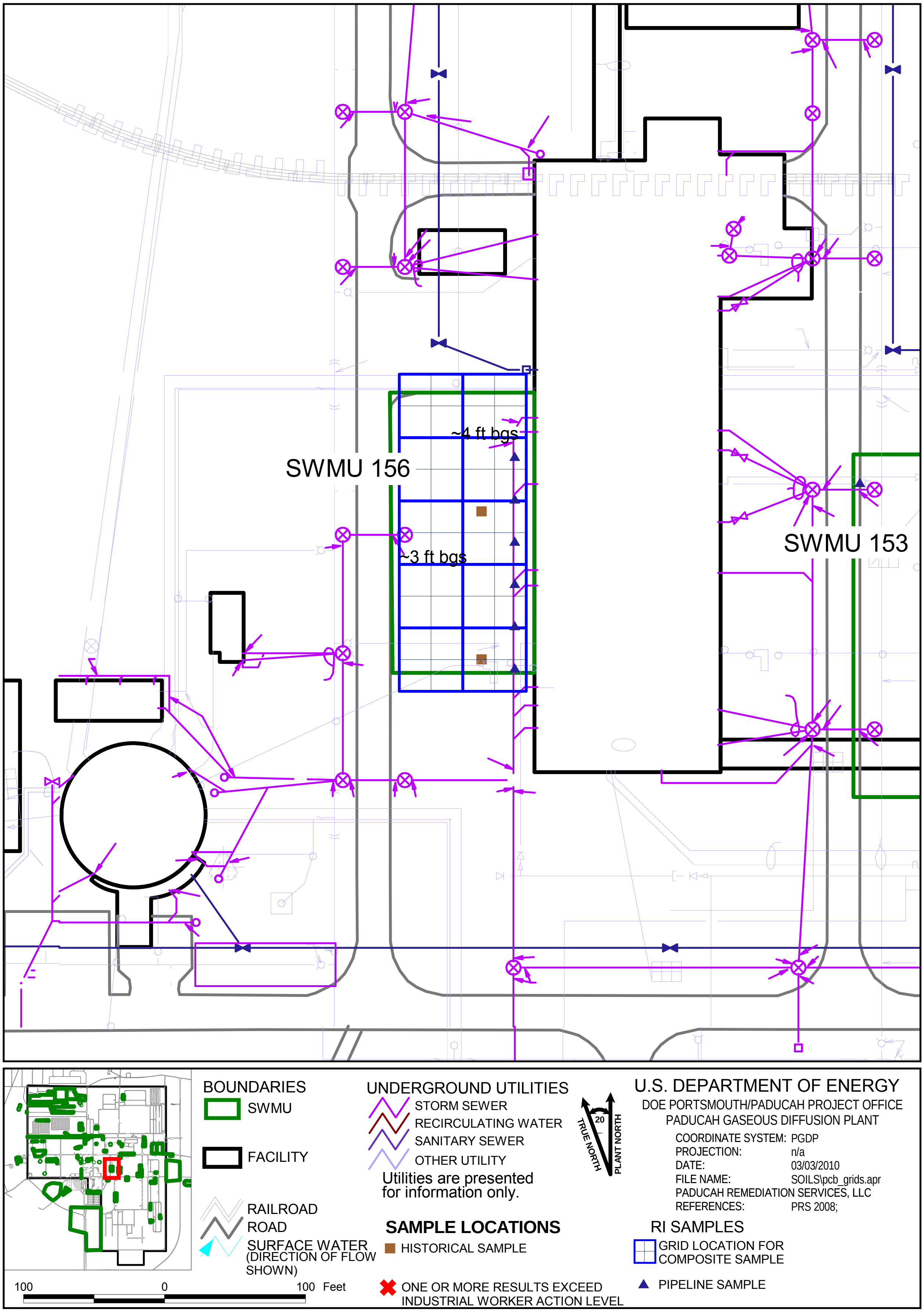

Figure 9.51. SOU RI Samples for SWMU 156

SWMU 160

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.52 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

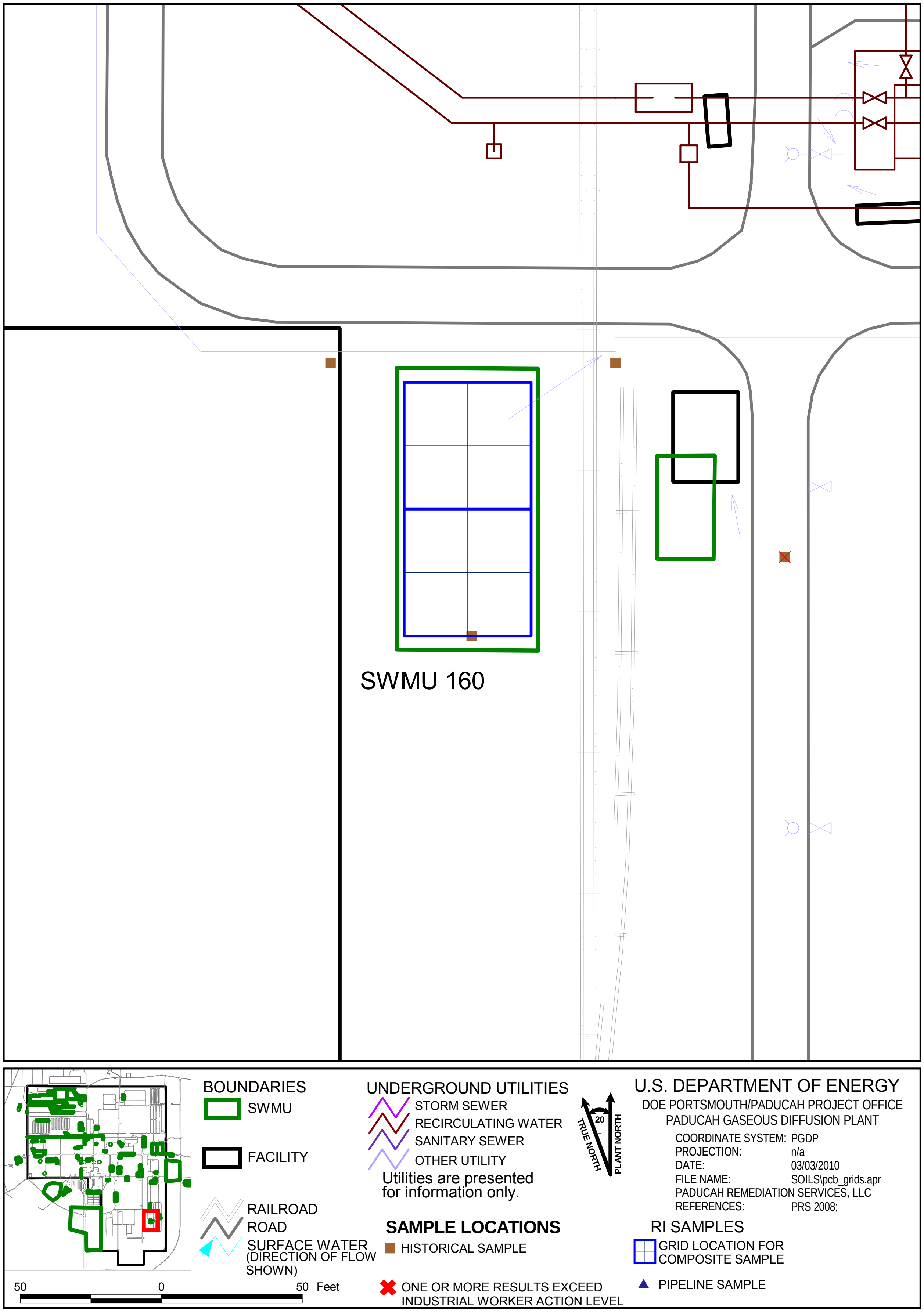

Figure 9.52. SOU RI Samples for SWMU 160

SWMU 163

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.53 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. Two grid sample locations for both surface and subsurface are planned for the unit; additionally, one sample from each horizon will be randomly selected and submitted for fixed-base laboratory analysis.

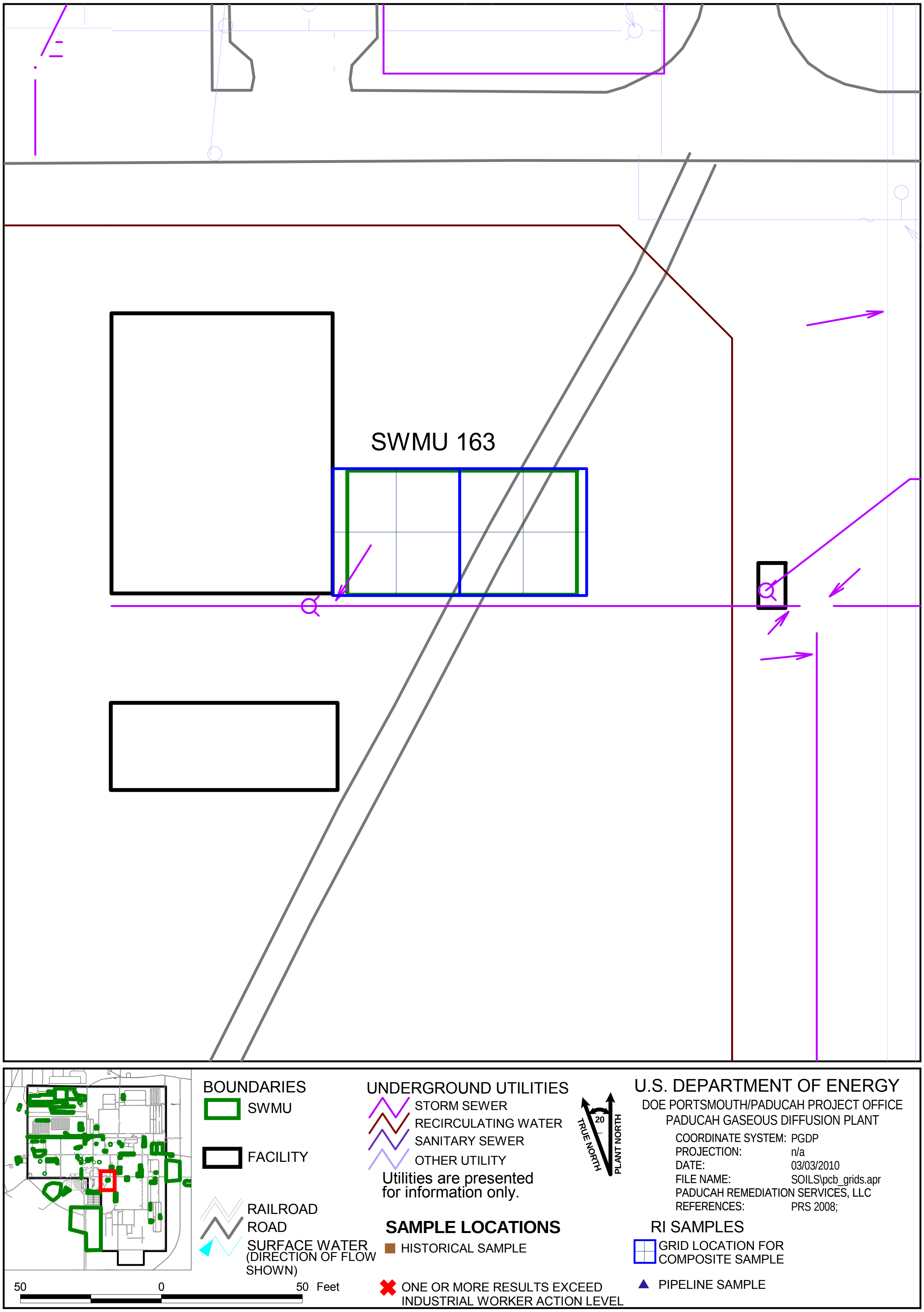

Figure 9.53. SOU RI Samples for SWMU 163

SWMU 219

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.54 shows a map of the sampling locations.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

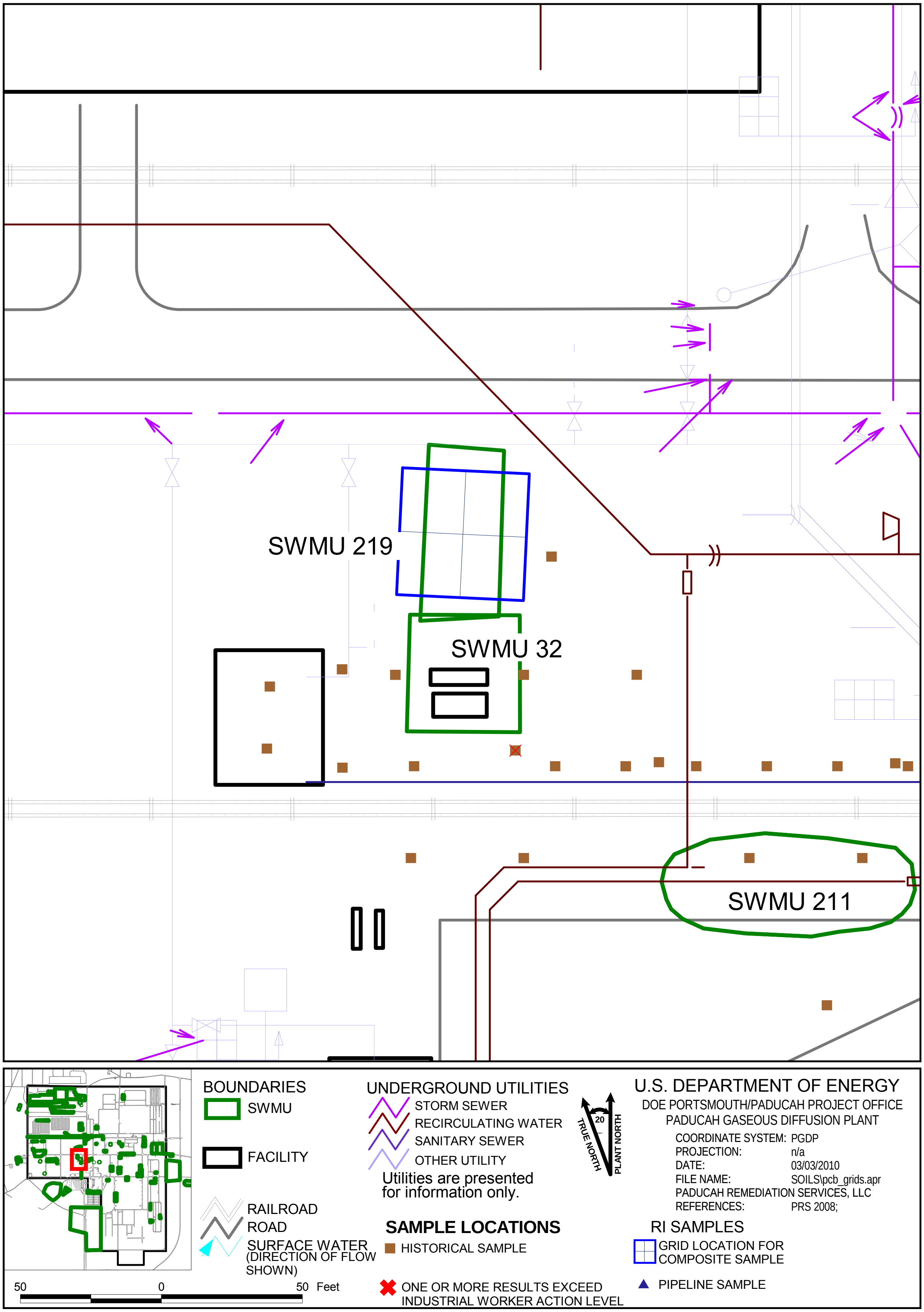

Figure 9.54. SOU RI Samples for SWMU 219

SWMU 488

Based on previous investigations, additional sampling is needed to support the scope of this project. Figure 9.55 shows a map of the sampling locations with utilities overlaid and any additional sampling points for the pipeline, as appropriate.

The SWMU will undergo a radiological walkover survey using a FIDLER, and a grab sample will be collected for radiological constituents, should a project action limit be exceeded. One grid sample location for both surface and subsurface is planned for the unit; additionally, each horizon will be submitted for fixed-base laboratory analysis.

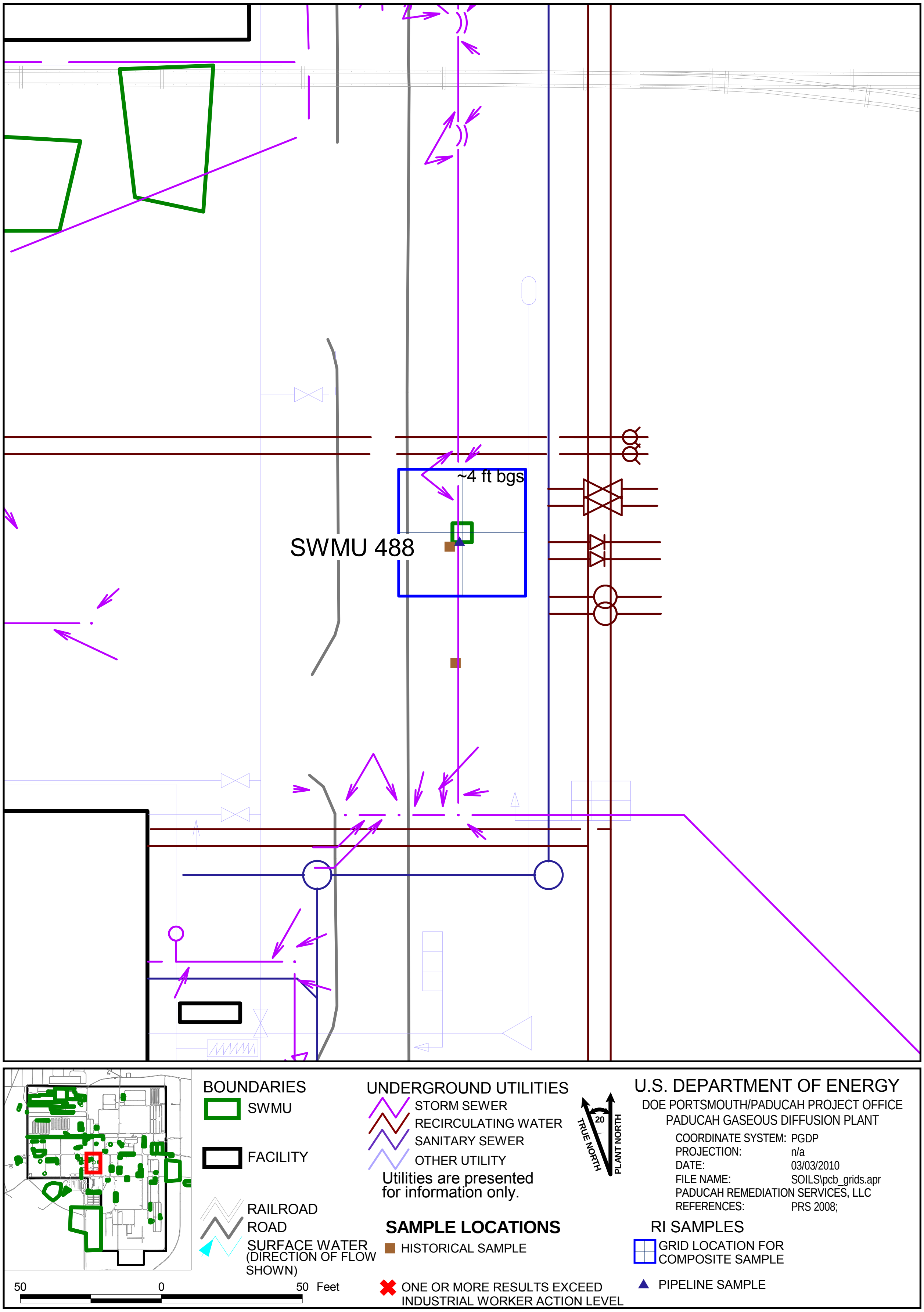

Figure 9.55. SOU RI Samples for SWMU 488

9.4 SAMPLING PROCEDURES

Fieldwork and sampling at PGDP will be conducted in accordance with DOE Prime Contractor-approved work instructions or procedures consistent with *Environmental Investigation Standard Operating Procedure and Quality Assurance Manual*, EPA Region 4, November 2001. DOE Prime Contractor will approve any deviations from these work instructions and procedures. The DOE Prime Contractor will document changes on Field Change Request forms as detailed in the QAPP. Table 9.4 provides an example list of investigation activities that may require work instructions or procedures.

9.5 DOCUMENTATION

Field documentation will be maintained throughout the SOU RI/FS in various types of documents and formats, including the field logbooks, sample labels, sample tags, chain-of-custody forms, and field data sheets. Additional information is contained in the DMIP (Chapter 12).

9.5.1 Field Planning Meeting

A field planning meeting will occur before work begins at the site, so that all involved personnel will be informed of the requirements of the fieldwork associated with the project. Additional planning meetings will be held as needed or if the scope of work changes. Each meeting will have a written agenda and attendees must sign an attendance sheet, which will be maintained on-site and in the project files. The following example topics will be discussed at these meetings:

- Project- and site-specific health and safety, objectives and scope of the fieldwork, equipment and training requirements;
- Procedures;
- Worker feedback;
- Required QC measures; and
- Documents covering on-site fieldwork.

Table 9.4. Example Fieldwork and Sampling Activities Requiring Work Instructions or Procedures

Investigation Activity
Use of Field Logbooks
Lithologic Logging
Labeling, Packaging, and Shipping of Environmental Field Samples
Sampling of Containerized Wastes
Opening Containerized Waste
On-Site Handling and Disposal of Waste Materials
Identification and Management of Waste Not From a Radioactive Material Management Area
Paducah Contractor Records Management Program
Quality Assured Data
Chain-of-Custody
Field Quality Control
Data Management Coordination Equipment Decontamination
Off-Site Decontamination Pad Operating Procedures
Cleaning and Decontaminating Sample Containers and Sampling Equipment
Environmental Radiological Screening
Pumping Liquid Wastes Into Tankers
Archival of Environmental Data Within the ER Program
Data Entry
Data Validation
Soil Sampling
Composite Sampling

9.5.2 Readiness Checklist

Before implementation of the field program, project personnel will review the work control documents to identify field activities and materials required to complete the activities, including, but not limited to, the following items:

- Task deliverables,
- Required approvals and permits,
- Personnel availability,
- Training,
- Field equipment,
- Sampling equipment,
- Site facilities and equipment, and
- Health and safety equipment.

Before fieldwork begins, appropriate DOE Prime Contractor personnel will concur that readiness has been achieved.

9.6 SAMPLE LOCATION SURVEY

A coordinate survey of sampling locations will be conducted upon completion of RI/FS field activities. Where possible, temporary markers consisting of flagging or of wooden or metal stakes will be used to mark sample locations. A thorough description of each location, including the location of the grab samples collected for compositing, will be made during field sampling activities and will be documented using field maps. A member of the field sampling crew will accompany the survey crew to provide information regarding the location of sampling points. Each sample point will have coordinates obtained with a GPS unit. For composite grid sampling, the center point of each grid will serve as the sample location coordinate. For non-standard grids, representative coordinates will be used and documented in the RI. Coordinates will be entered into Paducah Project Environmental Measurements System (PEMS) and will be transferred with the station's ready-to-load (RTL) file to Paducah OREIS.

10. ENVIRONMENTAL, SAFETY, AND HEALTH PLAN

10.1 PURPOSE

This ES&H Plan has been developed to discuss the general ES&H requirements associated with the SOU RI/FS Work Plan and identify some potential hazards. Site-specific hazards and controls will be established for each task and location prior to performing work. These hazards and controls will be documented in the form of Site-Specific Health and Safety Plan (HASPs), Activity Hazard Assessments (AHAs), work packages, and procedures. Personnel will be familiar with these work control documents prior to performing work in the affected areas.

10.2 INTEGRATED SAFETY MANAGEMENT/ENVIRONMENTAL MANAGEMENT

The SOU Project will utilize an ISMS, which integrates the Safety Management System, the Environmental Management System (EMS), and the Quality Management System, to ensure personnel and environmental safety and quality are integrated into management and work practices at all levels so that missions are accomplished while protecting the public, the workers, and the environment. The concepts of the ISMS/EMS will be utilized to provide a formal, organized process to ensure the safe performance of work. The ISMS/EMS Plan identifies the methodologies that will be used to address previously recognized hazards and how the hazards are mitigated using contractor-accepted ES&H practices.

The core functions and guiding principles of ISMS/EMS will be implemented by incorporating applicable programs, policies, technical specifications, and procedures from the DOE, U.S. Occupational Safety and Health Administration (OSHA), EPA, and other applicable regulatory guidance. Brief descriptions of the five ISMS/EMS core functions are provided here.

10.2.1 Define Scope of Work

Defining and understanding the scope of work is the first critical step in successfully performing any specific activity in a safe and compliant manner. Each member of the project team will participate in discussions conducted to understand the scope and contribute to the planning of the work. The SOU RI/FS project team will meet with personnel to ensure that everyone understands the scope of work and the technical and safety issues involved. These meetings are conducted to ensure all parties are in agreement on the scope and approach to complete the work.

10.2.2 Analyze Hazards

In the course of planning the work, the project team will identify hazards including personnel safety and environmental risks associated with the performance of the work. Hazards may be identified and assessed by performing a site visit, reviewing lessons learned, and reviewing project plans or historical data. The hazard assessment process will be prescribed by the DOE Prime Contractor procedures and policies.

Once the hazards have been identified and assessed, measures will be identified to minimize risks to workers, the public, and the environment. These measures are described in the project-specific AHAs, which serve to provide a control mechanism for all work activities. AHAs are detailed, activity-specific evaluations that address each step of the task and/or activity that will be performed. The AHA development process entails a detailed evaluation of each task to identify specific activities or operations required to successfully complete the scope of work and define the potential chemical, physical, radiological, and/or biological hazards that may be encountered; the media and manner in which they may occur; and how they are to be recognized, mitigated, and controlled. Appropriate hazard controls may include engineering controls, administrative controls, and the use of PPE. The SOU RI/FS project team is responsible for the preparation, revision, and implementation of AHAs.

Applicable AHAs will be reviewed with the personnel who will perform the work. Participants in this review will sign and date the AHA to signify that they understand all hazards, controls, and requirements in the AHAs. Copies of the AHAs with appropriate signatures shall be maintained at the work location.

Following completion of an activity, employees will provide feedback, and "lessons learned" will be documented.

10.2.3 Develop/Implement Controls

The primary mechanisms used to flowdown ISMS/EMS controls to the project team are project-specific plans and technical procedures. Other mechanisms include program/project management systems, employee training, communication, work site inspections, independent assessments, and audits. These mechanisms are communicated in the following:

- Pre-Job meetings
- Orientations
- Training
- Plan-of-the-day/pre-job briefings
- AHAs
- Radiological work permits (RWP)

The plan-of-the-day/pre-job briefing incorporates the principles of ISMS/EMS. The specific steps within ISMS/EMS are emphasized to each employee. It is emphasized that no employee will be directed or forced to perform any task that he/she believes is unsafe, puts health at risk, or that could endanger the public or the environment. One of the key elements of ISMS/EMS is that all personnel are permitted to stop work or decline to perform an assigned task because of a reasonable belief that the task poses an imminent risk of death, serious physical harm, or other serious hazard to workers or the environment.

Employee involvement is emphasized in all training sessions, beginning with initial orientation training, and is then periodically reinforced in refresher training, as applicable, and in ES&H briefings/meetings. Employees are encouraged to participate in the selection, development, and presentation of training/meeting topics and their full and constructive input is encouraged in all communication sessions.

10.2.4 Perform Work

After the project team has been given approval to proceed, the project-specific plans and procedures will be implemented and adherence will be accordance with PRS-WCE-0044, *Adherence to Performance Documents*. The SOU RI/FS project team will verify that all applicable plans, procedures, forms, and records are contained in the project files and accessible by approved personnel. If any conflict arises between documents, work will stop until the issue is resolved by appropriate Subject Matter Experts. Actions that will be taken during the performance of the work to incorporate ISMS/EMS principles include the following:

- Plan-of-the-day/pre-job briefings
- Monthly project safety meetings

- ES&H oversight/inspections
- Safety inspections
- Equipment inspection
- Stop work authority

10.2.5 Feedback/Improvement

Feedback and improvement is accomplished through several channels, including ISMS/EMS audits, self-assessments, employee suggestions, lessons learned, and post-job briefings.

SOU RI/FS project management will encourage employees to freely submit suggestions that offer opportunities for improvement and constructive criticism on the program. Project management will conduct periodic inspections and meetings with project personnel at the work site to discuss safety issues, environmental issues, and/or concerns as well as other relevant topics.

During field activities, meetings and briefings will provide opportunities for project personnel to communicate the following:

- Lessons learned and any other topics relevant to the work performed
- How work steps/procedures could be modified to promote a safer working environment
- How communications could be improved within the project team
- Overall issues or concerns they may have regarding how the work was performed

10.3 FLOWDOWN TO SUBCONTRACTORS

The ISMS/EMS approach to ES&H ensures that personnel, including subcontractors, are aware of their roles, responsibilities, and authorities for worker/public safety and protection of the environment. All organizations will be responsible for compliance with the Prime Contractor's Worker Safety and Health (S&H) Program, ISMS Program, Radiation Protection Program, Environmental Protection Program, and QA Program. In addition, subcontract requirements will flow down to lower-tier subcontractors, as applicable. Personnel will have the appropriate health and safety training required by OSHA 29 *CFR* § 1910 and § 1926, but will also undergo site-specific pre-job training including safety and environmental to ensure that ES&H issues related to the activities to be performed or specific to the work site are clearly understood. Documentation of training will be available for review prior to starting work.

10.4 SUSPENDING/STOPPING WORK

In accordance with 10 CFR § 851.20 and the DOE Prime Contractor's Worker Safety and Health Program and procedures, employees and subcontractors have suspend/stop-work authority. Individuals involved in any aspect of the project have the authority and responsibility to suspend or stop work for any perceived threat to the S&H of the workers, the public, or to the environment. Concerns shall be brought to the attention of the FTM and SHR, they will be evaluated by Project Management personnel, and actions will be taken to rectify or control the situation. In the case of imminent danger or emergency situations, personnel should halt activities immediately and instruct other affected workers to pull back from the hazardous area. The FTM and/or SHR should be notified immediately, at which time Management and/or emergency responders will be notified.

10.5 ISMS BRIEFINGS AND ORIENTATIONS

Plan-of-the-day/pre-job briefings detailing the specific hazards of the work to be performed and safety precautions and procedures specific for the job shall be conducted by the FTM and/or SHR at the beginning of each shift. During these briefings, work tasks and the associated hazards (personnel safety and environmental risks) and mitigating controls will be discussed using task-specific AHAs, project documents, and/or lessons learned as guidance.

Prior to performing work on the site, personnel shall be required to read or be briefed on the DOE Prime Contractor's Worker Safety and Health Program, applicable AHAs, the work package, and other applicable documents. This shall be documented as required reading, acknowledgement forms, or briefing sheets. Visitors will also be oriented to the applicable plans and potential hazards that they may encounter.

10.6 KEY PROJECT PERSONNEL AND RESPONSIBILITIES

One of the primary underlying principles of a successful project organization is the establishment of clearly defined roles and responsibilities and effective lines of communication among employees and among the Prime Contractor, subcontractors, and other organizations involved in the project. Ensuring that personnel fully understand their roles and responsibilities and that they have a thorough understanding of the scope of work and other project requirements will provide the foundation for successful and safe completion of the project.

The roles and responsibilities of key field team members are briefly described as follows:

- The Environmental Restoration PM oversees the implementation of the project plans and provides the resources for the project.

- The RI Project Manager oversees the project plans and work activities while ensuring that operations are conducted in accordance with the DOE Prime Contractor procedures, regulatory requirements, and Worker Safety and Health Program and is responsible for coordinating and assigning resources needed for the project. The RI Project Manager also performs management audits and inspections.

- The QA Specialist provides support and oversight to the project to ensure that work is performed in accordance with the work package and other applicable plans and procedures.

- The FTM coordinates field activities and logistics and provides the communications between the project team and the field team as well as other support groups. The FTM also ensures that on-site personnel comply with the Worker Safety and Health Program, work packages, and applicable procedures.

- The SHR provides S&H support and oversight to the project to ensure that work is being performed safely and in accordance with the Worker Safety and Health Program, applicable regulations, 10 *CFR* § 851, DOE directives, and applicable plans and procedures.

- The Radiological Control Group provides support and guidance to the project and assists the FTM and SHR with implementation of radiological controls and as-low-as-reasonably-achievable (ALARA) principles. The Radiological Control Technician (RCT) observes the work area before/during activities for radiological hazard and authorizes entry into and exit from the radiological work area.

- Environmental Compliance organization provides environmental support and oversight to the project to ensure that the planning and fieldwork is being performed properly and in accordance with all applicable regulations, DOE directives, and relevant plans and procedures.

- The Waste Management Coordinator provides waste management support to the project to coordinate waste containers and removal of waste from the worksite while complying with the Worker Safety and Health Program, as well as ES&H and work control requirements.

- Field Team/Subcontractors—Samplers, drillers, operators, maintenance mechanics, and electricians perform work as specified in work packages, adhering to the Worker Safety and Health Program, HASP, RWPs, project procedures, and AHAs. Field Team personnel also participate in the identification of the hazards and development of the work controls to be utilized during the work.

10.7 SITE CONTROL

Work zones will be utilized to control access. These areas will be controlled by the SHR and/or FTM to minimize the number of individuals potentially exposed to site hazards and to ensure that individuals who enter follow the required procedures. The following is a description of the different types of zones that will be established at the site.

- Exclusion Zone (EZ)—The area where work is being performed and chemical, physical, and/or radiological hazards exist. Entry into this area is controlled and the area clearly marked with barrier tape, rope, or flagging. Signage required by OSHA will be posted. Unauthorized entry into these areas is strictly prohibited. Permission to enter the EZ is granted by the SHR.
- Contamination Reduction Zone (CRZ)—The area between the EZ and the Construction Zone (CZ). It serves as a buffer to reduce the possibility of the CZ becoming contaminated. It also is the area where decontamination of personnel and equipment is conducted. Entry into this area is controlled and the area clearly marked with barrier tape, rope, or flagging. Signage required by OSHA will be posted.
- CZ—The area outside of potential contamination, but still encompassing work activities and possible hazards associated with fieldwork activities. Entry into this area is controlled and the area clearly marked with barrier tape, rope, or flagging. Signage required by OSHA will be posted.
- Support Zone (SZ)—The area immediately outside of the work zones. This area serves as an administrative area, a storage area for noncontaminated equipment, a break area, and an area for the consumption of food and beverages. This area does not require delineation by barricade tape/ropes.

10.7.1 Visitors

Visitors to the site shall abide by the following:

- "Visitor" means persons not involved in routine site work activities.

- Visitors shall be instructed to stay outside of the EZ and CRZ and remain within the SZ during the extent of their stay.

- Visitors requesting to observe work conducted in the EZ must wear appropriate PPE prior to entry into that zone. Visitors who with to enter the EZ must produce evidence that they have medical clearance, and appropriate Hazardous Waste Operations and Emergency Response (HAZWOPER) training that is up-to-date. Visitors also must have received the required training for the tasks being performed and entry must be approved by the SHR and/or FTM.

10.7.2 Site Communications

PGDP plant radios, plant phones, and cell phones will be used for on-site and off-site communications. Project personnel will be orientated to the use of plant radios and emergency numbers. Hand signals may also be utilized; these will be covered with project personnel if necessary.

10.7.3 Authorization to Enter

Personnel shall adhere to site entry and control procedures identified in the RWP AHAs and this site-specific HASP; personnel must wear the appropriate PPE; and enter the work area only after receiving permission of the FTM, SHR, and RCT. The FTM (or designee) will verify that the appropriate training and briefing requirements are met prior to entry.

As a requirement for work on this project, workers entering the EZ or CRZ will be required to take a 40-hour HAZWOPER training. This training must cover the requirements in 29 *CFR* § 1910.120, HAZWOPER. In addition, workers must receive annual 8-hour refresher training (if applicable) and 3-day on-site supervision under a trained, experienced supervisor. The FTM shall receive additional 8-hour training in hazardous waste operations supervision. Workers and visitors entering the EZ or CRZ will be briefed in the provisions of this HASP and be required to sign the HASP Acknowledgment Form found in Attachment B. Workers entering radiological posted work areas also will be required to complete Radworker II training.

10.8 PERSONAL PROTECTIVE EQUIPMENT

When engineering controls are not feasible, when the administrative controls in place are not adequate, or when otherwise indicated (such as for ALARA), PPE will be specified by the AHA and/or RWP. At a minimum, personnel performing work in work zones may be required to wear the following standard safety apparel:

- Hard hats meeting the requirements of American National Standards Institute (ANSI) Z89.1 as prescribed in 29 *CFR* § 1910.135, *Head Protection*. Hard hats will be worn with the suspension properly installed. Hard hats will not be damaged, painted, or deformed.

- Safety glasses with firm side shields will meet the requirements of ANSI Z87.1, as prescribed in 29 *CFR* §1910.133, *Eye and Face Protection*. Prescription glasses also will meet the ANSI standard and be provided with fixed or firm clip-on side shields. Cover glasses used over prescription glasses will be permitted. Safety glasses will be worn in any area where construction activities are taking place. Face shields will not be worn in lieu of safety glasses.

- Sturdy safety-toed work shoes or boots meeting the requirements of ANSI Z41, as prescribed in 29 *CFR* §1910.136, *Foot Protection*, shall be worn.

The required level of protection is specific to the activity being conducted. The levels of PPE apply only to activities conducted inside an established EZ. Work conducted within CRZs will vary, but generally is one level of protection lower than the EZ. Activities conducted within SZs should require normal work clothes and PPE unless specified by the FTM or SHR.

10.8.1 Task-Specific Levels of Protection

The levels of protection will be determined by the task and/or proximity of the task being performed and will be identified in the task specific AHAs and RWPs.

10.8.2 Respiratory Protection

Respiratory protection requirements will be determined by air monitoring and survey results. Personnel required to wear respiratory protection will be trained and quantitatively fit-tested prior to use of the respirator, as prescribed in accordance with DOE Prime Contractor procedure. Personnel required to wear respirators will inspect their respirators before and after each use and any deficiencies will be reported to the FTM or SHR immediately. Respirators will be properly stored in a bag in a clean, dry environment and routinely cleaned. Damaged respirators shall not be used.

10.9 MEDICAL SURVEILLANCE

The medical surveillance program provides for baseline, annual, and termination medical examinations for the following employees in accordance with 29 *CFR* § 1910.120, HAZWOPER. Each employee who is or may be exposed to hazardous substances or health hazards at or above the permissible exposure limit (PEL) for 30 days or more per year and each employee who wears a respirator for 30 days or more per year will receive a medical examination before assignment, approximately 12 months later, and at termination of employment, or at reassignment. Employees who develop signs or symptoms indicating overexposure or are injured or exposed above the PEL in an emergency situation will be examined medically as soon as possible following the incident.

Personnel performing HAZWOPER activities on this project must complete an annual HAZWOPER physical. The examining physician will document the worker's fitness for work. In addition, the physician will ensure personnel are capable of wearing a respirator through medical examination and conducting a pulmonary function test.

Radiation workers, working under an RWP, may be required to submit a baseline bioassay, periodic bioassay during the project, and exit bioassay at the end of the project.

10.9.1 Exposure Monitoring

Air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection needed on-site.

10.9.2 Routine Air Monitoring Requirements

Air monitoring will be performed during the following activities:

- Intrusive activities such as soil excavation;
- Activities where there is a potential for exposure to heavy metals (lead, arsenic, beryllium, etc.) and silica dust;
- Personnel are opening waste containers that contain potentially contaminated material.

10.9.3 Industrial Hygiene Monitoring

The Industrial Hygiene monitoring and sampling will be performed by assigned project S&H support personnel. Monitoring will use direct-reading instruments, air-sampling equipment, environmental-monitoring equipment, and assessment techniques as determined appropriate by the S&H Group based on professional judgment and in accordance with OSHA, National Institute for Occupational Safety and Health (NIOSH), and American Conference of Government Industrial Hygienists (ACGIH).

Personnel sampling will be conducted to assess the potential exposure to individual employees and to ensure that the proper level of PPE has been selected for the assigned task(s). Samples will be collected in the employee's breathing zone using personnel sampling pumps and the appropriate collection media. For tasks with the potential for exposure to significantly elevated chemical concentration, it is expected that the sampling frequency will increase.

If direct reading instruments indicate levels of vapors or particulates that exceed the action level for over 15 minutes in the work area, then personnel sampling will be initiated immediately. Sampling will be conducted, at a minimum, on the worker with the highest expected exposure. Monitoring will continue until levels recorded by direct reading instruments return below the action level.

Once initiated, sampling will always continue for a period long enough to collect a volume of air sufficient to allow the laboratory to achieve an analytical detection limit no greater than one-half the OSHA PEL or ACGIH threshold limit value (TLV), whichever is the more stringent of the two. The samples will be collected in accordance with the approved NIOSH or OSHA methodology and analyzed for the appropriate contaminant(s) of concern. All personnel exposure samples shall be analyzed by a laboratory accredited by American Industrial Hygiene Association (AIHA) in accordance with the appropriate NIOSH or OSHA methodology.

10.9.4 Radiological Monitoring

Radiological Control will perform personnel air monitoring during work in contamination areas and potentially at the boundary. Scanning of equipment and personnel also will be performed to minimize the possibility of the spread of contamination. Personnel working on the SOU RI/FS project also will be monitored through Dosimetry and required to wear a dosimeter when working in radiological zones and submit bioassays as required. A neutron dosimeter may be required if working in and around UF_6 cylinder storage yards, as determined by Radiological Control Organization.

10.10 EMERGENCY RESPONSE

10.10.1 Responsibilities

The PM, FTM, and SHR are responsible for the SOU RI/FS project emergency management program and ensuring that the appropriate emergency response equipment is readily available at the work site and in proper working order. Equipment and supplies to be maintained at the work site include, at a minimum the following:

- First-aid kit
- Emergency eyewash station
- Absorbents for spill control
- Fire extinguisher

In the event of an emergency, all site personnel shall follow the requirements and provisions of the PGDP Emergency Management Plan. Emergency response shall be provided by the PGDP emergency response organization. The SHR will be in charge of personnel accountability during emergency activities. All personnel working on-site will be trained to recognize and report emergencies to the SHR or the FTM. The SHR or FTM will be responsible for notifying the PGDP emergency response organization.

The PGDP emergency response organization will be contacted for emergency response to all medical emergencies, fires, spills, or other emergencies. The PSS will coordinate 24-hour emergency response coverage. The requirements of this section will be communicated to site workers. Any new hazards or changes in the plan also will be communicated to site workers.

The DOE on-scene coordinator will provide oversight on an ongoing basis for emergency management/recovery activities.

10.10.2 Reporting an Emergency

10.10.2.1 Discovery

The person who discovers an emergency should immediately report it, then attempt to establish control ONLY if the incident is minor in magnitude. Where such measures are obviously inadequate or not successful in controlling the incident or for emergency conditions, personal injuries, or other unusual events with potential for causing personal injury, environmental releases, or property damage, the employee will initiate notification of appropriate emergency response personnel.

SOU RI/FS project personnel will maintain a radio, telephone, or other reliable means of notifying emergency response personnel and the PSS.

10.10.2.2 Emergency Contacts

- ***Fire:*** Fire alarm pull box, plant telephone Bell System 333, or plant radio channel 16
- ***Medical:*** Plant telephone Bell System 333 or plant radio channel 16
- ***Security:*** Plant telephone Bell System 6246 or plant radio channel 16
- ***PSS:*** Plant telephone Bell System 6211 or plant radio channel 16.

If using a cell phone: 270-441-6333 for emergency, for NON-emergency use 270-441-6211.

10.10.2.3 Initial Emergency Response

When an emergency occurs, the SHR or FMT will assume responsibility for the management of the scene and the protection of the personnel. Personnel are to be evacuated from the immediate danger area, as appropriate. Depending on the degree of emergency, RADCON controls may need to be adhered to during the emergency. For personnel injury or illness, there will be at least one person with current training in first aid and cardiopulmonary resuscitation present on-site during all field activities. This individual will provide minor first aid until other emergency personnel arrive and assume emergency response duties or it is determined to transport the injured to the hospital or medical provider.

10.10.2.4 Paducah Gaseous Diffusion Plant Alarms

The alarms can be heard by calling 6161 on a Bell phone.

These include the following:

• ***Radiation Emergency/Criticality Accident Alarm System (CAAS):***	Continuous blast on a high-pitched air whistle or electronic horn ACTION: Evacuate area immediately and stay away from effected building, Report to an assigned plant assembly point.
• ***Attack Warning/Tornado Warning:***	Intermittent 2-second blast on plant horns ACTION: Take cover.
• ***Evacuate Signal:***	Continuous blast on plant horns ACTION: Evacuate building
• ***Plant Emergency:***	Hi-Lo Tones ACTION: Listen to plant public address system/radio for instructions
• ***Cascade Buildings:***	Three blasts on building horns or howlers ACTION: Call area control room.
• ***Other Buildings:***	One 10-second blast on building horns or sirens ACTION: Follow local emergency procedures.

During field activities all personnel must participate in all PGDP accountability/assembly drills by sending all on-site project personnel to the appropriate assembly station for accountability. The FTM, SHR, or designee will be responsible for accounting for all field personnel (including sub-tier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator.

10.10.3 Reporting a Spill

When a spill is discovered, the FTM or SHR will immediately contact PSS and the PM and convey as much information as possible (e.g., material involved, estimated quantity spilled/affected, location, affected personnel, other hazardous conditions).

10.10.4 Protective Actions for Spill

An effort will be made to stop the release and contain the spill using materials in the on-site spill response kit, only if it is safe to do so and if no unprotected exposures occur. A telephone contact list will be available for emergency notification.

In the event that personnel are exposed to hazardous chemicals or radioactive materials, appropriate emergency response action will be taken to remove the contaminated clothing. An emergency shower and eyewash station will be used to flush exposed skin and eyes, respectively. This emergency equipment will be maintained in a readily accessible location adjacent to the active work area.

If an acute exposure to airborne chemicals occurs or is suspected and the affected personnel are unable to escape the work zone, the FTM or SHR will immediately contact PSS for assistance. Rescue operations will not be performed unless the rescuers are dressed in the appropriate protective equipment.

SOU RI/FS Project Management will be responsible for ensuring all spills of hazardous materials are properly cleaned up and disposed of, including any material generated from the spill, unless otherwise directed.

The FTM or SHR has the following responsibilities:

- Ensure that spill containment is performed safely;
- Provide all known information to PSS to ensure proper response;
- Ensure that decontamination measures for exposed personnel are conducted safely and promptly; and
- Ensure that, if personnel are exposed to airborne chemicals and are unable to escape the work zone, rescue is not attempted unless rescue personnel are dressed in the appropriate protective equipment.

During field activities, all personnel must participate in all PGDP accountability/assembly drills by sending all on-site project personnel to the appropriate assembly station for accountability. The FTM, SHR, or designee will be responsible for accounting for all field personnel (including sub-tier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator directing the drill.

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11. QUALITY ASSURANCE PROJECT PLAN

QAPP Worksheet #1
Title Page

UFP-QAPP Manual Section 2.1:

Document Title: *Quality Assurance Project Plan (QAPP) for the Remedial Investigation/Feasibility Study (RI/FS) for Soils Operable Unit Field Investigation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*

Lead Organization: DOE

Preparer's Name and Organizational Affiliation: Contractor

Preparer's Address, Telephone Number, and E-mail Address:, 761 Veterans Avenue, Kevil, KY, 42053; (270) 441-5000

Preparation Date (Day/Month/Year) 09/2009

Document Control Number: N/A

QAPP Worksheet #2
QAPP Identifying Information

UFP-QAPP Manual Section 2.2.4:
Site Name/Project Name: Paducah Soils Operable Unit Remedial Investigation/Feasibility Study
Site Location: Paducah Gaseous Diffusion Plant
Site Number/Code: N/A
Operable Unit: Soils Operable Unit
Contractor Name: Paducah Remediation Services, LLC
Contractor Number: DE-AC30-06EW05001 (DOE-PRS contract)
Contract Title: Paducah Gaseous Diffusion Plant Remediation Subcontract
Work Assignment Number: N/A

1. Identify guidance used to prepare QAPP: Uniform Federal Policy for Quality Assurance Project Plans

2. Identify regulatory program: CERCLA and Federal Facility Agreement for the Paducah Gaseous Diffusion Plant (DOE/OR/07-1707)

3. Identify approval entity: U. S. EPA, Commonwealth of Kentucky

4. Indicate whether the QAPP is a generic or a $\boxed{\text{project-specific QAPP}}$. (circle one)

5. List dates of scoping sessions that were held: 05/25/2008, 06/22/2009

6. List dates and titles of QAPP documents written for previous site work, if applicable:

*Removal Action Work Plan for Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0220&D1)	(Latest date of regulatory approval – N/A)
Removal Action Work Plan for Contaminated Sediment Associated with the Surface Water Operable Unit (On-Site) at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0221&D1)	(Latest date of regulatory approval - N/A)

* Only those QAPP documents written in UFP format are included.

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

7. List organizational partners (stakeholders) and connection with lead organization:
U.S. EPA, Commonwealth of Kentucky

8. List data users: DOE, Contractor, U.S. EPA, Commonwealth of Kentucky

9. If any required QAPP elements and required information are not applicable to the project, then circle the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:
See individual worksheets for exclusions.

Note: Information is only entered in the "Crosswalk to Related Documents" if the information is not contained in the QAPP worksheets as indicated in first two columns. Also, if the required QAPP element fulfills other quality requirements, that requirement is noted in the "Crosswalk to Related Documents" column.

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
Project Management and Objectives		
2.1 Title and Approval Page	- Title and Approval Page	
2.2 Document Format and Table of Contents 2.2.1 Document Control Format 2.2.2 Document Control Numbering System 2.2.3 Table of Contents 2.2.4 QAPP Identifying Information	- Table of Contents - QAPP Identifying Information	
2.3 Distribution List and Project Personnel Sign-Off Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	- Distribution List - Project Personnel Sign-Off Sheet	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Crosswalk to Related Documents
2.4 Project Organization 2.4.1 Project Organizational Chart 2.4.2 Communication Pathways 2.4.3 Personnel Responsibilities and Qualifications 2.4.4 Special Training Requirements and Certification	- Project Organizational Chart - Communication Pathways - Personnel Responsibilities and Qualifications Table - Special Personnel Training Requirements Table	
2.5 Project Planning/Problem Definition 2.5.1 Project Planning (Scoping) 2.5.2 Problem Definition, Site History, and Background	- Project Planning Session Documentation (including Data Needs tables) - Project Scoping Session Participants Sheet - Problem Definition, Site History, and Background - Site Maps (historical and present)	
2.6 Project Quality Objectives and Measurement Performance Criteria 2.6.1 Development of Project Quality Objectives Using the Systematic Planning Process 2.6.2 Measurement Performance Criteria	- Site-Specific PQOs - Measurement Performance Criteria Table	
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	
2.8 Project Overview and Schedule 2.8.1 Project Overview 2.8.2 Project Schedule	- Summary of Project Tasks - Reference Limits and Evaluation Table - Project Schedule/Timeline Table	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Measurement/Data Acquisition		
3.1 Sampling Tasks 3.1.1 Sampling Process Design and Rationale 3.1.2 Sampling Procedures and Requirements 3.1.2.1 Sampling Collection Procedures 3.1.2.2 Sample Containers, Volume, and Preservation 3.1.2.3 Equipment/Sample Containers Cleaning and Decontamination Procedures 3.1.2.4 Field Equipment Calibration, Maintenance, Testing, and Inspection Procedures 3.1.2.5 Supply Inspection and Acceptance Procedures 3.1.2.6 Field Documentation Procedures	- Sampling Design and Rationale - Sample Location Map - Sampling Locations and Methods/Standard Operating Procedures (SOP) Requirements Table - Analytical Methods/SOP Requirements Table - Field Quality Control Sample Summary Table - Sampling SOPs - Project Sampling SOP References Table - Field Equipment Calibration, Maintenance, Testing, and Inspection Table	
3.2 Analytical Tasks 3.2.1 Analytical SOPs 3.2.2 Analytical Instrument Calibration Procedures 3.2.3 Analytical Instrument and Equipment Maintenance, Testing, and Inspection Procedures 3.2.4 Analytical Supply Inspection and Acceptance Procedures	- Analytical SOPs - Analytical SOP References Table - Analytical Instrument Calibration Table - Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table	
3.3 Sample Collection Documentation, Handling, Tracking, and Custody Procedures 3.3.1 Sample Collection Documentation 3.3.2 Sample Handling and Tracking System 3.3.3 Sample Custody	- Sample Collection Documentation Handling, Tracking, and Custody SOPs - Sample Container Identification - Sample Handling Flow Diagram - Example Chain-of-Custody Form and Seal	
3.4 Quality Control Samples 3.4.1 Sampling Quality Control Samples 3.4.2 Analytical Quality Control Samples	- QC Samples Table - Screening/Confirmatory Analysis Decision Tree	
3.5 Data Management Tasks 3.5.1 Project Documentation and Records 3.5.2 Data Package Deliverables 3.5.3 Data Reporting Formats 3.5.4 Data Handling and Management 3.5.5 Data Tracking and Control	- Project Documents and Records Table - Analytical Services Table - Data Management SOPs	

QAPP Worksheet #2
QAPP Identifying Information
(Continued)

Assessment/Oversight		
4.1 Assessments and Response Actions 4.1.1 Planned Assessments 4.1.2 Assessment Findings and Corrective Action Responses	- Assessments and Response Actions - Planned Project Assessments Table - Audit Checklists - Assessment Findings and Corrective Action Responses Table	
4.2 QA Management Reports	- QA Management Reports Table	.
4.3 Final Project Report		
Data Review		
5.1 Overview		
5.2 Data Review Steps 5.2.1 Step I: Verification 5.2.2 Step II: Validation 5.2.2.1 Step IIa Validation Activities 5.2.2.2 Step IIb Validation Activities 5.2.3 Step III: Usability Assessment 5.2.3.1 Data Limitations and Actions from Usability Assessment 5.2.3.2 Activities	- Verification (Step I) Process Table - Validation (Steps IIa and IIb) Process Table - Validation (Steps IIa and IIb) Summary Table - Usability Assessment	
5.3 Streamlining Data Review 5.3.1 Data Review Steps To Be Streamlined 5.3.2 Criteria for Streamlining Data Review 5.3.3 Amounts and Types of Data Appropriate for Streamlining		

QAPP Worksheet #3
Distribution List

UFP-QAPP Manual Section 2.3.1:

QAPP Recipients	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
The QAPP is submitted as a section of the RI/FS Work Plan; thus it will be included on the RI/FS Work Plan distribution list.	N/A	N/A	N/A	N/A	N/A	N/A

N/A = not applicable

QAPP Worksheet #4-1
Project Personnel Sign-Off Sheet

UFP-QAPP Manual Section 2.3.2
Organization: Contractor

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
Contractor	ER/EM Director	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Project Manager	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Quality Assurance Manager	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Task Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Engineer	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Compliance and Protection Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Environmental Sampling Lead	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	QA Specialist	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Health and Safety Representative	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A
Contractor	Waste Coordinator	N/A	Personnel will read and sign QAPP prior to mobilization.	N/A

N/A = not available

QAPP Worksheet #4-2
Project Personnel Sign-Off Sheet

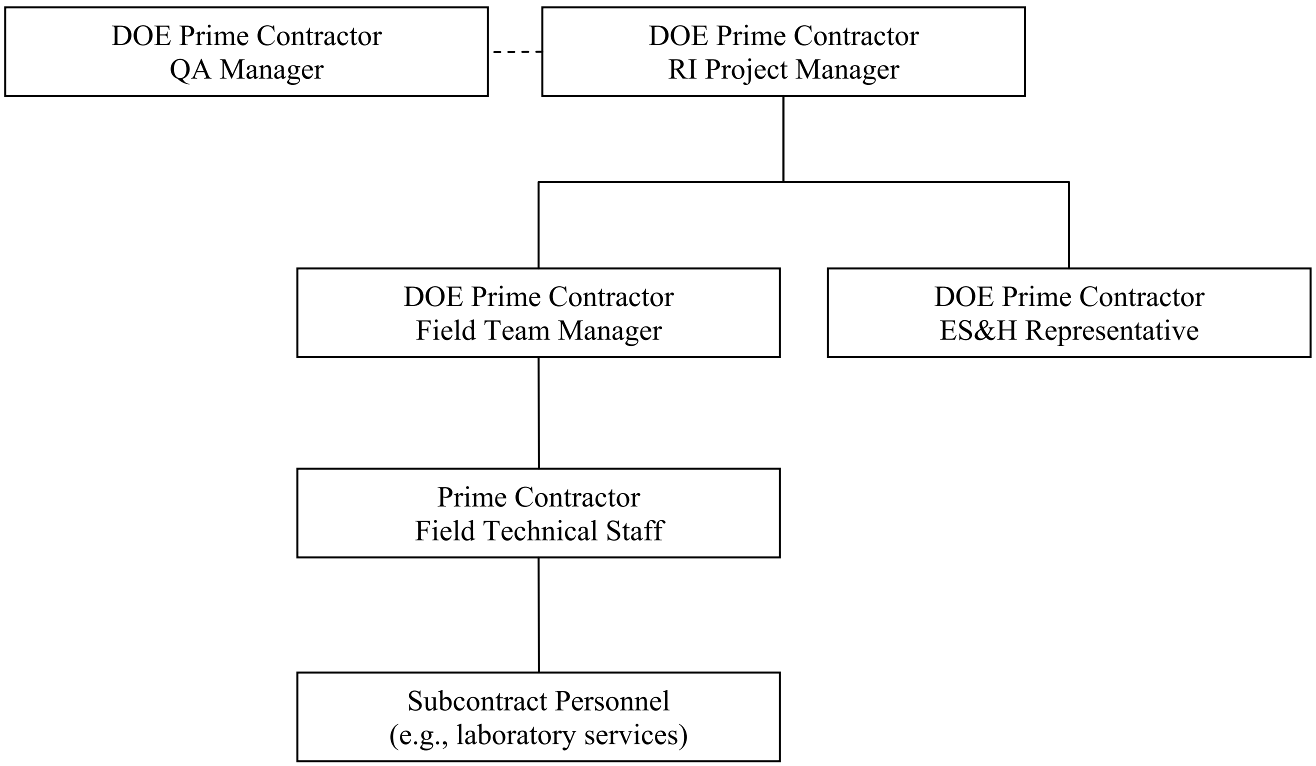
Organization: Contractor/Subcontractor

Project Personnel	Title	Telephone Number	Signature	Date QAPP Read
N/A	N/A	N/A	N/A	N/A

N/A = not applicable

QAPP Worksheet #5
Project Organizational Chart

UFP-QAPP Manual Section 2.4.1



QAPP Worksheet #6
Communication Pathways

UFP-QAPP Manual Section 2.4.2:

Note: Formal communications across company or regulatory boundaries occur via letter. Other forms of communication such as e-mail, verbal, meetings, etc., will occur throughout the project.

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Federal Facility Agreement DOE/OR/07-1707 (PRS-035)	DOE Paducah Site Lead	N/A	N/A	All formal communication among DOE, EPA, and the Kentucky Department for Environmental Protection
Federal Facility Agreement DOE/OR/07-1707 (PRS-035)	DOE Paducah Environmental Restoration Project Manager	N/A	N/A	All formal communications between DOE and Contractor for Environmental Restoration Projects
All Project Requirements	Prime Contractor Site Manager	N/A	N/A	All formal communication between Contractor and DOE
All Project Requirements	Contractor ER/EM Director	N/A	N/A	All communications between the project and the Site Manager
All Project Requirements	Contractor ER/EM Deputy Director	N/A	N/A	All communications between the project and the Site Manager
All Project Requirements	Contractor Project Manager	N/A	N/A	All communication between the project and the ER/EM Director
Project Quality Assurance Requirements	Contractor QA Manager	N/A	N/A	All quality related communications between the QA Department and the ER/EM Director
Project Quality Assurance Requirements	Contractor QA Specialist	N/A	N/A	All project quality related communications between the QA Department and the Contractor Project Manager
FFA Compliance	Contractor FFA Project Manager	N/A	N/A	All internal communication regarding FFA compliance with the Contractor Project Manager
Sampling Requirements	Contractor Environmental Sampling Lead	N/A	N/A	All internal communication regarding field sampling with the Contractor Project Manager
Analytical Laboratory Interface	Contractor Lab Coordinator	N/A	N/A	All communication between Contractor and analytical laboratory
Waste Management Requirements	Contractor Waste Coordinator	N/A	N/A	All internal communication regarding waste project waste management with the Contractor Project Manager

QAPP Worksheet #6
Communication Pathways (continued)

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure (Timing, Pathways, etc.)
Environmental Compliance Requirements	Contractor Environmental Compliance Lead	N/A	N/A	All internal correspondence regarding environmental requirements and compliance with the Contractor Project Manager
Subcontractor Requirements (if applicable)	Contractor Senior Subcontract Administrator	N/A	N/A	All correspondence between the project and subcontractors, if applicable
Health and Safety requirements	Contractor Health and Safety Representative	N/A	N/A	All internal communication regarding safety and health requirements with the Contractor Project Manager

N/A = not available, as personnel may change

QAPP Worksheet #7
Personnel Responsibilities and Qualifications Table

UFP-QAPP Manual Section 2.4.3:

Name	Title	Organizational Affiliation	Responsibilities	Education and Experience Qualifications
N/A	Paducah Site Lead	DOE	Overall site responsibility–liaison with EPA and Commonwealth of Kentucky	N/A
N/A	Paducah Environmental Restoration Project Manager	DOE	Environmental Restoration project responsibility	N/A
N/A	Paducah Site Manager (Acting)	Contractor	Contractor lead responsible for site	N/A
N/A	ER/EM Director	Contractor	Overall ER/EM project responsibility	N/A
N/A	Project Manager	Contractor	Overall soils/surface water responsibility	N/A
N/A	Quality Assurance Manager	Contractor	Overall project QA responsibility	N/A
N/A	Environmental Engineer	Contractor	Project coordination	N/A
N/A	Federal Facility Agreement Project Manager	Contractor	Project compliance with the FFA	N/A
N/A	Environmental Engineer	Contractor	Project SAP	N/A
N/A	Environmental Compliance and Protection Lead	Contractor	Project Environmental Compliance Protection responsibility	N/A
N/A	Environmental Sampling Lead	Contractor	Project Sampling responsibility	N/A
N/A	QA Specialist	Contractor	Project QA responsibility	N/A
N/A	Health and Safety Representative	Contractor	Project Safety and Health Responsibility	N/A
N/A	Waste Coordinator	Contractor	Overall Project waste management responsibility	N/A
N/A	Data Validator	Independent, Third-Party Contractor	Performing fixed-base laboratory data validation according to specified procedures	N/A

N/A = not available, as personnel may change

QAPP Worksheet #8
Special Personnel Training Requirements Table

UFP-QAPP Manual Section 2.4.4:

Project Function	Specialized Training – Title or Description of Course	Training Provider	Training Date	Personnel/Groups Receiving Training	Personnel Titles/ Organizational Affiliation	Location of Training Records/Certificates[1]
There will be no specialized training required for this project. Training required for this project is standard training that personnel already have.	N/A	N/A	N/A	N/A	N/A	N/A

[1]If training records and/or certificates are on file elsewhere, document their location in this column. If training records and/or certificates do not exist or are not available, then this should be noted.
N/A = not applicable

QAPP Worksheet #9-1
Project Scoping Session Participants Sheet

UFP-QAPP Manual Section 2.5.1:

Project Name Soils Operable Unit Remedial Investigation/Feasibility Study **Projected Date(s) of Sampling** TBD **Project Manager** Craig Jones	**Site Name** Paducah Gaseous Diffusion Plant **Site Location** Paducah, KY

Date of Session: 02/25/2008
Scoping Session Purpose: Discuss objectives and scope of project, work plan requirements, and deadlines.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Craig Jones	Project Manager	RSI	270-441-5114	N8e@prs-llc.net	PM
Richard Lee	Scientist	RSI	865-576-6596	rlee@rsienv.com	Project
Teresa Overby	Engineer	RSI	270-441-5188	to1@prs-llc.net	Project
LeAnne Garner	Engineer	Tetra Tech	270-441-5436	yln@prs-llc.net	Project

Comments/Decisions: Assigned individual responsibilities
Action Items:
Consensus Decisions:

QAPP Worksheet #9-2
Project Scoping Session Participants Sheet

UFP-QAPP Manual Section 2.5.1:

Project Name Soils OU RI/FS Work Plan **Projected Date(s) of Sampling** TBD **Project Manager** Craig Jones	**Site Name** Paducah Gaseous Diffusion Plant **Site Location** Paducah, KY

Date of Session:06/22/2009
Scoping Session Purpose: Requirements and format for QAPP for Work Plan.

Name	Title	Affiliation	Phone #	E-mail Address	Project Role
Doug Jones	QA Specialist	PRS	270-441-5089	dj1@prs-llc.net	QA
Teresa Overby	Task Lead	PRS	270-441-5188	to1@prs-llc.net	Task Lead
Wes Hodges	Radiological Engineer	PRS	270-441-5295	8hx@prs-llc.net	Radiological
LeAnne Garner	Project Engineer	PRS	270-441-5436	yln@prs-llc.net	Project
Lisa Crabtree	Sample/Data Management	PRS	270-441-5135	tvg@prs-llc.net	Sample/Data

Comments/Decisions: QAPP should be prepared in Uniform Federal Policy Worksheet style
Action Items:
Consensus Decisions:

QAPP Worksheet #10
Problem Definition

UFP-QAPP Manual Section 2.5.2:

The problem to be addressed by the project: The DOE, EPA, and Commonwealth of Kentucky have entered into a FFA agreement to investigate and, if warrented, remediate 86 areas (AOCs/SWMUs) of the Paducah Gaseous Diffusion Plant. The areas are listed in Section 1 of the RI/FS Work Plan. These investigations include collecting samples as noted in the Plan and analyzing the samples for field and laboratory analyses to identify the nature and extent of contamination. The soils in the various AOCs/SWMUs may have been contaminated through plant operations. **The environmental questions being asked:** Are the AOCs/SWMUs contaminated and, if so, to what extent and with what contaminants? **Observations from any site reconnaissance reports:** See SWMU Assessment Reports. **A synopsis of secondary data or information from site reports:** See previously issued SWMU Assessment Reports for the 86 areas to be addressed and Section 5 of the RI/FS Work Plan. **The possible classes of contaminants and the affected matrices:** See Section 5 of RI/FS Work Plan that provides information regarding the potential contaminants found within the soil matrices by AOC/SWMU.

QAPP Worksheet #10
Problem Definition
(Continued)

The rationale for inclusion of chemical and nonchemical analyses: As noted in Sections 5 and 9 of the RI/FS Work Plan and the AOC/SWMU Assessment Reports, various chemical and radiological parameters will be analyzed to determine the nature and extent of contamination at each AOC/SWMU. **Information concerning various environmental indicators:** Environmental indicators include metals, PCBs, and radiological parameters for PGDP contamination and are used as indicators for this project. **Project decision conditions ("If..., then..." statements):** See Section 1 of the RI/FS Work Plan, which provides the Data Quality Objectives (if…then…statements).

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

UFP-QAPP Manual Section 2.6.1:

Who will use the data? DOE, KY, and EPA will use the environmental sampling data to determine the nature and extent of contamination and assess any potential risks to ecological and human health posed by the contamination.
What will the data be used for? To determine the nature and extent of contamination and complete a baseline human health risk assessment and a screening ecological risk assessment.
What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Field screening data will be used to characterize metals, PCBs, and radiological contamination. Based on the type of anomaly identified, a percentage of the samples collected for field screening will be submitted to a fixed-base laboratory for analyses of target analytes listed on worksheet #10 and analyzed in a DOE Consolidated Audit Program (DOECAP) certified laboratory. Note that soil results will be reported on an "as received" or wet weight basis.

How "good" do the data need to be in order to support the environmental decision? The data need to be able to characterize and delineate the nature and extent of each SWMU/AOC. The data will be used to evaluate potential risks to ecological and human health. The acquired data must be of known quality to increase confidence that the 85 SWMUs and AOCs are being and will be addressed appropriately.

How much data are needed? (number of samples for each analytical group, matrix, and concentration) Soil samples and radiological walkover data will be collected in accordance with Chapter 9.

Where, when, and how should the data be collected/generated? This investigation will evaluate 85 SWMUs/AOCs. The collection of field data and analytical data will enable DOE to increase confidence that SWMU/AOCs have been adequately characterized so that response actions can be planned. Soil samples and radiological walkover data will be collected in accordance with Chapter 9.

Field analysis will be completed for each collected soil sample using the following field analytical methods:

- Immunoassay/colorimetric method to measure soil PCB concentrations
- XRF technology to measure metals concentrations

A minimum of 10% of the soil samples will be submitted to a DOE certified laboratory.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements
(continued)

Who will collect and generate the data? A sample team of individuals who are properly trained and skilled in the execution of the sampling procedures defined in this work plan will collect samples and perform the field screening measurements. The sample team members are responsible for safe conduct of work at all times and are responsible for collecting, preserving, handling, and storing samples in accordance with the provisions of the work plan. The sample team will perform radiological surveys and collect the soil samples following contractor sampling procedures.

How will the data be reported? Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The fixed-base laboratory will provide data in an electronic data deliverable (EDD) format. Project data will be reported from the Paducah OREIS.

How will the data be archived? Data will be archived in Paducah OREIS as required.

QAPP Worksheet #12-1
Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2:

Matrix	Soil/sediment
Analytical Group[1]	Volatile Organic Compounds
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-8260	Precision–Lab	RPD–22%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Trip Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Semivolatile Organic Compounds
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-8270	Precision–Lab	RPD–38%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
1 If information varies within an analytical group, separate by individual analyte.
2 Reference number from QAPP Worksheet #21 (see Section 3.1.2).
3 Reference number from QAPP Worksheet #23 (see Section 3.2).
4 The most current version of the method will be used.
5 Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
6 Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-3
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (aluminum, antimony, barium, beryllium, calcium, chromium, iron, magnesium, manganese, molybdenum, nickel, sodium, vanadium, and zinc)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-4
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (arsenic, cadmium, cobalt, copper, lead, mercury, selenium, silver, thallium, uranium)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness	90%	Data completeness check	S&A
	SW846-7471	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-5
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	PCBs
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	SW846-8082	Precision–Lab	RPD–43%	Laboratory Duplicates	A
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-6
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (Gross alpha and Gross beta)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	EPA 900	Precision–Lab	RPD–30% (gross alpha)	Laboratory Duplicates	A
		Precision–Lab	RPD–25% (gross beta)	Laboratory Duplicates	A
		Prescision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-7
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (uranium-234, uranium-235, uranium-238)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	Alpha spectroscopy	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Presision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-8
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (americium-241, neptunium-237, plutonium-238, plutonium-239/240, thorium-228, thorium-230, thorium-232)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	Alpha spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-9
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (cesium-137)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	Gamma spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-10
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Radionuclides (technetium-99)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	Liquid scintillation	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Prescision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-11
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	Metals (antimony, arsenic, barium, cadmium, chromium, copper, iron, lead, manganese, mercury, molybdenum, nickel, selenium, silver, uranium, vanadium, and zinc)
Concentration Level	Moderate

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW846-6200 (XRF)	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6]Percent recovery is laboratory-specific, calculated from studies performed as required. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #12-12
Measurement Performance Criteria Table

Matrix	Soil/sediment
Analytical Group[1]	PCBs (test kits)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	Manufacturer's instructions	Precision–Lab	n/a	n/a	n/a
		Precision	RPD–50%	Field Duplicates	S
		Accuracy/Bias	n/a	n/a	n/a
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Accuracy/Bias Contamination	No target compounds > QL	Field Blanks	S
		Accuracy/Bias Contamination	No target compounds > QL	Equipment Rinseates	S
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
[1]If information varies within an analytical group, separate by individual analyte.
[2]Reference number from QAPP Worksheet #21 (see Section 3.1.2).
[3]Reference number from QAPP Worksheet #23 (see Section 3.2).
[4]The most current version of the method will be used.
[5]Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
N/A = not applicable

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

UFP-QAPP Manual Section 2.7:

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/Collection Dates)	How Data Will Be Used	Limitations on Data Use
Appendix C "Analytical Data"; process knowledge	Data are from various sources, also see Section 5	DOE; previous analytical sampling/analysis results; contaminant conclusions based process knowledge	To determine whether SWMU is contaminated and, if so, to quantify risk to human health and provide input to the remedy alternatives	Radiological data should be evaluated for analytical limitations, data is used for planning purposes only

QAPP Worksheet #14
Summary of Project Tasks[1]

UFP-QAPP Manual Section 2.8.1:

Sampling Tasks: See Section 9 (Field Sampling Plan) of the RI/FS Work Plan.
Analysis Tasks: See Section 9 (Field Sampling Plan) of the RI/FS Work Plan.
Quality Control Tasks: QC Samples: Work Sheet # 20 & 28; Equipment Calibration: Work Sheet # 22 & 24; Data Review/Validation: Work Sheet # 34, 35, 36, & 37.
Secondary Data: See Section 9 (Field Sampling Plan) of the RI/FS Work Plan.
Data Management Tasks: See Section 12 (Data Management Implementation Plan) of the RI/FS Work Plan.
Documentation and Records: Documentation and Records will be per DOE Prime Contractor procedure PRS-DOC-1009, *Documents and Records*. Also, See Section 12 (Data Management Implementation Plan) of the RI/FS Work Plan.
Assessment/Audit Tasks: Assessments and audits will be per DOE Prime Contractor procedure PRS-ENM-5003, *Quality Assured Data*. Also, See Section 11 (Quality Assurance Project Plan) of the RI/FS Work Plan.
Data Review Tasks: Data review tasks will be per DOE Prime Contractor procedure PRS-ENM-5003, *Quality Assured Data*.

[1]It is understood that SOPs are contractor specific.

QAPP Worksheet #15-1
Reference Limits and Evaluation Table

UFP-QAPP Manual Section 2.8.1:
Matrix: Soil/Sediment
Analytical Group: volatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Acetone	67-64-1	53,400	10	5	1	6.47	10
Acrolein	107-02-8	4.29	10	5	1	2.901	4.29
Acrylonitrile	107-13-1	64.5	10	5	1	1.126	10
Benzene	71-43-2	327	10	5	1	0.253	10
Bromodichloromethane	75-27-4	390	10	5	1	0.254	10
Bromoform	75-25-2	13,800	10	5	1	0.366	10
Bromomethane	74-83-9	186	10	5	1	0.396	10
2-Butanone	78-93-3	153,000	10	5	1	0.389	10
Carbon disulfide	75-15-0	15,700	10	5	1	0.369	10
Carbon tetrachloride	56-23-5	97.8	10	5	1	0.360	10
Chlorobenzene	108-90-7	4,470	10	5	1	0.382	10
Chloroethane	75-00-3	978	10	5	1	0.382	10
2-Chloroethyl vinyl ether	110-75-8	n/a	10	5	1	0.523	10
Chloroform	67-66-3	18.2	10	5	1	0.092	10
Chloromethane	74-87-3	884	10	5	1	0.553	10
Dibromochloromethane	124-48-1	334	10	5	1	0.329	10
Dibromomethane	74-95-3	3,170	10	5	1	0.405	10
Dichlorodifluoromethane	75-71-8	5,200	10	5	1	0.449	10
1,1-Dichloroethane	75-34-3	22,900	10	5	1	0.392	10
1,2-Dichloroethane	107-06-2	152	10	5	1	0.372	10
1,1-Dichloroethene	75-35-4	27.6	10	5	1	0.365	10
cis-1,2-Dichloroethene	156-59-2	1,980	10	5	1	0.159	10
trans-1,2-Dichloroethene	156-60-5	3,260	10	5	1	0.178	10

QAPP Worksheet #15-1 Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: volatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
1,2-Dichloropropane	78-87-5	180	10	5	1	0.317	10
cis-1,3-Dichloropropene	10061-01-5	n/a	10	5	1	0.339	10
trans-1,3-Dichloropropene	10061-02-6	n/a	10	5	1	0.349	10
trans-1,4-Dichloro-2-butene (100)	110-57-6	n/a	10	5	1	0.397	10
Ethyl benzene	100-41-4	6,010	10	5	1	0.299	10
Ethyl methacrylate	97-63-2	99,700	10	5	1	0.240	10
Iodomethane	74-88-4	n/a	10	5	1	1.511	10
2-Hexanone	591-78-6	n/a	10	5	1	0.261	10
Methylene chloride	75-09-2	3,920	10	5	1	0.801	10
4-Methyl-2-pentanone	108-10-1	9,660	10	5	1	0.326	10
Styrene	100-42-5	128,000	10	5	1	0.347	10
1,1,1,2-Tetrachloroethane	630-20-6	1,430	10	5	1	0.238	10
1,1,2,2-Tetrachloroethane	79-34-5	145	10	5	1	0.272	10
Tetrachloroethene	127-18-4	1,170	10	5	1	0.280	10
Toluene	108-88-3	31,200	10	5	1	0.303	10
1,1,1-Trichloroethane	71-55-6	23,200	10	5	1	0.291	10
1,1,2-Trichloroethane	79-00-5	345	10	5	1	0.573	10
Trichloroethene	79-01-6	741	10	5	1	0.290	10
Trichlorofluoromethane	75-69-4	19,300	10	5	1	0.167	10
1,2,3-Trichloropropane	96-18-4	0.629	10	5	1	0.559	0.629
Vinyl acetate	108-05-4	21,300	10	5	1	0.305	10
Vinyl chloride	75-01-4	40	10	5	1	0.428	10
m,p-xylene	NS831	107,000	20	5	1	0.569	20
o-xylene	95-47-6	659,000	10	5	1	0.318	10

n/a = not available
[1]Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001d). See Section 6.1.1 for additional information.
[2]Analytical MDLs and QLs are those documented in validated methods.
[3]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
1,2,4-Trichlorobenzene	120-82-1	12,200	660	660		33.3	660
1,2-Dichlorobenzene	95-50-1	40,000	660	660		33.3	660
1,3-Dichlorobenzene	541-73-1	997	660	660		33.3	660
1,4-Dichlorobenzene	106-46-7	1,360	660	660		33.3	660
2,4,5-Trichlorophenol	95-95-4	160,000	660	660		33.3	660
2,4,6-Trichlorophenol	88-06-2	8,510	660	660		33.3	660
2,4-Dichlorophenol	120-83-2	6,930	660	660		33.3	660
2,4-Dimethylphenol	105-67-9	32,000	660	660		33.3	660
2,4-Dinitrotoluene	121-14-2	209	660	660		33.3	209
2,6-Dinitrotoluene	606-20-2	209	660	660		33.3	209
2-Chloronaphthalene	91-58-7	33,800	660	660		33.3	660
2-Chlorophenol	95-57-8	2,810	660	660		33.3	660
2-Methylnaphthalene	91-57-6	n/a	660	660		33.3	660
2-Nitrophenol	88-75-5	n/a	660	660		33.3	660
4-Bromophenyl phenyl ether	101-55-3	n/a	660	660		33.3	660

QAPP Worksheet #15-2 Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
4-Chlorophenylphenyl ether	7005-72-3	n/a	660	660		33.3	660
Acenaphthene	83-32-9	n/a	660	660		33.3	660
Acenaphthylene	208-96-8	n/a	660	660		33.3	660
Anthracene	120-12-7	526,000	660	660		33.3	660
Benz(a)anthracene	56-55-3	67	660	660		33.3	67
Benzo(a)pyrene	50-32-8	6.7	660	660		33.3	6.7
Benzo(b)fluoranthene	205-99-2	67	660	660		33.3	67
Benzo(ghi)perylene	191-24-2	n/a	660	660		33.3	660
Benzo(k)fluoranthene	207-08-9	670	660	660		33.3	660
bis(2-chloroethoxy)methane	111-91-1	n/a	660	660		33.3	660
bis(2-chloroethyl) ether	111-44-4	29	660	660		33.4	29
bis(2-chloroisopropyl) ether	108-60-1	1,340	660	660		33.3	660
bis(2-ethylhexyl)phthalate	117-81-7	2,840	660	660		43.3	660
Butyl benzyl phthalate	85-68-7	373,000	660	660		33.3	660
Chrysene	218-01-9	6,700	660	660		33.3	660
Dibenz(a,h)anthracene	53-70-3	6.7	660	660		33.3	6.7
Dibenzofuran	132-64-9	2,930	660	660		33.3	660
Diethylphthalate	84-66-2	1,970,000	660	660		33.3	660
Dimethylphthalate	131-11-3	24,600,000	660	660		33.3	660
Di-n-butylphthalate	84-74-2	264,000	660	660		33.3	660
Di-n-octylphthalate	117-84-0	49,200	660	660		33.3	660
Fluoranthene	206-44-0	34,300	660	660		33.3	660
Fluorene	86-73-7	50,100	660	660		33.3	660

QAPP Worksheet #15-2 Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Hexachlorobenzene	118-74-1	58.5	660	660		33.3	58.5
Hexachlorobutadiene	87-68-3	320	660	660		33.3	320
Hexachlorocyclopentadiene	77-47-4	9,590	660	660		330	660
Hexachloroethane	67-72-1	1,600	660	660		33.3	660
Indeno(1,2,3-cd)pyrene	193-39-5	67	660	660		33.3	67
Isophorone	78-59-1	98,500	660	660		33.3	660
m,p-cresol		9,770[4]	660	660		66.6	660
Naphthalene	91-20-3	3,470	660	660		33.3	660
Nitrobenzene	98-95-3	492	660	660		33.3	660
N-Nitroso-di-n-propylamine	621-64-7	7.3	660	660		33.3	7.3
N-Nitrosodiphenylamine	86-30-6	10,400	660	660		33.3	660
o-cresol	95-48-7	79,900	660	660		33.3	660
Phenanthrene	85-01-8	n/a	660	660		33.3	660
Phenol	108-95-2	1,480,000	660	660		33.3	660
Pyrene	129-00-0	25,700	660	660		33.3	660
Pyridine	110-86-1	1,600	660	660		66.6	660
3,3'-Dichlorobenzidine	91-94-1	208	1300	1300		33.3	208
4-Chloro-3-methylphenol	59-50-7	n/a	1300	1300		33.3	1300
4-Chloroaniline	106-47-8	6,390	1300	1300		33.3	1300
Benzyl Alcohol	100-51-6	593,000	1300	1300		33.3	1300
2,4-Dinitrophenol	51-28-5	5,280	3300	3300		330	3300
2-Methyl-4,6-dinitrophenol	534-52-1	n/a	3300	3300		330	3300
2-Nitroaniline	88-74-4	91.3	3300	3300		33.3	91.3
3-Nitroaniline	99-09-2	n/a	3300	3300		33.3	3300

QAPP Worksheet #15-2 Reference Limits and Evaluation Table (Continued)

Matrix: Soil/Sediment
Analytical Group: semivolatile organic compounds
Concentration Level: low

Analyte	CAS Number	Project Action Limit (µg/kg)[1]	Project Quantitation Limit (µg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
4-Nitroaniline	100-01-6	n/a	3300	3300		330	3300
4-Nitrophenol	100-02-7	21,100	3300	3300		330	3300
Benzoic Acid	65-85-0	10,600,000	3300	3300		330	3300
Pentachlorophenol	87-86-5	646	3300	3300		330	646

n/a = not available
[1]Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001d). See Section 6.1.1 for additional information.
[2]Analytical MDLs and QLs are those documented in validated methods.
[3]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.
[4]Lowest no action limit among m-cresol and p-cresol was used.

QAPP Worksheet #15-3
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: metals
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Aluminum	7429-90-5	732	20	20			20
Antimony	7440-36-0	0.0635	10	10		0.164	0.164
Arsenic	7440-38-2	0.132	1	1		0.203	0.203
Barium	7440-39-3	37	2.5	2.5		0.057	2.5
Beryllium	7440-41-7	0.16	0.5	0.5		0.011	0.16
Cadmium	7440-43-9	2.64	0.5	0.5		0.011	0.5
Chromium	7440-47-3	60.5	2.5	2.5		0.302	2.5
Copper	7440-50-8	68.1	2.5	2.5		0.0536	2.5
Iron	7439-89-6	314	20	20		3.30	20
Lead	7439-92-1	50	20	1		0.026	20
Manganese	7439-96-5	7.46	2.5	2.5		0.054	2.5
Mercury	7439-97-6	0.158	0.02	0.02		0.006	0.02
Molybdenum	7439-98-7	10.9	5	5		0.077	5
Nickel	7440-02-0	34	5	5		0.0822	5
Selenium	7782-49-2	12.1	1	1		0.045	1
Silver	7440-22-4	6.12	1	1		0.008	1
Thallium	7440-28-0	0.107[4]	2	2		0.058	0.107
Uranium	7440-61-1	2.16	1	1		0.012	1
Vanadium	7440-62-2	0.562	2.5	2.5		0.735	0.735
Zinc	7440-66-6	401	20	20		1.33	20

n/a = not available
[1]Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001d). See Section 6.1.1 for additional information.
[2]Analytical MDLs and QLs are those documented in validated methods.
[3]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.
[4]The no action level for thallium chloride was used.

QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: radionuclides
Concentration Level: low

Analyte	CAS Number	Project Action Limit (pCi/g)[1]	Project Quantitation Limit (pCi/g)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDCs	Method QLs	MDCs	QLs
Alpha Activity	12587-46-1	n/a	5	5		5	5
Beta Activity	12587-47-2	n/a	5	5		5	5
Americium-241	14596-10-2	0.836	0.05	3		0.05	0.05
Cesium-137	10045-97-3	0.0128	0.1	0.5		0.1	0.1
Neptunium-237	13994-20-2	0.0405	0.05	3		0.05	0.05
Plutonium-238	13981-16-3	2.27	0.05	6		0.05	0.05
Plutonium-239/240	n/a	2.22	0.05	4		0.05	0.05
Technetium-99	14133-76-7	67.4	1	8		1	1
Thorium-228	14274-82-9	0.00418	0.05	3		0.05	0.05
Thorium-230	14269-63-7	2.85	0.05	4		0.05	0.05
Thorium-232	n/a	2.61	0.05	3		0.05	0.05
Uranium-234	13966-29-5	3.81	0.15	3		0.15	0.15
Uranium-235	15117-96-1	0.0591	0.05	2		0.05	0.05
Uranium-238	24678-82-8	0.261	0.15	2		0.15	0.15

n/a = not available
[1]Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001d). See Section 6.1.1 for additional information.
[2]Analytical MDCs and QLs are those documented in validated methods.
[3]Achievable MDCs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-5
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: PCBs
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Aroclor-1016	12674-11-2	0.0574	0.1	0.1	n/a	5.39	57.4
Aroclor-1221	11104-28-2	0.0574	0.1	0.1	n/a	5.39	57.4
Aroclor-1232	11141-16-5	0.0574	0.1	0.1	n/a	5.39	57.4
Aroclor-1242	53469-21-9	0.0574	0.1	0.1	n/a	5.39	57.4
Aroclor-1248	12672-29-6	0.0574	0.1	0.1	n/a	5.39	57.4
Aroclor-1254	11097-69-1	0.0388	0.1	0.1	n/a	6.13	57.4
Aroclor-1260	11096-82-5	0.0574	0.1	0.1	n/a	6.13	57.4
Total PCBs	1336-36-3	0.0574	0.1	0.1	n/a	51.47	57.4

n/a = not available
[1]Project Action Limits shown are no action levels for the Child Resident scenario from the Risk Methods Document (DOE 2001d). See Section 6.1.1 for additional information.
[2]Analytical MDLs and QLs are those documented in validated methods.
[3]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-6
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: metals by XRF
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Antimony	7440-36-0	30	30	30		30	n/a
Arsenic	7440-38-2	11	11	11		11	n/a
Barium	7440-39-3	170	100	100		100	n/a
Cadmium	7440-43-9	12	12	12		12	n/a
Chromium	7440-47-3	85	85	85		85	n/a
Copper	7440-50-8	35	35	35		35	n/a
Iron	7439-89-6	28,000	100	100		100	n/a
Lead	7439-92-1	23	13	13		13	n/a
Manganese	7439-96-5	820	85	85		85	n/a
Mercury	7439-97-6	10	10	10		10	n/a
Molybdenum	7439-98-7	830	15	15		15	n/a
Nickel	7440-02-0	65	65	65		65	n/a
Selenium	7782-49-2	20	20	20		20	n/a
Silver	7440-22-4	10	10	10		10	n/a
Uranium	7440-61-1	20	20	20		20	n/a
Vanadium	7440-62-2	70	70	70		70	n/a
Zinc	7440-66-6	60	25	25		25	n/a

n/a = not available
[1] These Project Action Limits are explained in Table 9.2.
[2] Analytical MDLs and QLs are those documented in validated methods.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #15-7
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: PCBs by test kit
Concentration Level: low

Analyte	CAS Number	Project Action Limit (mg/kg)[1]	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achievable Laboratory Limits[3]	
				MDLs	Method QLs	MDLs	QLs
Total PCBs	1336-36-3	5	5	5		5	n/a

n/a = not available
[1] These Project Action Limits are explained in Table 9.2.
[2]Analytical MDLs and QLs are those documented in validated methods.
[3]Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits will be part of the scope submitted for laboratory solicitation for the Soils OU project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

QAPP Worksheet #16
Project Schedule/Timeline Table

UFP-QAPP Manual Section 2.8.2:

Activities	Organization	Dates (MM/DD/YY) Anticipated Date(s) of Initiation	Dates (MM/DD/YY) Anticipated Date of Completion	Deliverable	Deliverable Due Date
The schedule is included in Section 2 of this RI/FS Work Plan.					

QAPP Worksheet #17
Sampling Design and Rationale

UFP-QAPP Manual Section 3.1.1:

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach):
The Soils OU SWMUs have been divided into 45 ft^2 grids and will be composite sampled as described in Section 9, "Field Sampling Plan." This approach allows for a non-biased statistical evaluation to determine if the exposure unit within the SWMU is contaminated.
Describe the sampling design and rationale in terms of what matrices will be sampled, what analytical groups will be analyzed and at what concentration levels, the sampling locations (including QC, critical, and background samples), the number of samples to be taken, and the sampling frequency (including seasonal considerations) [May refer to map or Worksheet #18 for details]:
Surface and subsurface soils will be sampled from Soils OU SWMUs that have not been adequately characterized previously. At each SWMU, a wide range of analyses will be collected: SVOCs, metals, and radionuclides. It is not known the levels of chemicals that will be detected at each SWMU. Available historical data has been provided in Appendix C. Additional information is available in Worksheet 18 and in Section 9, "Field Sampling Plan."

QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 99	Soil	surface	SVOCs	See Appendix C for available historical information	5	See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			PCBs		5		
			Metals		5		
			Radionuclides		5		
			Metals by XRF		51+2 field duplicate		
			PCBs by test kit		51+2 field duplicate		
		shallow	SVOCs		5		
			PCBs		5		
			Metals		5		
			Radionuclides		5		
			Metals by XRF		51+2 field duplicate		
			PCBs by test kit		51+2 field duplicate		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		8+1 field duplicate		
			PCBs by test kit		8+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18 -1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 194	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		30+1 field duplicate		
			PCBs		30		
			Metals		30		
			Radionuclides		30+1 field duplicate		
			Metals by XRF		394+15 field duplicates		
			PCBs by test kit		394+15 field duplicates		
		shallow					
			SVOCs		35+2 field duplicates		
			PCBs		35		
			Metals		35		
			Radionuclides		35+2 field duplicates		
			Metals by XRF		394+16 field duplicates		
			PCBs by test kit		394+16 field duplicates		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18 -1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 196	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 211	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1+1 field duplicate		
			PCBs		1		
			Metals		1		
			Radionuclides		1+1 field duplicate		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		
		shallow	VOCs		2+1 field duplicate		
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		pipeline	VOCs		2		
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 483	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5		
			PCBs by test kit		5		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5		
			PCBs by test kit		5		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		
			PAHs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 489	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		
			PAHs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 531	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		7		
			PCBs by test kit		7		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		7		
			PCBs by test kit		7		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 47	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow	VOCs		4		
			SVOCs		3		
			PCBs		3		
			Metals		3		
			Radionuclides		3		
			Metals by XRF		3		
			PCBs by test kit		3		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 200	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		14		
			PCBs by test kit		14		
		shallow					
			SVOCs		1+1 field duplicate		
			PCBs		1		
			Metals		1		
			Radionuclides		1+1 field duplicate		
			Metals by XRF		14		
			PCBs by test kit		14		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 212	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		6		
			PCBs by test kit		6		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 213	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 214	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 215	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 216	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 217	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		18+1 field duplicate		
			PCBs by test kit		18+1 field duplicate		
		shallow					
			SVOCs		2+1 field duplicate		
			PCBs		2		
			Metals		2		
			Radionuclides		2+1 field duplicate		
			Metals by XRF		18+1 field duplicate		
			PCBs by test kit		18+1 field duplicate		
		pipeline	SVOCs		1+1 field duplicate		
			PCBs		1		
			Metals		1		
			Metals by XRF		10+1 field duplicate		
			PCBs by test kit		10+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 221	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		5		
			PCBs by test kit		5		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 222	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 224	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 225	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 226	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		11		
			PCBs by test kit		11		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		11		
			PCBs by test kit		11		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 227	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2+1 field duplicate		
			PCBs		2		
			Metals		2		
			Radionuclides		2+1 field duplicate		
			Metals by XRF		27+1 field duplicate		
			PCBs by test kit		27+1 field duplicate		
		shallow					
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		27+1 field duplicate		
			PCBs by test kit		27+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 228	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5		
			PCBs by test kit		5		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5		
			PCBs by test kit		5		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-1 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 229	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		18+1 field duplicate		
			PCBs by test kit		18+1 field duplicate		
		shallow					
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		18+1field duplicate		
			PCBs by test kit		18+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 26	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		6		
			PCBs		6		
			Metals		6		
			Metals by XRF		64+2 field duplicates		
			PCBs by test kit		64+2 field duplicates		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 76	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 158	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		3+1 field duplicate		
			PCBs		3		
			Metals		3		
			Radionuclides		3+1 field duplicate		
			Metals by XRF		25+1 field duplicate		
			PCBs by test kit		25+1 field duplicate		
		shallow					
			SVOCs		3		
			PCBs		3		
			Metals		3		
			Radionuclides		3		
			Metals by XRF		25+1 field duplicate		
			PCBs by test kit		25+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 169	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5		
			PCBs by test kit		5		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		5+1 field duplicate		
			PCBs by test kit		5+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 176	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		20+1field duplicate		
			PCBs by test kit		20+1field duplicate		
		shallow					
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		20+1 field duplicate		
			PCBs by test kit		20+1 field duplicate		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		7+1 field duplicate		
			PCBs by test kit		7+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 177	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		20		
			PCBs by test kit		20		
		shallow					
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		20		
			PCBs by test kit		20		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		3		
			PCBs by test kit		3		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 138	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		24+1 field duplicate		
			PCBs by test kit		24+1 field duplicate		
		shallow					
			SVOCs		2+1 field duplicate		
			PCBs		2		
			Metals		2		
			Radionuclides		2+1 field duplicate		
			Metals by XRF		24+1 field duplicate		
			PCBs by test kit		24+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		1		
			PCBs by test kit		1		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 180	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		4		
			PCBs		4		
			Metals		4		
			Radionuclides		4		
			Metals by XRF		46+2 field duplicates		
			PCBs by test kit		46+2 field duplicates		
		shallow					
			SVOCs		4		
			PCBs		4		
			Metals		4		
			Radionuclides		4		
			Metals by XRF		46+2 field duplicates		
			PCBs by test kit		46+2 field duplicates		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 195	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		15+1 field duplicate		
			PCBs		15		
			Metals		15		
			Radionuclides		15+1 field duplicate		
			Metals by XRF		209+10field duplicate		
			PCBs by test kit		209+10field duplicate		
		shallow					
			SVOCs		18+1 field duplicate		
			PCBs		18		
			Metals		18		
			Radionuclides		18+1 field duplicate		
			Metals by XRF		209+10field duplicate		
			PCBs by test kit		209+10field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 493	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-2 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 517	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 12	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		15+1 field duplicate		
			PCBs by test kit		15+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		15+1 field duplicate		
			PCBs by test kit		15+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 14	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		10		
			PCBs		10		
			Metals		10		
			Radionuclides		10		
			Metals by XRF		121+6 field duplicate		
			PCBs by test kit		121+6 field duplicate		
		shallow					
			SVOCs		10		
			PCBs		10		
			Metals		10		
			Radionuclides		10		
			Metals by XRF		121+6 field duplicate		
			PCBs by test kit		121+6 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 15	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		10		
			PCBs		10		
			Metals		10		
			Radionuclides		10		
			Metals by XRF		117+5 field duplicate		
			PCBs by test kit		117+5 field duplicate		
		shallow					
			SVOCs		10		
			PCBs		10		
			Metals		10		
			Radionuclides		10		
			Metals by XRF		117.5 field duplicate		
			PCBs by test kit		117.5 field duplicate		
		pipeline	SVOCs		2		
			PCBs		2		
			Metals		2		
			Metals by XRF		25+1 field duplicate		
			PCBs by test kit		25+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 16	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		4		
			PCBs		4		
			Metals		4		
			Radionuclides		4		
			Metals by XRF		45+2 field duplicates		
			PCBs by test kit		45+2 field duplicates		
		shallow					
			SVOCs		4+1 field duplicate		
			PCBs		4		
			Metals		4		
			Radionuclides		4+1 field duplicate		
			Metals by XRF		45+2 field duplicate s		
			PCBs by test kit		45+2 field duplicates		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 520	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		5		
			PCBs		5		
			Metals		5		
			Radionuclides		5		
			Metals by XRF		70+3 field duplicates		
			PCBs by test kit		70+3 field duplicates		
		shallow					
			SVOCs		5		
			PCBs		5		
			Metals		5		
			Radionuclides		5		
			Metals by XRF		70+3 field duplicates		
			PCBs by test kit		70+3 field duplicates		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 74	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 75	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		3		
			PCBs by test kit		3		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		3		
			PCBs by test kit		3		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 78	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		4		
			PCBs by test kit		4		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 79	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 80	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 81	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		8		
			PCBs by test kit		8		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		8		
			PCBs by test kit		8		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 135	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		Shallow					
			SVOCs		0		
			PCBs		0		
			Metals		0		
			Radionuclides		0		
			Metals by XRF		0		
			PCBs by test kit		0		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		11+1 field duplicate		
			PCBs by test kit		11+1 field duplicate		

[1]**Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).**

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 153	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		10		
			PCBs by test kit		10		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		10		
			PCBs by test kit		10		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		2		
			PCBs by test kit		2		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 154	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		2+1 field duplicate		
			PCBs		2		
			Metals		2		
			Radionuclides		2+1 field duplicate		
			Metals by XRF		20+1 field duplicate		
			PCBs by test kit		20+1 field duplicate		
		shallow					
			SVOCs		2		
			PCBs		2		
			Metals		2		
			Radionuclides		2		
			Metals by XRF		20+1 field duplicate		
			PCBs by test kit		20+1 field duplicate		
		pipeline	SVOCs		3		
			PCBs		3		
			Metals		3		
			Metals by XRF		34+1 field duplicate		
			PCBs by test kit		34+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 155	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		16+1 field duplicate		
			PCBs by test kit		16+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		16+1 field duplicate		
			PCBs by test kit		16+1 field duplicate		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		18+1 field duplicate		
			PCBs by test kit		18+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 156	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		10+1 field duplicate		
			PCBs by test kit		10+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		10+1 field duplicate		
			PCBs by test kit		10+1 field duplicate		
		pipeline	SVOCs		1		
			PCBs		1		
			Metals		1		
			Metals by XRF		6		
			PCBs by test kit		6		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 160	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 163	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2		
			PCBs by test kit		2		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		2+1 field duplicate		
			PCBs by test kit		2+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 219	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1		
			PCBs by test kit		1		
		shallow					
			SVOCs		1+1 field duplicate		
			PCBs		1		
			Metals		1		
			Radionuclides		1+1 field duplicate		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		0		
			PCBs by test kit		0		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #18-3 Sampling Locations and Methods/SOP Requirements Table (Continued)

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (identify field duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
SWMU 488	Soil	surface		See Appendix C for available historical information		See Worksheet #21, Ref. #6	See Worksheet #17, Section 9
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		shallow					
			SVOCs		1		
			PCBs		1		
			Metals		1		
			Radionuclides		1		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		
		pipeline	SVOCs		0		
			PCBs		0		
			Metals		0		
			Metals by XRF		1+1 field duplicate		
			PCBs by test kit		1+1 field duplicate		

[1]Specify the appropriate letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume[2]	Containers (number, size, and type)[2]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
soil	Volatile organic compounds	low	SW846-8260			cool 4 °C	14 days
soil	Semivolatile organic compounds	low	SW846-8270			cool 4 °C	14 days until extraction/40 days
soil	PCBs	low	SW846-8082			cool 4 °C	14 days until extraction/40 days
soil	Metals	low	SW846-6020, and -7471			cool 4 °C	180 days (28 days for mercury)
soil	Radionuclides	low	see Worksheets #12-6 through #12-10			cool 4 °C	180 days
soil	PCBs	low	test kit			cool 4 °C	14 days until extraction/40 days
soil	Metals	low	SW846-6200 (XRF)			cool 4 °C	180 days (28 days for mercury)

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2] Sample volume and container requirements will be specified by the laboratory.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

UFP-QAPP Manual Section 3.1.1:

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference[1]	No. of Sampling Locations[2]	No. of Field Duplicate Pairs	Inorganic No. of MS	No. of Field Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab
Soil	VOCs	low	SW846-8260	6	1	n/a	1	1	n/a	9
Soil	SVOCs	low	SW846-8270	296	15	n/a	15	15	n/a	341
Soil	Metals	low	SW846-6020, and -7174	296	0	n/a	0	143	n/a	439
Soil	Radionuclides	low	see Worksheets #12-6 through #12-10	275	14	n/a	14	14	n/a	317
Soil	PCBs	low	SW846-8082	296	0	n/a	0	143	n/a	439
Soil	Metals	low	XRF	2,943	143	n/a	143	0	n/a	3,229
Soil	PCBs	low	test kit	2,943	143	n/a	143	0	n/a	3,229

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).
[2]If samples will be collected at different depths at the same location, count each discrete sampling depth as a separate sampling location or station.

n/a = not applicable

Note: MS samples are provided by the laboratory. Additional volume is not required to be collected in the field. Field duplicates, field blanks, and equipment blanks are not being collected for field laboratory confirmatory samples, as these are quality control samples. Equipment blanks for field laboratory analyses are being analyzed by the fixed-base laboratory because the field laboratory is unable to analyze water samples.

QAPP Worksheet #21
Project Sampling SOP References Table[1]

UFP-QAPP Manual Section 3.1.2:

Reference Number	Title, Revision Date, and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	PRS-ENM-0023, Composite Sampling	Contractor	Sampling	N	NA
2	PRS-ENM-2300, Collection of Soil Samples	Contractor	Sampling	N	NA
3	PRS-ENM-2700, Logbooks and Data Forms	Contractor	Sampling	N	NA
4	PRS-ENM-2702, Decontamination of Sampling Equipment	Contractor	Sampling	N	NA
5	PRS-ENM-2704, Trip, Equipment and Field Blank	Contractor	Sampling	N	NA
6	PRS-ENM-2708, Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals	Contractor	Sampling	N	NA
7	PRS-ENM-5004, Sample Tracking, Lab Coordination, and Sample Handling Guidance	Contractor	Sampling	N	NA
8	PRS-ENR-0032, PCB Wipe Procedure	Contractor	Sampling	N	NA

[1] It is understood that SOPs are contractor specific.
NA = not applicable

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.1.2.4:

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Ludlum Model 3, 12, 2221, and 2224 with Ludlum Model 43-5 Alpha Scintillator	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2
Ludlum Model 3, 12, 2221, and 2224 with Ludlum Model 44-9 Geiger-Müeller Detector	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2
Ludlum Model 2221 and 2224 with Ludlum Model 44-10 Gamma Scintillator or FIDLER	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table (Continued)

UFP-QAPP Manual Section 3.1.2.4:

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
Global Positioning System Gamma Ray Survey Instrumentation	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As Needed	RCT using instrument-ation	1, 2

[1]Specify the appropriate reference letter or number from the Project Sampling SOP References table (Worksheet #21).

QAPP Worksheet #23
Analytical SOP References Table

Reference Number[1]	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
8260	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	VOAs	GC/MS	TBD	TBD
8270	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS)	Definitive	SVOAs	GC/MS	TBD	TBD
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	Definitive	PCBs	GC	TBD	TBD
6020	Inductively Coupled Plasma-Mass Spectrometry	Definitive	Metals	ICP-MS	TBD	TBD
7471	Mercury by Cold-Vapor Atomic Absorption	Definitive	Metals	AA	TBD	TBD
Gas Flow Proportional*	Gross Alpha and Beta Activity	Definitive	Rads	Gas flow proportional counter	TBD	TBD
Alpha Spec*	Alpha Spectrometry	Definitive	Rads	Alpha Spectrometry	TBD	TBD
Gamma Spec*	Gamma Spectrometry	Definitive	Rads	Gamma Spectrometry	TBD	TBD
Liquid Scintillation*	Tc-99 by Liquid Scintillation	Definitive	Rads	Liquid Scintillation	TBD	TBD
XRF		to be used as definitive				
PCB test kit						

[1] Analysis will be by the most recent revision.
* Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #24
Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference[1]
The laboratory is responsible for maintaining instrument calibration information per their QA Plan. This information is audited annually by the DOECAP. Laboratory(s) contracted will be DOECAP certified.						

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference[1]
The laboratory is responsible for maintaining instrument and equipment maintenance, testing, and inspection information per their QA Plan. This information is audited annually by the DOECAP. Laboratory(s) contracted will be DOECAP certified.								

[1]Specify the appropriate reference letter or number from the Analytical SOP References table (Worksheet #23).

QAPP Worksheet #26
Sample Handling System

UFP-QAPP Manual Appendix A:

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization):	Sampling Teams/DOE Prime Contractor and Subcontractors
Sample Packaging (Personnel/Organization):	Sampling Teams/DOE Prime Contractor and Subcontractors
Coordination of Shipment (Personnel/Organization):	Lab Coordinator/DOE Prime Contractor
Type of Shipment/Carrier:	Direct Delivery or Overnight/Fed Ex
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Management/Contracted Laboratory
Sample Custody and Storage (Personnel/Organization):	Sample Management/Contracted Laboratory
Sample Preparation (Personnel/Organization):	Analysts/Contracted Laboratory
Sample Determinative Analysis (Personnel/Organization):	Analysts/Contracted Laboratory
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	The field laboratory is required to analyze samples within 48 hours of collection and those samples are archived until results are screened (same day as analysis). The fixed-base laboratory archives samples after analysis for 6 months.
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	Same as above.
Biological Sample Storage (No. of days from sample collection):	N/A
SAMPLE DISPOSAL	
Personnel/Organization:	Waste Disposition/DOE Prime Contractor and Subcontractors
Number of Days from Analysis	TBD

N/A = not applicable

QAPP Worksheet #27
Sample Custody Requirements[1]

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Field sample custody requirements will be per DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*.

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal).

Laboratory sample custody procedures are per the DOECAP certified laboratory sample custody procedures.

Sample Identification Procedures:

Sample identification requirements will be per DOE prime contractor project work plan.

Chain-of-custody Procedures:

Chain-of-custody requirements will be per DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #28-1
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	Soil/XRF
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	DOE/Contractor
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	NA	NA	NA	Precision	See PRS-ENM-5003, Quality Assured Data Procedure
Field Blanks	Minimum 5%	NA	NA	NA	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Equipment Rinseates	Minimum 5%	NA	NA	NA	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure

[1] It is understood that SOPs are contractor specific.

N/A = not available

QAPP Worksheet #28-1
Quality Control Requirements[1] (continued)

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	Twice each day the XRF is used	Method 6200 or per manufacturer's instructions	Recalibrate per Method 6200 or per manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Instrument Blank	Beginning of each day the XRF is used, every 20 samples; thereafter	Method 6200 or per manufacturer's instructions	Recalibrate per Method 6200 or per manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Method Blank	Once each day the XRF is used	Method 6200 or per manufacturer's instructions	Identify and reanalyze per Method 6200	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Instrument Performance Sample	Once each day the XRF is used	Method 6200 or per manufacturer's instructions	Recalibrate per Method 6200 or per manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Internal Standards	Twice each day the XRF is used	Method 6200 or per manufacturer's instructions	Recalibrate per Method 6200 or per manufacturer's instructions	QA Specialist	Precision	See PRS-ENM-5003, Quality Assured Data Procedure

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #28-2
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	PCB Wipe
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	DOE/PRS
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	NA	NA	NA	Precision	See PRS-ENM-5003, Quality Assured Data Procedure

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #28-3
Quality Control Requirements[1]

UFP-QAPP Manual Section 3.4:

Matrix	Soil/PCB Test Kit
Analytical Group	SMO/Field Screenings
Concentration Level	TBD
Sampling SOP	See #21
Analytical Method/ SOP Reference	Manufacturer methods
Sampler's Name	TBD
Field Sampling Organization	DOE/PRS
Analytical Organization	SMO/Field Screenings
No. of Sample Locations	See RI/FS SAP

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Duplicates	Minimum 5%	NA	NA	NA	Precision	See PRS-ENM-5003, Quality Assured Data Procedure
Field Blanks	Minimum 5%	NA	NA	NA	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Equipment Rinseates	Minimum 5%	NA	NA	NA	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #28-3
Quality Control Requirements (continued)

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Initial Calibration	Manufacturer's instructions	Manufacturer's instructions	Manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Instrument Blank	Manufacturer's instructions	Manufacturer's instructions	Manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Method Blank	Manufacturer's instructions	Manufacturer's instructions	Manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Instrument Performance Sample	Manufacturer's instructions	Manufacturer's instructions	Manufacturer's instructions	QA Specialist	Accuracy/Bias (Contamination)	See PRS-ENM-5003, Quality Assured Data Procedure
Internal Standards	Manufacturer's instructions	Manufacturer's instructions	Manufacturer's instructions	QA Specialist	Precision	See PRS-ENM-5003, Quality Assured Data Procedure

[1] It is understood that SOPs are contractor specific.
N/A = not available

QAPP Worksheet #29
Project Documents and Records Table[1]

UFP-QAPP Manual Section 3.5.1:

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records	Other
Data Logbooks and associated completed sampling forms, sample chains-of-custody	Laboratory data packages, OREIS database and associated data packages	OREIS database and associated data packages	PRS-ENM-5003, att. G Data Assessment Review Checklist and Comment Form	Form QAP-E-004, *Management/Independent Assessment Report*

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	VOAs	low	SWMU 211, 47	8260	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	SVOAs	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 224, 225, 226, 227, 228, 229, 26, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 74, 79, 80, 81, 135, 160,	8270	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	PCBs	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 224, 225, 226, 227, 228, 229, 26, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 74, 79, 80, 81, 135, 160	8082	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 224, 225, 226, 227, 228, 229, 26, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 80, 81, 74, 135, 160	6020	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 26, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	6020	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals	Low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 26, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	7471	28-day	TBD	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Rads	Low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	Gas Flow Proportional*	28-day	TBD	TBD

* Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Rads	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	Alpha Spec*	28-day	TBD	TBD

* Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Rads	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	Gamma Spec*	28-day	TBD	TBD

* Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Rads	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	Liquid Scintillation*	28-day	TBD	TBD

* Analytical methods for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the RI/FS WP.

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	XRF	2-day	GEO Consultants	TBD

QAPP Worksheet #30
Analytical Services Table (continued)

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	PCBs	low	SWMU 99, 194, 196, 211, 483, 489, 531, 47, 200, 212, 213, 214, 215, 216, 217, 221, 222, 226, 227, 228, 229, 76, 158, 169, 176, 177, 138, 180, 195, 493, 517, 12, 14, 15, 16, 75, 78, 153, 154, 155, 156, 163, 219, 488, 520, 79, 74, 80, 81, 135, 160	Test kits	2-day	GEO Consultants	TBD

QAPP Worksheet #31
Planned Project Assessments Table

UFP-QAPP Manual Section 4.1.1:

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (CA) (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of CA (Title and Organizational Affiliation)
Independent Assessment/ Surveillance	Minimum of once per project (project duration estimated to be 4 months)	Internal	DOE Prime Contractor QA	QA Specialists	Project Manager	Project Management/QA Specialist	QA Specialist
Laboratory Audit	Annual	External	DOE Consolidated Audit Program (DOECAP)	Laboratory Assessor	Laboratory	Laboratory	DOECAP
Management Assessments	Minimum of once per project (project duration estimated to be 4 months)	Internal	Project Management	Project Management	Project Team	Project Management/QA Specialist	QA Specialist
Management By Walking Around (MBWA)	Monthly per project	Internal	Project Management	Project Management	Project Team	Project Management/QA Specialist	QA Specialist
MBWA Follow-up surveillances	Quarterly (if required)	Internal	Project Management	ER/EM Director, Project Manager or designee	Project Team	Project Management/QA Specialist	QA Specialist

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses[1]

UFP-QAPP Manual Section 4.1.2:

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
Management, independent, and surveillances	Form QAP-E-004, *Management/ Independent Assessment Report,* and QAP-E-0710, *Issue Identification Form*	Project Management, Issue Owner	Upon issuance of Form QAP-E-004, *Management/ Independent Assessment Report,* form E-QAP-0710, *Issue Identification Form*, will be completed and attached to the assessment report	E-QAP-0710, *Issue Identification Form* documents the issue response and/or corrective actions	Action owner as designated by issue owner	Fifteen days for initial issue response, corrective action schedule determined by issue owner, per PRS-QAP-1210

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #33
QA Management Reports Table

UFP-QAPP Manual Section 4.2:

Type of Report	Frequency (daily, weekly monthly, quarterly, annually, etc.)	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation (Title and Organizational Affiliation)	Report Recipient(s) (Title and Organizational Affiliation)
Management by Walking Around	Monthly	Last day of each month	Project Manager, Contractor	Contractor Management
QA Assessment Reports	Minimum 2 (One management assessment report, one independent assessment report)	Prior to project termination	Project Manager or designee and QA Specialist, Contractor	PM, QA, and Contractor Management

QAPP Worksheet #34
Verification (Step I) Process Table[1]

Verification Input	Description	Internal/ External	Responsible for Verification (Name, Organization)
Field Logbooks	Field logbooks are verified per DOE prime contractor procedure PRS-ENM-2700, *Logbooks and Data Forms*, and PRS-ENM-5003, *Quality Assured Data*.	Internal	Project Management or designee, Contractor
Chains-of-custody	Chains-of-custody are controlled by DOE prime contractor procedure PRS-ENM-5004, *Sample Tracking, Lab Coordination and Sample Handling Guidance*. Chains-of-custody will be included in data assessment packages for review as part of data verification and data assessment.	Internal	Sample and Data Management, Project Management, and QA Personnel, Contractor
Field and Laboratory Data	Field and analytical data are verified and assessed per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. Data assessment packages will be created per this procedure. The data assessment packages will include field and analytical data, chains of custody, data verification and assessment queries, and other project specific information needed for personnel to adequately review the package. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if data met the data quality objectives of the project.	Internal	Sample and Data Management, Project Management, and QA Personnel, Contractor

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table[1]

Step IIa/IIb	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The laboratory data documentation obtained will be contractual screened and will be included in the data assessment packages, per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*.	Sample and Data Management Personnel, Contractor
IIa	Chain-of Custody, Sample Handling, Sampling Methods and Procedures, and Field Transcription	These items will be validated during the data assessment process as required by DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. The documentation of this validation will be included in the data assessment packages.	Project and QA Personnel, Contractor
IIa	Analytical Methods and Procedures, Laboratory Data Qualifiers, and Standards	These items will be reviewed during the data validation process as required by DOE prime contractor data validation procedures. Data validation will be performed in parallel with data assessment. The data validation report and data validation qualifiers will be considered when the data assessment process is being finalized.	Data Validation Subcontractor, Sample and Data Management, Project and QA Personnel, Contractor
IIa	Audits	The audit reports and accreditation and certification records for the laboratory supporting the projects will be considered in the bidding process.	Sample and Data Management Personnel, Contractor
IIb	Deviations and qualifiers from Step IIa	Any deviations and qualifiers resulting from Step IIa process will be documented in the data assessment packages.	Sample and Data Management, Project, and QA Personnel, Contractor
IIb	Sampling Plan, Sampling Procedures, Co-located Field Duplicates, Project Quantitation Limits, Confirmatory Analyses, Performance Criteria	These items will be evaluated as part of the data verification and data assessment process per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. These items will be considered when evaluating whether the project met their Data Quality Objectives.	Sample and Data Management, Project, and QA Personnel, Contractor

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table[1]

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa/IIb	Soil	Semivolatile organic compounds	Low	DOE prime contractor procedure PRS-ENM-5105, *Volatile and Semivolatile Data Verification and Validation*	TBD
IIa/IIb	Soil	Metals	Low	DOE prime contractor procedure PRS-ENM-5107, *Inorganic Data Verification and Validation*	TBD
IIa/IIb	Soil	Radionuclides	Low	DOE prime contractor procedure PRS-ENM-5102, *Radiochemical Data Verification and Validation*	TBD
IIa/IIb	Soil	PCBs	Low	DOE prime contractor procedure PRS-ENM-0811, *Pesticide and PCB Data* Verification *and Validation*	TBD

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #37
Usability Assessment[1]

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used: Field and analytical data are verified and assessed per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. Data assessment packages will be created per this procedure. Data assessment packages will include field and analytical data, chains-of-custody, data verification and assessment queries, and other project specific information needed for personnel to adequately review the package. Data assessment packages will be reviewed to document any issues pertaining to the data and to indicate if DQOs of the project were met.

Describe the evaluative procedures used to assess overall measurement error associated with the project: PARCCS parameters (precision, accuracy, representativeness, comparability, completeness, and sensitivity) will be evaluated per DOE prime contractor procedure PRS-ENM-5003, *Quality Assured Data*. This information will be included in the data assessment packages for review by project personnel. Data assessment can be used to document QC exceedances, trends, and/or bias in the data set. Data assessment also can be used to document any statistics used.

Identify the personnel responsible for performing the usability assessment: Project and QA Personnel.

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies: Data assessment packages will be created, which will include data assessment comments/questions and laboratory comments. Data verification and assessment queries indicating any historical outliers and background soil exceedances also will be included in the data assessment packages.

[1] It is understood that SOPs are contractor specific.

12. DATA MANAGEMENT IMPLEMENTATION PLAN

The purpose of this DMIP is to identify and document data management requirements and applicable procedures, expected data types and information flow, and roles and responsibilities for all data management activities associated with the Soils OU Project at the PGDP. Data management provides a system for efficiently generating and maintaining technically and legally defensible data that provide the basis for making sound decisions regarding the environmental and waste characterization at PGDP.

Data management for this project is implemented throughout the life cycle for environmental measurements data. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual use of the data for decision-making purposes, to the long-term storage of data.

Data types to be managed for the project include field data and analytical data. Historical data is downloaded from Paducah OREIS, if available. All historical data available in electronic format are stored in Paducah PEMS. Field data are collected in field logbooks or field data forms and are entered into Paducah PEMS, as appropriate, for storage. Analytical data are planned and managed through Paducah PEMS and transferred to Paducah OREIS for long-term storage and reporting.

To meet current regulatory requirements for DOE environmental management projects, complete documentation of the information flow is established. Each phase of the data management process (planning, collecting, analyzing, managing, verifying, assessing, reporting, consolidating, and archiving) must be appropriately planned and documented. The Soils OU project team is responsible for data collection and data management for this project.

The scope of this DMIP is limited to environmental information generated under the Soils OU project. This information includes electronic and/or hard copy records obtained by the project that describe environmental conditions. Information generated by the project (e.g., laboratory analytical results from samples collected) and obtained from sources outside the project (e.g., historical data) falls within the scope of this DMIP. Certain types of information, such as personnel or financial records, are outside the scope of this DMIP.

12.1 PROJECT MISSION

Requirements and responsibilities described in this plan apply to activities conducted by the project team in support of the Soils OU project. Specific activities involving data include, but are not limited to, sampling of sediment, soil and biota; storing, analyzing, and shipping samples, when applicable; and evaluation, verification, validation, assessment, and reporting of analytical results.

12.2 DATA MANAGEMENT ACTIVITIES

Data management activities for the Soils OU project include the following:

- Acquire existing data
- Plan data collection
- Prepare for sampling activities
- Collect field data

- Collect field samples
- Submit samples for analysis
- Process field measurement and laboratory analytical data
- Laboratory Contractual Screening
- Verify data
- Validate data
- Assess data
- Consolidate, analyze, and use data and records
- Submit data to the Paducah OREIS

Section 12.7 contains a detailed discussion of the activities listed above.

12.3 DATA MANAGEMENT INTERACTIONS

The Data Manager interfaces with the Data Coordinator to oversee the use of Paducah PEMS and to ensure that data deliverables meet DOE's standards. The Data Coordinator enters information into Paducah PEMS related to the fixed-base laboratory data once the samples have been delivered and the Lab Coordinator has verified receipt of the samples. The fixed-base laboratory hard-copy data and the EDDs are loaded into Paducah PEMS by the Data Coordinator. The Data Coordinator will perform electronic data verification. The Soils OU project team is responsible for data assessment. The Data Coordinator is responsible for preparing the data for transfer from Paducah PEMS to Paducah OREIS. The Data Manager is responsible for transferring the data from the RTL files to the Paducah OREIS database.

The Lab Coordinator develops the Statement of Work (SOW) to be performed by an analytical laboratory in the form of a project-specific laboratory SOW. Analytical method, laboratory QC requirements, and deliverable requirements are specified in this SOW.

The Lab Coordinator receives EDDs, performs contractual screenings, and distributes data packages. The Lab Coordinator interacts with the Data Manager to ensure that hard copy and electronic-deliverable formats are properly specified and interfaces with the contract laboratory to ensure that the requirements are understood and met.

12.3.1 Data Needs and Sources

Multiple data types will be generated and/or assessed during this project. These data types include field data, analytical data (including environmental data), and geographic information system (GIS) data.

12.3.2 Historical Data

Historical data that are available electronically will be downloaded from Paducah OREIS as needed. Historical data available in electronic format will be stored in the project's Paducah PEMS and will be evaluated when necessary.

12.3.3 Field Data

Field data for the project includes sample collection information and field screen measurement results, such as PCB field test kits and XRF.

12.3.4 Analytical Data

Analytical data for the project consist of laboratory analyses for environmental and waste characterization.

12.3.5 GIS Coverage

The Paducah GIS network is used for preparing maps used in data analysis and reporting of both historical and newly generated data. Coverage for use during the project is as follows:

- Stations (station coordinates are downloaded from Paducah OREIS)
- Facilities
- Plant roads
- Plant fences
- Streams
- Topographic contours

12.4 DATA FORMS AND LOGBOOKS

Field logbooks, site logbooks, chain-of-custody forms, data packages with associated QA/QC information, and field forms are maintained according to the requirements defined in procedure PRS-DOC-1009, *Records Management, Administrative Records, and Document Control*.

Duplicates of field records are maintained until the completion of the project. Logbooks and field documentation are copied periodically. The originals are forwarded to the DMC and copies are maintained in the field office.

12.4.1 Field Forms

Sample information is environmental data describing the sampling event and consists of the following: station (or location), date collected, time collected, and other sampling conditions. This information is recorded in logbooks, chain-of-custody forms, or sample labels. This information is entered directly into Paducah PEMS by the Data Coordinator.

Sample chain-of-custody forms contain sample-specific information recorded during collection of the sample. Any deviations from the sampling plan are noted on the sample chain-of-custody form or logbook. The Sampling Team Leader reviews each sample chain-of-custody form for accuracy and completeness as soon as practical following sample collection.

Sample chain-of-custody forms are generated from Paducah PEMS with the following information:

Information that is preprinted:	Information that is entered manually:
- Lab chain-of-custody number	- Sample date and time
- Project name or number	- Sample comments (optional)
- Sample ID number	
- Sampling location	
- Sample type (e.g., REG = regular sample)	
- Sample matrix (e.g., SO = soil)	
- Sample preservation type	
- Analysis (e.g., TCE)	
- Sample container (volume, type)	

Sample identification numbers are identified in Paducah PEMS and are assigned by the Data Coordinator. In order to prevent confusion with historical projects, and so that Soils OU sample numbers do not coincide with sample numbers already existing in Paducah OREIS, the letters SOU will be added to the beginning of the sample number. An example of the sample numbering schemes used for the Soils OU project is provided below.

SOUssseeMA000

where	SOU	Designates the Soils OU RI
	sss	Identifies the SWMU/AOC being investigated
	ee	Identifies the grid (based on the same numbering scheme, SOUsss-ee identifies the location name)
	M	Identifies the media type (W identifies the sample as water, S identifies the sample as soil)
	A	Identifies the sequential sample (usually “A” for a primary sample and “B” for a secondary sample). If additional rounds of sampling are required, the sequential letter designations will continue.
	000	Identifies the planned depth of the sample in ft bgs

12.4.2 Lithologic Description Forms

Lithologic description forms will be used as necessary for this project.

12.4.3 Well Construction Detail Forms

These forms are not necessary for use during this project.

12.4.4 Logbook Sample Collection Sheets

Sample collection sheets are utilized as an aid for recording sampling information in the field. Logbooks are kept in accordance with PRS-ENM-2700, *Logbooks and Data Forms*.

12.5 DATA AND DATA RECORDS TRANSMITTALS

12.5.1 Paducah OREIS Data Transmittals

Data to be stored in Paducah OREIS is submitted to the Data Manager prior to reporting. Official data reporting will be generated from data stored in Paducah OREIS.

12.5.2 Data Records Transmittals

The Soils OU project personnel will make records transfers to the DMC.

12.6 DATA MANAGEMENT SYSTEMS

12.6.1 Paducah PEMS

Paducah PEMS is the data management system that supports the project’s sampling and measurement collection activities and generates Paducah OREIS RTL files. The data management staff access Paducah

PEMS throughout the life cycle of the project. The project uses Paducah PEMS to support the following functions:

- Initiate the project
- Plan for sampling
- Record sample collection and field measurements
- Record the dates of sample shipments to the laboratory (if applicable)
- Receive and process analytical results
- Verify data
- Access and analyze data
- Transfer project data (in RTL format) to Paducah OREIS

Paducah PEMS is used to generate sample chain-of-custody forms, import laboratory-generated data, update field and laboratory data, based on data verification, data validation if applicable, data assessment and transfer data to Paducah OREIS. Requirements for addressing the day-to-day operations of Paducah PEMS include backups, security, and interfacing with the SMO.

The Information Technology group performs system backups daily. The security precautions and procedures implemented by the data management team are designed to minimize the vulnerability of the data to unauthorized access or corruption. Only members of the data management team have access to the project's Paducah PEMS and the hard-copy data files. Members of the data management team have installed password-protected screen savers.

12.6.2 Paducah OREIS

Paducah OREIS is the centralized, standardized, quality assured, and configuration-controlled data management system that is the long-term repository of environmental data (measurements and geographic) for Paducah environmental management projects. Paducah OREIS is comprised of hardware, commercial software, customized integration software, an environmental measurements database, a geographic database, and associated documentation. The Soils OU project will use Paducah OREIS for the following functions:

- Access to existing data
- Spatial analysis
- Report generation
- Long-term storage of project data (as applicable)

12.6.3 Paducah Analytical Project Tracking System

The Paducah Analytical Project Tracking System is the business management information system that manages analytical sample analyses for Paducah environmental projects. The Paducah Analytical Project Tracking System provides cradle-to-grave tracking of sampling and analysis activities. The Paducah Analytical Project Tracking System generates the SOW, tracks collection and receipt of samples by the laboratory, flags availability of the analytical results, and allows invoice reconciliation. The Paducah Analytical Project Tracking System interfaces with Paducah PEMS (output from the Paducah Analytical Project Tracking System is automatically transferred to Paducah PEMS).

12.7 DATA MANAGEMENT TASKS AND ROLES AND RESPONSIBILITIES

12.7.1 Data Management Tasks

The following data management tasks are numbered and grouped according to the activities summarized in Section 12.2. An explanation of the data review process is provided in the following sections.

12.7.2 Acquire Existing Data

The primary background data for this project consists of historical analytical data from previous sampling events in the Soils OU SWMUs/AOCs. Paducah OREIS and the Paducah OREIS Data Catalog were queried for the existing information that is provided in Appendix C.

12.7.3 Plan Data Collection

Other documents for this project provide additional information for the tasks of project environmental data collection, including sampling and analysis planning, QA, waste management, and health and safety. Also, a laboratory SOW will be developed for this project in accordance with PRS-ENM-5004, *Sample Tracking Lab Coordination, and Sample Handling Guidance*.

12.7.4 Prepare for Sampling Activities

The data management tasks involved in sample preparation, as specified in PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*, include identifying all sampling locations, preparing descriptions of these stations, identifying sample containers and preservation, developing field logbooks, preparation of sample kits and chains-of-custody, and coordinating sample delivery to the laboratory. The Lab Coordinator conducts activities associated with the analytical laboratories. Coordinates for sample locations will be obtained using a GPS, which will have sub-meter accuracy.

12.7.5 Collect Field Data and Samples

Paducah PEMS is used to identify, track, and monitor each sample and associated data from the point of collection through final data reporting. Project documentation includes field logbooks, chain-of-custody records, and hard-copy analytical results.

Data management requirements for field logbooks and field forms specify that (1) sampling documentation must be controlled from initial preparation to completion, (2) sampling documentation generated must be maintained in a project file, and (3) modifications to planned activities and deviations from procedures shall be recorded.

Before the start of sampling, the Lab Coordinator specifies the contents of sample kits, which includes sample containers provided by the laboratories, labels, preservatives, and chain-of-custody records. Sample labels and chains of custody are completed according to PRS-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*.

The Soils OU project field team will collect samples for the project. The field team will record pertinent sampling information on the chain-of-custody and in the field logbook. The Data Coordinator enters the information from the chain-of-custody forms into Paducah PEMS.

12.7.6 Submit Samples for Analysis

Before the start of field sampling, the FTM or designee coordinates the delivery of samples with the Lab Coordinator who, in turn, coordinates with the analytical laboratories, according to PRS-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*. The Lab Coordinator presents a general sampling schedule to the analytical laboratories. The Lab Coordinator also coordinates the receipt of samples and containers with the laboratories. The Lab Coordinator ensures that hard-copy deliverables and EDDs from the laboratories contain the appropriate information and are in the correct format.

12.7.7 Process Field Measurement and Laboratory Analytical Data

Data packages and EDDs received from the laboratory are tracked, reviewed, and maintained in a secure environment. Paducah PEMS is used for tracking project-generated data. The following information is tracked, as applicable: sample delivery group number, date received, number of samples, sample analyses, receipt of EDD, and comments. The laboratory EDDs are checked as specified in PRS-ENM-5007, *Data Management Coordination*.

The field screen measurement data will be provided by the Soils OU project team to the Data Manager for loading into Paducah PEMS. This data will be provided in a format specified by the Data Manager. Once this data has been loaded to Paducah PEMS, it will be compared to the original files submitted by the project to ensure that it was loaded correctly.

12.7.8 Laboratory Contractual Screening

Laboratory contractual screening is the process of evaluating a set of data against the requirements specified in the analytical SOW to ensure that all requested information is received. The contractual screening includes, but is not limited to, the analytes requested, total number of analyses, method used, EDDs, units, holding times, and reporting limits achieved. Contractual screening is performed for 100 percent of the data. The Lab Coordinator is primarily responsible for the contractual screening upon receipt of data from the analytical laboratory according to PRS-ENM-5003, *Quality Assured Data.*

12.7.9 Data Verification

Data verification is the process for comparing a data set against a set standard or contractual requirement. Verification is performed by the Data Coordinator electronically, manually, or by a combination of both according to PRS-ENM-5003, *Quality Assured Data*. Verification is performed for 100 percent of data. Data verification includes contractual screening and criteria specific to the Soils OU project. Verification qualifiers may be applied to the data based on holding time exceedance, criteria exceedance, historical exceedance, or background exceedance. Verification qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS.

12.7.10 Data Validation

Data validation is the process performed by a third-party, qualified individual. Third party validation is defined as validation performed by persons independent from sampling, laboratory, and decision making for the program/project (i.e., not the program/project manager). Data validation evaluates the laboratory adherence to analytical-method requirements. Data validation is managed and coordinated with the data management team. The Data Validator performs data validation according to approved procedures. Data validation is documented in a formal deliverable from the data validator. Validation qualifiers are input and stored in Paducah PEMS and transferred to Paducah OREIS.

A minimum of 10 percent of the total number of samples will be validated for this project. Data Validation will apply only to the definitive data. Data packages chosen for data validation will be validated at 100 percent.

12.7.11 Data Assessment

Data assessment is the process for assuring that the type, quality, and quantity of data are appropriate for their intended use. It allows for the determination that a decision (or estimate) can be made with the desired level of confidence, given the quality of the data set. Data assessment follows data verification and data validation (if applicable) and must be performed at a rate of 100 percent to ensure data is useable.

The data assessment is conducted by the Soils OU project according to PRS-ENM-5003, *Quality Assured Data.* Assessment qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS. Any problems found during the review process are resolved and documented in the data assessment package.

12.7.12 Data Consolidation and Usage

The data consolidation process consists of the activities necessary to prepare the evaluated data for the users. The Data Coordinator prepares files of the assessed data from Paducah PEMS to Paducah OREIS for future use in accordance with PRS-ENM-1001, *Transmitting Data to OREIS*. The Data Manager is responsible for transferring the data to Paducah OREIS. Data used in reports distributed to external agencies is obtained from data in Paducah OREIS and has been through the data review process. All data reported has the approval of the Data Manager.

12.7.13 Data Management Roles and Responsibilities

The following project roles are defined, and the responsibilities are summarized for each data management task described in the previous subsection.

12.7.13.1 RI Project Manager

The RI Project Manager is responsible for the day-to-day operation of the Soils OU project. The RI Project Manager ensures the requirements of policies and procedures are met. The RI project manager, or designee assesses data in accordance with PRS-ENM-5003, *Quality Assured Data*. The RI Project Manager is responsible to flowdown data management requirements to subcontractors as required.

12.7.13.2 Project Team

The project team consists of the technical staff and support staff (including the data management team) that conducts the various tasks required to successfully complete the project.

12.7.13.3 Data User

Data users are members of the project team who require access to project information to perform reviews, analyses, or ad hoc queries of the data. The data user determines project data usability by comparing the data against predefined acceptance criteria and assessing that the data are sufficient for the intended use.

12.7.13.4 Data Coordinator

The Data Coordinator enters the data into Paducah PEMS, including chain-of-custody information, field data, data assessment and data validation qualifiers, and any pertinent sampling information. After receiving a notification that a fixed-base lab EDD is available to download, the Data Coordinator loads the EDD to Paducah PEMS, performs electronic verification of the data, and then compiles the data assessment package. The Data Coordinator also prepares data for transfer from Paducah PEMS to Paducah OREIS.

12.7.13.5 Project Records Coordinator

The Project Records Coordinator is responsible for the long-term storage of project records. The Soils OU project team will interface with the Project Records Coordinator and will transfer documents and records in accordance with DOE requirements.

12.7.13.6 QA Specialist

The QA Specialist is part of the project team and is responsible for reviewing project documentation to determine if the project team followed applicable procedures.

12.7.13.7 Data Manager

The Data Manager is responsible for long-term storage of project data and for transmitting data to external agencies according to the *Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities,* DOE/OR/07-1595&D2, and the Paducah Data Management Policy. The Data Manager ensures compliance to procedures relating to data management with respect to the project and that the requirements of PRS-ENM-5003, *Quality Assured Data,* are followed.

12.7.13.8 Lab Coordinator

The Lab Coordinator is responsible for contracting any fixed-base laboratory utilized during the sampling activities. The Lab Coordinator also provides coordination for sample shipment to the laboratory, contractual screening of data packages, and transmittal of data packages to the Paducah DMC.

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13. WASTE MANAGEMENT PLAN

13.1 OVERVIEW

This WMP is the primary document for management and final disposition of IDW, decontamination water, and waste water that will be generated during the Soils OU RI/FS. The RI entails the collection of surface soil samples and installation of soil borings at 85 SWMUs/AOCs located mostly inside the secured area of the PGDP. The soil borings will be executed to a maximum depth of 16 ft bgs. Standing water may be present in SWMU 77 that would need to be pumped prior to sampling the soils. Previous investigations and process knowledge indicate elevated levels of radiological contamination, PCBs, and RCRA hazardous metals may be present at these locations.

This WMP addresses the management of wastes generated during the RI from the point of generation through final disposition. Waste generated will be managed according to contractor-approved procedures and DOE requirements. Additionally, this WMP will comply with all applicable regulatory directives of RCRA, TSCA, and PGDP RADCON policies.

A copy of the WMP will be available on-site during execution of the RI. The Waste Management Coordinator will be responsible for daily oversight of waste management activities and for ensuring compliance with the WMP.

The WMP emphasizes the following objectives:

- Management of the waste in a manner that is protective of human health and the environment
- Minimization of waste generation thereby reducing unnecessary costs (analytical, storage, disposal, etc.)
- Compliance with federal, state, and DOE requirements
- Selection of storage and/or disposal alternatives for the waste

All waste management activities must comply with this WMP, applicable contractor procedures, *Waste Acceptance Criteria for the Department of Energy Treatment, Storage and Disposal Units at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky* [BJC/PAD-11/R3, new PRS-WSD-0011, henceforth referred to as the waste acceptance criteria (WAC)] and WAC for on-site treatment, storage, and disposal facilities that may be designated to receive Soils OU RI waste.

During the course of the RI, additional contractor and DOE waste management requirements may be identified. If necessary, revisions will be made to the WMP to ensure waste management personnel's compliance with all pertinent requirements.

13.2 WASTE PLANNING AND GENERATION

13.2.1 Waste Planning

Items to be identified for each waste stream include waste description, volume (ft^3), container type and an estimate of the number of each type, preliminary waste category, characterization method, analytes, potential treatment options, and future disposition, Refer to Table 13.1 for information on each waste stream. Using information from documents such as the Sampling and Analysis Plan (SAP) and the PGDP landfill WAC, waste types, and volumes are identified. Characterization methods, planned analyses, and suitable containers also can be identified in this manner. The Waste Generation Plan (WGP) must be signed by the generator and the Waste Operations Manager. A revised WGP must be submitted if the amount of waste to be generated changes significantly during the RI. These are changes that could affect the treatment, storage, and disposal of project IDW. For example, if additional boring are added to the project, a new WGP would need to be formulated.

Table 13.1 Waste Plan per Waste Type

Waste type	Volume (ft^3)	Container Type	Estimated Number of Containers	Prelim-inary Waste Category	Characterization Method	Analytes	Potential Treatment Method	Expected Disposition
Soil	8023'	55 gallon drum	1084	L	See Section 11- QAPP	See Section 11- QAPP	NA	On-site landfill
PPE/Plastic	377'[2]	55 gallon drum	21	L	characterized using soil data	See Section 11- QAPP	NA	On-site landfill
Sampling equipment	76'[3]	55 gallon drum	10	S	characterized using soil data	See Section 11- QAPP	NA	On-site landfill
Decontamination Water	377'[4]	55 gallon drum	21		Waste Characterization SAP[5]	as required per KDWM permit	carbon filter	KPDES outfall
Waste water	306	55 gallon drum	41	S	Waste Characterization SAP[5]	as required per KDWM permit	carbon filter	KPDES outfall
Field laboratory reagents	0.67	5-gallon drum	1	R	Waste Characterization SAP[5]	RCRA metals, RCRA VOAs, RCRA SVOAs, and PCBs	NA	WCS
Field laboratory extraction residuals	2.68	5-gallon drum	4	S	Waste Characterization SAP[5]	RCRA metals, RCRA VOAs, RCRA SVOAs, and PCBs	NA	On-site landfill
Glass	1.34	sharps container	2	S	Visual inspection and Process Knowledge	NA	NA	On-site landfill

[1] Volume base on an estimate of 7839 bore holes at 1 ft^3 each and 184 pipeline samples at 1ft^3 each
[2] Volume base on one container per four SWMUs (total of 82 SWMUs)
[3] Volume base on one container per eight SWMUs (total of 82 SWMUs)
[4] Volume base on one container per four SWMUs (total of 82 SWMUs)
[5] PRS-WSD-0307, Paducah Waste Characterization Sampling and Analysis Plan

13.2.2 Waste Generation

A variety of IDW is expected to be generated during the RI. All waste generated has the potential to contain contaminants related to known or suspected past operational or disposal practices. IDW generated during sampling activities may include soil, PPE, plastic, sampling residuals and returns, metal sampling equipment, field laboratory waste, waste water, and decontamination water or sludge. Waste will be stored at the C-760, C-611-T02, and C-416 CERCLA waste storage areas during the waste characterization period prior to disposal. The C-760, C-611-T02, and C-416 CERCLA storage areas comply with the substantive requirements of a RCRA 90-day Accumulation Area; however, the 90-day storage restriction does not apply to CERCLA storage areas. Brief descriptions of each waste stream are outlined in the following sections.

13.2.2.1 Soil

Soil borings will be executed and samples obtained from 85 SWMUs/AOCs, a majority of which are located inside the secured area of the PGDP. It is expected that Geoprobe™ technology will be used to obtain the samples, per past practice. Though some waste soil is expected to be generated, the use of this method greatly reduces the waste generated by the sampling effort. Each soil boring's waste material must be segregated exclusive of other waste to facilitate waste characterization at the conclusion of field activities. Soil will be containerized in 55-gal drums. If soil is found to be uncontaminated, it may be used to fill the borehole.

13.2.2.2 Personal Protective Equipment, Plastic

PPE will be worn by project personnel as specified in the HASP and will be characterized concurrently with contacting waste materials. Plastic sheeting and other plastic used during sampling activities also can be included in this waste stream. To facilitate waste characterization, this waste must be segregated and labeled per individual boring number. PPE and plastic will be containerized in 55-gal drums.

13.2.2.3 Sampling Equipment, Sample Residuals

Sampling residuals will be generated from sampling activities. Sample returns and containers will be containerized in 55-gal drums and characterized as per associated analytical results. Disposable sampling equipment may be generated as waste. Sampling equipment also will be characterized per associated analytical results.

13.2.2.4 Field Laboratory Waste

A small amount of field laboratory waste will be generated Three waste streams are expected to be generated. These include laboratory reagents, extraction residuals, and glass. The waste streams will be characterized using process knowledge [material safety data sheets (MSDS), test method information, etc.], visual inspection, and analytical data. Each waste steam will be segregated and will be stored in an approved container.

13.2.2.5 Decontamination Water and Sludge

Decontamination water and sludge (soil/water) will be generated during drilling/sampling equipment decontamination. The decontamination water will be containerized and stored at a permitted storage facility. The water will be sampled and, if necessary, treated before it is disposed of in accordance with KPDES permit requirements. The sludge will be containerized in 55-gal drums and characterized with soil waste.

13.2.2.6 Waste Water

Waste water may be generated by removal of standing water at sampling locations (e.g., SWMU 77) and by decontamination of equipment. If present, the waste water will be sampled. The waste water will be pumped either for direct discharge under the KPDES permit (if water quality requirements are met) or into containers for treatment prior to discharge/disposal depending on analytical results.

13.3 WASTE MANAGEMENT ROLES AND RESPONSIBILITIES

13.3.1 Waste Management Tracking Responsibilities

Waste generated during the RI sampling activities will require the implementation of a comprehensive waste tracking system to maintain waste inventory. The tracking system will document waste container numbers and locations, waste description, generation date, sampling, treatment and disposal date, and disposal location. To prevent inappropriate disposal of waste, generation data and information necessary to determine the amount of contamination present will be documented so that proper disposal methods can be implemented. Determination of the ultimate disposal method is the responsibility of the RI Project Manager.

13.3.2 Waste Management Coordinator

The WMC will ensure that all waste management activities comply with contractor requirements and the WMP. Responsibilities of the WMC include coordination of activities with field personnel, oversight of waste management operations, and maintenance of the waste management logbook that contains a complete history of generated waste and the current status of individual waste containers.

The WMC will ensure that procurement and inspection of equipment, material, or services critical for shipments of waste to off-site treatment, storage, and disposal facilities are conducted in accordance with procedure PRS-WSD-3012, *Procurement and Inspection of Items Critical for Paducah Off-Site Waste Shipments.* Additionally, the WMC will ensure that wastes expected to be disposed of at the C-746-U Landfill are packaged and managed according to the WAC.

Additional responsibilities of the WMC include the following:

- Maintaining an adequate supply of labels
- Maintaining drum inventories
- Interfacing with necessary personnel
- Preparing Requests for Disposal (RFDs)
- Tracking generated waste
- Ensuring waste containers are properly labeled
- Coordinating waste disposal or transfers
- Coordinating sampling of waste containers to characterize wastes
- Ensuring that waste storage areas are properly established, maintained, and closed

The WMC or designee will maintain the waste inventory system such that all waste generated during the RI is properly tracked and identified. The waste inventory database shall include the following:

- Generation date
- RFD number
- Origin location
- Waste type
- Description
- Quantity

- Storage location
- Sampling status
- Analytical results
- Resampling status
- Disposal date, location

13.3.3 RI Field Crew

The RI sampling/drill crew must coordinate closely with the WMC concerning daily sampling/drilling locations. The WMC will contact the Waste Operations Manager or his designee and have waste containers delivered to the sampling/drill location.

13.3.4 Waste Operations

When necessary, the WMC will be responsible for interfacing with DOE Prime Contractor Waste Operations personnel to schedule characterization sampling of waste for on-site disposal. Waste Operations Sampling personnel will complete all chain-of-custody forms and are responsible for packaging and delivery of samples to the PGDP on-site laboratory.

13.4 INVESTIGATION-DERIVED WASTE SEGREGATION, CONTAINERIZATION AND STORAGE

13.4.1 IDW Segregation

Soil borings advanced to 16 ft bgs using direct push technology will generate less than 1 ft^3 of soil waste per borehole. To facilitate waste characterization at the conclusion of field activities, each borehole's waste must be segregated until analytical results are obtained. Since it is impractical to use an exclusive 55-gal drum for each borehole's waste, soil waste will be placed in appropriately sized 6-mil plastic bags, labeled with the borehole number, and then placed in a 55-gal drum for storage. PPE and plastic also will be placed in a 55-gal drum.

13.4.2 Container Labeling and Identification

Each waste stream (soil, PPE and plastic, sample residuals, etc.) will be tracked and labeled with the RFD (form WSD-F-0014) system. All containers of a single waste stream will be tracked under the same RFD number and each container's contents represented on a Waste Item Container Log (form WSD-F-0015). Containers will be labeled per the WAC.

13.4.3 IDW Storage

The WMC will establish and maintain an appropriate waste storage area for the RI in accordance with contractor procedure PRS-WSD-3010, *Waste Generator Responsibilities for Temporary On-Site Storage of Regulated Waste Materials at Paducah.* The C-760 CERCLA waste storage area near the NW corner of C-335, C-611-T02, and C-416 will be the storage areas for RI waste prior to characterization. The C-760, C-611-T02, and C-416 CERCLA storage area is equipped with secondary containment areas facilitating the temporary storage of liquid waste, if necessary.

13.5 TRANSPORTATION OF INVESTIGATION-DERIVED WASTE

Transportation of waste at PGDP will comply with PRS-WSD-0661, *Transportation Safety Document for On-Site Transportation Within the Paducah Gaseous Diffusion Plant, Paducah, KY* and PRS-WSD-0019, *On-site Transportation and Movement of Waste Containers and other Support Equipment.* The WMC will interface with Waste Operations personnel to schedule transportation of waste containers. Waste handling will be carried out by United Steel Workers craft personnel.

13.5.1 Required Equipment

Equipment that will be used to move or handle IDW must be inspected by procedure PRS-ESH-2007, *Industrial Motorized Trucks (Forklifts),* by the SHR or designee. Equipment that does not pass this inspection will be tagged out-of-service until corrective actions have been approved and implemented.

Transportation of waste will require the use of forklift trucks, flatbed trailers, and flatbed trucks. A drum grabber will be mounted on the forklift to place drums onto pallets for transport.

13.5.2 Containerization and Transportation of Solid IDW

Solid waste must be containerized in U.S. Department of Transportation 1A2/X drums and must contain a 12-mil plastic liner and absorbent clay material prior to transporting waste material to a treatment, storage, or disposal facility in accordance with PRS-WSD-3015, *Waste Packaging*.

13.5.3 Containerization and Transportation of Liquid IDW

Liquid waste must be containerized in U.S. Department of Transportation 1A1 closed-top drums in accordance with PRS-WSD-3015, *Waste Packaging*.

13.6 IDW CHARACTERIZATION, SAMPLING, AND ANALYSIS

Sampling and analysis of all RI waste shall comply with the RI SAP and the WAC. Since all waste will be segregated according to boring number, the waste will be characterized according to analytical results of the environmental samples. The contaminants of concern during RI sampling include radionuclides, PCBs, and RCRA metals. PPE will be characterized as contaminated if analytical results of the borehole on which it was used indicate contamination.

For solid waste, the “20 times” rule will be used to determine if the waste is characteristically hazardous. If the total concentration of RCRA constituents is greater than 20 times the Toxicity Characteristic Leaching Procedure (TCLP) limits in 40 *CFR* § 261.24, then the waste will be considered characteristically hazardous and placed into RCRA storage until further TCLP analysis can be performed for complete analysis.

13.7 SAMPLE RESIDUALS AND MISCELLANEOUS WASTE MANAGEMENT

Sample residuals and returns shall be returned to the waste stream prior to final waste disposition. Any hazardous waste returns will be included with waste to be shipped off-site for proper treatment and/or disposal.

13.8 WASTE MINIMIZATION

Waste minimization requirements that will be implemented, as appropriate, include those established by the 1984 Hazardous and Solid Waste Amendments of RCRA; DOE orders 5400.1, 5400.3, and 435.1; and the Contractor. Requirements specified in the Contractor's WMP (PRS-CDL-0029), *Waste Management Plan for the Paducah Environmental Remediation Project,* concerning waste generation, tracking, and reduction techniques will be followed.

To support the commitment to waste reduction, an effort will be made during all field activities to minimize waste generation, largely through ensuring that potentially contaminated waste material is localized and is not allowed to come into contact with clean material. Such an event could create more contaminated waste. Waste minimization also will be facilitated through waste segregation, selection of PPE, and waste handling practices.

Solid wastes such as Tyvek coveralls and packaging materials will be segregated. An attempt will be made to separate visibly soiled coveralls from clean coveralls. In some instances, partially soiled coveralls can be cut up and segregated. Other solid waste will not be allowed to contact potentially contaminated soil waste. Efforts will be made to keep Tyvek coveralls clean, reuse clean coveralls, and use coveralls only when necessary. Proper waste handling and spill control techniques will help minimize waste, particularly around decontamination areas where water must be containerized.

13.9 HEALTH AND SAFETY ISSUES RELATED TO IDW ACTIVITIES

Waste management activities will be conducted in compliance with health and safety DOE Prime Contractor procedures and general requirements as described in the ES&H plan, included as Chapter 10 of this work plan.

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14. COMMUNITY RELATIONS PLAN

SOU RI/FS information will be included in the appropriate stakeholder-related activities as described in the *Community Relations Under the Federal Facility Agreement at the U. S. Department of Energy, Paducah Gaseous Diffusion Plant* (DOE 2009e) and any subsequent updates of the Community Relations Plan.

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APPENDIX A

POTENTIAL APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS AND TO BE CONSIDERED GUIDANCE

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ACRONYMS

ALARA	as low as reasonably achievable
ARAR	applicable or relevant and appropriate requirement
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COE	U.S. Army Corps of Engineers
EDE	effective dose equivalent
EPA	U.S. Environmental Protection Agency
Fed. Reg.	*Federal Register*
FS	feasibility study
KAR	*Kentucky Administrative Record*
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NWP	Nationwide Permit
OSHA	Occupational Safety and Health Association
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RI	remedial investigation
SWMU	solid waste management unit
T&E	threatened and endangered
TBC	To Be Considered
USC	*United States Code*
USCA	*United States Code Annotated*

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A.1 INTRODUCTION

Congress specified in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) § 121(d) (42 *USCA* § 9621) that remedial actions for cleanup of hazardous substances must comply with requirements or standards under federal or more stringent state environmental laws that are applicable or relevant and appropriate to the hazardous substances or particular circumstances at a site or obtain a waiver [see also 40 *CFR* § 300.430(f) (1) (ii) (B)]. Inherent in the application of applicable or relevant and appropriate requirements (ARARs) is the assumption that protection of human health and the environment is ensured.

This appendix supplies a preliminary discussion of available federal and state chemical-, location-, and action-specific ARARs that may be associated with potential remedial actions at the Soils Operable Unit (Soils OU) at the Paducah Gaseous Diffusion Plant (PGDP). The process of ARAR identification is an iterative one that is continually changing as the remedial investigation/feasibility study (RI/FS) progresses; therefore, the ARARs that are identified represent a compilation of potential ARARs that are subject to change as site-specific contamination at the Soils OU is further characterized and alternatives are further evaluated. Site-specific ARARs will be identified further during the remedial action selection for the FS.

The U.S. Environmental Protection Agency (EPA) differentiates ARARs as either "applicable" or "relevant and appropriate" to a site. The terms and conditions of these categories are as follows:

- *Applicable requirements* are "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance found at a CERCLA site" (40 *CFR* § 300.5); and

- *Relevant and appropriate requirements* are "those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under federal environmental or state environmental or facility siting laws that, while not applicable to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site" (40 *CFR* § 300.5).

The EPA also categorizes ARARs based on whether they are specific to the chemical(s) present at the site (chemical-specific), the remedial action being evaluated (action-specific), or the location of the site (location-specific). The EPA designated these categories to assist in the identification of ARARs; however, they are not necessarily precise [53 *Fed. Reg*. 51437 (1988)]. Some ARARs may fit into more than one category, while others may not definitively fit into any one category. Terms and conditions relevant to this categorization are included in the list that follows:

- *Chemical-specific ARARs* usually are "health- or risk-based numerical values or methodologies that, when applied to site-specific conditions, result in the establishment of numerical values" [53 *Fed. Reg*. 51437 (1988)]. These values establish the acceptable amount or concentration of a chemical that may remain in, or be discharged to, the ambient environment.

- *Action-specific ARARs* usually are "technology- or activity-based requirements or limitations placed on actions taken with respect to hazardous wastes, or requirements to conduct certain actions to address particular circumstances at a site" [53 *Fed. Reg*. 51437 (1988)]. Selection of a particular remedial action at a site will trigger action-specific ARARs that specify appropriate technologies and performance standards.

- *Location-specific ARARs* "generally are restrictions placed upon the concentration of hazardous substances or the conduct of activities solely because they are in special locations" [53 *Fed. Reg.* 51437 (1988)]. Some examples of special locations include floodplains, wetlands, historic places, and sensitive ecosystems or habitats.

Chemical-specific ARARs include concentration limits for contaminants such as maximum contaminant levels. Action-specific ARARs include performance and design standards, such as the Resource Conservation and Recovery Act (RCRA) minimum technology requirements. Location-specific ARARs include regulations covering preservation of historic sites and protection of wetlands and floodplains.

Pursuant to CERCLA § 121(e) [42 *USCA* § 9621(e) (1)], response actions, or portions of response actions entirely on-site, as defined in 40 *CFR* § 300.5, must comply with the substantive portions of ARARs, but not the procedural or administrative requirements. Additionally, CERCLA § 121(d) (4) [42 *USCA* § 9621(d) (4)] provides six ARAR waiver options that may be invoked, provided that human health and the environment are protected.

Published unpromulgated information that does not necessarily meet the definition of an ARAR may be necessary, under certain circumstances, to determine what is protective of human health and the environment. This type of information is known as To Be Considered (TBC) guidance and also may be useful in developing CERCLA remedies. Because ARARs do not exist for every chemical or circumstance that may be found at a CERCLA site, the EPA believes that it may be necessary, when determining cleanup requirements or designing a remedy, to consult reliable information that otherwise would not be considered a potential ARAR. Criteria or guidance developed by the EPA, other federal agencies, or states may assist in determining, for example, health-based levels for a particular contaminant or the appropriate method for conducting an action for which there are no ARARs. The TBC guidance generally falls within four categories: (1) health effects information; (2) technical information on how to perform or evaluate investigations or response actions; (3) policy; and (4) proposed regulations, if the proposed regulation is noncontroversial and likely to be promulgated as drafted.

The EPA requires compliance with Occupational Safety and Health Association (OSHA) standards through § 300.150 of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), not through the ARARs process. Worker health and safety requirements typically are not addressed as ARARs. The regulations at 29 *CFR* § 1910.120 are designed to protect workers involved in cleanup operations at uncontrolled hazardous waste sites and to provide for worker protection during initial site characterization and analysis, monitoring activities, materials handling activities, training, and emergency response.

The remainder of this appendix will address those requirements that apply to remedial actions through the CERCLA (i.e., ARARs) process. As mentioned above, ARARs identification is an iterative process that continually changes as the RI/FS progresses. Based on the remedial action ultimately selected, ARARs specific to that action will be identified later in the remedial action process.

A.2 CHEMICAL-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

A.2.1 Radionuclide Contamination

Radionuclides have been detected in soil at some of the Soils OU solid waste management units (SWMUs). While no cleanup standards currently exist for soil contaminated with radionuclides, U.S. Department of Energy (DOE) Order 5400.5, *Radiation Protection of the Public and the Environment* specifies radiation exposure limits for members of the general public. They include an effective dose equivalent (EDE) of 100 mrem/yr. The Order also requires DOE personnel and contractors to strive to ensure that radiation doses to members of the public are as low as reasonably achievable (ALARA) below the appropriate limits. The Order applies to exposure of the public as a result of routine DOE activities, including implementation of remedial actions. While all DOE facilities must comply with this Order, under the NCP, it would be classified as TBC guidance for radionuclide remediation rather than applicable or relevant and appropriate since it has not been promulgated.

A.2.2 Radionuclide Emission Standards

On-site activities involved with the implementation of any remedial action selected may produce airborne pollutants. If radionuclide emissions were to occur, emission standards for DOE facilities would apply. The regulations promulgated pursuant to the Clean Air Act of 1970, as amended by the Clean Air Act of 1990, set emission standards for radionuclides, other than radon, from DOE facilities. This regulation requires that DOE ensure that emissions from its facilities do not exceed those amounts that would cause any member of the public to receive, in any year, an effective dose equivalent in excess of 10 mrem/yr (40 *CFR* § 61.92). These regulations in 40 *CFR* § 61.92 would be applicable to any activity that would result in radionuclide emissions.

A.2.3 Polychlorinated Biphenyls

Soils contaminated with polychlorinated biphenyls (PCBs) are considered "bulk PCB remediation waste" under 40 *CFR* § 761.3. Cleanup and removal of bulk PCB remediation waste will be conducted in accordance with 40 *CFR* § 761.61. These would be applicable requirements.

A.3 LOCATION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

A.3.1 Threatened or Endangered Species

No threatened or endangered (T&E) species or their potential habitats or critical habitats have been identified in the boundaries of the Soils OU SWMUs. Kentucky has no T&E species regulations promulgated at this time. A list of plant and animal species identified for monitoring purposes is maintained by the Kentucky State Nature Preserves Commission. If T&E species later are discovered in the area, potential impacts to the species should be considered for all DOE actions.

A.3.2 Cultural Resources

No cultural resources have been identified in the boundaries of the Soils OU SWMUs.

A.3.3 Floodplains/Wetlands

Eight SWMUs have been identified in a 100-year floodplain, and wetlands have been identified near a few of the SWMUs (CDM 1994). Although all ARARs discussed in this section are applicable, they will be met by avoidance of the resource. If impacts become apparent, however, mitigation measures will be addressed and/or initiated during the remedial design and/or remedial action phase to comply with the ARARs.

Construction activities must avoid or minimize adverse impacts on wetlands and act to preserve and enhance their natural and beneficial values [Executive Order 11990; 40 *CFR* § 6.302(a); 40 *CFR* § 6, Appendix A; and 10 *CFR* § 1022]. In addition, construction activities must minimize potential harm to the 100-year floodplain [Executive Order 11988 and 10 *CFR* § 1022].

40 *CFR* § 230.10(b) prohibits discharges of dredged or fill material that cause or contribute to violations of state water quality standards, violate toxic effluent standards or discharge prohibitions (33 *USC* § 1317), or jeopardize T&E species or their critical habitat under the Endangered Species Act (16 *USC* § 1531, *et seq.*). If it becomes apparent that impacts to wetlands are unavoidable, the substantive requirements of 61 *Fed. Reg.* 65920 Nationwide Permits (NWPs), or 33 *CFR* § 325 (processing of general permits), governing discharges of dredged or fill material into waters of the United States would become applicable.

Specific requirements applicable to all NWPs are defined in 61 *Fed. Reg*. 65920 (December 13, 1996). The substantive requirements of NWP 38 (cleanup of hazardous and toxic waste) are applicable to this action, but the specific requirement of notification is not required for CERCLA actions under this NWP. Consequently, although wetlands should be delineated and avoided, the delineation does not have to be sent to the U.S. Army Corps of Engineers (COE), and the COE does not have to be notified for this action [61 *Fed. Reg*. 65905-65906 (1996)].

As required by 401 *KAR* 4:060, activities or structures exempted by 401 *KAR* 4:020, that includes activities covered by a COE NWP, may be placed within the regulatory floodway limit of a stream only if they are not of such nature as to result in increases in flood elevations.

A.4 ACTION-SPECIFIC APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

A.4.1 Site Preparation, Construction, and Excavation Activities

Action-specific ARARs will be developed in the FS.

APPENDIX B
DOCUMENT OUTLINE

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INTEGRATED RFI/RI REPORT

Executive Summary
1. Introduction
    1.1 Purpose of Report
    1.2 Site Background
        1.2.1 Site Description
        1.2.2 Site History
        1.2.3 Previous Investigations
    1.3 Report Organization
2. Study Area Investigation
    2.1 Includes all field activities associated with site characterization. These may include physical and chemical monitoring of some of the following:
        2.1.1 Surface Features
        2.1.2 Contaminant Source Investigations
        2.1.3 Meteorological Investigations
        2.1.4 Surface Water and Sediment Investigations
        2.1.5 Geological Investigations
        2.1.6 Soil and Vadose Zone Investigations
        2.1.7 Groundwater Investigations
        2.1.8 Human Population Surveys
        2.1.9 Ecological Investigations
    2.2 If technical memoranda documenting field activities were prepared, they may be included in an appendix and summarized in this report section.
3. Physical Characteristics of the Study Area
    3.1 Includes results of the field activities to determine physical characteristics. These may include some of the following:
        3.1.1 Surface Features
        3.1.2 Meteorology
        3.1.3 Surface Water Hydrology
        3.1.4 Geology
        3.1.5 Soils
        3.1.6 Hydrogeology
        3.1.7 Demography and Land Use
        3.1.8 Ecology
4. Nature and Extent of Contamination
    4.1 Presents the results of site characterization, both natural chemical components and contaminants of the following media:
        4.1.1 Sources (Lagoons, Sludges, Tanks, etc.)
        4.1.2 Soils and Vadose Zone
        4.1.3 Groundwater
        4.1.4 Surface Water and Sediments
        4.1.5 Air
5. Fate and Transport
    5.1 Potential Routes of Migration (i.e., Air, Groundwater, etc.)
    5.2 Contaminant Persistence
        5.2.1 Describe estimated persistence in the study area environment and physical, chemical, and/or biological factors of importance for the media of interest.
    5.3 Contaminant Migration
        5.3.1 Describe factors affecting contaminant migration for the media of importance (e.g., sorption onto soils, solubility in water, movement of groundwater, etc.).

5.3.2 Describe modeling methods and results, if applicable.

6. BRA
    - 6.1 Human Health Evaluation
        - 6.1.1 Exposure Assessment
        - 6.1.2 Toxicity Assessment
        - 6.1.3 Risk Characterization
    - 6.2 Environmental Evaluation
7. Summary and Conclusions
    - 7.1 Summary
        - 7.1.1 Nature and Extent of Contamination
        - 7.1.2 Fate and Transport
        - 7.1.3 Risk Assessment
    - 7.2 Conclusions
        - 7.2.1 Data Limitations and Recommendations for Future Work
        - 7.2.2 Recommended RA Objectives

Appendices

- A Technical Memoranda on Field Activities
- B Analytical Data and QA/QC Evaluation Results
- C Risk Assessment Methods

NOTE: Elements included in this outline shall be considered and incorporated, as appropriate, when developing the above-referenced document.

INTEGRATED FS/CMS REPORT

Executive Summary
1. Introduction
    1.1 Purpose and Organization of Report
    1.2 Background Information (Summarized from RI/RFI Report)
        1.2.1 Site Description
        1.2.2 Site History
        1.2.3 Nature and Extent of Contamination 1.2.4 Contaminant Fate and Transport 1.2.5 BRA
2. Identification and Screening of Technologies
    2.1 Introduction
    2.2 RA Objectives -
        Presents the development of RA objectives for each medium of interest. For each medium, the following should be discussed:
        2.2.1 Contaminants of Interest
        2.2.2 Allowable Exposure Based upon Risk Assessment (including ARARs)
        2.2.3 Development of Remediation Goals
    2.3 General Response Actions -
        For each medium of interest, describe the estimation of areas or volumes to which treatment, containment, or exposure technologies may be applied.
    2.4 Identification and Screening of Technology Types and Process Options - For each medium of interest, describe:
        2.4.1 Identification and Screening of Technologies
        2.4.2 Evaluation of Technologies and Selection of Representative Technologies
3. Development and Screening of Alternatives
    3.1 Development of Alternatives -
        Describes rationale for combination of technologies/media into alternatives.
    3.2 Screening of Alternatives (if conducted)
        3.2.1 Introduction
        3.2.2 Alternative 1
        3.2.2.1 Description
        3.2.2.2 Evaluation
        3.2.3 Alternative 2 (etc.)
        3.2.4 Alternative 3 (etc.)
4. Detailed Analysis of Alternatives
    4.1 Introduction
    4.2 Individual Analysis of Alternatives
        4.2.1 Alternative 1
            4.2.1.1 Description
            4.2.1.2 Assessment
        4.2.2 Alternative 2 (etc.)
        4.2.3 Alternative 3 (etc.)
    4.3 Comparative Analysis
Bibliography
Appendices

NOTE: Elements included in this outline shall be considered and incorporated, as appropriate, when developing the above-referenced document.

Baseline Risk Assessment Outline

Baseline Human Health Risk Assessment

1. Results of Previous Studies
2. Identification of Chemicals of Potential Concern
   - 2.1 Sources of Data
   - 2.2 General Data Evaluation Considerations
   - 2.3 Risk Assessment Specific Data Evaluation
   - 2.4 Evaluation of Data from Other Sources
   - 2.5 Summary of Chemicals of Potential Concern
3. Exposure Assessment
   - 3.1 Characterization of Exposure Setting
   - 3.2 Identification of Exposure Pathways
   - 3.3 Quantification of Exposure
   - 3.4 Summary of Exposure Assessment
4. Toxicity Assessment
   - 4.1 Inorganics
   - 4.2 Organics
   - 4.3 Radionuclides
   - 4.4 Chemicals for Which No EPA Toxicity Values Are Available
   - 4.5 Uncertainties Related to Toxicity Assessment
   - 4.6 Summary
5. Risk Characterization
   - 5.1 Determination of Noncancer Effects
   - 5.2 Determination of Excess Cancer Risk
   - 5.3 Risk Characterization for Current Use Scenario(s)
   - 5.4 Risk Characterization for Future Use Scenario(s)
   - 5.5 Risk Characterization for Lead (if needed)
   - 5.6 Identification of Use Scenarios, Contaminants, Pathways, and Media of Concern
   - 5.7 Summary of Risk Characterization
6. Uncertainty in the Risk Assessment
   - 6.1 Uncertainties Associated with Data
   - 6.2 Uncertainties Associated with Exposure Assessment
   - 6.3 Uncertainties Associated with Toxicity Assessment
   - 6.4 Uncertainties Associated with Risk Characterization
   - 6.5 Summary of Uncertainties
7. Conclusions and Summary
   - 7.1 Chemicals of Potential Concern
   - 7.2 Exposure Assessment
   - 7.3 Toxicity Assessment
   - 7.4 Risk Characterization
   - 7.5 Observations

Screening-Level Ecological Risk Assessment

(The outline of the SERA will be consistent with the completion of Steps 1, 2, and 3 of the EPA ecological risk assessment process as outlined in Volume 2 of the DRAFT PGDP Risk Methods Document (DOE 2009b). This outline for the ecological risk assessment is dependent on the amount of information available after completion of field activities; therefore, the outline will be determined at that time.)[1]

[1]Please refer to the Risk Methods Document (DOE 2009b) for additional information.

APPENDIX C
HISTORICAL DATA SUMMARY

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APPENDIX C
HISTORICAL DATA SUMMARY

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APPENDIX D
DECISION TREES

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D.1. GROUP 1–FORMER FACILITY SITES

D.1.1 SWMU 1 (C-747-C OIL LANDFARM)

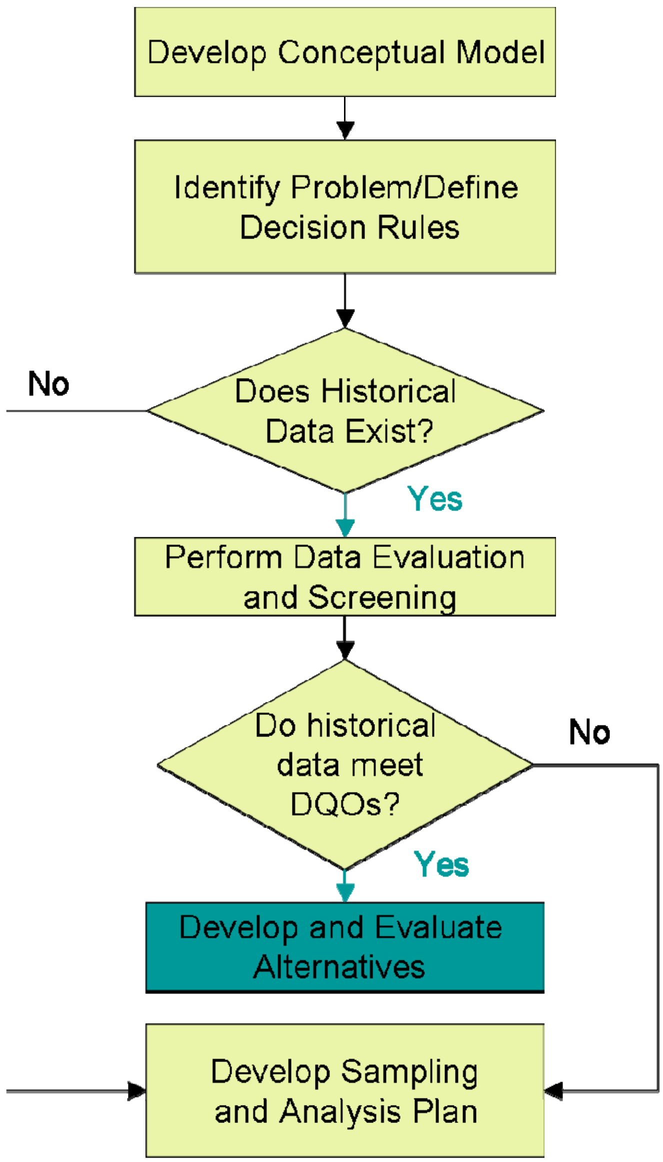

Figure D.1. Decision Tree Analysis – SWMU 1

The decision tree was modified from the initial analysis presented in the Scoping Document. According to the WAG 27 BRA, "all scenarios assessed are a land use scenario of concern for both systemic toxicity and ELCR." This unit will be addressed more fully in the FS. Additionally, radiological walkovers are proposed for this unit to address more fully the extent of surface radiological contamination, if present.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, dioxin/furans, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- AIP Soil Remediation PR June 2004 Split w/DOE AIPSORUPRSP06-04
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- Southwest Plume Site Investigation SWMU001 ERI04SW-SWMU001
- Southwest Plume Site Investigation SWMU001—Head Space 2 Day Turn ERI04SW-001HS-2
- Southwest Plume Site Investigation SWMU001—Head Space 7 Day Turn ERI04SW-001HS-7
- Surface Water OU— Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU— Outfall 008 Activity 1 EU06 SWOU05-K008A106
- Surface Water OU— Outfall 008 Activity 1 EU07 SWOU05-K008A107
- Surface Water OU— Outfall 008 Activity 1 EU08 SWOU05-K008A108
- Surface Water OU— Outfall 008 Activity 1 EU09 SWOU05-K008A109
- Surface Water OU— Outfall 008 Activity 1 EU10 SWOU05-K008A110
- Surface Water OU— Outfall 008 Activity 2 EU07 AND EU08 SWOU05-K008A20708
- Surface Water OU— Outfall 008 Activity 2 EU09 AND EU10 SWOU05-K008A20910
- WAG 23 Excavation Sampling
- WAG 23 Phase 1
- WAG 23 Phase 2
- WAG 27 Excavation Sampling
- WAG 27 RI Sampling

Uncertainties

The sampling from some of these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.2 SWMU 99 (C-745 KELLOGG BUILDING SITE)

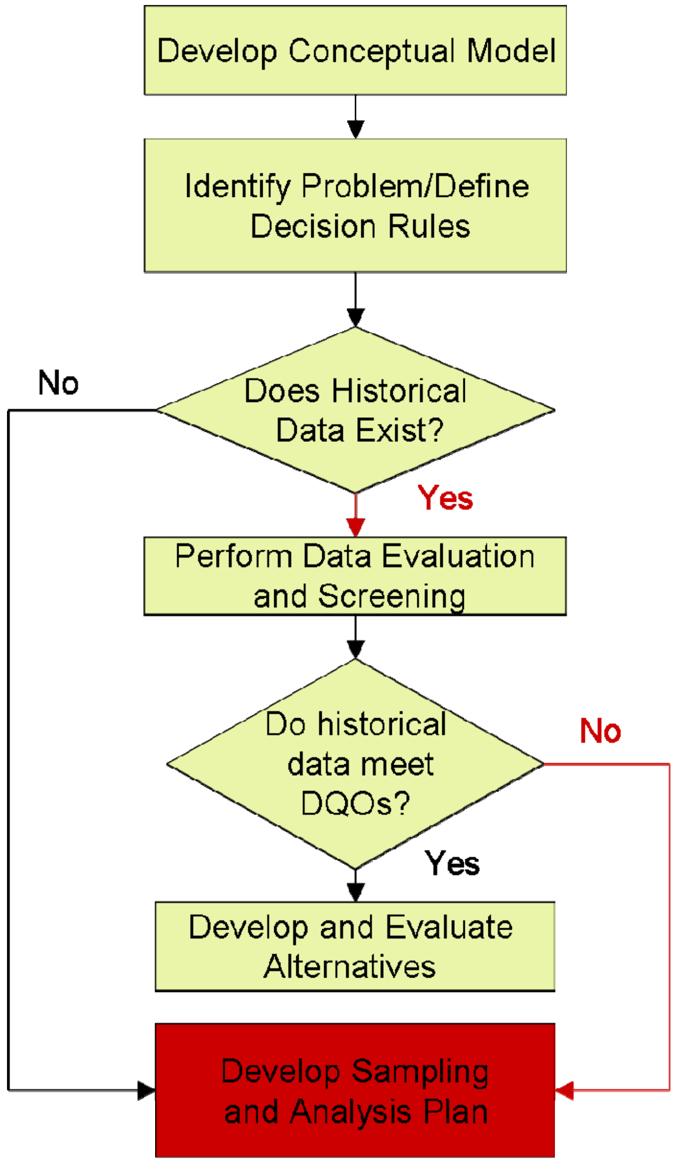

Figure D.2. Decision Tree Analysis – SWMU 99

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2 and Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, VOAs in surface and shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation —Phase 2
- Surface Water OU— Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU— Outfall 002 Activity 1 EU08 SWOU05-K002A108
- Surface Water OU—Outfall 002 Activity 2 EU07 AND EU08 SWOU05-K002A20708
- Surface Water OU— Outfall 010 Activity 1 EU03 SWOU05-K010A103
- Surface Water OU—Outfall 010 Activity 1 EU08 SWOU05-K010A108
- Surface Water OU—Outfall 010 Activity 1 EU09 SWOU05-K010A109
- Surface Water OU—Outfall 010 Activity 2 EU03 AND EU04 SWOU05-K010A20304
- WAG 28—SWMU 99

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.3 SWMU 172 (C-726 SANDBLASTING FACILITY)

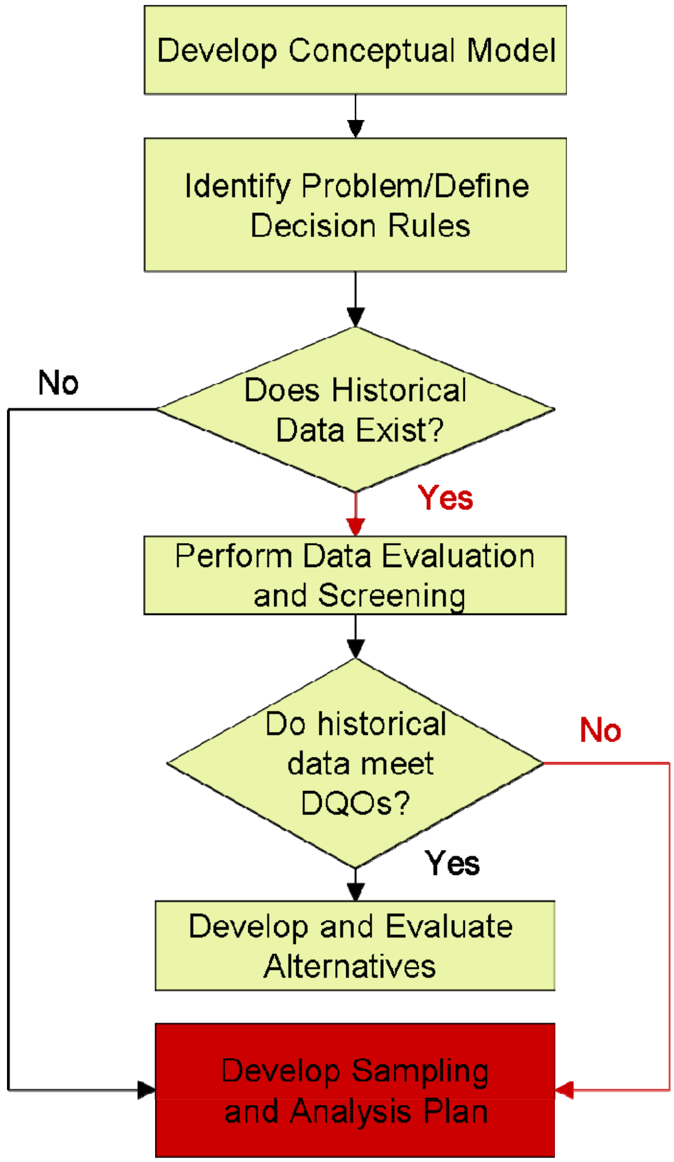

Figure D.3. Decision Tree Analysis – SWMU 172

Additional samples are needed at this location; however, this location has not undergone D&D. Consequently, no samples can be taken at this time.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 2
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 015 Activity 1 EU04 SWOU05-K015A104
- WAG 6—A

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.4 SWMU 194 [MCGRAW CONSTRUCTION FACILITIES (SOUTH SIDE)]

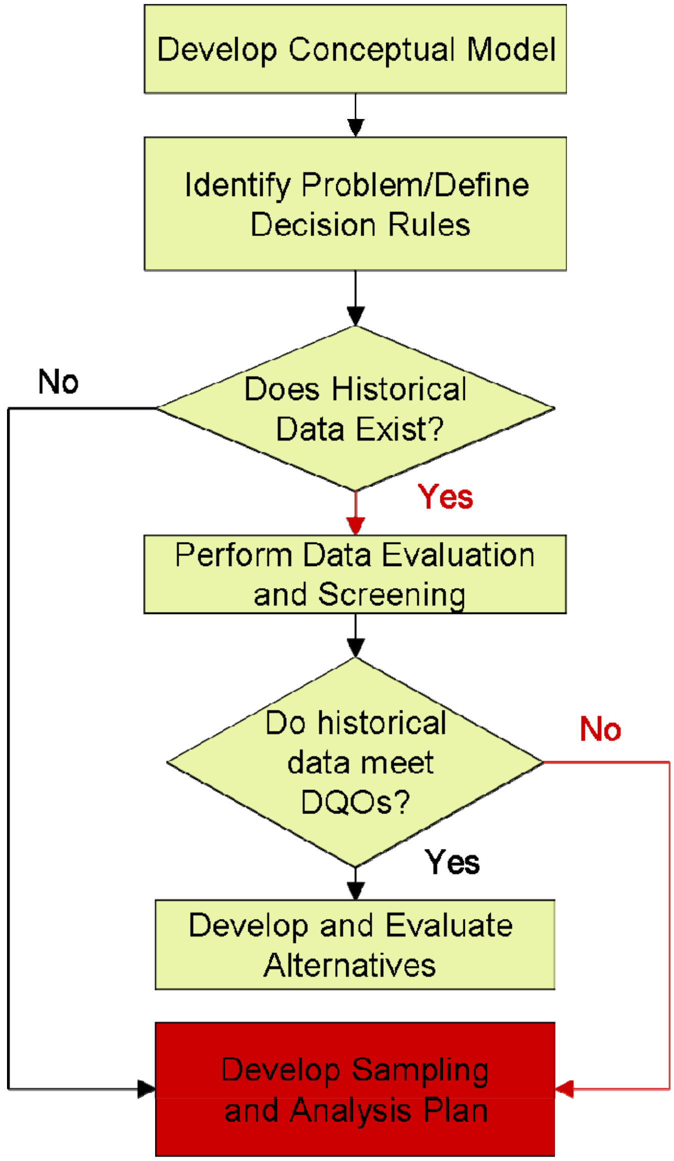

Figure D.4. Decision Tree Analysis – SWMU 194

The decision tree was modified from the initial analysis presented in the Scoping Document. Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- AIP Sediment Toxicity Study for Bayou Creek and Little Bayou Creek January 2002 AIPSERV01-02
- Groundwater Monitoring Phase IV
- Historical data from AnaLIS for WAG 28 DQO
- RCWC Data
- RCWC Data ESO16937
- Remedial Action Site Investigation—Phase 1
- UF6 Conversion Facility Soil Borings
- WAG 28—SWMU 194

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.5 SWMU 196 (C-746-A SEPTIC SYSTEM)

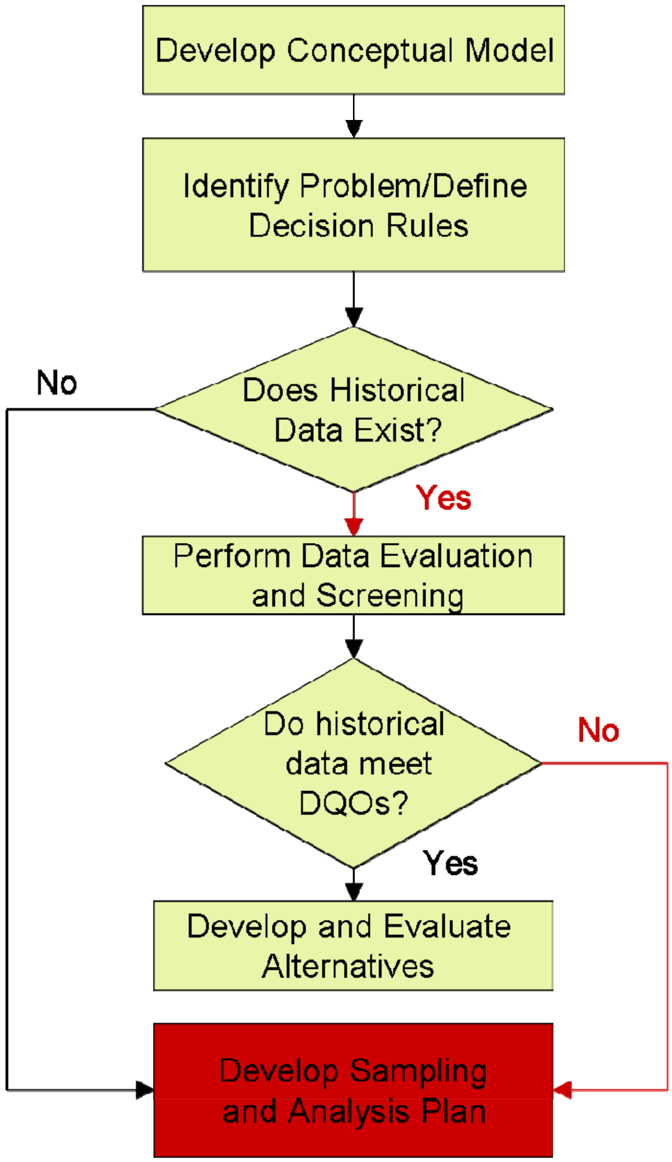

Figure D.5. Decision Tree Analysis – SWMU 196

The decision tree was modified from the initial analysis presented in the Scoping Document. Additional samples are planned at this location.

The WAGs 9 & 11 Site Evaluation states that the unit most scenarios present concern unless lead is not considered as a COPC.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils and metals, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Excavation of Petroleum contaminated soil associated with UST #5 EF02-27
- Excavation of Petroleum contaminated soil associated with UST #5—Resample event EF02-30
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU12 SWOU05-K001A112
- WAG 15
- WAG 15 PAH Sampling
- WAG 27 RI Sampling

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.6 SWMU 211 (C-720 TCE SPILL SITE NORTHWEST)

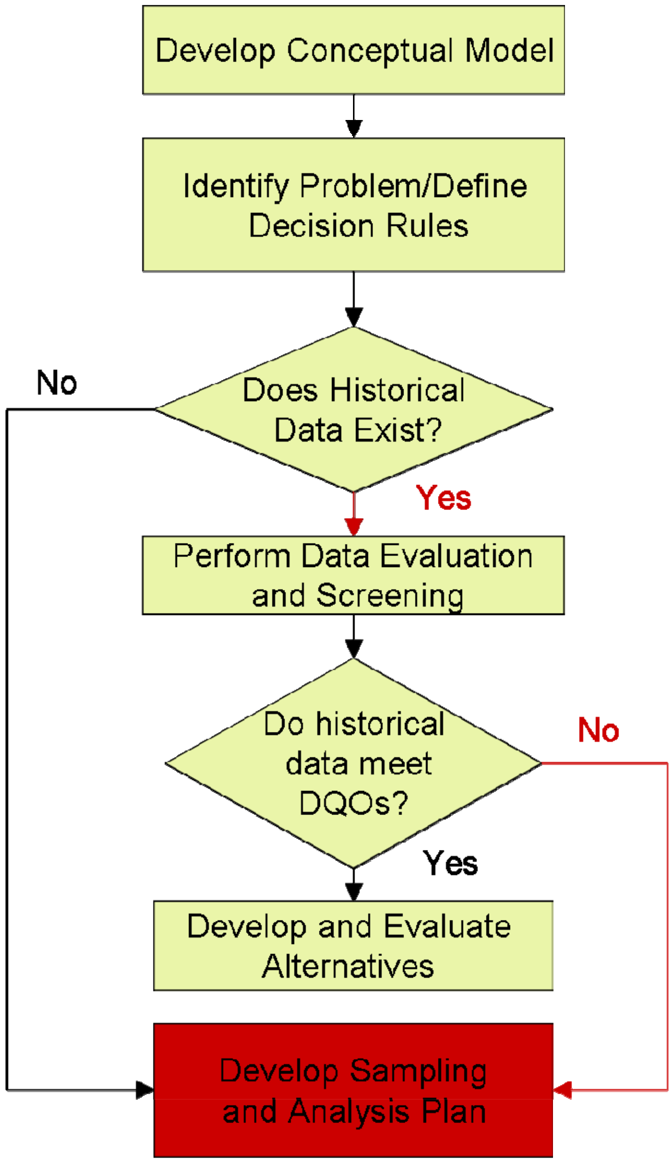

Figure D.6. Decision Tree Analysis – SWMU 211

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils and metals, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- AIP Soil PR June 2004 Split w/Doe AIPSOPRSP06-04
- Remedial Action Site Investigation—Phase 2
- Southwest Plume Site Investigation—C-720 ERI04SW-C720
- Southwest Plume Site Investigation C720—Head Space 2 Day Turn ERI04SW-C720HS-2
- WAG 23 Phase 1
- WAG 27 RI Sampling

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.1.7 SWMU 483 [NITROGEN GENERATING FACILITIES (SOILS UNDER FACILITY)]

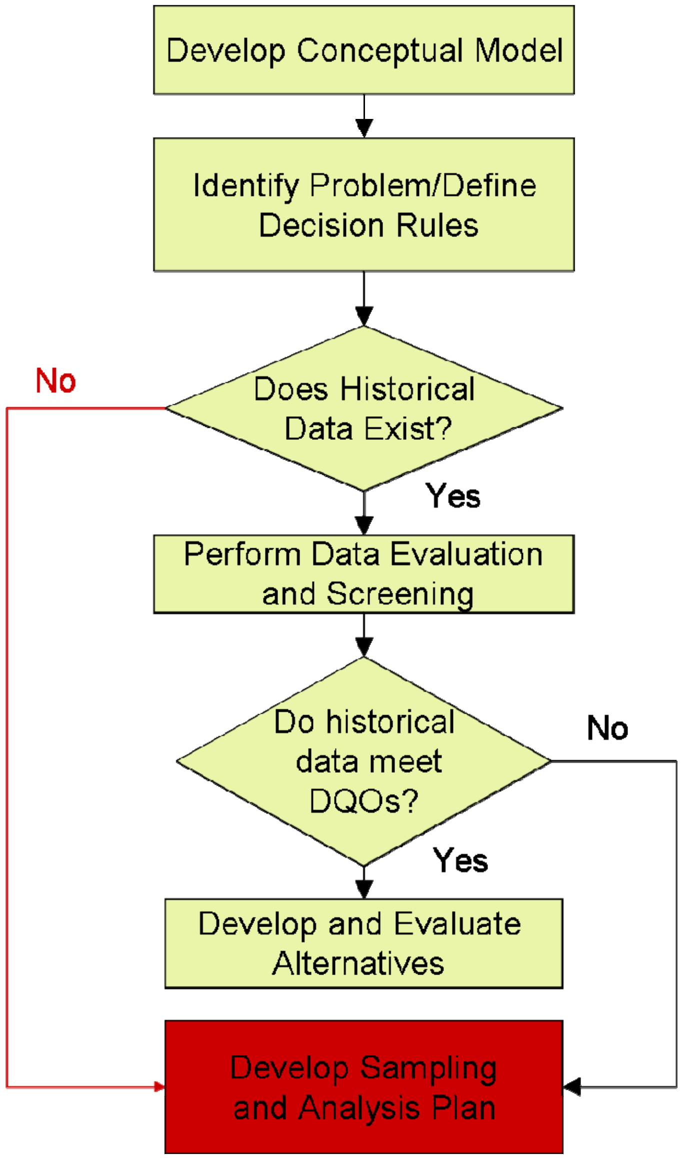

Figure D.7. Decision Tree Analysis – SWMU 483

Additional samples are needed at this location; however, the facility has not undergone D&D. Consequently, few samples can be taken at this time.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data exist for this SWMU.

Uncertainties

Though the overarching sampling plan for the Soils OU RI is non-biased grid sampling, the sampling planned for this unit is not fully encompassing of the unit, it is targeted upon the areas for potential contamination; therefore, any action taken at this unit may be decided upon too conservatively.

D.1.8 SWMU 489 (SEPTIC TANK, NORTH OF C-710)

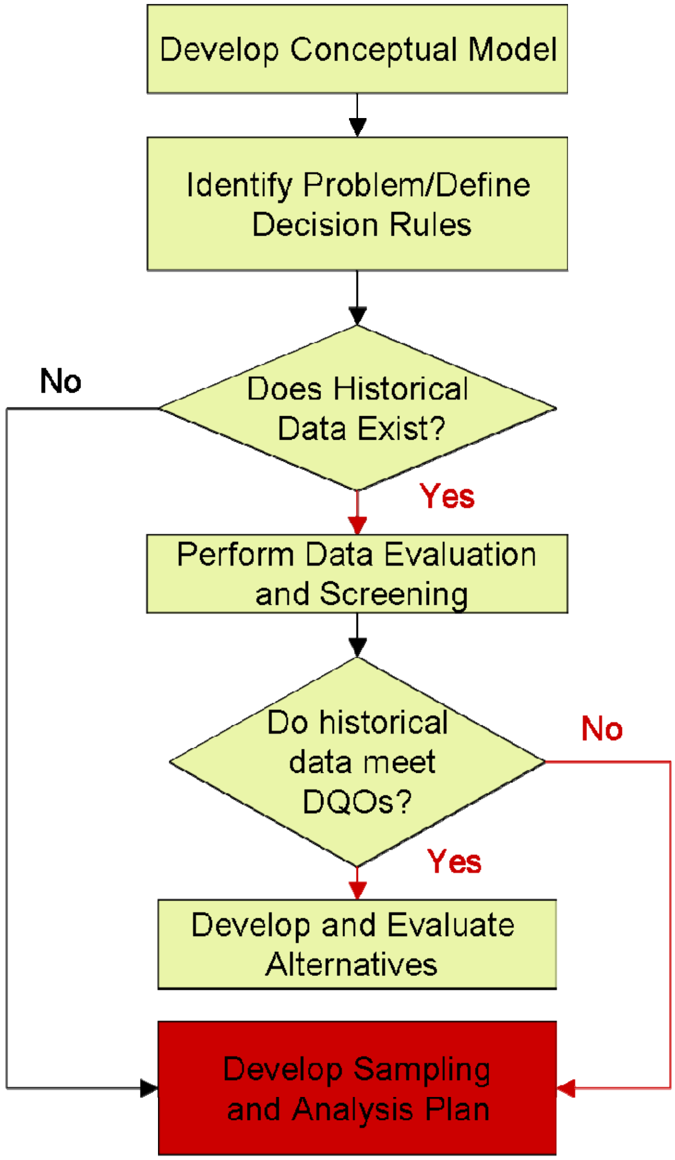

Figure D.8. Decision Tree Analysis – SWMU 489

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.1.9 SWMU 531 (ALUMINUM SLAG REACTING AREA)

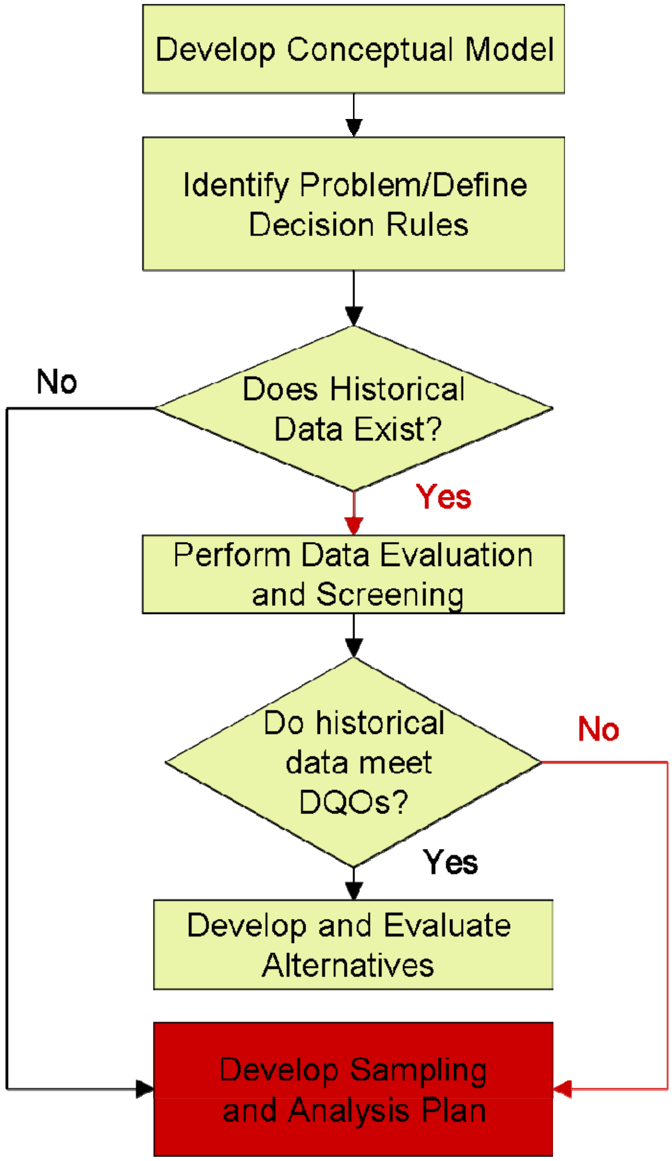

Figure D.9. Decision Tree Analysis – SWMU 531

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface soils and metals, and radionuclides in the shallow subsurface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU12 SWOU05-K001A112
- WAG 27 RI Sampling

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2. GROUP 1–STORAGE AREA

D.2.1 SWMU 47 (C-400 TECHNETIUM STORAGE TANK AREA)

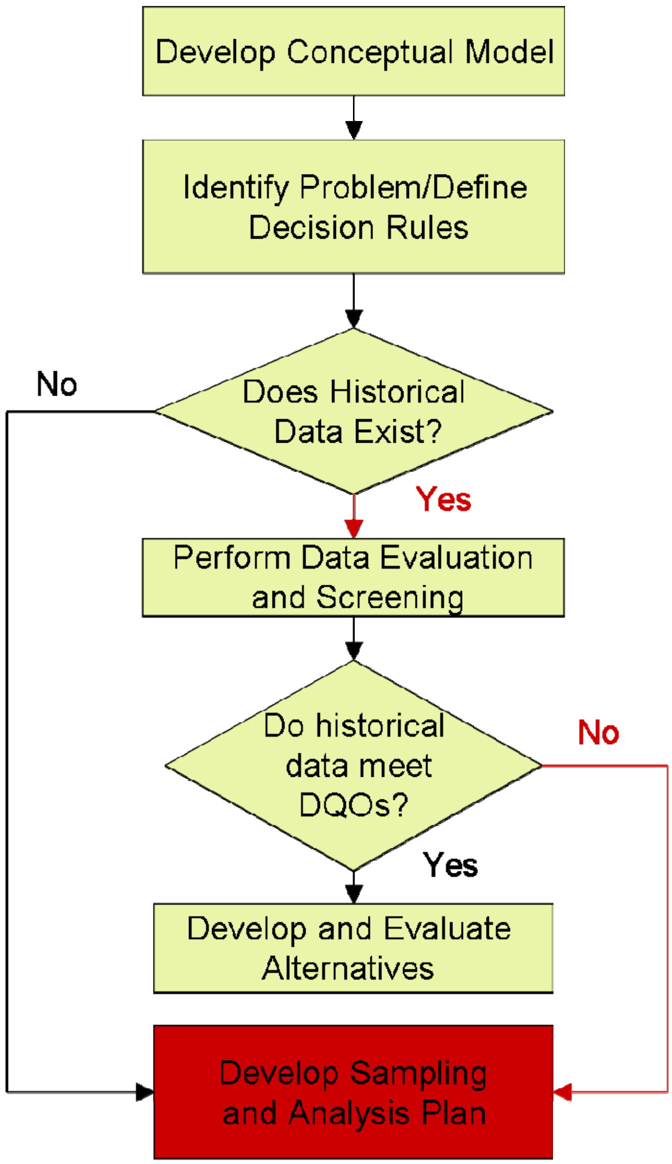

Figure D.10. Decision Tree Analysis – SWMU 47

Additional samples are needed at this location to help delineate extent of contamination from the building.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface soils and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 2
- WAG 6—A

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.2 SWMU 200 (SOIL CONTAMINATION SOUTH OF TSCA WASTE STORAGE FACILITY)

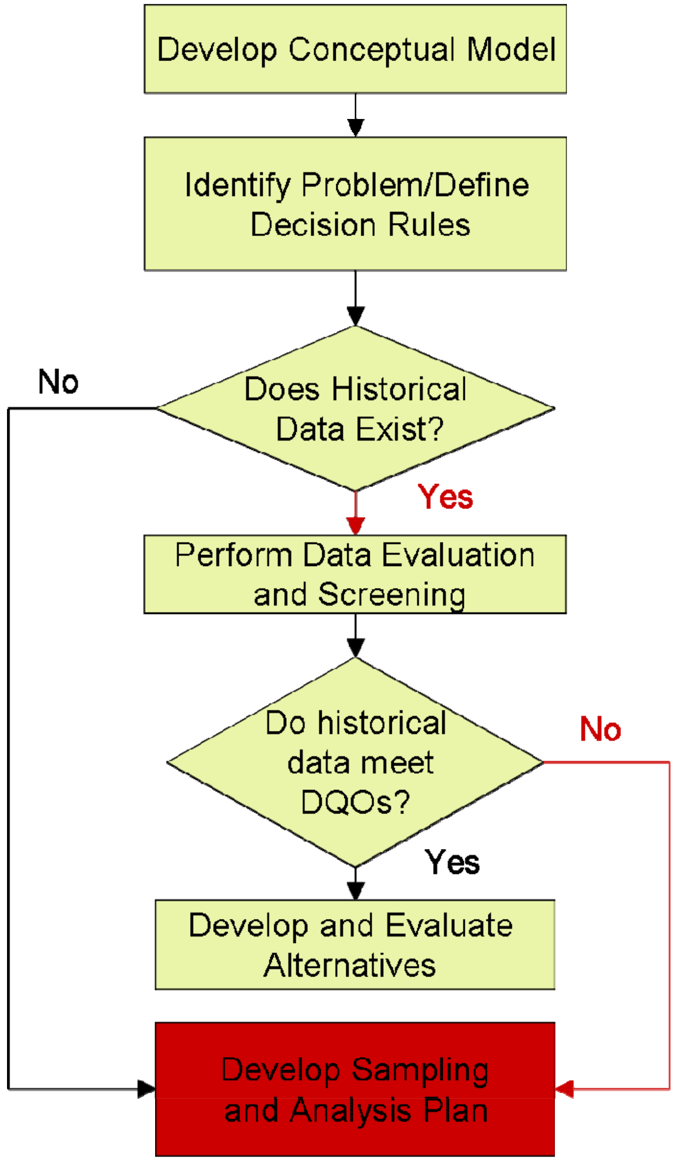

Figure D.11. Decision Tree Analysis – SWMU 200

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The majority of the sampling from the project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.3 SWMU 212 (C-745-A RADIOLOGICAL CONTAMINATION AREA)

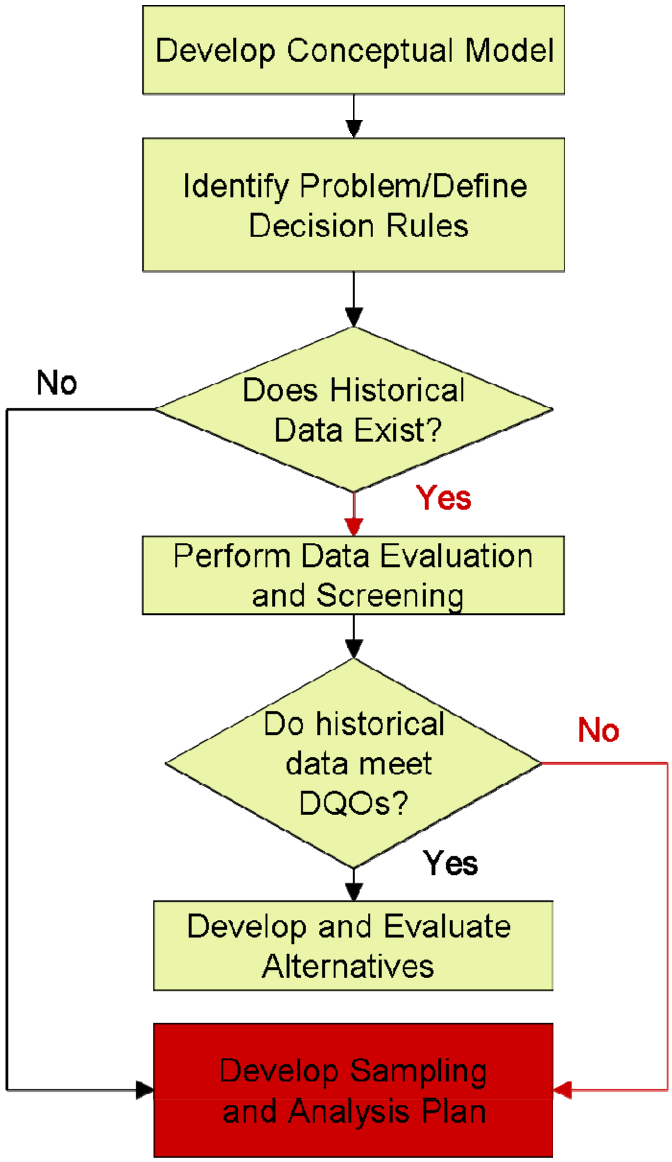

Figure D.12. Decision Tree Analysis – SWMU 212

While the exact history is unknown, supposition is that the area may have been used as an unloading site near railroad tracks, and a release of radiological contaminants may have occurred. Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface soils and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 008 Activity 1 EU04 SWOU05-K008A104
- Surface Water OU—Outfall 008 Activity 1 EU08 SWOU05-K008A108
- WAG 23 Phase 1
- WAG 27 RI Sampling

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.4 SWMU 213 (DMSA OS-02)

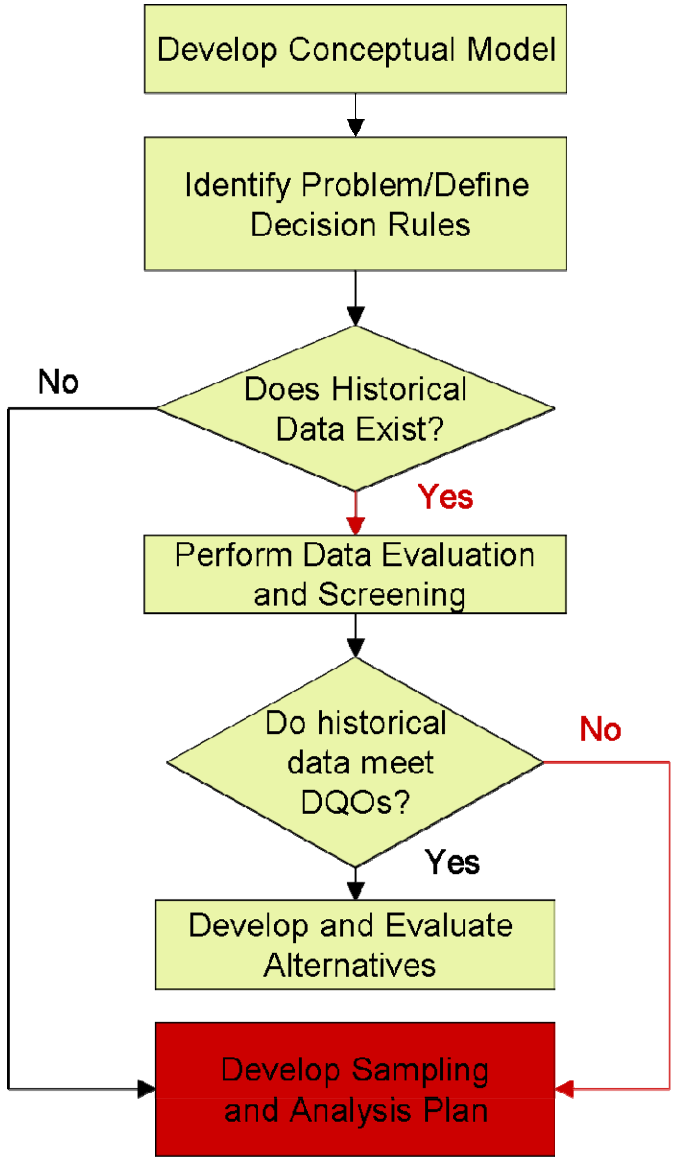

Figure D.13. Decision Tree Analysis – SWMU 213

No hazardous wastes were stored in this unit. Limited sampling is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 015 Activity 1 EU08 SWOU05-K015A108
- Surface Water OU—Outfall 015 Activity 1 EU09 SWOU05-K015A109
- Surface Water OU—Outfall 015 Activity 2 EU07 AND EU08 SWOU05-K015A20708
- Surface Water OU—Outfall 015 Activity 2 EU09 AND EU10 SWOU05-K015A20910
- Surface Water OU—Outfalls Activity 1 Contingency SWOU05-A1OUTFALLC

Uncertainties

Sampling from these projects was non-biased; however, it likely was targeted on the interior ditches.

D.2.5 SWMU 214 (DMSA OS-03)

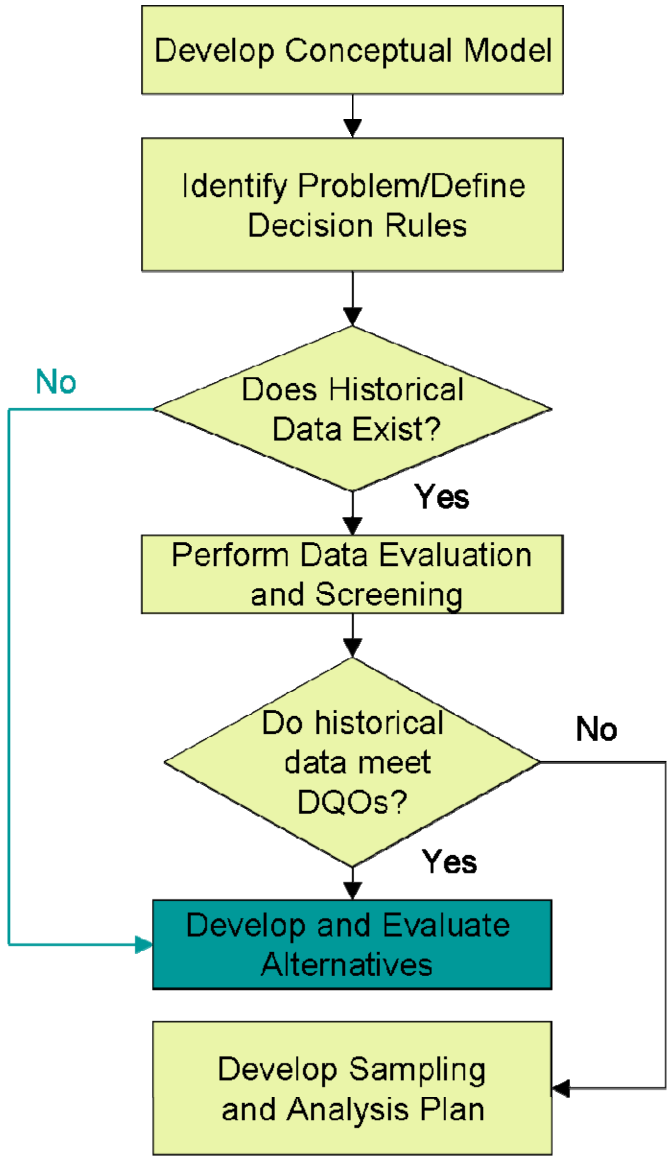

Figure D.14. Decision Tree Analysis – SWMU 214

There have been no known spills or releases of materials from this facility to the environment. Limited sampling is planned.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Though this DMSA is proposed for no further action, the unit must be demonstrated that proposal meets radiation requirements.

D.2.6 SWMU 215 (DMSA OS-04)

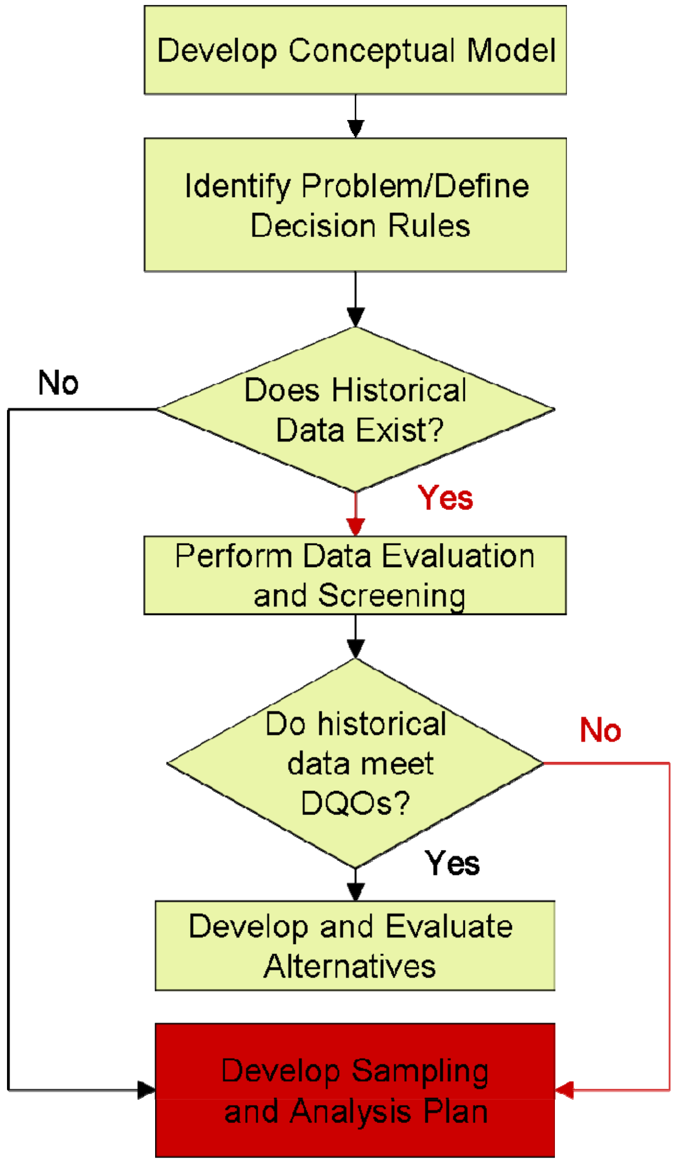

Figure D.15. Decision Tree Analysis – SWMU 215

Limited sampling is planned.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, radionuclides, and pesticides/PCBs in the surface and pesticides/PCBs, radionuclides, and SVOAs in the shallow subsurface soils. These data were collected from the following projects:

- OS-04 DMSA Characterization—Zone 1—Additional Sampling OS04CH03-Z1
- OS-04 DMSA Characterization—Zone 1 OS04-CH02-Z1
- OS-04 DMSA Characterization—Sludge from Railcar OS04-CH06-Z1

Uncertainties

Not available.

D.2.7 SWMU 216 (DMSA OS-05)

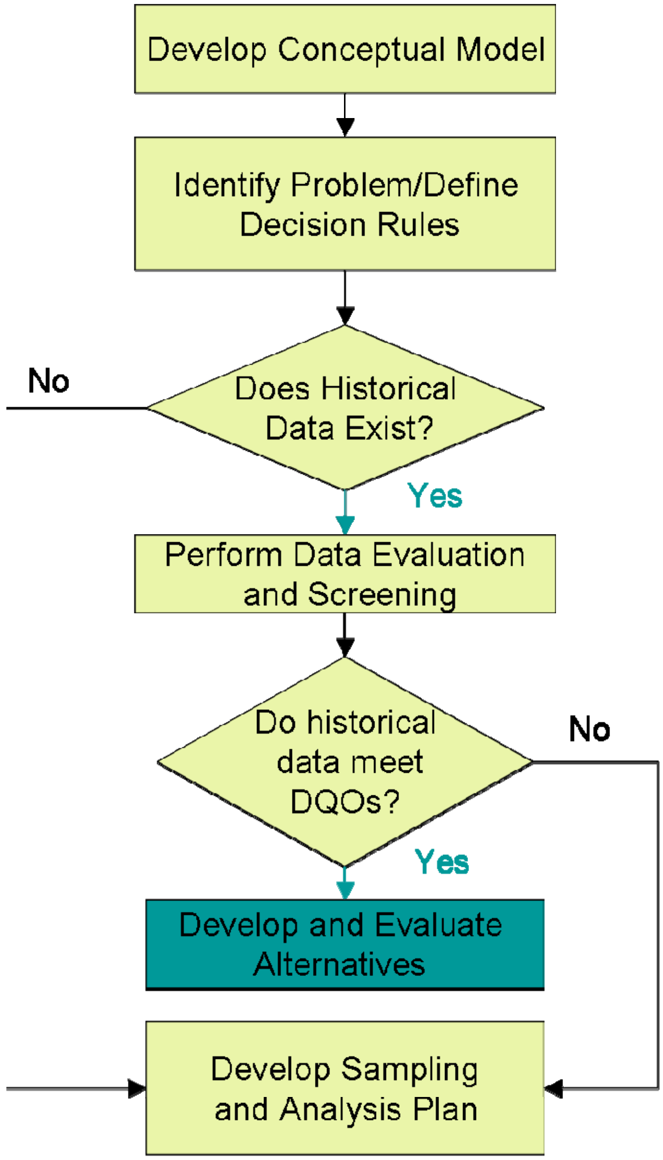

Figure D.16. Decision Tree Analysis – SWMU 216

There have been no known spills or releases of materials from this SWMU to the environment. Limited sampling is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 008 Activity 1 EU09 SWOU05-K008A109
- Surface Water OU—Outfall 008 Activity 2 EU09 AND EU10 SWOU05-K008A20910

Uncertainties

Though this DMSA is proposed for no further action, the unit must be demonstrated that proposal meets radiation requirements.

D.2.8 SWMU 217 (DMSA OS-06)

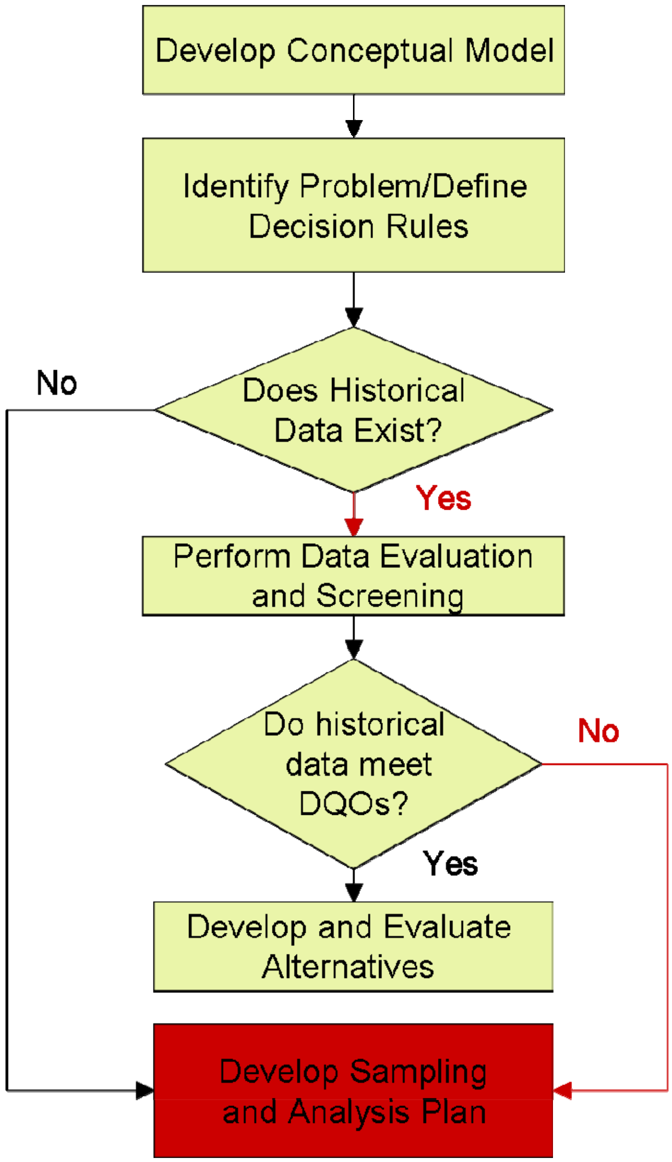

Figure D.17. Decision Tree Analysis – SWMU 217

The decision tree was modified from the initial analysis presented in the Scoping Document. There are no known releases associated with this SWMU. Additional sampling is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 008 Activity 1 EU14 SWOU05-K008A114
- Surface Water OU—Outfall 008 Activity 2 EU13 AND EU14 SWOU05-K008A21314
- WAGs 1 & 7

Uncertainties

Though this DMSA is proposed for no further action, the unit must be demonstrated that proposal meets radiation requirements.

D.2.9 SWMU 218 (DMSA OS-07)

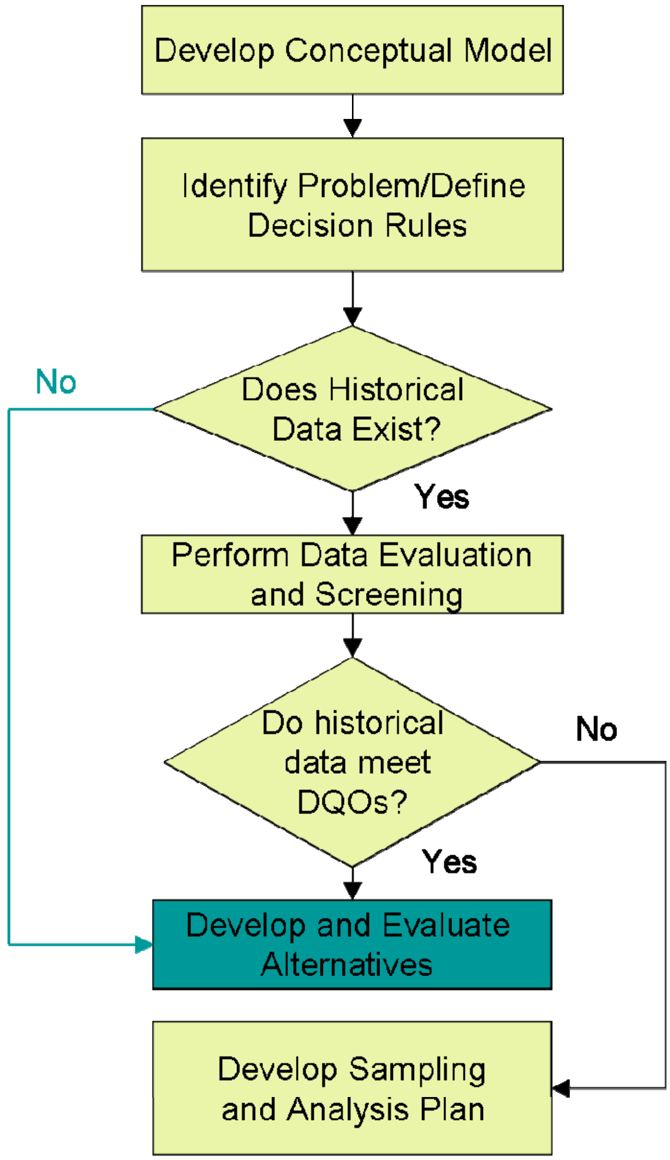

Figure D.18. Decision Tree Analysis – SWMU 218

Additional sampling is required; however, SWMU 218 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.2.10 SWMU 220 (DMSA OS-09)

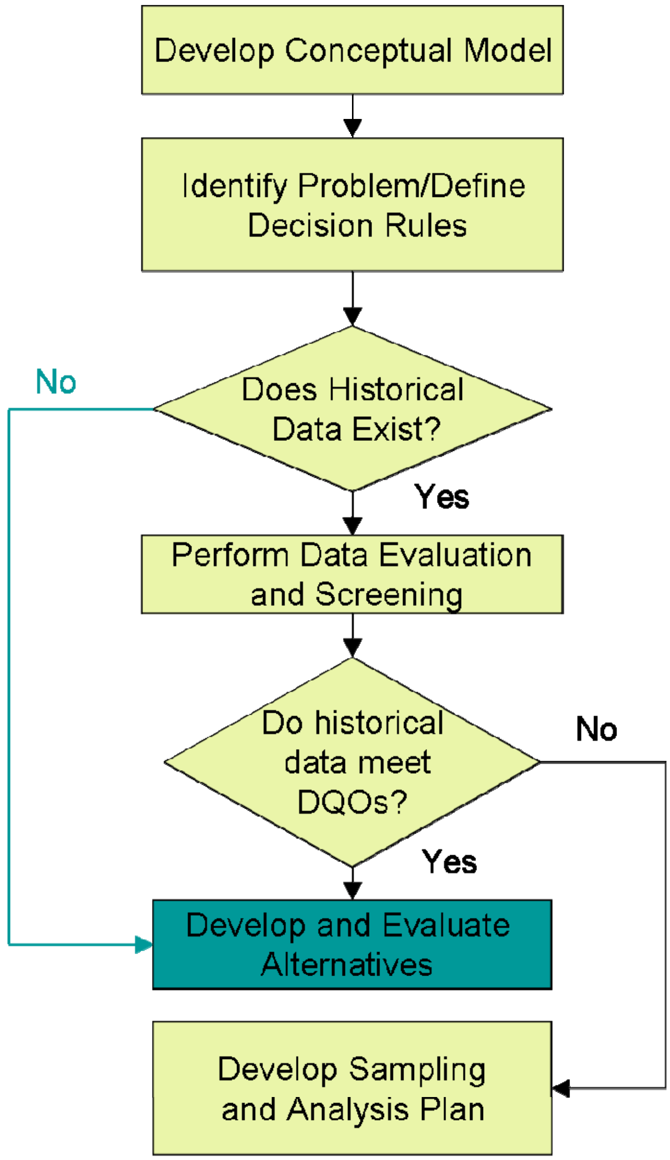

Figure D.19. Decision Tree Analysis – SWMU 220

Additional sampling is required; however, SWMU 220 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.2.11 SWMU 221 (DMSA OS-10)

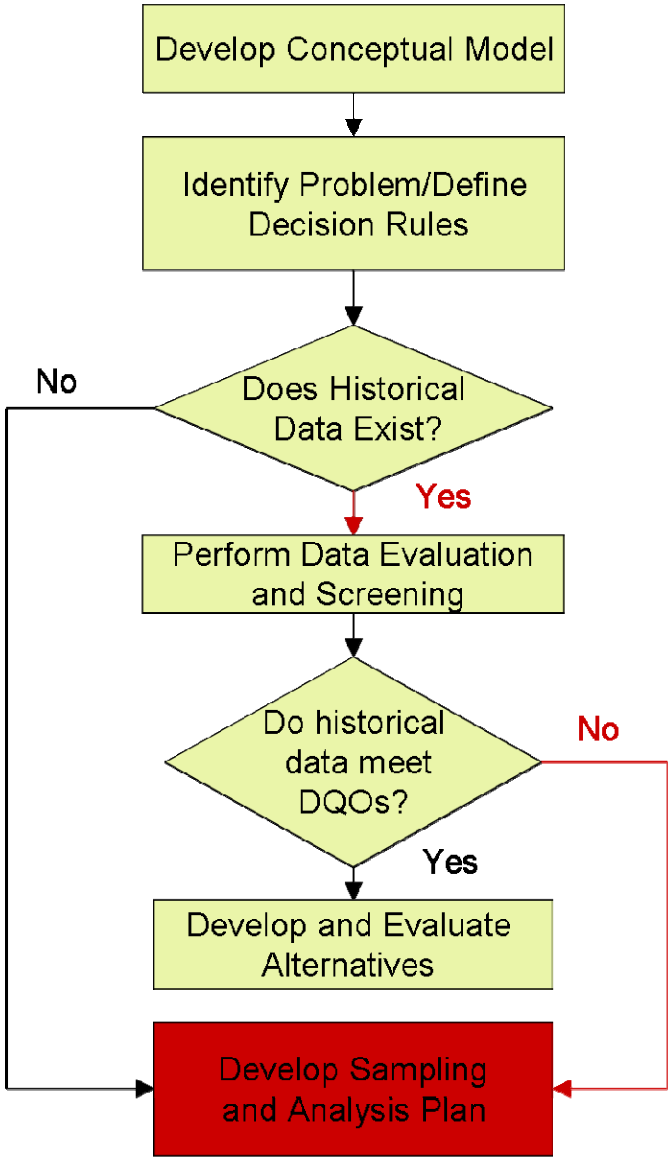

Figure D.20. Decision Tree Analysis – SWMU 221

There have been no known spills or releases of materials from this SWMU to the environment. Limited sampling is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.2.12 SWMU 222 (DMSA OS-11)

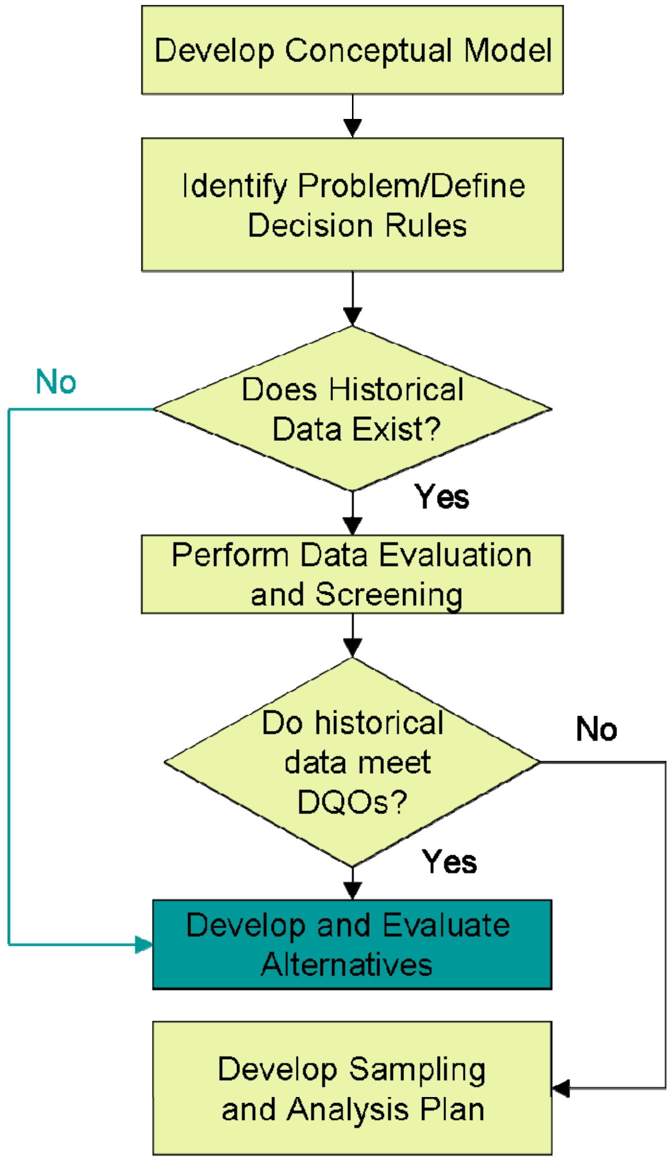

Figure D.21. Decision Tree Analysis – SWMU 222

A RCRA No Further Action is pending. Limited sampling is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Though this DMSA is proposed for no further action, the unit must be demonstrated that proposal meets radiation requirements.

D.2.13 SWMU 223 (DMSA OS-12)

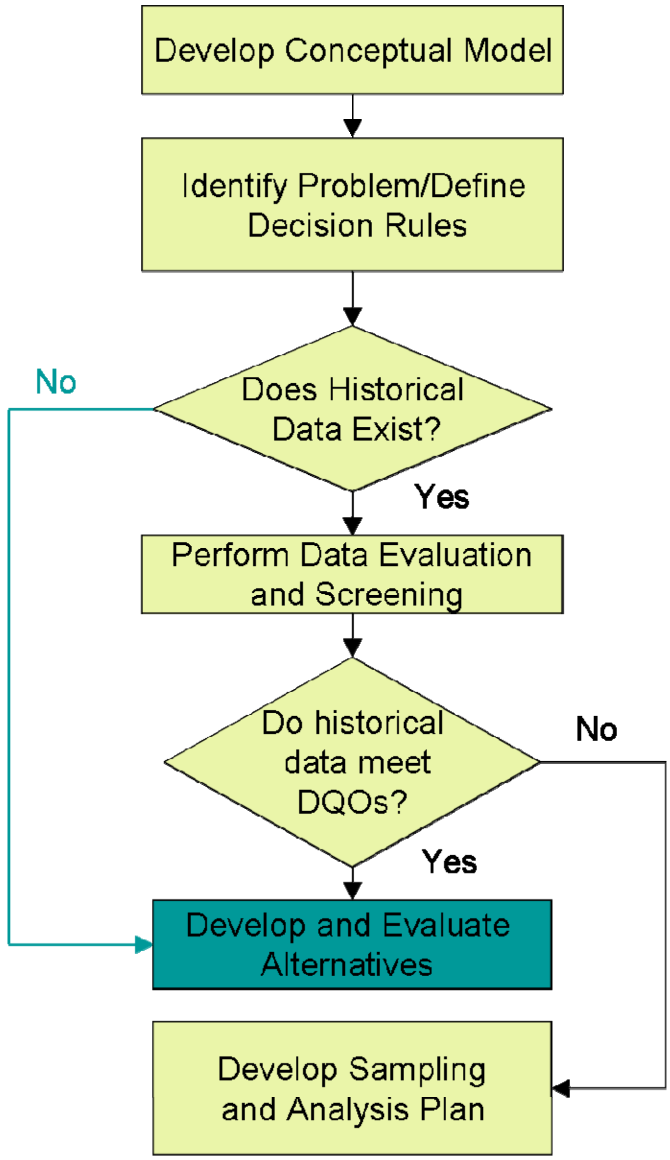

Figure D.22. Decision Tree Analysis – SWMU 223

Additional sampling is required; however, SWMU 223 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.2.14 SWMU 224 (DMSA OS-13)

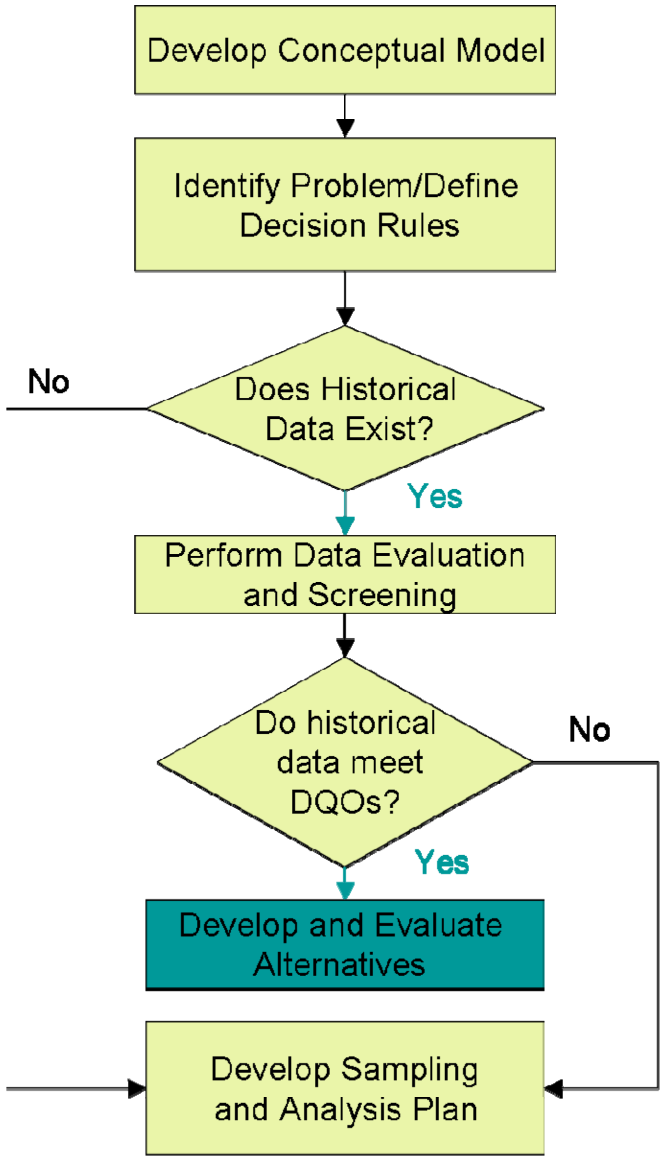

Figure D.23. Decision Tree Analysis – SWMU 224

Limited sampling is planned at this unit.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Historical data from AnaLIS for WAG 28 DQO
- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Phase 1
- WAG 23 Phase 2
- WAG 8—SWMU 340
- WAG 8—SWMU 340 Contingency

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling, primarily targeted on C-340; therefore, though limited additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.15 SWMU 225 (DMSA OS-14)

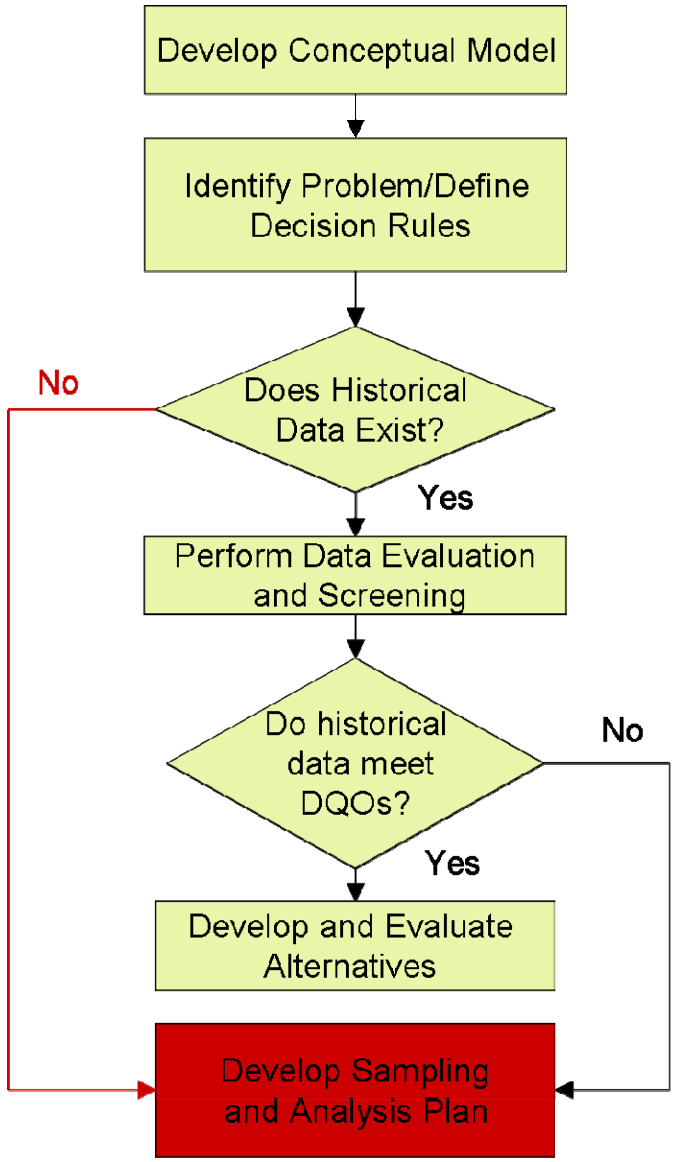

Figure D.24. Decision Tree Analysis – SWMU 225

Limited sampling is planned.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU are not available in OREIS.

Uncertainties

Not available.

D.2.16 SWMU 226 (DMSA OS-15)

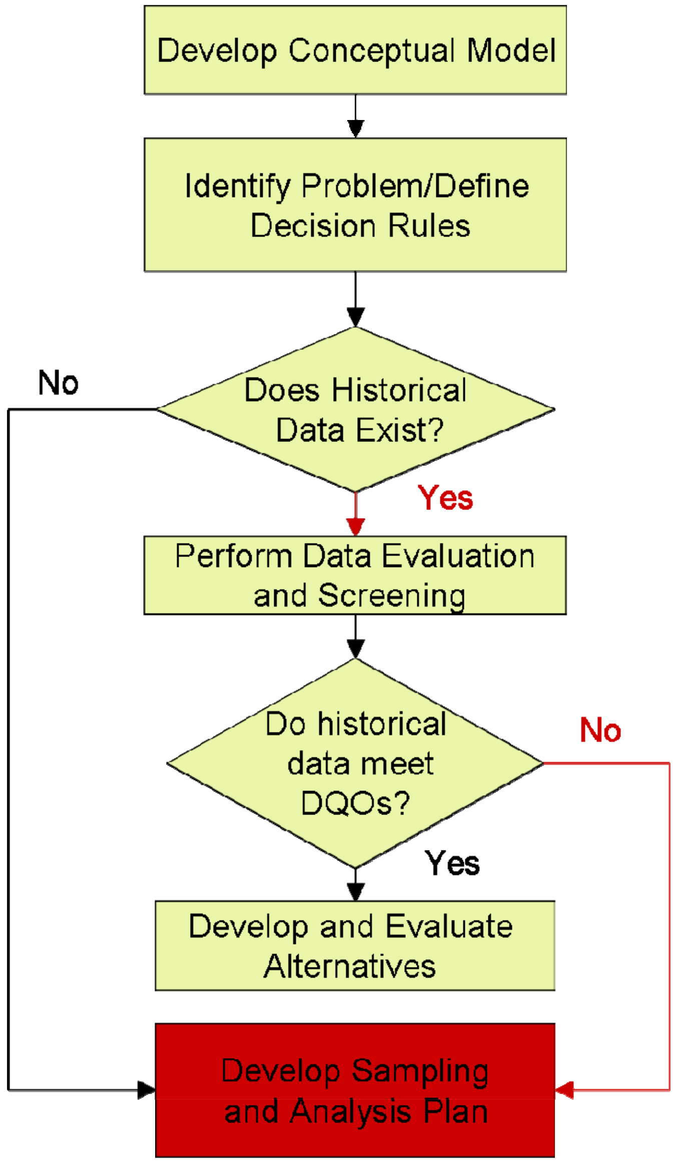

Figure D.25. Decision Tree Analysis – SWMU 226

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following projects:

- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU20 SWOU05-K001A120
- Surface Water OU—Outfall 001 Activity 1 EU21 SWOU05-K001A121
- Surface Water OU—Outfall 001 Activity 2 EU19 AND EU20 SWOU05-K001A21920
- Surface Water OU—Outfall 001 Activity 2 EU21 AND EU22 SWOU05-K001A22122

Uncertainties

Sampling from these projects was non-biased; however, it likely was targeted on the interior ditches.

D.2.17 SWMU 227 (DMSA OS-16)

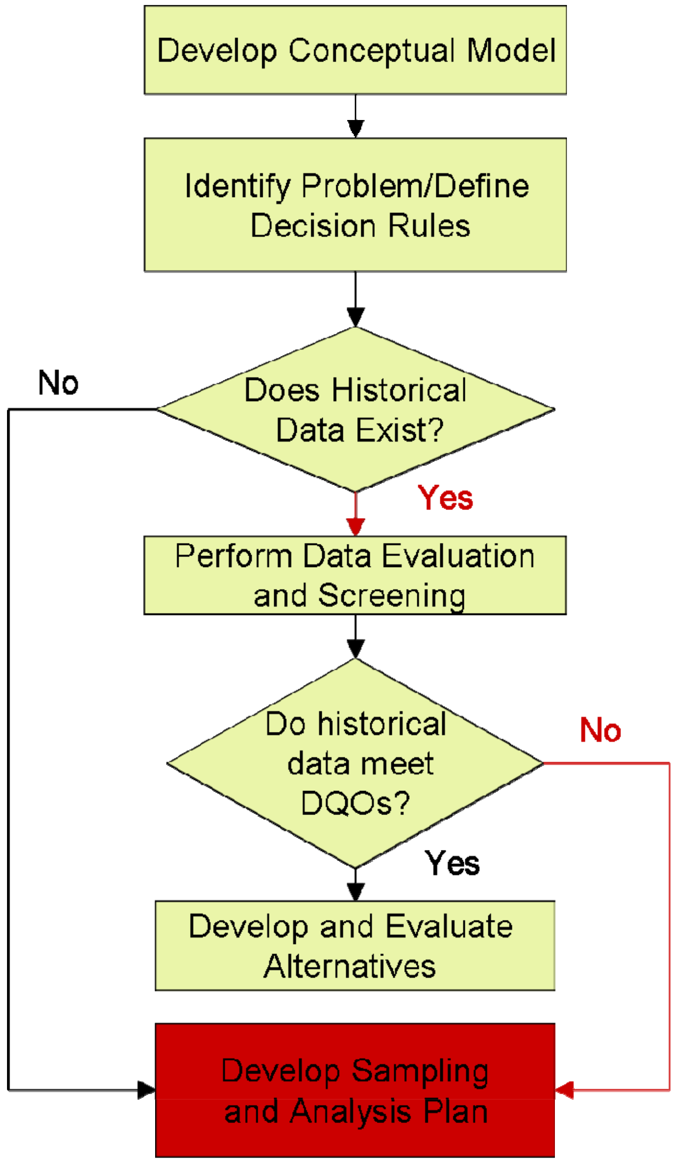

Figure D.26. Decision Tree Analysis – SWMU 227

The decision tree was modified from the initial analysis presented in the Scoping Document. Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Characterization of Drainage Ditches SY01-DCH
- Remedial Action Site Investigation—Phase 1
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU09 SWOU05-K001A109
- Surface Water OU—Outfall 001 Activity 1 EU11 SWOU05-K001A111
- Surface Water OU—Outfall 001 Activity 1 EU12 SWOU05-K001A112
- Surface Water OU—Outfall 001 Activity 1 EU13 SWOU05-K001A113
- Surface Water OU—Outfall 001 Activity 2 EU09 AND EU10 SWOU05-K001A20910
- Surface Water OU—Outfall 001 Activity 2 EU11 AND EU12 SWOU05-K001A21112
- Surface Water OU—Outfall 001 Activity 2 EU13 AND EU14 SWOU05-K001A21314
- WAG 3—SWMU 6

Uncertainties

Sampling from these projects was a mix of that targeted with biased sampling and non-biased, but targeted on the interior ditches; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.18 SWMU 228 (DMSA OS-17)

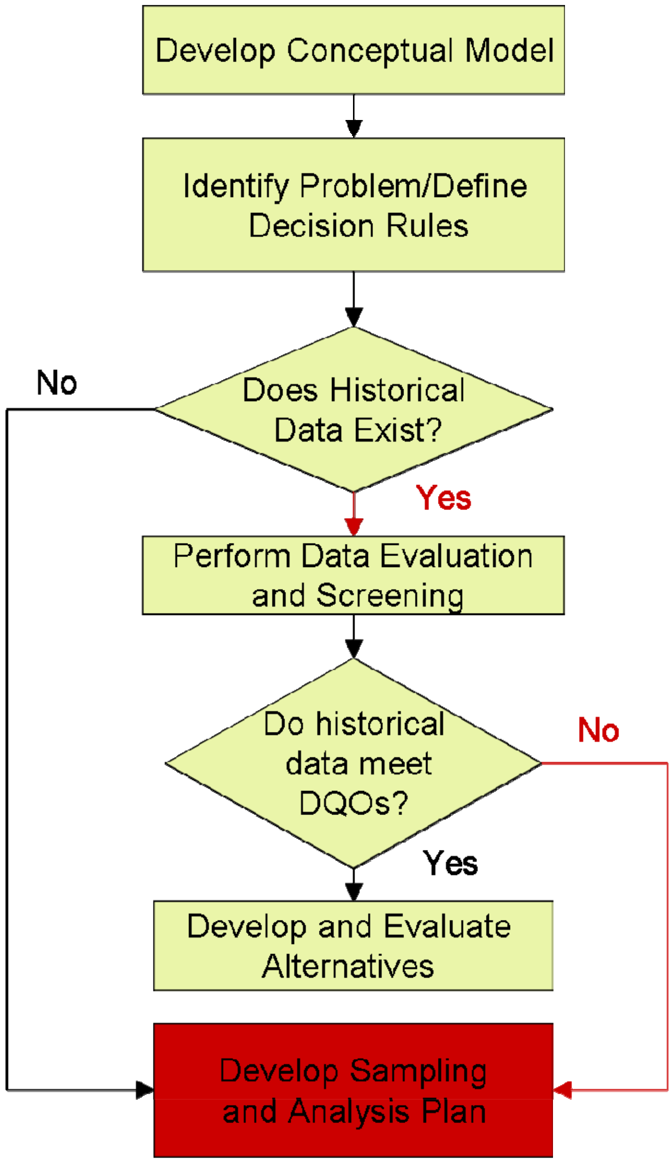

Figure D.27. Decision Tree Analysis – SWMU 228

The decision tree was modified from the initial analysis presented in the Scoping Document. Additional samples are planned at this location.

__Develop Conceptual Model__

The conceptual model is shown in Figure 6.3.

__Identify Problem/Define Decision Rules__

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Burial Ground OU SWMU 6 Angle Borings BGOU07-SWMU6ASB1
- Burial Ground OU SWMU 6 Angle Borings BGOU07-SWMU6ASB2
- Characterization of Drainage Ditches—Resample SY01-DCH-R
- Characterization of Drainage Ditches SY01-DCH
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU08 SWOU05-K001A108
- Surface Water OU—Outfall 001 Activity 1 EU09 SWOU05-K001A109
- Surface Water OU—Outfall 001 Activity 2 EU09 AND EU10 SWOU05-K001A20910
- WAG 3—SWMU 5
- WAG 3—SWMU 5—Phase II
- WAG 3—SWMU 6

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.2.19 SWMU 229 (DMSA OS-18)

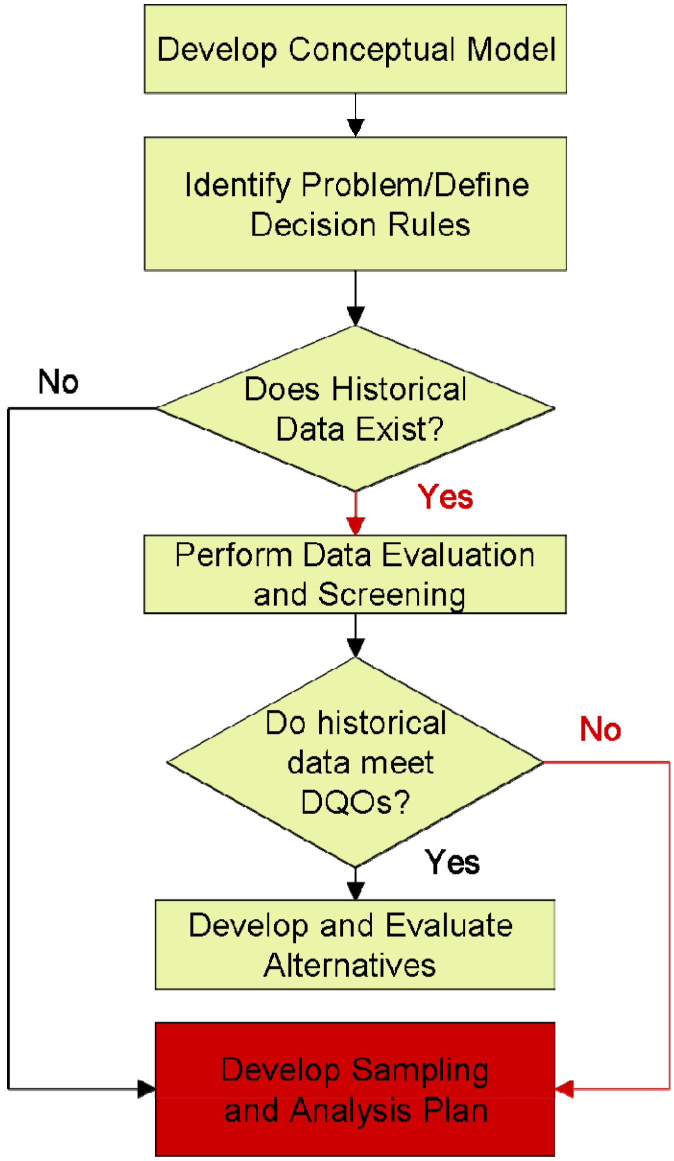

Figure D.28. Decision Tree Analysis – SWMU 229

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Characterization of Drainage Ditches—Resample SY01-DCH-R
- Characterization of Drainage Ditches SY01-DCH
- Scrap Metal Site Characterization for C-746-P1 Yard—Resample SY01-C746P1-R
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU08 SWOU05-K001A108
- WAG 3—SWMU 5
- WAG 3—SWMU 5—Phase II

Uncertainties

Some the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.3. GROUP 2–UNDERGROUND/TANK

D.3.1 SWMU 11 (C-400 TRICHLOROETHENE LEAK SITE, SOUTHEAST OF C-400 BUILDING)

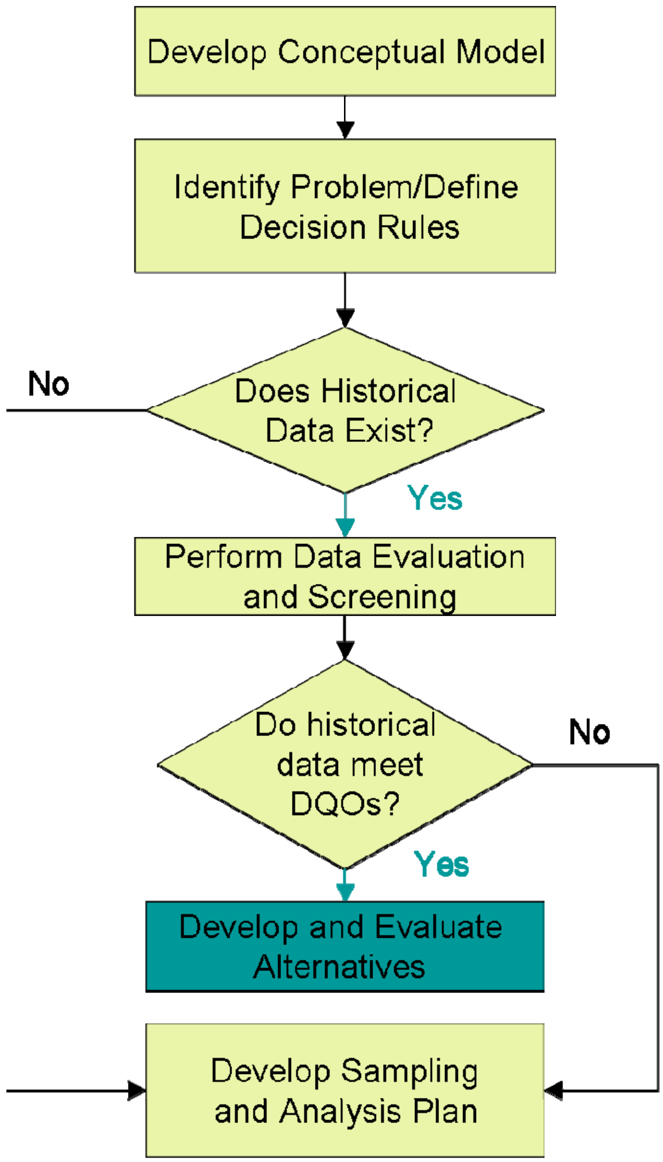

Figure D.29. Decision Tree Analysis – SWMU 11

The decision tree was modified from the initial analysis presented in the Scoping Document. The WAG 6 BHHRA indicates soils from this area exceed *de minimis* levels for most scenarios. This unit will be more fully addressed in the FS. Additionally, radiological walkovers are proposed for this unit to more address fully the extent of surface radiological contamination, if present.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in shallow subsurface soils. These data were collected from the following projects:

- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- Six Phase Piezometers—Baseline
- Six Phase Piezometers—Final
- WAG 6—A

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.3.2 SWMU 26 (C-400 TO C-404 4-INCH UNDERGROUND TRANSFER LINE, 1,500 FT LONG)

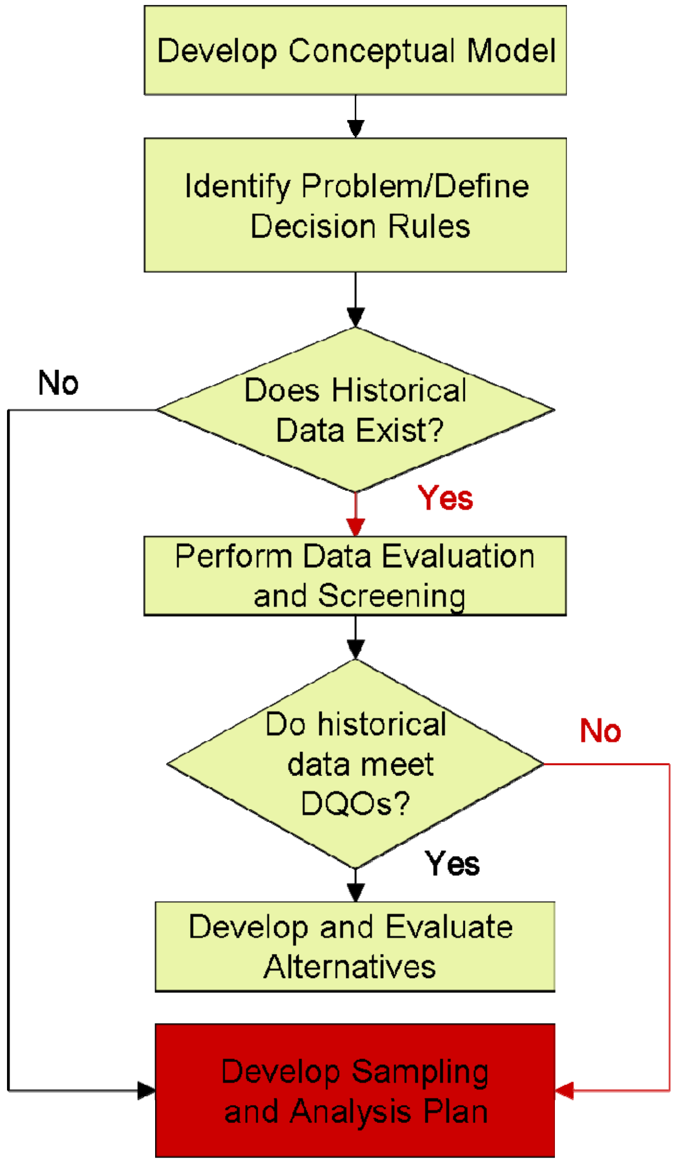

Figure D.30. Decision Tree Analysis – SWMU 26

Additional pipeline samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- 745-C Road Repair Sampling EF04-02
- AIP Sediment RU Split March 2004 AIPSERUSP03-04
- AIP Soil CH October 2005 01 AIPSOCH10-051
- Burial Ground OU SWMU 3 Angle Borings BGOU07-SWMU3ASB2
- Historical data from AnaLIS for WAGS 9&11 DQO
- *In situ* Waste Characterization—SECTION 1 ERI04-NS-INCHAR1
- NSDD Characterization of Section 1 ERI01-NS-SEC1
- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU18 SWOU05-K001A118
- Surface Water OU—Outfall 001 Activity 1 EU23 SWOU05-K001A123
- Surface Water OU—Outfall 015 Activity 1 EU03 SWOU05-K015A103
- Surface Water OU—Outfall 015 Activity 1 EU04 SWOU05-K015A104
- Surface Water OU—Outfall 015 Activity 2 EU03 AND EU04 SWOU05-K015A20304
- Surface Water OU—Outfalls Activity 1 Contingency SWOU05-A1OUTFALLC
- Verification Sampling—Post Excavation Sampling (Activity II)—SECTION 1 ERI04-NS-VEREXC1
- Verification Sampling—Remedial Action Support Survey (Activity 1)—SECTION 1 ERI04-NS-VERPCB
- WAG 15
- WAG 6—A

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional surface data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.3.3 SWMU 27 (C-722 ACID NEUTRALIZATION TANK)

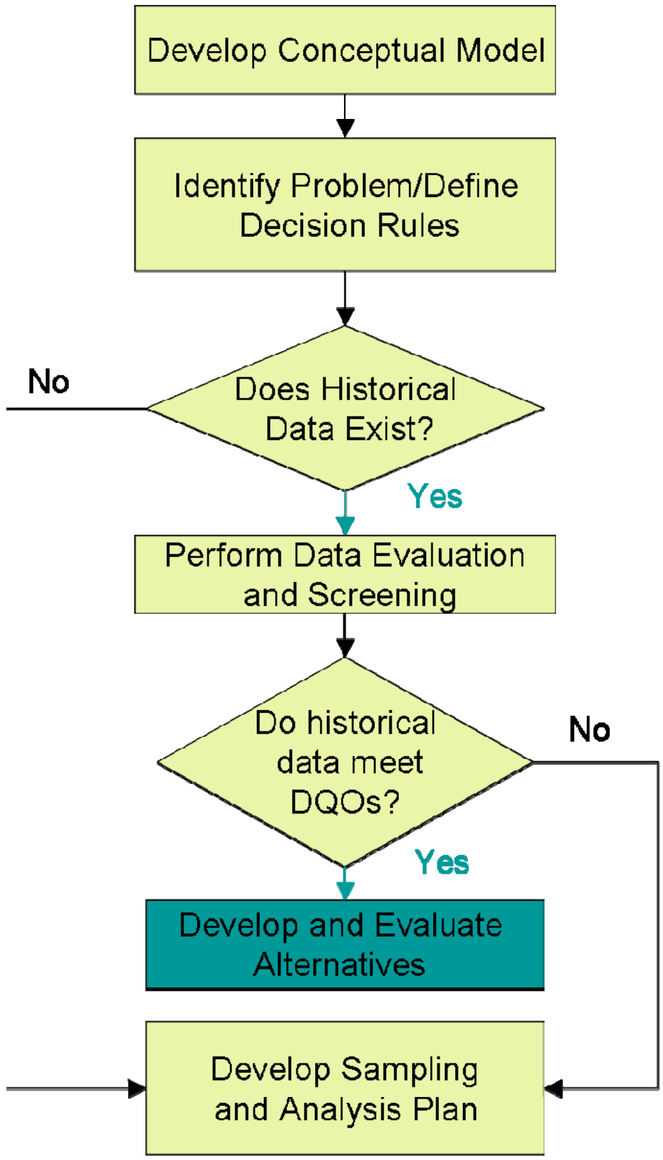

Figure D.31. Decision Tree Analysis – SWMU 27

The decision tree was modified from the initial analysis presented in the Scoping Document. No additional samples are needed at this location based on the results presented in the Site Evaluation for WAGs 9 and 11. An NFA was proposed for the unit.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include radionuclides in the surface soils and metals, pesticides/PCBs, radionuclides, and VOAs shallow subsurface soils. These data were collected from the following project:

- WAGs 9 and 11 Site Evaluation

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.3.4 SWMU 31 (C-720 COMPRESSOR PIT WATER STORAGE TANK)

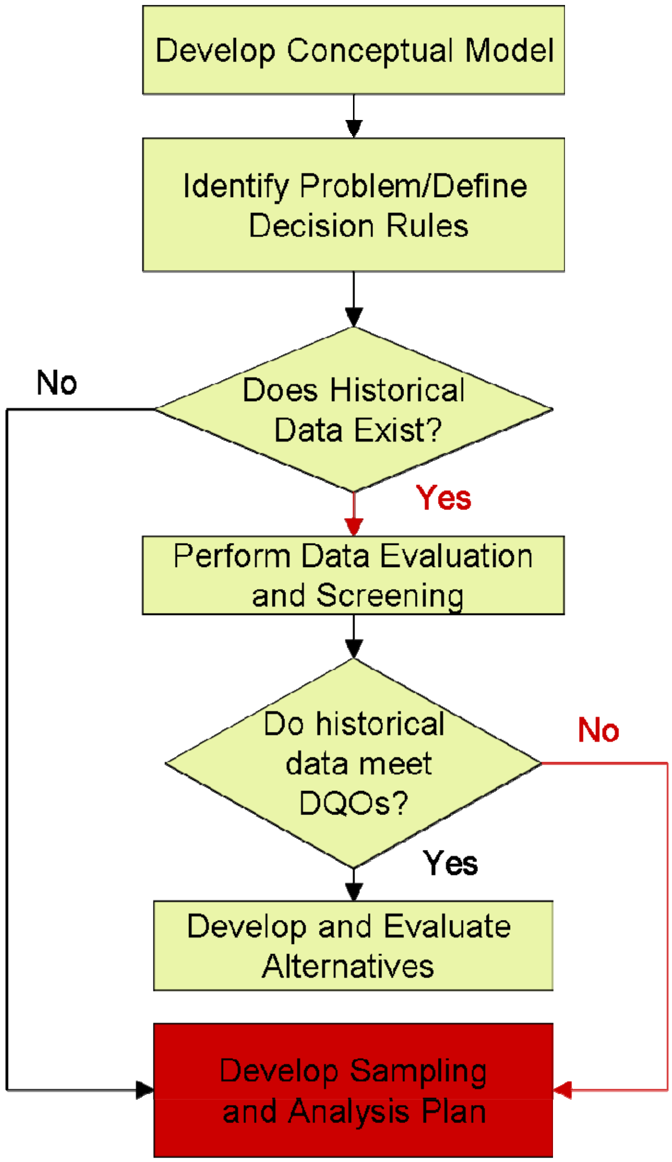

Figure D.29. Decision Tree Analysis – SWMU 31

Additional sampling is required; however, SWMU 31 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include radionuclides in the surface soils and metals, pesticides/PCBs, radionuclides, and VOAs shallow subsurface soils. These data were collected from the following project:

- WAGs 9 and 11 Site Evaluation

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during a future activity, any action taken at this unit may be decided upon too conservatively.

D.3.5 SWMU 32 (C-728 2 CLEAN WASTE OIL TANKS)

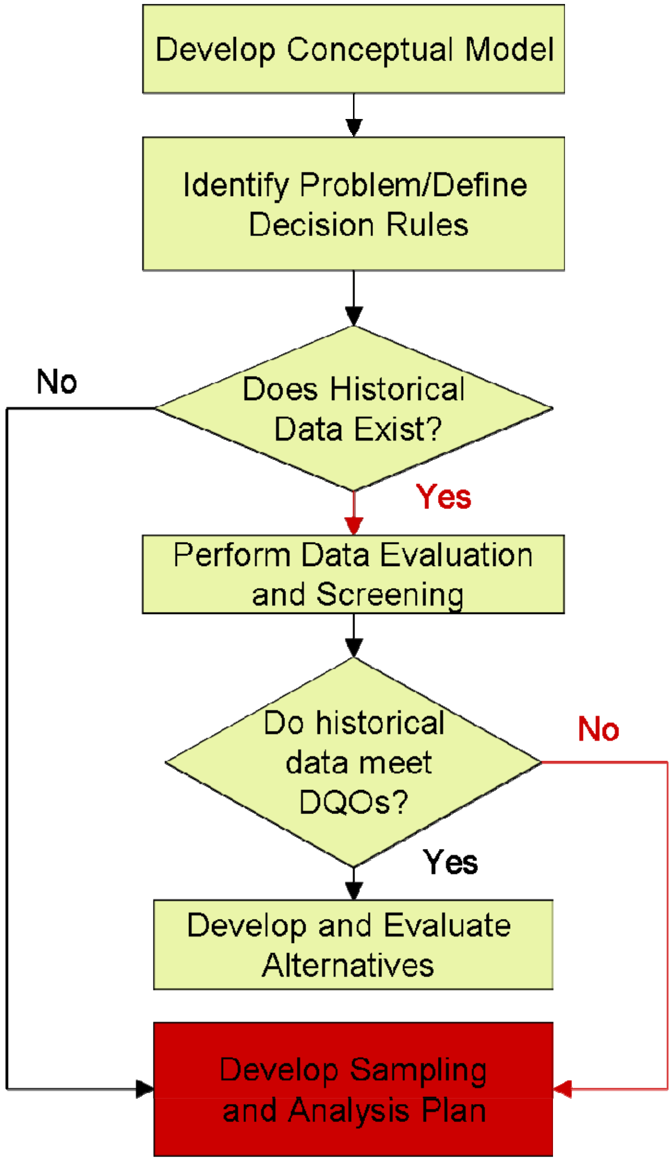

Figure D.31. Decision Tree Analysis – SWMU 32

Additional sampling is required; however, SWMU 32 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Historical data from AnaLIS for WAG 28 DQO
- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Phase 1
- WAG 23 Phase 2

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during a future activity, any action taken at this unit may be decided upon too conservatively.

D.3.6 SWMU 40 (C-403 NEUTRALIZATION TANK)

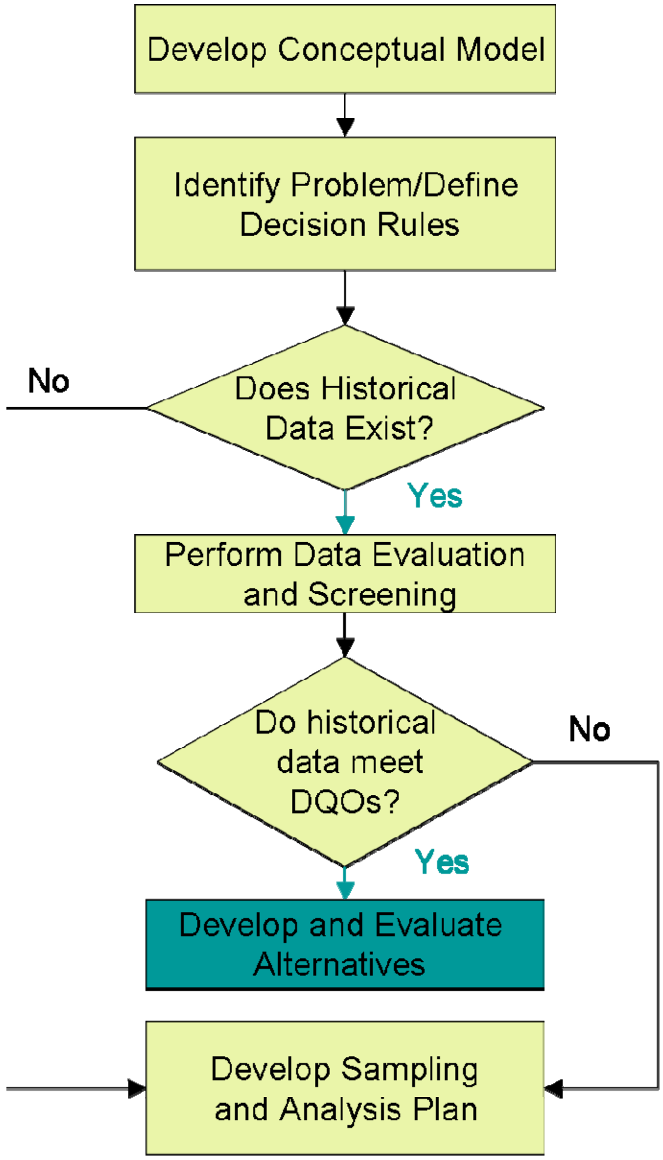

Figure D.34. Decision Tree Analysis – SWMU 40

The decision tree was not presented in the Scoping Document. This unit was planned for removal during the Soils Inactive Facilities Removal Action.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- RCWC Data
- Remedial Action Site Investigation—Phase 2
- WAG 6—A

Uncertainties

The decision already has been made to excavate this unit; therefore, there are no uncertainties associated with this unit for this RI.

D.3.7 SWMU 76 (C-632-B SULFURIC ACID STORAGE TANK)

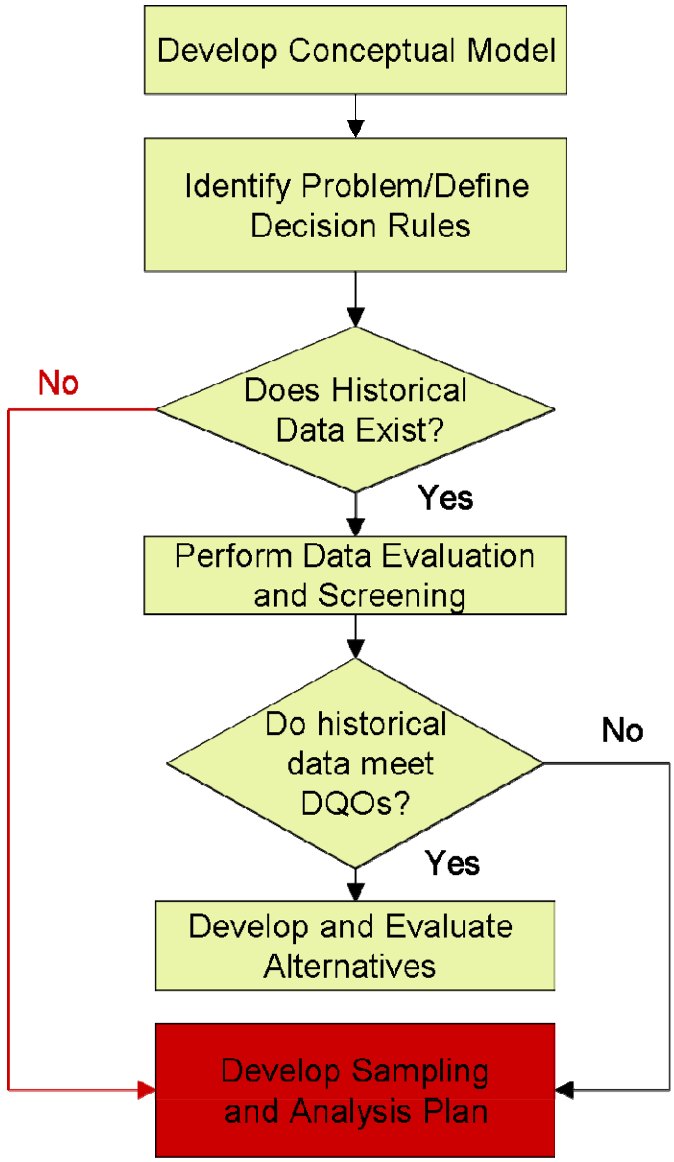

Figure D.35. Decision Tree Analysis – SWMU 76

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available in OREIS.

Uncertainties

Not available.

D.3.8 SWMU 77 (C-634-B SULFURIC ACID STORAGE TANK)

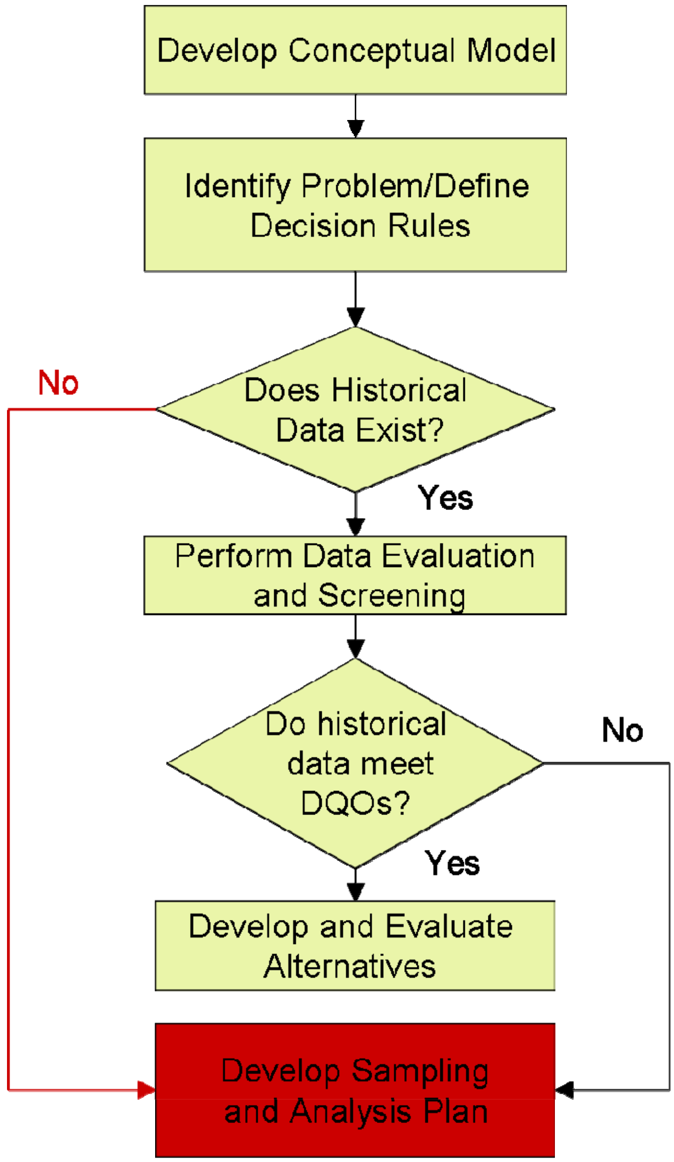

Figure D.36. Decision Tree Analysis – SWMU 77

Additional sampling is required; however, SWMU 77 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface soils. These data were collected from the following projects:

- RCWC Data
- RCWC Data 92-82A

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during a future activity, any action taken at this unit may be decided upon too conservatively.

D.3.9 SWMU 165 (C-616-L PIPELINE AND VAULT SOIL CONTAMINATION)

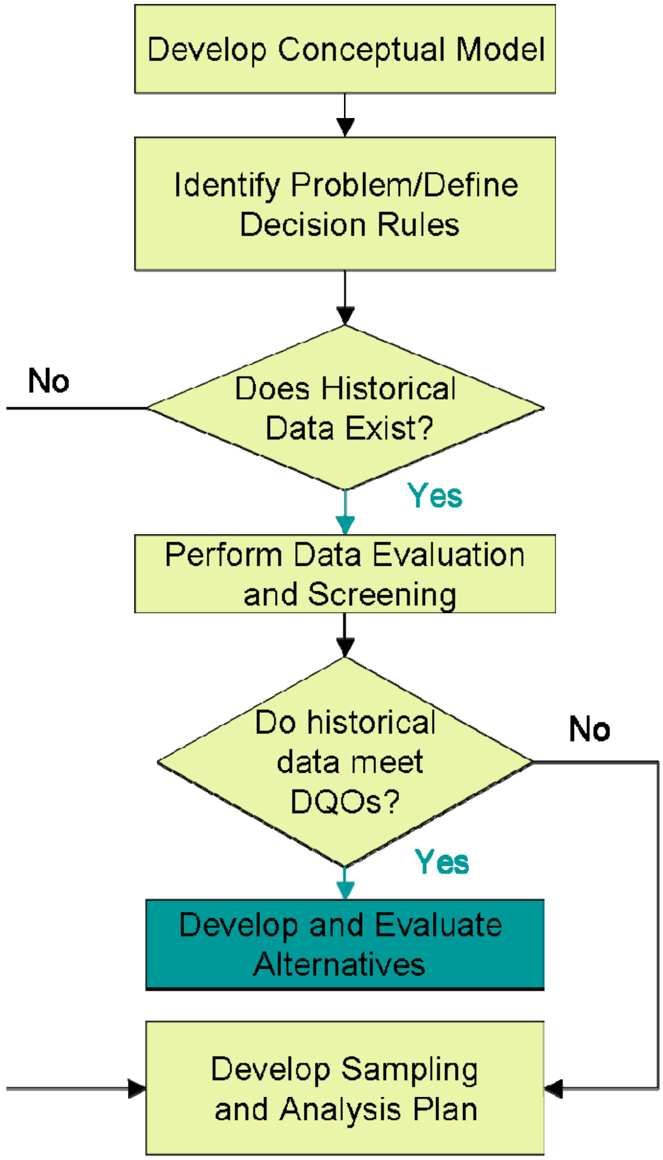

Figure D.37. Decision Tree Analysis – SWMU 165

The decision tree was modified from the initial analysis presented in the Scoping Document. According to the WAGs 9 and 11 Site Evaluation, SWMU 165 does not present risks to industrial workers, potential residential groundwater users, or non-human receptors that exceed *de minimis* levels.

Radiation data may not be of sufficient quality for planning, characterization, and assessment. A radiological walkover is planned.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Historical data from AnaLIS for WAGS 9 &11 DQO
- NSDD Characterization of Section 1 ERI01-NS-SEC1
- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 015 Activity 1 EU04 SWOU05-K015A104
- Surface Water OU—Outfall 015 Activity 2 EU03 AND EU04 SWOU05-K015A20304
- SWMU 165 samples taken during WAGs 1 & 7
- Verification Sampling—Post Excavation Sampling (Activity II)—SECTION 1 ERI04-NS-VEREXC1
- Verification Sampling—Remedial Action Support Survey (Activity 1)—SECTION 1 ERI04-NS-VERPCB
- WAGs 9 and 11 Site Evaluation

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.3.10 SWMU 170 (C-729 ACETYLENE BUILDING DRAIN PITS)

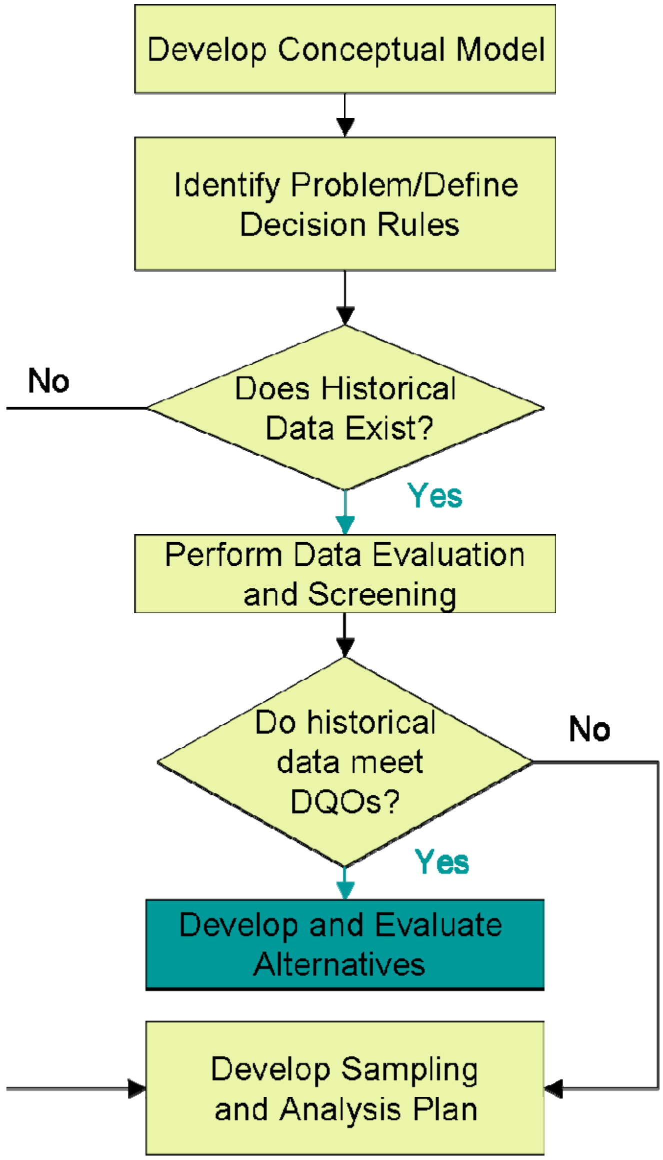

Figure D.38. Decision Tree Analysis – SWMU 170

The decision tree was modified from the initial analysis presented in the Scoping Document. According to the WAGs 9 and 11 Site Evaluation, SWMU 165 does not present risks to industrial workers, potential residential groundwater users, or non-human receptors that exceed *de minimis* levels.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface and radionuclides and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- RCWC Data
- RCWC Data 92-53
- WAGs 9 and 11 Site Evaluation

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.4. GROUP 2–CHROMIUM AREAS

D.4.1 SWMU 158 (CHILLED-WATER SYSTEM LEAK SITE)

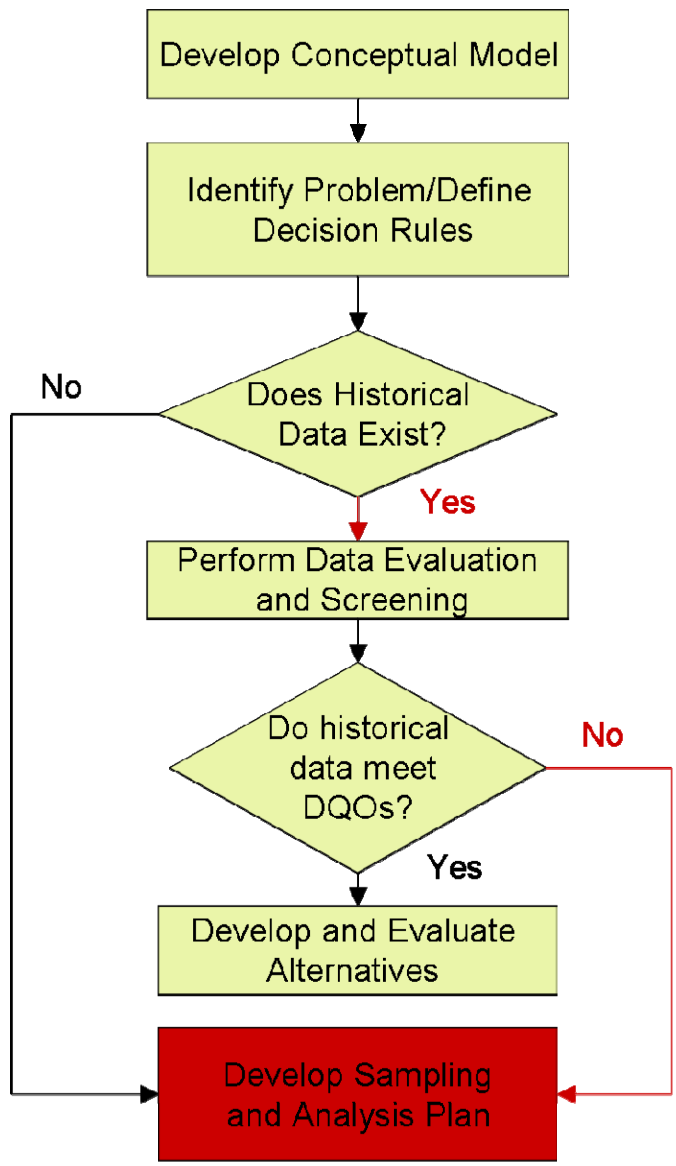

Figure D.39. Decision Tree Analysis – SWMU 158

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following project:

- WAG 27 RI Sampling

Uncertainties

The sampling from this project likely was targeted with biased sampling; however, SWMU 158 was not the target of the investigation; therefore, data planned for collection during this RI should not be biased.

D.4.2 SWMU 169 (C-410-E HF VENT SURGE PROTECTION TANK)

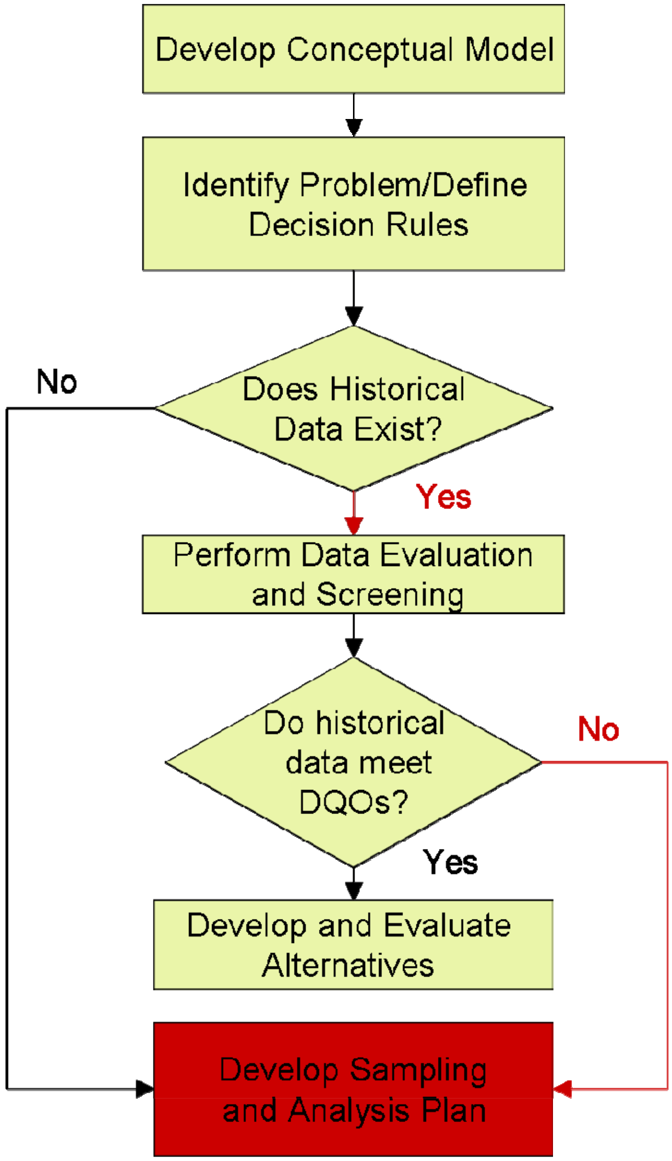

Figure D.40. Decision Tree Analysis – SWMU 169

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface and metals, pesticides/PCBs, radionuclides, and VOAs in the shallow subsurface soils. These data were collected from the following project:

- WAGs 9 and 11 Site Evaluation

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.4.3 SWMU 176 (C-331 RECIRCULATING WATER LEAK NORTHWEST NW SIDE)

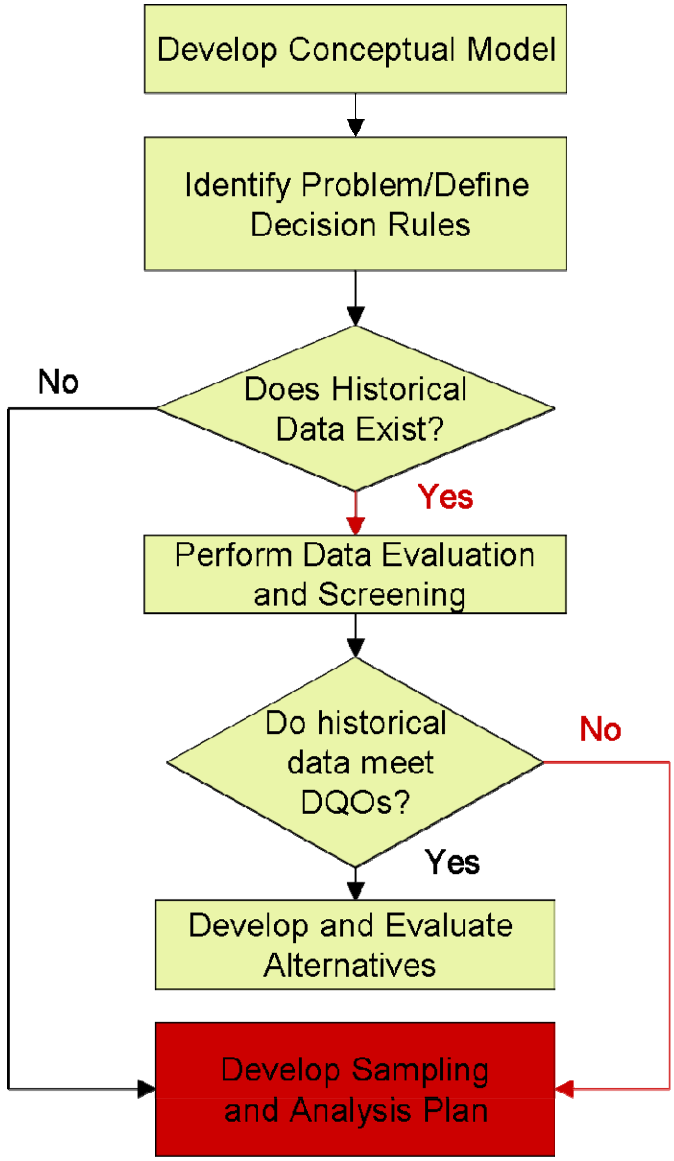

Figure D.41. Decision Tree Analysis – SWMU 176

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.4.4 SWMU 177 (C-331 LEAK EAST SIDE)

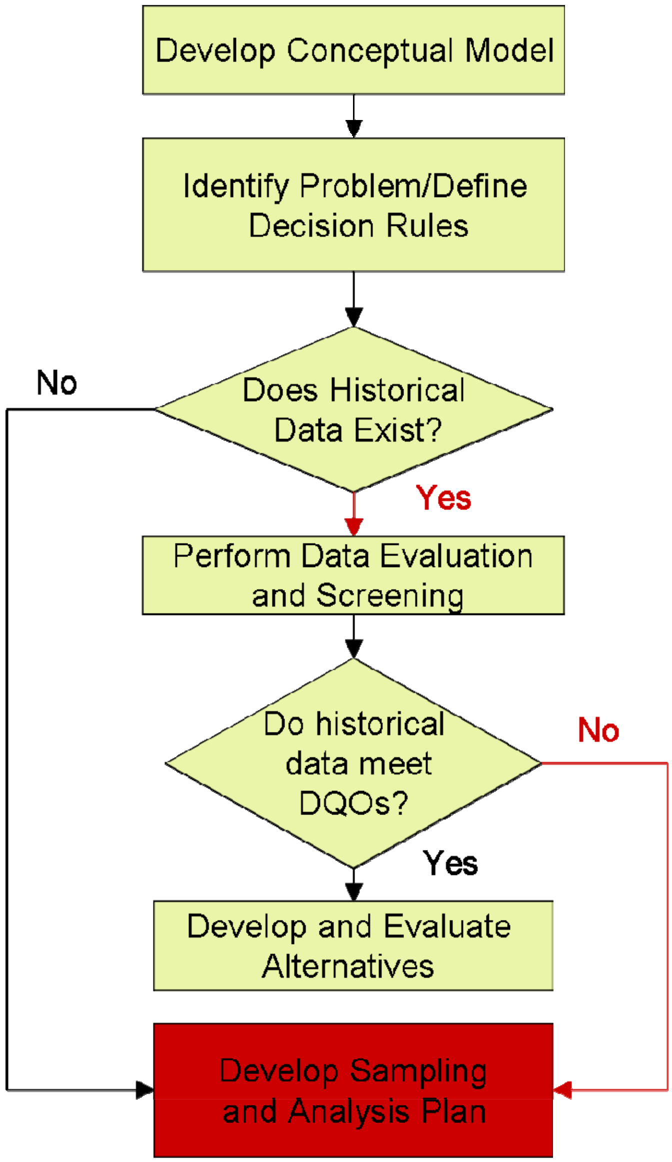

Figure D.42. Decision Tree Analysis – SWMU 177

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5. GROUP 2–SOIL/RUBBLE PILE

D.5.1 SWMU 19 (C-410-B HF EMERGENCY LAGOON)

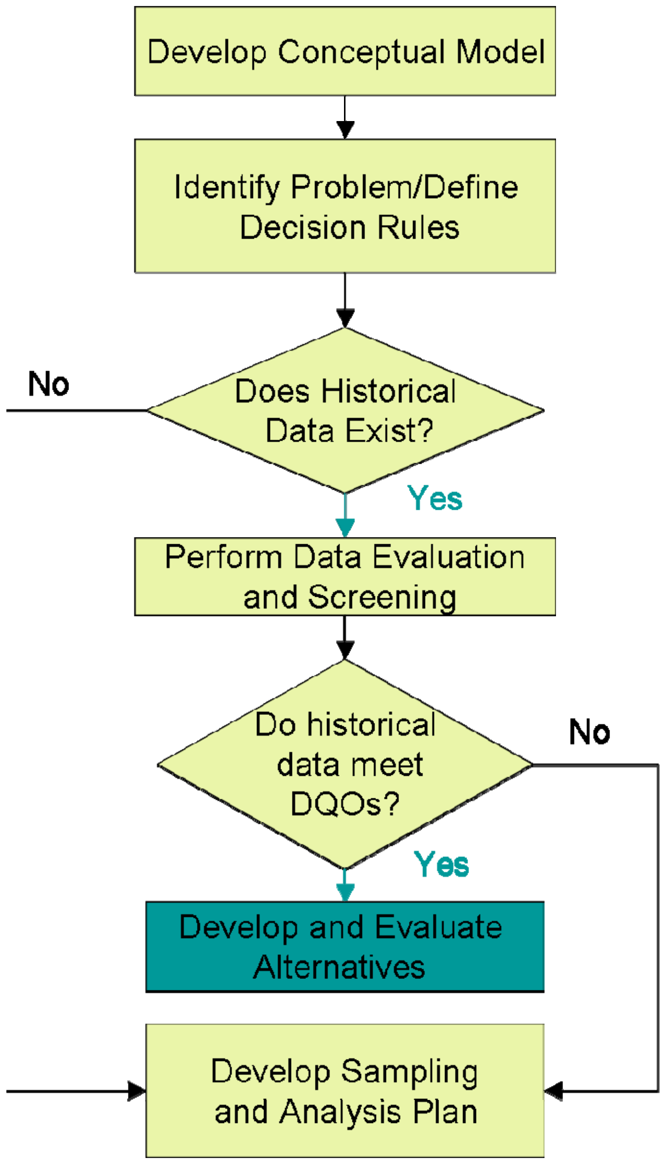

Figure D.43. Decision Tree Analysis – SWMU 19

The decision tree was not presented in the Scoping Document. This unit is planned for removal during the Soils Inactive Facilities Removal Action.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- C-410 Soil Near Water Line Excavation Locations DDSM02-01
- Remedial Action Site Investigation—Phase 2
- WAGs 9 and 11 Site Evaluation

Uncertainties

The decision already has been made to excavate this unit; therefore, there are no uncertainties associated with this unit for this RI.

D.5.2 SWMU 20 (C-410-E EMERGENCY HOLDING POND)

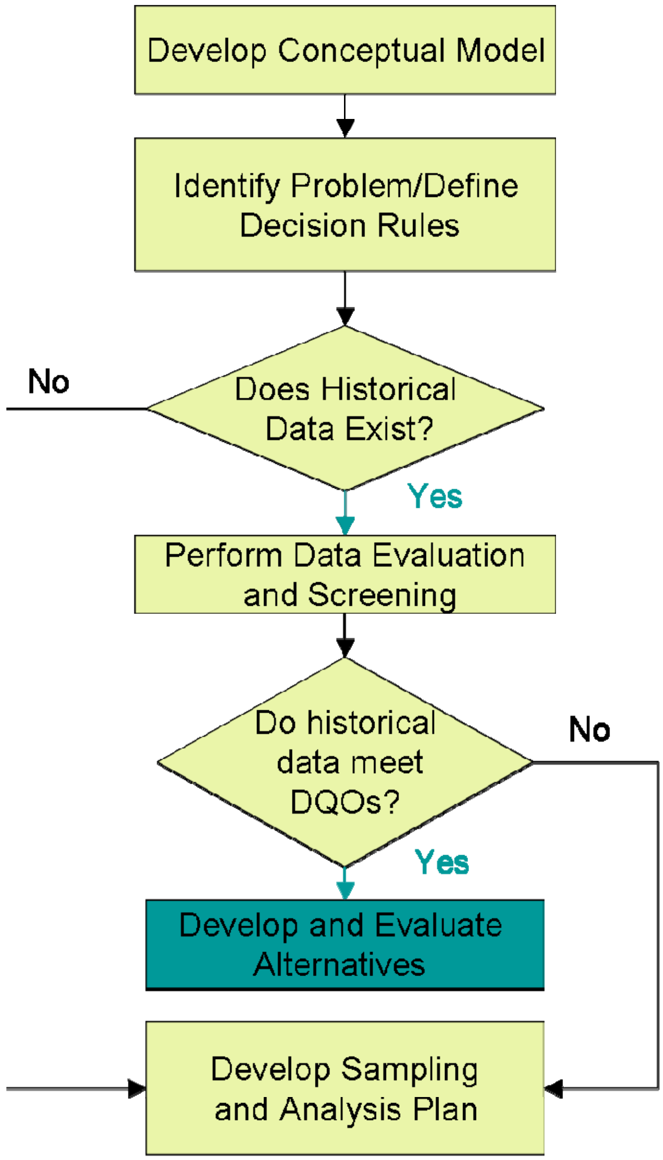

Figure D.44. Decision Tree Analysis – SWMU 20

The decision tree was modified from the initial analysis presented in the Scoping Document. According to the WAGs 9 and 11 Site Evaluation, SWMU 20 presents risks to industrial workers above *de minimis* levels.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface and metals, pesticides/PCBs, radionuclides, and VOAs in the shallow subsurface soils. These data were collected from the following project:

- WAGs 9 and 11 Site Evaluation

Uncertainties

The sampling from this project likely was targeted with biased sampling; therefore, though no additional data is planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.3 SWMU 138 (C-100 SOUTHSIDE BERM)

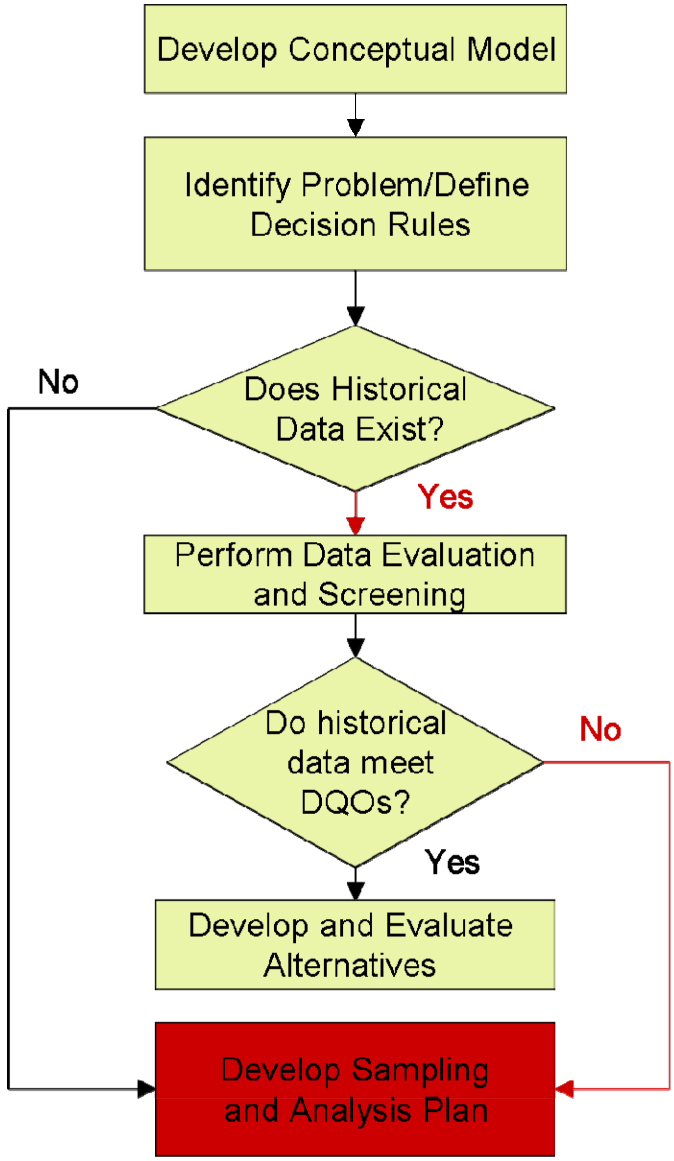

Figure D.45. Decision Tree Analysis – SWMU 138

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and VOAs in the surface soils. These data were collected from the following projects:

- RCWC Data
- RCWC Data 91-37

Uncertainties

The sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.4 SWMU 180 (OUTDOOR FIRING RANGE WESTERN KENTUCKY WILDLIFE MANAGEMENT AREA)

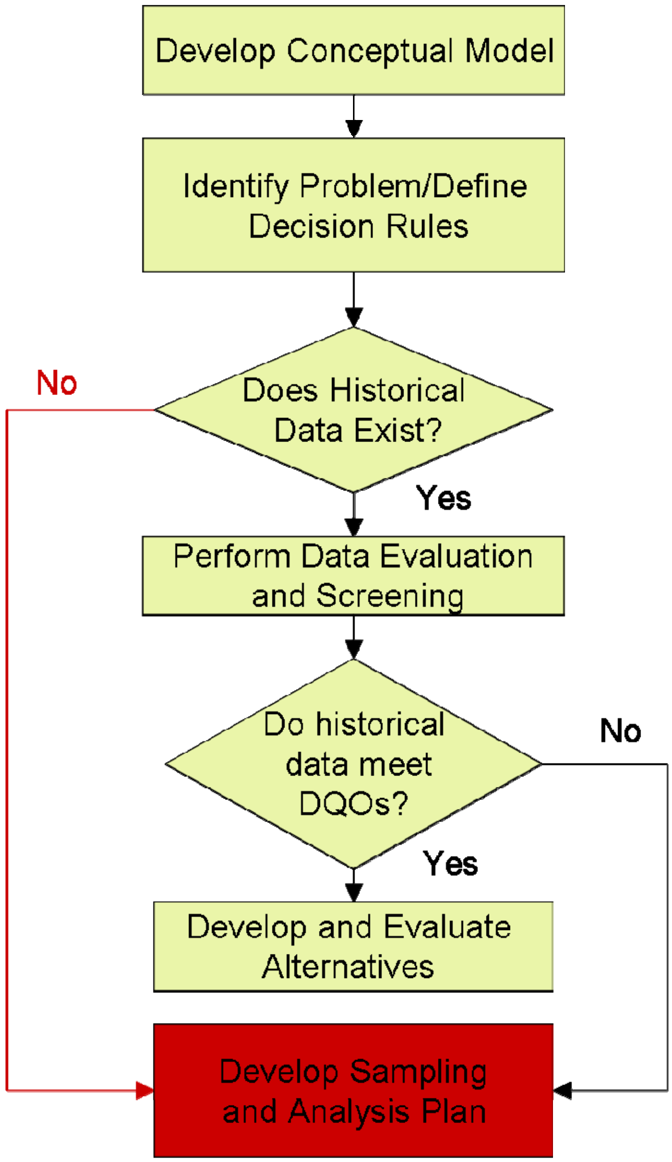

Figure D.46. Decision Tree Analysis – SWMU 180

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available.

Uncertainties

Not available.

D.5.5 SWMU 181 OUTDOOR FIRING RANGE PGDP

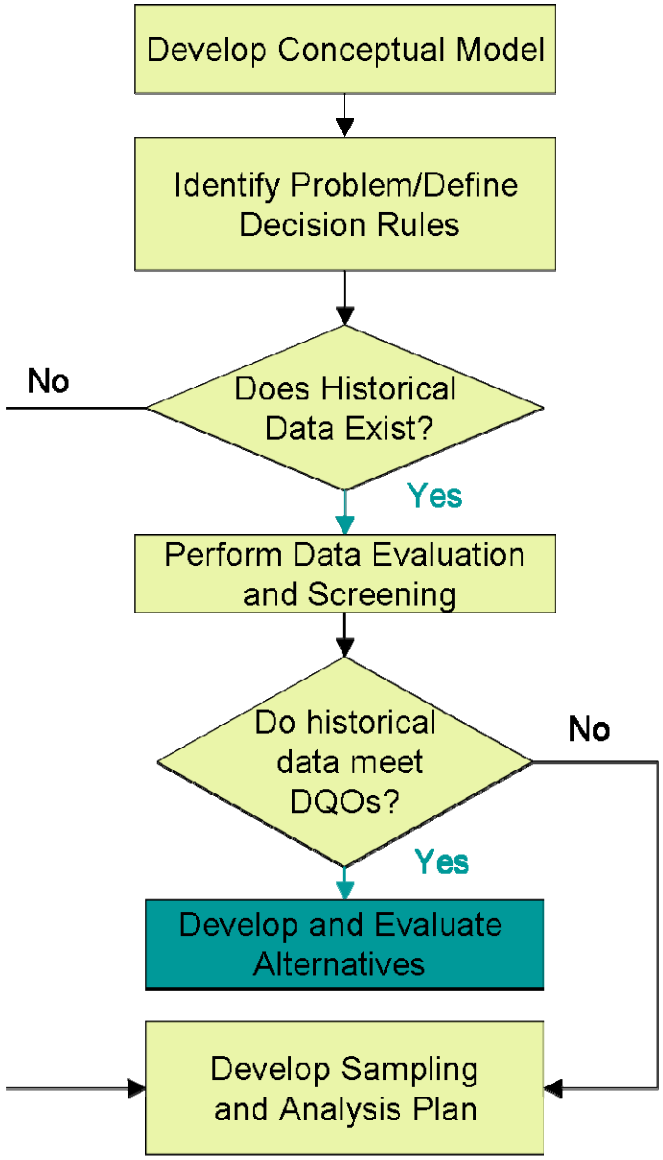

Figure D.47. Decision Tree Analysis – SWMU 181

The decision tree was modified from the initial analysis presented in the Scoping Document. This unit is planned for removal during the Soils Inactive Facilities Removal Action.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils and metals, pesticides/PCBs, and radionuclides in the shallow subsurface soils. These data were collected from the following projects:

- AIP Sediment Toxicity Outfall June 2001 AIPSERVOF06-01
- AIP Soil Samples C-218 Firing Range C21803, C21804, C21805 & C21806 11/08 Split w/DOE AIPSOSLSP11-08
- C-218 Firing Range SOU09-RANGE
- RCWC Data 93-19
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 008 Activity 1 EU01 SWOU05-K008A101
- Surface Water OU—Outfall 008 Activity 2 EU01 AND EU02 SWOU05-K008A20102

Uncertainties

The decision already has been made to excavate the contaminated soils within this unit; therefore, there are few uncertainties associated with this unit for this RI. Remaining uncertainties include whether sufficient soil was excavated to fully remediate the unit.

D.5.6 SWMU 195 (CURLEE ROAD CONTAMINATED SOIL MOUNDS)

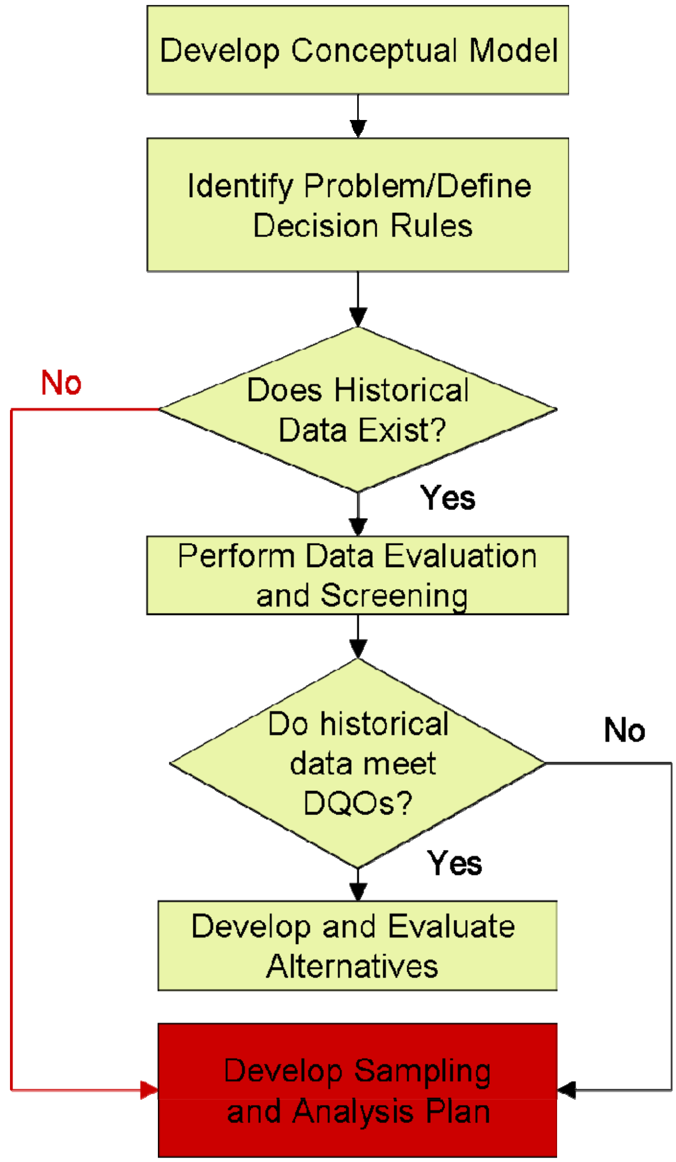

Figure D.48. Decision Tree Analysis – SWMU 195

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and VOAs in the surface soils. These data were collected from the following projects:

- Annual Sediment Sampling 1989
- Annual Sediment Sampling 1990
- Annual Sediment Sampling 1991
- Historical data from AnaLIS for WAG 28 DQO
- RCWC Data ESO16937

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.7 AOC 204 (DYKE ROAD HISTORICAL STAGING AREA)

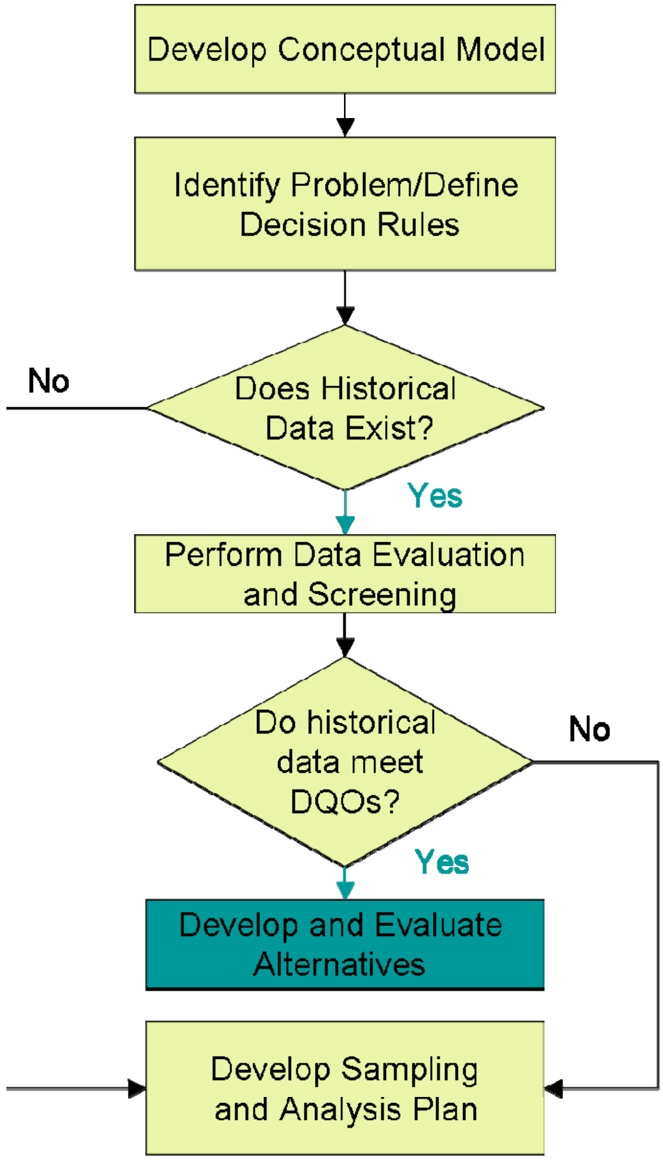

Figure D.49. Decision Tree Analysis – AOC 204

The decision tree was modified from the initial analysis presented in the Scoping Document. According to the WAG 28 BHHRA, several scenarios exceed *de minimis*. This unit will be more fully addressed in the FS.

Additionally, radiological walkovers are proposed for this unit to address more fully the extent of surface radiological contamination, if present.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- AIP Limited Sampling of Outfall 008, 010, and Section 3A of N/S Ditch
- AIP Sediment & Soil CH Split December 2000 AIPSESOCHSP12-00
- AIP Sediment Toxicity Outfall June 2001 AIPSERVOF06-01
- Annual Sediment Sampling 1989
- Annual Sediment Sampling 1990
- Annual Sediment Sampling 1991
- Contingency WAG 28—SWMU 204
- Contingency WAG 28—SWMU 99
- False Claims Investigation—Dept. of Justice—Soils/Sediment
- KYRAD Limited Sampling of Outfall 008, 010, and Section 3A of N/S Ditch
- Limited Sampling of Outfall 008, 010, and Section 3A of N/S Ditch
- Outfall 010 Culvert Repair Excavation Site SM02-16
- Outfalls 011/012 Time Critical Removal
- PCB Contamination Study
- Soil Sampling at K011 for Volatiles SM02-19
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 010 Activity 1 EU01 SWOU05-K010A101
- Surface Water OU—Outfall 010 Activity 1 EU02 SWOU05-K010A102
- Surface Water OU—Outfall 010 Activity 1 EU03 SWOU05-K010A103
- Surface Water OU—Outfall 010 Activity 1 EU09 SWOU05-K010A109
- Surface Water OU—Outfall 010 Activity 2 EU01 AND EU02 SWOU05-K010A20102
- Surface Water OU—Outfall 010 Activity 2 EU09 AND EU10 SWOU05-K010A20910
- Surface Water OU—Outfall 011 Activity 1 EU01 SWOU05-K011A101
- Surface Water OU—Outfall 011 Activity 2 EU01 SWOU05-K011A201
- WAG 28—SWMU 204

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.8 SWMU 486 (RUBBLE PILE WKWMA)

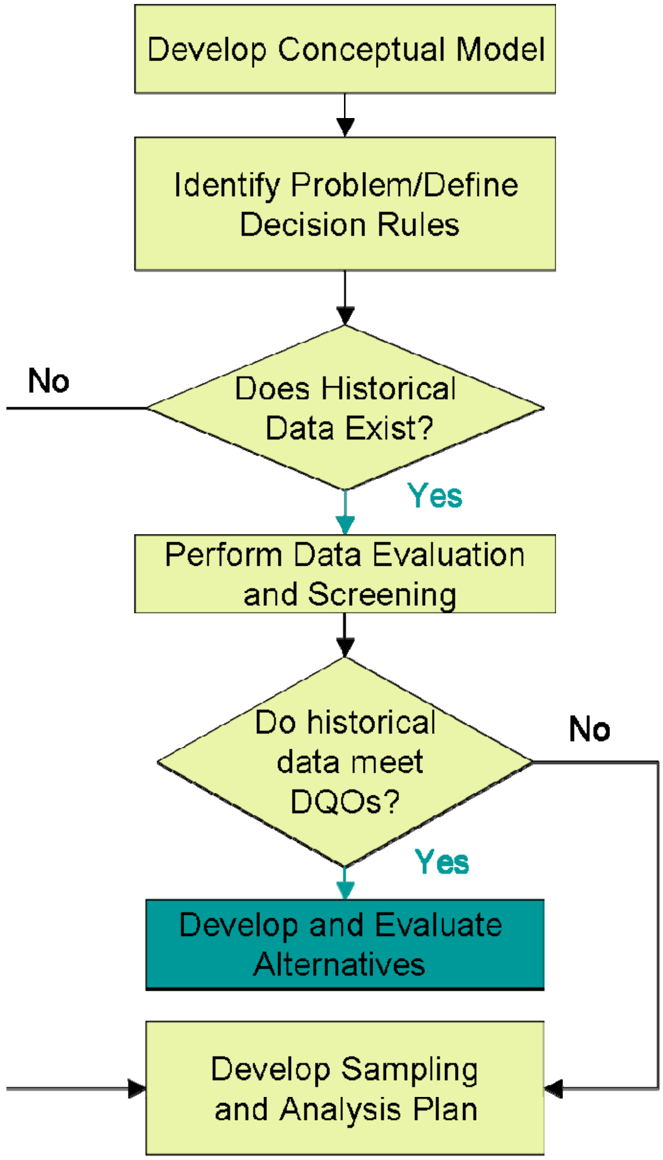

Figure D.50. Decision Tree Analysis – SWMU 486

The decision tree was not presented in the Scoping Document, the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available in OREIS.

Uncertainties

Not available.

D.5.9 SWMU 487 (RUBBLE PILE WKWMA)

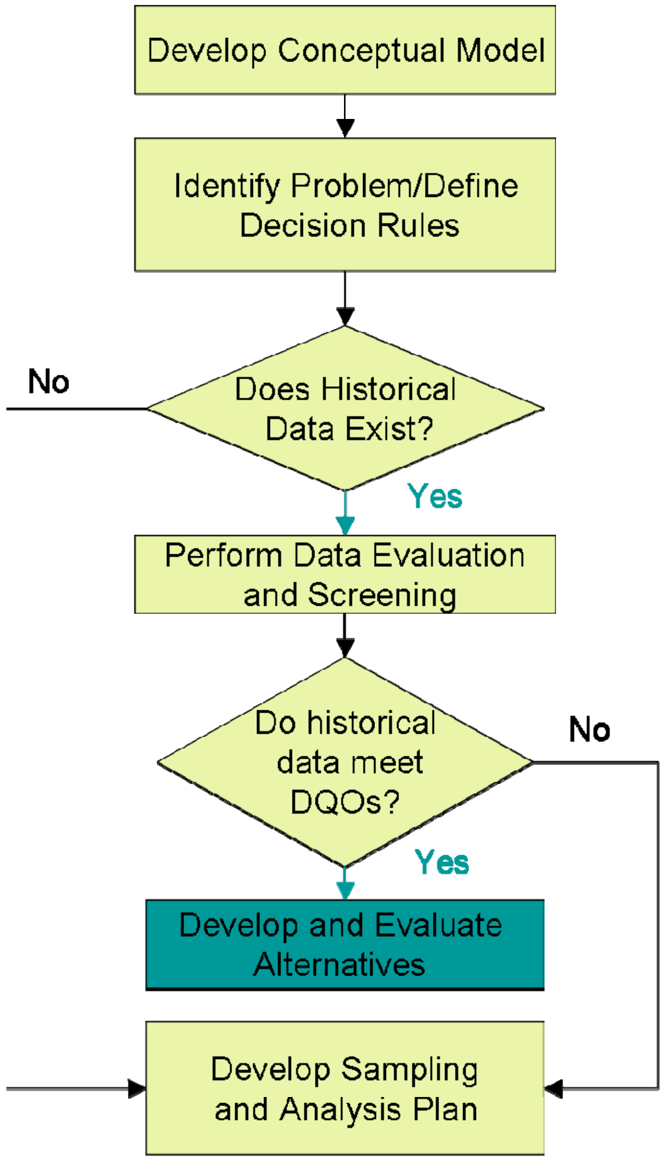

Figure D.51. Decision Tree Analysis – SWMU 487

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available in OREIS.

Uncertainties

Not available.

D.5.10 AOC 492 (CONTAMINATED SOIL AREA, NORTH OF OUTFALL 10)

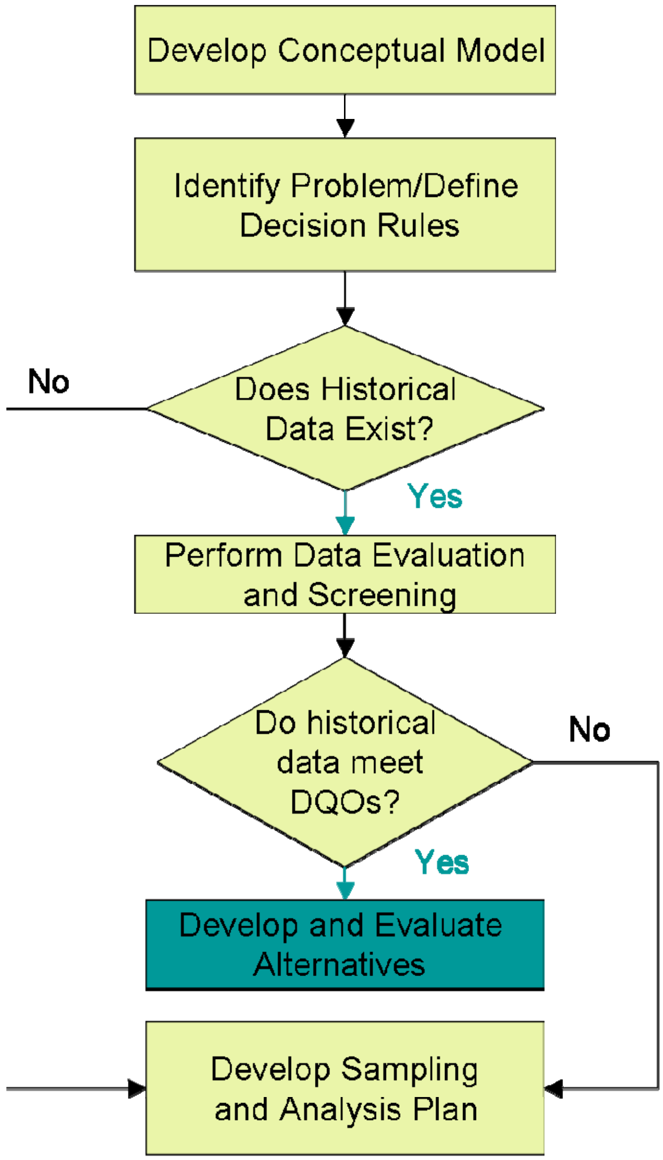

Figure D.52. Decision Tree Analysis – AOC 492

The decision tree was modified from the initial analysis presented in the Scoping Document, due to additional sampling being performed. This unit will be addressed more fully in the FS.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include herbicides, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following projects:

- AIP Sediment 97
- AIP Sediment 99
- ANNUAL SEDIMENT SAMPLING EMPSD00
- Outfalls 011/012 Time Critical Removal
- Remedial Action Site Investigation—Phase 2
- Semi-annual Sediment Sampling—Fall
- Semi-annual Sediment Sampling—Fall - EMPSD02-01
- Semi-annual Sediment Sampling—May EMPSD03-02
- Semi-annual Sediment Sampling—May EMPSD04-02
- Semi-annual Sediment Sampling—November EMPSD03-01
- Semi-annual Sediment Sampling—November EMPSD04-01
- Semi-annual Sediment Sampling—Spring—EMPSD02-02
- Semi-annual Sediment Sampling—Summer (Revision)—EMPSD01-03
- Special Soil Sampling @ Little Bayou Creek and K011 ESSPSO01-01

Uncertainties

Not available.

D.5.11 SWMU 493 (CONCRETE RUBBLE PILES NEAR OUTFALL 001)

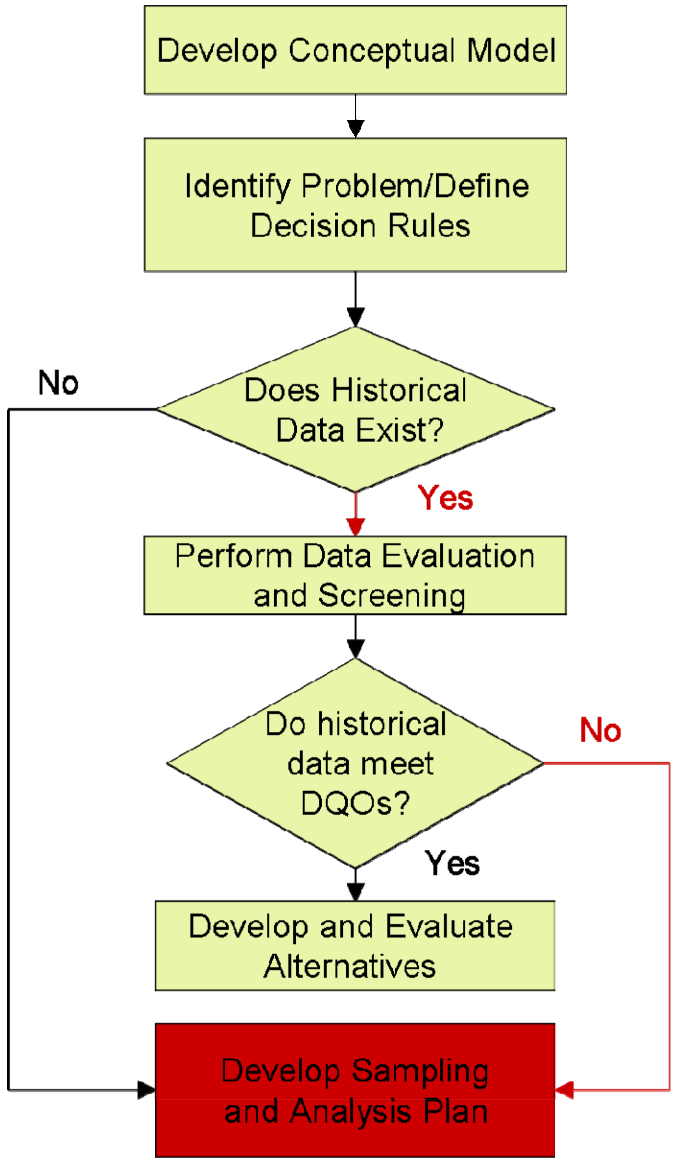

Figure D.53. Decision Tree Analysis – SWMU 493

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Beryllium Characterization @ Northwest Storm Water Collection Basin SY01-BSN-R
- Characterization of the Northwest Storm Water Collection Basin SY01-BSN
- Scrap Metal Sediment Basin Debris Piles—SWMU 493 SY02-DEBRIS
- Scrap Metal Sediment Basin Debris Piles—SWMU 517 SY02-DEBRIS2
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU4 SWOU05-K001A104
- Surface Water OU—Outfall 001 Activity 2 EU3 AND EU4 SWOU05-K001A20304

Uncertainties

Sampling from some of these projects may have been targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.12 SWMU 517 (RUBBLE AND DEBRIS EROSION CONTROL FILL AREA)

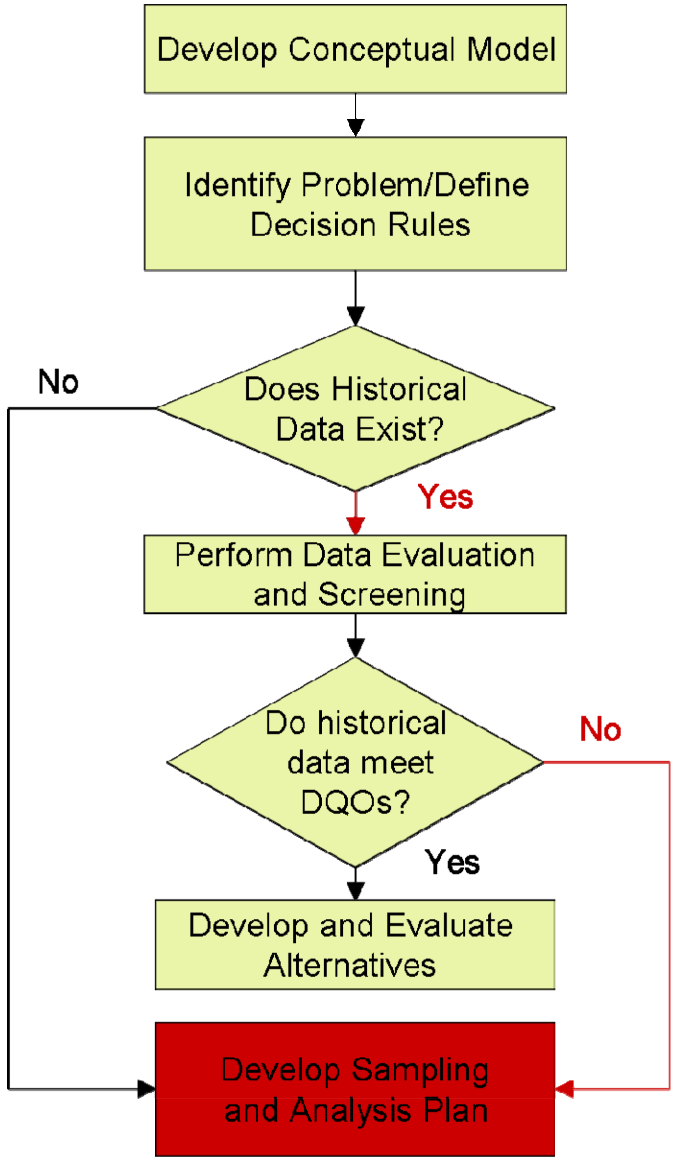

Figure D.54. Decision Tree Analysis – SWMU 517

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following projects:

- Characterization of the Northwest Storm Water Collection Basin SY01-BSN
- Scrap Metal Sediment Basin Debris Piles—SWMU 517 SY02-DEBRIS2
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU2 SWOU05-K001A102
- Surface Water OU—Outfall 001 Activity 1 EU3 SWOU05-K001A103
- Surface Water OU—Outfall 001 Activity 2 EU1 AND EU2 SWOU05-K001A20102

Uncertainties

Sampling from some of these projects may have been targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.5.13 AOC 541 (CONTAMINATED AREA BY OUTFALL 011)

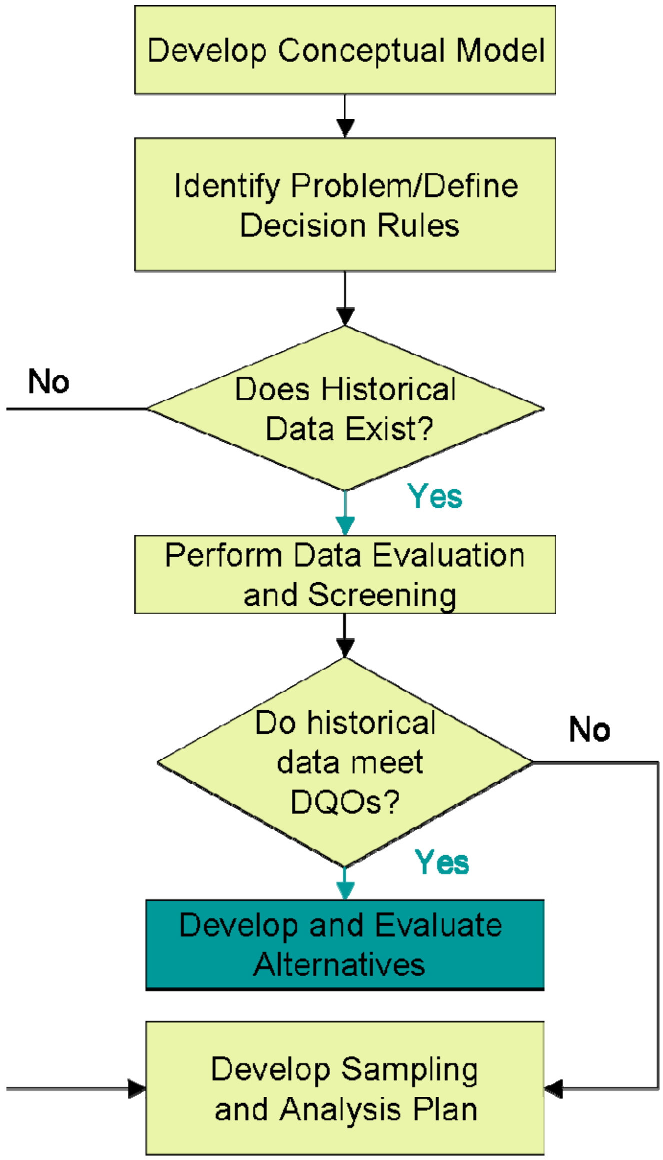

Figure D.55. Decision Tree Analysis – AOC 541

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Annual Sediment Sampling 1989 through 1999
- False Claims Investigation—DOE Headquarters-Soils/Sediment
- Historical data from AnaLIS for WAG 28 DQO
- KPDES Outfall Sampling 1994
- Outfalls 011/012 Time Critical Removal
- PCB Contamination Study
- RCWC Data 94-98
- RCWC Data ESO16937
- Remedial Action Site Investigation—Phase 2
- Soil Contamination Area South of Outfall 011 SM02-21
- Soil Piles Little Bayou Creek Field Screen Data—SP09-LBC-FIELD
- Soil Piles Little Bayou Creek Subunit 3 (Addm 1B) SP09-LBC-SU3
- Storm Water Collection Basin near Outfall 008 ERI02-BSN011
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 011 Activity 1 EU01 SWOU05-K011A101
- USEC Sediment for 1999 through 2005

Uncertainties

The majority of the sampling at this unit is from non-biased sampling.

D.5.14 SWMU 561 (SOIL PILE I)

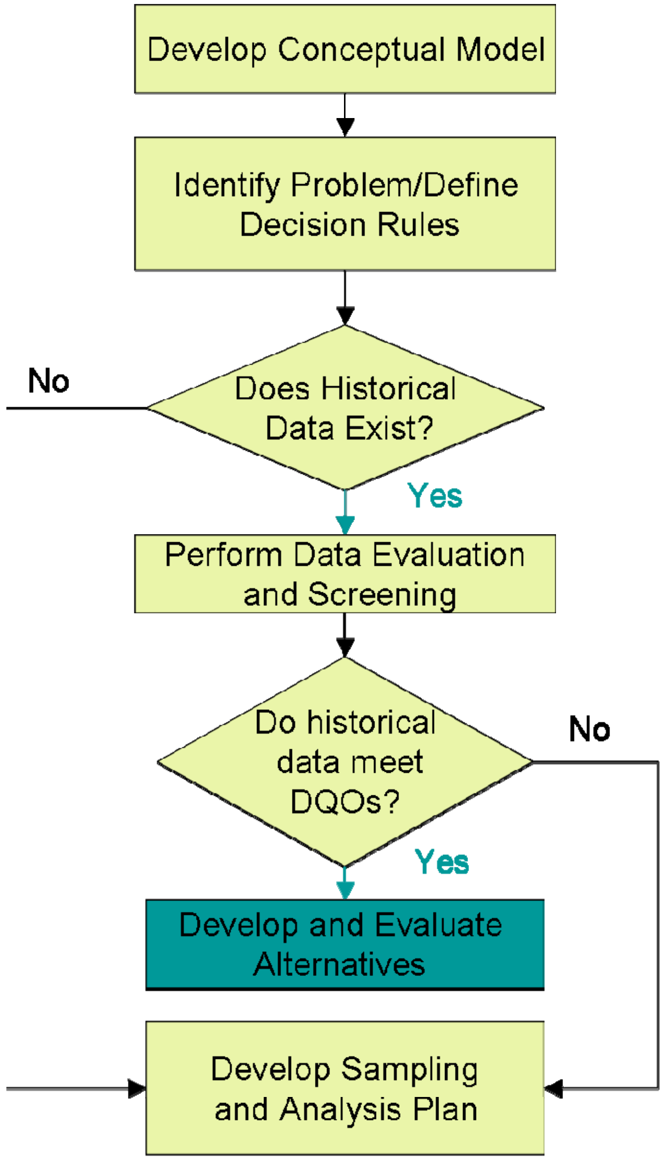

Figure D.56. Decision Tree Analysis – SWMU 561

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- AIP Soil Samples from Surface Locations taken June 2007 (Soil Piles) AIPSOSL06-07
- AIP Soil Samples Little Bayou Creek Soil Pile Investigation November 2006 Split with DOE AIPSOSLSP1
- PCB Contamination Study
- Soil Piles Little Bayou Creek Field Screen Data—SP07-LBC-FIELD
- Soil Piles Little Bayou Creek Subunit 1 SP07-LBC-SU1
- Soil Piles Little Bayou Creek Subunit 2 SP07-LBC-SU2
- Soil Piles Little Bayou Creek Subunit 3 SP07-LBC-SU3SF
- Soil Piles Little Bayou Creek Subunit 3 SP07-LBC-SU3SSF
- Soil Piles Little Bayou Creek Subunit 3 Additional Field Screen SP07-LBC-SU3SSF-FS
- Soil Piles Little Bayou Creek Subunit 3 Contingency SP07-LBC-SU3C
- Soil Piles Little Bayou Creek Subunit 4 SP07-LBC-SU4SF
- Soil Piles Little Bayou Creek Subunit 4 SP07-LBC-SU4SSF
- Soil Piles Little Bayou Creek Subunit 4 Subsurface Field Screen SP07-LBC-SU4SSF-FS
- Soil Piles Little Bayou Creek Subunit 5 SP07-LBC-SU5
- Special Soil Sampling along Little Bayou Creek, North of McCaw Road EMSPSO07-01

Uncertainties

The majority of the sampling from this unit is from non-biased sampling.

D.5.15 AOC 562 (ADDENDUM I-B SOIL PILES D, H J, AND K)

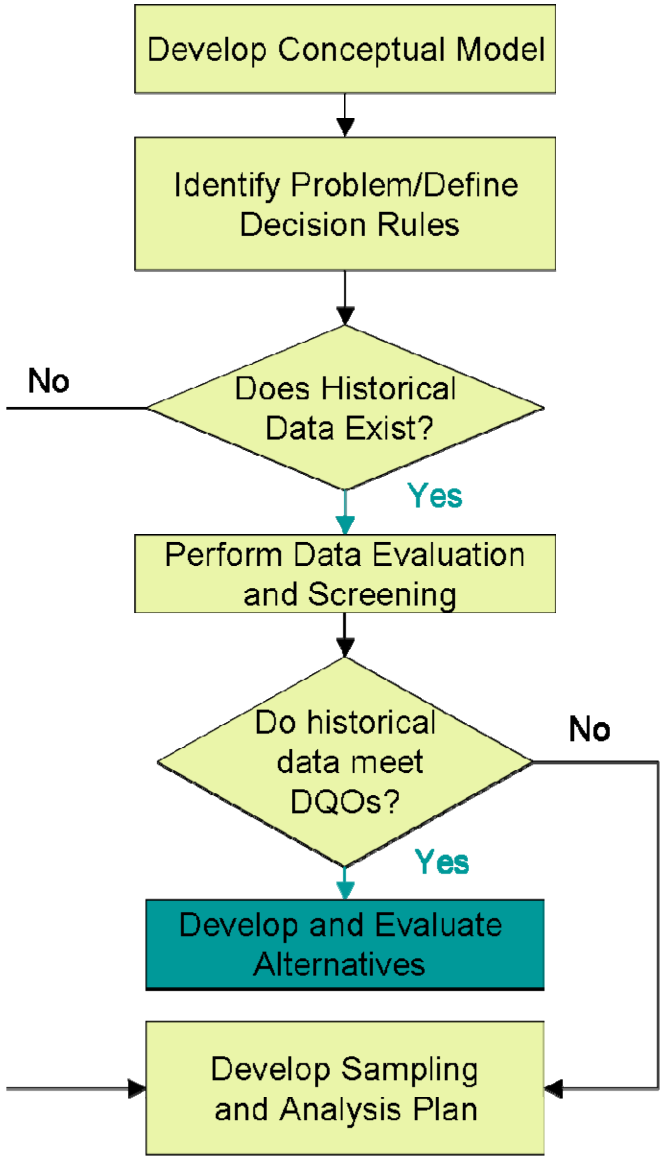

Figure D.57. Decision Tree Analysis – AOC 562

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.2.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Soil Piles Little Bayou Creek Field Screen Data—SP09-LBC-FIELD
- Soil Piles Little Bayou Creek Subunit 1 (Addm 1B)—Contingency SP09-LBC-SU1C
- Soil Piles Little Bayou Creek Subunit 1 (Addm 1B) SP09-LBC-SU1

Uncertainties

The sampling from these projects was non-biased sampling. High areas of contamination may have been missed during sampling. Further, all isotopic uranium analyses were conducted using an extraction method that may result in lower values for isotopes near background values.

D.5.16 AOC 563 (ADDENDUM I-B SOIL PILES 20 AND BW)

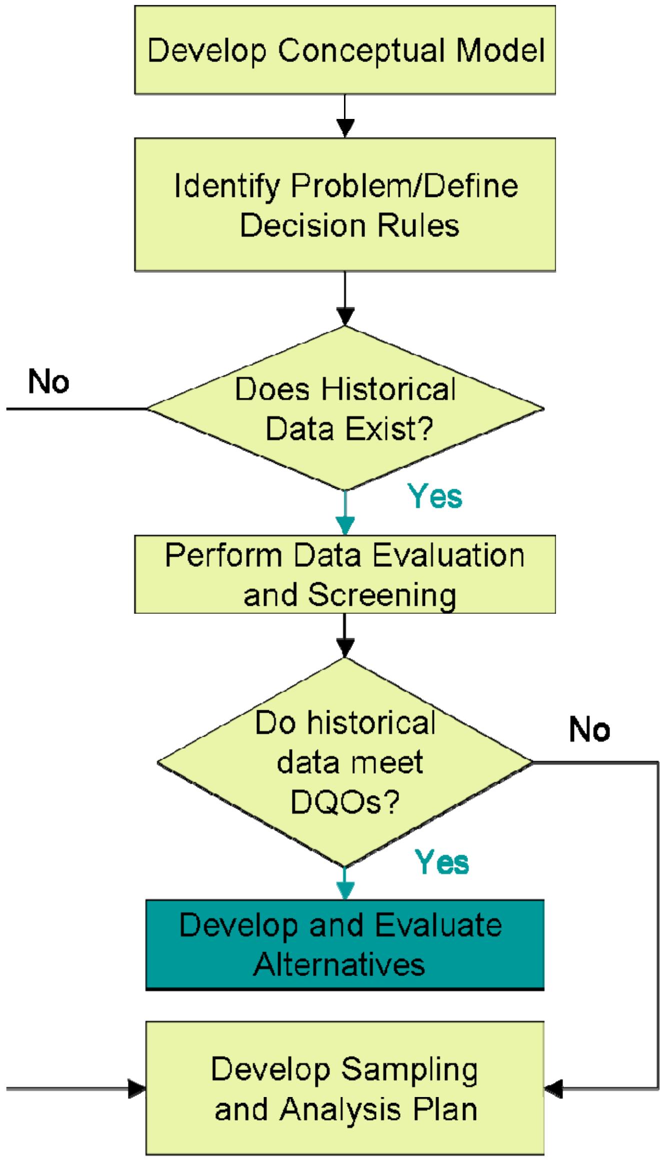

Figure D.58. Decision Tree Analysis – AOC 563

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

<u>Data Evaluation and Screening</u>

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Soil Piles Little Bayou Creek Field Screen Data—SP09-LBC-FIELD
- Soil Piles Little Bayou Creek Subunit 4 (Addm 1B) SP09-LBC-SU4

<u>Uncertainties</u>

The sampling from these projects was non-biased sampling. High areas of contamination may have been missed during sampling. Further, all isotopic uranium analyses were conducted using an extraction method that may result in lower values for isotopes near background values.

D.5.17 AOC 564 (ADDENDUM I-B SOIL PILE AT)

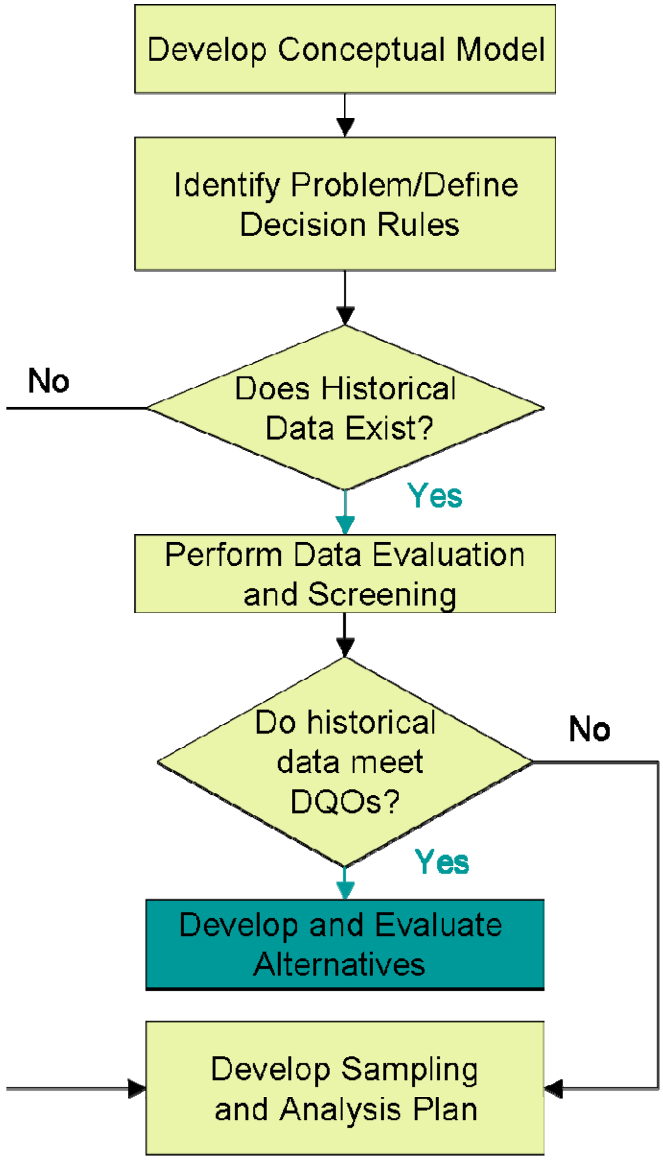

Figure D.59. Decision Tree Analysis – AOC 564

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Soil Piles Little Bayou Creek Field Screen Data—SP09-LBC-FIELD
- Soil Piles Little Bayou Creek Subunit 5 (Addm 1B)—Contingency SP09-LBC-SU5C
- Soil Piles Little Bayou Creek Subunit 5 (Addm 1B) SP09-LBC-SU5

Uncertainties

The sampling from these projects was non-biased sampling. High areas of contamination may have been missed during sampling. Further, all isotopic uranium analyses were conducted using an extraction method that may result in lower values for isotopes near background values.

D.5.18 AOC 565 (ALONG BAYOU CREEK NORTH OF C-611 WATER TREATMENT PLANT. RUBBLE AREA K-19)

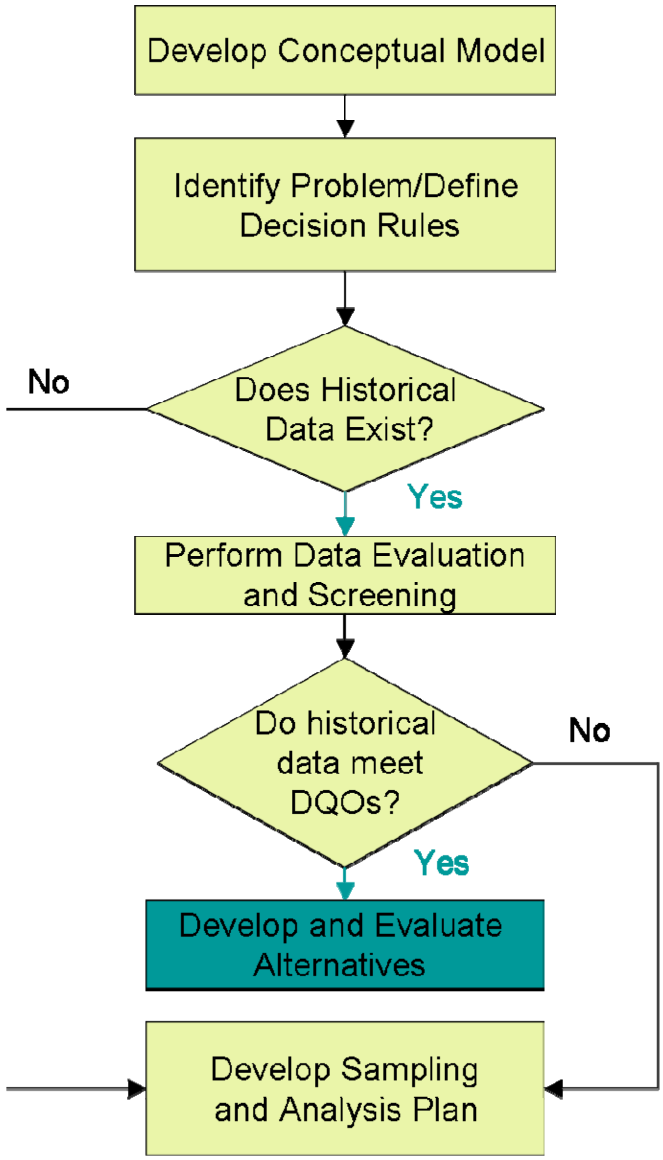

Figure D.60. Decision Tree Analysis – AOC 565

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface soils. These data were collected from the following project:

- Remedial Action Site Investigation—Phase 2

Uncertainties

The sampling from this project likely was targeted with biased sampling and is of questionable quality.

D.5.19 AOC 567 (CONTAMINATED SOIL AREA K013)

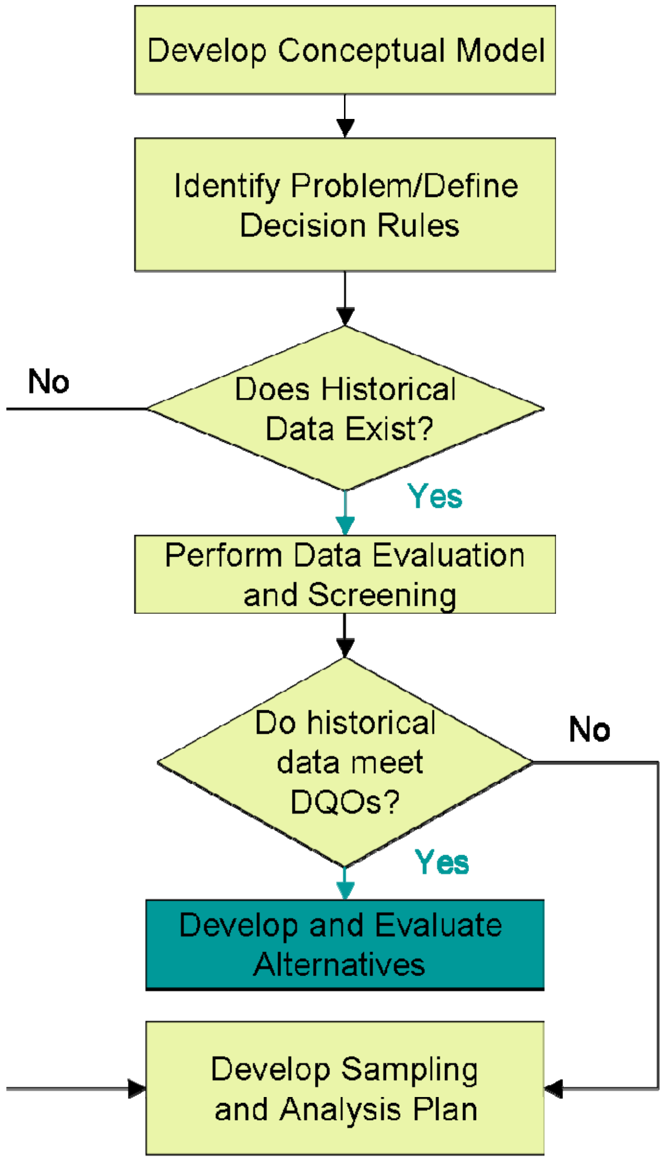

Figure D.61. Decision Tree Analysis – AOC 567

The decision tree was not presented in the Scoping Document; the unit was added to the scope of the RI after its development. No additional samples are needed at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and SVOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Soil Pile in AOI 13—SP09-AOI13
- Soil Piles near Outfall 013—SP09-K013

Uncertainties

The sampling from these projects was non-biased sampling. High areas of contamination may have been missed during sampling. Further, all isotopic uranium analyses were conducted using an extraction method that may result in lower values for isotopes near background values.

D.6. GROUP 3–SCRAP YARD

D.6.1 SWMU 12 (C-747-A UF4 DRUM YARD)

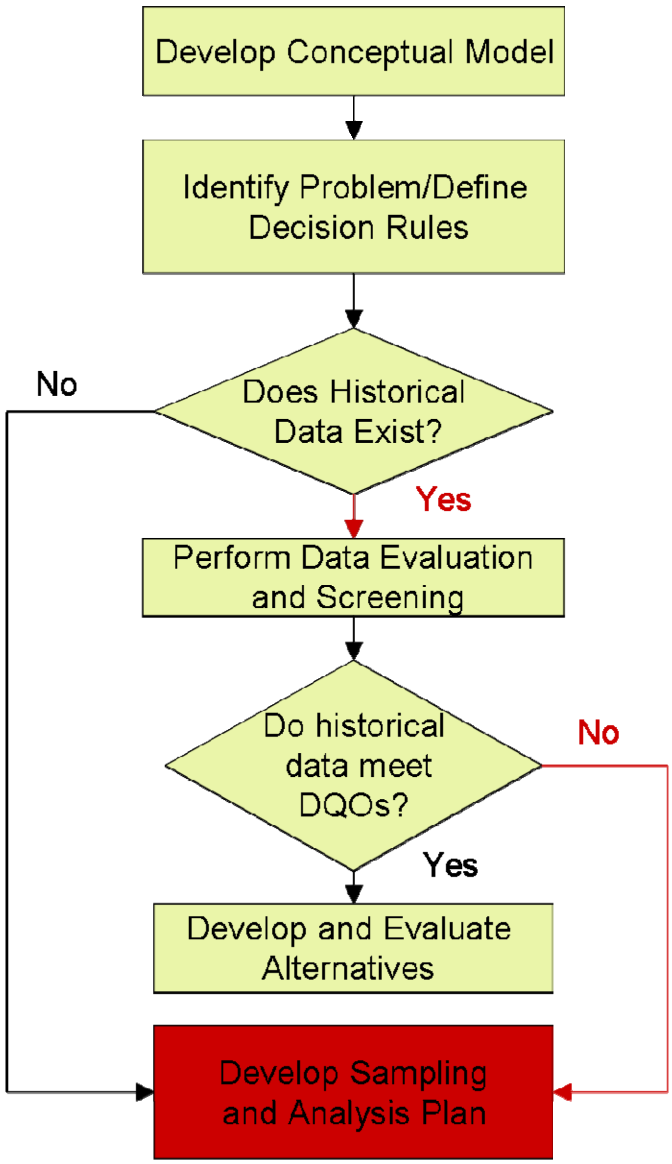

Figure D.62. Decision Tree Analysis – SWMU 12

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Burial Ground OU SWMU 7 Angle Borings BGOU07-SWMU7ASB1
- Burial Ground OU SWMU 7 Vertical Borings BGOU07-SWMU7VSB
- Remedial Action Site Investigation—Phase 2
- WAG 22 (SWMUs 7 and 30) 1021003

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.6.2 SWMU 13 (C-746 P AND P1 SCRAP YARDS)

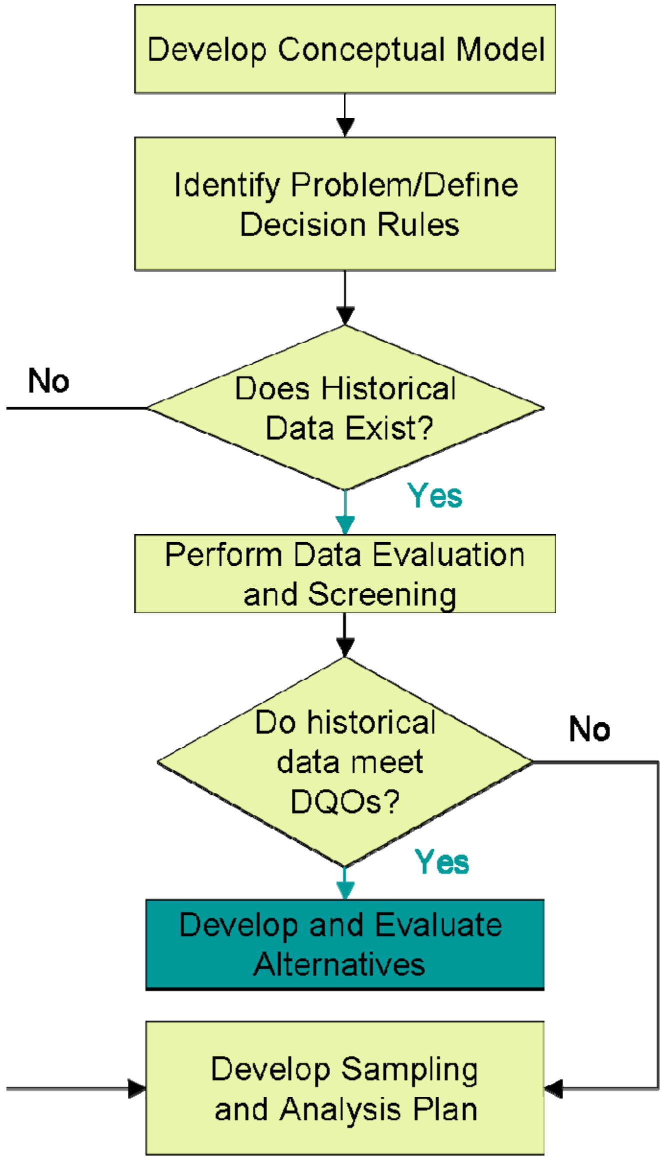

Figure D.63. Decision Tree Analysis – SWMU 13

The decision tree was modified from the initial analysis presented in the Scoping Document. Historical sampling is sufficient to characterize soils.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- AIP Sediment CH April 2001 AIPSECH04-01
- Characterization of Drainage Ditches SY01-DCH
- Remedial Action Site Investigation—Phase 2
- Scrap Metal Site Characterization for C-746-P Yard SY01-C746P
- Scrap Yard Profile of Soil—C746P SYSSP04-C746P
- Scrap Yard Profile of Soil—C746P1 SYSSP04-C746P1
- WAG 22 (SWMUs 7 and 30) 1021003

Uncertainties

The majority of the sampling for this unit was collected using grid sampling, so the results should present a non-biased picture of the unit.

D.6.3 SWMU 14 (C-746-E E SCRAP YARD)

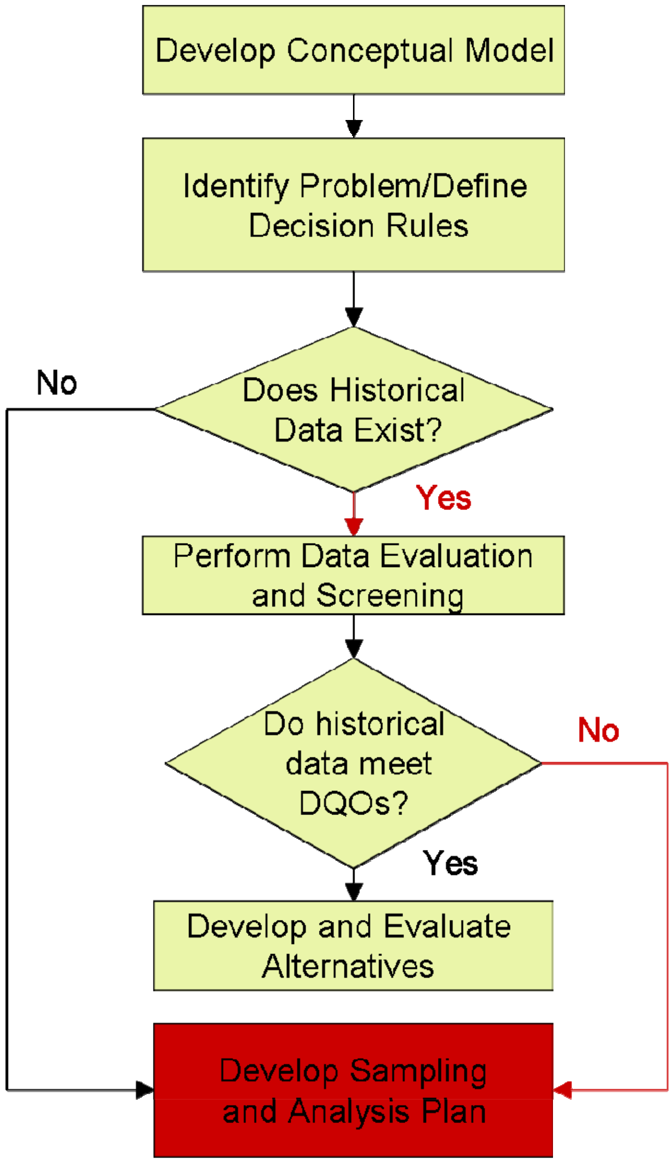

Figure D.64. Decision Tree Analysis – SWMU 14

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Burial Ground OU SWMU 7 Angle Borings BGOU07-SWMU7ASB4
- False Claims Investigation—DOE Headquarters-Soils/Sediment
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- Scrap Yard Profile of Soil—C746C SYSSP04-C746C
- WAG 22 (SWMUs 7 and 30) 1021003

Uncertainties

The sampling from these projects may have been targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.6.4 SWMU 15 (C-746-C C SCRAP YARD)

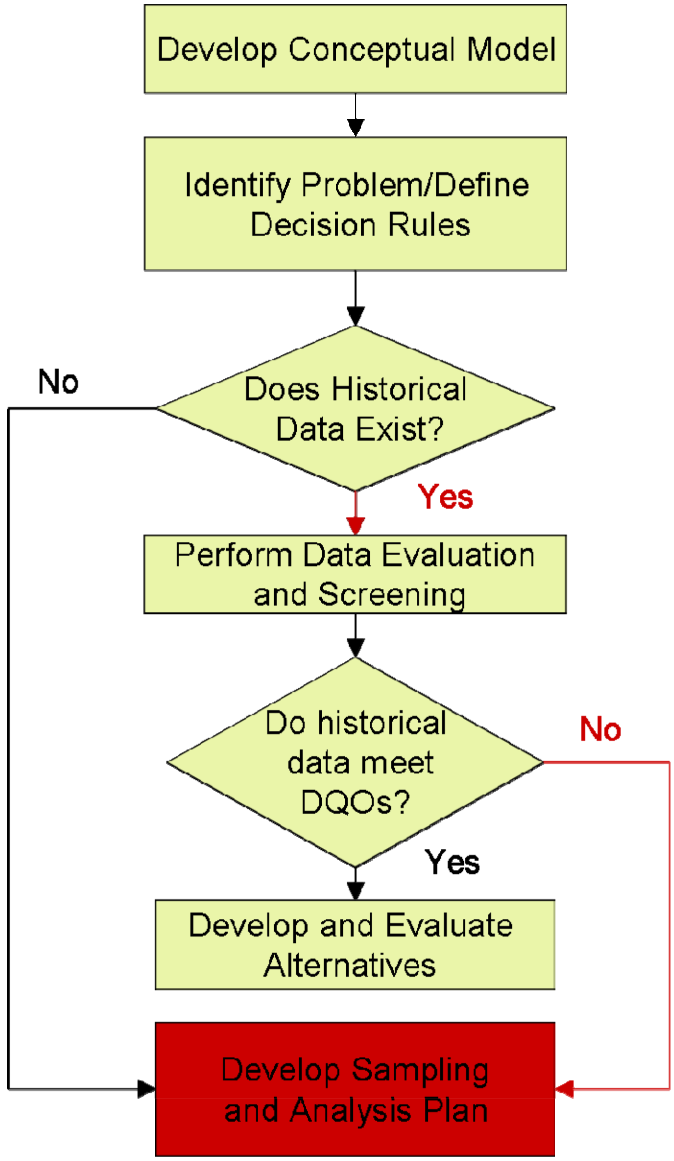

Figure D.65. Decision Tree Analysis – SWMU 15

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- RCWC Data
- Scrap Yard Profile of Soil—C746C SYSSP04-C746C

Uncertainties

The sampling from the RCWC projects likely was targeted with biased sampling. The Scrap Yard Profile sampling was conducted on a grid and should present a non-biased picture of the unit.

D.6.5 SWMU 16 (C-746-D D SCRAP YARD)

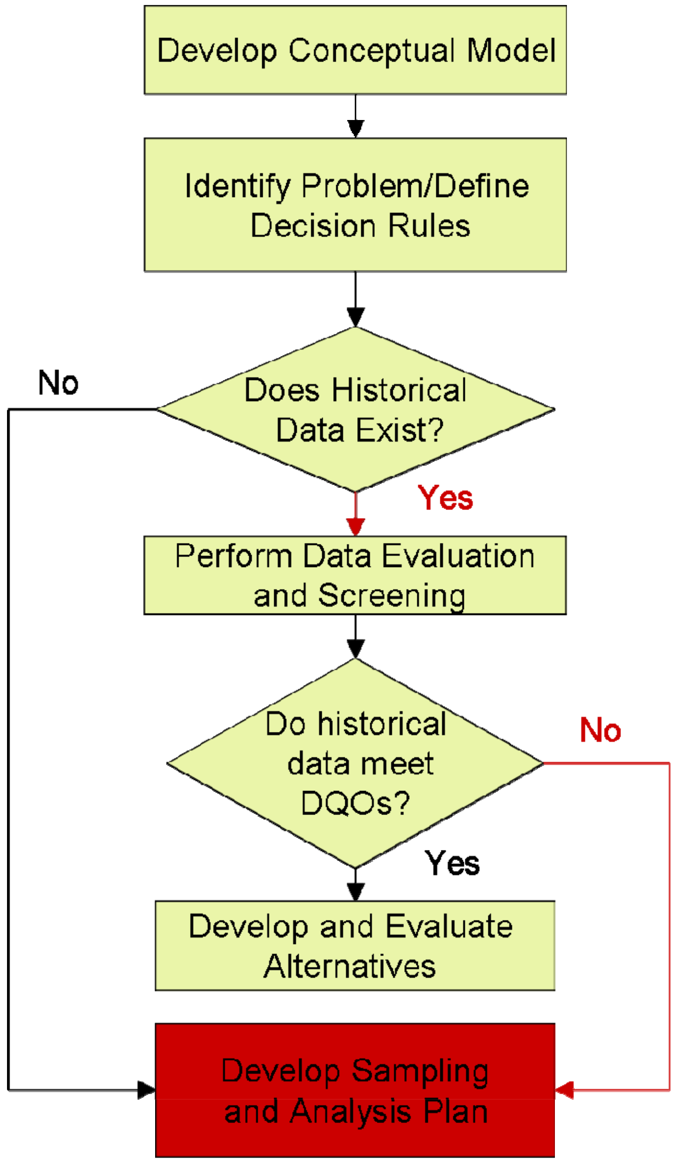

Figure D.66. Decision Tree Analysis – SWMU 16

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- C-746-D Yard Gate SYDGATE03-01
- Remedial Action Site Investigation—Phase 2
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 010 Activity 1 EU08 SWOU05-K010A108
- Surface Water OU—Outfall 010 Activity 2 EU07 AND EU08 SWOU05-K010A20708
- WAG 28—SWMU 99
- WAG 28—SWMU 99 (Extra samples)

Uncertainties

The sampling from some of these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.6.6 SWMU 518 (FIELD SOUTH OF C-746-P1 CLEAN SCRAP YARD)

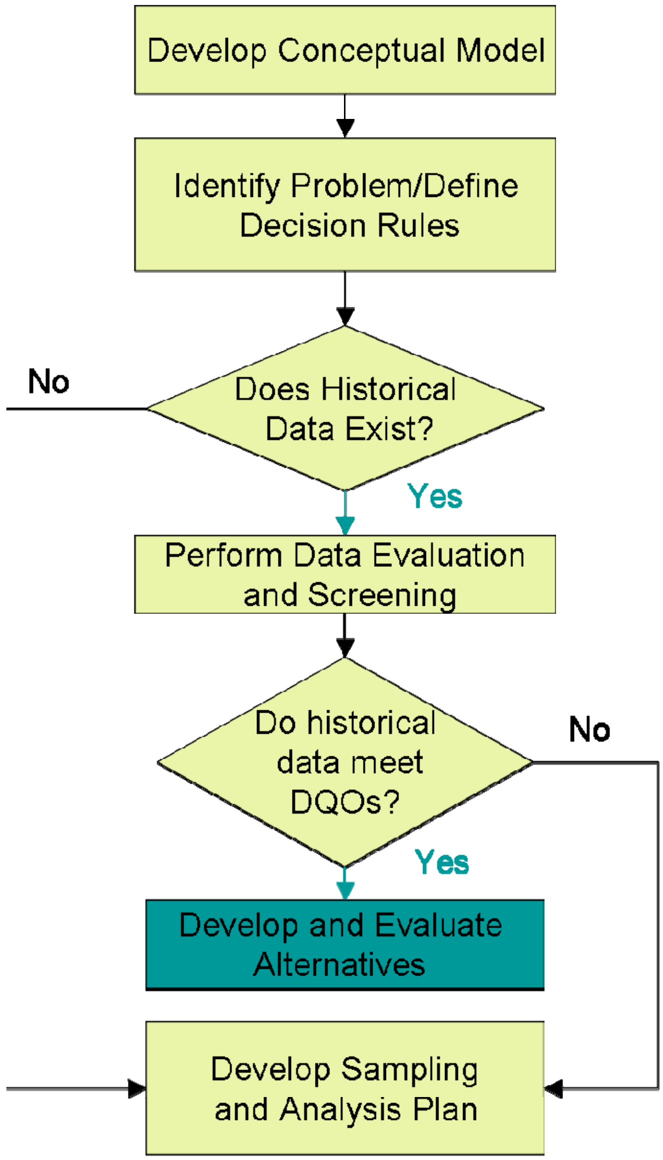

Figure D.67. Decision Tree Analysis – SWMU 518

The decision tree was modified from the initial analysis presented in the Scoping Document. No additional samples are needed at this location. Additionally, a radiological walkover is proposed for this unit to address more fully the extent of surface radiological contamination, if present.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Characterization of Drainage Ditches—Resample SY01-DCH-R
- Characterization of Drainage Ditches SY01-DCH
- Remedial Action Site Investigation—Phase 2
- Scrap Metal Site Characterization for C-746-P1 Yard—Resample SY01-C746P1-R
- Scrap Metal Site Characterization for C-746-P1 Yard SY01-C746P1
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU08 SWOU05-K001A108
- Surface Water OU—Outfall 001 Activity 2 EU3 AND EU4 SWOU05-K001A20304
- Surface Water OU—Outfall 001 Activity 2 EU7 AND EU8 SWOU05-K001A20708
- WAG 3—SWMU 5

Uncertainties

The sampling from some of these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively. Further, Kentucky Radiation Health Branch has noted that elevated readings were found during a radiological walkover survey for this unit.

D.6.7 SWMU 520 (SCRAP MATERIAL WEST OF C-746-A)

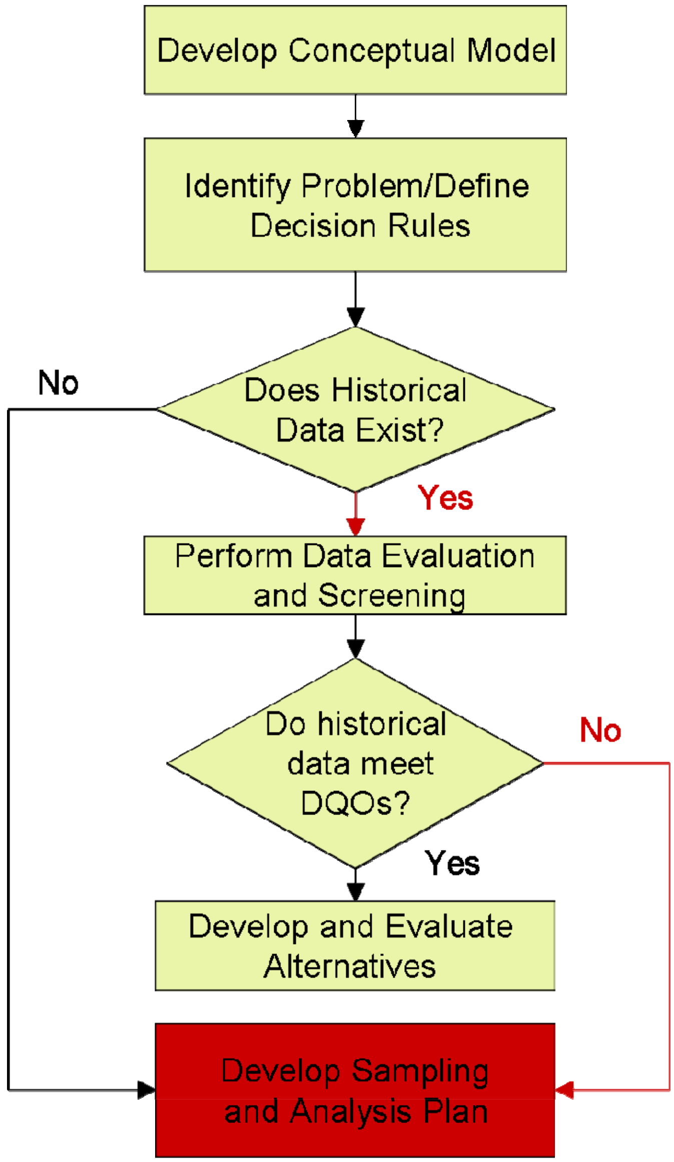

Figure D.68. Decision Tree Analysis – SWMU 520

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and shallow subsurface soils. These data were collected from the following projects:

- Burial Ground OU SWMU 6 Angle Borings BGOU07-SWMU6ASB1
- Characterization of Drainage Ditches—Resample SY01-DCH-R
- Contingency WAG 3—SWMU 6
- Excavation of Petroleum contaminated soil associated with UST #5 EF02-27
- Excavation of Petroleum contaminated soil associated with UST #5—Resample event EF02-30
- Remedial Action Site Investigation—Phase 2
- Soil Piles North of C-747-B from Balance of Scrap Ditches SY02-747BSP
- Surface Water OU—Activity 1 ISOCS data SWOU05-ISOCS
- Surface Water OU—Outfall 001 Activity 1 EU08 SWOU05-K001A108
- Surface Water OU—Outfall 001 Activity 1 EU09 SWOU05-K001A109
- Surface Water OU—Outfall 001 Activity 1 EU12 SWOU05-K001A112
- Surface Water OU—Outfall 001 Activity 2 EU09 AND EU10 SWOU05-K001A20910
- Surface Water OU—Outfall 001 Activity 2 EU11 AND EU12 SWOU05-K001A21112
- WAG 15
- WAG 15 PAH Sampling
- WAG 27 RI Sampling
- WAG 3—SWMU 6

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7. GROUP 3–PCBS

D.7.1 SWMU 56 (C-540-A PCB STAGING AREA)

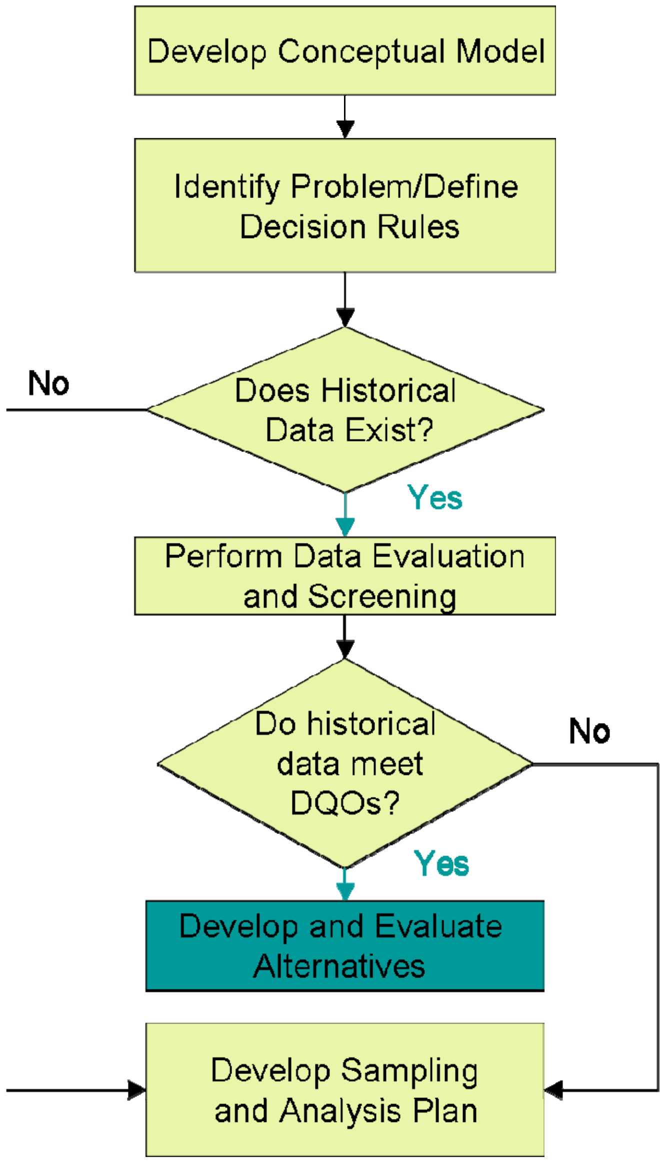

Figure D.69. Decision Tree Analysis – SWMU 56

The decision tree was modified from the initial analysis presented in the Scoping Document. No additional samples are needed at this location.

SWMU 56 is contained within SWMU 80. Extent characterization is planned for that location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- False Claims Investigation—Dept. of Justice—Soils/Sediment
- Historical data from AnaLIS for WAG 28 DQO
- Outfalls 011/012 Time Critical Removal
- RCWC Data
- RCWC Data LMES96-46
- RCWC Data PUMPHOUSE
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Excavation Sampling
- WAG 23 Phase 1
- WAG 23 Phase 2

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.2 SWMU 57 (C-541-A PCB WASTE STAGING AREA)

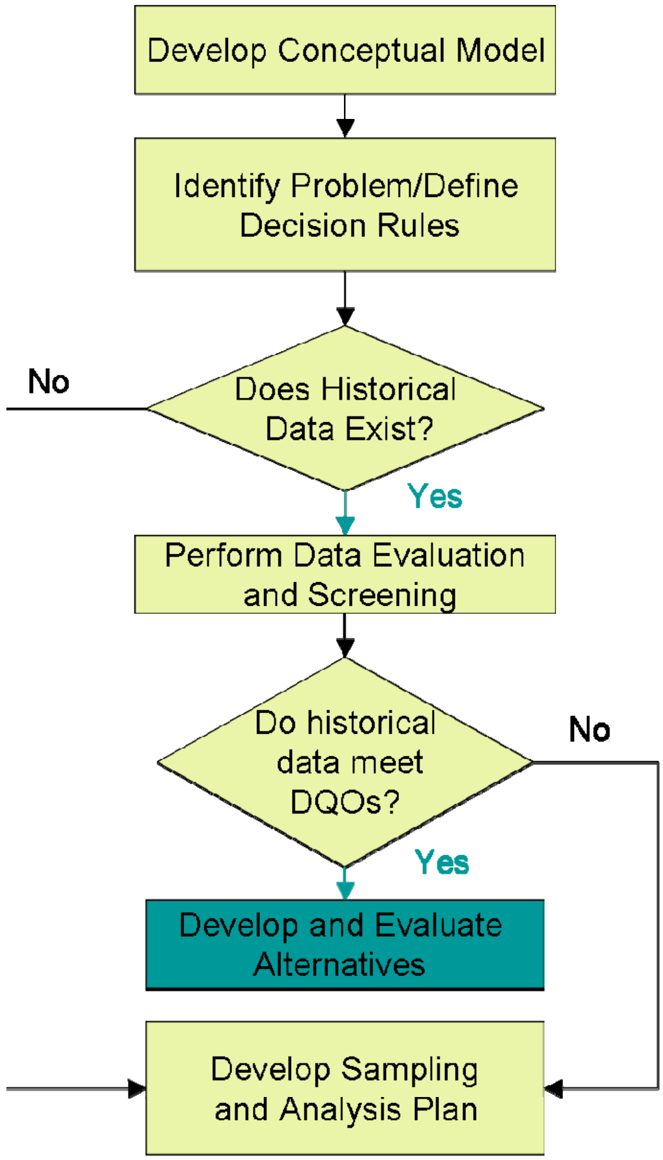

Figure D.70. Decision Tree Analysis – SWMU 57

The decision tree was modified from the initial analysis presented in the Scoping Document. No additional samples are needed at this location.

SWMU 57 is contained within SWMU 81. Extent characterization is planned for that location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Historical data from AnaLIS for WAG 28 DQO
- RCWC Data
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Excavation Sampling
- WAG 23 Phase 1
- WAG 23 Phase 2

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.3 SWMU 74 (C-340 PCB TRANSFORMER SPILL SITE)

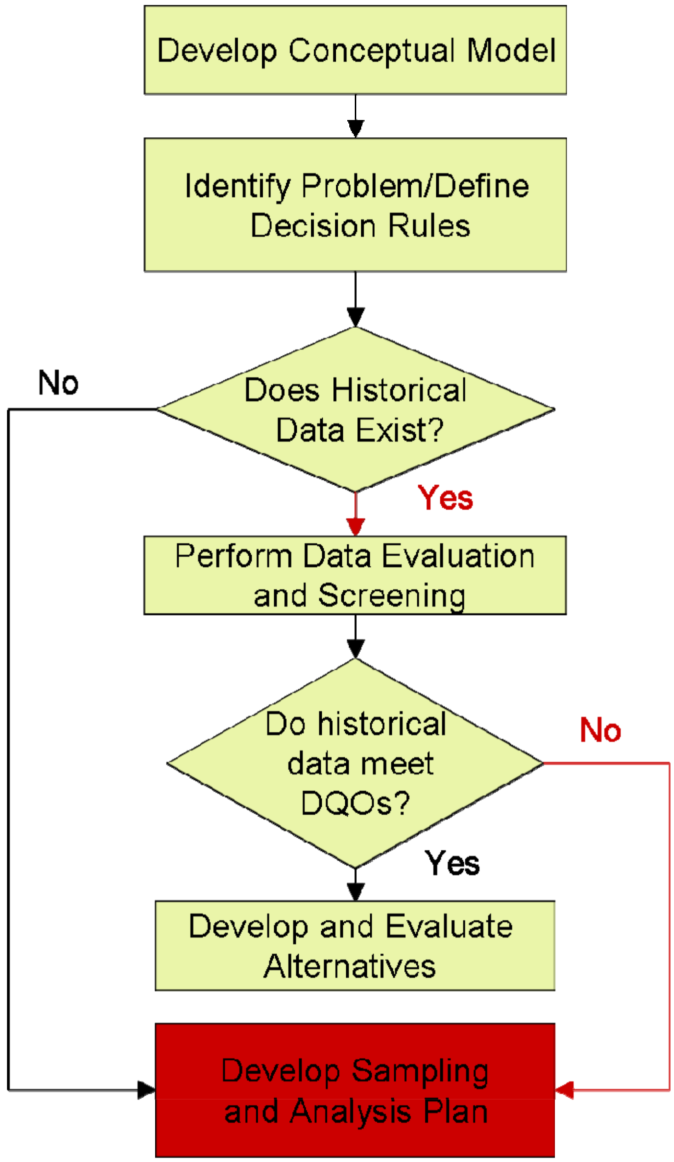

Figure D.71. Decision Tree Analysis – SWMU 74

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 8—SWMU 82

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.4 SWMU 75 (C-633 PCB SPILL SITE)

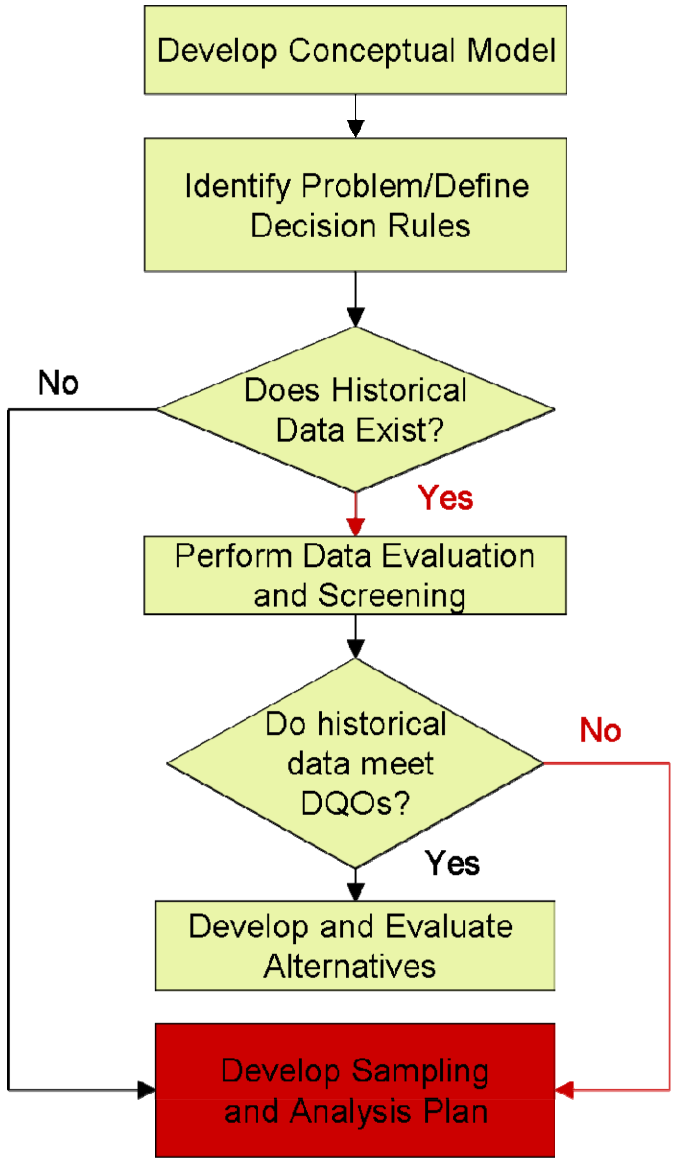

Figure D.72. Decision Tree Analysis – SWMU 75

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, pesticides/PCBs, radionuclides, and VOAs in the surface and pesticides/PCBs and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Historical data from AnaLIS for WAG 28 DQO
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.5 SWMU 78 (C-420 PCB SPILL SITE)

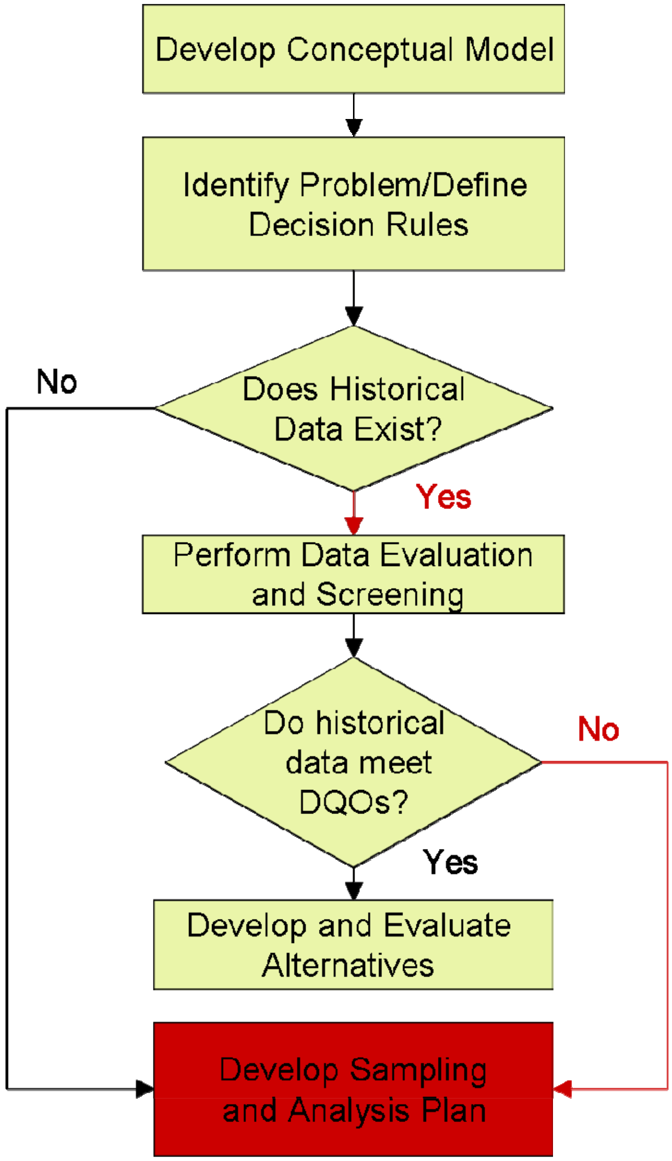

Figure D.73. Decision Tree Analysis – SWMU 78

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- C-410 Soil Near Water Line Excavation Locations DDSM02-01
- D&D C-410 Electrical Installation DD02-410-ELEC
- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 6—A

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.6 SWMU 79 (C-611 PCB SPILL SITE)

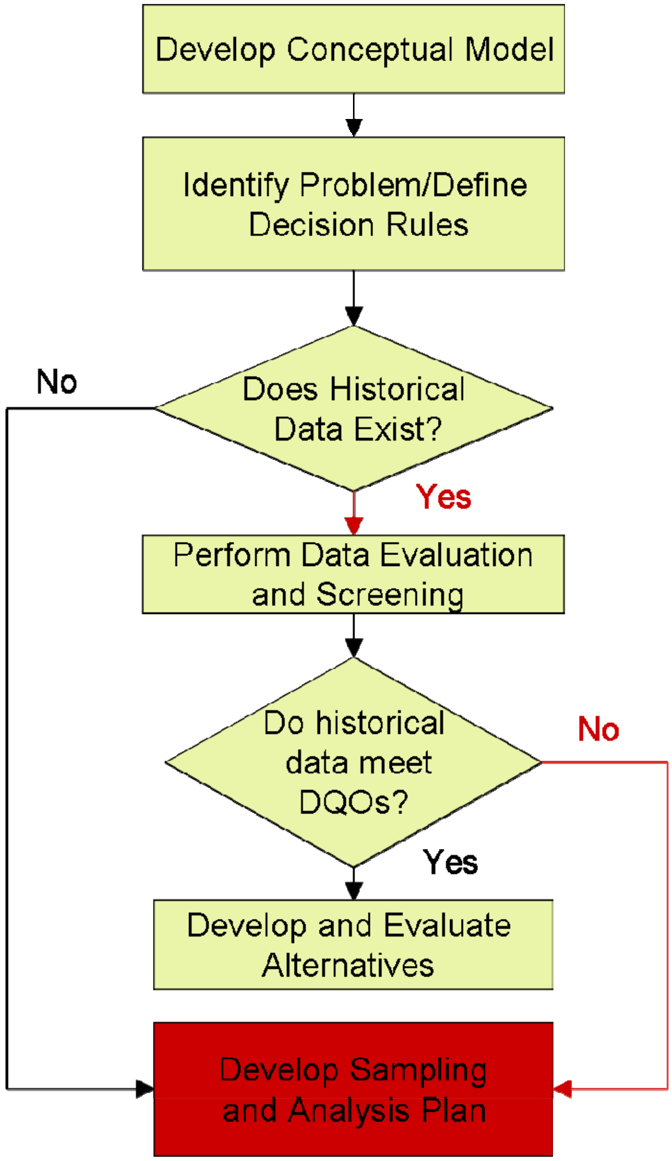

Figure D.74. Decision Tree Analysis – SWMU 79

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.2.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs in the surface and dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAGs 1 & 7

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.7 SWMU 80 (C-540 PCB SPILL SITE)

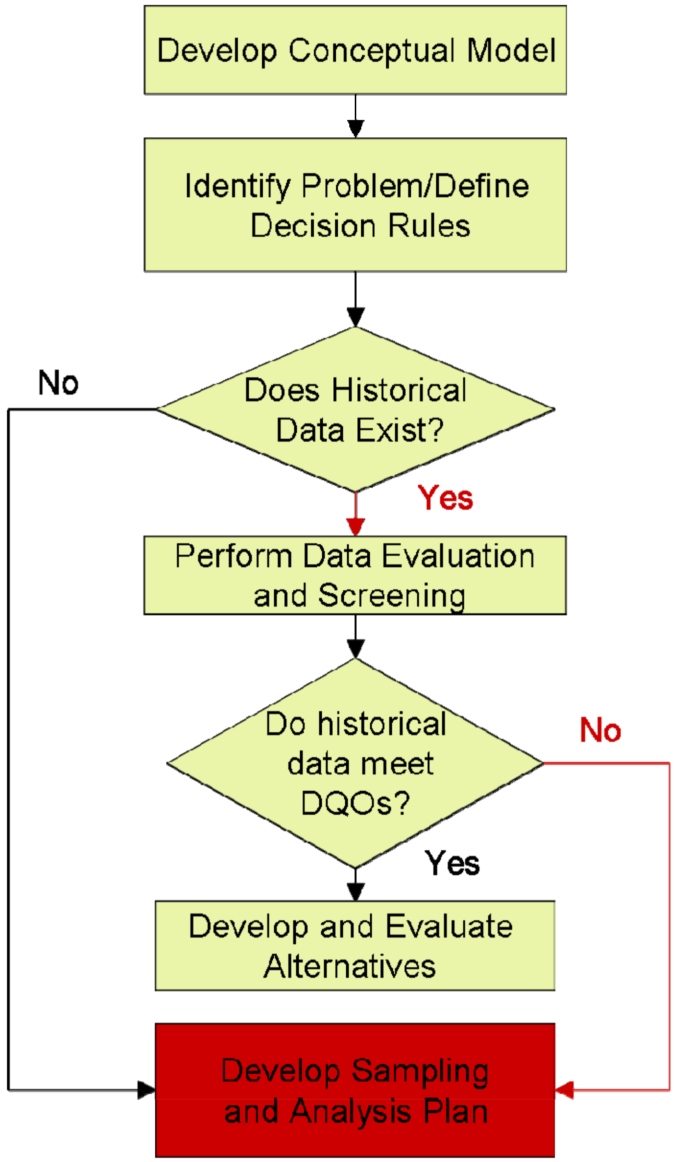

Figure D.75. Decision Tree Analysis – SWMU 80

Limited sampling is planned to determine extent.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, radionuclides, and VOAs in the surface and pesticides/PCBs and radionuclides in the shallow subsurface soils. These data were collected from the following projects:

- RCWC Data PUMPHOUSE
- Remedial Action Site Investigation—Phase 1
- WAG 23 Excavation Sampling
- WAG 23 Phase 1
- WAG 23 Phase 2

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though limited additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.8 SWMU 81 (C-541 PCB SPILL SITE)

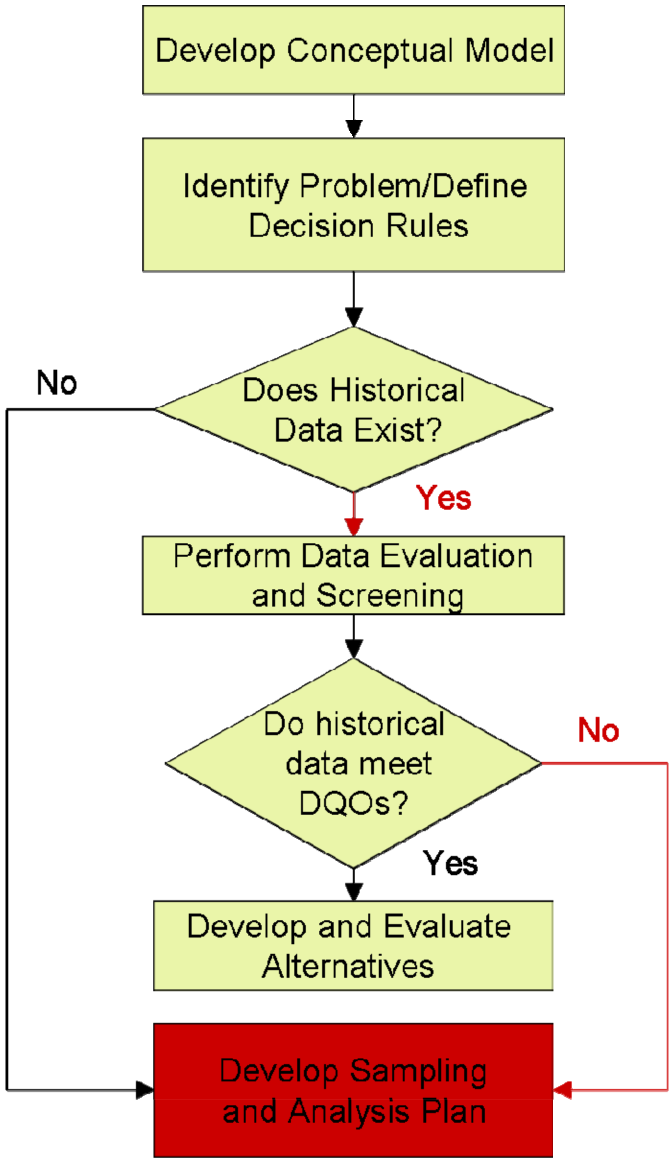

Figure D.76. Decision Tree Analysis – SWMU 81

Limited sampling is planned to determine extent.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Excavation Sampling
- WAG 23 Phase 1
- WAG 23 Phase 2

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though limited additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.9 SWMU 135 (C-333 PCB SOIL CONTAMINATION)

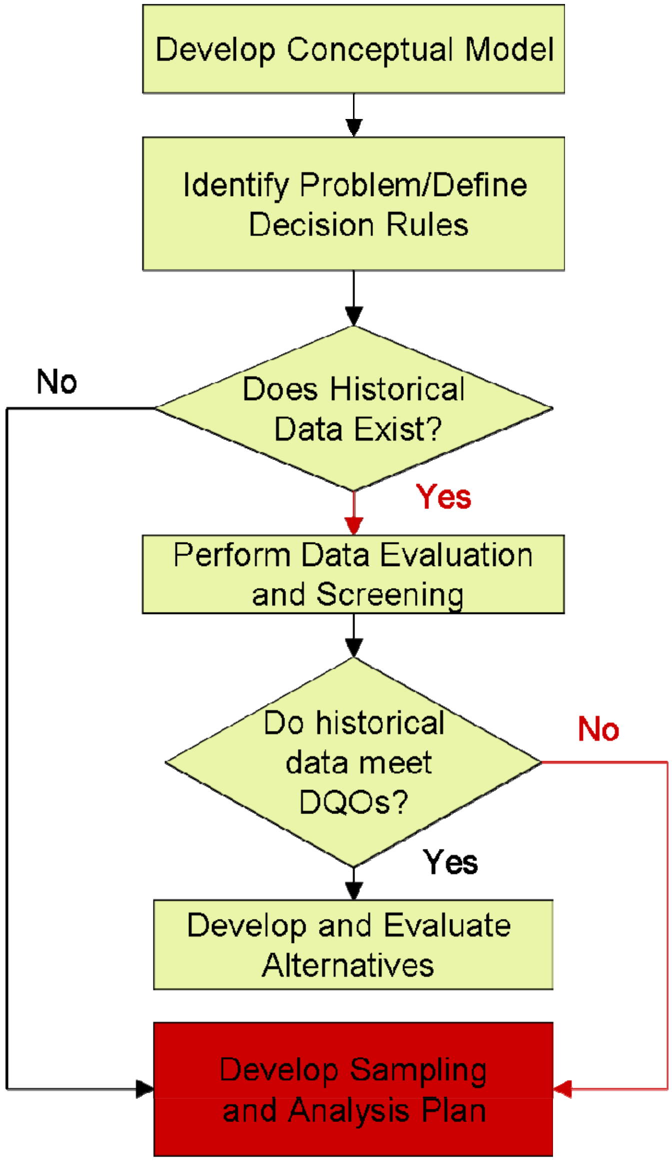

Figure D.77. Decision Tree Analysis – SWMU 135

Limited sampling is planned to determine extent.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides, in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The majority of the sampling from the project likely was targeted with biased sampling; therefore, though limited additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.10 SWMU 137 (C-746-A INACTIVE PCB AREA)

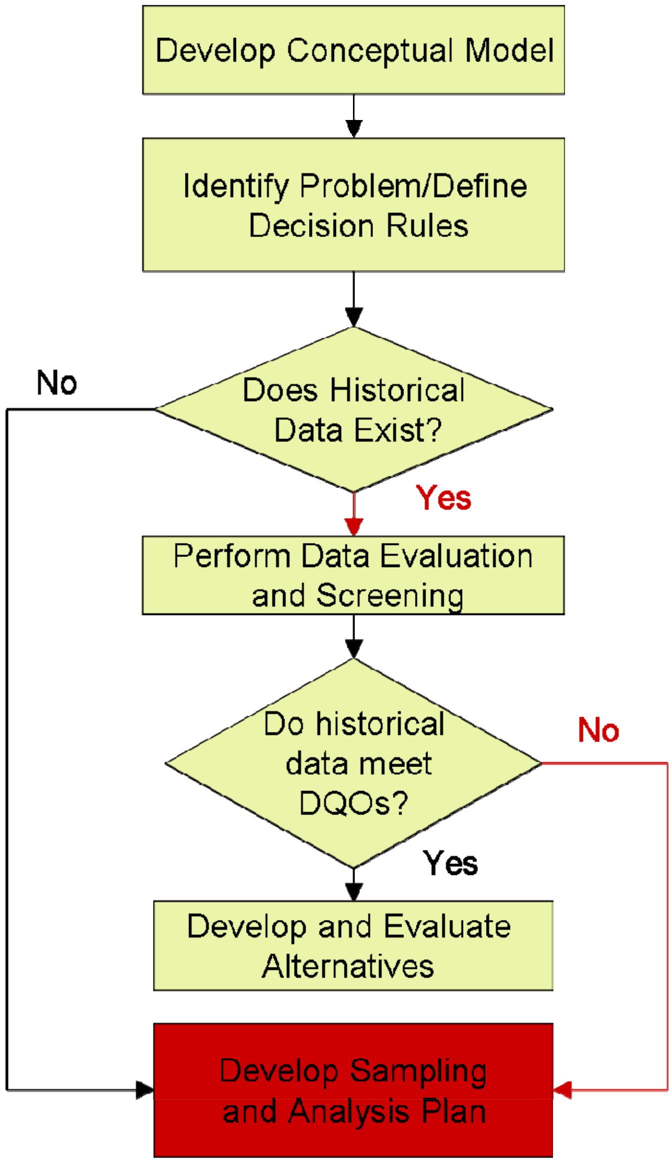

Figure D.78. Decision Tree Analysis – SWMU 137

Additional sampling is required; however, SWMU 137 has a concrete surface. Since soil sampling is not possible at this time, a radiation evaluation and a visual inspection for oil staining will be conducted.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available in OREIS.

Uncertainties

Not available.

D.7.11 SWMU 153 (C-331 PCB SOIL CONTAMINATION -WEST)

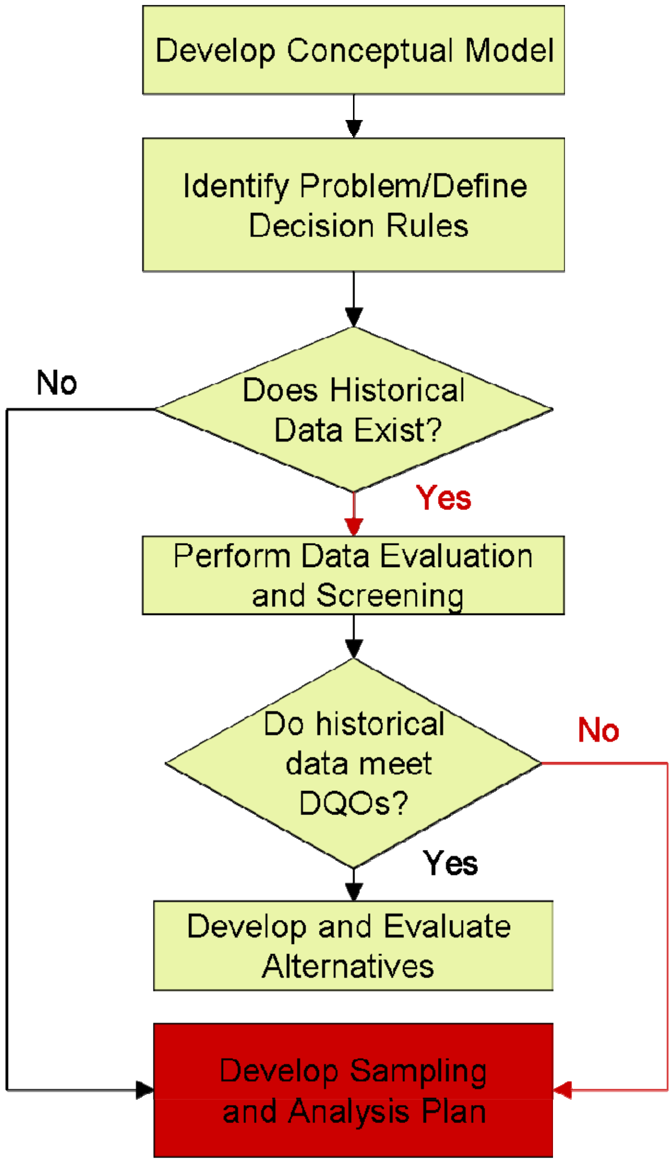

Figure D.79. Decision Tree Analysis – SWMU 153

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The majority of the sampling from the project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.12 SWMU 154 (C-331 PCB SOIL CONTAMINATION-SOUTHEAST)

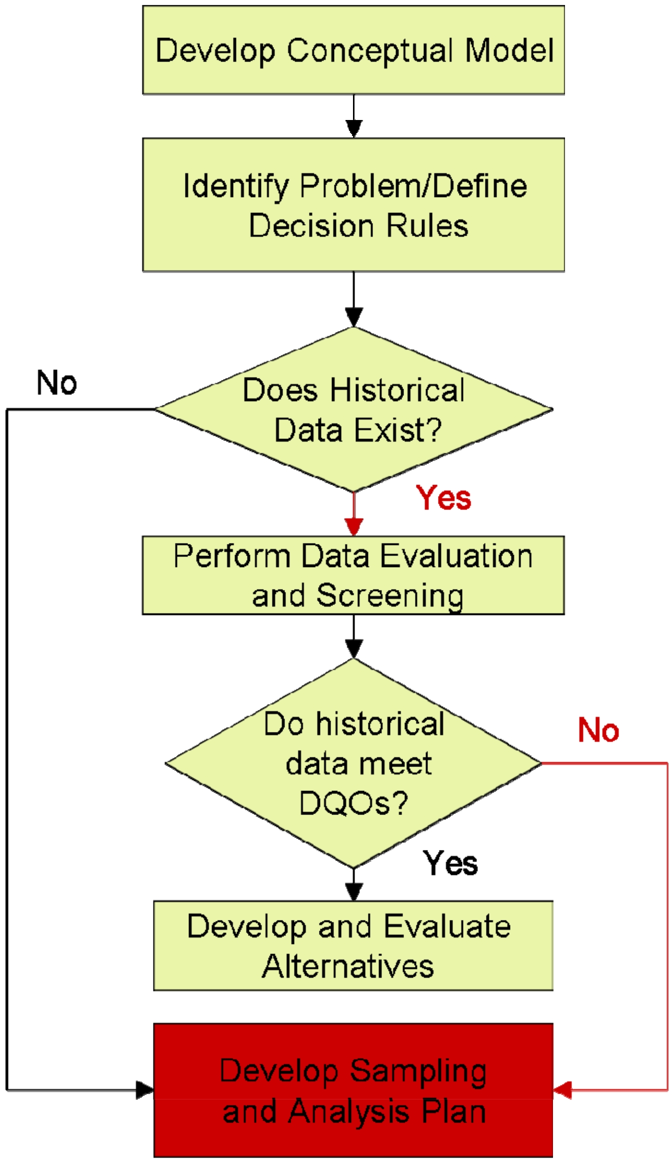

Figure D.80. Decision Tree Analysis – SWMU 154

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The majority of the sampling from the project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.13 SWMU 155 (C-333 PCB SOIL CONTAMINATION-WEST)

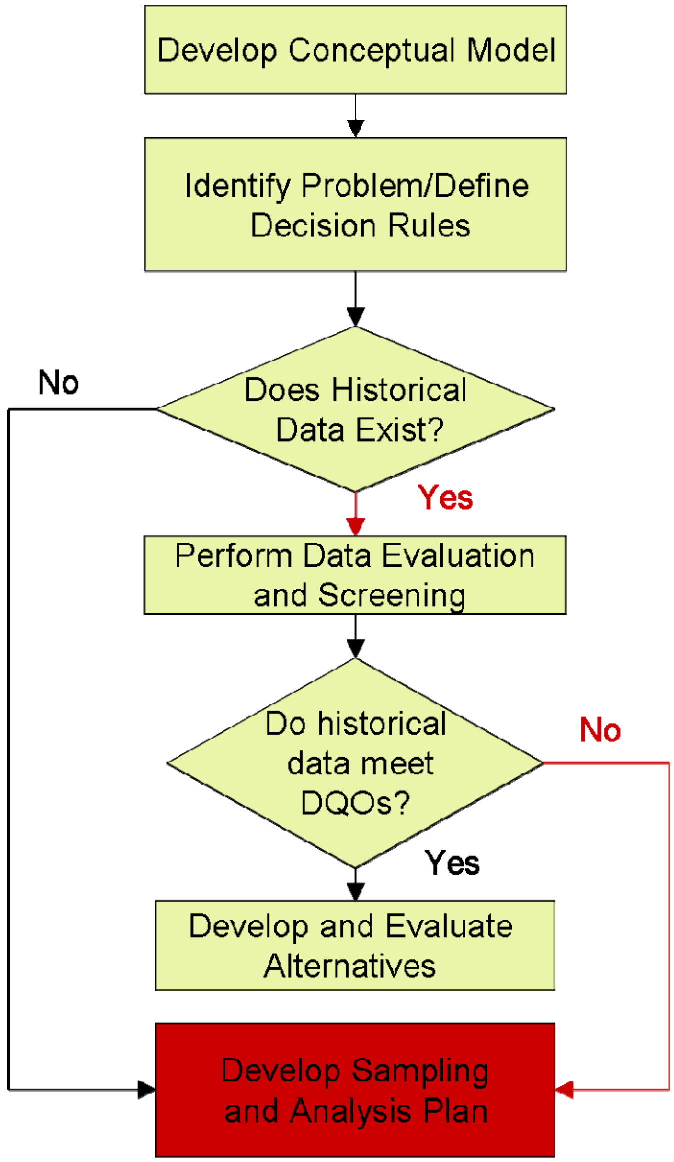

Figure D.81. Decision Tree Analysis – SWMU 155

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The majority of the sampling from the project likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.14 SWMU 156 (C-310 PCB SOIL CONTAMINATION-WEST)

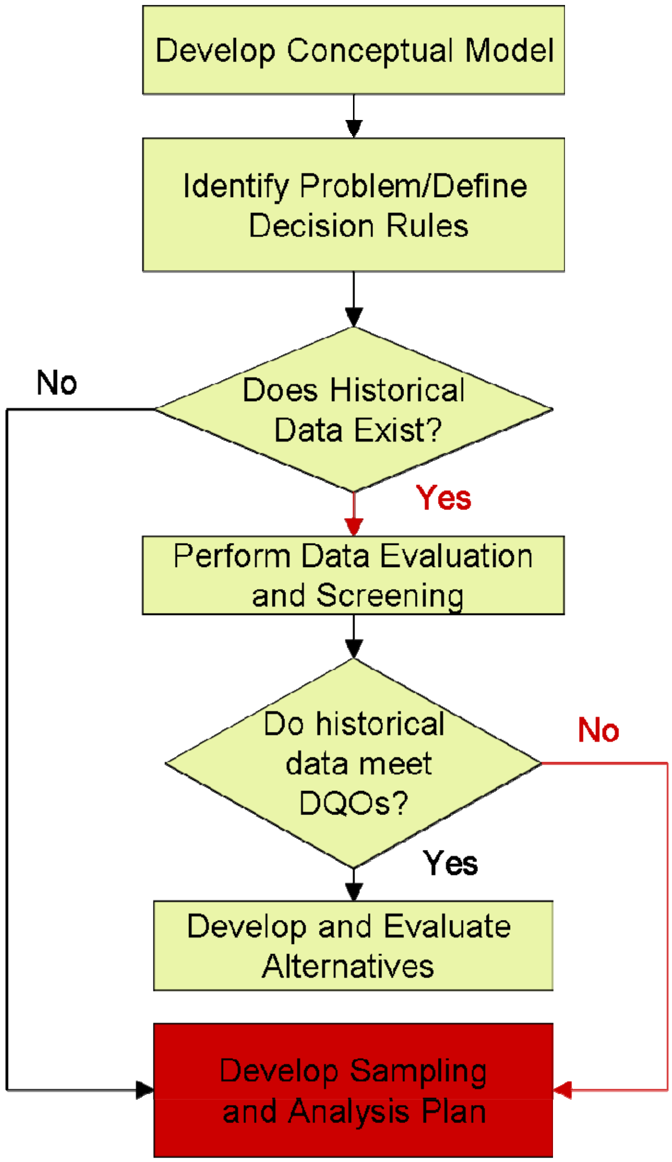

Figure D.82. Decision Tree Analysis – SWMU 156

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include metals, pesticides/PCBs, and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data

Uncertainties

The sampling from the historical project likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.15 SWMU 160 (C-745 CYLINDER YARD SPOILS-PCB SOILS)

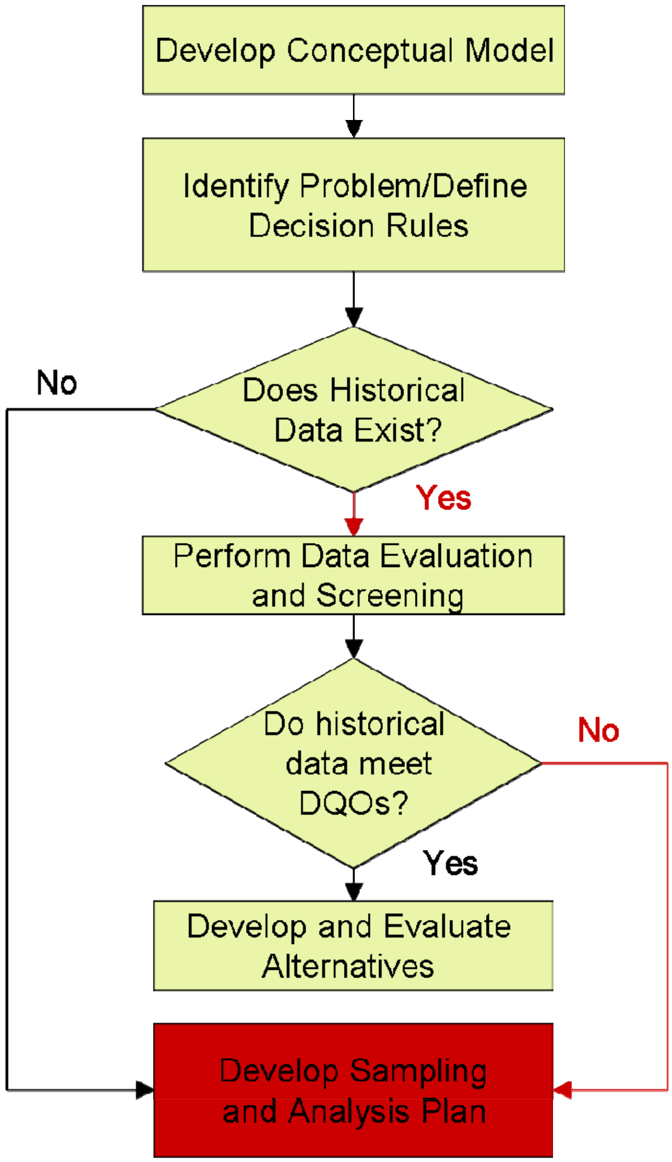

Figure D.83. Decision Tree Analysis – SWMU 160

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs and radionuclides in the surface soils. These data were collected from the following project:

- RCWC Data 92-82A

Uncertainties

The sampling from the historical project likely was targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.16 SWMU 163 (C-304 HVAC PIPING SYSTEM-SOIL BACKFILL FROM C-611)

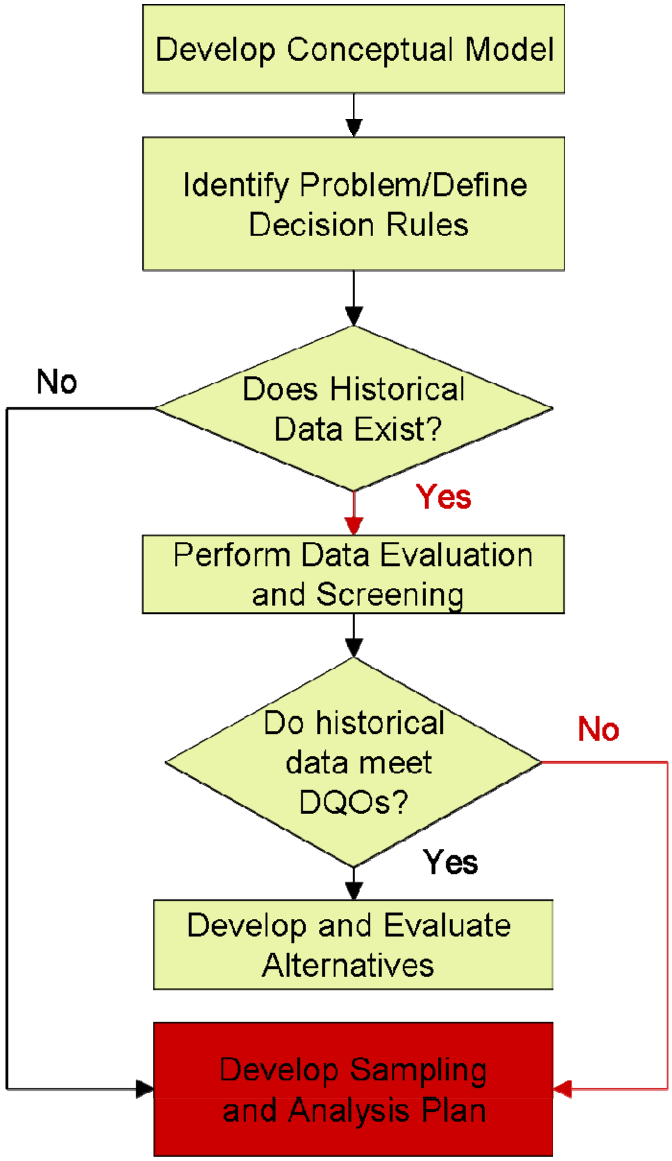

Figure D.84. Decision Tree Analysis – SWMU 163

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

No historical data for this SWMU are available in OREIS.

Uncertainties

Not available.

D.7.17 SWMU 219 (DMSA OS-08)

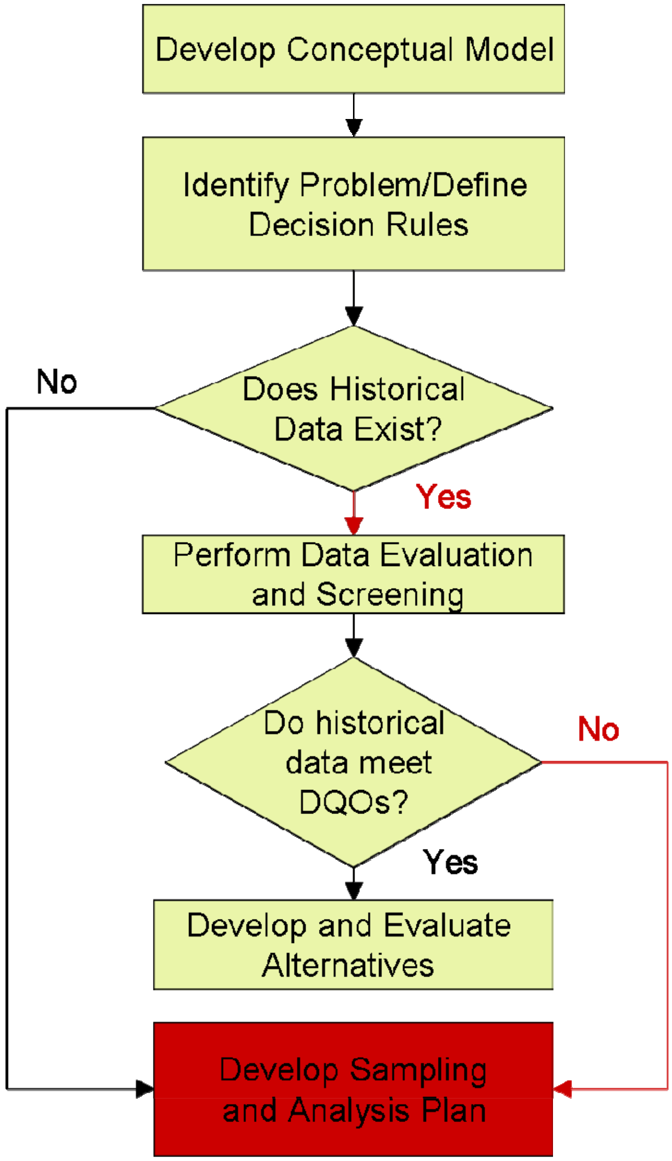

Figure D.85. Decision Tree Analysis – SWMU 219

Additional samples are planned at this location.

Develop Conceptual Model

The conceptual model is shown in Figure 6.3.

Identify Problem/Define Decision Rules

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include dioxins/furans, metals, pesticides/PCBs, radionuclides, SVOAs, and VOAs in the surface and pesticides/PCBs, radionuclides, SVOAs, and VOAs in the shallow subsurface soils. These data were collected from the following projects:

- Remedial Action Site Investigation—Phase 1
- Remedial Action Site Investigation—Phase 2
- WAG 23 Phase 1

Uncertainties

The majority of the sampling from these projects likely was targeted with biased sampling; therefore, though additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

D.7.18 SWMU 488 (PCB CONTAMINATION AREA BY THE C-410 TRAILER COMPLEX)

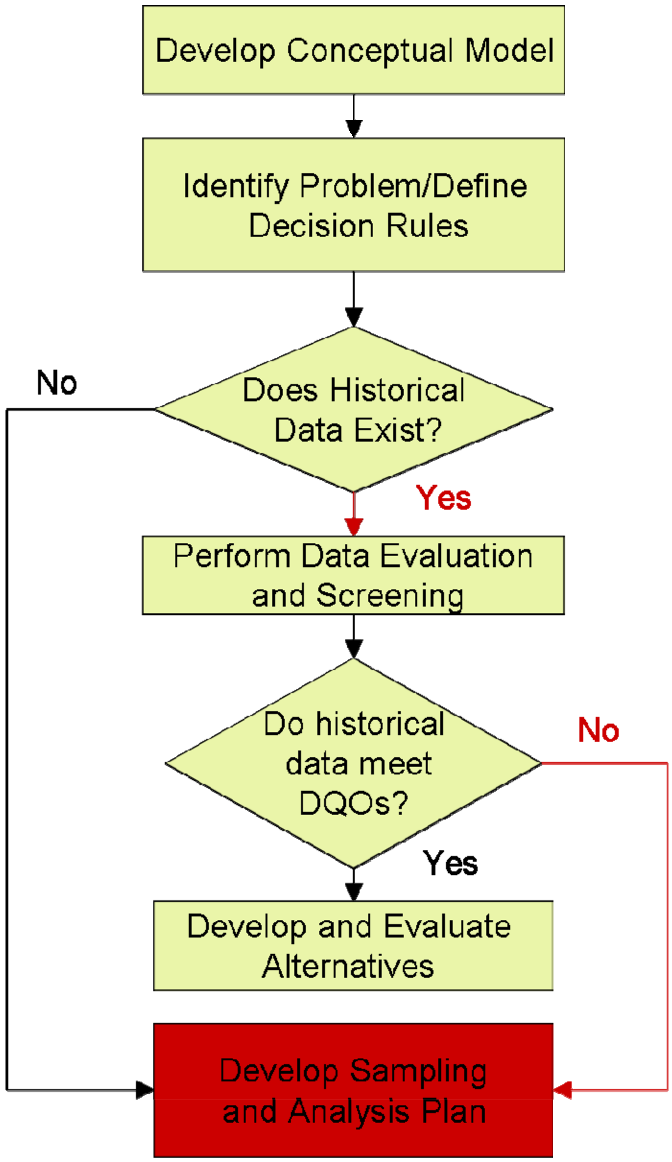

Figure D.86. Decision Tree Analysis – SWMU 488

Additional samples are planned at this location.

<u>Develop Conceptual Model</u>

The conceptual model is shown in Figure 6.3.

<u>Identify Problem/Define Decision Rules</u>

The problem and decision rules are shown in Table 1.2.

Data Evaluation and Screening

Historical data for this SWMU include pesticides/PCBs in the surface soils. These data were collected from the following projects:

- Characterization of the D&D/DMSA Trailer Complex Site—SM01-05
- PCB Characterization of the D&D/DMSA Trailer Complex Site—SM01-09

Uncertainties

Sampling from these projects may have been targeted with biased sampling; therefore, though no additional data are planned for collection during this RI, any action taken at this unit may be decided upon too conservatively.

APPENDIX E
EARLY ACTION OPTIONS

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