Department of Energy

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DEC 1 5 2010

PPPO-02-971713-11

Ms. Jennifer Tufts
U.S. Environmental Protection Agency, Region 4
Federal Facilities Branch
61 Forsyth Street
Atlanta, Georgia 30303

Mr. Edward Winner, FFA Manager
Kentucky Department for Environmental Protection
Division of Waste Management
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601

Dear Ms. Tufts and Mr. Winner:

TRANSMITTAL OF THE SITEWIDE EVALUATION WORK PLAN AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-0228&D1)

Enclosed is the D1 *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0228&D1, for regulatory review and/or approval. Per the Federal Facilities Agreement, because this is a secondary document, comments and/or approval is requested within 90 days.

If you have any questions or require additional information, please contact Rob Seifert at (270) 441-6823.

Sincerely,

Reinhard Knerr
Paducah Site Lead
Portsmouth/Paducah Project Office

Enclosure:
D1 Sitewide Evaluation Work Plan

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DOE/LX/07-0228&D1
Secondary Document

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

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DOE/LX/07-0228&D1
Secondary Document

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

Date Issued—December 2010

U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-10CC40020

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PREFACE

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, under the Soils Operable Unit (OU), was prepared to identify any unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act evaluation and to develop information usable when completing the Resource Conservation and Recovery Act EIs process for the Paducah Gaseous Diffusion Plant (PGDP). The Site Management Plan (DOE 2010a) defined the scope and provided key planning assumptions. This evaluation will include a focused radiological survey and visual walkover survey to cover U.S. Department of Energy (DOE)-owned property outside PGDP and not currently a solid waste management unit (SWMU)/area of concern (AOC). Any radiological anomalies in the West Kentucky Wildlife Management Area (WKWMA) on property owned by WKWMA, identified in radiological flyover surveys, also will be evaluated under this work plan. Anomalies identified as soil and rubble areas will be further evaluated under this work plan. Any other areas identified requiring additional investigation will be evaluated to determine the appropriate OU for follow-up investigations. Collection of field and fixed-base laboratory data will enable DOE to increase confidence that SWMU/AOCs have been appropriately identified. Information will be documented in a Site Evaluation Report, which will include SWMU/AOC Assessment Reports (SARs) for newly identified areas meeting the criteria to be managed under the Federal Facility Agreement (EPA 1998).

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CONTENTS

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FIGURES

TABLE

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ACRONYMS

AOC	area of concern
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COE	U. S. Army Corps of Engineers
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EI	Environmental Indicator
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
GPS	global positioning system
KDFWR	Kentucky Department of Fish and Wildlife Resources
MARSSIM	Multi-Agency Radiation Survey & Site Investigation Manual
NAL	no action level
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	remedial investigation
SAP	sampling and analysis plan
SAR	SWMU assessment report
SER	site evaluation report
SMP	Site Management Plan
SVOC	semivolatile organic compounds
SWMU	solid waste management unit
TNT	trinitrotoluene
USEC	United States Enrichment Corporation
VOC	volatile organic compounds
WAG	waste area group
WKWMA	West Kentucky Wildlife Management Area
XRF	X-ray fluorescence

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EXECUTIVE SUMMARY

PROBLEM STATEMENT

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, documenting work to be performed under the Soils Operable Unit (OU), was prepared to identify unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation and to develop information usable when completing the Resource Conservation and Recovery Act (RCRA) Environmental Indicators (EIs) process for the Paducah Gaseous Diffusion Plant (PGDP).

BACKGROUND

This evaluation includes scoping surveys of the U.S. Department of Energy (DOE)-owned property outside PGDP and West Kentucky Wildlife Management Area (WKWMA)-owned property around PGDP. Contamination sources may be present within the WKWMA that are not of DOE origin, for example the former Kentucky Ordnance Works occupies an area of the WKWMA southwest of PGDP.

Several evaluations/investigations have been performed in the DOE-owned areas outside PGDP to identify and appropriately manage material originating from PGDP. Ongoing efforts are being performed under the Soils OU, Surface Water OU, and Burial Grounds OU. Under the Soils OU and of relevance to this sitewide evaluation are work efforts that have been performed in support of soils and rubble area evaluations. Results of historical studies of rubble areas at PGDP and surrounding areas are presented in four reports (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995) and as part of a soil and rubble evaluation. The Waste Area Group (WAG) 17 RCRA Facility Investigation (RFI) (DOE 1995) was completed between October and December 1995 and included investigation of 37 areas of concern (AOCs). The findings of the WAG 17 RCRA Facility Investigation are provided in the Remedial Investigation (RI) report (DOE 1997a) and in the WAG 17 Record of Decision (DOE 1997b).

On November 2, 2006, Paducah Remediation Services, LLC, radiological control technicians and representatives from the Kentucky Division of Waste Management observed and surveyed a series of soil and rubble areas on the DOE Reservation. As a result of a comprehensive survey conducted in 2007, 122 soil and rubble areas were identified for possible inclusion as solid waste management units/AOCs (DOE 2007a). These existing soil and rubble areas were evaluated under the Soil Piles Sampling and Analysis Plan (SAP) (DOE 2007b): Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), Addendum 2 (DOE 2008b); and the SAP for the Rubble Areas (DOE 2008c). Work has been completed and Site Evaluation Reports have been issued for Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d); Addendum 1-B Soil Piles (DOE 2009a); Addendum 2 Soil Piles (DOE 2009b); and Rubble Areas (DOE 2009c). In addition, a Soils OU RI/Feasibility Study (RI/FS) Work Plan was prepared and implemented during 2010 (DOE 2010b).

The scope of work and key planning assumptions for this evaluation are provided in the Site Management Plan (SMP) (DOE 2010a).

PROJECT OBJECTIVES

The objective is to identify unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information that is usable when completing the RCRA EI process for PGDP.

CONCEPTUAL SITE MODEL

Known recreational activities that take place in the WKWMA include hunting and field trials (both horses and dogs). Other recreational uses, such as hiking, also are possible; therefore, recreational user exposure to surface soils is the primary exposure pathway. The teen recreational user's screening concentration is lowest when compared to the other users for the same target risk and hazard level; therefore, the teen recreational user is considered in the Conceptual Site Model for users of the WKWMA (DOE 2001). The recreational user could be exposed to contaminants through contact with surface soils through the following exposure routes:

- External exposure from ionizing radiation (the most likely exposure route)
- Dermal contact
- Incidental ingestion
- Inhalation

Industrial workers might be expected to work on DOE-owned property outside PGDP; however, this would not be on a regular basis and their exposure would be limited to performance of tasks associated with site evaluation, maintenance, and remedial action.

CONTAMINANTS

Information from soils evaluations of previous soil piles and rubble areas identified the following types of contaminants as potentially present in site media:

- Polychlorinated biphenyls
- Radionuclides
- Metals

EVALUATION STRATEGY

The SMP (DOE 2010a) provides key planning assumptions for this evaluation including scoping surveys to identify anomalies. On DOE property outside PGDP, identification of anomalies will be by radiological and visual walkover surveys, with potential anomalies identified by radiological readings at greater than twice instrument background, a release is visually identified, or an anomaly is identified by process knowledge. Radiological and visual walkover surveys currently are being performed by DOE under DOE authority to identify anomalies on DOE-owned property outside PGDP. Anomalies on property owned by WKWMA will be identified using radiological flyover surveys, with identified radiological anomalies being subject to visual and radiological walkover surveys. Radiological flyover surveys were performed under DOE authority in October through November 2009.

Anomalies, once identified, will be categorized according to physical attributes as follows:

- Soil areas–which are defined as soil piles and disturbed soil areas.
- Rubble areas–which are defined as areas of varied materials.

Confirmed anomalies (identified and categorized) will be evaluated further under this work plan.

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1. INTRODUCTION

1.1 SCOPE OF WORK

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, documenting work to be performed under the Soils Operable Unit (OU), was prepared to identify unknown contaminated areas originating from the Paducah Gaseous Diffusion Plant (PGDP) requiring further Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation and to develop information usable when completing the Resource Conservation and Recovery Act (RCRA) Environmental Indicators (EIs) process for PGDP. Information will be documented in a site evaluation report (SER). Solid Waste Management Unit (SWMU) Assessment Reports (SARs) will be attached to the SER for any new SWMUs/areas of concern (AOCs) identified during this evaluation. SWMU and AOC are defined in the Federal Facility Agreement (FFA) (EPA 1998) as follows:

"SWMU – means any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or Hazardous Waste. Such units include any area at a facility at which routine and systematic releases of hazardous wastes or hazardous constituents has occurred."

"AOC – shall include any area having a probably or known release of a hazardous waste, hazardous constituent or hazardous substance which is not from a solid waste management unit and which poses a current or potential threat to human health or the environment. Such areas of concern may require investigations and remedial action…."

According to the Site Management Plan (SMP) (DOE 2010a), the "scope of the project includes a survey of the U.S. Department of Energy (DOE)-owned property outside the limited/controlled area. A sitewide evaluation will be performed to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the RCRA EIs process." Key DOE Planning Assumptions from the Life Cycle Baseline provided in the SMP are as follows:

(1) A flyover radiological survey will be conducted for a 25 square miles area.

(2) A visual walkover survey will cover DOE-owned property that is outside PGDP and not currently a SWMU/AOC (approximately 2,676 acres). DOE property licensed to Western Kentucky Wildlife Management Area (WKWMA) and areas owned by WKWMA identified as anomalies in the flyover also will be surveyed.

(3) Visual observation also will be used to identify piles, spills, buried materials, and other anomalies.

(4) A radiological walkover survey using Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) approach will cover, at a minimum, 10% of the property identified above (approximately 240 acres). All anomalies identified will be scanned regardless of what percentage of land they cover.

(5) All anomalies will be documented on a map and in a database including location, description, photos, and data.

(6) Analytical sampling will be conducted if the radiological scan indicates contamination (i.e., twice instrument background) or a release is visually identified.

(7) Information will be documented in a SER. SARs will be attached to the SER for any new SWMUs/AOCs identified during this evaluation.

(8) Any newly identified SWMUs/AOCs will be addressed in the Soils OU Remedial Action (Phase I—Pre Gaseous Diffusion Plant Shutdown). A separate removal action will not be performed.

Soil samples (from soil areas) and wipe samples (from stained rubble areas) from confirmed anomalies that are determined to be the responsibility of DOE will be analyzed by field and fixed-base analytical methods as discussed in Sections 5, Appendix A, and Appendix B of this work plan. This work plan was prepared by the DOE prime contractor for environmental remediation at PGDP. Resulting fixed-base laboratory analytical data will be of sufficient quality so that it can be used in subsequent CERCLA documents to evaluate potential human health risks and to support decisions regarding any need for response actions. Figure 1 illustrates PGDP and surrounding area.

1.2 OBJECTIVES

The objective is to identify unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information usable when completing the RCRA EI process for PGDP. Specifically the evaluation was designed to obtain data to support the following objectives:

- Identify anomalies (based on scoping surveys) on DOE-owned and WKWMA-owned property and confirm DOE origin. DOE origin is determined on DOE-owned property by radiological and visual walkover surveys where radiological readings are greater than twice instrument background or where a release is visually identified or where an anomaly is identified by process knowledge. DOE origin is determined on WKWMA-owned property by a radiological signature from the aerial radiological survey;

- For anomalies confirmed to be of DOE origin, establish the presence or absence of DOE-related contaminants [metals, polychlorinated biphenyls (PCBs), and radionuclides];

- Collect data to perform data screening to determine if such anomalies may pose risks to human health under current use scenarios and to support future decisions; and

- Determine appropriate path forward per the FFA (EPA 1998).

1.3 GUIDANCE

The following guidance was used as a basis for preparing this work plan:

- U.S. Environmental Protection Agency (EPA), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988);

- EPA Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA 2006);

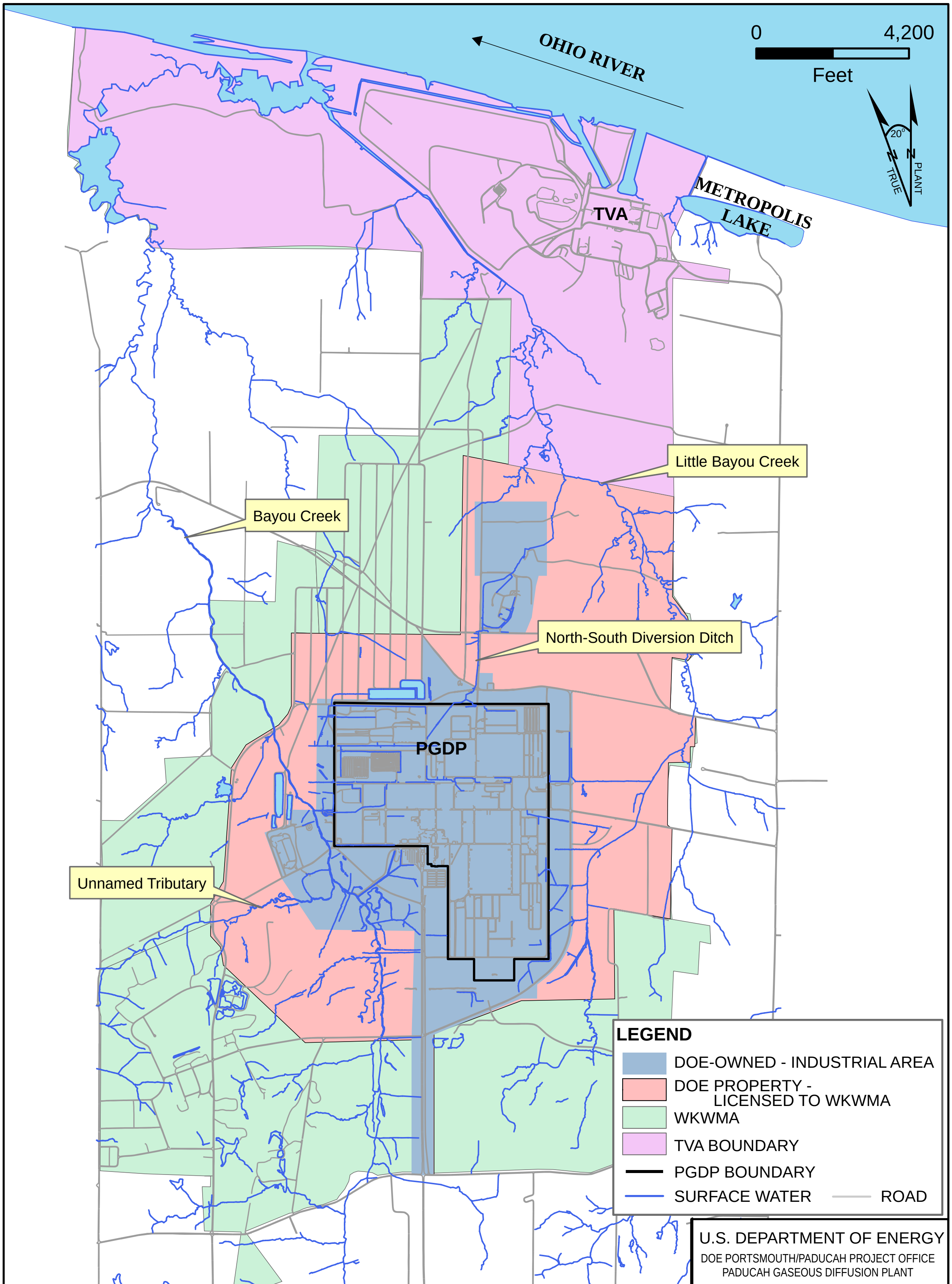

Figure 1. Map of PGDP and Surrounding Area

- EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition (EPA 2004);

- EPA Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005a; EPA 2005b; EPA 2005c; EPA 2005d);

- EPA Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (EPA 1992); and

- MARSSIM Manual (DOE 2000).

The Environmental Management (EM) Program at PGDP is conducted in compliance with several laws and regulations. In general, these laws include RCRA in 1976; CERCLA; the Clean Water Act of 1972; the Toxic Substances Control Act of 1976; the Endangered Species Act of 1973; and Commonwealth of Kentucky statutes and regulations. DOE may perform maintenance actions under its authority provided in the Atomic Energy Act. Although all of these regulations impact the PGDP EM Program, this work plan is designed to support CERCLA decisions concerning unknown contaminated areas.

1.4 WORK PLAN ORGANIZATION

Section 2 includes information on site background and physical setting. Section 3 is an initial evaluation of the site including the site conceptual model. Section 4 provides a brief description of tasks to be performed, Section 5 provides the work plan rationale, and Section 6 provides a schedule.

Appendix A of this work plan contains the Sampling and Analysis Plan (SAP). Various methods will be used to assist in identifying specific anomalies to be evaluated further; therefore the specific types and numbers of anomalies, sample locations and numbers, and sample designations will documented in work package documents. Appendix B contains the Quality Assurance Project Plan (QAPP); Appendix C contains the Environment, Safety, and Health Plan; and Appendix D contains the Data Management Implementation Plan.

2. SITE BACKGROUND AND PHYSICAL SETTING

PGDP, located within the Jackson Purchase region of western Kentucky, is an active uranium enrichment facility owned by 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 (USEC) assumed management and operation of the PGDP enrichment facility under a lease agreement with DOE. DOE retains ownership of the enrichment complex. The DOE Portsmouth/Paducah Project Office is responsible for EM activities associated with PGDP (CERCLIS# KY8-890-008-982) and serves as the lead agency for remedial actions at PGDP. EPA Region 4 and Kentucky Department for Environmental Protection serve as the regulatory oversight agencies for the facility.

Of the 1,386 ha (3,423 acres) owned by DOE, approximately 303 ha (749 acres) of this parcel are inside PGDP. Most of the facilities used to support enrichment operations are located in this area. Outside PGDP, several support facilities for both the DOE and USEC missions can be found. The support facilities include landfills (both active and closed), modular office complexes, a water treatment facility, groundwater remediation systems, decontamination facilities, storage areas, a storm water retention basin, and liquid effluent treatment facilities. Of the remaining DOE land, approximately 842 ha (2,081 acres) is licensed to the Commonwealth of Kentucky Department of Fish and Wildlife Resources (KDFWR) and serves as a portion of the WKWMA. The licensed portion of the WKWMA is used by the public for hunting and horse and dog field trials. KDFWR staff work in the licensed area performing wildlife management activities.

The topography of the DOE Reservation is level to slightly rolling. It is rural and predominantly open grasslands with scattered wooded areas of mature hardwoods and brush. Approximately 60% of the total area outside PGDP but on the DOE Reservation is grasslands; much of this non-wooded area contains electrical power lines.

Two creeks—Bayou Creek and Little Bayou Creek—pass through the DOE Reservation, draining north into the Ohio River. Multiple permitted drainage outfalls and ditches from PGDP discharge to these two creeks. There are approximately 11,000 m (36,100 ft) of combined drainage ditches and creeks that potentially have been impacted by PGDP discharges. Areas in and near outfall ditches were surveyed previously and are posted appropriately.

Contamination sources may be present within the WKWMA that are not of DOE origin; for example, the former Kentucky Ordnance Works occupies an area of the WKWMA southwest of PGDP. Substantial work has been performed in areas outside PGDP to identify, and appropriately manage, material originating from PGDP. Ongoing efforts are being performed under the Soils OU, Surface Water OU and Burial Grounds OU. Under the Soils OU and of relevance to this sitewide evaluation are the work efforts that have been performed in support of soils and rubble area evaluations. Results of historical studies of rubble areas at PGDP and surrounding areas are presented in four reports (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995) and as part of an ongoing soil and rubble evaluation (see below). The Waste Area Group (WAG) 17 RCRA Facility Investigation (RFI) (DOE 1995) was completed between October and December 1995 and included investigation of 37 AOCs. The findings of the WAG 17 RFI are provided in the Remedial Investigation (RI) report (DOE 1997a) and in the WAG 17 Record of Decision (DOE 1997b). Radionuclides and polychlorinated biphenyls (PCBs) are the primary potential contaminants of concern for pre-GDP shutdown. The Soils OU focuses on accessible plant surface soils (ground surface to 10 ft bgs and 16 ft bgs in the vicinity of pipelines). A series of Soils OU actions have been completed to date and a removal action for soils at SWMUs 19 (C-410-B HF Neutralization Lagoon), and 181 (C-218 Outdoor Firing Range) is being implemented as a non-time-critical removal.

On November 2, 2006, Paducah Remediation Services, LLC radiological control technicians and Kentucky Division of Waste Management personnel observed and surveyed a series of soil piles on the DOE Reservation. As a result of a comprehensive survey conducted by DOE in 2007, additional soil and rubble areas were identified in a letter for possible inclusion as SWMUs/AOCs (DOE 2007a). This letter, dated February 17, noted that "a total of 150 areas, consisting of soil and rubble have been identified to date." Of those 150 areas, 28 areas previously have been identified as SWMUs or AOCs, and 13 areas had sufficient data to make a SWMU or AOC determination, leaving 109 areas (85 soil areas and 24 rubble areas) to be evaluated. All of the soil areas were on DOE property whereas only 6 of the 24 rubble areas were on DOE property. The letter contained a planning schedule for characterization and notification for the soil and rubble areas on DOE property, and the work was subsequently incorporated into the SMP as part of the soil/rubble areas under the Soils OU. These areas and two additional soil piles (AOCs 492 and 541) currently are being evaluated under the Soil Piles SAP (DOE 2007b) and associated addenda, Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b). In addition, identified rubble areas are being evaluated under the Rubble Areas SAP (DOE 2008c). In order to facilitate the process, these soil and rubble areas were prioritized as follows:

- Little Bayou Creek Soil Pile I on the east side of the plant between McCaw Road and Outfall 002 Ditch – Addendum 1-A.

- Little Bayou Creek including AOC 492 and 541 north and east of the plant including the North-South Diversion Ditch, but excluding Soil Pile I–Addendum 1-B.

- Bayou Creek and unnamed tributary west side of the plant – Addendum 2.

- Rubble areas.

Existing SWMUs/AOCs (i.e., identified to date and covered under other work elements) outside PGDP are shown in Figure 2. Work has been completed and SERs have been issued for Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d): Addendum 1-B Soil Piles (DOE 2009a); Addendum 2 Soil Piles (DOE 2009b); and Rubble Areas (DOE 2009c). In addition, a Soils OU RI/Feasibility Study (RI/FS) Work Plan is being prepared (DOE 2010b).

In order to expedite the current sitewide evaluation, DOE is proceeding with a radiological and visual walkover survey (planning assumptions 2 through 5 in the 2009 SMP, as noted in Section 1) of the DOE-owned property outside PGDP for the purpose of identifying potential anomalies (DOE 2008e). DOE is performing this task under its own authority. Planned surveys are complete and 633 anomalies were visually identified. All anomalies have been radiologically surveyed and all are less than twice instrument background.

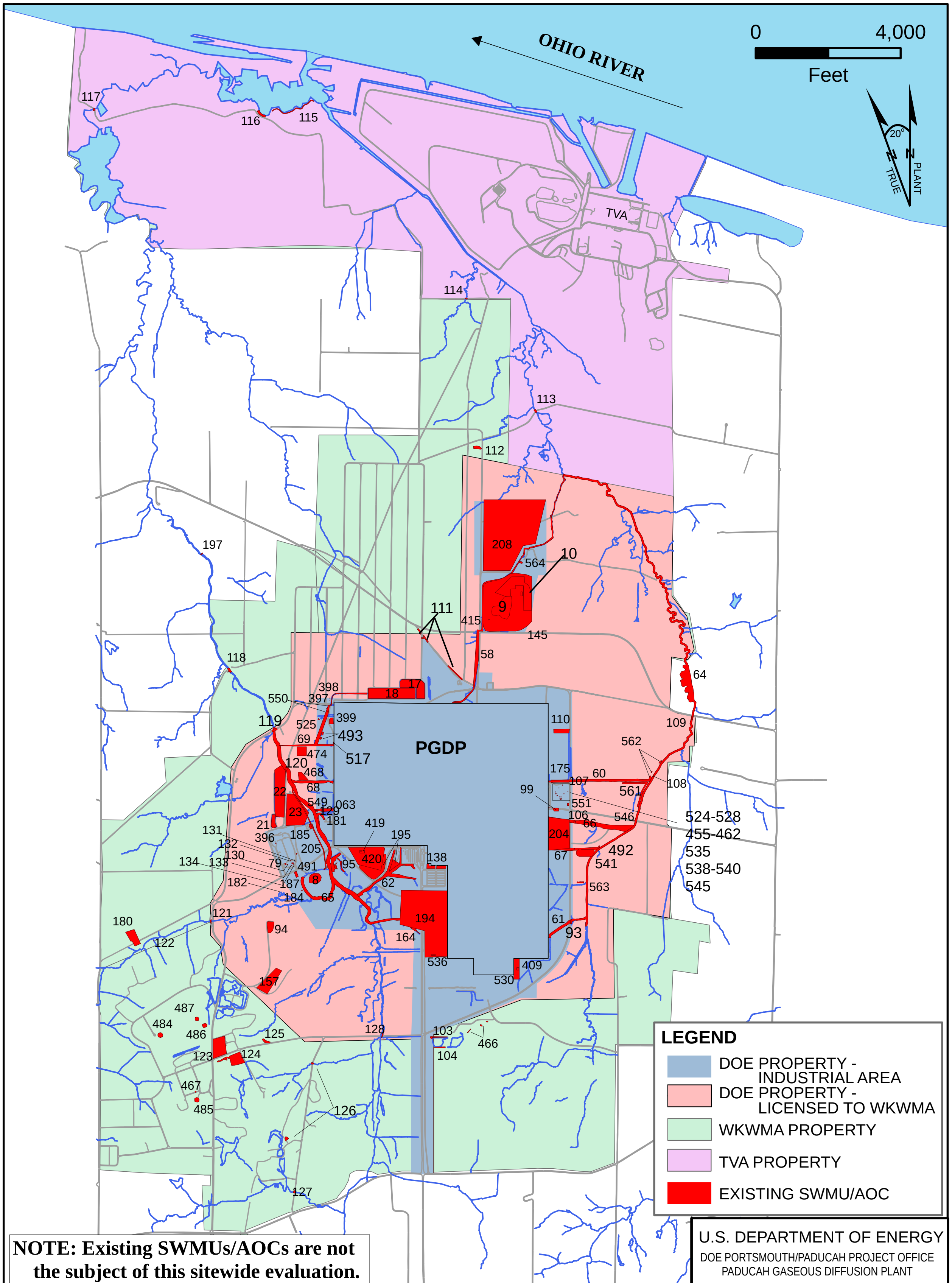

Figure 2. Existing SWMUs/AOCs outside PGDP

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3. INITIAL EVALUATION

Based on previous experience (DOE 2007a), the types of anomalies expected to be encountered likely will consist of bare soil areas (possibly indicative of spills), soil piles, and rubble areas. Existing soil piles and rubble areas being investigated under other Soils OU SAPs are generally located adjacent to PGDP outfalls, Little Bayou and Bayou Creeks, along the unnamed tributary, and the North-South Diversion Ditch. Unknown contaminated areas might be expected to be found near surface water drainages, near the edges of woods, and near roadways. Proximity to surface water drainage areas results in several potential secondary exposure routes that potentially could impact human health and the environment. The majority of the secondary routes assume that soils either have been released to adjacent waterways or moved through the food chain. Precipitation could result in contaminant migration; however, PGDP historical monitoring data over the past 5-10 years indicate little migration is occurring because contaminant levels in surrounding creeks are stable or decreasing.

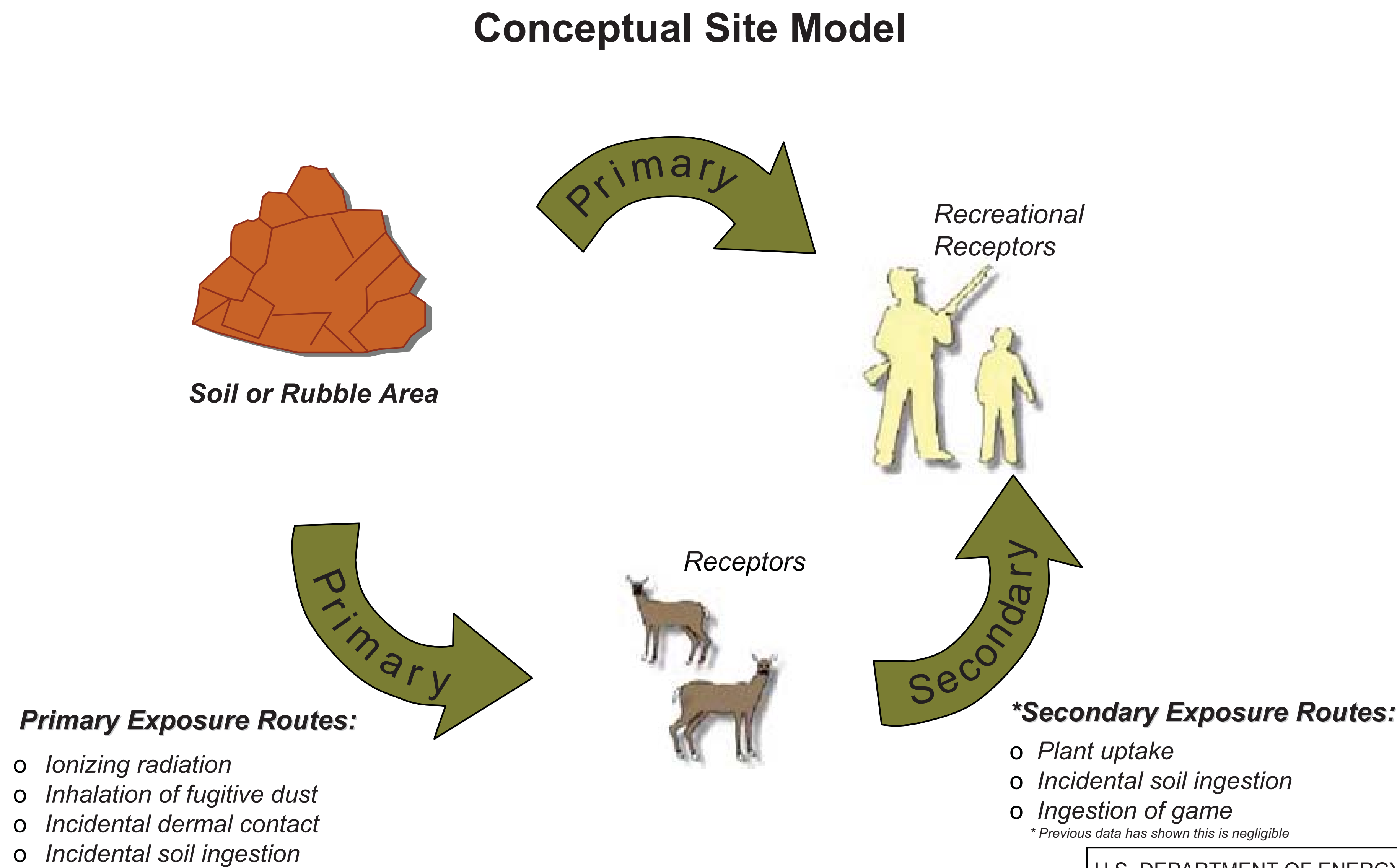
Contaminants found during sampling of soil piles under the Soil Piles Evaluation (DOE 2008d; DOE 2009a; DOE 2009b) do not bioaccumulate in plants to a great degree. As a result, plant uptake and corresponding accumulation in animal tissue is unlikely, but soil ingestion as part of normal feeding activities is likely a complete pathway. Ecological receptors also may be exposed to on-site contaminants; however, the primary focus of this evaluation effort is to determine risks to human health. Evaluation of ecological risks will be completed as part of a subsequent action under the PGDP FFA (EPA 1998). Fixed-base laboratory analytical data from samples collected as part of this site evaluation shall be of sufficient quality to be used for risk assessment purposes.

Sampling is necessary to gather data to allow DOE to assess potential risks to human health posed by confirmed anomalies. Sampling also provides data to assist in future determination of nature and extent of any contamination. Contaminants attributable to DOE activities that might be present include metals, PCBs, and radionuclides. It should be noted that metals and PCBs may be present from other sources.

Based on experience gained through execution of the SAP for the Soil Piles Evaluation (DOE 2007b) and its addenda [Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b)] and the SAP for the Rubble Areas (DOE 2008c), as reported in the SERs [Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d), Addendum 1-B Soil Piles (DOE 2009a), Addendum 2 Soil Piles (DOE 2009b)], and Rubble Areas (DOE 2009c), volatile organic compounds (VOCs) are not expected to be encountered and semivolatile organic compounds (SVOC) are ubiquitous; therefore, the presence of these compounds will not be evaluated. Consideration will be given to adding groups of compounds to the analysis requirements, such as VOCs, SVOCs, and asbestos, if visual walkover survey observations, research, and/or process knowledge of identified anomalies indicate that it is warranted.

The following information describes the Conceptual Site Model for the unknown contaminated areas (see Figure 3).

Recreational activities known to take place in the evaluation area include hunting and field trials (horses and dogs). Other recreational uses, such as hiking, also are possible; therefore, recreational user exposure to surface soils is the primary exposure pathway. The recreational user could be exposed to contaminants by contact with surface soils through the following exposure routes:



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DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

LATA Environmental Services of Kentucky, LLC

Figure 3. Conceptual Site Model

- External exposure (ionizing radiation)
- Dermal contact
- Incidental ingestion
- Inhalation

Industrial workers might be expected to work on DOE-owned property outside PGDP; however, this would not be on a regular basis and their exposure would be limited to performance of tasks associated with site evaluation, maintenance, and remedial action.

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4. TASKS

The following presents tasks necessary to complete this sitewide evaluation.

4.1 SCOPING SURVEYS

Scoping surveys, as described in Section A.3, will be performed to identify anomalies. On DOE property outside PGDP, identification of anomalies will be by radiological and visual walkover surveys, with potential anomalies identified by radiological readings at greater than twice instrument background or a release is visually identified or an anomaly is identified by process knowledge. Radiological and visual walkover surveys currently are being performed by DOE under DOE authority to identify anomalies on DOE-owned property outside PGDP. Anomalies on property owned by WKWMA will be identified using radiological flyover surveys (see Figure 4), with identified radiological anomalies being subject to visual and radiological walkover surveys. Radiological flyover surveys were performed under DOE authority in October through November 2009. Aerial photographic surveys were performed in May, 2009 for the purpose of providing an updated base map. Information on anomalies gathered from the radiological and visual walkover surveys will include the following descriptive data: location [using global positioning system (GPS)], areal footprint, height of pile or depth of depression, and physical description.

Once anomalies are identified, they will be categorized based on physical attributes and then evaluated by performing sampling and data screening activities that are appropriate to the category, and as described in Section 5.

4.2 FIELD SAMPLING ACTIVITIES

Activities included in this task are as follows:

- Subcontractor procurement
- Planning
- Mobilization
- Anomaly description and documentation
- Site preparation activities (such as clearing and grubbing)
- Civil survey (using GPS) and sample location staking/marking
- Media sampling (for field laboratory testing and fixed-base laboratory testing)
- Field laboratory analytical testing
- Sample shipping
- Equipment decontamination
- Investigation derived waste management and disposal
- Task management

If archeological features/artifacts are discovered during clearing, grubbing, and soil sampling, DOE will proceed in accordance with the approved Cultural Resources Management Plan.

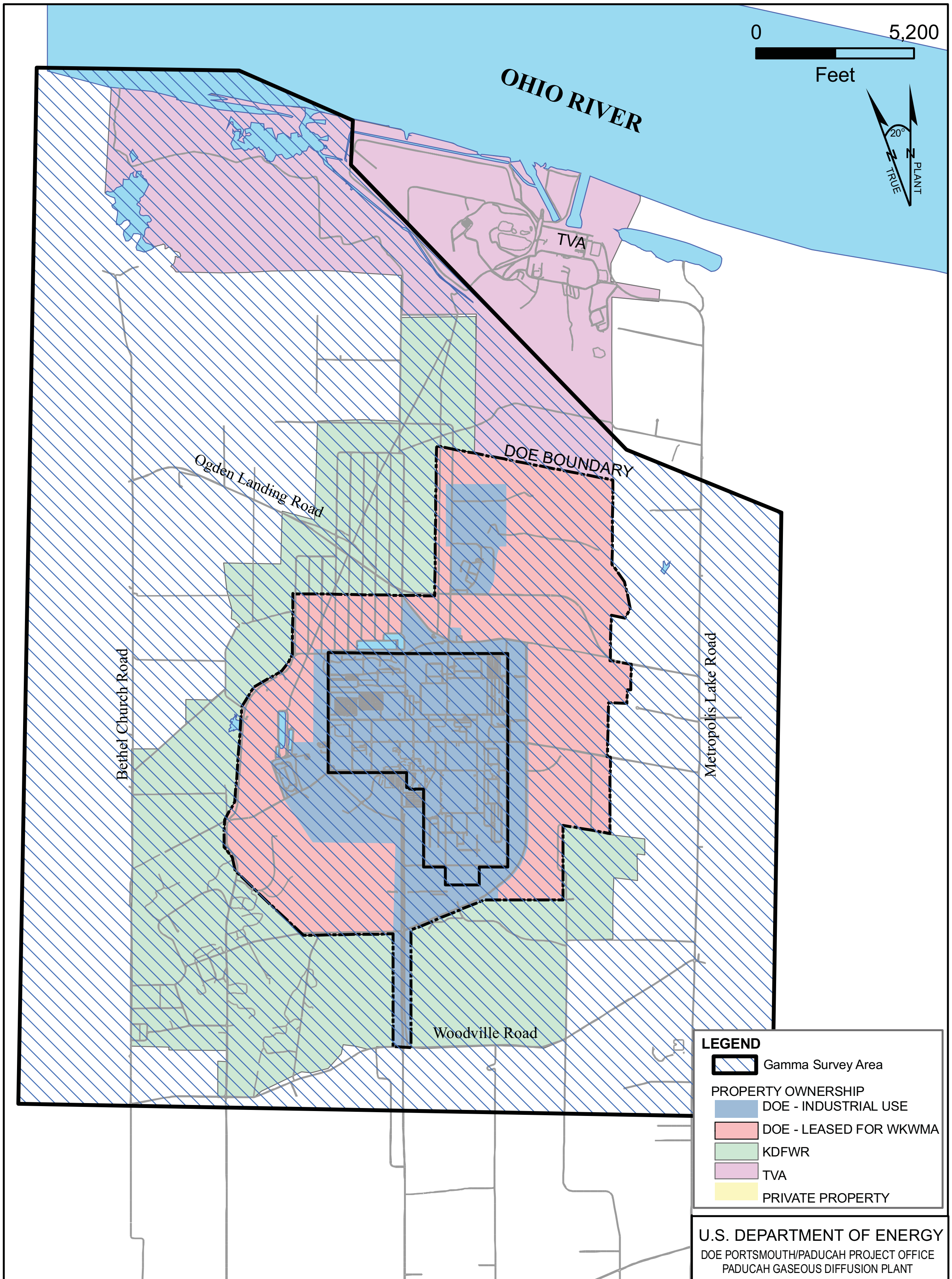


Figure 4. PGDP Radiological Aerial Survey Area 2009

4.3 SAMPLE ANALYSIS/VALIDATION AND DATA SCREENING

This task will include analysis of media samples at the fixed-base laboratory, sample validation as described in Appendix B, and data screening. Field and fixed-base analytical results will be used to meet the sampling objectives. Data screening will be performed with the principal objective of informing risk managers in support of decision making for the site. Key considerations include the following:

- Determine whether all or portions of the study area may be eliminated from concern.
- Identify where risk characterization suggest actions may be needed.
- Determine whether additional data gathering and/or risk assessments are warranted.

The data screening provides information to the stakeholders based on the Commonwealth of Kentucky and nationally accepted risk assessment methods. These objectives are consistent with the goals, objectives, and requirements identified in the Paducah Risk Methods Document (DOE 2001). The scope of the screening is to assess risks to human receptors who may be exposed to chemicals or radionuclides through normal recreational use of the site. This data screening does not examine ecological risks.

To determine the presence or absence of contaminants in each anomaly, contaminant concentrations from field and fixed-base laboratory analyses will be compared to the values for background and teen recreator no action levels (NALs) provided in the PGDP Risk Methods Document (DOE 2001), and as shown in Table 1. Nondetect results will not be considered present above background or NALs even if the detection limit for the chemical is greater than the background or NAL value. Detection limits that are higher than background and/or NALs will be addressed as an uncertainty in the SER.

Following data screening, those constituents that (1) exceed PGDP background concentrations or (2) exhibited concentrations in excess of the teen recreator NALs will be considered as contaminants of potential concern for quantitative risk assessment in future investigative activities of the anomaly. Section 40 *CFR* § 300.420 sets the criteria if a remedial action is warranted.

4.4 SITE EVALUATION REPORT

After project data has been validated and fully evaluated, a SER [consistent with Section IX of the FFA (EPA 1998)] will be prepared. This SER, which is a combined removal/remediation site evaluation and SAR, will document the findings as a result of implementation of this work plan will follow the outline in Appendix D of the FFA (EPA 1998) and will include the following:

- A description of the project scope and objectives with regulatory overview and project background;

- Physical description of the project area including potential sources of contamination (if applicable);

- Description of field and analytical methods;

- Quality Assurance/Quality Control Report;

- Discussion and results, including the conceptual site model and distribution of contaminants (if present);

- Results of data screening;

- Recommendations; and
- SAR (if applicable).

Table 1. Data Screening Criteria[1]

Analyte	Child Resident No Action Level (mg/kg or pCi/g)[1]	Child Resident Action Level (mg/kg or pCi/g)[1]	Teen Recreational User No Action Level (mg/kg or pCi/g)[1]	Teen Recreational User Action Level (mg/kg or pCi/g)[1]	PGDP Surface Background (mg/kg or pCi/g)[2]	PGDP Subsurface Background (mg/kg or pCi/g)[2]
Aluminum	732	100,000	3,010	100,000	13,000	12,000
Antimony	0.0635	46.9	0.242	344	0.21	0.21
Arsenic	0.132	35	0.346	314	12	7.9
Barium	37	12,500	148	100,000	200	170
Beryllium	0.16	158	0.606	884	0.67	0.69
Cadmium	2.64	11.5	14.7	45.3	0.21	0.21
Calcium	N/A	N/A	N/A	N/A	200,000	6,100
Chromium	60.5	71,900	227	100,000	16	43
Cobalt	209	13,300	1,390	100,000	14	13
Copper	68.1	7,900	331	100,000	19	25
Iron	314	60,500	1,350	100,000	28,000	28,000
Lead	50	400	50	400	36	23
Magnesium	N/A	N/A	N/A	N/A	7,700	2,100
Manganese	7.46	3,700	29	39,100	1,500	820
Mercury	0.158	100,000	0.634	797	0.2	0.13
Molybdenum	10.9	1,080	56.4	41,700	N/A	N/A
Nickel	34	4,240	161	100,000	21	22
Selenium	12.1	1,090	65	44,700	0.8	0.7
Silver	6.12	1,030	27	27,100	2.3	2.7
Sodium	N/A	N/A	N/A	N/A	320	340
Thallium	0.107	16.6	0.479	465	0.21	0.34
Uranium	2.16	133	14.7	6,830	4.9	4.6
Vanadium	0.562	554	2.12	3,090	38	37
Zinc	401	62,200	1,800	100,000	65	60
Aroclor-1016	0.0574	7.08	0.127	28.3	N/A	N/A
Aroclor-1221	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1232	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1242	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1248	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1254	0.0388	2.02	0.127	13.1	N/A	N/A
Aroclor-1260	0.0574	10.5	0.127	28.3	N/A	N/A
Total PCBs	0.0574	10.5	0.127	28.3	N/A	N/A
Americium-241	0.836	83.6	11.6	1,160	N/A	N/A
Cesium-137 [3]	0.0128	1.28	0.178	17.8	0.49	0.28
Neptunium-237 [3]	0.0405	4.05	0.565	56.5	0.1	N/A
Plutonium-238	2.27	227	31	3,100	0.073	N/A
Plutonium-239/240	2.22	222	30.3	3,030	0.025	N/A
Technetium-99	67.4	6,740	926	92,600	2.5	2.8
Thorium-228	0.00418	0.418	0.0584	5.84	1.6	1.6
Thorium-230	2.85	285	39	3,900	1.5	1.4
Thorium-232	2.61	261	35.7	3,570	1.5	1.5
Uranium-234	3.81	381	52.2	5,220	1.2	1.2
Uranium-235 [3]	0.0591	5.91	0.826	82.6	0.06	0.06
Uranium-238 [3]	0.261	26.1	3.64	364	1.2 (0.4)[4]	1.2 (0.4)[4]

N/A = not available or not applicable.
[1] Values in table are current values and will be updated prior to completion of the Sitewide Evaluation Report. ELCR, HI, and Action Levels are provided in Table A.14 and ELCR, HI, and No Action Levels are provided in Table A.17 of the Risk Methods Document (DOE 2001).
[2] PGDP background values are taken from Table A.12 of the Risk Methods Document (DOE 2010c).
[3] Screening values derived considering the contribution from short-lived decay products.
[4] Adjusted values in parentheses will be used for screening if nitric acid is used for sample extraction.

5. WORK PLAN RATIONALE

This work plan was prepared to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the RCRA EIs. This evaluation will include a radiological survey and visual walkover survey to cover DOE-owned property outside PGDP and currently not a SWMU/AOC. This work was performed under DOE authority. Any anomalies in the WKWMA, on property owned by WKWMA, identified in flyover surveys also will be evaluated under this work plan. The sampling approach for identified anomalies will be based on their physical form (e.g., soil and rubble areas). Collection of field and fixed-base laboratory data will enable DOE to increase confidence that SWMUs/AOCs have been appropriately identified.

5.1 SCOPING SURVEY APPROACH

Figure 5 shows the generalized approach to the radiological scoping surveys (DOE 2008e) that are and will be used to identify anomalies for categorization and further evaluation based on physical form:

- Soil areas–which are defined as soil piles and disturbed soil areas.
- Rubble areas–which are defined as areas of varied materials.

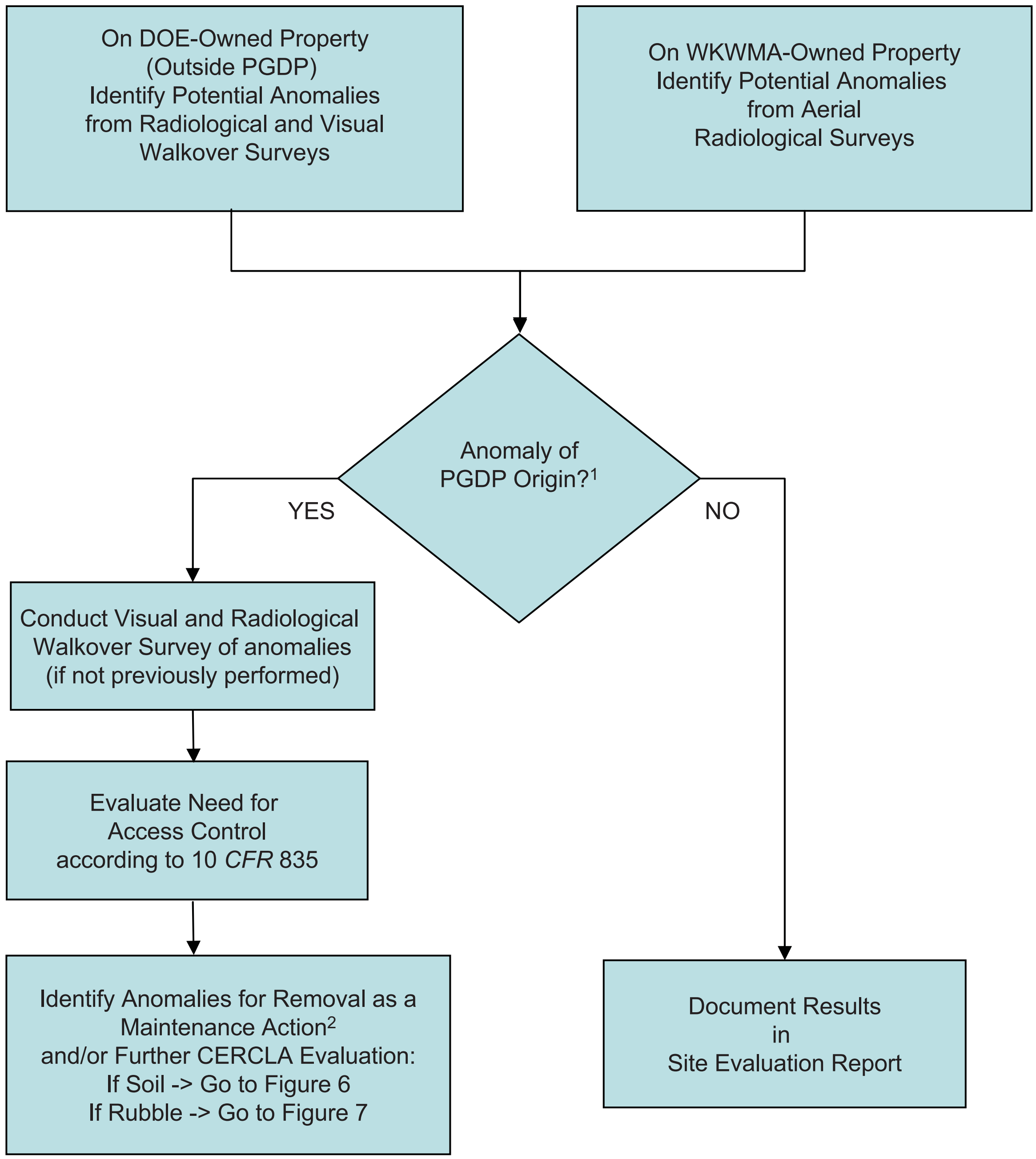
It should be noted that aerial, visual walkover and radiological walkover surveys have been conducted and are ongoing. To date no anomalies have been discovered with a radiological reading of greater than twice instrument background.

Categorized anomalies will be further evaluated using the approaches described in Sections 5.2 and 5.3 if the radiological screening indicates greater than twice instrument background and/or visual evidence (including process knowledge) indicates a possible origin from PGDP. Work package documents will be prepared after surveys are completed and prior to any sampling activities to provide more specific information to field personnel on sample locations, numbers, analyses, and designations, etc.

5.2 SOIL AREAS SAMPLING APPROACH

Soil areas will be evaluated based on the approach provided in Figure 6. This approach has been developed taking into account results from other soil pile evaluations (DOE 2008d; DOE 2009a; and DOE 2009b). No previous sampling efforts have been performed on the soil that will be evaluated as part of this study. A systematic biased sampling approach will be implemented for small soil areas or piles and a systematic random approach will be implemented for large soil areas or piles consistent with approved methodologies for soil piles investigated under other SAPs. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. Soils areas are divided into two groups: small and large. Soil areas whose length and width are less than or equal to 30 ft are classified as small. Soil areas whose length or width is greater than 30 ft are classified as large.

These approaches are designed to ensure data are acquired from all soil piles and a sufficient number of samples are collected to aid in determining the concentration and distribution of constituents throughout the study area.



[1] On DOE property outside PGDP, potential anomalies will be identified by radiological readings at greater than twice instrument background or where a release is visually identified or where an anomaly is identified by process knowledge. On WKWMA property potential anomalies will be identified by radiological flyover surveys.

[2] Rubble areas only - if the anomaly is removed as a maintenance action, conduct a radiological scan, collect a sample of underlying soil and document the results in the SER.

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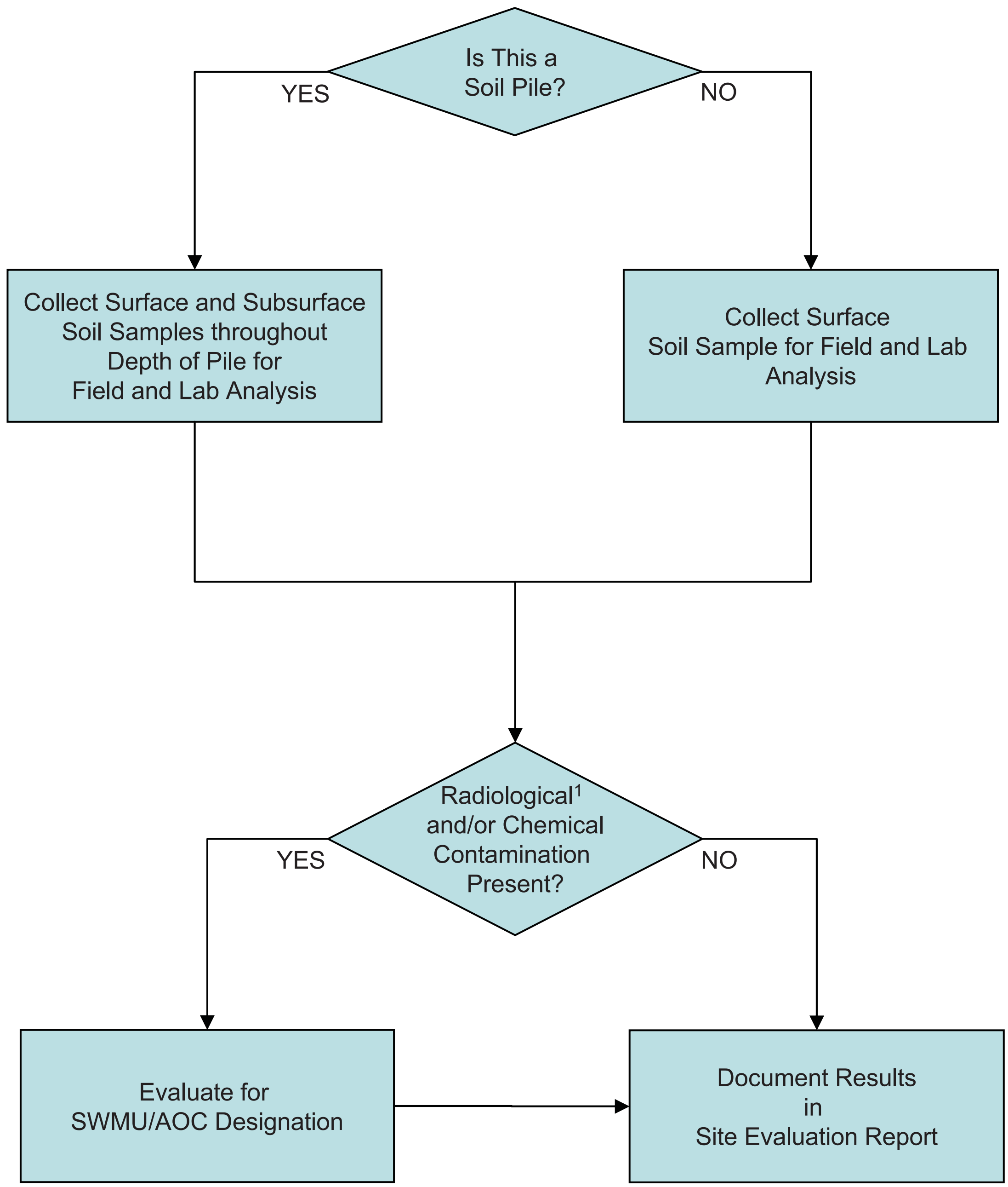
Figure 5. Sitewide Scoping Survey Decision Flowchart



[1] Radiological contamination is considered present if radiological signature is greater than twice instrument background

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Figure 6. Sampling Approach for Soil Areas

Prior to the collection of soil samples, each soil area or pile will be visually evaluated to determine the necessity for clearing and grubbing. Site preparation will occur prior to any sampling activities. In addition, each location will undergo a radiological survey as discussed in Appendix A.

5.2.1 Sample Locations

Following site preparations, sample locations will be identified, staked, and surveyed (using GPS).

5.2.1.1 Small soil areas/piles

For small soil piles, a single location at the highest point of the pile will be sampled. For small soil areas, a single location at the approximate center of the area will be sampled. It is assumed that the highest point or central points would represent the most likely place to encounter contamination, if it exists. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading also will be taken and analyzed at a fixed-base laboratory for radiological constituents.

5.2.1.2 Large soil areas/piles

A 50 ft grid will be used to place sample locations for each large soil area/pile. Samples will be collected from within the grid square at the approximate center. Sample locations for large soil piles may be adjusted at the discretion of the project manager and field team leader, if actual field conditions indicate a predetermined sample location cannot be accessed. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. If a given location is moved, the reason for the move (e.g., tree is in the way), along with its spacing in relation to adjacent locations, will be fully documented in the field logbook.

Soil piles found to date (DOE 2007a) and being investigated under other work elements generally have covered a large area with large variation in pile size; therefore, a systematic sampling approach has been developed. It is designed to ensure that data is acquired from all soil areas/piles, irrespective of their size, while ensuring that a sufficient number of samples is acquired to support informed decision making. To develop the sampling strategy, practices previously approved at PGDP have been consulted and form the basis for the sampling design. Recent SAPs contain provisions for a similar sample density in similar settings, employing sample spacing ranging from 10 to 50 ft as a means of identifying contamination and delineating contamination. Generally, sample spacing from 35 to 50 ft has been accepted for initial data acquisition, with tighter spacing applied to delineate contamination boundaries.

5.2.2 Sample Requirements

Samples from bare soil areas (no relief above grade) will be collected from the surface only (0-1 ft depth). Metals, PCBs, and site-related radionuclides are generally immobile; therefore, if site-related material were placed on the ground surface, it likely would still be present at the surface. Consequently, if no contamination is detected at the surface, then it is reasonable to assume that no contamination would be detected in deeper soil. If the site evaluation indicates that contamination is present in the surface soil of bare soil areas at concentrations that indicate further investigation is warranted, then this recommendation would be included in the SER.

Samples from small and large soil piles will be collected from the following depth intervals:

- A surface soil sample will be acquired from 0-1 ft at every sampled location.

- Thereafter, soil cores will be advanced and soil samples collected at 3 ft intervals, until the interface with the soil pile and the natural grade has been reached. For any soil interval, where the span to the natural grade is greater than 1 ft but less than 3 ft, the sampler will be halted when the natural grade is reached, irrespective of its length. Multiple cores over this span may be collected to acquire sufficient sample volume for field and laboratory analyses. If multiple cores are required, they will be combined and homogenized before they are placed in containers for analysis.

For small soil piles/areas with only one sample location, no field laboratory analysis will occur and all soils samples will be submitted to a fixed-base laboratory for analysis of metals, PCBs, and radionuclides per the methods specified in Appendix B worksheet #15-1, 15-2, and 15-3.

For large soil piles/areas all soil samples will undergo field laboratory analyses for metals [by X-ray fluorescence (XRF)], radioactivity (by GM scan), and PCBs (using test kits). Ten percent of the samples will be randomly preselected for definitive fixed-base laboratory analysis for metals (Appendix B worksheet #15-4) and PCBs (Appendix B, worksheet #15-5), with a minimum of one surface soil sample and one subsurface soil sample per large pile and one surface soil sample per large bare soil area.

5.3 RUBBLE AREAS SAMPLING APPROACH

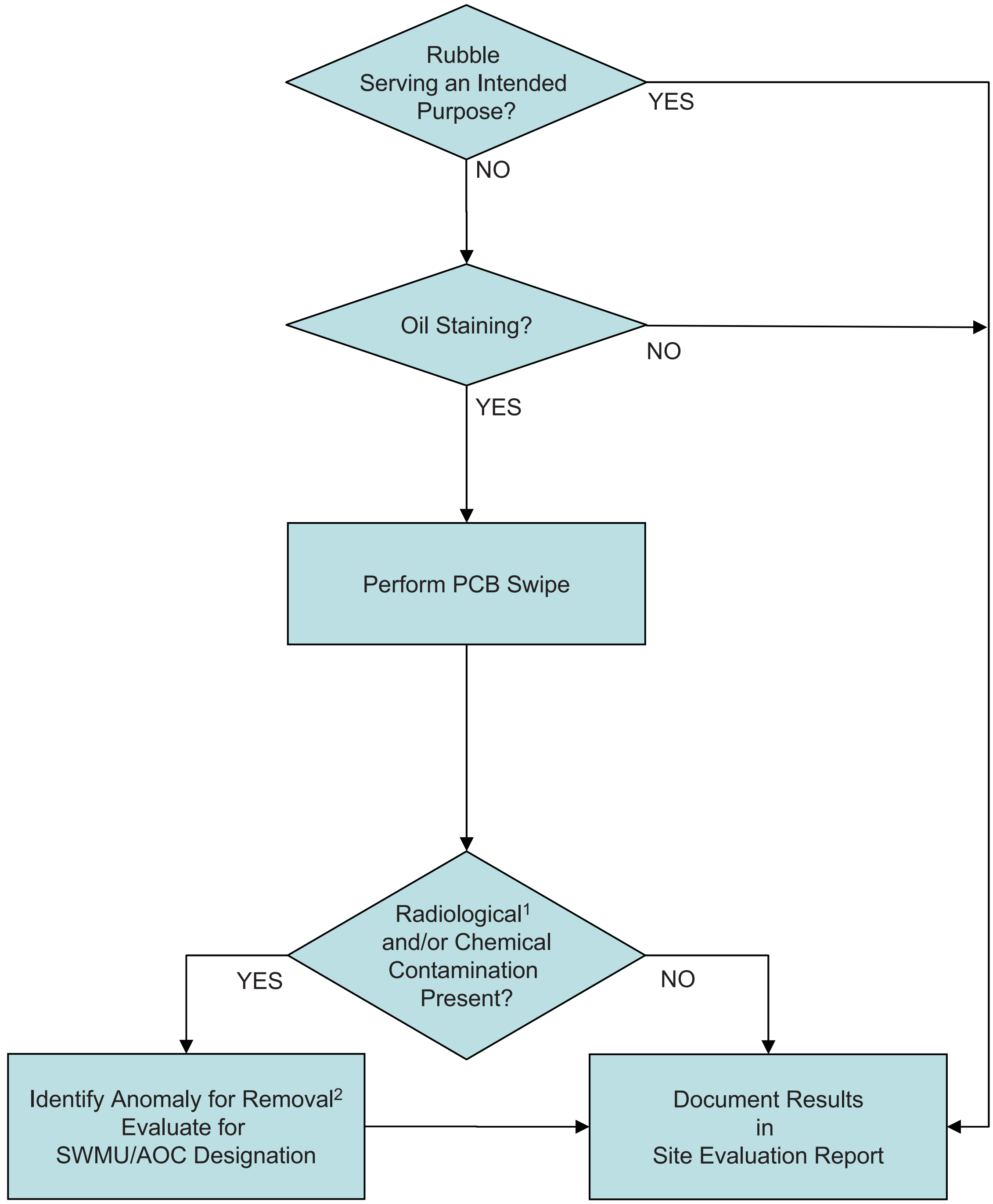
Rubble areas will be evaluated based on the approach provided in Figure 7. The approach for the rubble areas is has been developed taking into consideration results from similar studies conducted at PGDP such as WAG 17 (DOE 1995) and Rubble Piles Evaluation (DOE 2009c). The results of these evaluations, in addition to 2006 radiological survey data, indicate there is no widespread contamination in rubble areas.

Each rubble area will be visually evaluated to determine the necessity for clearing and grubbing. Site preparation will occur prior to any sampling activities. In addition, each location will undergo a radiological survey as discussed in Appendix A. For rubble areas exhibiting oil staining, wipe samples of the oil stained portion of rubble will be collected for field analysis of PCBs. No additional sampling will occur.

DOE may elect to remove any rubble area as a maintenance action. If so, upon removal of the rubble, one surface soil sample will be collected from immediately beneath the rubble area.

5.3.1 Sample Locations

Wipe samples will be collected from rubble areas that exhibit oil staining. If the rubble area is removed as a maintenance action, one surface soil sample will be taken from immediately below the rubble area, at the lowest point of the area or at the central point of the area if the area is topographically flat. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. Details of any wipe and soil sample locations (if applicable) will be included in work package documents.



[1] Radiological contamination is considered present if radiological signature is greater than twice instrument background.
[2] If the anomaly is removed as a maintenance action, conduct radiological scan, collect sample of underlying soil and document results in SER.

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Figure 7. Sampling Approach for Rubble Areas

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5.3.2 Sample Requirements

Wipe samples will be analyzed for PCBs using field test kits (Appendix B worksheet #15-6).

Soil samples from beneath removed rubble (if removed as part of a maintenance action) will undergo field analyses for radioactivity (by NaI scan). One soil sample per removed rubble area will be collected and submitted for definitive fixed laboratory analysis for metals, radionuclides, and PCBs, as specified in Appendix B (Worksheets # 15-1, 15-2, and 15-3). If the area is extensive or if there are several small rubble piles within a rubble area, then a composite soil sample may be collected and considered representative for the entire rubble area.

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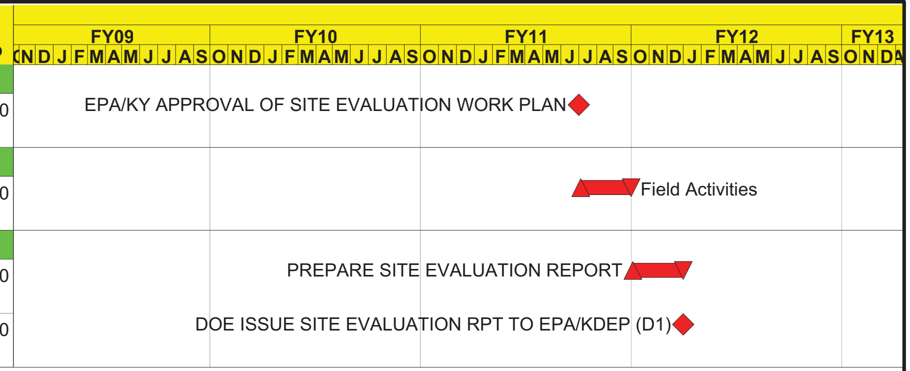
6. SCHEDULE

Figure 8 provides a schedule of the activities proposed for the Soils OU Sitewide Evaluation Work Plan implementation. This schedule represents an estimate for planning purposes and is included here for informational purposes only and is not intended to establish enforceable schedules or milestones. Enforceable milestones are contained in Appendix C of the FFA (EPA 1998) and Appendix 5 of the SMP (DOE 2010a). Also note that the schedule includes business days in lieu of calendar days.

Activity ID	Activity Description	Early Start	Early Finish	Orig Dur	Rem Dur	% Comp
04.11.06.01.02.01.03 Site Evaluation Work Plan						
AR00002250	EPA/KY APPROVAL OF SITE EVALUATION WORK PLAN		30JUN11	0	0	0
04.11.06.01.02.02 Field Activities						
AR00002337	Field Activities	05JUL11	30SEP11	63	63	0
04.11.06.01.02.03 Site Evaluation Report						
AR00002330	PREPARE SITE EVALUATION REPORT	03OCT11	30DEC11	61	61	0
AR00002460	DOE ISSUE SITE EVALUATION RPT TO EPA/KDEP (D1)		30DEC11	0	0	0



Start Date	01OCT02	Early Bar	SOIL	Sheet 1 of 1
Finish Date	29JUN12	Progress Bar	Paducah Remediation Services	
Data Date	24APR06	Critical Activity	SITEWIDE EVALUATION SCHEDULE	
Run Date	13SEP10 09:41			

Date	Revision	Checked	Approved

Figure 8. Sitewide Evaluation Schedule

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APPENDIX A

SAMPLING AND ANALYSIS PLAN

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CONTENTS

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ACRONYMS

agl	above ground level
DEM	digital elevation model
DPT	direct push technology
DOE	U.S. Department of Energy
ER	exposure rate
GIS	Geographic Information System
GPS	global positioning system
IDW	investigation-derived waste
NaI	sodium iodide
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plan
PPE	personal protective equipment
SAP	Sampling and Analysis Plan
SRM	standard reference material
WKWMA	West Kentucky Wildlife Management Area
XRF	x-ray fluorescence

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A.1. INTRODUCTION

This Sampling and Analysis Plan (SAP) provides information relative to data collection, media sample collection, and field analysis. The primary objective of this effort is to identify any unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act evaluation and to develop information usable when completing the Resource Conservation and Recovery Act Environmental Indicators. Specifically the evaluation was designed to obtain data to support the following objectives:

- Identify anomalies (based on screening surveys) on U.S. Department of Energy (DOE)-owned and West Kentucky Wildlife Management Area (WKWMA)-owned property and confirm DOE origin. On DOE owned property, this is determined by radiological and visual walkover surveys where radiological readings are greater than twice background or where a release is visually identified or where an anomaly is identified by process knowledge. On WKWMA property, DOE origin is determined by radiological signature from the aerial radiological survey;

- For the anomalies confirmed to be of DOE origin, establish the presence or absence of DOE-related contaminants [metals, polychlorinated biphenyls (PCBs), and radionuclides];

- Perform data screening to determine if such anomalies may pose risks to human health; and

- Determine appropriate path forward per the Federal Facility Agreement (EPA 1998).

This SAP incorporates techniques that are consistent with the SAP for Soils Piles (DOE 2007a), Addendum 1-A (DOE 2007b), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b), the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study (DOE 2010), and the SAP for the Rubble Areas (DOE 2008c).

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A.2. SAMPLE LOCATION, FREQUENCY, AND DESIGNATIONS

Once anomaly identification has been completed from scoping surveys, maps will be developed that show the footprint of each soil or rubble area with sample locations. In addition, tables will be developed indicating the dimensions of the anomaly, locations and estimated number of samples, and this information will be included in work package documents.

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A.3. SCOPING SURVEYS

Scoping surveys are to be used to identify potential anomalies originating from Paducah Gaseous Diffusion Plant (PGDP) for further evaluation. Several types of surveys were planned:

- A radiological flyover survey has been performed for the purpose of identifying surface radiological anomalies that were not previously identified on WKWMA-owned property. Walkover visual and radiological surveys then were performed on the anomalies identified by radiological aerial surveys.

- An aerial photographic survey has been performed to provide an updated topographic map.

- Focused walkover visual and radiological surveys have been performed on DOE property outside the limited/controlled area.

This section describes the planned surveys. Although these surveys have largely been completed at this time, text referring to what was planned has been retained.

A.3.1 AERIAL RADIOLOGICAL SURVEY

The Remote Sensing Laboratory performed an aerial radiological survey of PGDP in 1990. In January 2008, representatives from the DOE Paducah Site contacted the National Nuclear Security Administration to request a low-level aerial survey to update this information. If approved, the aerial radiological and multispectral survey will provide gross count, man-made gross count, and isotopic extraction contours. This includes providing Geographic Information System (GIS) layers in a suitable format to be included in the database being administered by the RSL-Nellis. More specifically, this survey includes mapping, using aerial measurement assets, the radiological activity around PGDP. The activity will be measured from an altitude of 150 ft above ground level (agl) where possible. The terrestrial exposure rate is derived from the integral count rate in the gamma energy spectrum range. This gross count rate, measured in counts per second (cps) at survey altitude, is converted to exposure rate (ER) in μR/h at 1 meter agl. Over most of the survey area, the inferred terrestrial ER is expected to be less than 7 μR/h (typical for natural background in the Paducah area determined from previous survey data); however, it is expected that the instruments can read with accuracy to 1 uR/hr. It is, however, subject to interference from gamma radiation emitted from DUF_6 cylinders stored on the site. The planned survey area is approximately 25 square miles. Data will be analyzed to determine surface radioactivity. The detection capabilities of the helicopter system for the detection of U-238 are as follows. Assuming the survey parameters that were flown, and assuming that U-238 is present on the soil surface with no self shielding, the approximate minimal detectable activity is 10 mCi for a point source and 10 $\mu Ci/m^2$ for a distributed source. It should be noted that these are somewhat conservative estimates, but they do not include the effect of any self-shielding, since it is not possible to ascertain in what shape or configuration that the material might be.

The survey produced a set of GIS-compatible overlay maps of (1) the inferred exposure rate and (2) the areas exhibiting excess or elevated levels of man-made radioisotopes. The aerial radiological data will be displayed as a contour map (color-coded contours with designators) superimposed onto either a geo-referenced U.S. Geological Survey topographic map or a GIS populated place layer map of the survey area. The maps will be examined for indications of elevated radiological signature indicating potential anomalies that could be attributed to DOE activity.

A.3.2 AERIAL PHOTOGRAPHY SURVEY

Approximately 32 square miles has been photographed in color from a height of greater than 5,000 ft when the foliage is dormant. A survey firm was used to provide survey data for photograph control. This included targets that did not move for the entire length of time of the photo shoot. The site was photographed and mapped at a scale of 1 inch = 100 ft with 2 ft minimum topographic contours. Orthophoto imagery was produced at 1/2 ft pixel resolution. Mapping included surface model contours and all planimetric detail appropriate for that map scale. High resolution aerial photographs were collected to develop a digital elevation model (DEM). This DEM provided delineation of current surface features, including watersheds, drainage pathways, roads, and land cover. Height of trees and other vegetative cover can be determined, and a three-dimensional model, created from such photography, facilitating identification of soil and rubble areas and enable estimation of pile volumes. Comparison of recently acquired data with historic photographs will assist in tracking changes at specific locations through time.

The aerial photography (topography) survey produced a map and surface model in DGN and DWG formats. The photographs will be examined, along with historical aerial photographs to look for indications of earth disturbance, unnatural earth mounds or rubble material that could be potential anomalies. It should be noted that the topographic survey was performed on April 8, 2009.

A.3.3 VISUAL AND RADIOLOGICAL WALKOVER SURVEY

The visual walkover survey was performed over the areas colored in light pink and light blue, excluding the area within the PGDP fence, as depicted on Figure 2 of the workplan. This includes all of the DOE-owned property outside PGDP fence (including property leased to WKWMA). Visual walkover surveys were accomplished by visually observing and physically locating a potential anomaly and recording the location, physical size, type of anomaly, any other pertinent information, and performing a topographic survey. This was performed in concert with the radiological survey described below.

MARSSIM (DOE 2000) guidance includes classification of areas based on potential for contamination. Property to be evaluated under this work plan is assumed to be Class 3. These areas are defined as areas with potential for contamination typically ≤ 10% reference level; therefore, DOE property was evaluated with 100% visual and a minimum of 10% gamma/GPS walkover surveys with all identified anomalies (on DOE and WKWMA property) included in the radiological walkover survey.

Radiological surveys were performed using a sodium iodide (gamma) detector or equivalent with a GPS data-logger. U-238 will be used as the target radionuclide.

Note that the survey was performed using a LM 221 survey meter equipped with 3x3 NaI probes and using a Polaris Ranger 700 6x6 where the terrain was suitable. A scanning speed of up to 3m/sec was used, which is sufficient to achieve a scanning sensitivity of below 528 pCi/g U-238 (equivalent to 15 mrem/year dose). Where the terrain was not suitable for driving, the team covered the area on foot using a scanning speed of up to 0.5 m/sec. The meter was held approximately 4 inches from the ground during the survey.

Radiological Controls Technicians performed the scan surveys of accessible land areas. Static measurements were used to confirm the presence of activity in elevated areas. If elevated activity was confirmed, then the area of elevated activity was bounded. Probes were source checked at the start of work to ensure they are functioning properly. The survey meters were equipped with digital data ports that download accumulated counts to the GPS data loggers. Readings greater than twice ambient (instrument) background will be pin flagged and resurveyed to confirm the measurement.

Sketches will be provided showing the position of the anomalies relative to PGDP.

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A.4. SAMPLING EQUIPMENT AND ANALYSIS

Fieldwork and sampling at PGDP will be conducted in accordance with DOE Prime Contractor-approved work instructions or procedures. DOE or its 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 Quality Assurance Project Plan.

A.4.1 DATA/SAMPLING EQUIPMENT AND TECHNIQUES

A.4.1.1 Radiological Scanning

Radiological surveys of anomalies in advance of sampling will be performed using a sodium iodide (NaI) (gamma) detector or equivalent with a GPS data-logger if the ground/concrete has flat surfaces. If the surface to be scanned is particularly uneven and the NaI detector proves to be ineffective, then a GM pancake probe may be used.

A.4.1.2 Media Sampling

The following types of samples will be collected for analysis by field and laboratory methods:

- Surface and subsurface soil samples may be collected from the soil areas evaluation (see Section 5.2 and Figure 6 of the work plan).

- Wipe samples (of rubble exhibiting oil staining) and surface soil samples (if rubble is removed) may be collected from the rubble areas evaluation(see Section 5.3 and Figure 7 of the work plan).

No liquid samples are planned to be collected other than for quality assurance purposes (See Appendix B) and investigation-derived waste (IDW) disposal purposes (to be specified in work package documentation).

Soil samples will be collected in accordance with (1) PAD-ENM-2300 *Collection of Soil Samples,* (2) PAD-ENM-0023, *Composite Sampling,* and (3) PAD-ENR-0020, *Direct Push Technology Sampling.* The following general provisions will apply to all sampling activities:

- Surface soil samples will be collected using disposable, stainless steel scoops to minimize the quantity of IDW, particularly liquid waste, generated during sample collection.

- Subsurface samples will be acquired using standard collection techniques such as direct push technology (DPT) or hollow stem auger, depending on the condition of the subsurface/difficulty in acquiring samples.

Wipe samples will be collected in accordance with manufacturer's instructions.

The following provides a general equipment/supplies list for the sampling activities. The list assumes site and sample location surveying is completed separately as part of civil survey efforts and site preparation.

- Personal protective equipment (PPE)
- Stainless steel scoops

- Sorbent material
- Plastic sheeting
- Nylon brush (dry decontamination)
- Deionized water
- Cooler(s)
- Adhesive tape (e.g., clear, duct, and strapping)
- Pens and markers
- Zipper-sealing plastic bag
- Plastic sheeting
- Field analytical test kits
- Utility knife
- Health and safety supplies
- GPS unit and survey supplies including 100-ft tape measure
- Field logbook
- Chain-of-custody forms
- Sample labels
- Custody seals
- Sample containers (bottles)
- Blue ice
- Shipping/transport paperwork
- Acetate sleeves for portable DPT

A.4.2 FIELD ANALYTICAL TECHNIQUES

Analytical data acquisition will rely on both field measurements (screening) and fixed-base laboratory (definitive) data to determine if contamination exists in media associated with identified anomalies and further defined as soil or rubble. The following describes the field analytical techniques to be used.

A.4.2.1 Determination of Radioactivity

Radiological walkover surveys will be accomplished with scanning instrumentation. In addition, 100% surface scans will be performed on all identified anomalies, including a 3 ft buffer area around each anomaly, using a sodium iodide (gamma) detector or equivalent with a GPS data-logger. Before scanning an anomaly, radiation control technician(s) or properly qualified designee(s) will perform a local environmental background determination for gamma radioactivity using a NaI detector or equivalent with a GPS data-logger. Prior to its use, the instrument will be calibrated and operated in accordance with (1) PAD-RAD-0506, *Radiological Protection Operating Guide,* and (2) PAD-RAD-1309, *Setup for Operability Tests of Portable Field Instruments.*

Before surveying any of the anomalies, background gamma radioactivity values will be established for the particular instruments used as follows:

- In the case of rubble areas, the rubble used to determine background values will be at the Kevil Post Office, which is composed of native materials similar to those present in the rubble areas concrete typically found at PGDP and is approximately the same age (i.e., 30 years in age). Measurement of background for comparison purposes will be in disintegrations per minute (dpm) or counts per minute (cpm). Ten one-minute static count readings will be taken at the background site, with the readings measured at several different points on the concrete. The background level used for comparison will be the mean of all the background readings and the 95% confidence level determined by the standard deviation of the readings (after testing the normality of the distribution). This approach is consistent with the determination of concrete background radiation levels completed for the Waste Area Group (WAG) 17 Resource Conservation and Recovery Act Facility Investigation (DOE 1995) and the Sampling and Analysis Plan for Rubble Areas (DOE 2008c).

- Soil background will be determined at the WKWMA lodge in Ballard County. This is an area that has not been impacted by PGDP activities and is upwind of the predominant wind direction at the site. Ten one-minute static count readings will be taken at the background site. The background level used for comparison will be the mean of the background readings and the 95% confidence level determined by the standard deviation of the readings (after testing the normality of the distribution).

Upon completion of the appropriate background determination, a complete surface scan of all exposed rubble or soil surfaces will be completed using the NaI scanning instrument. The instrument will record measurements of gamma activity emitted from anomalies. All recorded measurements will be documented.

A.4.2.2 Determination of Metals Using X-Ray Fluorescence

Survey and verification field samples will undergo *ex situ* x-ray fluorescence (XRF) analysis for RCRA metals and total uranium. Analysis will be performed in a field laboratory using procedure PAD-ENR-0034 *XRF Field Lab Analysis of Soils.* The XRF sample will consist of a minimum of 20 grams of soil. To further ensure the defensibility of XRF data, periodic performance checks and blanks will be performed to monitor instrument drift. The frequency of calibration verification samples and blanks will be 1 each for every 20 samples analyzed. They will be analyzed sequentially; calibration verification and a blank analysis will follow the 20th natural sample analyzed or at the end of a group of samples, whichever is more frequent. Along with each batch of samples totaling 20 or less, an independent standard reference material (SRM) will be analyzed. The SRM will have a concentration within the calibration and will have verifiable levels documented by a certificate of analysis. Data outputs will be recorded in the field logbook or on a spreadsheet.

A.4.2.3 Determination of PCBs Using Field Test Kits

Field wipe samples will undergo field PCB analysis using immunoassay analysis using an EnSys™ 12T Wipe Test Kit, or equivalent which follows EPA SW-846 Method #4020. The test kits provide results in the range of 5 $\mu g/100cm^2$ to 5000 $\mu g/100cm^2$.

Soil samples will undergo field PCB analysis using methanol extraction and colorimetric analysis using a HACH Pocket Colormeter™ II Test Kit, or equivalent. A minimum of 20 grams of soil will be collected for PCB analysis. To ensure PCB data can be fully evaluated, a pre-weighed aliquot of each sample will be extracted and analyzed, and the colorimeter will be calibrated with each analytical batch in accordance with the manufacturer's specifications. All test kits and reagents (i.e., calibration standards, calibration verification standards, standard reference materials, kit reagents, and blanks) will be prepared and stored in accordance with the method requirements. Because the cuvettes and reagents in the PCB kits are in matched lots, each analytical batch is limited to the number (20) provided in each kit. Calibration standards and a reagent blank will be analyzed with each analytical batch prior to sample analysis. Along with each batch of samples totaling 20 or fewer, an independent SRM will be analyzed to verify the method detection limit, to establish precision and accuracy, and to estimate extraction efficiency. The SRM will have a concentration within the operating range of the colorimeter calibration and will have verifiable levels documented by a certificate of analysis. Data outputs will be recorded in the field logbook or on a spreadsheet.

A.4.3 DOCUMENTATION

Field documentation on logbooks and field forms will be in accordance with PAD-ENM-2700 *Logbooks and Data Forms.* Data will be archived electronically following guidance in PAD-ENM-1003, *Developing, Implementing, and Maintaining Data Management Implementation Plans.* Records will be kept in accordance with PAD-DOC-1009, *Records Management, Administrative Records, and Document Control.*

A.4.4 DECONTAMINATION AND WASTE MANAGEMENT

Decontamination of sampling equipment will be in accordance with PAD-ENM-2702, *Decontamination of Sampling Equipment and Devices.*

While the overall composition and distribution of hazardous, toxic, and/or radioactive materials is not fully known for the anomalies that might be encountered during this evaluation, preliminary radiation screening and laboratory data from similar activities suggests elevated levels of contaminants may be present. As a result, those materials that contact soil during evaluation activities in addition to materials that do not undergo decontamination, or result from field decontamination will be categorized as IDW. The following types of IDW will be generated during the characterization effort:

- PPE
- Plastic sheeting
- Stainless steel scoops
- Compositing pans
- DPT thin-walled sampling tubes
- Miscellaneous sampling and field screening supplies

Waste generated during sitewide evaluation efforts will be stored in appropriate waste storage areas, managed and disposed per established DOE prime contractor procedures. Specific provisions of waste management as they relate to IDW generated by sitewide evaluation efforts are outlined in the following sections.

A.4.4.1 Personal Protective Equipment

All PPE employed during sitewide evaluation efforts will be considered IDW. For purposes of segregation and storage, at the end of each work shift or each time PPE is replaced, PPE for all members of the field team doffing their PPE will be placed in plastic bags; the bag then will be sealed and labeled to reflect the area in which field work occurred. The bags and PPE then will be placed in a waste container.

A.4.4.2 Plastic Sheeting

At the end of each activity or field day, whichever is more frequent, plastic sheeting employed during field activities to reduce the spread of contamination will be placed in plastic bags; the bag then will be sealed, labeled to reflect the area in which the field work took place, and the bags and plastic sheeting placed in an appropriate waste container.

A.4.4.3 Sampling Equipment and Miscellaneous Supplies

Following use and dry decontamination of sampling tools (stainless steel scoops, compositing pans), supplies and nylon brushes will be segregated and stored in plastic bags. The bags will remain open until the end of each work shift or until they reach capacity (whichever is more frequent) so they (1) may be filled to capacity and (2) additional field supplies can be stored in them until they reach capacity or the work shift is complete. At the end of the work shift or when the bags reach capacity, they will be sealed, labeled to reflect the area where they were used, and placed in an appropriate waste container.

A.4.4.4 Soil Cuttings/Sample Residuals

Excess soil acquired during sample collection will be handled as IDW. Laboratory sample residuals will be disposed according to laboratory procedures.

A.4.4.5 Liquid Investigation-Derived Waste

Liquid IDW will be minimized by using disposable sampling equipment and support supplies to the maximum extent practical. If liquid IDW is generated as a result of decontamination of sampling equipment, field personnel will make every effort to minimize the quantities of liquid IDW generated Laboratory liquid IDW such as sample residuals and field standards used for PCB field screening may require special handling and disposal as Toxic Substances Control Act wastes.

Decontamination water will be placed in an appropriate waste container.

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A.5. REFERENCES

DOE (U.S. Department of Energy) 1995. *Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan for Waste Group Area Grouping (WAG) 17 at the Paducah Gaseous Diffusion Plant,* U.S. Department of Energy, *Paducah*, KY, October.

DOE 2000. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* DOE/EH--624/R1 U.S. Department of Energy, August.

DOE 2007a. *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0015D2/R1, U.S. Department of Energy, Paducah, KY, September.

DOE 2007b. *Addendum 1-A to Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0015/A1/D2R1, U.S. Department of Energy, Paducah, KY, August.

DOE 2008a. Addendum 1-B to *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0015/1B&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2008b. Addendum 2 to *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0015/A2&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2008c. *Sampling and Analysis Plan for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0060&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2010. *Work Plan for the Soil Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0120&D2/R1, U.S. Department of Energy, Paducah, KY, February.

EPA 1998. *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, U.S. Environmental Protection Agency, Region 4, Atlanta, GA, February 13.

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APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

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CONTENTS

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QAPP WORKSHEETS

ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	chemical of potential concern
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
EPA	U. S. Environmental Protection Agency
FFA	Federal Facility Agreement
HF	hydrogen fluoride
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SI	Site Investigation
SWMU	solid waste management unit
TCE	trichloroethene
UFP	Uniform Federal Policy for Quality Assurance Project Plans

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QAPP Worksheet #1
Title and Approval Page

UFP-QAPP Manual Section 2.1:

Site Name/Project Name:
Site Location:

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
Document Title

U.S. Department of Energy
Lead Organization

LATA Environmental Services of Kentucky, LLC
Preparer's Name and Organizational Affiliation

761 Veterans Avenue, Kevil, KY, 42053; (270) 441-5000
Preparer's Address, Telephone Number, and E-mail Address

10/2010

Preparation Date (Month/Year)

Investigative Organization's Project Manager: Teresa Overby
Signature

Teresa Overby / LATA Kentucky / 12/14/2010
Printed Name/Organization/Date

Investigative Organization's Project QA Officer: Irene M Dudley
Signature

Irene M Dudley / LATA Kentucky / 12-14-2010
Printed Name/Organization/Date

Approval Signatures: Barbara A. Mazurowski
Signature

Barbara A. Mazurowski 12-15-10
Printed Name/Title/Date

Approval Authority

Other Approval Signatures:

Printed Name/Title/Date

Document Control Number: DOE/LX/07-0228

QAPP Worksheet #2
QAPP Identifying Information

UFP-QAPP Manual Section 2.2.4:
Site Name/Project Name: *Sitewide Evaluation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
Site Location: Paducah Gaseous Diffusion Plant
Site Number/Code: N/A
Operable Unit: Soils Operable Unit
Contractor Name: LATA Environmental Services of Kentucky, LLC
Contractor Number: DE-AC30-10CC40020 (DOE-LATA Kentucky 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 Compliance 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: Scoping was accomplished from 2007 to 2008.
6. List dates and titles of QAPP documents written for previous site work, if applicable:

Title:	**Approval Date:**
Removal Action Work Plan for Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plan, Paducah, Kentucky (DOE/LX/07-0220&D2R1)	11/12/2009 (Latest date of regulatory approval).
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&D2R1)	11/12/2009 (Latest date of regulatory approval).
Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0120&D2R2)	01/06/2010 (Latest date of regulatory approval).

7. List organizational partners (stakeholders) and connection with lead organization:
U.S. EPA, Commonwealth of Kentucky
8. List data users: DOE, Contractor, subcontractors, U.S. EPA, Commonwealth of Kentucky
9. If any required QAPP elements and required information are not applicable to the project, then indicate the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:
N/A

QAPP elements and required information that are not applicable to the project are indicated and an explanation is provided in the QAPP.

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	Worksheet No.	Crosswalk to Related Documents
Project Management and Objectives			
2.1 Title and Approval Page	- Title and Approval Page	1	
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	
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	3 4 Omitted[1]	
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	5 6 Omitted[1] 7 Omitted[1] 8	DOE O 414.1C/10 *CFR* § 830.120 Criterion 1– Management Program; Criterion 2 Training and Qualification;
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)	9 Omitted[1] 10	DOE O 414.1C/10 *CFR* § 830.120 Criterion 6 – Design
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	11 12	
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13	

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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	23 24 25	DOE O 414.1C/10 *CFR* § 830.120 Criterion 8– Inspection and Acceptance Testing
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	26 27	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4– Documents and Records
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Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
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	29 30	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4–Documents and Records
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[1] Worksheets omitted: #4–included in contractor work control documentation, #6–communication pathways established elsewhere, #7–personnel qualifications are not listed, and #9–scoping activities occurred in 2007 through 2008.

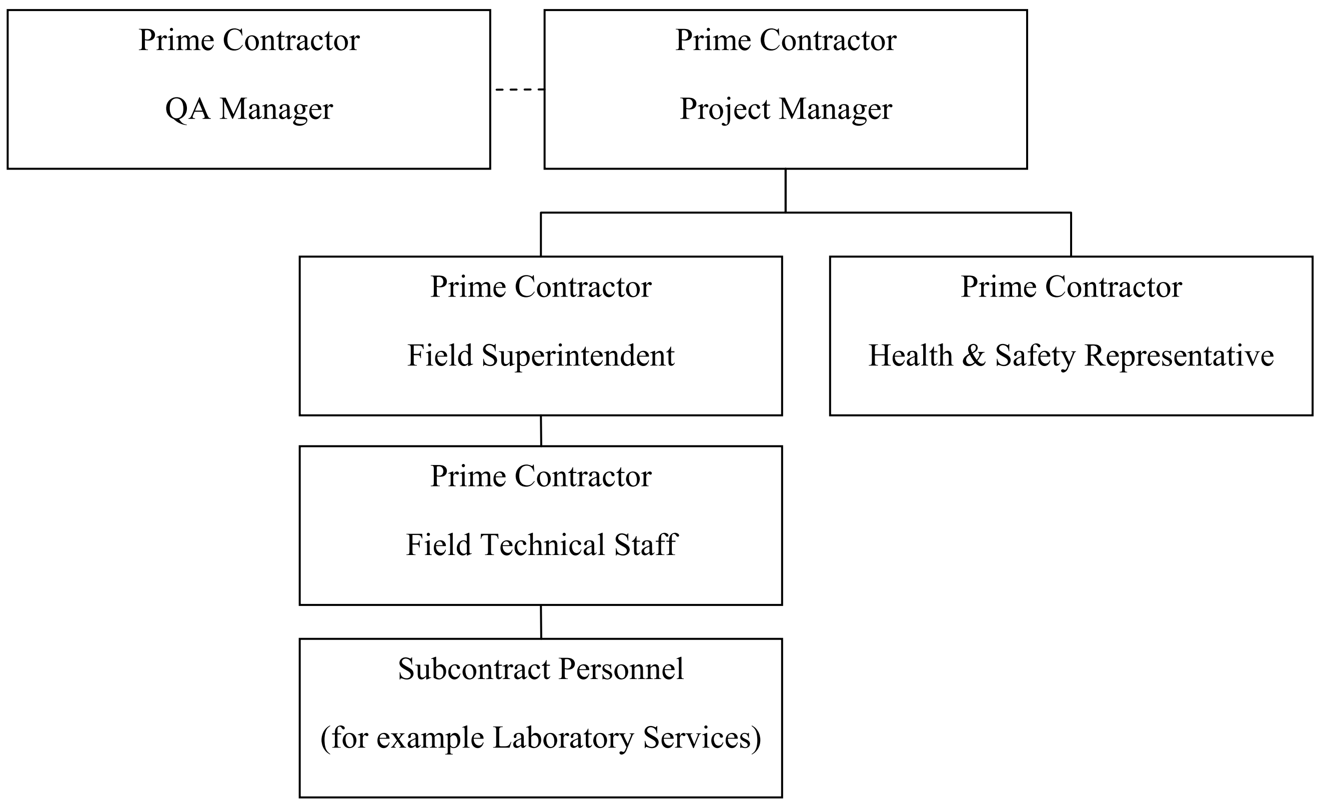
QAPP Worksheet #3
Distribution List

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 in concert with the Sitewide Evaluation Work Plan; thus, it will be included on the Sitewide Evaluation Work Plan distribution list.	N/A	N/A	N/A	N/A	N/A	N/A

QAPP Worksheet #5
Project Contractor Organizational Chart

UFP-QAPP Manual Section 2.4.1



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]
Project Tasks	There will be no specialized training required for this project other than what is normally required for site work at PGDP. The contractor will evaluate specific tasks and personnel will be assigned training as necessary to perform those tasks. Training may address health and safety aspects of specific tasks as well as contractor-specific, site-specific, and task-specific requirements.	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.

QAPP Worksheet #10
Problem Definition

UFP-QAPP Manual Section 2.5.2:

The problem to be addressed by the project: Per the Site Management Plan (SMP) – Annual Revision – FY2009, DOE/LX/07-0185&D2/R1, for PGDP "a sitewide evaluation will be performed to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the Resource Conservation and Recovery Act Corrective Action (RCRA) Environmental Indicators process."

The environmental questions being asked: Are there any unknown contaminated areas, originating from PGDP, requiring further CERCLA evaluation?

Observations from any site reconnaissance reports: Radiological and visual walkover surveys performed to date under DOE authority on DOE-Owned Property outside of the fenced area indicate 150 potential anomalies identified visually with none exhibiting an elevated (greater than 2 x background) radiological signature.

A synopsis of secondary data or information from site reports: Section 3 of the work plan describes the secondary data used to develop DQOs.

The possible classes of contaminants and the affected matrices:
Potential classes of contaminants are metals, PCBs, and radiological contamination.
Affected matrices are expected to be as follows (if present):

1. Soil – which is defined as soil piles and disturbed soil areas.
2. Rubble areas – which are defined as areas of varied materials.

The rationale for inclusion of chemical and nonchemical analyses: Worksheet #11 presents rationale for inclusion of chemical and nonchemical analyses.

Information concerning various environmental indicators: Environmental indicators include metals, PCBs, and uranium parameters for PGDP contamination and are utilized as indicators for this project.

Project decision conditions ("IE..., then..." statements): Flowcharts listed in Worksheet #11 and located in the Sitewide Evaluation Work Plan present the project decisions conditions by which previously unidentified anomalies will be identified.

QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

UFP-QAPP Manual Section 2.6.1:

Who will use the data? DOE, Prime Contractor, subcontractor, KY, and EPA.

What will the data be used for? To identify any unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information usable when completing the RCRA EI process.

What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Radiological surveys and visual walkover surveys will be used to identify and define the limits of potential anomalies. Field screening methods will be used to perform initial characterization of soil/rubble for metals, PCBs, and radiological contamination as discussed in the work plan. Based on the type of anomaly identified, a percentage of the samples collected for field screening will be analyzed for target analytes listed on Worksheet #10 at a DOE Consolidated Audit Program (DOECAP) certified laboratory. The actual number of samples submitted to the off-site laboratory, based on the type and size of each anomaly, will be identified in work package documents.

Note that the 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 allow identification and evaluation of anomalies. Data used for future human health risk assessment will be evaluated for use per the RMD (DOE 2001). Data must meet the sensitivity requirements for comparison to appropriate criteria as discussed in Section 4.3 of this work plan. The acquired data must be of known quality to increase confidence that SWMUs and AOCs associated with PGDP have been identified.

How much data are needed? (number of samples for each analytical group, matrix, and concentration) The number of samples will be dependent on the number and types of anomalies identified as defined in the Work Plan and Appendix A.

Where, when, and how should the data be collected/generated? See Work Plan and Appendix A.

Who will collect and generate the data? A sample team of individuals who are properly trained and skilled in the execution of screening and sampling procedures will collect samples and perform the field screening measurements.

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). Project data will be reported from the Paducah Oak Ridge Environmental Information System (OREIS).

How will the data be archived? Data will be archived in OREIS. Data will be archived for 30 years per contract requirements.

QAPP Worksheet #12-1
Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2:

Matrix	Soil
Analytical Group	Metals (aluminum, antimony, barium, beryllium, calcium, chromium, iron, magnesium, manganese, molybdenum, nickel, sodium, vanadium, and zinc)
Concentration Level	Low

Sampling Procedure	**Analytical Method/SOP**[1]	**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)**
See Worksheet #21	SW846-6010	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metals (arsenic, cadmium, cobalt, copper, lead, selenium, silver thallium, uranium)
Concentration Level	Low

Sampling Procedure	**Analytical Method/SOP**[1]	**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)**
See Worksheet #21	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[1]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-3
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metal (mercury)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-7470	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[1]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-4
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	PCBs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-8082	Precision–Lab	RPD–43%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-5
Measurement Performance Criteria Table

Matrix	Wipe Sample
Analytical Group	PCBs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Immunoassay PCB Wipe Test Kit	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	A
					A
					A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-6
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (uranium-234, uranium-235, uranium-238)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Alpha spectroscopy	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-7
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (americium-241, neptunium-237, plutonium-238, plutonium-239/240, thorium-230,)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Alpha spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-8
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (cesium-137)
Concentration Level	Low

Sampling Procedure	**Analytical Method/SOP**[1]	**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)**
See Worksheet #21	Gamma spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-9
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (technetium-99)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Liquid scintillation	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-10
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-6200 (XRF)	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

QAPP Worksheet #12-11
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Total PCB
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	HACH Pocket Colorimeter™ II Test Kit or equivalent	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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
Process knowledge, historical use and results of Soil Piles and Rubble Areas evaluations.	DOE 2008. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2. DOE 2009. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1. DOE 2009. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0188&D2. DOE 2009. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0227&D0.	See reports	Assist in planning	Assist in planning only.

QAPP Worksheet #14
Summary of Project Tasks[1]

UFP-QAPP Manual Section 2.8.1:

Sampling Tasks: Sampling will be per Sitewide Evaluation Work Plan and Appendix A, Sampling and Analysis Plan

Analysis Tasks: Analysis will be per Sitewide Evaluation Work Plan and Appendix A, Sampling and Analysis Plan

Quality Control Tasks: Quality Control will be per QAPP worksheets as follows:

- QC samples – Worksheets #20 and #28
- Equipment calibration – Worksheets #22 and #24
- Data review/validation – Worksheets #34, #35, #36 and #37

Secondary Data: Process knowledge, historical use and results of Soil Piles and Rubble Areas evaluations:

- DOE 2008. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2.
- DOE 2009. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1.
- DOE 2009. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0188&D2.
- DOE 2009. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0227&D0.

Data Management Tasks: Data Management will be per DOE Prime Contractor procedure, PAD-ENM-5007, *Data Management Coordination.*

Documentation and Records: Documentation and Records will be per DOE Prime Contractor procedure, PAD-RM-1009, *Records Management, Administrative Records and Document Control.*

Assessment/Audit Tasks: Assessments and audits will be per DOE Prime Contractor procedure, PAD-QA-1420, *Conduct of Assessments.*

Data Review Tasks: Data review tasks will be per DOE Prime Contractor procedure, PAD-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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
Acetone	67-64-1	53,400	10	n/a	n/a	6.47	20
Acrolein	107-02-8	4.29	10	n/a	n/a	2.901	50**
Acrylonitrile	107-13-1	64.5	10	n/a	n/a	1.126	50
Benzene	71-43-2	327	10	0.03	n/a	0.253	5
Bromodichloromethane	75-27-4	390	10	0.03	n/a	0.254	5
Bromoform	75-25-2	13,800	10	0.20	n/a	0.366	5
Bromomethane	74-83-9	186	10	0.03	n/a	0.396	10
2-Butanone	78-93-3	153,000	10	n/a	n/a	0.389	20
Carbon disulfide	75-15-0	15,700	10	n/a	n/a	0.369	5
Carbon tetrachloride	56-23-5	97.8	10	0.02	n/a	0.360	5
Chlorobenzene	108-90-7	4,470	10	0.03	n/a	0.382	5
Chloroethane	75-00-3	978	10	n/a	n/a	0.382	10
2-Chloroethyl vinyl ether	110-75-8	n/a	10	n/a	n/a	0.523	20
Chloroform	67-66-3	18.2	10	0.04	n/a	0.092	5
Chloromethane	74-87-3	884	10	0.05	n/a	0.553	10
Dibromochloromethane	124-48-1	334	10	0.07	n/a	0.329	5
Dibromomethane	74-95-3	3,170	10	0.01	n/a	0.405	5
Dichlorodifluoromethane	75-71-8	5,200	10	0.11	n/a	0.449	10
1,1-Dichloroethane	75-34-3	22,900	10	0.03	n/a	0.392	5
1,2-Dichloroethane	107-06-2	152	10	0.02	n/a	0.372	5
1,1-Dichloroethene	75-35-4	27.6	10	n/a	n/a	0.365	5
cis-1,2-Dichloroethene	156-59-2	1,980	10	0.06	n/a	0.159	5
trans-1,2-Dichloroethene	156-60-5	3,260	10	n/a	n/a	0.178	5
1,2-Dichloropropane	78-87-5	180	10	0.02	n/a	0.317	5

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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
cis-1,3-Dichloropropene	10061-01-5	n/a	10	n/a	n/a	0.339	5
trans-1,3-Dichloropropene	10061-02-6	n/a	10	n/a	n/a	0.349	5
trans-1,4-Dichloro-2-butene (100)	110-57-6	n/a	10	n/a	n/a	0.397	10
Ethyl benzene	100-41-4	6,010	10	0.03	n/a	0.299	5
Ethyl methacrylate	97-63-2	99,700	10	n/a	n/a	0.240	5
Iodomethane	74-88-4	n/a	10	n/a	n/a	1.511	5
2-Hexanone	591-78-6	n/a	10	n/a	n/a	0.261	20
Methylene chloride	75-09-2	3,920	10	n/a	n/a	0.801	5
4-Methyl-2-pentanone	108-10-1	9,660	10	n/a	n/a	0.326	20
Styrene	100-42-5	128,000	10	0.27	n/a	0.347	5
1,1,1,2-Tetrachloroethane	630-20-6	1,430	10	0.07	n/a	0.238	5
1,1,2,2-Tetrachloroethane	79-34-5	145	10	0.20	n/a	0.272	5
Tetrachloroethene	127-18-4	1,170	10	0.05	n/a	0.280	5
Toluene	108-88-3	31,200	10	0.08	n/a	0.303	5
1,1,1-Trichloroethane	71-55-6	23,200	10	0.04	n/a	0.291	5
1,1,2-Trichloroethane	79-00-5	345	10	0.08	n/a	0.573	5
Trichloroethene	79-01-6	741	10	0.02	n/a	0.290	5
Trichlorofluoromethane	75-69-4	19,300	10	n/a	n/a	0.167	5
1,2,3-Trichloropropane	96-18-4	0.629	10	0.09	n/a	0.559	5**
Vinyl acetate	108-05-4	21,300	10	n/a	n/a	0.305	5
Vinyl chloride	75-01-4	40	10	0.04	n/a	0.428	5
m,p-xylene	NS831	107,000	20	0.06	n/a	0.569	5
o-xylene	95-47-6	659,000	10	0.06	n/a	0.318	5

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).
[2] Analytical MDLs and QLs are those documented in validated methods. MDLs listed are taken from Table 2 of SW846-8260B.

QAPP Worksheet #15-1
Reference Limits and Evaluation Table (Continued)

[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
**The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	12,200	660	n/a	660	33.3	330
1,2-Dichlorobenzene	95-50-1	40,000	660	n/a	660	33.3	330
1,3-Dichlorobenzene	541-73-1	997	660	n/a	660	33.3	330
1,4-Dichlorobenzene	106-46-7	1,360	660	n/a	660	33.3	330
2,4,5-Trichlorophenol	95-95-4	160,000	660	n/a	660	33.3	330
2,4,6-Trichlorophenol	88-06-2	8,510	660	n/a	660	33.3	330
2,4-Dichlorophenol	120-83-2	6,930	660	n/a	660	33.3	330
2,4-Dimethylphenol	105-67-9	32,000	660	n/a	660	33.3	330
2,4-Dinitrotoluene	121-14-2	209	660	n/a	660	33.3	330**
2,6-Dinitrotoluene	606-20-2	209	660	n/a	660	33.3	330**
2-Chloronaphthalene	91-58-7	33,800	660	n/a	660	33.3	330
2-Chlorophenol	95-57-8	2,810	660	n/a	660	33.3	330
2-Methylnaphthalene	91-57-6	n/a	660	n/a	660	33.3	330
2-Nitrophenol	88-75-5	n/a	660	n/a	660	33.3	330
4-Bromophenyl phenyl ether	101-55-3	n/a	660	n/a	660	33.3	330

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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
4-Chlorophenylphenyl ether	7005-72-3	n/a	660	n/a	660	33.3	330
Acenaphthene	83-32-9	n/a	660	n/a	660	33.3	330
Acenaphthylene	208-96-8	n/a	660	n/a	660	33.3	330
Anthracene	120-12-7	526,000	660	n/a	660	33.3	330
Benz(a)anthracene	56-55-3	67	660	n/a	660	33.3	330**
Benzo(a)pyrene	50-32-8	6.7	660	n/a	660	n/a	6.6*
Benzo(b)fluoranthene	205-99-2	67	660	n/a	660	33.3	330**
Benzo(ghi)perylene	191-24-2	n/a	660	n/a	660	33.3	330
Benzo(k)fluoranthene	207-08-9	670	660	n/a	660	33.3	330
bis(2-chloroethoxy)methane	111-91-1	n/a	660	n/a	660	33.3	330
bis(2-chloroethyl) ether	111-44-4	29	660	n/a	660	n/a	6.6*
bis(2-chloroisopropyl) ether	108-60-1	1,340	660	n/a	660	33.3	330
bis(2-ethylhexyl)phthalate	117-81-7	2,840	660	n/a	660	43.3	330
Butyl benzyl phthalate	85-68-7	373,000	660	n/a	660	33.3	330
Chrysene	218-01-9	6,700	660	n/a	660	33.3	330
Dibenz(a,h)anthracene	53-70-3	6.7	660	n/a	660	n/a	6.6*
Dibenzofuran	132-64-9	2,930	660	n/a	660	33.3	330
Diethylphthalate	84-66-2	1,970,000	660	n/a	660	33.3	330
Dimethylphthalate	131-11-3	24,600,000	660	n/a	660	33.3	330
Di-n-butylphthalate	84-74-2	264,000	660	n/a	n/a	33.3	330
Di-n-octylphthalate	117-84-0	49,200	660	n/a	660	33.3	330
Fluoranthene	206-44-0	34,300	660	n/a	660	33.3	330
Fluorene	86-73-7	50,100	660	n/a	660	33.3	330

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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
Hexachlorobenzene	118-74-1	58.5	660		660	33.3	330**
Hexachlorobutadiene	87-68-3	320	660		660	33.3	330**
Hexachlorocyclopentadiene	77-47-4	9,590	660		660	330	1600
Hexachloroethane	67-72-1	1,600	660		660	33.3	330
Indeno(1,2,3-cd)pyrene	193-39-5	67	660		660	33.3	330**
Isophorone	78-59-1	98,500	660		660	33.3	330
m,p-cresol		9,770[4]	660		660	66.6	660
Naphthalene	91-20-3	3,470	660		660	33.3	330
Nitrobenzene	98-95-3	492	660		660	33.3	330
N-Nitroso-di-n-propylamine	621-64-7	7.3	660		660	n/a	6.6*
N-Nitrosodiphenylamine	86-30-6	10,400	660		660	33.3	330
o-cresol	95-48-7	79,900	660		660	33.3	330
Phenanthrene	85-01-8	n/a	660		660	33.3	330
Phenol	108-95-2	1,480,000	660		660	33.3	330
Pyrene	129-00-0	25,700	660		660	33.3	330
Pyridine	110-86-1	1,600	660		n/a	66.6	660
3,3'-Dichlorobenzidine	91-94-1	208	1300		1300	33.3	1600**
4-Chloro-3-methylphenol	59-50-7	n/a	1300		1300	33.3	330
4-Chloroaniline	106-47-8	6,390	1300		1300	33.3	330
Benzyl Alcohol	100-51-6	593,000	1300		1300	33.3	330
2,4-Dinitrophenol	51-28-5	5,280	3300		3300	330	1600
2-Methyl-4,6-dinitrophenol	534-52-1	n/a	3300		3300	330	1600
2-Nitroaniline	88-74-4	91.3	3300		3300	33.3	330**
3-Nitroaniline	99-09-2	n/a	3300		3300	33.3	330

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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
4-Nitroaniline	100-01-6	n/a	3300		n/a	330	1600
4-Nitrophenol	100-02-7	21,100	3300		3300	330	1600
Benzoic Acid	65-85-0	10,600,000	3300		3300	330	1600
Pentachlorophenol	87-86-5	646	3300		3300	330	660**

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. Method QLs listed are taken from Table 2 of SW846-8270D.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
[4] Lowest no action limit among m-cresol and p-cresol was used.
*QL for 8270C [Selective Ion Mode (SIM) Operation]
** The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aluminum	7429-90-5	732	20	n/a	0.0001	1.14	5.0
Antimony	7440-36-0	0.0635	10	n/a	0.0001	0.164	0.5
Arsenic	7440-38-2	0.132	1	n/a	0.001	0.203	1.0
Barium	7440-39-3	37	2.5	n/a	0.0001	0.057	2.0
Beryllium	7440-41-7	0.16	0.5	n/a	0.0001	0.011	0.1**
Cadmium	7440-43-9	2.64	0.5	n/a	0.0001	0.011	0.05
Chromium	7440-47-3	60.5	2.5	n/a	0.0001	0.302	1.0
Copper	7440-50-8	68.1	2.5	n/a	0.0001	0.0536	1.0
Iron	7439-89-6	314	20	n/a	0.0001	3.30	5.0
Lead	7439-92-1	50	20	n/a	0.0001	0.026	0.3
Manganese	7439-96-5	7.46	2.5	n/a	0.0001	0.054	0.5
Mercury	7439-97-6	0.158	0.02	0.00093	n/a	0.006	0.033
Molybdenum	7439-98-7	10.9	5	n/a	n/a	0.077	0.5
Nickel	7440-02-0	34	5	n/a	0.0001	0.0822	0.5
Selenium	7782-49-2	12.1	1	n/a	0.001	0.045	0.5
Silver	7440-22-4	6.12	1	n/a	0.0001	0.008	0.2
Thallium	7440-28-0	0.107[4]	2	n/a	0.0001	0.058	0.2**
Uranium	7440-61-1	2.16	1	n/a	n/a	0.012	0.1
Vanadium	7440-62-2	0.562	2.5	n/a	0.0001	0.735	1.0
Zinc	7440-66-6	401	20	n/a	0.0001	1.33	5.0

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. MDL listed for Mercury is taken from SW846-7471B (Section 2.3). Method QLs for the remaining metals are taken from SW846-6020A (Section 1.2)

[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
[4] The no action level for thallium chloride was used.
** The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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 (pCi/g)	Method QLs (pCi/g)	MDCs (pCi/g)	QLs (pCi/g)
Alpha Activity	12587-46-1	n/a	5	5	n/a	n/a	10
Beta Activity	12587-47-2	n/a	5	5	n/a	n/a	10
Americium-241	14596-10-2	0.836	0.05	3	n/a	n/a	0.1
Cesium-137	10045-97-3	0.0128	0.1	0.5	n/a	n/a	0.2
Neptunium-237	13994-20-2	0.0405	0.05	3	n/a	n/a	0.1
Plutonium-238	13981-16-3	2.27	0.05	6	n/a	n/a	0.1
Plutonium-239/240	n/a	2.22	0.05	4	n/a	n/a	0.1
Technetium-99	14133-76-7	67.4	1	8	n/a	n/a	1
Thorium-228	14274-82-9	0.00418	0.05	3	n/a	n/a	0.1
Thorium-230	14269-63-7	2.85	0.05	4	n/a	n/a	0.1
Thorium-232	n/a	2.61	0.05	3	n/a	n/a	0.1
Uranium-234	13966-29-5	3.81	0.15	3	n/a	n/a	0.1
Uranium-235/236	15117-96-1	0.0591	0.05	2	n/a	n/a	0.1
Uranium-238	24678-82-8	0.261	0.15	2	n/a	n/a	0.1

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 MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.

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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aroclor-1016	12674-11-2	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1221	11104-28-2	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1232	11141-16-5	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1242	53469-21-9	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1248	12672-29-6	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1254	11097-69-1	0.0388	0.1	n/a	n/a	0.00613	0.033
Aroclor-1260	11096-82-5	0.0574	0.1	n/a	n/a	0.00613	0.033
Total PCBs	1336-36-3	0.0574	0.1	n/a	n/a	0.05147	0.300

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. SW846-8082 does not list MDLs or Method QLs.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.

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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Antimony	7440-36-0	30	30	40	n/a	30	n/a
Arsenic	7440-38-2	11	11	40	n/a	11	n/a
Barium	7440-39-3	170	100	20	n/a	100	n/a
Cadmium	7440-43-9	12	12	100	n/a	12	n/a
Chromium	7440-47-3	85	85	150	n/a	85	n/a
Copper	7440-50-8	35	35	50	n/a	35	n/a
Iron	7439-89-6	28,000	100	60	n/a	100	n/a
Lead	7439-92-1	23	13	20	n/a	13	n/a
Manganese	7439-96-5	820	85	70	n/a	85	n/a
Mercury	7439-97-6	10	10	30	n/a	10	n/a
Molybdenum	7439-98-7	830	15	10	n/a	15	n/a
Nickel	7440-02-0	65	65	50	n/a	65	n/a
Selenium	7782-49-2	20	20	40	n/a	20	n/a
Silver	7440-22-4	10	10	70	n/a	10	n/a
Uranium	7440-61-1	20	20	n/a	n/a	20	n/a
Vanadium	7440-62-2	70	70	50	n/a	70	n/a
Zinc	7440-66-6	60	25	50	n/a	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. MDLs are taken from SW846-6200, Table 1, "Example Interference Free Lower Limits of Detection."
[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 project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award. MDLs for the XRF are based on Thermo Scientific NITON XL3t 300 Series Instruments for Environmental Analysis "Limits of Detection for Contaminants in Soil" for a typical soil matrix.

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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Total PCBs	1336-36-3	n/a	1, 5, 10, 50	n/a	1, 5, 10, 50	n/a	1, 5, 10, 50

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 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[1]

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

[1] See Work Plan Section 6.

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):

A systematic sampling approach will be implemented for all anomalies. A systematic sampling approach has been developed to ensure that data is acquired from all soil piles or areas, irrespective of their size, while ensuring that a sufficient number of samples is acquired to support informed decision making. To develop the sampling strategy, practices previously approved at PGDP have been consulted and form the basis for the sampling design.

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]:

Section 5.0 of the Sitewide Evaluation Work Plan presents the approach and decision flowcharts to locate and identify the anomalies to be evaluated.

QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements Table for Screening Samples

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number[1]	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (Identify Field Duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Soil	Soil	Surface/subsurface	Metals 6200 by XRF	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	PCB by HACH Pocket Colorimeter™ II Test Kit (or equivalent)	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	Gamma radiation by sodium iodide detector (or equivalent)	greater than 40 pCi/g	N/A	N/A	N/A
Rubble Areas	Wipe samples of above surface rubble	Aboveground surface	PCB by EnSys Immunoassay Wipe Test Kit (or equivalent)	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Rubble and soil beneath the rubble if the rubble is removed	Aboveground surface (rubble) and surface [(soil) (if rubble is removed)]	Gamma radiation by sodium iodide detector (or equivalent)	greater than 40 pCi/g	N/A	N/A	N/A

QAPP Worksheet #18-2
Sampling Locations and Methods/SOP Requirements Table for Samples Submitted to the Fixed-Base Laboratory for Analysis

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number[1]	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (Identify Field Duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Soil	Soil	Surface/subsurface	Metals	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	PCBs	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	Radionuclides	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	Metals	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	PCBs	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	Radionuclides	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17

QAPP Worksheet #19
Analytical SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	PCBs	low	See Worksheet #12	[1]	[1]	cool 4 °C	14 days until extraction/40 days
Soil	Metals	low	See Worksheet #12			cool 4 °C	180 days/28 days
Soil	Radionuclides	low	See Worksheet #12			cool 4 °C	180 days

[1] 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	No. of Sampling Locations[1]	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[1]
Soil	PCBs	low	SW846-8082	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD
Soil	Metals	low	SW846-6010/6020/7470	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD
Soil	Radionuclides	low	see Worksheet 12	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD

[1] Work package documents will identify the sampling locations, the matrices, and the number of samples, sample identification numbers for samples to be submitted to DOECAP certified laboratory. This is not applicable for samples analyzed by field methods.

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	PAD-ENM-0023 Rev. 0, *Composite Sampling*	Contractor	Sampling	N	N/A
2	PAD-ENM-2300 Rev. 0, *Collection of Soil Samples*	Contractor	Sampling	N	N/A
3	PAD-ENR-0020 Rev. 0, *Direct push Technology Sampling*	Contractor	Sampling	N	N/A
4	PAD-ENM-2700 Rev. 0, *Logbooks and Data Forms*	Contractor	Sampling	N	N/A
5	PAD-ENM-2702 Rev. 0, *Decontamination of Sampling Equipment*	Contractor	Sampling	N	N/A
6	PAD-ENM-2704 Rev. 0, *Trip, Equipment and Field Blank*	Contractor	Sampling	N	N/A
7	PAD-ENM-2708 Rev. 0, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*	Contractor	Sampling	N	N/A
8	PAD-ENM-5004 Rev. 0, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*	Contractor	Sampling	N	N/A

[1] It is understood that all SOPs are contractor specific.

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]
Field Instrumentation	Per the manufacturer's instructions	Per the manufacturer's instructions	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As needed	Equipment user	Field instrumentation manufacturer's manual

QAPP Worksheet #23
Analytical SOP References Table

UFP-QAPP Manual Section 3.2.1:

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)
6010	Inductively Coupled Plasma-Atomic Emission Spectrometry	Definitive	Metals	ICP	TBD	TBD
6020	Inductively Coupled Plasma-Mass Spectrometry	Definitive	Metals	ICP-MS	TBD	TBD
7470	Mercury (Manual Cold-Vapor Technique)	Definitive	Metals	AA	TBD	TBD
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	Definitive	PCBs	GC	TBD	TBD
Alpha Spec	Alpha Spectrometry	Definitive	Radionuclides	Alpha Spectrometry	TBD	TBD
Gamma Spec	Gamma Spectrometry	Definitive	Radionuclides	Gamma Spectrometry	TBD	TBD
Liquid Scintillation	Tc-99 by Liquid Scintillation	Definitive	Radionuclides	Liquid Scintillation	TBD	TBD
Metals by XRF	Metals by XRF	Screening	Metals	XRF	TBD	TBD
Immunoassay PCB Wipe Test	PCB by EnSys 12T Wipe Test System (or equivalent)	Screening	PCBs	Colorimeter	TBD	TBD
Immunoassay PCB Soil Test	PCB by HACH Pocket Colorimeter™ II Test Kit (or equivalent)	Screening	PCBs	Colorimeter	TBD	TBD
Radiological Scan	Gamma radiation	Screening	Radiation	Sodium Iodide detector or equivalent	TBD	TBD

[1] Analysis will be by the most recent revision.

QAPP Worksheet #24
Analytical Instrument Calibration Table

UFP-QAPP Manual Section 3.2.2:

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
*						

* 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. Laboratory contracting will be subsequent to the completion of the Sitewide Evaluation Work Plan. Field survey/sampling instrumentation will be calibrated according to manufacturer's instructions.

QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.2.3:

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
*								

* 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. Laboratory contracting will be subsequent to the completion of the Sitewide Evaluation Work Plan. Field survey/sampling instrumentation will be maintained, tested, and inspected according to manufacturer's instructions.

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):	See Worksheet #19
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	See Worksheet #19
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	N/A

QAPP Worksheet #27
Sample Custody Requirements[1]

UFP-QAPP Manual Section 3.3.3:

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Field sample custody requirements will be per DOE Prime Contractor procedure, PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal) are per the DOECAP certified laboratory procedures.

Sample Identification Procedures:

Sample identification requirements will be specified in work package documents.

Chain-of-custody Procedures:

Chain-of-custody requirements will be per DOE Prime Contractor procedure, PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #28
QC Samples Table

UFP-QAPP Manual Section 3.4:

Matrix	Soil
Analytical Group	SMO
Concentration Level	TBD
Sampling SOP	See Worksheet #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	Contractor
Analytical Organization	SMO
No. of Sample Locations	TBD. See Sitewide Evaluation Work Plan

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria[1]
Field Duplicates	Minimum 5%	N/A	N/A	N/A	Precision	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Split Samples	As requested by regulatory agency	N/A	N/A	N/A	N/A	N/A
Field Blanks	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Trip Blanks[2]	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Equipment Rinseates	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

QAPP Worksheet #28
QC Samples Table (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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Precision	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Zeroing Blank	Per manufacturer's instructions	HACH Pocket Colorimeter^{TM} II Test Kit for PCB in Soil per manufacturer's instructions	Per manufacturer's manufactures instructions	Environmental Sampling Lead	Per manufacturer's manufactures instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

QAPP Worksheet #28
QC Samples Table (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
Low/High Standards	Per manufacturer's instructions	HACH Pocket Colorimeter^{TM} II Test Kit for PCB in Soil per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Zeroing Blank	Per manufacturer's instructions	EnSys Immunoassay PCB Wipe Test Kit per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Low/High Standards	Per manufacturer's instructions	EnSys Immunoassay PCB Wipe Test Kit per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

[1] It is understood that SOPs are contractor specific.
[2] VOC analyses only

QAPP Worksheet #29
Project Documents and Records Table

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[1]	Other
Data Logbooks and associated completed sampling forms Sample Chains-of-Custody	Laboratory Data Packages OREIS database & associated data packages	OREIS database & associated data packages	PAD-ENM-5003, att. G Data Assessment Review Checklist and Comment Form	Form QA-F-0004, *Management/ Independent Assessment Report*

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #30
Analytical Services Table

UFP-QAPP Manual Section 3.5.2.3:

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP[1]	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	TBD	8082	28-day	TBD	TBD
Soil	Metals	low	TBD	6010	28-day	TBD	TBD
Soil	Metals	low	TBD	6020	28-day	TBD	TBD
Soil	Metals	low	TBD	7470	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Alpha Spec	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Gamma Spec	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Liquid Scintillation	28-day	TBD	TBD

[1] Analytical method SOPs for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the Site Evaluation Work Plan.

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	TBD	Internal	Prime Contractor QA	QA Specialists, Contractor or Independent Assessor	Project Manager, Contractor	Project Management, Contractor	QA Specialist, Contractor
Laboratory Audit	Annual	External	DOE Consolidated Audit Program (DOECAP)	Laboratory Assessor	Laboratory	Laboratory	DOECAP
Management Assessments	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor	QA Specialist, Contractor
Management By Walking Around (MBWA)[1]	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor	QA Specialist, Contractor
MBWA Follow-up surveillances	Quarterly	Internal	Prime Contractor Project Management	ER/EM Director, Project Management or designee, Contractor	Project Management/Designee, Contractor	Project Management, Contractor	QA Specialist, Contractor

[1] Reference: PAD-QA-1033 Management by Walking Around (MBWA) Program

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)	Time frame 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 QA-F-0004, *Management/ Independent Assessment Report,* and QA-F-0710, *Issue Identification Form*	Project Management, Issue Owner, Contractor	Upon issuance of Form QAP-E-004, *Management/ Independent Assessment Report,* form QA-F-0710, *Issue Identification Form,* will be completed and attached to the assessment report.	QA-F-0710, *Issue Identification Form*, documents the issue response and/or corrective actions.	Action owner as designated by Issue Owner, Contractor	Fifteen days for initial issue response, corrective action schedule determined by Issue Owner, per PAD-QA-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)
Performance Summary Report	1/month	By the 12th of each month	Project Manager, Contractor	Contractor Management
Site Evaluation Report	1/end of project	TBD	Project Manager, Contractor	DOE, U.S. EPA, Commonwealth of Kentucky

QAPP Worksheet #34
Verification (Step I) Process Table

UFP-QAPP Manual Section 5.2.1:

Verification Input	Description[1]	Internal/ External	Responsible for Verification (Name, Organization)
Field Logbooks	Field logbooks are verified per DOE Prime Contractor procedure, PAD-ENM-2700, *Logbooks and Data Forms*, and PAD-ENM-5003, *Quality Assured Data*.	Internal	Project Management or designee, Contractor
Chains of custody	Chains of custody are controlled by DOE Prime Contractor procedure, PAD-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, PAD-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[2], Contractor

[1] It is understood that SOPs are contractor specific.
[2] QA specialist performed general QA review.

QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Validation Input	Description[1]	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The documentation from the contractual screening will be included in the data assessment packages, per DOE Prime Contractor procedure, PAD-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, PAD-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, PAD-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

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[1]	Data Validator (title and organizational affiliation)
IIa/IIb	Soil	PCBs	Low	DOE Prime Contractor procedure, PAD-ENM-0811, *Pesticide and PCB Data Verification and Validation*	TBD
IIa/IIb	Soil	Metals	Low	DOE Prime Contractor procedure, PAD-ENM-5107, *Inorganic Data Verification and Validation*	TBD
IIa/IIb	Soil	Radionuclides	Low	DOE Prime Contractor procedure, PAD-ENM-5102, *Radiochemical Data Verification and Validation*	TBD

[1] It is understood that SOPs are contractor specific.

QAPP Worksheet #37
Usability Assessment[1]

UFP-QAPP Manual Section 5.2.3:

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, PAD-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 data quality objectives 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, PAD-ENM-5003, *Quality Assured Data*. This information will be included in the data assessment packages for review by project personnel. Data assessment also will include documentation of QC exceedances, trends, and/or bias in the data set. Data assessment will 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.

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APPENDIX C

ENVIRONMENT, SAFETY, AND HEALTH PLAN

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CONTENTS

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ACRONYMS

ACGIG	American Conference of Government Industrial Hygienists
AHA	Activity Hazard Assessment
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
CFR	*Code of Federal Regulations*
CRZ	contamination reduction zone
DOE	U. S. Department of Energy
EMS	Environmental Management System
EPA	U. S. Environmental Protection Agency
ES&H	Environmental Safety and Health
EZ	exclusion zone
FS	Field Superintendent
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operation
ISMS	Integrated Safety Management System
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
PSS	Plant Shift Superintendent
RADCON	radiation control
RWP	radiological work permit
S&H	Safety and Health
SHS	Safety and Health Specialist
SZ	support zone
TLD	thermoluminescent dosimeter
TLV	threshold limit value

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C.1. INTRODUCTION

This (ES&H) Plan has been developed to discuss the general ES&H requirements associated with the Sitewide Evaluation 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 Plans (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.

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C.2. INTEGRATED SAFETY MANAGEMENT/ENVIRONMENTAL MANAGEMENT

The Project team will utilize an Integrated Safety Management System (ISMS) which integrates the Safety Management Systems, the Environmental Management System (EMS), and 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 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 U.S. Department of Energy (DOE), U.S. Occupational Safety and Health Administration (OSHA), the U.S. Environmental Protection Agency (EPA), and other applicable regulatory guidance. Brief descriptions of the five ISMS/EMS core functions are provided below.

C.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 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.

C.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, environmental, 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 personal protective equipment (PPE). The 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.

C.2.3 DEVELOP/IMPLEMENT CONTROLS

The primary mechanisms used to flow down 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 human health at risk, or that could endanger the public or the environment. One of the key elements of ISMS/EMS is that all personnel have “stop work authority” and are encouraged to use this authority whenever there is 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.

C.2.4 PERFORM WORK

After the project team has been given approval to proceed, the project-specific plans will be implemented. The project team will verify that all applicable plans, forms, and records are contained in the project files and accessible by approved personnel. 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

C.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.

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 and 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; and
- Overall issues or concerns they may have regarding how the work was performed.

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C.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/EMS Program, Radiation Protection Program, and Quality Assurance 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.

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C.4. SUSPENDING/STOPPING WORK

In accordance with 10 *CFR* § 851.20 and the DOE Prime Contractor's Worker S&H Program and procedures, workers have the right to decline to perform an assigned task because of a reasonable belief under the circumstances that the task poses an imminent risk of death or serious physical harm to the worker. 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 Field Superintendent (FS) and Safety and Health Specialist (SHS) they will be evaluated by management 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 FS and/or SHS should be notified immediately, at which time management and/or emergency responders will be notified.

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C.5. ISMS/EMS 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 FS and/or SHS 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 work control documents. This shall be documented as required reading, acknowledgement forms, or briefing sheets. Visitors also will be oriented to the applicable plans and potential hazards that they may encounter.

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C.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.

These are the roles and responsibilities of key field team members.

- The Environmental Restoration Project Director oversees the implementation of the project plans and provides the resources for the project.

- The 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 Project Manager also performs management audits and inspections.

- The FS coordinates field activities and logistics and provides communication between the project team and the field team as well as other support groups. The FS also ensures that on-site personnel comply with the Worker S&H Program, work packages, and applicable procedures.

- The S&H Specialist provides safety and health support and oversight to the project to ensure that work is being performed safely and in accordance with the Worker S&H Program, applicable regulations, 10 *CFR* § 851, DOE directives, and applicable plans and procedures.

- The Quality Assurance 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 Radiological Control Group provides support and guidance to the project and assists the FS and SHS with implementation of radiological controls and as-low-as-reasonably-achievable (ALARA) principles. The Radiological Control Technician 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 field work 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 S&H Program, as well as ES&H and work control requirements.

- Field Team/Subcontractors–Samplers, drillers, operators, and maintenance perform work as specified in work packages, adhering to the Worker S&H 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.

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C.7. SITE CONTROL

C.7.1 WORK SITE CONTROL ZONES

Work zones will be utilized to control access. These areas will be controlled by the FS, SHS, and/or RCT 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 may be established at the site.

C.7.1.1 Exclusion Zone

The exclusion zone (EZ) is the immediate area around an excavation or remedial action activity where there is potential for personal exposure to hazardous materials. The exclusion zone will be marked and entry and exit points will be established to regulate movement of personnel and equipment to reduce the potential of the spread of contamination.

C.7.1.2 Contamination Reduction Zone

The contamination reduction zone (CRZ) is the transition area between the EZ and construction zone or support zone. This area will provide a buffer area to reduce the probability that contamination will leave the EZ. The CRZ is designed for the following activities:

- Decontamination of equipment, workers, and sample containers;
- Staging of emergency response equipment and supplies (e.g., first-aid, fire equipment);
- Scanning of personnel, materials, and equipment;
- Sample packing and preparation; and
- Worker rest area.

The CRZ is designed to reduce the possibility of the clean area becoming contaminated by site hazards. The degree of contamination in the CRZ decreases as the distance from the contaminants increases.

C.7.1.3 Construction Zone

The construction zone is the area outside of potential contamination, but still encompasses 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.

C.7.1.4 Support Zone

The support zone (SZ) is the outermost area of the site. This area is uncontaminated where workers provide operational and administrative support. The support zone is clean and will not be entered by contaminated equipment or personnel, unless properly controlled or except under emergency or evacuation conditions. Normal work clothes are appropriate within this zone.

C.7.1.5 Site Communications

Paducah Gaseous Diffusion Plant (PGDP) plant radios, plant phones, and cell phones will be used for on-site and off-site communication. 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.

C.7.1.6 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 FS, SHS, and Radiological Control Technician. The FS (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 the appropriate level of HAZWOPER training. This training must cover the requirements in 29 *CFR* § 1910.120, HAZWOPER. As applicable, workers must receive annual 8-hour refresher training (if applicable) and 1 or 3-day on-site supervision under a trained, experienced supervisor. The FS 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. Workers entering radiological posted work areas also will be required to complete Radworker II training.

C.7.1.7 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 wish to enter the EZ must produce evidence that they have medical clearance and appropriate 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 FS, SHS, and/or RCT.

C.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 are generally one level of protection lower than the EZ. Activities conducted within SZs should require normal work clothes and PPE unless specified by the FS or SHS.

C.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.

C.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 and 29 *CFR* § 1910.134, Respiratory Protection. Personnel required to wear respirators will inspect their respirators before and after each use, and any deficiencies will be reported to the FS or SHS immediately. Respirators will be properly stored in a bag in a clean, dry environment and routinely cleaned. Damaged respirators shall not be used.

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C.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 and ability to wear a respirator.

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.

C.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.

C.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; and
- Personnel are opening waste containers that contain potentially contaminated material.

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C.10. INDUSTRIAL HYGIENE MONITORING

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 always will 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 in accordance with the appropriate NIOSH or OSHA methodology.

C.10.1 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 Sitewide Evaluation project will be monitored through dosimetry and required to wear a thermoluminescent dosimeter (TLD) when working in radiological zones and submit bioassays as required.

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C.11. EMERGENCY RESPONSE

C.11.1 RESPONSIBILITIES

The PM, FS, and SHS are responsible for the project emergency management program and ensuring that the appropriate emergency response equipment is readily available at the work site and in proper working order.

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 SHS 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 SHS or the FS. The SHS or FS 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 Plant Shift Superintendent (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.

C.11.2 REPORTING AN EMERGENCY

C.11.2.1 Discovery

The person who discovers an emergency should immediately report it, then attempt to establish control ONLY if the incident is minor in magnitude (e.g., using a fire extinguisher to put out an incipient fire if trained to do so and extinguishment can be accomplished in a safe manner). 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.

Sitewide Evaluation project personnel will maintain a radio, telephone, or other reliable means of notifying emergency response personnel and the PSS.

C.11.2.2 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.

C.11.3 INITIAL EMERGENCY RESPONSE

When an emergency occurs, the SHS or FS 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 should be an adequate number of personnel 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.

C.11.4 PADUCAH GASEOUS DIFFUSION PLANT ALARMS

The alarms can be heard by calling 6161 on a Bell phone.

These include the following:

***Radiation Emergency/CAAS*:**	Continuous blast on a high-pitched air whistle or electronic horn **ACTION**: Evacuate area immediately and stay away from affected 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 FS, SHS, or designee will be responsible for accounting for all field personnel (including subtier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator.

C.11.5 REPORTING A SPILL

When a spill is discovered, the FS or SHS will immediately contact Environmental Compliance, the 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).

C.11.5.1 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 FS or SHS will immediately contact PSS for assistance. Rescue operations will not be performed unless the rescuers are dressed in the appropriate protective equipment.

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 FS or SHS 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.
- 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.
- Notify Environmental Compliance for spill reporting and cleanup requirements.

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 FS, SHS, 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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APPENDIX D

DATA MANAGEMENT IMPLEMENTATION PLAN

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CONTENTS

ACRONYMS

COC	chain-of-custody
DMC	Document Management Center
DMIP	Data Management Implementation Plan
DOE	U.S. Department of Energy
EDD	electronic data deliverables
GIS	geographic information system
OREIS	Oak Ridge Environmental Information System
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QC	quality control
RTL	ready-to-load
SOW	statement of work

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D.1 INTRODUCTION

The purpose of this Data Management Implementation Plan (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 Sitewide Evaluation at the Paducah Gaseous Diffusion Plant (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 usage 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. Field data are collected in field logbooks or field data forms and are entered into Paducah Project Environmental Measurements System (PEMS), as appropriate, for storage. Analytical data are planned and managed through Paducah PEMS and transferred to Paducah Oak Ridge Environmental Information System (OREIS) for long-term storage and reporting.

To meet current regulatory requirements for U.S. Department of Energy (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 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 Sitewide Evaluation. 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.

D.2 PROJECT MISSION

Requirements and responsibilities described in this plan apply to activities conducted by the project team in support of the Sitewide Evaluation. Specific activities involving data include, but are not limited to, sampling of sediment and soil; storing, analyzing, and shipping samples, when applicable; and evaluation, verification, validation, assessment, and reporting of analytical results.

D.3 DATA MANAGEMENT ACTIVITIES

Data management will be implemented throughout the life cycle of the Sitewide Evaluation. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual usage of the data for decision-making purposes, to the long-term storage of data. Data management activities 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 D.8 contains a detailed discussion of the activities listed above.

D.4 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 electronic data deliverables (EDDs) are loaded into Paducah PEMS by the Data Coordinator. The project team is responsible for data verification and 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 ready-to-load (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 methods, laboratory quality control (QC) requirements, and deliverable requirements are specified in this SOW. In addition, 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.

D.4.1 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.

D.4.2 HISTORICAL DATA

No historical data is available for this Sitewide Evaluation.

D.4.3 FIELD DATA

Field (screening) data for the project includes sample collection information and field screen measurement results.

D.4.4 ANALYTICAL DATA

Analytical (definitive) data for the project consists of laboratory analyses for environmental and waste characterization.

D.4.5 SURVEY DATA COVERAGE

Global Positioning System or standard survey techniques will be used to obtain civil survey data for this project. 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

D.5 DATA FORMS AND LOGBOOKS

Field logbooks, site logbooks, chain-of-custody (COC) forms, data packages with associated quality assurance/QC (QA/QC) information, and field forms are maintained according to the requirements defined in procedure PAD-DOC-1009, *Records Management, Administrative Records, and Document Control*.[1] 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 Document Management Center (DMC) and copies are maintained in the field office.

D.5.1 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, COC forms, or sample labels and is entered directly into Paducah PEMS by the Data Coordinator. Sample identification numbers are identified in Paducah PEMS as assigned by the Data Coordinator.

Sample COC forms contain sample-specific information recorded during collection of the sample. Any deviations from the sampling plan are noted on the sample COC form or logbook. The Sampling Team

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[1] It is understood that procedures are contractor specific.

Leader reviews each sample COC form for accuracy and completeness as soon as practical following sample collection.

Sample COC forms are generated from Paducah PEMS with the following information:

Information that is preprinted:	**Information that is entered manually:**
- Lab COC 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)	
- Analysis (e.g., PCB[1])	
- Sample container (volume, type)	

[1] PCB = Polychlorinated Biphenyl

D.5.2 LITHOLOGIC DESCRIPTION FORMS

Lithologic description forms will be used as necessary for this project.

D.5.3 WELL CONSTRUCTION DETAIL FORMS

These forms are not necessary for use during this project.

D.5.4 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 PAD-ENM-2700, *Logbooks and Data Forms*.

D.6 DATA AND DATA RECORDS TRANSMITTALS

D.6.1 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.

D.6.2 DATA RECORDS TRANSMITTALS

Project personnel will make records transfers to the DMC.

D.7 DATA MANAGEMENT SYSTEMS

D.7.1 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 accesses 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 COC 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 sample management office.

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.

D.7.2 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 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)

D.7.3 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).

D.8 DATA MANAGEMENT TASKS AND ROLES AND RESPONSIBILITIES

D.8.1 DATA MANAGEMENT TASKS

An explanation of the data review process is provided in the following sections.

D.8.1.1 Plan Data Collection

Other documents for this project provide additional information for the tasks of project environmental data collection, including sampling and analysis planning, quality assurance, waste management, and health and safety. Also, a laboratory SOW will be developed for this project.

D.8.1.2 Prepare for Sampling Activities

The data management tasks involved in sample preparation include identifying all sampling locations, preparing descriptions of these stations, identifying sample containers and preservation, developing field logbooks, preparation of sample kits and COCs, 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 global positioning system.

D.8.1.3 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, COC 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 COC records. Sample labels and COCs are completed according to PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*.

The project field team will collect samples for the project and will record pertinent sampling information on the COC and in the field logbook. The Data Coordinator enters the information from the COC forms into Paducah PEMS.

D.8.1.4 Submit Samples for Analysis

Before the start of field sampling, the Field Superintendent or designee coordinates the delivery of samples with the Lab Coordinator who, in turn, coordinates with the analytical laboratories. 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.

D.8.1.5 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 PAD-ENM-5007, *Data Management Coordination*.

The field screen measurement data will be provided by the 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.

D.8.1.6 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. During contractual screening, the analytical method requested on the laboratory statement of work is compared to the analytical method received from the laboratory to ensure that contract requirements were met.

D.8.1.7 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. Verification is performed for 100 percent of data. Data verification includes contractual screening and criteria as specified in Appendix B, the Quality Assurance Project Plan. Data is flagged as necessary. Verification qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS.

D.8.1.8 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.

D.8.1.9 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. Per contractor procedure, data validation can be performed concurrently with data verification and data assessment. Data assessment is not finalized until data validation is complete, if applicable, and the data validation qualifiers have been evaluated. Data assessment is performed on 100 percent of the data set, even when data validation is not required.

The data assessment is conducted by the project team according to DOE Prime Contractor procedure, PAD-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.

D.8.1.10 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. 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.

D.8.2 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.

D.8.2.1 Project Manager

The Project Manager is responsible for the day-to-day operation of the project. The Project Manager ensures the requirements of policies and procedures are met. The project manager or designee assesses data in accordance with DOE Prime Contractor procedure, PAD-ENM-5003, *Quality Assured Data*. The Project Manager is responsible to flow down data management requirements to subcontractors as required.

D.8.2.2 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.

D.8.2.3 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.

D.8.2.4 Data Coordinator

The Data Coordinator enters the data into Paducah PEMS, including COC information, field data, data assessment and data validation qualifiers, and any pertinent sampling information. After receiving a notification that a fixed-base laboratory 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.

D.8.2.5 Document Control Center Manager

The DMC Manager is responsible for long-term storage of project records. The project team will interface with the DMC Manager and will transfer documents and records in accordance with DOE requirements.

D.8.2.6 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.

D.8.2.7 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 DOE Prime Contractor procedure, PAD-ENM-5003, *Quality Assured Data,* are followed.

D.8.2.8 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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Secondary Document

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

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Secondary Document

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

Date Issued—December 2010

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U.S. DEPARTMENT OF ENERGY
Office of Environmental Management

Prepared by
LATA ENVIRONMENTAL SERVICES OF KENTUCKY, LLC
managing the
Environmental Management Activities at the
Paducah Gaseous Diffusion Plant
under contract DE-AC30-10CC40020

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PREFACE

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, under the Soils Operable Unit (OU), was prepared to identify any unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act evaluation and to develop information usable when completing the Resource Conservation and Recovery Act EIs process for the Paducah Gaseous Diffusion Plant (PGDP). The Site Management Plan (DOE 2010a) defined the scope and provided key planning assumptions. This evaluation will include a focused radiological survey and visual walkover survey to cover U.S. Department of Energy (DOE)-owned property outside PGDP and not currently a solid waste management unit (SWMU)/area of concern (AOC). Any radiological anomalies in the West Kentucky Wildlife Management Area (WKWMA) on property owned by WKWMA, identified in radiological flyover surveys, also will be evaluated under this work plan. Anomalies identified as soil and rubble areas will be further evaluated under this work plan. Any other areas identified requiring additional investigation will be evaluated to determine the appropriate OU for follow-up investigations. Collection of field and fixed-base laboratory data will enable DOE to increase confidence that SWMU/AOCs have been appropriately identified. Information will be documented in a Site Evaluation Report, which will include SWMU/AOC Assessment Reports (SARs) for newly identified areas meeting the criteria to be managed under the Federal Facility Agreement (EPA 1998).

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CONTENTS

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FIGURES

TABLE

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ACRONYMS

AOC	area of concern
ARARs	applicable or relevant and appropriate requirements
bgs	below ground surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COE	U. S. Army Corps of Engineers
D&D	decontamination and decommissioning
DOE	U.S. Department of Energy
EI	Environmental Indicator
EM	Environmental Management
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
FS	Feasibility Study
GPS	global positioning system
KDFWR	Kentucky Department of Fish and Wildlife Resources
MARSSIM	Multi-Agency Radiation Survey & Site Investigation Manual
NAL	no action level
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QAPP	Quality Assurance Project Plan
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI	remedial investigation
SAP	sampling and analysis plan
SAR	SWMU assessment report
SER	site evaluation report
SMP	Site Management Plan
SVOC	semivolatile organic compounds
SWMU	solid waste management unit
TNT	trinitrotoluene
USEC	United States Enrichment Corporation
VOC	volatile organic compounds
WAG	waste area group
WKWMA	West Kentucky Wildlife Management Area
XRF	X-ray fluorescence

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EXECUTIVE SUMMARY

PROBLEM STATEMENT

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, documenting work to be performed under the Soils Operable Unit (OU), was prepared to identify unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation and to develop information usable when completing the Resource Conservation and Recovery Act (RCRA) Environmental Indicators (EIs) process for the Paducah Gaseous Diffusion Plant (PGDP).

BACKGROUND

This evaluation includes scoping surveys of the U.S. Department of Energy (DOE)-owned property outside PGDP and West Kentucky Wildlife Management Area (WKWMA)-owned property around PGDP. Contamination sources may be present within the WKWMA that are not of DOE origin, for example the former Kentucky Ordnance Works occupies an area of the WKWMA southwest of PGDP.

Several evaluations/investigations have been performed in the DOE-owned areas outside PGDP to identify and appropriately manage material originating from PGDP. Ongoing efforts are being performed under the Soils OU, Surface Water OU, and Burial Grounds OU. Under the Soils OU and of relevance to this sitewide evaluation are work efforts that have been performed in support of soils and rubble area evaluations. Results of historical studies of rubble areas at PGDP and surrounding areas are presented in four reports (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995) and as part of a soil and rubble evaluation. The Waste Area Group (WAG) 17 RCRA Facility Investigation (RFI) (DOE 1995) was completed between October and December 1995 and included investigation of 37 areas of concern (AOCs). The findings of the WAG 17 RCRA Facility Investigation are provided in the Remedial Investigation (RI) report (DOE 1997a) and in the WAG 17 Record of Decision (DOE 1997b).

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On November 2, 2006, Paducah Remediation Services, LLC, radiological control technicians and representatives from the Kentucky Division of Waste Management observed and surveyed a series of soil and rubble areas on the DOE Reservation. As a result of a comprehensive survey conducted in 2007, 122 soil and rubble areas were identified for possible inclusion as solid waste management units/AOCs (DOE 2007a). These existing soil and rubble areas were evaluated under the Soil Piles Sampling and Analysis Plan (SAP) (DOE 2007b): Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), Addendum 2 (DOE 2008b); and the SAP for the Rubble Areas (DOE 2008c). Work has been completed and Site Evaluation Reports have been issued for Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d); Addendum 1-B Soil Piles (DOE 2009a); Addendum 2 Soil Piles (DOE 2009b); and Rubble Areas (DOE 2009c). In addition, a Soils OU RI/Feasibility Study (RI/FS) Work Plan was prepared and implemented during 2010 (DOE 2010b).

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The scope of work and key planning assumptions for this evaluation are provided in the Site Management Plan (SMP) (DOE 2010a).

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PROJECT OBJECTIVES

The objective is to identify unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information that is usable when completing the RCRA EI process for PGDP.

CONCEPTUAL SITE MODEL

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Known recreational activities that take place in the WKWMA include hunting and field trials (both horses and dogs). Other recreational uses, such as hiking, also are possible; therefore, recreational user exposure to surface soils is the primary exposure pathway. The teen recreational user's screening concentration is lowest when compared to the other users for the same target risk and hazard level; therefore, the teen recreational user is considered in the Conceptual Site Model for users of the WKWMA (DOE 2001). The recreational user could be exposed to contaminants through contact with surface soils through the following exposure routes:

- External exposure from ionizing radiation (the most likely exposure route)
- Dermal contact
- Incidental ingestion
- Inhalation

Industrial workers might be expected to work on DOE-owned property outside PGDP; however, this would not be on a regular basis and their exposure would be limited to performance of tasks associated with site evaluation, maintenance, and remedial action.

CONTAMINANTS

Information from soils evaluations of previous soil piles and rubble areas identified the following types of contaminants as potentially present in site media:

- Polychlorinated biphenyls
- Radionuclides
- Metals

EVALUATION STRATEGY

The SMP (DOE 2010a) provides key planning assumptions for this evaluation including scoping surveys to identify anomalies. On DOE property outside PGDP, identification of anomalies will be by radiological and visual walkover surveys, with potential anomalies identified by radiological readings at greater than twice instrument background, a release is visually identified, or an anomaly is identified by process knowledge. Radiological and visual walkover surveys currently are being performed by DOE under DOE authority to identify anomalies on DOE-owned property outside PGDP. Anomalies on property owned by WKWMA will be identified using radiological flyover surveys, with identified radiological anomalies being subject to visual and radiological walkover surveys. Radiological flyover surveys were performed under DOE authority in October through November 2009.

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Anomalies, once identified, will be categorized according to physical attributes as follows:

- Soil areas–which are defined as soil piles and disturbed soil areas.
- Rubble areas–which are defined as areas of varied materials.

Confirmed anomalies (identified and categorized) will be evaluated further under this work plan.

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1. INTRODUCTION

1.1 SCOPE OF WORK

This *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D1, documenting work to be performed under the Soils Operable Unit (OU), was prepared to identify unknown contaminated areas originating from the Paducah Gaseous Diffusion Plant (PGDP) requiring further Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) evaluation and to develop information usable when completing the Resource Conservation and Recovery Act (RCRA) Environmental Indicators (EIs) process for PGDP. Information will be documented in a site evaluation report (SER). Solid Waste Management Unit (SWMU) Assessment Reports (SARs) will be attached to the SER for any new SWMUs/areas of concern (AOCs) identified during this evaluation. SWMU and AOC are defined in the Federal Facility Agreement (FFA) (EPA 1998) as follows:

"SWMU – means any discernible unit at which solid wastes have been placed at any time, irrespective of whether the unit was intended for the management of solid or Hazardous Waste. Such units include any area at a facility at which routine and systematic releases of hazardous wastes or hazardous constituents has occurred."

"AOC – shall include any area having a probably or known release of a hazardous waste, hazardous constituent or hazardous substance which is not from a solid waste management unit and which poses a current or potential threat to human health or the environment. Such areas of concern may require investigations and remedial action…."

According to the Site Management Plan (SMP) (DOE 2010a), the "scope of the project includes a survey of the U.S. Department of Energy (DOE)-owned property outside the limited/controlled area. A sitewide evaluation will be performed to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the RCRA EIs process." Key DOE Planning Assumptions from the Life Cycle Baseline provided in the SMP are as follows:

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(1) A flyover radiological survey will be conducted for a 25 square miles area.

(2) A visual walkover survey will cover DOE-owned property that is outside PGDP and not currently a SWMU/AOC (approximately 2,676 acres). DOE property licensed to Western Kentucky Wildlife Management Area (WKWMA) and areas owned by WKWMA identified as anomalies in the flyover also will be surveyed.

(3) Visual observation also will be used to identify piles, spills, buried materials, and other anomalies.

(4) A radiological walkover survey using Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) approach will cover, at a minimum, 10% of the property identified above (approximately 240 acres). All anomalies identified will be scanned regardless of what percentage of land they cover.

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(5) All anomalies will be documented on a map and in a database including location, description, photos, and data.

(6) Analytical sampling will be conducted if the radiological scan indicates contamination (i.e., twice instrument background) or a release is visually identified.

(7) Information will be documented in a SER. SARs will be attached to the SER for any new SWMUs/AOCs identified during this evaluation.

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(8) Any newly identified SWMUs/AOCs will be addressed in the Soils OU Remedial Action (Phase I—Pre Gaseous Diffusion Plant Shutdown). A separate removal action will not be performed.

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Soil samples (from soil areas) and wipe samples (from stained rubble areas) from confirmed anomalies that are determined to be the responsibility of DOE will be analyzed by field and fixed-base analytical methods as discussed in Sections 5, Appendix A, and Appendix B of this work plan. This work plan was prepared by the DOE prime contractor for environmental remediation at PGDP. Resulting fixed-base laboratory analytical data will be of sufficient quality so that it can be used in subsequent CERCLA documents to evaluate potential human health risks and to support decisions regarding any need for response actions. Figure 1 illustrates PGDP and surrounding area.

1.2 OBJECTIVES

The objective is to identify unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information usable when completing the RCRA EI process for PGDP. Specifically the evaluation was designed to obtain data to support the following objectives:

- Identify anomalies (based on scoping surveys) on DOE-owned and WKWMA-owned property and confirm DOE origin. DOE origin is determined on DOE-owned property by radiological and visual walkover surveys where radiological readings are greater than twice instrument background or where a release is visually identified or where an anomaly is identified by process knowledge. DOE origin is determined on WKWMA-owned property by a radiological signature from the aerial radiological survey;

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- For anomalies confirmed to be of DOE origin, establish the presence or absence of DOE-related contaminants [metals, polychlorinated biphenyls (PCBs), and radionuclides];

- Collect data to perform data screening to determine if such anomalies may pose risks to human health under current use scenarios and to support future decisions; and

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- Determine appropriate path forward per the FFA (EPA 1998).

1.3 GUIDANCE

The following guidance was used as a basis for preparing this work plan:

- U.S. Environmental Protection Agency (EPA), Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988);

- EPA Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA 2006);

Figure 1. Map of PGDP and Surrounding Area

- EPA Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition (EPA 2004);

- EPA Uniform Federal Policy for Quality Assurance Project Plans (EPA 2005a; EPA 2005b; EPA 2005c; EPA 2005d);

- EPA Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (EPA 1992); and

- MARSSIM Manual (DOE 2000).

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The Environmental Management (EM) Program at PGDP is conducted in compliance with several laws and regulations. In general, these laws include RCRA in 1976; CERCLA; the Clean Water Act of 1972; the Toxic Substances Control Act of 1976; the Endangered Species Act of 1973; and Commonwealth of Kentucky statutes and regulations. DOE may perform maintenance actions under its authority provided in the Atomic Energy Act. Although all of these regulations impact the PGDP EM Program, this work plan is designed to support CERCLA decisions concerning unknown contaminated areas.

1.4 WORK PLAN ORGANIZATION

Section 2 includes information on site background and physical setting. Section 3 is an initial evaluation of the site including the site conceptual model. Section 4 provides a brief description of tasks to be performed, Section 5 provides the work plan rationale, and Section 6 provides a schedule.

Appendix A of this work plan contains the Sampling and Analysis Plan (SAP). Various methods will be used to assist in identifying specific anomalies to be evaluated further; therefore the specific types and numbers of anomalies, sample locations and numbers, and sample designations will documented in work package documents. Appendix B contains the Quality Assurance Project Plan (QAPP); Appendix C contains the Environment, Safety, and Health Plan; and Appendix D contains the Data Management Implementation Plan.

2. SITE BACKGROUND AND PHYSICAL SETTING

PGDP, located within the Jackson Purchase region of western Kentucky, is an active uranium enrichment facility owned by 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 (USEC) assumed management and operation of the PGDP enrichment facility under a lease agreement with DOE. DOE retains ownership of the enrichment complex. The DOE Portsmouth/Paducah Project Office is responsible for EM activities associated with PGDP (CERCLIS# KY8-890-008-982) and serves as the lead agency for remedial actions at PGDP. EPA Region 4 and Kentucky Department for Environmental Protection serve as the regulatory oversight agencies for the facility.

Of the 1,386 ha (3,423 acres) owned by DOE, approximately 303 ha (749 acres) of this parcel are inside PGDP. Most of the facilities used to support enrichment operations are located in this area. Outside PGDP, several support facilities for both the DOE and USEC missions can be found. The support facilities include landfills (both active and closed), modular office complexes, a water treatment facility, groundwater remediation systems, decontamination facilities, storage areas, a storm water retention basin, and liquid effluent treatment facilities. Of the remaining DOE land, approximately 842 ha (2,081 acres) is licensed to the Commonwealth of Kentucky Department of Fish and Wildlife Resources (KDFWR) and serves as a portion of the WKWMA. The licensed portion of the WKWMA is used by the public for hunting and horse and dog field trials. KDFWR staff work in the licensed area performing wildlife management activities.

The topography of the DOE Reservation is level to slightly rolling. It is rural and predominantly open grasslands with scattered wooded areas of mature hardwoods and brush. Approximately 60% of the total area outside PGDP but on the DOE Reservation is grasslands; much of this non-wooded area contains electrical power lines.

Two creeks—Bayou Creek and Little Bayou Creek—pass through the DOE Reservation, draining north into the Ohio River. Multiple permitted drainage outfalls and ditches from PGDP discharge to these two creeks. There are approximately 11,000 m (36,100 ft) of combined drainage ditches and creeks that potentially have been impacted by PGDP discharges. Areas in and near outfall ditches were surveyed previously and are posted appropriately.

Contamination sources may be present within the WKWMA that are not of DOE origin; for example, the former Kentucky Ordnance Works occupies an area of the WKWMA southwest of PGDP. Substantial work has been performed in areas outside PGDP to identify, and appropriately manage, material originating from PGDP. Ongoing efforts are being performed under the Soils OU, Surface Water OU and Burial Grounds OU. Under the Soils OU and of relevance to this sitewide evaluation are the work efforts that have been performed in support of soils and rubble area evaluations. Results of historical studies of rubble areas at PGDP and surrounding areas are presented in four reports (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995) and as part of an ongoing soil and rubble evaluation (see below). The Waste Area Group (WAG) 17 RCRA Facility Investigation (RFI) (DOE 1995) was completed between October and December 1995 and included investigation of 37 AOCs. The findings of the WAG 17 RFI are provided in the Remedial Investigation (RI) report (DOE 1997a) and in the WAG 17 Record of Decision (DOE 1997b). Radionuclides and polychlorinated biphenyls (PCBs) are the primary potential contaminants of concern for pre-GDP shutdown. The Soils OU focuses on accessible plant surface soils (ground surface to 10 ft bgs and 16 ft bgs in the vicinity of pipelines). A series of Soils OU actions have been completed to date and a removal action for soils at SWMUs 19 (C-410-B HF Neutralization Lagoon), and 181 (C-218 Outdoor Firing Range) is being implemented as a non-time-critical removal.

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On November 2, 2006, Paducah Remediation Services, LLC radiological control technicians and Kentucky Division of Waste Management personnel observed and surveyed a series of soil piles on the DOE Reservation. As a result of a comprehensive survey conducted by DOE in 2007, additional soil and rubble areas were identified in a letter for possible inclusion as SWMUs/AOCs (DOE 2007a). This letter, dated February 17, noted that "a total of 150 areas, consisting of soil and rubble have been identified to date." Of those 150 areas, 28 areas previously have been identified as SWMUs or AOCs, and 13 areas had sufficient data to make a SWMU or AOC determination, leaving 109 areas (85 soil areas and 24 rubble areas) to be evaluated. All of the soil areas were on DOE property whereas only 6 of the 24 rubble areas were on DOE property. The letter contained a planning schedule for characterization and notification for the soil and rubble areas on DOE property, and the work was subsequently incorporated into the SMP as part of the soil/rubble areas under the Soils OU. These areas and two additional soil piles (AOCs 492 and 541) currently are being evaluated under the Soil Piles SAP (DOE 2007b) and associated addenda, Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b). In addition, identified rubble areas are being evaluated under the Rubble Areas SAP (DOE 2008c). In order to facilitate the process, these soil and rubble areas were prioritized as follows:

- Little Bayou Creek Soil Pile I on the east side of the plant between McCaw Road and Outfall 002 Ditch – Addendum 1-A.
- Little Bayou Creek including AOC 492 and 541 north and east of the plant including the North-South Diversion Ditch, but excluding Soil Pile I–Addendum 1-B.
- Bayou Creek and unnamed tributary west side of the plant – Addendum 2.
- Rubble areas.

Existing SWMUs/AOCs (i.e., identified to date and covered under other work elements) outside PGDP are shown in Figure 2. Work has been completed and SERs have been issued for Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d): Addendum 1-B Soil Piles (DOE 2009a); Addendum 2 Soil Piles (DOE 2009b); and Rubble Areas (DOE 2009c). In addition, a Soils OU RI/Feasibility Study (RI/FS) Work Plan is being prepared (DOE 2010b).

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In order to expedite the current sitewide evaluation, DOE is proceeding with a radiological and visual walkover survey (planning assumptions 2 through 5 in the 2009 SMP, as noted in Section 1) of the DOE-owned property outside PGDP for the purpose of identifying potential anomalies (DOE 2008e). DOE is performing this task under its own authority. Planned surveys are complete and 633 anomalies were visually identified. All anomalies have been radiologically surveyed and all are less than twice instrument background.

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Figure 2. Existing SWMUs/AOCs outside PGDP

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3. INITIAL EVALUATION

Based on previous experience (DOE 2007a), the types of anomalies expected to be encountered likely will consist of bare soil areas (possibly indicative of spills), soil piles, and rubble areas. Existing soil piles and rubble areas being investigated under other Soils OU SAPs are generally located adjacent to PGDP outfalls, Little Bayou and Bayou Creeks, along the unnamed tributary, and the North-South Diversion Ditch. Unknown contaminated areas might be expected to be found near surface water drainages, near the edges of woods, and near roadways. Proximity to surface water drainage areas results in several potential secondary exposure routes that potentially could impact human health and the environment. The majority of the secondary routes assume that soils either have been released to adjacent waterways or moved through the food chain. Precipitation could result in contaminant migration; however, PGDP historical monitoring data over the past 5-10 years indicate little migration is occurring because contaminant levels in surrounding creeks are stable or decreasing.

Contaminants found during sampling of soil piles under the Soil Piles Evaluation (DOE 2008d; DOE 2009a; DOE 2009b) do not bioaccumulate in plants to a great degree. As a result, plant uptake and corresponding accumulation in animal tissue is unlikely, but soil ingestion as part of normal feeding activities is likely a complete pathway. Ecological receptors also may be exposed to on-site contaminants; however, the primary focus of this evaluation effort is to determine risks to human health. Evaluation of ecological risks will be completed as part of a subsequent action under the PGDP FFA (EPA 1998). Fixed-base laboratory analytical data from samples collected as part of this site evaluation shall be of sufficient quality to be used for risk assessment purposes.

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Sampling is necessary to gather data to allow DOE to assess potential risks to human health posed by confirmed anomalies. Sampling also provides data to assist in future determination of nature and extent of any contamination. Contaminants attributable to DOE activities that might be present include metals, PCBs, and radionuclides. It should be noted that metals and PCBs may be present from other sources.

Based on experience gained through execution of the SAP for the Soil Piles Evaluation (DOE 2007b) and its addenda [Addendum 1-A (DOE 2007c), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b)] and the SAP for the Rubble Areas (DOE 2008c), as reported in the SERs [Addendum 1-A Soil Piles (Soil Pile I) (DOE 2008d), Addendum 1-B Soil Piles (DOE 2009a), Addendum 2 Soil Piles (DOE 2009b)], and Rubble Areas (DOE 2009c), volatile organic compounds (VOCs) are not expected to be encountered and semivolatile organic compounds (SVOC) are ubiquitous; therefore, the presence of these compounds will not be evaluated. Consideration will be given to adding groups of compounds to the analysis requirements, such as VOCs, SVOCs, and asbestos, if visual walkover survey observations, research, and/or process knowledge of identified anomalies indicate that it is warranted.

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The following information describes the Conceptual Site Model for the unknown contaminated areas (see Figure 3).

Recreational activities known to take place in the evaluation area include hunting and field trials (horses and dogs). Other recreational uses, such as hiking, also are possible; therefore, recreational user exposure to surface soils is the primary exposure pathway. The recreational user could be exposed to contaminants by contact with surface soils through the following exposure routes:

Figure 3. Conceptual Site Model

- External exposure (ionizing radiation)
- Dermal contact
- Incidental ingestion
- Inhalation

Industrial workers might be expected to work on DOE-owned property outside PGDP; however, this would not be on a regular basis and their exposure would be limited to performance of tasks associated with site evaluation, maintenance, and remedial action.

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4. TASKS

The following presents tasks necessary to complete this sitewide evaluation.

4.1 SCOPING SURVEYS

Scoping surveys, as described in Section A.3, will be performed to identify anomalies. On DOE property outside PGDP, identification of anomalies will be by radiological and visual walkover surveys, with potential anomalies identified by radiological readings at greater than twice instrument background or a release is visually identified or an anomaly is identified by process knowledge. Radiological and visual walkover surveys currently are being performed by DOE under DOE authority to identify anomalies on DOE-owned property outside PGDP. Anomalies on property owned by WKWMA will be identified using radiological flyover surveys (see Figure 4), with identified radiological anomalies being subject to visual and radiological walkover surveys. Radiological flyover surveys were performed under DOE authority in October through November 2009. Aerial photographic surveys were performed in May, 2009 for the purpose of providing an updated base map. Information on anomalies gathered from the radiological and visual walkover surveys will include the following descriptive data: location [using global positioning system (GPS)], areal footprint, height of pile or depth of depression, and physical description.

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Once anomalies are identified, they will be categorized based on physical attributes and then evaluated by performing sampling and data screening activities that are appropriate to the category, and as described in Section 5.

4.2 FIELD SAMPLING ACTIVITIES

Activities included in this task are as follows:

- Subcontractor procurement
- Planning
- Mobilization
- Anomaly description and documentation
- Site preparation activities (such as clearing and grubbing)
- Civil survey (using GPS) and sample location staking/marking
- Media sampling (for field laboratory testing and fixed-base laboratory testing)
- Field laboratory analytical testing
- Sample shipping
- Equipment decontamination
- Investigation derived waste management and disposal
- Task management

If archeological features/artifacts are discovered during clearing, grubbing, and soil sampling, DOE will proceed in accordance with the approved Cultural Resources Management Plan.

Figure 4. PGDP Radiological Aerial Survey Area 2009

4.3 SAMPLE ANALYSIS/VALIDATION AND DATA SCREENING

This task will include analysis of media samples at the fixed-base laboratory, sample validation as described in Appendix B, and data screening. Field and fixed-base analytical results will be used to meet the sampling objectives. Data screening will be performed with the principal objective of informing risk managers in support of decision making for the site. Key considerations include the following:

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- Determine whether all or portions of the study area may be eliminated from concern.
- Identify where risk characterization suggest actions may be needed.
- Determine whether additional data gathering and/or risk assessments are warranted.

The data screening provides information to the stakeholders based on the Commonwealth of Kentucky and nationally accepted risk assessment methods. These objectives are consistent with the goals, objectives, and requirements identified in the Paducah Risk Methods Document (DOE 2001). The scope of the screening is to assess risks to human receptors who may be exposed to chemicals or radionuclides through normal recreational use of the site. This data screening does not examine ecological risks.

To determine the presence or absence of contaminants in each anomaly, contaminant concentrations from field and fixed-base laboratory analyses will be compared to the values for background and teen recreator no action levels (NALs) provided in the PGDP Risk Methods Document (DOE 2001), and as shown in Table 1. Nondetect results will not be considered present above background or NALs even if the detection limit for the chemical is greater than the background or NAL value. Detection limits that are higher than background and/or NALs will be addressed as an uncertainty in the SER.

Following data screening, those constituents that (1) exceed PGDP background concentrations or (2) exhibited concentrations in excess of the teen recreator NALs will be considered as contaminants of potential concern for quantitative risk assessment in future investigative activities of the anomaly. Section 40 *CFR* § 300.420 sets the criteria if a remedial action is warranted.

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4.4 SITE EVALUATION REPORT

After project data has been validated and fully evaluated, a SER [consistent with Section IX of the FFA (EPA 1998)] will be prepared. This SER, which is a combined removal/remediation site evaluation and SAR, will document the findings as a result of implementation of this work plan will follow the outline in Appendix D of the FFA (EPA 1998) and will include the following:

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- A description of the project scope and objectives with regulatory overview and project background;
- Physical description of the project area including potential sources of contamination (if applicable);
- Description of field and analytical methods;
- Quality Assurance/Quality Control Report;
- Discussion and results, including the conceptual site model and distribution of contaminants (if present);
- Results of data screening;

- Recommendations; and
- SAR (if applicable).

Table 1. Data Screening Criteria[1]

Analyte	Child Resident No Action Level (mg/kg or pCi/g)[1]	Child Resident Action Level (mg/kg or pCi/g)[1]	Teen Recreational User No Action Level (mg/kg or pCi/g)[1]	Teen Recreational User Action Level (mg/kg or pCi/g)[1]	PGDP Surface Background (mg/kg or pCi/g)[2]	PGDP Subsurface Background (mg/kg or pCi/g)[2]
Aluminum	732	100,000	3,010	100,000	13,000	12,000
Antimony	0.0635	46.9	0.242	344	0.21	0.21
Arsenic	0.132	35	0.346	314	12	7.9
Barium	37	12,500	148	100,000	200	170
Beryllium	0.16	158	0.606	884	0.67	0.69
Cadmium	2.64	11.5	14.7	45.3	0.21	0.21
Calcium	N/A	N/A	N/A	N/A	200,000	6,100
Chromium	60.5	71,900	227	100,000	16	43
Cobalt	209	13,300	1,390	100,000	14	13
Copper	68.1	7,900	331	100,000	19	25
Iron	314	60,500	1,350	100,000	28,000	28,000
Lead	50	400	50	400	36	23
Magnesium	N/A	N/A	N/A	N/A	7,700	2,100
Manganese	7.46	3,700	29	39,100	1,500	820
Mercury	0.158	100,000	0.634	797	0.2	0.13
Molybdenum	10.9	1,080	56.4	41,700	N/A	N/A
Nickel	34	4,240	161	100,000	21	22
Selenium	12.1	1,090	65	44,700	0.8	0.7
Silver	6.12	1,030	27	27,100	2.3	2.7
Sodium	N/A	N/A	N/A	N/A	320	340
Thallium	0.107	16.6	0.479	465	0.21	0.34
Uranium	2.16	133	14.7	6,830	4.9	4.6
Vanadium	0.562	554	2.12	3,090	38	37
Zinc	401	62,200	1,800	100,000	65	60
Aroclor-1016	0.0574	7.08	0.127	28.3	N/A	N/A
Aroclor-1221	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1232	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1242	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1248	0.0574	10.5	0.127	28.3	N/A	N/A
Aroclor-1254	0.0388	2.02	0.127	13.1	N/A	N/A
Aroclor-1260	0.0574	10.5	0.127	28.3	N/A	N/A
Total PCBs	0.0574	10.5	0.127	28.3	N/A	N/A
Americium-241	0.836	83.6	11.6	1,160	N/A	N/A
Cesium-137[3]	0.0128	1.28	0.178	17.8	0.49	0.28
Neptunium-237[3]	0.0405	4.05	0.565	56.5	0.1	N/A
Plutonium-238	2.27	227	31	3,100	0.073	N/A
Plutonium-239/240	2.22	222	30.3	3,030	0.025	N/A
Technetium-99	67.4	6,740	926	92,600	2.5	2.8
Thorium-228	0.00418	0.418	0.0584	5.84	1.6	1.6
Thorium-230	2.85	285	39	3,900	1.5	1.4
Thorium-232	2.61	261	35.7	3,570	1.5	1.5
Uranium-234	3.81	381	52.2	5,220	1.2	1.2
Uranium-235[3]	0.0591	5.91	0.826	82.6	0.06	0.06
Uranium-238[3]	0.261	26.1	3.64	364	1.2 (0.4)[4]	1.2 (0.4)[4]

N/A = not available or not applicable.

[1] Values in table are current values and will be updated prior to completion of the Sitewide Evaluation Report. ELCR, HI, and Action Levels are provided in Table A.14 and ELCR, HI, and No Action Levels are provided in Table A.17 of the Risk Methods Document (DOE 2001).

[2] PGDP background values are taken from Table A.12 of the Risk Methods Document (DOE 2010c).

[3] Screening values derived considering the contribution from short-lived decay products.

[4] Adjusted values in parentheses will be used for screening if nitric acid is used for sample extraction.

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5. WORK PLAN RATIONALE

This work plan was prepared to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the RCRA EIs. This evaluation will include a radiological survey and visual walkover survey to cover DOE-owned property outside PGDP and currently not a SWMU/AOC. This work was performed under DOE authority. Any anomalies in the WKWMA, on property owned by WKWMA, identified in flyover surveys also will be evaluated under this work plan. The sampling approach for identified anomalies will be based on their physical form (e.g., soil and rubble areas). Collection of field and fixed-base laboratory data will enable DOE to increase confidence that SWMUs/AOCs have been appropriately identified.

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5.1 SCOPING SURVEY APPROACH

Figure 5 shows the generalized approach to the radiological scoping surveys (DOE 2008e) that are and will be used to identify anomalies for categorization and further evaluation based on physical form:

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- Soil areas–which are defined as soil piles and disturbed soil areas.
- Rubble areas–which are defined as areas of varied materials.

It should be noted that aerial, visual walkover and radiological walkover surveys have been conducted and are ongoing. To date no anomalies have been discovered with a radiological reading of greater than twice instrument background.

Categorized anomalies will be further evaluated using the approaches described in Sections 5.2 and 5.3 if the radiological screening indicates greater than twice instrument background and/or visual evidence (including process knowledge) indicates a possible origin from PGDP. Work package documents will be prepared after surveys are completed and prior to any sampling activities to provide more specific information to field personnel on sample locations, numbers, analyses, and designations, etc.

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5.2 SOIL AREAS SAMPLING APPROACH

Soil areas will be evaluated based on the approach provided in Figure 6. This approach has been developed taking into account results from other soil pile evaluations (DOE 2008d; DOE 2009a; and DOE 2009b). No previous sampling efforts have been performed on the soil that will be evaluated as part of this study. A systematic biased sampling approach will be implemented for small soil areas or piles and a systematic random approach will be implemented for large soil areas or piles consistent with approved methodologies for soil piles investigated under other SAPs. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. Soils areas are divided into two groups: small and large. Soil areas whose length and width are less than or equal to 30 ft are classified as small. Soil areas whose length or width is greater than 30 ft are classified as large.

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These approaches are designed to ensure data are acquired from all soil piles and a sufficient number of samples are collected to aid in determining the concentration and distribution of constituents throughout the study area.

Figure 5. Sitewide Scoping Survey Decision Flowchart

Figure 6. Sampling Approach for Soil Areas

Prior to the collection of soil samples, each soil area or pile will be visually evaluated to determine the necessity for clearing and grubbing. Site preparation will occur prior to any sampling activities. In addition, each location will undergo a radiological survey as discussed in Appendix A.

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VSP calculates the statistically-based number of samples required for verification of sampling soil. For this work plan, the number of total soil samples (assumed to represent screening samples) based on the teen recreational user is 95.

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5.2.1 Sample Locations

Following site preparations, sample locations will be identified, staked, and surveyed (using GPS).

5.2.1.1 Small soil areas/piles

For small soil piles, a single location at the highest point of the pile will be sampled. For small soil areas, a single location at the approximate center of the area will be sampled. It is assumed that the highest point or central points would represent the most likely place to encounter contamination, if it exists. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading also will be taken and analyzed at a fixed-base laboratory for radiological constituents.

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5.2.1.2 Large soil areas/piles

A 50 ft grid will be used to place sample locations for each large soil area/pile. Samples will be collected from within the grid square at the approximate center. Sample locations for large soil piles may be adjusted at the discretion of the project manager and field team leader, if actual field conditions indicate a predetermined sample location cannot be accessed. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. If a given location is moved, the reason for the move (e.g., tree is in the way), along with its spacing in relation to adjacent locations, will be fully documented in the field logbook.

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Soil piles found to date (DOE 2007a) and being investigated under other work elements generally have covered a large area with large variation in pile size; therefore, a systematic sampling approach has been developed. It is designed to ensure that data is acquired from all soil areas/piles, irrespective of their size, while ensuring that a sufficient number of samples is acquired to support informed decision making. To develop the sampling strategy, practices previously approved at PGDP have been consulted and form the basis for the sampling design. Recent SAPs contain provisions for a similar sample density in similar settings, employing sample spacing ranging from 10 to 50 ft as a means of identifying contamination and delineating contamination. Generally, sample spacing from 35 to 50 ft has been accepted for initial data acquisition, with tighter spacing applied to delineate contamination boundaries.

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Figure 4. Sitewide Scoping Survey Decision Flowchart¶
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5.2.2 Sample Requirements

Samples from bare soil areas (no relief above grade) will be collected from the surface only (0-1 ft depth). Metals, PCBs, and site-related radionuclides are generally immobile; therefore, if site-related material were placed on the ground surface, it likely would still be present at the surface. Consequently, if no contamination is detected at the surface, then it is reasonable to assume that no contamination would be detected in deeper soil. If the site evaluation indicates that contamination is present in the surface soil of bare soil areas at concentrations that indicate further investigation is warranted, then this recommendation would be included in the SER.

Samples from small and large soil piles will be collected from the following depth intervals:

- A surface soil sample will be acquired from 0-1 ft at every sampled location.

- Thereafter, soil cores will be advanced and soil samples collected at 3 ft intervals, until the interface with the soil pile and the natural grade has been reached. For any soil interval, where the span to the natural grade is greater than 1 ft but less than 3 ft, the sampler will be halted when the natural grade is reached, irrespective of its length. Multiple cores over this span may be collected to acquire sufficient sample volume for field and laboratory analyses. If multiple cores are required, they will be combined and homogenized before they are placed in containers for analysis.

For small soil piles/areas with only one sample location, no field laboratory analysis will occur and all soils samples will be submitted to a fixed-base laboratory for analysis of metals, PCBs, and radionuclides per the methods specified in Appendix B worksheet #15-1, 15-2, and 15-3.

For large soil piles/areas all soil samples will undergo field laboratory analyses for metals [by X-ray fluorescence (XRF)], radioactivity (by GM scan), and PCBs (using test kits). Ten percent of the samples will be randomly preselected for definitive fixed-base laboratory analysis for metals (Appendix B worksheet #15-4) and PCBs (Appendix B, worksheet #15-5), with a minimum of one surface soil sample and one subsurface soil sample per large pile and one surface soil sample per large bare soil area.

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5.3 RUBBLE AREAS SAMPLING APPROACH

Rubble areas will be evaluated based on the approach provided in Figure 7. The approach for the rubble areas is has been developed taking into consideration results from similar studies conducted at PGDP such as WAG 17 (DOE 1995) and Rubble Piles Evaluation (DOE 2009c). The results of these evaluations, in addition to 2006 radiological survey data, indicate there is no widespread contamination in rubble areas.

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Each rubble area will be visually evaluated to determine the necessity for clearing and grubbing. Site preparation will occur prior to any sampling activities. In addition, each location will undergo a radiological survey as discussed in Appendix A. For rubble areas exhibiting oil staining, wipe samples of the oil stained portion of rubble will be collected for field analysis of PCBs. No additional sampling will occur.

DOE may elect to remove any rubble area as a maintenance action. If so, upon removal of the rubble, one surface soil sample will be collected from immediately beneath the rubble area.

5.3.1 Sample Locations

Wipe samples will be collected from rubble areas that exhibit oil staining. If the rubble area is removed as a maintenance action, one surface soil sample will be taken from immediately below the rubble area, at the lowest point of the area or at the central point of the area if the area is topographically flat. If the radiological surveys indicate elevated radiological readings greater than twice instrument background, then a biased sample at the highest radiological reading will be taken and analyzed at a fixed-base laboratory for radiological constituents. Details of any wipe and soil sample locations (if applicable) will be included in work package documents.

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Figure 7. Sampling Approach for Rubble Areas

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5.3.2 Sample Requirements

Wipe samples will be analyzed for PCBs using field test kits (Appendix B worksheet #15-6).

Soil samples from beneath removed rubble (if removed as part of a maintenance action) will undergo field analyses for radioactivity (by NaI scan). One soil sample per removed rubble area will be collected and submitted for definitive fixed laboratory analysis for metals, radionuclides, and PCBs, as specified in Appendix B (Worksheets # 15-1, 15-2, and 15-3). If the area is extensive or if there are several small rubble piles within a rubble area, then a composite soil sample may be collected and considered representative for the entire rubble area.

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6. SCHEDULE

Figure 8 provides a schedule of the activities proposed for the Soils OU Sitewide Evaluation Work Plan implementation. This schedule represents an estimate for planning purposes and is included here for informational purposes only and is not intended to establish enforceable schedules or milestones. Enforceable milestones are contained in Appendix C of the FFA (EPA 1998) and Appendix 5 of the SMP (DOE 2010a). Also note that the schedule includes business days in lieu of calendar days.

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Figure 8. Sitewide Evaluation Schedule

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Analyte	Child Resident No Action Level (mg/kg or pCi/g)[1]	Teen Recreational User No Action Level (mg/kg or pCi/g)[1]	PGDP Surface Background (mg/kg or pCi/g)[2]	PGDP Subsurface Background (mg/kg or pCi/g)[2]
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Uranium	2.16	14.7	4.9	4.6

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Table 1. Data Screening Criteria (Continued)

Vanadium	0.562	2.12	38	37
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Aroclor-1248	0.0574	0.127	N/A	N/A
Aroclor-1254	0.0388	0.127	N/A	N/A
Aroclor-1260	0.0574	0.127	N/A	N/A
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Americium-241	0.836	11.6	N/A	N/A
Cesium-137	0.0128	0.178	0.49	0.28
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Plutonium-238	2.27	31	0.073	N/A
Plutonium-239/240	2.22	30.3	0.025	N/A
Technetium-99	67.4	926	2.5	2.8
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Thorium-232	2.61	35.7	1.5	1.5
Uranium-234	3.81	52.2	2.5 (1.73)[3]	2.4 (1.63)[3]
Uranium-235	0.0591	0.826	0.14 (0.1)[3]	0.14 (0.1)[3]
Uranium-238	0.261	3.64	1.2 (0.4)[3]	1.2 (0.4)[3]

N/A = not available or not applicable.
[1]Excess Lifetime Cancer Risk and Hazard Index values are from Table A.17 of the Risk Methods Document (DOE 2001).
[2] PGDP background values are taken from Table A.12 of the Risk Methods Document (DOE 2001).
[3] Adjusted values in parentheses will be used for screening if nitric acid is used for sample extraction.

APPENDIX A

SAMPLING AND ANALYSIS PLAN

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CONTENTS

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ATTACHMENT 2: CD CONTAINING DATA USED IN CALCULATION OF N . A2-1

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ACRONYMS

agl	above ground level
DEM	digital elevation model
DPT	direct push technology
DOE	U.S. Department of Energy
ER	exposure rate
GIS	Geographic Information System
GPS	global positioning system
IDW	investigation-derived waste
NaI	sodium iodide
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plan
PPE	personal protective equipment
SAP	Sampling and Analysis Plan
SRM	standard reference material
WKWMA	West Kentucky Wildlife Management Area
XRF	x-ray fluorescence

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A.1. INTRODUCTION

This Sampling and Analysis Plan (SAP) provides information relative to data collection, media sample collection, and field analysis. The primary objective of this effort is to identify any unknown contaminated areas requiring further Comprehensive Environmental Response, Compensation, and Liability Act evaluation and to develop information usable when completing the Resource Conservation and Recovery Act Environmental Indicators. Specifically the evaluation was designed to obtain data to support the following objectives:

- Identify anomalies (based on screening surveys) on U.S. Department of Energy (DOE)-owned and West Kentucky Wildlife Management Area (WKWMA)-owned property and confirm DOE origin. On DOE owned property, this is determined by radiological and visual walkover surveys where radiological readings are greater than twice background or where a release is visually identified or where an anomaly is identified by process knowledge. On WKWMA property, DOE origin is determined by radiological signature from the aerial radiological survey;

- For the anomalies confirmed to be of DOE origin, establish the presence or absence of DOE-related contaminants [metals, polychlorinated biphenyls (PCBs), and radionuclides];

- Perform data screening to determine if such anomalies may pose risks to human health; and

- Determine appropriate path forward per the Federal Facility Agreement (EPA 1998).

This SAP incorporates techniques that are consistent with the SAP for Soils Piles (DOE 2007a), Addendum 1-A (DOE 2007b), Addendum 1-B (DOE 2008a), and Addendum 2 (DOE 2008b), the Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study (DOE 2010), and the SAP for the Rubble Areas (DOE 2008c).

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A.2. SAMPLE LOCATION, FREQUENCY, AND DESIGNATIONS

Once anomaly identification has been completed from scoping surveys, maps will be developed that show the footprint of each soil or rubble area with sample locations. In addition, tables will be developed indicating the dimensions of the anomaly, locations and estimated number of samples, and this information will be included in work package documents.

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A.3. SCOPING SURVEYS

Scoping surveys are to be used to identify potential anomalies originating from Paducah Gaseous Diffusion Plant (PGDP) for further evaluation. Several types of surveys were planned:

- A radiological flyover survey has been performed for the purpose of identifying surface radiological anomalies that were not previously identified on WKWMA-owned property. Walkover visual and radiological surveys then were performed on the anomalies identified by radiological aerial surveys.
- An aerial photographic survey has been performed to provide an updated topographic map.
- Focused walkover visual and radiological surveys have been performed on DOE property outside the limited/controlled area.

This section describes the planned surveys. Although these surveys have largely been completed at this time, text referring to what was planned has been retained.

A.3.1 AERIAL RADIOLOGICAL SURVEY

The Remote Sensing Laboratory performed an aerial radiological survey of PGDP in 1990. In January 2008, representatives from the DOE Paducah Site contacted the National Nuclear Security Administration to request a low-level aerial survey to update this information. If approved, the aerial radiological and multispectral survey will provide gross count, man-made gross count, and isotopic extraction contours. This includes providing Geographic Information System (GIS) layers in a suitable format to be included in the database being administered by the RSL-Nellis. More specifically, this survey includes mapping, using aerial measurement assets, the radiological activity around PGDP. The activity will be measured from an altitude of 150 ft above ground level (agl) where possible. The terrestrial exposure rate is derived from the integral count rate in the gamma energy spectrum range. This gross count rate, measured in counts per second (cps) at survey altitude, is converted to exposure rate (ER) in μR/h at 1 meter agl. Over most of the survey area, the inferred terrestrial ER is expected to be less than 7 μR/h (typical for natural background in the Paducah area determined from previous survey data); however, it is expected that the instruments can read with accuracy to 1 uR/hr. It is, however, subject to interference from gamma radiation emitted from DUF_6 cylinders stored on the site. The planned survey area is approximately 25 square miles. Data will be analyzed to determine surface radioactivity. The detection capabilities of the helicopter system for the detection of U-238 are as follows. Assuming the survey parameters that were flown, and assuming that U-238 is present on the soil surface with no self shielding, the approximate minimal detectable activity is 10 mCi for a point source and 10 μCi/m^2 for a distributed source. It should be noted that these are somewhat conservative estimates, but they do not include the effect of any self-shielding, since it is not possible to ascertain in what shape or configuration that the material might be.

The survey produced a set of GIS-compatible overlay maps of (1) the inferred exposure rate and (2) the areas exhibiting excess or elevated levels of man-made radioisotopes. The aerial radiological data will be displayed as a contour map (color-coded contours with designators) superimposed onto either a geo-referenced U.S. Geological Survey topographic map or a GIS populated place layer map of the survey area. The maps will be examined for indications of elevated radiological signature indicating potential anomalies that could be attributed to DOE activity.

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<#>Reconnaissance Flight: The helicopter will fly at high altitudes to identify hazardous areas and to document view obstructions (i.e., towers, line wires).¶
<#>Geo-reference Flight: The helicopter will be flown over roads and other landmarks in and around the survey area. The purpose is to verify geo-referencing of the computer generated plots to maps and photographs by matching the Global Positioning System (GPS)-traced flights on the plots to the landmarks on the maps and photographs. This flight will occur only once.¶
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<#>Pre-flight Performance Checks: Before the first survey flight of each day, the detectors and electronics will be allowed to equalize with environmental conditions (usually about one hour). The measurement system will be checked for proper operation using the line spectra of radioactive check sources. The source checking shall be performed at the beginning of each day. The sources will be transported to and from the fixed base of operation each day.¶
<#>Test and Water Line Characterization: To assure data integrity and to monitor/correct for variations in detector background count rate due to aircraft, radon, and cosmic rays, measurements will be made over a fixed test line and water line before and after each flight. Test and water line areas will be selected outside the survey area, but close to it. The fixed test line to be used is located along Ogden Landing Road, which is outside the eastern boundary of the survey area, and the fixed water line to be used is over the Ohio River just to the northeast of the survey area. Ground level exposure rate measurements will be made with the pressurized ionizati ... [1]

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A.3.2 AERIAL PHOTOGRAPHY SURVEY

Approximately 32 square miles has been photographed in color from a height of greater than 5,000 ft when the foliage is dormant. A survey firm was used to provide survey data for photograph control. This included targets that did not move for the entire length of time of the photo shoot. The site was photographed and mapped at a scale of 1 inch = 100 ft with 2 ft minimum topographic contours. Orthophoto imagery was produced at 1/2 ft pixel resolution. Mapping included surface model contours and all planimetric detail appropriate for that map scale. High resolution aerial photographs were collected to develop a digital elevation model (DEM). This DEM provided delineation of current surface features, including watersheds, drainage pathways, roads, and land cover. Height of trees and other vegetative cover can be determined, and a three-dimensional model, created from such photography, facilitating identification of soil and rubble areas and enable estimation of pile volumes. Comparison of recently acquired data with historic photographs will assist in tracking changes at specific locations through time.

The aerial photography (topography) survey produced a map and surface model in DGN and DWG formats. The photographs will be examined, along with historical aerial photographs to look for indications of earth disturbance, unnatural earth mounds or rubble material that could be potential anomalies. It should be noted that the topographic survey was performed on April 8, 2009.

A.3.3 VISUAL AND RADIOLOGICAL WALKOVER SURVEY

The visual walkover survey was performed over the areas colored in light pink and light blue, excluding the area within the PGDP fence, as depicted on Figure 2 of the workplan. This includes all of the DOE-owned property outside PGDP fence (including property leased to WKWMA). Visual walkover surveys were accomplished by visually observing and physically locating a potential anomaly and recording the location, physical size, type of anomaly, any other pertinent information, and performing a topographic survey. This was performed in concert with the radiological survey described below.

MARSSIM (DOE 2000) guidance includes classification of areas based on potential for contamination. Property to be evaluated under this work plan is assumed to be Class 3. These areas are defined as areas with potential for contamination typically ≤ 10% reference level; therefore, DOE property was evaluated with 100% visual and a minimum of 10% gamma/GPS walkover surveys with all identified anomalies (on DOE and WKWMA property) included in the radiological walkover survey.

Radiological surveys were performed using a sodium iodide (gamma) detector or equivalent with a GPS data-logger. U-238 will be used as the target radionuclide.

Note that the survey was performed using a LM 221 survey meter equipped with 3x3 NaI probes and using a Polaris Ranger 700 6x6 where the terrain was suitable. A scanning speed of up to 3m/sec was used, which is sufficient to achieve a scanning sensitivity of below 528 pCi/g U-238 (equivalent to 15 mrem/year dose). Where the terrain was not suitable for driving, the team covered the area on foot using a scanning speed of up to 0.5 m/sec. The meter was held approximately 4 inches from the ground during the survey.

Radiological Controls Technicians performed the scan surveys of accessible land areas. Static measurements were used to confirm the presence of activity in elevated areas. If elevated activity was confirmed, then the area of elevated activity was bounded. Probes were source checked at the start of work to ensure they are functioning properly. The survey meters were equipped with digital data ports

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- **Deleted:** An anomaly is assumed potentially to have originated from PGDP if it has a radiological signature greater than twice background, if visual evidence exists, or if process knowledge exists to support PGDP origin.¶

that download accumulated counts to the GPS data loggers. Readings greater than twice ambient (instrument) background will be pin flagged and resurveyed to confirm the measurement.

Sketches will be provided showing the position of the anomalies relative to PGDP.

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A.4. SAMPLING EQUIPMENT AND ANALYSIS

Fieldwork and sampling at PGDP will be conducted in accordance with DOE Prime Contractor-approved work instructions or procedures. DOE or its 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 Quality Assurance Project Plan.

A.4.1 DATA/SAMPLING EQUIPMENT AND TECHNIQUES

A.4.1.1 Radiological Scanning

Radiological surveys of anomalies in advance of sampling will be performed using a sodium iodide (NaI) (gamma) detector or equivalent with a GPS data-logger if the ground/concrete has flat surfaces. If the surface to be scanned is particularly uneven and the NaI detector proves to be ineffective, then a GM pancake probe may be used.

A.4.1.2 Media Sampling

The following types of samples will be collected for analysis by field and laboratory methods:

- Surface and subsurface soil samples may be collected from the soil areas evaluation (see Section 5.2 and Figure 6 of the work plan).

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- Wipe samples (of rubble exhibiting oil staining) and surface soil samples (if rubble is removed) may be collected from the rubble areas evaluation(see Section 5.3 and Figure 7 of the work plan).

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No liquid samples are planned to be collected other than for quality assurance purposes (See Appendix B) and investigation-derived waste (IDW) disposal purposes (to be specified in work package documentation).

Soil samples will be collected in accordance with (1) PAD-ENM-2300 *Collection of Soil Samples,* (2) PAD-ENM-0023, *Composite Sampling,* and (3) PAD-ENR-0020, *Direct Push Technology Sampling.* The following general provisions will apply to all sampling activities:

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- Surface soil samples will be collected using disposable, stainless steel scoops to minimize the quantity of IDW, particularly liquid waste, generated during sample collection.

- Subsurface samples will be acquired using standard collection techniques such as direct push technology (DPT) or hollow stem auger, depending on the condition of the subsurface/difficulty in acquiring samples.

Wipe samples will be collected in accordance with manufacturer's instructions.

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The following provides a general equipment/supplies list for the sampling activities. The list assumes site and sample location surveying is completed separately as part of civil survey efforts and site preparation.

- Personal protective equipment (PPE)
- Stainless steel scoops

- Sorbent material
- Plastic sheeting
- Nylon brush (dry decontamination)
- Deionized water
- Cooler(s)
- Adhesive tape (e.g., clear, duct, and strapping)
- Pens and markers
- Zipper-sealing plastic bag
- Plastic sheeting
- Field analytical test kits
- Utility knife
- Health and safety supplies
- GPS unit and survey supplies including 100-ft tape measure
- Field logbook
- Chain-of-custody forms
- Sample labels
- Custody seals
- Sample containers (bottles)
- Blue ice
- Shipping/transport paperwork
- Acetate sleeves for portable DPT

A.4.2 FIELD ANALYTICAL TECHNIQUES

Analytical data acquisition will rely on both field measurements (screening) and fixed-base laboratory (definitive) data to determine if contamination exists in media associated with identified anomalies and further defined as soil or rubble. The following describes the field analytical techniques to be used.

A.4.2.1 Determination of Radioactivity

Radiological walkover surveys will be accomplished with scanning instrumentation. In addition, 100% surface scans will be performed on all identified anomalies, including a 3 ft buffer area around each anomaly, using a sodium iodide (gamma) detector or equivalent with a GPS data-logger. Before scanning an anomaly, radiation control technician(s) or properly qualified designee(s) will perform a local environmental background determination for gamma radioactivity using a NaI detector or equivalent with a GPS data-logger. Prior to its use, the instrument will be calibrated and operated in accordance with (1) PAD-RAD-0506, *Radiological Protection Operating Guide,* and (2) PAD-RAD-1309, *Setup for Operability Tests of Portable Field Instruments.*

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Before surveying any of the anomalies, background gamma radioactivity values will be established for the particular instruments used as follows:

- In the case of rubble areas, the rubble used to determine background values will be at the Kevil Post Office, which is composed of native materials similar to those present in the rubble areas concrete typically found at PGDP and is approximately the same age (i.e., 30 years in age). Measurement of background for comparison purposes will be in disintegrations per minute (dpm) or counts per minute (cpm). Ten one-minute static count readings will be taken at the background site, with the readings measured at several different points on the concrete. The background level used for comparison will be the mean of all the background readings and the 95% confidence level determined by the standard deviation of the readings (after testing the normality of the distribution). This approach is consistent with the determination of concrete background radiation levels completed for the Waste Area Group (WAG) 17 Resource Conservation and Recovery Act Facility Investigation (DOE 1995) and the Sampling and Analysis Plan for Rubble Areas (DOE 2008c).

- Soil background will be determined at the WKWMA lodge in Ballard County. This is an area that has not been impacted by PGDP activities and is upwind of the predominant wind direction at the site. Ten one-minute static count readings will be taken at the background site. The background level used for comparison will be the mean of the background readings and the 95% confidence level determined by the standard deviation of the readings (after testing the normality of the distribution).

Upon completion of the appropriate background determination, a complete surface scan of all exposed rubble or soil surfaces will be completed using the NaI scanning instrument. The instrument will record measurements of gamma activity emitted from anomalies. All recorded measurements will be documented.

A.4.2.2 Determination of Metals Using X-Ray Fluorescence

Survey and verification field samples will undergo *ex situ* x-ray fluorescence (XRF) analysis for RCRA metals and total uranium. Analysis will be performed in a field laboratory using procedure PAD-ENR-0034 *XRF Field Lab Analysis of Soils*. The XRF sample will consist of a minimum of 20 grams of soil. To further ensure the defensibility of XRF data, periodic performance checks and blanks will be performed to monitor instrument drift. The frequency of calibration verification samples and blanks will be 1 each for every 20 samples analyzed. They will be analyzed sequentially; calibration verification and a blank analysis will follow the 20th natural sample analyzed or at the end of a group of samples, whichever is more frequent. Along with each batch of samples totaling 20 or less, an independent standard reference material (SRM) will be analyzed. The SRM will have a concentration within the calibration and will have verifiable levels documented by a certificate of analysis. Data outputs will be recorded in the field logbook or on a spreadsheet.

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A.4.2.3 Determination of PCBs Using Field Test Kits

Field wipe samples will undergo field PCB analysis using immunoassay analysis using an EnSys™ 12T Wipe Test Kit, or equivalent which follows EPA SW-846 Method #4020. The test kits provide results in the range of 5 μg/100cm^2 to 5000 μg/100cm^2.

Soil samples will undergo field PCB analysis using methanol extraction and colorimetric analysis using a HACH Pocket Colormeter™ II Test Kit, or equivalent. A minimum of 20 grams of soil will be collected for PCB analysis. To ensure PCB data can be fully evaluated, a pre-weighed aliquot of each sample will be extracted and analyzed, and the colorimeter will be calibrated with each analytical batch in accordance with the manufacturer's specifications. All test kits and reagents (i.e., calibration standards, calibration verification standards, standard reference materials, kit reagents, and blanks) will be prepared and stored in accordance with the method requirements. Because the cuvettes and reagents in the PCB kits are in matched lots, each analytical batch is limited to the number (20) provided in each kit. Calibration standards and a reagent blank will be analyzed with each analytical batch prior to sample analysis. Along with each batch of samples totaling 20 or fewer, an independent SRM will be analyzed to verify the method detection limit, to establish precision and accuracy, and to estimate extraction efficiency. The SRM will have a concentration within the operating range of the colorimeter calibration and will have verifiable levels documented by a certificate of analysis. Data outputs will be recorded in the field logbook or on a spreadsheet.

A.4.3 DOCUMENTATION

Field documentation on logbooks and field forms will be in accordance with PAD-ENM-2700 *Logbooks and Data Forms.* Data will be archived electronically following guidance in PAD-ENM-1003, *Developing, Implementing, and Maintaining Data Management Implementation Plans.* Records will be kept in accordance with PAD-DOC-1009, *Records Management, Administrative Records, and Document Control.*

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A.4.4 DECONTAMINATION AND WASTE MANAGEMENT

Decontamination of sampling equipment will be in accordance with PAD-ENM-2702, *Decontamination of Sampling Equipment and Devices.*

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While the overall composition and distribution of hazardous, toxic, and/or radioactive materials is not fully known for the anomalies that might be encountered during this evaluation, preliminary radiation screening and laboratory data from similar activities suggests elevated levels of contaminants may be present. As a result, those materials that contact soil during evaluation activities in addition to materials that do not undergo decontamination, or result from field decontamination will be categorized as IDW. The following types of IDW will be generated during the characterization effort:

- PPE
- Plastic sheeting
- Stainless steel scoops
- Compositing pans
- DPT thin-walled sampling tubes
- Miscellaneous sampling and field screening supplies

Waste generated during sitewide evaluation efforts will be stored in appropriate waste storage areas, managed and disposed per established DOE prime contractor procedures. Specific provisions of waste management as they relate to IDW generated by sitewide evaluation efforts are outlined in the following sections.

A.4.4.1 Personal Protective Equipment

All PPE employed during sitewide evaluation efforts will be considered IDW. For purposes of segregation and storage, at the end of each work shift or each time PPE is replaced, PPE for all members of the field team doffing their PPE will be placed in plastic bags; the bag then will be sealed and labeled to reflect the area in which field work occurred. The bags and PPE then will be placed in a waste container.

A.4.4.2 Plastic Sheeting

At the end of each activity or field day, whichever is more frequent, plastic sheeting employed during field activities to reduce the spread of contamination will be placed in plastic bags; the bag then will be sealed, labeled to reflect the area in which the field work took place, and the bags and plastic sheeting placed in an appropriate waste container.

A.4.4.3 Sampling Equipment and Miscellaneous Supplies

Following use and dry decontamination of sampling tools (stainless steel scoops, compositing pans), supplies and nylon brushes will be segregated and stored in plastic bags. The bags will remain open until the end of each work shift or until they reach capacity (whichever is more frequent) so they (1) may be filled to capacity and (2) additional field supplies can be stored in them until they reach capacity or the work shift is complete. At the end of the work shift or when the bags reach capacity, they will be sealed, labeled to reflect the area where they were used, and placed in an appropriate waste container.

A.4.4.4 Soil Cuttings/Sample Residuals

Excess soil acquired during sample collection will be handled as IDW. Laboratory sample residuals will be disposed according to laboratory procedures.

A.4.4.5 Liquid Investigation-Derived Waste

Liquid IDW will be minimized by using disposable sampling equipment and support supplies to the maximum extent practical. If liquid IDW is generated as a result of decontamination of sampling equipment, field personnel will make every effort to minimize the quantities of liquid IDW generated Laboratory liquid IDW such as sample residuals and field standards used for PCB field screening may require special handling and disposal as Toxic Substances Control Act wastes.

Decontamination water will be placed in an appropriate waste container.

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A.5. REFERENCES

DOE (U.S. Department of Energy) 1995. *Resource Conservation and Recovery Act (RCRA) Facility Investigation Work Plan for Waste Group Area Grouping (WAG) 17 at the Paducah Gaseous Diffusion Plant,* U.S. Department of Energy, *Paducah*, KY, October.

DOE 2000. *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)* DOE/EH--624/R1 U.S. Department of Energy, August.

DOE 2007a. *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0015D2/R1, U.S. Department of Energy, Paducah, KY, September.

DOE 2007b. *Addendum 1-A to Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0015/A1/D2R1, U.S. Department of Energy, Paducah, KY, August.

DOE 2008a. Addendum 1-B to *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0015/1B&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2008b. Addendum 2 to *Sampling and Analysis Plan for Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0015/A2&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2008c. *Sampling and Analysis Plan for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0060&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2010. *Work Plan for the Soil Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-0120&D2/R1, U.S. Department of Energy, Paducah, KY, February.

EPA 1998. *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, U.S. Environmental Protection Agency, Region 4, Atlanta, GA, February 13.

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CALCULATION OF N—THE NUMBER OF STATISTICALLY BASED SAMPLES REQUIRED FOR SITE-WIDE EVALUATION OF SOIL¶
This attachment contains the information used to calculate the statistically-based number of samples required for verification of sampling soil at the Paducah Gaseous Diffusion Plant. Historical data available for soil piles, excluding Piles I and O, were used to represent conditions expected at soil areas that are the subject of the current work plan.¶
Data were taken from Soil Pile Project Environmental Measurements System since not all data have been transferred to Paducah OREIS. These data provide the results used to calculate the statistical inputs for the sample design. Only those chemicals with at least one detection across the sample population were used. Additionally, one-half the detection limit was used in calculations for those samples that were nondetect. Table 1 presents the statistical summary from these data. Data used in this analysis are included on a CD in Attachment 2.¶
Table 1. Statistical Summary from Selected Soil Piles¶
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The following activities will take place as part of this survey.

Reconnaissance Flight: The helicopter will fly at high altitudes to identify hazardous areas and to document view obstructions (i.e., towers, line wires).

Geo-reference Flight: The helicopter will be flown over roads and other landmarks in and around the survey area. The purpose is to verify geo-referencing of the computer generated plots to maps and photographs by matching the Global Positioning System (GPS)-traced flights on the plots to the landmarks on the maps and photographs. This flight will occur only once.

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Pre-flight Performance Checks: Before the first survey flight of each day, the detectors and electronics will be allowed to equalize with environmental conditions (usually about one hour). The measurement system will be checked for proper operation using the line spectra of radioactive check sources. The source checking shall be performed at the beginning of each day. The sources will be transported to and from the fixed base of operation each day.

Test and Water Line Characterization: To assure data integrity and to monitor/correct for variations in detector background count rate due to aircraft, radon, and cosmic rays, measurements will be made over a fixed test line and water line before and after each flight. Test and water line areas will be selected outside the survey area, but close to it. The fixed test line to be used is located along Ogden Landing Road, which is outside the eastern boundary of the survey area, and the fixed water line to be used is over the Ohio River just to the northeast of the survey area. Ground level exposure rate measurements will be made with the pressurized ionization chamber. Exact locations of the ground measurements will be determined in the field.

Survey Flight: The data will normally be collected at 150 ft (46 m) agl. The Bell 412/HP helicopter can fly along predetermined lines spaced 250 ft (76 m) apart. The flight lines should be parallel to the contours of the terrain so that it is easier for the helicopter to maintain the 150-ft altitude. The nominal ground speed of the helicopter normally will be 70 knots (36 m/s). The survey site will encompass an area of approximately 25 square miles.

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ATTACHMENT 1

CALCULATION OF N-THE NUMBER OF STATISTICALLY BASED SAMPLES REQUIRED FOR SITEWIDE EVALUATION OF SOIL

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CALCULATION OF N—THE NUMBER OF STATISTICALLY BASED SAMPLES REQUIRED FOR SITE-WIDE EVALUATION OF SOIL

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Data were taken from Soil Pile Project Environmental Measurements System since not all data have been transferred to Paducah OREIS. These data provide the results used to calculate the statistical inputs for the sample design. Only those chemicals with at least one detection across the sample population were used. Additionally, one-half the detection limit was used in calculations for those samples that were nondetect. Table 1 presents the statistical summary from these data. Data used in this analysis are included on a CD in Attachment 2.

Table 1. Statistical Summary from Selected Soil Piles

Chemical	Units	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variation
Aluminum	mg/kg	1.95E+03	1.34E+04	7.17E+03	2.03E+03	2.83E-01
Arsenic	mg/kg	1.75E+00	4.30E+01	4.95E+00	3.60E+00	7.27E-01
Barium	mg/kg	1.78E+01	1.43E+02	6.89E+01	2.25E+01	3.27E-01
Beryllium	mg/kg	2.20E-01	2.12E+00	3.23E-01	2.30E-01	7.10E-01
Cadmium	mg/kg	2.13E-01	1.96E+00	3.76E-01	2.89E-01	7.67E-01
Calcium	mg/kg	4.79E+01	6.62E+04	2.63E+03	6.89E+03	2.62E+00
Chromium	mg/kg	5.27E+00	3.14E+02	1.94E+01	3.57E+01	1.84E+00
Cobalt	mg/kg	2.30E+00	1.26E+01	5.44E+00	1.66E+00	3.06E-01
Copper	mg/kg	2.45E+00	4.63E+01	7.72E+00	4.50E+00	5.82E-01
Iron	mg/kg	5.13E+03	3.14E+04	1.09E+04	3.91E+03	3.59E-01
Lead	mg/kg	3.02E+00	6.16E+01	1.14E+01	6.73E+00	5.89E-01
Magnesium	mg/kg	1.30E+02	2.28E+03	8.40E+02	3.98E+02	4.74E-01
Manganese	mg/kg	8.51E+01	1.58E+03	4.69E+02	2.19E+02	4.67E-01
Mercury	mg/kg	7.00E-03	2.30E-01	2.47E-02	2.35E-02	9.52E-01
Molybdenum	mg/kg	2.13E+00	7.84E+00	2.44E+00	5.31E-01	2.17E-01
Nickel	mg/kg	2.21E+00	1.79E+01	6.47E+00	2.88E+00	4.46E-01

Chemical	Units	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variation
Selenium	mg/kg	4.25E-01	2.82E+00	6.13E-01	4.94E-01	8.06E-01
Thallium	mg/kg	8.50E-01	4.97E+00	1.18E+00	8.77E-01	7.45E-01
Uranium	mg/kg	4.25E-01	2.08E+02	5.69E+00	1.97E+01	3.45E+00
Vanadium	mg/kg	8.45E+00	7.40E+01	1.81E+01	7.44E+00	4.11E-01
Zinc	mg/kg	8.85E+00	2.37E+02	2.76E+01	2.62E+01	9.48E-01
Anthracene	mg/kg	2.30E-01	6.70E-01	2.48E-01	2.86E-02	1.15E-01
Benzo(a)anthracene	mg/kg	2.30E-01	1.70E+00	2.65E-01	1.39E-01	5.22E-01
Benzo(a)pyrene	mg/kg	2.30E-01	7.80E-01	2.52E-01	4.92E-02	1.96E-01
Benzo(b)fluoranthene	mg/kg	2.30E-01	5.30E+00	2.92E-01	3.64E-01	1.24E+00
Benzo(ghi)perylene	mg/kg	2.30E-01	8.70E-01	2.49E-01	4.19E-02	1.68E-01
Benzo(k)fluoranthene	mg/kg	2.30E-01	2.20E+00	2.56E-01	1.32E-01	5.16E-01
Chrysene	mg/kg	2.30E-01	2.10E+00	2.72E-01	1.84E-01	6.79E-01
Fluoranthene	mg/kg	2.30E-01	1.90E+00	2.90E-01	2.19E-01	7.57E-01

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Table 1. Statistical Summary from Selected Soil Piles (Continued)

Chemical	Units	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variation
Indeno(1,2,3-cd)pyrene	mg/kg	2.30E-01	1.20E+00	2.51E-01	6.40E-02	2.55E-01
Phenanthrene	mg/kg	2.30E-01	1.40E+00	2.59E-01	1.01E-01	3.90E-01
Pyrene	mg/kg	2.30E-01	2.10E+00	2.82E-01	1.93E-01	6.86E-01
PCB, Total	mg/kg	6.00E-02	3.54E+00	1.52E-01	3.96E-01	2.60E+00
PCB-1248	mg/kg	4.50E-02	1.95E+00	6.61E-02	1.72E-01	2.60E+00
PCB-1254	mg/kg	4.00E-02	1.23E+00	8.26E-02	1.66E-01	2.01E+00
PCB-1260	mg/kg	4.50E-02	1.15E+00	8.11E-02	1.30E-01	1.60E+00

Chemical	Units	Minimum	Maximum	Average	Standard Deviation	Coefficient of Variati on
Cesium-137	pCi/g	1.45E-02	9.79E-01	1.50E-01	1.87E-01	1.24E+00
Neptunium-237	pCi/g	8.45E-03	1.20E-01	2.36E-02	8.51E-03	3.61E-01
Plutonium-239/240	pCi/g	4.89E-03	3.53E-02	7.76E-03	5.17E-03	6.67E-01
Technetium-99	pCi/g	2.68E-01	9.21E+00	6.63E-01	1.12E+00	1.69E+00
Thorium-228	pCi/g	5.65E-02	5.61E-01	3.28E-01	8.40E-02	2.56E-01
Thorium-230	pCi/g	6.45E-02	1.87E+00	2.70E-01	1.91E-01	7.08E-01
Thorium-232	pCi/g	1.19E-01	5.48E-01	3.51E-01	7.39E-02	2.11E-01
Uranium	pCi/g	1.09E-01	4.95E+01	1.91E+00	6.34E+00	3.32E+00
Uranium-234	pCi/g	5.60E-02	6.70E+00	3.59E-01	8.71E-01	2.43E+00
Uranium-235	pCi/g	5.65E-03	5.91E-01	3.40E-02	8.40E-02	2.47E+00
Uranium-238	pCi/g	4.30E-02	4.42E+01	1.57E+00	5.58E+00	3.56E+00

The coefficient of variation (CV) is a ratio of standard deviation to the mean (or average). The ratio indicates the amount of dispersion of the variable, (i.e., a higher CV is a higher dispersion of results). The CV was compared for all chemicals evaluated. The highest CV was 3.56 for uranium-238, followed by 3.45 for uranium metal. Additional inputs to the calculation were selected, based on uranium-238 in order to provide a conservative estimate of the number of samples.

The input for the width of the grey region (delta) is developed as part of the planning process. The grey reion is the region of tolerance for error regarding the decision. The action level parameters chosen were the risk-based "no action levels" for the default teen recreational user scenario as presented in the 2001 Paducah Risk Methods Document: *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky, Volume 1. Human Health*, DOE/OR/07-1506/&D2. The width of the gray region (delta) was set to one-half the action level parameter (or one-half the risk-based "no action level").

Visual Sample Plan (VSP) performed the statistical evaluation with the variables listed in Table 2 as inputs to the sample design for "Compare Average to Fixed Threshold." The sample design not requiring data to have a distributional assumption was chosen to provide a more conservative estimate. In all of these scenarios, choosing to assume the site is "clean" or "dirty" does not affect the required number of samples.

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Table 2. VSP Inputs

Parameter	Input	Reasoning
Sample Design	Compare Average to Fixed Threshold	Calculate the number of samples needed to compare a sample mean or median against a predetermined threshold.
	Data Not Required to be Normally Distributed	Not requiring the normal distribution provides a more conservative estimate.
	Ordinary Sampling No Distribution Assumption	
True Mean or Median >= Action Level (assume site is dirty)	Null Hypothesis	Assume our baseline condition that the site is dirty.
False rejection rate (Alpha):	5%	Project will assume 5 % false rejection rate (i.e., willingness to accept missing contamination).
False acceptance rate (Beta):	20%	Project will assume 20 % false acceptance rate (i.e., willingness to accept labeling area contaminated when it is actually clean).
Width of Gray Region (Delta):	1.82	Selected as 50 %, the no action level. The gray region is similar to a decision error.
Action Level (DCGLw)	3.64	No action level for U-238 under the teen recreational use scenario.
Estimated Standard Deviation	5.58	Calculated for U-238 from Soil Piles sampling data.

The minimum number of samples required for a survey unit using the inputs listed in Table 2 is 95.

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ATTACHMENT 2

CD CONTAINING DATA USED IN CALCULATION OF N

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ATTACHMENT 2

DATA USED IN CALCULATION OF N (CD)

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APPENDIX B

QUALITY ASSURANCE PROJECT PLAN

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CONTENTS

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QAPP WORKSHEETS

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ACRONYMS

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	chemical of potential concern
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
EPA	U. S. Environmental Protection Agency
FFA	Federal Facility Agreement
HF	hydrogen fluoride
OU	operable unit
PCB	polychlorinated biphenyl
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SI	Site Investigation
SWMU	solid waste management unit
TCE	trichloroethene
UFP	Uniform Federal Policy for Quality Assurance Project Plans

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QAPP Worksheet #1
Title and Approval Page

UFP-QAPP Manual Section 2.1:

Site Name/Project Name:
Site Location:

Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky
Document Title
U.S. Department of Energy
Lead Organization
LATA Environmental Services of Kentucky, LLC

Preparer's Name and Organizational Affiliation
761 Veterans Avenue, Kevil, KY, 42053; (270) 441-5000
Preparer's Address, Telephone Number, and E-mail Address
10/2010
Preparation Date (Month/Year)

Investigative Organization's Project Manager: ____________________
Signature
____
Printed Name/Organization/Date

Investigative Organization's Project QA Officer: ____________________
Signature
____
Printed Name/Organization/Date

Approval Signatures: ____________________
Signature
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Printed Name/Title/Date
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Approval Authority

Other Approval Signatures: ____________________
Signature
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Printed Name/Title/Date

Document Control Number: DOE/LX/07-0228

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QAPP Worksheet #2
QAPP Identifying Information

UFP-QAPP Manual Section 2.2.4:
Site Name/Project Name: *Sitewide Evaluation at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*
Site Location: Paducah Gaseous Diffusion Plant
Site Number/Code: N/A
Operable Unit: Soils Operable Unit
Contractor Name: LATA Environmental Services of Kentucky, LLC
Contractor Number: DE-AC30-10CC40020 (DOE-LATA Kentucky contract)
Contract Title: Paducah Gaseous Diffusion Plant Remediation Subcontract
Work Assignment Number: N/A

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1. Identify guidance used to prepare QAPP: Uniform Federal Policy for Quality Assurance Project Plans

... [3]

2. Identify regulatory program: CERCLA and Federal Facility Compliance Agreement for the Paducah Gaseous Diffusion Plant (DOE/OR/07-1707)

3. Identify approval entity: U.S. EPA, Commonwealth of Kentucky

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4. Indicate whether the QAPP is a generic or a project-specific QAPP (circle one).

5. List dates of scoping sessions that were held: Scoping was accomplished from 2007 to 2008.

6. List dates and titles of QAPP documents written for previous site work, if applicable:

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Title:	Approval Date:
Removal Action Work Plan for Soils Operable Unit Inactive Facilities at the Paducah Gaseous Diffusion Plan, Paducah, Kentucky (DOE/LX/07-0220&D2R1)	11/12/2009 (Latest date of regulatory approval).
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&D2R1)	11/12/2009 (Latest date of regulatory approval).
Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0120&D2R2)	01/06/2010 (Latest date of regulatory approval).

Deleted: *Quality Assurance Program Plan for the Paducah Environmental Remediation Project, Paducah Gaseous Diffusion Plant, Paducah,* Kentucky (PRS-CDL-0058)
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7. List organizational partners (stakeholders) and connection with lead organization:
U.S. EPA, Commonwealth of Kentucky

8. List data users: DOE, Contractor, subcontractors, U.S. EPA, Commonwealth of Kentucky

9. If any required QAPP elements and required information are not applicable to the project, then indicate the omitted QAPP elements and required information on the attached table. Provide an explanation for their exclusion below:
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QAPP elements and required information that are not applicable to the project are indicated and an explanation is provided in the QAPP.

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	Worksheet No.	Crosswalk to Related Documents
Project Management and Objectives			
2.1 Title and Approval Page	- Title and Approval Page	1	
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	
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	3 4 Omitted[1]	
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	5 6 Omitted[1] 7 Omitted[1] 8	DOE O 414.1C/10 *CFR* § 830.120 Criterion 1– Management Program; Criterion 2 Training and Qualification;
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)	9 Omitted[1] 10	DOE O 414.1C/10 *CFR* § 830.120 Criterion 6 – Design
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	11 12	
2.7 Secondary Data Evaluation	- Sources of Secondary Data and Information - Secondary Data Criteria and Limitations Table	13	

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Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
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	14/15 16	
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/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	17/18/19/20 21 22	DOE O 414.1C/10 *CFR* § 830.120 Criterion 5–Work Processes; Criterion 6– Design
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	23 24 25	DOE O 414.1C/10 *CFR* § 830.120 Criterion 8–Inspection and Acceptance Testing
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	26 27	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4–Documents and Records
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	28	

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Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
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	29 30	DOE O 414.1C/10 *CFR* § 830.120 Criterion 4–Documents and Records
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	31 32	DOE O 414.1C/10 *CFR* § 830.120 Criterion 3–Quality Improvement; Criterion 9–Management Assessment; Criterion 10–Independent Assessment
4.2 QA Management Reports	- QA Management Reports Table	33	
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	34/35 36 37	
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			

[1] Worksheets omitted: #4–included in contractor work control documentation, #6–communication pathways established elsewhere, #7–personnel qualifications are not listed, and #9–scoping activities occurred in 2007 through 2008.

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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 in concert with the Sitewide Evaluation Work Plan; thus, it will be included on the Sitewide Evaluation Work Plan distribution list.	N/A	N/A	N/A	N/A	N/A	N/A

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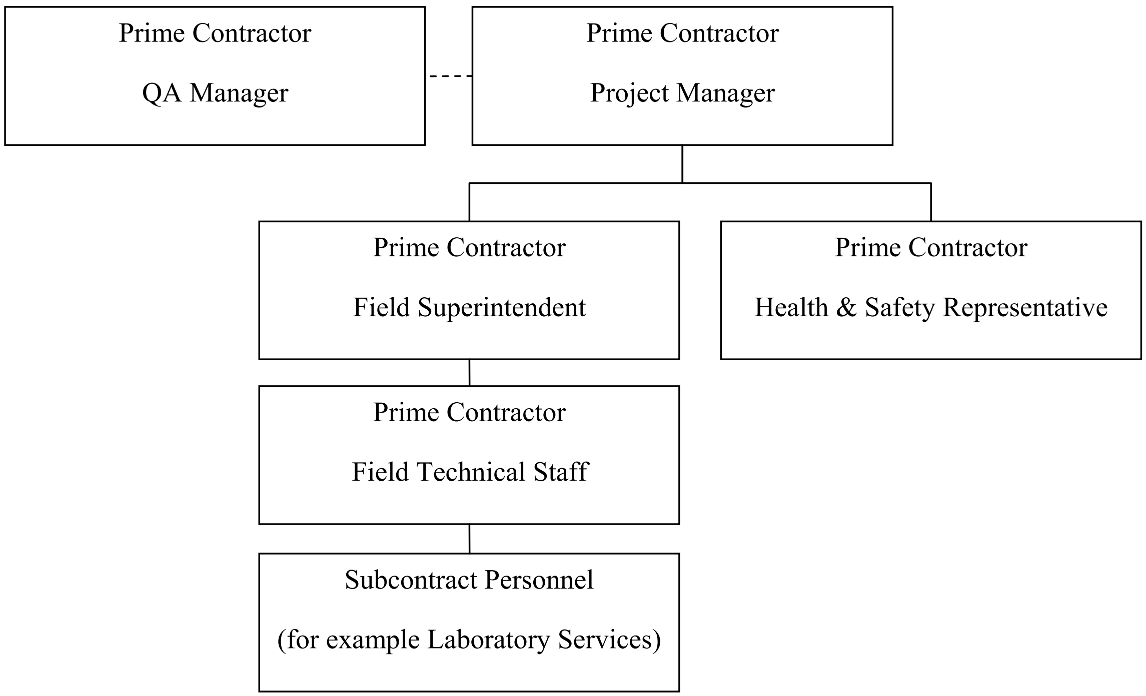
QAPP Worksheet #5
Project Contractor Organizational Chart

UFP-QAPP Manual Section 2.4.1



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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]
Project Tasks	There will be no specialized training required for this project other than what is normally required for site work at PGDP. The contractor will evaluate specific tasks and personnel will be assigned training as necessary to perform those tasks. Training may address health and safety aspects of specific tasks as well as contractor-specific, site-specific, and task-specific requirements.	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.

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QAPP Worksheet #10
Problem Definition

UFP-QAPP Manual Section 2.5.2:

The problem to be addressed by the project: Per the Site Management Plan (SMP) – Annual Revision – FY2009, DOE/LX/07-0185&D2/R1, for PGDP "a sitewide evaluation will be performed to identify any unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the Resource Conservation and Recovery Act Corrective Action (RCRA) Environmental Indicators process."

The environmental questions being asked: Are there any unknown contaminated areas, originating from PGDP, requiring further CERCLA evaluation?

Observations from any site reconnaissance reports: Radiological and visual walkover surveys performed to date under DOE authority on DOE-Owned Property outside of the fenced area indicate 150 potential anomalies identified visually with none exhibiting an elevated (greater than 2 x background) radiological signature.

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A synopsis of secondary data or information from site reports: Section 3 of the work plan describes the secondary data used to develop DQOs.

The possible classes of contaminants and the affected matrices:
Potential classes of contaminants are metals, PCBs, and radiological contamination.
Affected matrices are expected to be as follows (if present):

1. Soil – which is defined as soil piles and disturbed soil areas.
2. Rubble areas – which are defined as areas of varied materials.

The rationale for inclusion of chemical and nonchemical analyses: Worksheet #11 presents rationale for inclusion of chemical and nonchemical analyses.

Information concerning various environmental indicators: Environmental indicators include metals, PCBs, and uranium parameters for PGDP contamination and are utilized as indicators for this project.

Project decision conditions ("IE..., then..." statements): Flowcharts listed in Worksheet #11 and located in the Sitewide Evaluation Work Plan present the project decisions conditions by which previously unidentified anomalies will be identified.

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QAPP Worksheet #11
Project Quality Objectives/Systematic Planning Process Statements

UFP-QAPP Manual Section 2.6.1:

Who will use the data? DOE, Prime Contractor, subcontractor, KY, and EPA.

What will the data be used for? To identify any unknown contaminated areas originating from PGDP requiring further CERCLA evaluation and to develop information usable when completing the RCRA EI process.

What type of data are needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) Radiological surveys and visual walkover surveys will be used to identify and define the limits of potential anomalies. Field screening methods will be used to perform initial characterization of soil/rubble for metals, PCBs, and radiological contamination as discussed in the work plan. Based on the type of anomaly identified, a percentage of the samples collected for field screening will be analyzed for target analytes listed on Worksheet #10 at a DOE Consolidated Audit Program (DOECAP) certified laboratory. The actual number of samples submitted to the off-site laboratory, based on the type and size of each anomaly, will be identified in work package documents.

Note that the soil results will be reported on an "as received" or wet weight basis.

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How "good" do the data need to be in order to support the environmental decision? The data need to allow identification and evaluation of anomalies. Data used for future human health risk assessment will be evaluated for use per the RMD (DOE 2001). Data must meet the sensitivity requirements for comparison to appropriate criteria as discussed in Section 4.3 of this work plan. The acquired data must be of known quality to increase confidence that SWMUs and AOCs associated with PGDP have been identified.

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How much data are needed? (number of samples for each analytical group, matrix, and concentration) The number of samples will be dependent on the number and types of anomalies identified as defined in the Work Plan and Appendix A.

Where, when, and how should the data be collected/generated? See Work Plan and Appendix A.

Who will collect and generate the data? A sample team of individuals who are properly trained and skilled in the execution of screening and sampling procedures will collect samples and perform the field screening measurements.

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). Project data will be reported from the Paducah Oak Ridge Environmental Information System (OREIS).

How will the data be archived? Data will be archived in OREIS. Data will be archived for 30 years per contract requirements.

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QAPP Worksheet #12-1
Measurement Performance Criteria Table

UFP-QAPP Manual Section 2.6.2:

Matrix	Soil
Analytical Group	Metals (aluminum, antimony, barium, beryllium, calcium, chromium, iron, magnesium, manganese, molybdenum, nickel, sodium, vanadium, and zinc)
Concentration Level	Low

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Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-6010	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-2
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metals (arsenic, cadmium, cobalt, copper, lead, selenium, silver thallium, uranium)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-6020	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[1]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-3
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metal (mercury)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-7470	Precision–Lab	RPD–35%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[1]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-4
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	PCBs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-8082	Precision–Lab	RPD–43%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-5
Measurement Performance Criteria Table

Matrix	Wipe Sample
Analytical Group	PCBs
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Immunoassay PCB Wipe Test Kit	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	A
					A
					A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-6
Measurement Performance Criteria Table

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Matrix	Soil
Analytical Group	Radionuclides (uranium-234, uranium-235, uranium-238)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Alpha spectroscopy	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

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[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-7
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (americium-241, neptunium-237, plutonium-238, plutonium-239/240, thorium-230)
Concentration Level	Low

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Sampling Procedure	**Analytical Method/SOP[1]**	**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)**
See Worksheet #21	Alpha spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

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[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-8
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (cesium-137)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Gamma spectroscopy	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-9
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Radionuclides (technetium-99)
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	Liquid scintillation	Precision–Lab	RPD–50%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-10
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Metals
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	SW846-6200 (XRF)	Precision–Lab	RPD–20%	Laboratory Duplicates	A
		Accuracy/Bias	+/- 20% recovery	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > quantitation limit	Method Blanks/Instrument Blanks	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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QAPP Worksheet #12-11
Measurement Performance Criteria Table

Matrix	Soil
Analytical Group	Total PCB
Concentration Level	Low

Sampling Procedure	Analytical Method/SOP[1]	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)
See Worksheet #21	HACH Pocket Colorimeter™ II Test Kit or equivalent	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	Manufacturer's Instruction Manual	A
		Completeness[2]	90%	Data completeness check	S&A

[1] The most current version of the method will be used.
[2] Completeness is calculated as the number of samples planned to be collected divided by the number of samples results that are not rejected.

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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
Process knowledge, historical use and results of Soil Piles and Rubble Areas evaluations.	DOE 2008. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2. DOE 2009. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1. DOE 2009. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0188&D2. DOE 2009. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0227&D0.	See reports	Assist in planning	Assist in planning only.

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QAPP Worksheet #14
Summary of Project Tasks[1]

UFP-QAPP Manual Section 2.8.1:

Sampling Tasks: Sampling will be per Sitewide Evaluation Work Plan and Appendix A, Sampling and Analysis Plan

Analysis Tasks: Analysis will be per Sitewide Evaluation Work Plan and Appendix A, Sampling and Analysis Plan

Quality Control Tasks: Quality Control will be per QAPP worksheets as follows:

- QC samples – Worksheets #20 and #28
- Equipment calibration – Worksheets #22 and #24
- Data review/validation – Worksheets #34, #35, #36 and #37

Secondary Data: Process knowledge, historical use and results of Soil Piles and Rubble Areas evaluations:

- DOE 2008. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2.
- DOE 2009. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1.
- DOE 2009. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0188&D2.
- DOE 2009. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0227&D0.

Data Management Tasks: Data Management will be per DOE Prime Contractor procedure, PAD-ENM-5007, *Data Management Coordination.*

Documentation and Records: Documentation and Records will be per DOE Prime Contractor procedure, PAD-RM-1009, *Records Management, Administrative Records and Document Control.*

Assessment/Audit Tasks: Assessments and audits will be per DOE Prime Contractor procedure, PAD-QA-1420, *Conduct of Assessments.*

Data Review Tasks: Data review tasks will be per DOE Prime Contractor procedure, PAD-ENM-5003, *Quality Assured Data.*

[1] It is understood that SOPs are contractor specific.

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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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
Acetone	67-64-1	53,400	10	n/a	n/a	6.47	20
Acrolein	107-02-8	4.29	10	n/a	n/a	2.901	50**
Acrylonitrile	107-13-1	64.5	10	n/a	n/a	1.126	50
Benzene	71-43-2	327	10	0.03	n/a	0.253	5
Bromodichloromethane	75-27-4	390	10	0.03	n/a	0.254	5
Bromoform	75-25-2	13,800	10	0.20	n/a	0.366	5
Bromomethane	74-83-9	186	10	0.03	n/a	0.396	10
2-Butanone	78-93-3	153,000	10	n/a	n/a	0.389	20
Carbon disulfide	75-15-0	15,700	10	n/a	n/a	0.369	5
Carbon tetrachloride	56-23-5	97.8	10	0.02	n/a	0.360	5
Chlorobenzene	108-90-7	4,470	10	0.03	n/a	0.382	5
Chloroethane	75-00-3	978	10	n/a	n/a	0.382	10
2-Chloroethyl vinyl ether	110-75-8	n/a	10	n/a	n/a	0.523	20
Chloroform	67-66-3	18.2	10	0.04	n/a	0.092	5
Chloromethane	74-87-3	884	10	0.05	n/a	0.553	10
Dibromochloromethane	124-48-1	334	10	0.07	n/a	0.329	5
Dibromomethane	74-95-3	3,170	10	0.01	n/a	0.405	5
Dichlorodifluoromethane	75-71-8	5,200	10	0.11	n/a	0.449	10
1,1-Dichloroethane	75-34-3	22,900	10	0.03	n/a	0.392	5
1,2-Dichloroethane	107-06-2	152	10	0.02	n/a	0.372	5
1,1-Dichloroethene	75-35-4	27.6	10	n/a	n/a	0.365	5
cis-1,2-Dichloroethene	156-59-2	1,980	10	0.06	n/a	0.159	5
trans-1,2-Dichloroethene	156-60-5	3,260	10	n/a	n/a	0.178	5
1,2-Dichloropropane	78-87-5	180	10	0.02	n/a	0.317	5

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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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
cis-1,3-Dichloropropene	10061-01-5	n/a	10	n/a	n/a	0.339	5
trans-1,3-Dichloropropene	10061-02-6	n/a	10	n/a	n/a	0.349	5
trans-1,4-Dichloro-2-butene (100)	110-57-6	n/a	10	n/a	n/a	0.397	10
Ethyl benzene	100-41-4	6,010	10	0.03	n/a	0.299	5
Ethyl methacrylate	97-63-2	99,700	10	n/a	n/a	0.240	5
Iodomethane	74-88-4	n/a	10	n/a	n/a	1.511	5
2-Hexanone	591-78-6	n/a	10	n/a	n/a	0.261	20
Methylene chloride	75-09-2	3,920	10	n/a	n/a	0.801	5
4-Methyl-2-pentanone	108-10-1	9,660	10	n/a	n/a	0.326	20
Styrene	100-42-5	128,000	10	0.27	n/a	0.347	5
1,1,1,2-Tetrachloroethane	630-20-6	1,430	10	0.07	n/a	0.238	5
1,1,2,2-Tetrachloroethane	79-34-5	145	10	0.20	n/a	0.272	5
Tetrachloroethene	127-18-4	1,170	10	0.05	n/a	0.280	5
Toluene	108-88-3	31,200	10	0.08	n/a	0.303	5
1,1,1-Trichloroethane	71-55-6	23,200	10	0.04	n/a	0.291	5
1,1,2-Trichloroethane	79-00-5	345	10	0.08	n/a	0.573	5
Trichloroethene	79-01-6	741	10	0.02	n/a	0.290	5
Trichlorofluoromethane	75-69-4	19,300	10	n/a	n/a	0.167	5
1,2,3-Trichloropropane	96-18-4	0.629	10	0.09	n/a	0.559	5**
Vinyl acetate	108-05-4	21,300	10	n/a	n/a	0.305	5
Vinyl chloride	75-01-4	40	10	0.04	n/a	0.428	5
m,p-xylene	NS831	107,000	20	0.06	n/a	0.569	5
o-xylene	95-47-6	659,000	10	0.06	n/a	0.318	5

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).
[2] Analytical MDLs and QLs are those documented in validated methods. MDLs listed are taken from Table 2 of SW846-8260B.

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QAPP Worksheet #15-1
Reference Limits and Evaluation Table (Continued)

[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
**The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
1,2,4-Trichlorobenzene	120-82-1	12,200	660	n/a	660	33.3	330
1,2-Dichlorobenzene	95-50-1	40,000	660	n/a	660	33.3	330
1,3-Dichlorobenzene	541-73-1	997	660	n/a	660	33.3	330
1,4-Dichlorobenzene	106-46-7	1,360	660	n/a	660	33.3	330
2,4,5-Trichlorophenol	95-95-4	160,000	660	n/a	660	33.3	330
2,4,6-Trichlorophenol	88-06-2	8,510	660	n/a	660	33.3	330
2,4-Dichlorophenol	120-83-2	6,930	660	n/a	660	33.3	330
2,4-Dimethylphenol	105-67-9	32,000	660	n/a	660	33.3	330
2,4-Dinitrotoluene	121-14-2	209	660	n/a	660	33.3	330**
2,6-Dinitrotoluene	606-20-2	209	660	n/a	660	33.3	330**
2-Chloronaphthalene	91-58-7	33,800	660	n/a	660	33.3	330
2-Chlorophenol	95-57-8	2,810	660	n/a	660	33.3	330
2-Methylnaphthalene	91-57-6	n/a	660	n/a	660	33.3	330
2-Nitrophenol	88-75-5	n/a	660	n/a	660	33.3	330
4-Bromophenyl phenyl ether	101-55-3	n/a	660	n/a	660	33.3	330

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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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
4-Chlorophenylphenyl ether	7005-72-3	n/a	660	n/a	660	33.3	330
Acenaphthene	83-32-9	n/a	660	n/a	660	33.3	330
Acenaphthylene	208-96-8	n/a	660	n/a	660	33.3	330
Anthracene	120-12-7	526,000	660	n/a	660	33.3	330
Benz(a)anthracene	56-55-3	67	660	n/a	660	33.3	330**
Benzo(a)pyrene	50-32-8	6.7	660	n/a	660	n/a	6.6*
Benzo(b)fluoranthene	205-99-2	67	660	n/a	660	33.3	330**
Benzo(ghi)perylene	191-24-2	n/a	660	n/a	660	33.3	330
Benzo(k)fluoranthene	207-08-9	670	660	n/a	660	33.3	330
bis(2-chloroethoxy)methane	111-91-1	n/a	660	n/a	660	33.3	330
bis(2-chloroethyl) ether	111-44-4	29	660	n/a	660	n/a	6.6*
bis(2-chloroisopropyl) ether	108-60-1	1,340	660	n/a	660	33.3	330
bis(2-ethylhexyl)phthalate	117-81-7	2,840	660	n/a	660	43.3	330
Butyl benzyl phthalate	85-68-7	373,000	660	n/a	660	33.3	330
Chrysene	218-01-9	6,700	660	n/a	660	33.3	330
Dibenz(a,h)anthracene	53-70-3	6.7	660	n/a	660	n/a	6.6*
Dibenzofuran	132-64-9	2,930	660	n/a	660	33.3	330
Diethylphthalate	84-66-2	1,970,000	660	n/a	660	33.3	330
Dimethylphthalate	131-11-3	24,600,000	660	n/a	660	33.3	330
Di-n-butylphthalate	84-74-2	264,000	660	n/a	n/a	33.3	330
Di-n-octylphthalate	117-84-0	49,200	660	n/a	660	33.3	330
Fluoranthene	206-44-0	34,300	660	n/a	660	33.3	330
Fluorene	86-73-7	50,100	660	n/a	660	33.3	330

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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 (µg/kg)	Method QLs (µg/kg)	MDLs (µg/kg)	QLs (µg/kg)
Hexachlorobenzene	118-74-1	58.5	660		660	33.3	330**
Hexachlorobutadiene	87-68-3	320	660		660	33.3	330**
Hexachlorocyclopentadiene	77-47-4	9,590	660		660	330	1600
Hexachloroethane	67-72-1	1,600	660		660	33.3	330
Indeno(1,2,3-cd)pyrene	193-39-5	67	660		660	33.3	330**
Isophorone	78-59-1	98,500	660		660	33.3	330
m,p-cresol		9,770[4]	660		660	66.6	660
Naphthalene	91-20-3	3,470	660		660	33.3	330
Nitrobenzene	98-95-3	492	660		660	33.3	330
N-Nitroso-di-n-propylamine	621-64-7	7.3	660		660	n/a	6.6*
N-Nitrosodiphenylamine	86-30-6	10,400	660		660	33.3	330
o-cresol	95-48-7	79,900	660		660	33.3	330
Phenanthrene	85-01-8	n/a	660		660	33.3	330
Phenol	108-95-2	1,480,000	660		660	33.3	330
Pyrene	129-00-0	25,700	660		660	33.3	330
Pyridine	110-86-1	1,600	660		n/a	66.6	660
3,3'-Dichlorobenzidine	91-94-1	208	1300		1300	33.3	1600**
4-Chloro-3-methylphenol	59-50-7	n/a	1300		1300	33.3	330
4-Chloroaniline	106-47-8	6,390	1300		1300	33.3	330
Benzyl Alcohol	100-51-6	593,000	1300		1300	33.3	330
2,4-Dinitrophenol	51-28-5	5,280	3300		3300	330	1600
2-Methyl-4,6-dinitrophenol	534-52-1	n/a	3300		3300	330	1600
2-Nitroaniline	88-74-4	91.3	3300		3300	33.3	330**
3-Nitroaniline	99-09-2	n/a	3300		3300	33.3	330

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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] MDLs (µg/kg)	Analytical Method[2] Method QLs (µg/kg)	Achievable Laboratory Limits[3] MDLs (µg/kg)	Achievable Laboratory Limits[3] QLs (µg/kg)
4-Nitroaniline	100-01-6	n/a	3300		n/a	330	1600
4-Nitrophenol	100-02-7	21,100	3300		3300	330	1600
Benzoic Acid	65-85-0	10,600,000	3300		3300	330	1600
Pentachlorophenol	87-86-5	646	3300		3300	330	660**

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[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. Method QLs listed are taken from Table 2 of SW846-8270D.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
[4] Lowest no action limit among m-cresol and p-cresol was used.
*QL for 8270C [Selective Ion Mode (SIM) Operation]
** The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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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] MDLs (mg/kg)	Analytical Method[2] Method QLs (mg/kg)	Achievable Laboratory Limits[3] MDLs (mg/kg)	Achievable Laboratory Limits[3] QLs (mg/kg)
Aluminum	7429-90-5	732	20	n/a	0.0001	1.14	5.0
Antimony	7440-36-0	0.0635	10	n/a	0.0001	0.164	0.5
Arsenic	7440-38-2	0.132	1	n/a	0.001	0.203	1.0
Barium	7440-39-3	37	2.5	n/a	0.0001	0.057	2.0
Beryllium	7440-41-7	0.16	0.5	n/a	0.0001	0.011	0.1**
Cadmium	7440-43-9	2.64	0.5	n/a	0.0001	0.011	0.05
Chromium	7440-47-3	60.5	2.5	n/a	0.0001	0.302	1.0
Copper	7440-50-8	68.1	2.5	n/a	0.0001	0.0536	1.0
Iron	7439-89-6	314	20	n/a	0.0001	3.30	5.0
Lead	7439-92-1	50	20	n/a	0.0001	0.026	0.3
Manganese	7439-96-5	7.46	2.5	n/a	0.0001	0.054	0.5
Mercury	7439-97-6	0.158	0.02	0.00093	n/a	0.006	0.033
Molybdenum	7439-98-7	10.9	5	n/a	n/a	0.077	0.5
Nickel	7440-02-0	34	5	n/a	0.0001	0.0822	0.5
Selenium	7782-49-2	12.1	1	n/a	0.001	0.045	0.5
Silver	7440-22-4	6.12	1	n/a	0.0001	0.008	0.2
Thallium	7440-28-0	0.107[4]	2	n/a	0.0001	0.058	0.2**
Uranium	7440-61-1	2.16	1	n/a	n/a	0.012	0.1
Vanadium	7440-62-2	0.562	2.5	n/a	0.0001	0.735	1.0
Zinc	7440-66-6	401	20	n/a	0.0001	1.33	5.0

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[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. MDL listed for Mercury is taken from SW846-7471B (Section 2.3). Method QLs for the remaining metals are taken from SW846-6020A (Section 1.2)

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[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.
[4] The no action level for thallium chloride was used.
** The laboratory will report results down to their MDL, qualifying the result as estimated, for these analytes that have a project limit below the laboratory QL. Standard practices for qualifying data will apply for any result reported below the laboratory QL.

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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 (pCi/g)	Method QLs (pCi/g)	MDCs (pCi/g)	QLs (pCi/g)
Alpha Activity	12587-46-1	n/a	5	5	n/a	n/a	10
Beta Activity	12587-47-2	n/a	5	5	n/a	n/a	10
Americium-241	14596-10-2	0.836	0.05	3	n/a	n/a	0.1
Cesium-137	10045-97-3	0.0128	0.1	0.5	n/a	n/a	0.2
Neptunium-237	13994-20-2	0.0405	0.05	3	n/a	n/a	0.1
Plutonium-238	13981-16-3	2.27	0.05	6	n/a	n/a	0.1
Plutonium-239/240	n/a	2.22	0.05	4	n/a	n/a	0.1
Technetium-99	14133-76-7	67.4	1	8	n/a	n/a	1
Thorium-228	14274-82-9	0.00418	0.05	3	n/a	n/a	0.1
Thorium-230	14269-63-7	2.85	0.05	4	n/a	n/a	0.1
Thorium-232	n/a	2.61	0.05	3	n/a	n/a	0.1
Uranium-234	13966-29-5	3.81	0.15	3	n/a	n/a	0.1
Uranium-235/236	15117-96-1	0.0591	0.05	2	n/a	n/a	0.1
Uranium-238	24678-82-8	0.261	0.15	2	n/a	n/a	0.1

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[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 MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.

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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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Aroclor-1016	12674-11-2	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1221	11104-28-2	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1232	11141-16-5	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1242	53469-21-9	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1248	12672-29-6	0.0574	0.1	n/a	n/a	0.00539	0.033
Aroclor-1254	11097-69-1	0.0388	0.1	n/a	n/a	0.00613	0.033
Aroclor-1260	11096-82-5	0.0574	0.1	n/a	n/a	0.00613	0.033
Total PCBs	1336-36-3	0.0574	0.1	n/a	n/a	0.05147	0.300

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. SW846-8082 does not list MDLs or Method QLs.
[3] Achievable MDLs and QLs are limits that an individual laboratory can achieve when performing a specific analytical method. These limits may not reflect the contractual reporting limits agreed to with the laboratory. The actual laboratory has not been contracted; numbers shown are based on historical information from the Soils Remedial Investigation. Actual laboratory numbers will be reported when the laboratory has been contracted.

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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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Antimony	7440-36-0	30	30	40	n/a	30	n/a
Arsenic	7440-38-2	11	11	40	n/a	11	n/a
Barium	7440-39-3	170	100	20	n/a	100	n/a
Cadmium	7440-43-9	12	12	100	n/a	12	n/a
Chromium	7440-47-3	85	85	150	n/a	85	n/a
Copper	7440-50-8	35	35	50	n/a	35	n/a
Iron	7439-89-6	28,000	100	60	n/a	100	n/a
Lead	7439-92-1	23	13	20	n/a	13	n/a
Manganese	7439-96-5	820	85	70	n/a	85	n/a
Mercury	7439-97-6	10	10	30	n/a	10	n/a
Molybdenum	7439-98-7	830	15	10	n/a	15	n/a
Nickel	7440-02-0	65	65	50	n/a	65	n/a
Selenium	7782-49-2	20	20	40	n/a	20	n/a
Silver	7440-22-4	10	10	70	n/a	10	n/a
Uranium	7440-61-1	20	20	n/a	n/a	20	n/a
Vanadium	7440-62-2	70	70	50	n/a	70	n/a
Zinc	7440-66-6	60	25	50	n/a	25	n/a

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[1] These Project Action Limits are explained in Table 9.2.
[2] Analytical MDLs and QLs are those documented in validated methods. MDLs are taken from SW846-6200, Table 1, "Example Interference Free Lower Limits of Detection."
[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 project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award. MDLs for the XRF are based on Thermo Scientific NITON XL3t 300 Series Instruments for Environmental Analysis "Limits of Detection for Contaminants in Soil" for a typical soil matrix.

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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 (mg/kg)	Method QLs (mg/kg)	MDLs (mg/kg)	QLs (mg/kg)
Total PCBs	1336-36-3	n/a	1, 5, 10, 50	n/a	1, 5, 10, 50	n/a	1, 5, 10, 50

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 project. As part of this scope, these limits will be a technical requirement used in evaluating laboratory award.

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Reference Limits and Evaluation Table¶
UFP-QAPP Manual Section 2.8.1:¶
Matrix: Soil¶
Analytical Group: Metals 6010/6020/7470¶
Concentration Level: Low¶
Analyte ... [4]

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QAPP Worksheet #16
Project Schedule/Timeline Table[1]

UFP-QAPP Manual Section 2.8.2:

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		

[1] See Work Plan Section 6.

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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):

A systematic sampling approach will be implemented for all anomalies. A systematic sampling approach has been developed to ensure that data is acquired from all soil piles or areas, irrespective of their size, while ensuring that a sufficient number of samples is acquired to support informed decision making. To develop the sampling strategy, practices previously approved at PGDP have been consulted and form the basis for the sampling design.

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]:

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Section 5.0 of the Sitewide Evaluation Work Plan presents the approach and decision flowcharts to locate and identify the anomalies to be evaluated.

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QAPP Worksheet #18-1
Sampling Locations and Methods/SOP Requirements Table for Screening Samples

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number[1]	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (Identify Field Duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Soil	Soil	Surface/subsurface	Metals 6200 by XRF	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	PCB by HACH Pocket Colorimeter™ II Test Kit (or equivalent)	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	Gamma radiation by sodium iodide detector (or equivalent)	greater than 40 pCi/g	N/A	N/A	N/A
Rubble Areas	Wipe samples of above surface rubble	Aboveground surface	PCB by EnSys Immunoassay Wipe Test Kit (or equivalent)	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Rubble and soil beneath the rubble if the rubble is removed	Aboveground surface (rubble) and surface [(soil) (if rubble is removed)]	Gamma radiation by sodium iodide detector (or equivalent)	greater than 40 pCi/g	N/A	N/A	N/A

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QAPP Worksheet #18-2
Sampling Locations and Methods/SOP Requirements Table for Samples Submitted to the Fixed-Base Laboratory for Analysis

UFP-QAPP Manual Section 3.1.1:

Sampling Location/ID Number[1]	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (Identify Field Duplicates)	Sampling SOP Reference[1]	Rationale for Sampling Location
Soil	Soil	Surface/subsurface	Metals	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	PCBs	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Soil	Soil	Surface/subsurface	Radionuclides	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	Metals	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	PCBs	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17
Rubble Areas	Soil (if rubble is removed)	Surface	Radionuclides	low	TBD (minimum of 5%)	See Worksheet #21	See Worksheet #17

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QAPP Worksheet #19
Analytical SOP Requirements Table

UFP-QAPP Manual Section 3.1.1:

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference	Sample Volume	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	PCBs	low	See Worksheet #12	[1]	[1]	cool 4 °C	14 days until extraction/40 days
Soil	Metals	low	See Worksheet #12			cool 4 °C	180 days/28 days
Soil	Radionuclides	low	See Worksheet #12			cool 4 °C	180 days

[1] Sample volume and container requirements will be specified by the laboratory.

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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	No. of Sampling Locations[1]	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[1]
Soil	PCBs	low	SW846-8082	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD
Soil	Metals	low	SW846-6010/6020/7470	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD
Soil	Radionuclides	low	see Worksheet 12	TBD (5%)	TBD (5%)	N/A	TBD (5%)	TBD (5%)	N/A	TBD

[1] Work package documents will identify the sampling locations, the matrices, and the number of samples, sample identification numbers for samples to be submitted to DOECAP certified laboratory. This is not applicable for samples analyzed by field methods.

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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	PAD-ENM-0023 Rev. 0, *Composite Sampling*	Contractor	Sampling	N	N/A
2	PAD-ENM-2300 Rev. 0, *Collection of Soil Samples*	Contractor	Sampling	N	N/A
3	PAD-ENR-0020 Rev. 0, *Direct push Technology Sampling*	Contractor	Sampling	N	N/A
4	PAD-ENM-2700 Rev. 0, *Logbooks and Data Forms*	Contractor	Sampling	N	N/A
5	PAD-ENM-2702 Rev. 0, *Decontamination of Sampling Equipment*	Contractor	Sampling	N	N/A
6	PAD-ENM-2704 Rev. 0, *Trip, Equipment and Field Blank*	Contractor	Sampling	N	N/A
7	PAD-ENM-2708 Rev. 0, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*	Contractor	Sampling	N	N/A
8	PAD-ENM-5004 Rev. 0, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*	Contractor	Sampling	N	N/A

[1] It is understood that all SOPs are contractor specific.

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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]
Field Instrumentation	Per the manufacturer's instructions	Per the manufacturer's instructions	Daily prior to use	Daily prior to use	Daily prior to use	Daily prior to use	As needed	Equipment user	Field instrumentation manufacturer's manual

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QAPP Worksheet #23
Analytical SOP References Table

UFP-QAPP Manual Section 3.2.1:

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)
6010	Inductively Coupled Plasma-Atomic Emission Spectrometry	Definitive	Metals	ICP	TBD	TBD
6020	Inductively Coupled Plasma-Mass Spectrometry	Definitive	Metals	ICP-MS	TBD	TBD
7470	Mercury (Manual Cold-Vapor Technique)	Definitive	Metals	AA	TBD	TBD
8082	Polychlorinated Biphenyls (PCBs) by Gas Chromatography	Definitive	PCBs	GC	TBD	TBD
Alpha Spec	Alpha Spectrometry	Definitive	Radionuclides	Alpha Spectrometry	TBD	TBD
Gamma Spec	Gamma Spectrometry	Definitive	Radionuclides	Gamma Spectrometry	TBD	TBD
Liquid Scintillation	Tc-99 by Liquid Scintillation	Definitive	Radionuclides	Liquid Scintillation	TBD	TBD
Metals by XRF	Metals by XRF	Screening	Metals	XRF	TBD	TBD
Immunoassay PCB Wipe Test	PCB by EnSys 12T Wipe Test System (or equivalent)	Screening	PCBs	Colorimeter	TBD	TBD
Immunoassay PCB Soil Test	PCB by HACH Pocket Colorimeter™ II Test Kit (or equivalent)	Screening	PCBs	Colorimeter	TBD	TBD
Radiological Scan	Gamma radiation	Screening	Radiation	Sodium Iodide detector or equivalent	TBD	TBD

[1] Analysis will be by the most recent revision.

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QAPP Worksheet #24
Analytical Instrument Calibration Table

UFP-QAPP Manual Section 3.2.2:

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
*						

* 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. Laboratory contracting will be subsequent to the completion of the Sitewide Evaluation Work Plan. Field survey/sampling instrumentation will be calibrated according to manufacturer's instructions.

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QAPP Worksheet #25
Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

UFP-QAPP Manual Section 3.2.3:

Instrument/ Equipment	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
*								

* 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. Laboratory contracting will be subsequent to the completion of the Sitewide Evaluation Work Plan. Field survey/sampling instrumentation will be maintained, tested, and inspected according to manufacturer's instructions.

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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):	See Worksheet #19
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	See Worksheet #19
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	N/A

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QAPP Worksheet #27
Sample Custody Requirements[1]

UFP-QAPP Manual Section 3.3.3:

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):
Field sample custody requirements will be per DOE Prime Contractor procedure, PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

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Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal) are per the DOECAP certified laboratory procedures.

Sample Identification Procedures:

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Sample identification requirements will be specified in work package documents.

Chain-of-custody Procedures:

Chain-of-custody requirements will be per DOE Prime Contractor procedure, PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

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[1] It is understood that SOPs are contractor specific.

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QAPP Worksheet #28
QC Samples Table

UFP-QAPP Manual Section 3.4:

Matrix	Soil
Analytical Group	SMO
Concentration Level	TBD
Sampling SOP	See Worksheet #21
Analytical Method/ SOP Reference	EPA methods
Sampler's Name	TBD
Field Sampling Organization	Contractor
Analytical Organization	SMO
No. of Sample Locations	TBD. See Sitewide Evaluation Work Plan

QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria[1]
Field Duplicates	Minimum 5%	N/A	N/A	N/A	Precision	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Split Samples	As requested by regulatory agency	N/A	N/A	N/A	N/A	N/A
Field Blanks	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Trip Blanks[2]	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Equipment Rinseates	Minimum 5%	N/A	N/A	N/A	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

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QAPP Worksheet #28
QC Samples Table (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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Accuracy/Bias (Contamination)	See PAD-ENM-5003 Rev. 0, *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	Environmental Sampling Lead	Precision	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Zeroing Blank	Per manufacturer's instructions	HACH Pocket Colorimeter™ II Test Kit for PCB in Soil per manufacturer's instructions	Per manufacturer's manufactures instructions	Environmental Sampling Lead	Per manufacturer's manufactures instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

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QAPP Worksheet #28
QC Samples Table (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
Low/High Standards	Per manufacturer's instructions	HACH Pocket Colorimeter™ II Test Kit for PCB in Soil per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Zeroing Blank	Per manufacturer's instructions	EnSys Immunoassay PCB Wipe Test Kit per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure
Low/High Standards	Per manufacturer's instructions	EnSys Immunoassay PCB Wipe Test Kit per manufacturer's instructions	Per manufacturer's instructions	Environmental Sampling Lead	Per manufacturer's instructions	See PAD-ENM-5003 Rev. 0, *Quality Assured Data* Procedure

[1] It is understood that SOPs are contractor specific.
[2] VOC analyses only

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QAPP Worksheet #29
Project Documents and Records Table

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[1]	Other
Data Logbooks and associated completed sampling forms Sample Chains-of-Custody	Laboratory Data Packages OREIS database & associated data packages	OREIS database & associated data packages	PAD-ENM-5003, att. G Data Assessment Review Checklist and Comment Form	Form QA-F-0004, *Management/ Independent Assessment Report*

[1] It is understood that SOPs are contractor specific.

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QAPP Worksheet #30
Analytical Services Table

UFP-QAPP Manual Section 3.5.2.3:

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP[1]	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	TBD	8082	28-day	TBD	TBD
Soil	Metals	low	TBD	6010	28-day	TBD	TBD
Soil	Metals	low	TBD	6020	28-day	TBD	TBD
Soil	Metals	low	TBD	7470	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Alpha Spec	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Gamma Spec	28-day	TBD	TBD
Soil	Radionuclides	low	TBD	Liquid Scintillation	28-day	TBD	TBD

[1] Analytical method SOPs for radiochemistry parameters are laboratory-specific. Laboratory contracting will be subsequent to the completion of the Site Evaluation Work Plan.

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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	TBD	Internal	Prime Contractor QA	QA Specialists, Contractor or Independent Assessor	Project Manager, Contractor	Project Management, Contractor	QA Specialist, Contractor
Laboratory Audit	Annual	External	DOE Consolidated Audit Program (DOECAP)	Laboratory Assessor	Laboratory	Laboratory	DOECAP
Management Assessments	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor	QA Specialist, Contractor
Management By Walking Around (MBWA)[1]	TBD	Internal	Prime Contractor Project Management	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor	QA Specialist, Contractor
MBWA Follow-up surveillances	Quarterly	Internal	Prime Contractor Project Management	ER/EM Director, Project Management or designee, Contractor	Project Management/Designee, Contractor	Project Management, Contractor	QA Specialist, Contractor

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[1] Reference: PAD-QA-1033 Management by Walking Around (MBWA) Program

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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)	Time frame 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 QA-F-0004, *Management/ Independent Assessment Report,* and QA-F-0710, *Issue Identification Form*	Project Management, Issue Owner, Contractor	Upon issuance of Form QAP-E-004, *Management/ Independent Assessment Report,* form QA-F-0710, *Issue Identification Form,* will be completed and attached to the assessment report.	QA-F-0710, *Issue Identification Form*, documents the issue response and/or corrective actions.	Action owner as designated by Issue Owner, Contractor	Fifteen days for initial issue response, corrective action schedule determined by Issue Owner, per PAD-QA-1210.

[1] It is understood that SOPs are contractor specific.

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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)
Performance Summary Report	1/month	By the 12th of each month	Project Manager, Contractor	Contractor Management
Site Evaluation Report	1/end of project	TBD	Project Manager, Contractor	DOE, U.S. EPA, Commonwealth of Kentucky

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QAPP Worksheet #34
Verification (Step I) Process Table

UFP-QAPP Manual Section 5.2.1:

Verification Input	Description[1]	Internal/ External	Responsible for Verification (Name, Organization)
Field Logbooks	Field logbooks are verified per DOE Prime Contractor procedure, PAD-ENM-2700, *Logbooks and Data Forms*, and PAD-ENM-5003, *Quality Assured Data*.	Internal	Project Management or designee, Contractor
Chains of custody	Chains of custody are controlled by DOE Prime Contractor procedure, PAD-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, PAD-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[2], Contractor

[1] It is understood that SOPs are contractor specific.
[2] QA specialist performed general QA review.

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QAPP Worksheet #35
Validation (Steps IIa and IIb) Process Table

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Validation Input	Description[1]	Responsible for Validation (Name, Organization)
IIa	Data Deliverables, Analytes, and Holding Times	The documentation from the contractual screening will be included in the data assessment packages, per DOE Prime Contractor procedure, PAD-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, PAD-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, PAD-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.

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QAPP Worksheet #36
Validation (Steps IIa and IIb) Summary Table

UFP-QAPP Manual Section 5.2.2:

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria[1]	Data Validator (title and organizational affiliation)
IIa/IIb	Soil	PCBs	Low	DOE Prime Contractor procedure, PAD-ENM-0811, *Pesticide and PCB Data Verification and Validation*	TBD
IIa/IIb	Soil	Metals	Low	DOE Prime Contractor procedure, PAD-ENM-5107, *Inorganic Data Verification and Validation*	TBD
IIa/IIb	Soil	Radionuclides	Low	DOE Prime Contractor procedure, PAD-ENM-5102, *Radiochemical Data Verification and Validation*	TBD

[1] It is understood that SOPs are contractor specific.

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QAPP Worksheet #37
Usability Assessment[1]

UFP-QAPP Manual Section 5.2.3:

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, PAD-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 data quality objectives 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, PAD-ENM-5003, *Quality Assured Data*. This information will be included in the data assessment packages for review by project personnel. Data assessment also will include documentation of QC exceedances, trends, and/or bias in the data set. Data assessment will 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.

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Document Title: *Quality Assurance Project Plan (QAPP) for the Sitewide Evaluation 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 (Month/Year) 039/10

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QAPP Worksheet #15-1
Reference Limits and Evaluation Table

UFP-QAPP Manual Section 2.8.1:
Matrix: Soil
Analytical Group: Metals 6010/6020/7470
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achi
				MDLs	Method QLs	M
Aluminum	7429-90-5	N/A	20	20	N/A	N/
Antimony	7440-36-0	N/A	10	10	N/A	N/
Arsenic	7440-38-2	N/A	1	1	N/A	N
Barium	7440-39-3	N/A	2.5	2.5	N/A	N/
Beryllium	7440-41-7	N/A	0.5	0.5	N/A	N/
Cadmium	7440-43-9	N/A	0.5	0.5	N/A	N/
Calcium	7440-70-2	N/A	100	100	N/A	N/
Chromium	7440-47-3	N/A	2.5	2.5	N/A	N/
Cobalt	7440-48-4	N/A	1	1	N/A	N
Copper	7440-50-8	N/A	2.5	2.5	N/A	N/
Iron	7439-89-6	N/A	20	20	N/A	N/
Lead	7439-92-1	N/A	1	1	N/A	N
Magnesium	7439-95-4	N/A	5	5	N/A	N
Manganese	7439-96-5	N/A	2.5	2.5	N/A	N/
Mercury	7439-97-6	N/A	0.02	0.02	N/A	N/
Molybdenum	7439-98-7	N/A	5	5	N/A	N

Nickel	7440-02-0	N/A	5	5	N/A	N
Selenium	7782-49-2	N/A	1	1	N/A	N
Silver	7440-22-4	N/A	2.5	2.5	N/A	N/
Sodium	7440-23-5	N/A	200	200	N/A	N/

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QAPP Worksheet #15-1
Reference Limits and Evaluation Table (Continued)

Matrix: Soil
Analytical Group: Metals 6010/6020/7470
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achi
				MDLs	Method QLs	M
Thallium	7440-28-0	N/A	2	2	N/A	N
Uranium	7440-61-1	N/A	1	1	N/A	N
Vanadium	7440-62-2	N/A	2.5	2.5	N/A	N/
Zinc	7440-66-6	N/A	20	20	N/A	N/

[1] Project Action Limits for the purpose of this evaluation are provided in Table 1 of the work plan
[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.

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QAPP Worksheet #15-2
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: PCBs 8082
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achi
				MDLs	Method QLs	M
Aroclor 1016	12674-11-2	N/A	0.1	0.1	N/A	N/
Aroclor 1221	11104-28-2	N/A	0.1	0.1	N/A	N/
Aroclor 1232	11141-16-5	N/A	0.1	0.1	N/A	N/
Aroclor 1242	11104-29-3	N/A	0.1	0.1	N/A	N/
Aroclor 1248	12672-29-6	N/A	0.1	0.1	N/A	N/
Aroclor 1254	11097-69-1	N/A	0.1	0.1	N/A	N/
Aroclor 1260	11096-82-5	N/A	0.1	0.1	N/A	N/
Total PCBs	1336-36-3	N/A	0.1	0.1	N/A	N/

[1] Project Action Limits for the purpose of this evaluation are provided in Table 1 of the work plan.
[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.

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QAPP Worksheet #15-3
Reference Limits and Evaluation Table

Matrix: Soil

Analytical Group: Radionuclides
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (pCi/g)	Project Quantitation Limit (pCi/g)	Analytical Method[2]		Achi
				MDA/MDC[4]	Method QLs	MDA
Alpha Activity	12587-46-1	N/A	5	5	N/A	N
Beta Activity	12587-47-2	N/A	5	5	N/A	N
Americium-241	14596-10-2	N/A	0.05	0.05	N/A	N/A
Cesium-137	10045-97-3	N/A	0.1	0.1	N/A	N/
Neptunium-237	13994-20-2	N/A	0.05	0.05	N/A	N/A
Plutonium-238	13981-16-3	N/A	0.05	0.05	N/A	N/A
Plutonium-239/240	N/A	N/A	0.05	0.05	N/A	N/A
Technetium-99	14133-76-7	N/A	1	1	N/A	N
Thorium-228	14274-82-9	N/A	0.05	0.05	N/A	0
Thorium-230	14269-63-7	N/A	0.05	0.05	N/A	N/A
Thorium-232	N/A	N/A	0.05	0.05	N/A	0
Uranium-234	13966-29-5	N/A	0.15	0.15	N/A	N/A
Uranium-235	15117-96-1	N/A	0.05	0.05	N/A	N/A
Uranium-238	24678-82-8	N/A	0.15	0.15	N/A	N/A

[1] Project Action Limits for the purpose of this evaluation are provided in Table 1 of the work plan.
[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.
[4] MDA is applicable to activity and MDC is applicable to concentrations.

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QAPP Worksheet #15-4
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: Metals 6200 (XRF)
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (mg/kg)	Project Quantitation Limit (mg/kg)	Analytical Method[2]		Achi
				MDLs	Method QLs	M
Antimony	7440-36-0	N/A	30	30	N/A	N/
Arsenic	7440-38-2	N/A	11	11	N/A	N/
Barium	7440-39-3	N/A	100	100	N/A	N/A
Cadmium	7440-43-9	N/A	12	12	N/A	N/
Calcium	7440-70-2	N/A	500	500	N/A	N/A
Chromium	7440-47-3	N/A	85	85	N/A	N/
Cobalt	7440-48-4	N/A	260	260	N/A	N/A
Copper	7440-50-8	N/A	35	35	N/A	N/
Iron	7439-89-6	N/A	100	100	N/A	N/A
Lead	7439-92-1	N/A	13	13	N/A	N/
Manganese	7439-96-5	N/A	85	85	N/A	N/
Mercury	7439-97-6	N/A	10	10	N/A	N/
Molybdenum	7439-98-7	N/A	15	15	N/A	N/
Nickel	7440-02-0	N/A	65	65	N/A	N/
Selenium	7782-49-2	N/A	20	20	N/A	N/
Silver	7440-22-4	N/A	10	10	N/A	N/
Thallium	7440-28-0	N/A	20	20	N/A	N/
Uranium	7440-61-1	N/A	20	20	N/A	N/

Vanadium	7440-62-2	N/A	70	70	N/A	N/
Zinc	7440-66-6	N/A	25	25	N/A	N/

[1] Project Action Limits for the purpose of this evaluation are provided in Table 1 of the work plan.
[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.

Page Break

QAPP Worksheet #15-5
Reference Limits and Evaluation Table

Matrix: Soil
Analytical Group: PCB HACH Colorimeter Method 10050
Concentration Level: Low

Analyte	CAS Number	Project Action Limit[1] (mg/kg)	Project Quantitation Limit (ppm)	Analytical Method[2]		Achi
				MDL	Method QLs	M
PCB	1336-36-3	N/A	1, -5, 10,- 50	N/A	1-, 5, 10-, 50	N

[1] Project Action Limit for the purpose of this evaluation are provided in Table 1 of the work plan.
[2] Analytical MDL and QLs are those documented in validated methods.
[3] Achievable MDL and QLs are limits that an individual laboratory can achieve when performing a specific analytical method.

Page Break

QAPP Worksheet #15-6
Reference Limits and Evaluation Table

Matrix: Wipe Sample
Analytical Group: PCBs EnSys Immunoassay Wipe Sample Test Kit
Concentration Level: Low

Analyte	CAS Number	Project Action Limit (ug/wipe)	Project Quantitation Limit (ug/wipe)	Analytical Method[1]		Achi
				MDLs	Method QLs	M
Total PCBs		N/A	10-100	10-100	N/A	10

[1] Analytical MDLs and QLs are those documented in manufacturer's instrument manual.
[2] Achievable QLs are limits that are interference-free media provided by the instrument manufacturer.

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4	PRS-ENR0032 Rev. 0, *PCB Sampling*	Contractor	Sampling	N
54	PRSPAD-ENM-2700 Rev. 0, *Logbooks and Data Forms*	Contractor	Sampling	N

APPENDIX C

ENVIRONMENT, SAFETY, AND HEALTH PLAN

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CONTENTS

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ACRONYMS

ACGIG	American Conference of Government Industrial Hygienists
AHA	Activity Hazard Assessment
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
CFR	*Code of Federal Regulations*
CRZ	contamination reduction zone
DOE	U. S. Department of Energy
EMS	Environmental Management System
EPA	U. S. Environmental Protection Agency
ES&H	Environmental Safety and Health
EZ	exclusion zone
FS	Field Superintendent
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operation
ISMS	Integrated Safety Management System
NIOSH	National Institute for Occupational Safety and Health
OSHA	Occupational Safety and Health Administration
PEL	permissible exposure limit
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
PSS	Plant Shift Superintendent
RADCON	radiation control
RWP	radiological work permit
S&H	Safety and Health
SHS	Safety and Health Specialist
SZ	support zone
TLD	thermoluminescent dosimeter
TLV	threshold limit value

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C.1. INTRODUCTION

This (ES&H) Plan has been developed to discuss the general ES&H requirements associated with the Sitewide Evaluation 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 Plans (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.

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C.2. INTEGRATED SAFETY MANAGEMENT/ENVIRONMENTAL MANAGEMENT

The Project team will utilize an Integrated Safety Management System (ISMS) which integrates the Safety Management Systems, the Environmental Management System (EMS), and 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 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 U.S. Department of Energy (DOE), U.S. Occupational Safety and Health Administration (OSHA), the U.S. Environmental Protection Agency (EPA), and other applicable regulatory guidance. Brief descriptions of the five ISMS/EMS core functions are provided below.

C.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 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.

C.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, environmental, 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 personal protective equipment (PPE). The 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.

C.2.3 DEVELOP/IMPLEMENT CONTROLS

The primary mechanisms used to flow down 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 human health at risk, or that could endanger the public or the environment. One of the key elements of ISMS/EMS is that all personnel have "stop work authority" and are encouraged to use this authority whenever there is 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.

C.2.4 PERFORM WORK

After the project team has been given approval to proceed, the project-specific plans will be implemented. The project team will verify that all applicable plans, forms, and records are contained in the project files and accessible by approved personnel. 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

C.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.

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 and 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; and
- Overall issues or concerns they may have regarding how the work was performed.

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C.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/EMS Program, Radiation Protection Program, and Quality Assurance 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.

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C.4. SUSPENDING/STOPPING WORK

In accordance with 10 *CFR* § 851.20 and the DOE Prime Contractor's Worker S&H Program and procedures, workers have the right to decline to perform an assigned task because of a reasonable belief under the circumstances that the task poses an imminent risk of death or serious physical harm to the worker. 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 Field Superintendent (FS) and Safety and Health Specialist (SHS) they will be evaluated by management 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 FS and/or SHS should be notified immediately, at which time management and/or emergency responders will be notified.

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C.5. ISMS/EMS 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 FS and/or SHS 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 work control documents. This shall be documented as required reading, acknowledgement forms, or briefing sheets. Visitors also will be oriented to the applicable plans and potential hazards that they may encounter.

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C.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.

These are the roles and responsibilities of key field team members.

- The Environmental Restoration Project Director oversees the implementation of the project plans and provides the resources for the project.

- The 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 Project Manager also performs management audits and inspections.

- The FS coordinates field activities and logistics and provides communication between the project team and the field team as well as other support groups. The FS also ensures that on-site personnel comply with the Worker S&H Program, work packages, and applicable procedures.

- The S&H Specialist provides safety and health support and oversight to the project to ensure that work is being performed safely and in accordance with the Worker S&H Program, applicable regulations, 10 *CFR* § 851, DOE directives, and applicable plans and procedures.

- The Quality Assurance 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 Radiological Control Group provides support and guidance to the project and assists the FS and SHS with implementation of radiological controls and as-low-as-reasonably-achievable (ALARA) principles. The Radiological Control Technician 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 field work 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 S&H Program, as well as ES&H and work control requirements.

- Field Team/Subcontractors–Samplers, drillers, operators, and maintenance perform work as specified in work packages, adhering to the Worker S&H 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.

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C.7. SITE CONTROL

C.7.1 WORK SITE CONTROL ZONES

Work zones will be utilized to control access. These areas will be controlled by the FS, SHS, and/or RCT 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 may be established at the site.

C.7.1.1 Exclusion Zone

The exclusion zone (EZ) is the immediate area around an excavation or remedial action activity where there is potential for personal exposure to hazardous materials. The exclusion zone will be marked and entry and exit points will be established to regulate movement of personnel and equipment to reduce the potential of the spread of contamination.

C.7.1.2 Contamination Reduction Zone

The contamination reduction zone (CRZ) is the transition area between the EZ and construction zone or support zone. This area will provide a buffer area to reduce the probability that contamination will leave the EZ. The CRZ is designed for the following activities:

- Decontamination of equipment, workers, and sample containers;
- Staging of emergency response equipment and supplies (e.g., first-aid, fire equipment);
- Scanning of personnel, materials, and equipment;
- Sample packing and preparation; and
- Worker rest area.

The CRZ is designed to reduce the possibility of the clean area becoming contaminated by site hazards. The degree of contamination in the CRZ decreases as the distance from the contaminants increases.

C.7.1.3 Construction Zone

The construction zone is the area outside of potential contamination, but still encompasses 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.

C.7.1.4 Support Zone

The support zone (SZ) is the outermost area of the site. This area is uncontaminated where workers provide operational and administrative support. The support zone is clean and will not be entered by contaminated equipment or personnel, unless properly controlled or except under emergency or evacuation conditions. Normal work clothes are appropriate within this zone.

C.7.1.5 Site Communications

Paducah Gaseous Diffusion Plant (PGDP) plant radios, plant phones, and cell phones will be used for on-site and off-site communication. 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.

C.7.1.6 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 FS, SHS, and Radiological Control Technician. The FS (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 the appropriate level of HAZWOPER training. This training must cover the requirements in 29 *CFR* § 1910.120, HAZWOPER. As applicable, workers must receive annual 8-hour refresher training (if applicable) and 1 or 3-day on-site supervision under a trained, experienced supervisor. The FS 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. Workers entering radiological posted work areas also will be required to complete Radworker II training.

C.7.1.7 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 wish to enter the EZ must produce evidence that they have medical clearance and appropriate 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 FS, SHS, and/or RCT.

C.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 are generally one level of protection lower than the EZ. Activities conducted within SZs should require normal work clothes and PPE unless specified by the FS or SHS.

C.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.

C.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 and 29 *CFR* § 1910.134, Respiratory Protection. Personnel required to wear respirators will inspect their respirators before and after each use, and any deficiencies will be reported to the FS or SHS immediately. Respirators will be properly stored in a bag in a clean, dry environment and routinely cleaned. Damaged respirators shall not be used.

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C.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 and ability to wear a respirator.

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.

C.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.

C.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; and
- Personnel are opening waste containers that contain potentially contaminated material.

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C.10. INDUSTRIAL HYGIENE MONITORING

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).

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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 always will 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 in accordance with the appropriate NIOSH or OSHA methodology.

C.10.1 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 Sitewide Evaluation project will be monitored through dosimetry and required to wear a thermoluminescent dosimeter (TLD) when working in radiological zones and submit bioassays as required.

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C.11. EMERGENCY RESPONSE

C.11.1 RESPONSIBILITIES

The PM, FS, and SHS are responsible for the project emergency management program and ensuring that the appropriate emergency response equipment is readily available at the work site and in proper working order.

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 SHS 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 SHS or the FS. The SHS or FS 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 Plant Shift Superintendent (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.

C.11.2 REPORTING AN EMERGENCY

C.11.2.1 Discovery

The person who discovers an emergency should immediately report it, then attempt to establish control ONLY if the incident is minor in magnitude (e.g., using a fire extinguisher to put out an incipient fire if trained to do so and extinguishment can be accomplished in a safe manner). 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.

Sitewide Evaluation project personnel will maintain a radio, telephone, or other reliable means of notifying emergency response personnel and the PSS.

C.11.2.2 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.

C.11.3 INITIAL EMERGENCY RESPONSE

When an emergency occurs, the SHS or FS 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 should be an adequate number of personnel 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.

C.11.4 PADUCAH GASEOUS DIFFUSION PLANT ALARMS

The alarms can be heard by calling 6161 on a Bell phone.

These include the following:

***Radiation Emergency/CAAS*:**	Continuous blast on a high-pitched air whistle or electronic horn
	ACTION: Evacuate area immediately and stay away from affected 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 FS, SHS, or designee will be responsible for accounting for all field personnel (including subtier subcontractor personnel) and reporting any unaccounted-for personnel to the emergency coordinator.

C.11.5 REPORTING A SPILL

When a spill is discovered, the FS or SHS will immediately contact Environmental Compliance, the 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).

C.11.5.1 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 FS or SHS will immediately contact PSS for assistance. Rescue operations will not be performed unless the rescuers are dressed in the appropriate protective equipment.

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 FS or SHS 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.
- 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.
- Notify Environmental Compliance for spill reporting and cleanup requirements.

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 FS, SHS, 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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APPENDIX D

DATA MANAGEMENT IMPLEMENTATION PLAN

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CONTENTS

ACRONYMS

COC	chain-of-custody
DMC	Document Management Center
DMIP	Data Management Implementation Plan
DOE	U.S. Department of Energy
EDD	electronic data deliverables
GIS	geographic information system
OREIS	Oak Ridge Environmental Information System
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
QA	quality assurance
QC	quality control
RTL	ready-to-load
SOW	statement of work

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D.1 INTRODUCTION

The purpose of this Data Management Implementation Plan (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 Sitewide Evaluation at the Paducah Gaseous Diffusion Plant (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 usage 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. Field data are collected in field logbooks or field data forms and are entered into Paducah Project Environmental Measurements System (PEMS), as appropriate, for storage. Analytical data are planned and managed through Paducah PEMS and transferred to Paducah Oak Ridge Environmental Information System (OREIS) for long-term storage and reporting.

To meet current regulatory requirements for U.S. Department of Energy (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 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 Sitewide Evaluation. 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.

D.2 PROJECT MISSION

Requirements and responsibilities described in this plan apply to activities conducted by the project team in support of the Sitewide Evaluation. Specific activities involving data include, but are not limited to, sampling of sediment and soil; storing, analyzing, and shipping samples, when applicable; and evaluation, verification, validation, assessment, and reporting of analytical results.

D.3 DATA MANAGEMENT ACTIVITIES

Data management will be implemented throughout the life cycle of the Sitewide Evaluation. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual usage of the data for decision-making purposes, to the long-term storage of data. Data management activities 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 D.8 contains a detailed discussion of the activities listed above.

D.4 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 electronic data deliverables (EDDs) are loaded into Paducah PEMS by the Data Coordinator. The project team is responsible for data verification and 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 ready-to-load (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 methods, laboratory quality control (QC) requirements, and deliverable requirements are specified in this SOW. In addition, 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.

D.4.1 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.

D.4.2 HISTORICAL DATA

No historical data is available for this Sitewide Evaluation.

D.4.3 FIELD DATA

Field (screening) data for the project includes sample collection information and field screen measurement results.

D.4.4 ANALYTICAL DATA

Analytical (definitive) data for the project consists of laboratory analyses for environmental and waste characterization.

D.4.5 SURVEY DATA COVERAGE

Global Positioning System or standard survey techniques will be used to obtain civil survey data for this project. 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

D.5 DATA FORMS AND LOGBOOKS

Field logbooks, site logbooks, chain-of-custody (COC) forms, data packages with associated quality assurance/QC (QA/QC) information, and field forms are maintained according to the requirements defined in procedure PAD-DOC-1009, *Records Management, Administrative Records, and Document Control*.[1] 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 Document Management Center (DMC) and copies are maintained in the field office.

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D.5.1 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, COC forms, or sample labels and is entered directly into Paducah PEMS by the Data Coordinator. Sample identification numbers are identified in Paducah PEMS as assigned by the Data Coordinator.

Sample COC forms contain sample-specific information recorded during collection of the sample. Any deviations from the sampling plan are noted on the sample COC form or logbook. The Sampling Team

[1] It is understood that procedures are contractor specific.

Leader reviews each sample COC form for accuracy and completeness as soon as practical following sample collection.

Sample COC forms are generated from Paducah PEMS with the following information:

Information that is preprinted:	Information that is entered manually:
- Lab COC 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)	
- Analysis (e.g., PCB[1])	
- Sample container (volume, type)	

[1] PCB = Polychlorinated Biphenyl

D.5.2 LITHOLOGIC DESCRIPTION FORMS

Lithologic description forms will be used as necessary for this project.

D.5.3 WELL CONSTRUCTION DETAIL FORMS

These forms are not necessary for use during this project.

D.5.4 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 PAD-ENM-2700, *Logbooks and Data Forms*.

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D.6 DATA AND DATA RECORDS TRANSMITTALS

D.6.1 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.

D.6.2 DATA RECORDS TRANSMITTALS

Project personnel will make records transfers to the DMC.

D.7 DATA MANAGEMENT SYSTEMS

D.7.1 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 accesses 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 COC 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 sample management office.

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.

D.7.2 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 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)

D.7.3 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).

D.8 DATA MANAGEMENT TASKS AND ROLES AND RESPONSIBILITIES

D.8.1 DATA MANAGEMENT TASKS

An explanation of the data review process is provided in the following sections.

D.8.1.1 Plan Data Collection

Other documents for this project provide additional information for the tasks of project environmental data collection, including sampling and analysis planning, quality assurance, waste management, and health and safety. Also, a laboratory SOW will be developed for this project.

D.8.1.2 Prepare for Sampling Activities

The data management tasks involved in sample preparation include identifying all sampling locations, preparing descriptions of these stations, identifying sample containers and preservation, developing field logbooks, preparation of sample kits and COCs, 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 global positioning system.

D.8.1.3 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, COC 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 COC records. Sample labels and COCs are completed according to PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*.

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The project field team will collect samples for the project and will record pertinent sampling information on the COC and in the field logbook. The Data Coordinator enters the information from the COC forms into Paducah PEMS.

D.8.1.4 Submit Samples for Analysis

Before the start of field sampling, the Field Superintendent or designee coordinates the delivery of samples with the Lab Coordinator who, in turn, coordinates with the analytical laboratories. 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.

D.8.1.5 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 PAD-ENM-5007, *Data Management Coordination*.

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The field screen measurement data will be provided by the 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.

D.8.1.6 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. During contractual screening, the analytical method requested on the laboratory statement of work is compared to the analytical method received from the laboratory to ensure that contract requirements were met.

D.8.1.7 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. Verification is performed for 100 percent of data. Data verification includes contractual screening and criteria as specified in Appendix B, the Quality Assurance Project Plan. Data is flagged as necessary. Verification qualifiers are stored in Paducah PEMS and transferred with the data to Paducah OREIS.

D.8.1.8 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.

D.8.1.9 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. Per contractor procedure, data validation can be performed concurrently with data verification and data assessment. Data assessment is not finalized until data validation is complete, if applicable, and the data validation qualifiers have been evaluated. Data assessment is performed on 100 percent of the data set, even when data validation is not required.

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The data assessment is conducted by the project team according to DOE Prime Contractor procedure, PAD-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.

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D.8.1.10 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. 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.

D.8.2 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.

D.8.2.1 Project Manager

The Project Manager is responsible for the day-to-day operation of the project. The Project Manager ensures the requirements of policies and procedures are met. The project manager or designee assesses data in accordance with DOE Prime Contractor procedure, PAD-ENM-5003, *Quality Assured Data*. The Project Manager is responsible to flow down data management requirements to subcontractors as required.

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D.8.2.2 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.

D.8.2.3 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.

D.8.2.4 Data Coordinator

The Data Coordinator enters the data into Paducah PEMS, including COC information, field data, data assessment and data validation qualifiers, and any pertinent sampling information. After receiving a notification that a fixed-base laboratory 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.

D.8.2.5 Document Control Center Manager

The DMC Manager is responsible for long-term storage of project records. The project team will interface with the DMC Manager and will transfer documents and records in accordance with DOE requirements.

D.8.2.6 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.

D.8.2.7 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 DOE Prime Contractor procedure, PAD-ENM-5003, *Quality Assured Data,* are followed.

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D.8.2.8 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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