Department of Energy

Portsmouth/Paducah Project Office
1017 Majestic Drive, Suite 200
Lexington, Kentucky 40513
(859) 219-4000

JUN 2 7 2014

PPPO-02-2398565-14

Mr. Todd Mullins
Federal Facility Agreement Manager
Division of Waste Management
Kentucky Department for Environmental Protection
200 Fair Oaks Lane, 2nd Floor
Frankfort, Kentucky 40601

Ms. Jennifer Tufts
Federal Facility Agreement Manager
U.S. Environmental Protection Agency, Region 4
61 Forsyth Street
Atlanta, Georgia 30303

Dear Mr. Mullins and Ms. Tufts:

TRANSMITTAL OF THE SITEWIDE EVALUATION WORK PLAN FOR ANOMALIES LOCATED OUTSIDE THE LIMITED AREA AT THE PADUCAH GASEOUS DIFFUSION PLANT, PADUCAH, KENTUCKY (DOE/LX/07-1288&D1)

Please find enclosed for your review the *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1288&D1. The approach included in this work plan was scoped by the Federal Facility Agreement (FFA) parties during scoping meetings held in March and April 2014, and is consistent with the Kentucky Department for Environmental Protection's (KDEP's) May 25, 2012, proposal to survey a subset of the anomalies to determine if additional evaluation of the remaining anomalies is required. This work plan supersedes the D2 *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D2, submitted to KDEP and the U.S. Environmental Protection Agency on May 23, 2011.

As a result of additional funding received in fiscal year 2014, this project is working to an accelerated schedule as discussed in the February 2014 FFA Managers' meeting. In order to meet the accelerated schedule, the U.S. Department of Energy requests a 30-day review of the subject document. Based on this schedule, please provide comments by July 29, 2014.

If you have any questions or require additional information, please contact Lisa Santoro at (270) 441-6804.

Sincerely,

Jennifer Woodard

Jennifer Woodard
Federal Facilities Agreement Manager
Portsmouth/Paducah Project Office

Enclosure:
Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky, DOE/LX/07-1288&D1

e-copy w/enclosure:
brandy.mitchell@lataky.com, LATA/Kevil
brian.begley@ky.gov, KDEP/Frankfort
craig.jones@lataky.com, LATA/Kevil
darla.bowen@lataky.com, LATA/Kevil
dennis.greene@lex.doe.gov, P2S/PAD
gaye.brewer@ky.gov, KDEP/PAD
jennifer.watson@lataky.com, LATA/Kevil
jennifer.woodard@lex.doe.gov, PPPO/PAD
latacorrespondence@lataky.com, LATA/Kevil
leo.williamson@ky.gov, KDEP/Frankfort
lisa.santoro@lex.doe.gov, PPPO/PAD
mark.duff@lataky.com, LATA/Kevil
mike.guffey@ky.gov, KDEP/Frankfort
myrna.redfield@lataky.com, LATA/Kevil
nathan.garner@ky.gov, KYRHB/Frankfort
pad.dmc@swiftstaley.com, SST/Kevil
rachel.blumenfeld@lex.doe.gov, PPPO/PAD
reinhard.knerr@lex.doe.gov, PPPO/PAD
richards.jon@@epamail.epa.gov, EPA/Atlanta
rob.seifert@lex.doe.gov, PPPO/PAD
stephaniec.brock@ky.gov, KYRHB/Frankfort
todd.mullins@ky.gov, KDEP/Frankfort
tufts.jennifer@epamail.epa.gov, EPA/Atlanta

DOE/LX/07-1288&D1
Secondary Document

Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

CLEARED FOR PUBLIC RELEASE

DOE/LX/07-1288&D1
Secondary Document

Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant Paducah, Kentucky

Date Issued—June 2014

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

CLEARED FOR PUBLIC RELEASE

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

TABLES

QAPP WORKSHEETS

ACRONYMS

AHA	Activity Hazard Assessment
ALARA	as low as reasonably achievable
ANSI	American National Standards Institute
AOC	area of concern
bgs	below ground surface
CAS	chemical abstracts service
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
COC	chain-of-custody
COPC	chemical of potential concern
DMC	Document Management Center
DMIP	Data Management Implementation Plan
DOE	U.S. Department of Energy
DOECAP	DOE Consolidated Audit Program
DQO	data quality objectives
EDD	electronic data deliverable
EM	Environmental Management
EMS	Emergency Management System
EPA	U.S. Environmental Protection Agency
ES&H	Environment, Safety, and Health
FIDLER	field instrument for detection of low energy
FFA	Federal Facility Agreement
FS	field Superintendent
FSP	field sampling plan
GIS	geographic information system
GPS	Global Positioning System
GWS	gamma walkover survey
HASP	health and safety plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICP	inductively coupled plasma
ID	identification
IDW	investigation-derived waste
ISMS	Integrated Safety Management System
KDEP	Kentucky Department for Environmental Protection
KDFWR	Kentucky Department of Fish and Wildlife Resources
KRCEE	Kentucky Research Consortium for Energy and Environment
LATA Kentucky	LATA Environmental Services of Kentucky, LLC
MARSSIM	Multi-Agency Radiation Survey & Site Investigation Manual
MBWA	Management by Walking Around
MDL	method detection limit
MS	matrix spike
N/A	not applicable
NAL	no action level
OREIS	Oak Ridge Environmental Information System
ORISE	Oak Ridge Institute for Science and Education
OU	operable unit
PAL	project action level

PARCCS	precision, accuracy, representativeness, comparability, completeness, and sensitivity
PEGASIS	Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System
PEL	permissible exposure limit
PEMS	Project Environmental Measurements System
PGDP	Paducah Gaseous Diffusion Plant
PPE	personal protective equipment
PPPO	Portsmouth/Paducah Project Office
PQL	practical quantitation limit
PT	proficiency testing
QA	quality assurance
QAPP	Quality Assurance Project Plan
QL	quantitation limit
RCRA	Resource Conservation and Recovery Act
RCT	radiological control technician
RPD	relative percent difference
RTL	ready to load
RWP	Radiological Work Permit
SAP	sampling and analysis plan
SAR	SWMU assessment report
SER	site evaluation report
S&H	Safety and Health
SMP	Site Management Plan
SOP	standard operating procedure
SOW	statement of work
SWMU	solid waste management unit
TBD	to be determined
TSDF	treatment, storage, and disposal facilities
USEC	United States Enrichment Corporation
WAC	waste acceptance criteria
WAG	waste area group
WE	Waste Engineer
WKWMA	West Kentucky Wildlife Management Area
WMP	Waste Management Plan
XRF	X-ray fluorescence

EXECUTIVE SUMMARY

This *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1288&D1, documenting work to be performed under the Soils Operable Unit, was prepared to outline a focused radiological survey and judgmental sampling effort planned for 25 of the previously identified 534 anomalies covering U.S. Department of Energy (DOE)-owned property outside the Limited Area at the Paducah Gaseous Diffusion Plant (PGDP) to validate the conclusions of the previous 2009-2010 effort. These areas currently are not designated as a solid waste management unit (SWMU)/area of concern (AOC). The Limited Area is defined as the 650 acres inside the fenced industrial area at PGDP. Selected anomalies consist of soil and soil areas containing debris and serve as proxies for the remainder of the 534 identified anomalies.

In 2009 and 2010, a series of sitewide activities was conducted on the DOE Reservation outside the Limited Area to identify anomalies. An anomaly was defined as any area that exhibited two times instrument radiological background and/or was a pile, dip, debris, or other potential man-made disturbance. This effort was augmented by the performance of an aerial radiological survey and high resolution aerial photography. Some 633 anomalies were identified. Of these, 99 had been identified previously by other investigations and were removed from the list. The remaining 534 were subjected to a scoping radiological survey. The results of these efforts indicated that none of the anomalies posed an immediate threat to the public or environment.

The overall objective of the Sitewide Evaluation is to collect data to support the determination of whether any of the anomalies require further Comprehensive Environmental Response, Compensation, and Liability Act evaluation and to develop information that can be used as an input to the Resource Conservation and Recovery Act Environmental Indicators process for PGDP. That is, this evaluation will determine if any of the anomalies meet the definition of a SWMU or AOC that requires designation as such and warrant further investigation.

The purpose of the current activity is to evaluate a subset of all of the anomalies to determine if additional evaluation is required of the other anomalies. This activity relies upon gamma walkover survey and *ex situ* X-ray fluorescence (XRF) analysis to measure uranium concentration associated with the selected anomalies. Uranium is used as a surrogate for other contaminants due to its being the primary radiological constituent found at PGDP.

The following are the Decision Rules established for this project.

- If the 25 selected anomalies show no uranium concentration above 10 mg/kg in soil,[1] then the other 509 anomalies are assumed not to be contaminated at a level of concern and therefore do not meet the definition of a SWMU or AOC.

[1] The project action level (PAL) for uranium (10 mg/kg) was set to ensure the data quality objectives, agreed to by the Federal Facility Agreement parties, were met using the XRF analytical method. The PAL approaches the PGDP surface soil background concentration of 4.9 mg/kg for uranium and is below the risk-based no action level of 64.4 mg/kg for the child recreational user (DOE 2011). Finally, an acknowledged XRF subject matter expert-confirmed detection at the PAL could be achieved reliably with an XRF calibrated to detect uranium.

- If one or more of the selected 25 anomalies show uranium concentration above 10 mg/kg in soil, then an evaluation of the remaining (509) anomalies by the FFA parties is necessary to determine whether a follow up action is needed (e.g., survey plan for individual survey units and the anomalies they contain).

The scope of work defined in this document was accomplished in agreement among DOE, the Commonwealth of Kentucky, and U.S. Environmental Protection Agency Region 4. The Site Management Plan defined the scope and provided key planning assumptions (DOE 2014). Information related to the previous activities, as appropriate, and this current activity will be documented in a Site Evaluation Report, which will include SWMU/AOC assessment reports for newly identified areas.

1. INTRODUCTION

1.1 SCOPE OF WORK

This *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky,* DOE/LX/07-1288&D1, describing work to be performed under the Soils Operable Unit (OU), was prepared to outline a focused radiological survey and judgmental sampling effort planned for 25[2] of the previously identified 534 anomalies covering U.S. Department of Energy (DOE)-owned property outside the Limited Area at the Paducah Gaseous Diffusion Plant (PGDP) to validate the conclusions from the previous 2009-2010 effort. These areas currently are not designated as a solid waste management unit (SWMU)/area of concern (AOC). The Limited Area is defined as the 650 acres inside the fenced industrial area at PGDP. Figure 1 illustrates PGDP and the surrounding area.

In 2009 and 2010, a series of sitewide activities was conducted on the DOE Reservation outside the Limited Area to identify anomalies. On the DOE Reservation outside the Limited Area, identification of anomalies was done by radiological and visual walkover surveys. An anomaly was defined as any area that exhibited two times instrument radiological background and/or was a pile, dip, debris, or other potential man-made disturbance. Some 633 anomalies were identified. Of these, 99 had been previously identified by other investigations and were removed from the list. The remaining 534 were subjected to a scoping radiological survey. The results of these efforts indicated that none of the anomalies posed an immediate threat to the public or environment. A more detailed survey effort is planned for 25 of the anomalies to validate the conclusions from the previous effort. The previous work performed for the Sitewide Evaluation is detailed further in Appendix B.

The scope of this current activity is defined in the Site Management Plan (SMP) (DOE 2014). According to the SMP, "the D2 Sitewide Evaluation Work Plan will be modified via addendum to incorporate discussion among the FFA parties on May 25, 2012. Characterization activities that are required, based upon these discussions, will be conducted, results of the characterization activities will be discussed with the FFA parties, and the appropriate path forward will be incorporated into the D1 SER." The SMP further states: "the FFA parties agree to survey 15 locations with highest counts per minute and 10 locations with the greatest delta in counts per minute per Kentucky's proposal for the Soils OU Sitewide sampling, dated May 25, 2012. The locations will be determined by the FFA parties prior to implementation. Upon completion of the survey, the surveys will be mapped, and an X-ray fluorescence (XRF) sample for total uranium will be collected from the highest survey reading at each of the 25 locations." It was agreed during 2014 scoping that a new work plan instead of an addendum would be developed. Also during 2014 scoping, the identification of the 25 anomalies deviated from the criteria outlined in the SMP and the anomalies were selected as described in Section 4 and in conjunction with site walkdowns performed by the FFA parties during 2014 scoping.

[2] 25 is 5% of overall total anomalies (i.e., approximately 500).

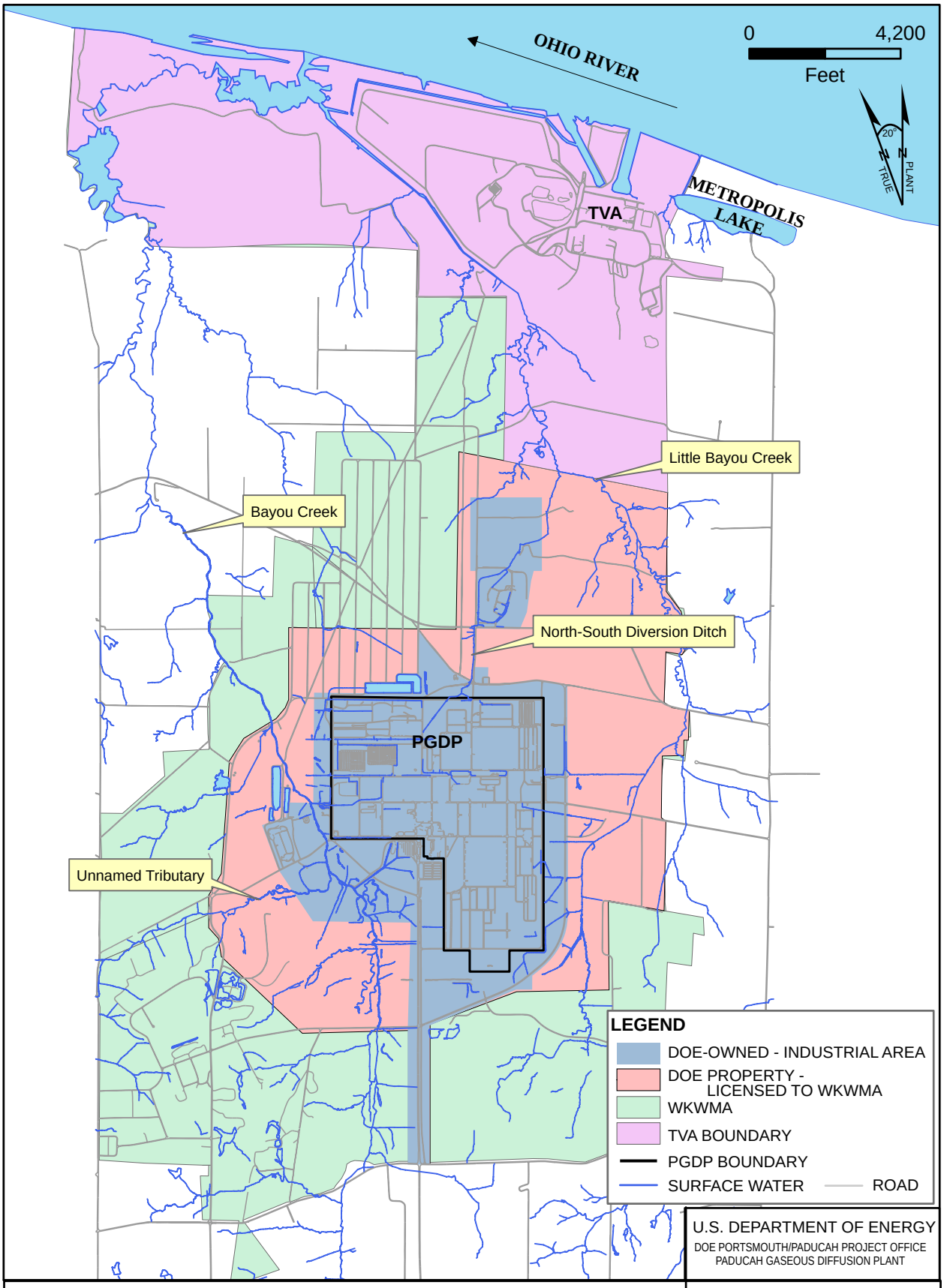


Figure 1. Map of PGDP and Surrounding Area

Table 1 lists the anomalies chosen for further evaluation in this project. Selection of the 25 anomalies is described in Section 4. The table includes the size of the anomaly and a short description of the anomaly along with initial survey information. As shown in Figure 2, the locations of the anomalies selected for the Sampling and Analysis Plan (SAP) are outside the limited PGDP area within the DOE property boundary. A gamma walkover survey and surface soil sampling will be conducted at each of the selected 25 anomalies. Table 1 and Figure 2 also list 3 contingency anomalies as alternates, should any of the selected 25 anomalies be inaccessible, contain standing water, or be deemed to be unsafe. If a contingency location is utilized, the Federal Facility Agreement (FFA) parties will be notified. Soil samples (from soil areas) from the selected 25 anomalies will be analyzed by field analytical methods as discussed in Section 5 of this work plan. Resulting field laboratory analytical data will be of sufficient quality so that it can be used in subsequent Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) documents to evaluate potential human health risks and to support decisions regarding any need for response actions.

The scope of work defined in this document was accomplished in agreement among the Commonwealth of Kentucky and U.S. Environmental Protection Agency Region 4 (EPA). This work plan will be followed by a sitewide evaluation report (SER) to document the results of the previous activities, as appropriate, and this current activity. SWMU assessment reports (SARs) will be attached to the SER for any new SWMUs/AOCs identified during this evaluation. SWMU and AOC are defined in the 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 probable 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….

1.2 OBJECTIVES

The overall objective of the Sitewide Evaluation is to collect data to support the determination of whether any of the anomalies require further CERCLA evaluation and to develop information that can be used as an input to the Resource Conservation and Recovery Act (RCRA) Environmental Indicators process for PGDP. That is, this evaluation will determine if any of the anomalies meet the definition of a SWMU or AOC that requires designation as such and warrant further investigation.

The purpose of the current activity is to evaluate a subset of all of the anomalies to determine if additional evaluation is required of the other anomalies. This activity relies upon gamma walkover survey (GWS) and *ex situ* XRF analysis to measure uranium concentration associated with the selected anomalies. Uranium is used as a surrogate for other contaminants due to its being the primary radiological constituent found at PGDP and serve as proxies for the remainder of the 509 identified anomalies. Based upon results, an evaluation of the remaining anomalies may be required per this project's decision rules.

Table 1. Selected Anomalies

Ranking	Anomaly Name	Area (m^2)	Description
1	PV-21-01-V-6	4,046	dirt mound
2	PG-02-03-R-2	660	dirt mound
3	PM-26-02-R-3	433	chunks of concrete
4	PE-01-03-V-18	91	soil mound, limbs, tree debris
5	PP-06-03-V-20	113	dirt mound
6	PS-26-02-V-1	1,063	dirt mound
7	PP-05-02-R-1a	90	dirt mounds
8	PU-24-01-V-5	3,594	dirt mound
9	PU-24-01-V-4	2,411	dirt mound
10	PY-13-01-V-2	10	concrete/pipe
11	PF-13-02-V-16	1,432	dirt mound
12	PV-24-01-V-8	1,962	dirt mound
13	PY-13-01-V-5	374	concrete
14	PF-13-02-R-1	532	dirt mound, concrete
15	PF-18-02-V-20	306	dirt mound
16	PQ-30-03-V-5	4,248	soil, limbs, debris
17	PY-14-01-V-7	1,351	soil mound, concrete
18	PY-13-01-V-4	170	dirt mound
19	PQ-30-03-V-6	248	soil mound, concrete
20	PE-01-03-V-24	22	soil mound, limbs, tree debris
21	PF-18-02-V-19	357	concrete pipe, dirt mounds
22	PY-14-01-V-8	29	soil mound
23	PY-14-01-V-6	145	soil mound
24	PQ-30-03-V-7	5,686	soil mound, concrete
25	PU-24-01-V-6	1,894	dirt mound, plastic construction fencing
26	PS-19-03-V-7*	120	soil mound
27	PM-26-02-V-7*	1,180	dirt mound
28	PF-26-02-V-11*	122	soil mound

*Contingency location

Note: Three contingency anomalies will be used as alternates, should any of the selected 25 anomalies be inaccessible, contain standing water, or be deemed to be unsafe.

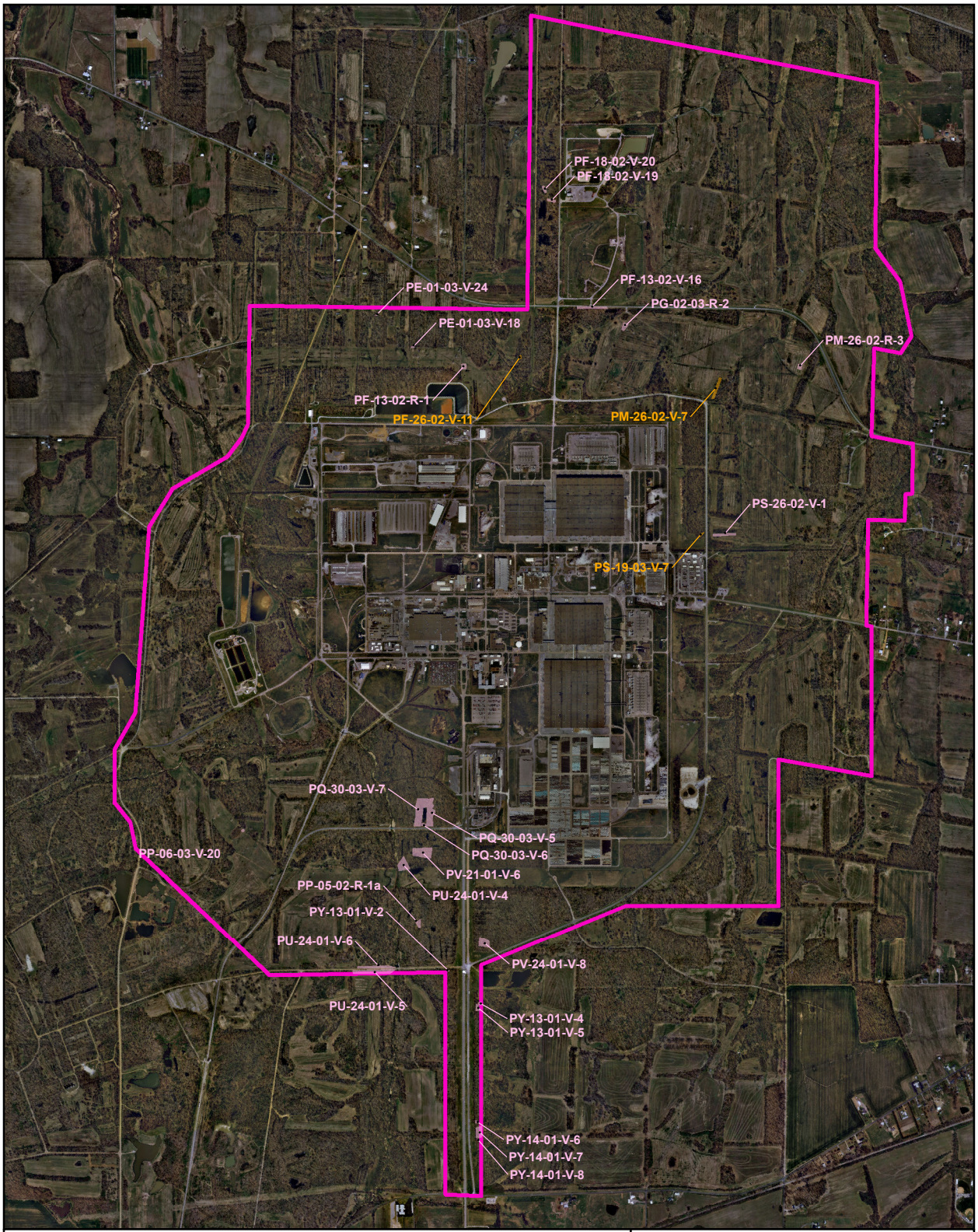


Figure 2. Locations of Selected Sitewide Evaluation Anomalies

1.3 GUIDANCE

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

- Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA (EPA 1988);
- Guidance on Systematic Planning Using the Data Quality Objectives Process (EPA 2006);
- Test Methods for Evaluating Solid Waste: Physical/Chemical Methods, SW-846, 3rd Edition (EPA 2004);
- Uniform Federal Policy for Quality Assurance Project Plans (QAPP) (EPA 2005a; EPA 2005b; EPA 2005c; EPA 2005d);
- Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies (EPA 1992); and
- Multi-Agency Radiation Survey & Site Investigation Manual (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 of 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 potentially contaminated areas.

1.4 WORK PLAN ORGANIZATION

Section 2 includes information on site background and physical setting. Section 3 presents the data quality objectives. Section 4 is the evaluation and selection of anomalies. Section 5 provides a brief description of tasks to be performed. Section 6 provides the QAPP; Section 7 is the environment, safety, and health plan; Section 8 is the data management implementation plan; Section 9 is the waste management plan; and Section 10 provides a schedule.

Appendix A of this work plan contains the Survey Plan for the GWSs associated with the 25 selected anomalies. Appendix B contains the information from the visual walkover survey that covered DOE-owned property outside PGDP and not currently a SWMU/AOC. This information was used to identify piles, spills, buried materials, and other anomalies. From these anomalies, 25 were selected by the FFA parties for additional evaluation.

2. SITE BACKGROUND AND PHYSICAL SETTING

PGDP, located within the Jackson Purchase region of western Kentucky, is an inactive 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 (KDEP) serve as the regulatory oversight agencies for the facility.

Of the 3,423 acres owned by DOE, approximately 650 acres of this parcel are inside the PGDP Limited Area. Most of the facilities used to support enrichment operations are located in this area. Outside the PGDP Limited Area, 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 2,081 acres is licensed to the Commonwealth of Kentucky Department of Fish and Wildlife Resources (KDFWR) and serves as a portion of the West Kentucky Wildlife Management Area (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 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.

Substantial work has been performed in areas outside the Limited Area to identify and appropriately manage contamination, as necessary. In addition to the creeks efforts under Surface Water OU discussed above, ongoing efforts are being performed under the Soils 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 (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995; DOE 2007a; DOE 2007b; DOE 2007c; DOE 2008a; DOE 2008b; DOE 2008c). Figure 3 depicts areas outside the Limited Area that are covered by one or more of these previously discussed projects and are not a part of this evaluation.

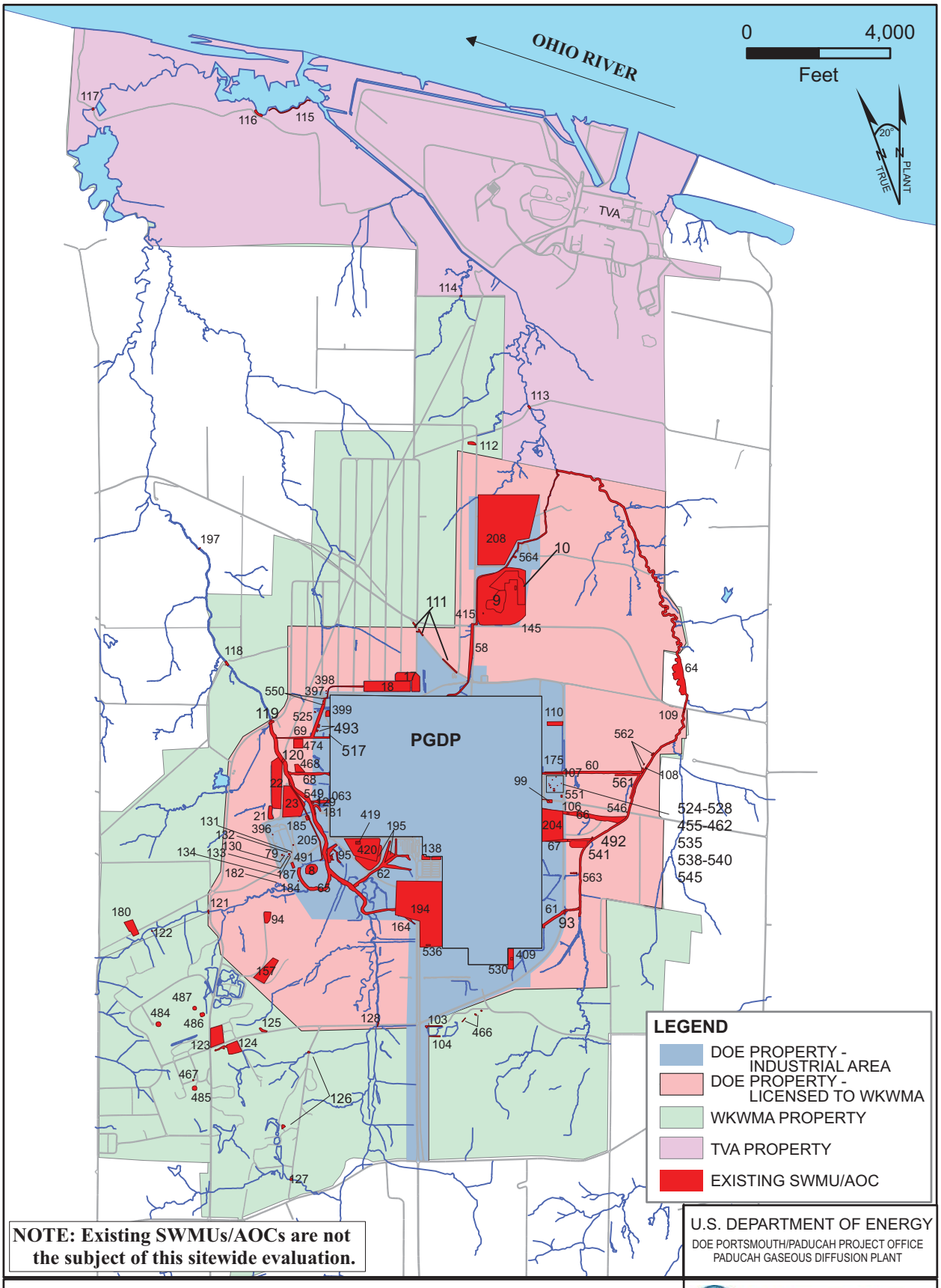


Figure 3. Existing SWMUs/AOCs outside PGDP

Soil SE\Figure2R1.mxd
8-31-2009

3. DATA QUALITY OBJECTIVES

The design of this work plan follows EPA's data quality objectives (DQOs) guidance, as specified in *Guidance for the Data Quality Objectives Process* (EPA 2006). The DQO guidance was developed by EPA to facilitate collection of data that are important to decision making during environmental investigations. It can be defined as a series of planning steps designed to ensure that the type, quantity, and quality of data collected are appropriate for the intended purpose. The planning steps that comprise the DQO process are as follow:

(1) State the problem
(2) Identify the goal of the study
(3) Identify information inputs
(4) Define the boundaries for the study
(5) Develop the analytic approach
(6) Specify performance or acceptance criteria
(7) Develop the plan for obtaining data

3.1 STATE THE PROBLEM

Field work conducted during the Sitewide Evaluation effort in 2009-2010 identified 534 anomalies on DOE-owned property outside of the Limited Area that were subjected to radiological survey. Results of this field work indicated that these anomalies do not represent unknown areas of contamination that pose a threat to the public or environment. A review of the field work and results indicated that an evaluation of 25 anomalies will validate the data that supports the conclusions of the previous effort.

3.2 IDENTIFY THE GOAL OF THE STUDY

The goal of the study is how best to collect data (i.e., GWS and XRF) for verification of the conclusions of the previous effort.

The following questions are addressed by this work plan.

Does a GWS for each of the 25 anomalies provide quality data that can be used to determine the area within each anomaly with the highest count rate for collection of a sample for uranium analysis by XRF?

Does the XRF results for uranium provide quality data that can be used in conjunction with the Decision Rules established in this work plan to determine if further evaluation of the other anomalies is necessary?

3.3 IDENTIFY INFORMATION INPUTS

The inputs to the decision primarily will be knowledge of the previous survey information, site history, resource constraints, analytical levels, and information gathered during the performance of this work plan. DOE, LATA Environmental Services of Kentucky, LLC (LATA Kentucky), Commonwealth of Kentucky, and EPA held scoping sessions during March and April 2014 to address input into the decision making and determination of the anomalies to be included in this work plan.

The DOE has conducted and is conducting a number of investigations to identify and manage material that may have originated from PGDP operations. Several evaluations/investigations have been performed by DOE within and outside of the DOE property boundary to identify and manage material originating from PGDP (DOE 1995, DOE 2007a, DOE 2007b, DOE 2007c, DOE 2008a, DOE 2008b, DOE 2008c, DOE 2008d, DOE 2009a, DOE 2009b, DOE 2009c, DOE 2010). For example, projects are being performed under the Soils OU and Surface Water OU to characterize and assess known SWMU and AOC. Soils and rubble area evaluations conducted under the Soils OU work are of relevance to the Sitewide Evaluation.

Results of historical studies of soil piles and rubble areas at PGDP and surrounding areas have been conducted by DOE (IT Corp. 1989; PGDP 1992; CH2M HILL 1992; DOE 1995). In 1995 DOE completed the Waste Area Group (WAG) 17 RCRA Facility Investigation (DOE 1995) that investigated 37 AOCs. The WAG 17 results are provided in a 1997 Remedial Investigation report (DOE 1997a) and in the WAG 17 Record of Decision (DOE 1997b).

In November 2006, soil piles and debris areas were surveyed on DOE property; these surveys identified 122 soil and rubble areas for potential inclusion as SWMU/AOCs (DOE 2007a). Soil and rubble areas were evaluated under the Soil Piles 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). Site Evaluation Reports have been released 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). DOE prepared and implemented a Soils OU Remedial Investigation/Feasibility Study Work Plan in 2010 (DOE 2010).

An additional input into the present survey plan are the maps developed by Oak Ridge Institute for Science and Education (ORISE) that provide the distribution of radionuclides outside the Limited Area within the DOE property boundary (ORISE 2012).

In 2008, the Kentucky Research Consortium for Energy and Environment (KRCEE) conducted a real-time demonstration at AOC 492 using a number of approaches and technologies that could be applicable to the Soils OU. The approaches utilized by KRCEE included (1) a Field Instrument for the Detection of Low-Energy Radiation/Laser-Assisted Ranging and Data System (FIDLER/LARADS) based gamma walkover system, (2) *in situ* High Purity Germanium gamma spectroscopy, (3) an XRF system, (4) Abraxis polychlorinated biphenyls (PCB) test kits, (5) multi-increment sampling techniques, and (6) adaptive compositing techniques (KRCEE 2008). The KRCEE project demonstrated these technologies would be applicable to ongoing Soils OU work.

The Sitewide Evaluation conducted during 2009 and 2010 determined the presence of approximately 633 anomalies representing potential man-made disturbances in areas located on DOE-owned property outside the Limited Area (DOE 2011). After crosswalking the anomalies with those historically identified, 99 were found to be part of previous evaluations/investigations [e.g., Soil Piles Addendum 2, WAG 17, existing SWMUs/AOCs or known existing structures (i.e., Kentucky Ordnance Works)] and are not included in this evaluation. The remaining anomalies are being evaluated by the Sitewide Evaluation project. The results of these efforts indicated that none of the anomalies posed an immediate threat to the public or environment.

Resource levels for the project were established by the SMP (DOE 2014) and are as follows: “the FFA parties agree to survey 15 locations with highest counts per minute and 10 locations with the greatest delta in counts per minute per Kentucky’s proposal for the Soils OU Sitewide sampling, dated May 25, 2012. The locations will be determined by the FFA parties prior to implementation. Upon completion of

the survey, the surveys will be mapped, and an XRF sample for total uranium will be collected from the highest survey reading at each of the 25 locations."

The analytical level for the project was established during scoping meetings conducted in March 2014. Anomalies will be evaluated using *ex situ* XRF analysis to measure uranium concentration. Uranium is used as a surrogate for other contaminants due to its being the primary radiological constituent found at PGDP. The project action level (PAL) established for uranium is 10 mg/kg in soil. The PAL was set to ensure the DQOs, agreed to by the FFA parties, were met using the XRF analytical method. The PAL approaches the PGDP surface soil background concentration of 4.9 mg/kg for uranium, and is below the risk-based no action level (NAL) of 64.4 mg/kg for the child recreational user (DOE 2011). Finally, an acknowledged XRF subject matter expert-confirmed detection at the PAL could be achieved reliably with an XRF calibrated to detect uranium.

3.4 STUDY BOUNDARIES

The survey plan focuses on 25 of the 534 anomalies found during implementation of the Sitewide Evaluation Work Plan. All anomalies are outside the Limited Area on DOE-owned property. Figure 2 presents the locations of the 25 anomalies that will be evaluated further by this work plan.

The activities of this project are required to occur this summer in order to meet the spending profile. Additional boundaries that could impact schedule include the presence of standing water within anomalies and/or persistent inclement weather.

3.5 ANALYTIC APPROACH

The following decision statements were developed during a scoping meeting held on March 20, 2014:

If the 25 anomalies[3] show no uranium concentration above 10 mg/kg in soil, then the other 509 anomalies are assumed not to be contaminated at a level of concern and, therefore, do not meet the definition of a SWMU or AOC.

If one or more of the 25 anomalies show uranium concentration above 10 mg/kg in soil, then an evaluation of the remaining (509) anomalies by the FFA parties is necessary to determine whether a follow-up action is needed (e.g., survey plan for individual survey units and the anomalies they contain).

3.6 PERFORMANCE OR ACCEPTANCE CRITERIA

The null hypothesis for this work plan is that one anomaly contains a uranium concentration greater than 10 mg/kg in soil at the area with the highest count rate within the anomaly. Type I and II errors have been minimized through the use of a judgmental sampling approach that will focus on areas of elevated count rate. Further error reduction has been accomplished through the anomaly selection process that targeted the 25 anomalies with the highest count rate and highest variance, as determined by prior surveys.

[3] 25 is 5% of overall total anomalies (i.e., approximately 500).

3.7 PLAN FOR OBTAINING DATA

The following actions, methods, and techniques will be used throughout the data collection process to minimize cost, field effort, and impact to future associated work.

- The work plan will conduct a GWS and sampling of 25 anomalies.
- The GWS will include at a minimum a 3-ft buffer zone around the anomaly.
- The GWS will be conducted to ensure collection of a minimum of one measurement per m^2.
- GWS measurements will be confirmed prior to sample collection.
- Sampling will consist of 5-point composite over one m^2.
- Samples will be split and archived for further XRF analysis, if necessary.
- Samples will be analyzed by a field method (i.e., XRF).
- Confirmation samples will be analyzed by a fixed-base laboratory to verify the field method (i.e., XRF).
- FFA parties will review and concur with sample locations or propose alternate location prior to sample collection.

4. EVALUATION AND SELECTION OF ANOMALIES

The types of anomalies encountered in the study area 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 generally are located adjacent to PGDP outfalls, Little Bayou and Bayou Creeks, along the unnamed tributary, and the North-South Diversion Ditch. Contaminated areas might 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.

During 2009 and 2010, DOE contractors performed radiological and visual walkover surveys and identified 633 anomalies representing potential man-made disturbances. After crosswalking the anomalies with those historically identified, 99 were found to be part of previous evaluation/investigations [e.g., Soil Piles Addendum 2, WAG 17, existing SWMUs/AOCs or known existing structures (i.e., Kentucky Ordnance Works)] and are not included in this evaluation. The remaining anomalies are being evaluated by the Sitewide Evaluation project. Additional information collected for the anomalies included in this evaluation is located in Appendix B.

An integrated ranking method was used to select 25 anomalies for additional evaluation. In addition, three anomalies were identified as contingent locations. (See Table 1 for the list of 25 selected anomalies and 3 contingent anomalies.) The ranking method considered both the maximum reported radiation measurements and the percent difference between the reported maximum and average.[4] This method was developed in cooperation with the FFA parties and meets the intent of the scope included in the SMP. The method is described below.

- Calculate the percent difference (e.g., variance) between reported maximum count rate and average count rate for each non-excluded anomaly. Sort anomalies by percent difference and assign rank. Anomaly with largest percent difference was assigned the highest rank.

- Sort non-excluded anomalies by maximum count rate and assign secondary rank. Anomaly with largest count rate was assigned the highest rank.

- Sum the percent difference and maximum count rate rankings for each anomaly. Sort anomalies according to ranking sums.

- Choose and prioritize the 25 selected anomalies with the highest ranking sums.

- Select and prioritize additional anomalies as a contingency.

[4] Anomalies may have been excluded based on several factors, including but not limited to, their proximity to uranium hexafluoride (UF_6) cylinder yards. Radiological surveys of these areas are inconclusive due to elevated radiation levels emitted by the UF_6 cylinders. The background radiation levels emitted in these areas exceed 7-9 μR/hr or higher. This elevated radiation level masks radiation emitted by any contamination present in the anomaly location.

After the 25 anomalies were selected, their spatial distribution was discussed during 2014 scoping. The majority of the selected anomalies are located to the north and south of the plant (Figure 2). This distribution was acceptable to the parties.

5. SAMPLING AND ANALYSIS PLAN

This SAP provides information relative to data collection, media sample collection, and field analysis. The objective of this project is to collect data to support the determination of whether any of the anomalies meet the definition of a SWMU or AOC that require designation as such and warrant further investigation. The purpose of the current activity is to evaluate a subset of all of the anomalies to determine if additional surveying is required of other anomalies. This activity uses gamma radiological walkover survey and XRF analysis as a surrogate for other contamination.

From each of the 25 selected anomalies, a GWS will be performed, and one judgmental sample will be collected for XRF analysis for uranium. Sampling and documentation are discussed in this section. Additional details are provided in the QAPP presented in Section 6.

5.1 SAMPLING

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 QAPP.

5.2 SAMPLING TECHNIQUES

Data collection for this work plan uses two types of sampling: (1) intrusive and (2) nonintrusive. The non-intrusive method will consist of gamma radiological walkover surveys as described in this SAP. The intrusive method includes the collection of 5-point composite surface soil samples.

5.2.1 Gamma Radiological Walkover Surveying

Gamma radiological walkover surveys of anomalies will be performed in advance of sampling. Additional information regarding these surveys is provided in Appendix A.

5.2.2 Media Sampling

One surface sample from each of the 25 selected anomalies will be collected for analysis by *ex situ* XRF methods. No liquid samples are planned to be collected other than for 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*, and (2) PAD-ENM-0023, *Composite Sampling.* Five-point composite soil samples will be collected from 0-4 inches[5] below surface distributed from the one-meter areas centered on the location with the highest count rate. Since the GWS implements an approach that ensures a data density of at least one measurement per square meter, the collection of a soil sample will represent a one square meter area consistent with the GWS. Additional information regarding selection of sample location is discussed in Appendix A.

[5] 0–4 inches was selected based on the depth of contamination the radiological instrument measures.

Soil samples will be collected using disposable, stainless steel scoops to minimize the quantity of IDW generated during sample collection. The surface of the sample location will be cleared carefully of any vegetation, debris, or litter prior to sample collection.

- The surface soil sample will be homogenized and composited in the field in accordance with the procedure. Any visible debris will be removed from the sample when the sample is homogenized.

- The surface soil sample will be split and one half the sample will be archived for further XRF analysis, if necessary. Samples will be retained until all samples have been analyzed and data collection has been verified as complete.

- The other half of the sample will be submitted for uranium analysis using *ex situ* XRF.

5.3 FIELD ANALYTICAL TECHNIQUES

Analytical data acquisition will rely on field measurements (i.e., XRF) data to determine if contamination exists in media associated with identified anomalies. The following describes the field analytical techniques to be used.

5.3.1 Determination of Radioactivity

Determination of radioactivity will be accomplished using a GWS. The GWSs are described in Appendix A.

5.3.2 Determination of Uranium Using X-Ray Fluorescence

Soil samples will undergo *ex situ* XRF analysis for 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.

Ten percent (3) of the samples will be analyzed by inductively coupled plasma-matrix spike (ICP-MS) for uranium by a fixed-base laboratory. These fixed-base laboratory samples will be selected randomly over all locations sampled. The fixed-base laboratory results will be used to determine the accuracy of the XRF results and will not be used as a representative concentration in decision making. Additional analytical details are provided in the QAPP presented in Section 6.

If other models, vendors, or contractor procedures are employed for field methods, the procedure for those operations will be added to the required reading for this work plan and the associated work package. All field methods shall be completed by a properly trained/qualified technician and will meet detection limits detailed in Section 6, QAPP Worksheet 15.

5.4 DOCUMENTATION

Field documentation on logbooks and field forms will be completed 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.*

6. QUALITY ASSURANCE PROJECT PLAN

This QAPP has been prepared based on the approved programmatic QAPP, DOE/LX/07/1269&D2/R1, *Programmatic Quality Assurance Project Plan* (DOE 2013a), which was based on the *Uniform Federal Policy for Quality Assurance Project Plans* (UFP-QAPP Manual) guidelines for QAPPs (Publication #DoD DTIC ADA 427785).

QAPP Worksheet #1
Title Page

Document Title: *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area*

Lead Organization: DOE

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

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

Preparation Date (Month/Year): 06/2014

Document Control Number: DOE/LX/07-1288&D1

LATA Kentucky Environmental Remediation Project Manager	Signature Mark J. Duff	Date: 6-23-14
LATA Kentucky Regulatory Manager	John Morgan for Signature Myrna Espinosa Redfield	Date: 6/23/14
LATA Kentucky Environmental Monitoring Project Manager	Lisa Crabtree Signature Lisa Crabtree	Date: 6/19/14

QAPP Worksheet #2
QAPP Identifying Information

Site Name/Project Name: Paducah Gaseous Diffusion Plant
Site Location: Paducah, Kentucky
Site Number/Code: KY8-890-008-982
Contractor Name: LATA Kentucky
Contractor Number: DE-AC30-10CC40020
Contract Title: Paducah Gaseous Diffusion Plant Paducah Environmental Remediation Project
Work Assignment Number: N/A

1. Identify guidance used to prepare QAPP:

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Implementing Environmental Quality Systems, Version 2.0, 126 pages.

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 1 UFP QAPP Manual, Version 1.0, 177 pages (DTIC ADA 427785 or EPA-505-B-04-900A).

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 2A UFP QAPP Worksheets, Version 1.0, 44 pages.

   Intergovernmental Data Quality Task Force, March 2005. The Uniform Federal Policy for Quality Assurance Project Plans: Part 2B Quality Assurance/Quality Control Compendium: Minimum QA/QC activities, Version 1.0, 76 pages.

   U.S. Environmental Protection Agency, Office of Environmental Information, February 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA/240/B-06/001.

2. Identify regulatory program: Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and *Federal Facility Agreement for the Paducah Gaseous Diffusion Plant*, DOE/OR/07-1707 (FFA)

3. Identify approval entity: DOE, EPA Region 4, and KDEP

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

5. List dates of scoping sessions that were held: March–April 2014

QAPP Worksheet #2 (Continued)
QAPP Identifying Information

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

Title:	**Approval Date:**
Data and Documents Management and Quality Assurance Plan for Paducah Environmental Management and Enrichment Facilities, (DOE/OR/07-1595&D2)	10/5/1998
Work Plan for the Soils Operable Unit Remedial Investigation/Feasibility Study at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky (DOE/LX/07-0120&D2/R2)	10/6/2010
Paducah Gaseous Diffusion Plant Programmatic Quality Assurance Project Plan, (DOE/LX/07-1269&D2/R1)	5/14/2013

7. List organizational partners (stakeholders) and connection with lead organization:
DOE, EPA Region 4, KDEP

8. List data users: DOE, LATA Kentucky, subcontractors, EPA Region 4, KDEP

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 here.

This QAPP includes all 37 worksheets that are required based on UFP-QAPP guidance.

QAPP Worksheet #2 (Continued)
QAPP Identifying Information

NOTE: Information is entered only in the "Crosswalk to Related Documents" if the information is not contained in the QAPP worksheets, as indicated in first two columns. Additionally, 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
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 Signoff Sheet 2.3.1 Distribution List 2.3.2 Project Personnel Sign-Off Sheet	• Distribution List • Project Personnel Sign-Off Sheet	3 4	
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 7 8	
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 10	
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 Project Quality Objectives • Measurement Performance Criteria Table	11 12	
2.7 Secondary Data Evaluation	• Sources of Secondary Data and Information • Secondary Data Criteria and Limitations Table	13	

QAPP Worksheet #2 (Continued)
QAPP Identifying Information

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	
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	
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	

QAPP Worksheet #2 (Continued)
QAPP Identifying Information

Required QAPP Element(s) and Corresponding QAPP Section(s)	Required Information	Worksheet No.	Crosswalk to Related Documents
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	
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	
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	
4.2 QA Management Reports	• QA Management Reports Table	33	
Data Review			
5.1 Overview	N/A	N/A	
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	N/A	N/A	

DOE = U.S. Department of Energy
QA = quality assurance
QAPP = Quality Assurance Project Plan
QC = quality control
SOP = standard operating procedure
N/A = not applicable

QAPP Worksheet #3
Minimum Distribution List

Controlled copies of the QAPP will be distributed according to the distribution list below. This list will be updated, as needed, and kept by the LATA Kentucky Records Management Department. Each person receiving a controlled copy also will receive any updates/revisions. If uncontrolled copies are distributed, it will be the responsibility of the person distributing the uncontrolled copy to provide updates/revisions.

Position Title	Organization	QAPP Recipients	Current Telephone Number	Current E-mail Address	Document Control Number
Paducah Site Lead, Acting	DOE	Rachel H. Blumenfeld	(270) 441-6806	rachel.blumenfeld@lex.doe.gov	1
Project Manager	DOE	Lisa Santoro	(270) 441-6804	lisa.santoro@lex.doe.gov	2
Environmental Remediation Project Manager	LATA Kentucky	Mark Duff	(270) 441-5030	mark.duff@lataky.com	3
Regulatory Manager	LATA Kentucky	Myrna Redfield	(270) 441-5113	myrna.redfield@lataky.com	4
Manager of Projects	LATA Kentucky	Craig Jones	(270) 441-5114	craig.jones@lataky.com	5
FFA Manager	KDEP	Todd Mullins	(502) 564-6716	todd.mullins@ky.gov	6
FFA Manager	EPA	Jennifer Tufts	(404) 562-8513	tufts.jennifer@epamail.epa.gov	8
Remedial Project Manager	EPA	Jon Richards	(404) 562-8648	richardsjon@epa.gov	9
Risk Assessment Manager	LATA Kentucky	Joe Towarnicky	(270) 441-5134	joseph.towarnicky@lataky.com	10
FFA Manager	LATA Kentucky	Jana White	(270) 441-5185	jana.white@lataky.com	11
Quality Assurance Manager	LATA Kentucky	Michelle Dudley	(270) 462-4544	michelle.dudley@lataky.com	12
Soils/Surface Water Project Manager	LATA Kentucky	Jennifer Watson	(270) 441-5293	jennifer.watson@lataky.com	13
Environment, Safety, and Health Manager	LATA Kentucky	David Kent	(270) 441-5404	david.kent@lataky.com	14
Radiation Safety and Emergency Programs Manager	LATA Kentucky	Kelly Ausbrooks	(270) 441-5123	kelly.ausbrooks@lataky.com	15
Regulatory Compliance Manager	LATA Kentucky	Michael Gerle	(270) 441-5069	michael.gerle@lataky.com	16
Environmental Monitoring Project Manager	LATA Kentucky	Lisa Crabtree	(270) 441-5135	lisa.crabtree@lataky.com	17

NOTE: Distribution is based on the position title. A change in the individual within an organization will not trigger a resubmission of the QAPP. DOE may choose to update the sheet and submit changes to the document holders. This change will not require a review by the FFA stakeholders as it is not a substantive change. These managers will be responsible for distribution to their staff assigned to the Sitewide Evaluation field sampling plan (FSP).

QAPP Worksheet #4
Project Personnel Sign-Off Sheet*

Personnel actively engaged in sample collection, data analysis, and data validation for the projects are required to read applicable sections of this project-specific QAPP and sign a Personnel Sign-off Sheet upon approval of its contents by all FFA parties. The master list of signatures will be kept with the project work control documentation. Additional sign-offs for project-specific worksheets will be handled in a similar manner.

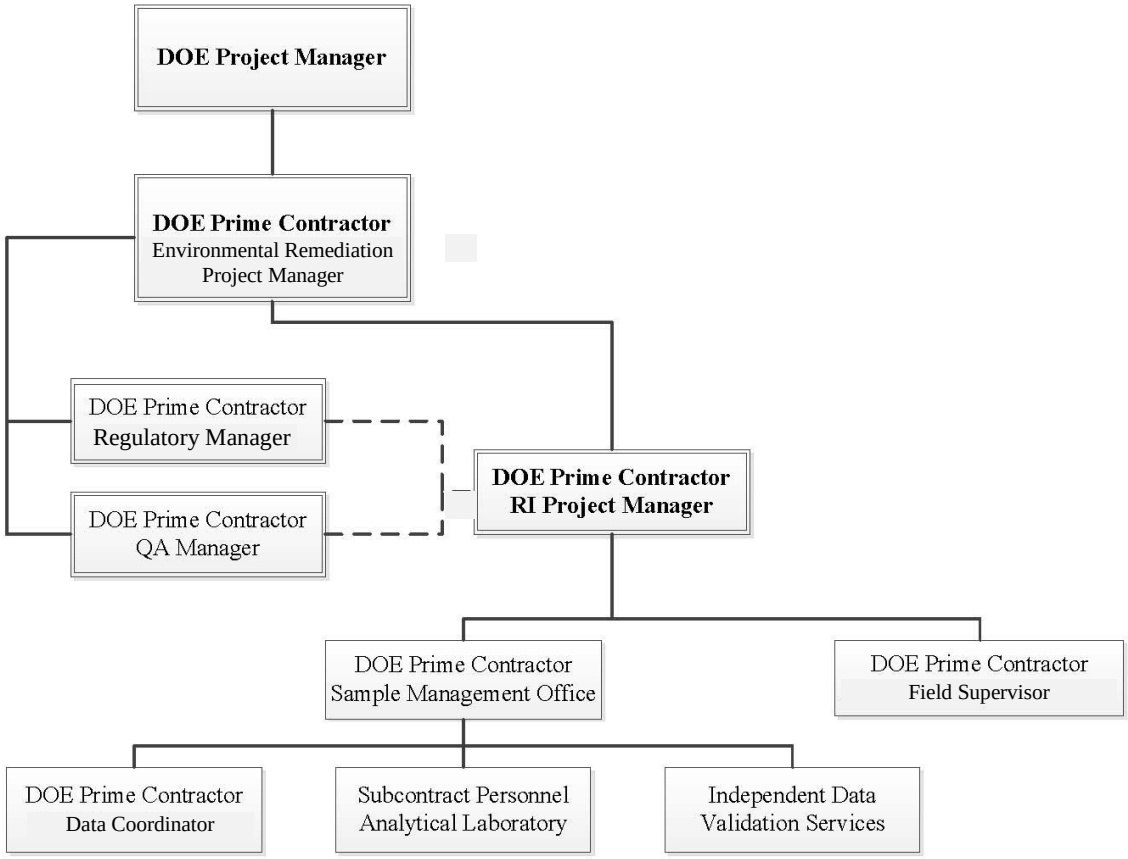
Project Position Title	Organization	Signature	Date
Project Manager			
Field Superintendent			
Frontline Supervisor			
Data Coordinator			
Data Validator			
Data Reviewer			
QA Specialist			
Health and Safety Representative			
Environmental Sampling Lead			
Sampler			
Radcon Supervisor			
Radiological Control Technician			

*Personnel will read and sign QAPP prior to mobilization.

QAPP Worksheet #5
Project Contractor Organizational Chart

This portion of the QAPP addresses the project organization as it provides for QA/QC coordination and responsibilities.

Project Level Organizational Chart



QAPP Worksheet #6
Communication Pathways

NOTE: Formal communication across company or regulatory boundaries occurs via letter. Other forms of communication, such as e-mail, meetings, etc., will occur throughout the project.

Communication Drivers	Organizational Affiliation	Position Title Responsible	Procedure
Federal Facility Agreement DOE/OR/07-1707	DOE Paducah	Paducah Site Lead	All formal communication among DOE, EPA, and KDEP.
Federal Facility Agreement DOE/OR/07-1707	DOE Paducah	DOE Project Manager	All formal communication between DOE and contractor for Environmental Remediation Projects.
All project requirements	LATA Kentucky	Environmental Remediation Project Manager	All formal communication between the project, the Site Lead, and the DOE Project Manager.
All project requirements	LATA Kentucky	Project Manager	All communication between the project and the LATA Kentucky Environmental Remediation Project Manager.
Project QA requirements	LATA Kentucky	Quality Assurance Manager	All project quality related communication between the QA department and LATA Kentucky project personnel.
FFA Compliance	LATA Kentucky	Regulatory Manager	All internal communication regarding FFA compliance with the LATA Kentucky Project Manager.

Roles presented above are at the program level. If there are additional communication requirements at the project-specific level, they will be addressed in a project-specific FSP through a worksheet or a section of the FSP.

QAPP Worksheet #6 (Continued)
Communication Pathways

Communication Drivers	Organizational Affiliation	Position Title Responsible	Organizational Department Manager	Procedure
Field Activities	LATA Kentucky	Field Superintendent	Soils OU Project Manager	All internal communication regarding all field activities with the LATA Kentucky Project Manager.
Field Analytical Laboratory	LATA Kentucky	Field Technician Lead	Soils OU Project Manager	All internal communication regarding field laboratory activities with the LATA Kentucky Project Manager.
Sampling Requirements	LATA Kentucky	Sampling Lead	Environmental Monitoring Project Manager	All internal communication regarding field sampling with the LATA Kentucky Project Manager.
Analytical Laboratory Interface	LATA Kentucky	Laboratory Coordinator	Environmental Monitoring Project Manager	All communication between LATA Kentucky and analytical laboratory.
Waste Management Requirements	LATA Kentucky	Waste Coordinator	Waste Disposition Manager	All internal communication regarding project waste management with LATA Kentucky Project Manager.
Environmental Compliance Requirements	LATA Kentucky	Compliance Manager	Regulatory Manager	All internal correspondence regarding environmental requirements and compliance with the LATA Kentucky Project Manager.
Subcontractor Requirements (if applicable)	LATA Kentucky	Subcontract Administrator	Business Manager	All correspondence between the project and subcontractors, if applicable.
Health and Safety Requirements	LATA Kentucky	Environment, Safety, and Health Manager	Environment, Safety, and Health Manager	All internal communication regarding safety and health requirements with the LATA Kentucky Project Manager.

NOTE: The programmatic document is position based with names of the current position holders. The document will not be updated if the designated position described is filled by a different individual. In the event the contractor changes, DOE will notify EPA and KDEP of the change, but not request approval of the report.

QAPP Worksheet #7
Personnel Responsibility and Qualifications Table

Position Title Responsible	Organization Affiliation	Responsibilities	Education and Experience Qualifications*
Project Manager	LATA Kentucky	Overall project responsibility	> 4 years relevant work experience
Environmental Engineer	LATA Kentucky	Project sampling and analysis plan	Bachelor of Science plus > 1 year relevant work experience
Environmental Compliance Manager	LATA Kentucky	Project environmental compliance responsibility	Bachelor degree plus > 4 years work experience
FFA Manager	LATA Kentucky	Project compliance with the FFA	> 4 years work relevant experience
Environmental Monitoring Project Manager	LATA Kentucky	Project sample and data management	> 4 year relevant work experience
Health and Safety Representative	LATA Kentucky	Project safety and health responsibility	Bachelor degree plus > 1 year relevant experience
Waste Coordinator	LATA Kentucky	Overall project waste management responsibility	> 4 years relevant experience
Data Validator	Independent third party contractor	Performing data validation according to specified procedures	Bachelor degree plus relevant experience
Analytical Laboratory Project Manager	Analytical Laboratory	Sample analysis and data reporting	Bachelor degree plus relevant experience
Quality Assurance Manager	LATA Kentucky	Project quality assurance responsibility	Bachelor degree plus > 1 year relevant experience
Field Superintendent	LATA Kentucky	Project compliance with the Characterization Plan	> 4 years relevant work experience

*****Candidates who do not have a certificate or required degree but demonstrate additional "equivalent relevant work experience" can be considered when evaluating qualifications. This assessment will be conducted by the PM as he/she assembles the appropriate team for the project.

QAPP Worksheet #8
Special Personnel Training Requirements Table

Personnel are trained in the safe and appropriate performance of their assigned duties in accordance with requirements of work to be performed. Work control packages will list specific project-level training requirements.

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*
Project Tasks	There will be no specialized training required for this program other than what normally is 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.	TBD	TBD	TBD	LATA Kentucky staff, subcontractors	Training files are maintained by the LATA Kentucky training organization. A training database is utilized to manage and track training.

TBD = to be determined
* Training records are maintained by the LATA Kentucky training department. If training records and/or certificates do not exist or are not available, then this should be noted.

QAPP Worksheet #9
Project Scoping Session Participant Sheet

This project-specific QAPP developed in association with the FSP followed the same systematic planning process as the programmatic and other project-specific QAPPs. The type and frequency of scoping sessions and the type and number of persons who participate in scoping sessions are related to the size and complexity of the project, technical components of the project, and the number of organizations involved.

Name of Project: Sitewide Evaluation
Date of Session: January 2014
Scoping Session Purpose: Discuss objectives and scope of project, work plan requirements, and deadlines

Position Title	Affiliation	Name	Phone #	E-mail Address	Project Role
Radiation Safety and Emergency Programs Manager	LATA Kentucky	Kelly Ausbrooks	(270) 441-5123	kelly.ausbrooks@lataky.com	Technical support
Health Physicist	LATA Kentucky	John Volpe	(502) 330-0222	john_volpe@bellsouth.net	Technical support
Scientist	LATA Kentucky	LeAnne Garner	(270) 441-5436	leanne.garner@lataky.com	Document preparation
Project Manager	LATA Kentucky	Jennifer Watson	(270) 441-5293	jennifer.watson@lataky.com	Project management
Manager of Projects	LATA Kentucky	Craig Jones	(270) 441-5114	craig.jones@lataky.com	Project management
Regulatory Manager	LATA Kentucky	Myrna Redfield	(270) 441-5113	myrna.redfield@lataky.com	Compliance support
Environmental Management Manager	LATA Kentucky	Lisa Crabtree	(270) 441-5135	lisa.crabtree@lataky.com	Laboratory/data support
Waste Disposition Manager	LATA Kentucky	Mike Zeiss	(270) 441-5106	mike.zeiss@lataky.com	Waste support
Site Operations and Maintenance Manager	LATA Kentucky	Tim Fralix	(270) 441-5025	tim.fralix@lataky.com	Work controls support
Environmental Reporting and Deliverable Quality Manager	LATA Kentucky	Jennifer Blewett	(270) 441-5070	jennifer.blewett@lataky.com	Document production
Project Management Office	LATA Kentucky	Linda Kobel	(770) 364-0336	linda.kobel@lataky.com	PM support
Business Manager	LATA Kentucky	Mark Cauley	(270) 441-5011	mark.cauley@lataky.com	Business support

QAPP Worksheet #9
Project Scoping Session Participant Sheet (continued)

Name of Project: Sitewide Evaluation
Date of Session: March–April 2014
Scoping Session Purpose: Discuss objectives and scope of project, work plan requirements, and deadlines

Name	Affiliation	Phone #	E-mail Address
Jennifer Tufts	EPA	(404) 562-8513	tufts.jennifer@epa.gov
Jon Richards	EPA	(404) 562-8648	richards.jon@epa.gov
Todd Mullins	KDWM	(502) 564-8158	todd.mullins@ky.gov
Gaye Brewer	KDWM	(270) 898-8468	gaye.brewer@ky.gov
Nathan Garner	KYRHB	(502) 564-8390	nathan.garner@ky.gov
Stephanie Brock	KYRHB	(502) 564-8390	stephaniec.brock@ky.gov
Lisa Santoro	DOE	(270) 441-6804	lisa.santoro@lex.doe.gov
Rich Bonczek	DOE	(859) 219-4051	rich.bonczek@lex.doe.gov
Don Dihel	DOE	(270) 441-6824	don.dihel@lex.doe.gov
Dennis Greene	Pro2Serve	(270) 441-6851	dennis.greene@lex.doe.gov
Bobette Nourse	SMSI	(865) 712-2669	bobette.nourse@lex.doe.gov
Martin Clauberg	SMSI	(865) 259-7155	martin.clauberg@lex.doe.gov
Kelly Ausbrooks	LATA Kentucky	(270) 441-5123	kelly.ausbrooks@lataky.com
John Volpe	LATA Kentucky	(502) 330-0222	john_volpe@bellsouth.net
LeAnne Garner	LATA Kentucky	(270) 441-5436	leanne.garner@lataky.com
Jennifer Watson	LATA Kentucky	(270) 441-5293	jennifer.watson@lataky.com

QAPP Worksheet #10
Problem Definition

The problem to be addressed by the project: A focused radiological survey and judgmental sampling effort is planned for 25 of the previously identified 534 anomalies covering DOE-owned property outside the Limited Area to validate the conclusions from the previous 2009-2010 effort. The results of the current activity will be evaluated to determine if additional evaluation is required of the other anomalies.

The environmental questions being asked: Do the results of the current activity (25 anomalies) validate the conclusions from the previous 2009-2010 effort or do the results indicate that additional evaluation is required of the remaining anomalies?

Observations from any site reconnaissance reports: Radiological and visual walkover surveys performed to date under DOE authority on DOE-owned property outside of the Limited Area identified 534 anomalies.

A synopsis of secondary data or information from site reports: Section 3 and Appendix B of the work plan describe the secondary data used to develop Data Quality Objectives (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:

Soil—which is defined as soil piles and disturbed soil areas.
Concrete rubble—which is defined as concrete pieces.

The rationale for inclusion of chemical and nonchemical analyses: Uranium will be used as a surrogate for other contaminants due to its being the primary radiological constituent found at PGDP and serve as proxies for the remainder of the 534 identified anomalies.

Information concerning various environmental indicators: Uranium will be used as an indicator for this project.

Project decision conditions ("If..., then..." statements): The following are the Decision Rules established for this project.

- If the 25 selected anomalies show no uranium concentration above 10 mg/kg in soil,[1] then the other 509 anomalies are assumed not to be contaminated at a level of concern and therefore do not meet the definition of a SWMU or AOC.

- If one or more of the 25 selected anomalies show uranium concentration above 10 mg/kg in soil, then an evaluation of the remaining (509) anomalies by the FFA parties is necessary to determine whether a follow up action is needed (e.g., survey plan for individual survey units and the anomalies they contain).

[1] The PAL for uranium (10 mg/kg) was set to ensure the DQOs, agreed to by the FFA parties, were met using the XRF analytical method. The PAL approaches the PGDP surface soil background concentration of 4.9 mg/kg for uranium, and is below the risk-based NAL of 64.4 mg/kg for the child recreational user (DOE 2011). Finally, an acknowledged XRF subject matter expert-confirmed detection at the PAL could be achieved reliably with an XRF calibrated to detect uranium.

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

Who will use the data? DOE, LATA Kentucky, subcontractor, KDEP, and EPA.

What will the data be used for? The GWS results will be used to identify the judgmental sample locations. The XRF uranium results of the 25 anomalies will be used to validate the conclusion from the previous 2009-2010 effort and will be evaluate to determine if additional evaluation is required of the remaining anomalies. Fixed-base laboratory analysis (uranium by ICP-MS) will be used to determine the accuracy of the XRF results; however, this data will not be used as a representative concentration in decision making.

What type of data is needed? (target analytes, analytical groups, field screening, on-site analytical or off-site laboratory techniques, sampling techniques) GWS results are needed to identify judgmental sample locations. XRF uranium results are needed to validate previous results and determine if further evaluation is needed of the remaining anomalies. Fixed-base laboratory analysis (uranium by ICP-MS) is needed to determine the accuracy of the XRF results.

How "good" do the data need to be in order to support the environmental decision? Data needs to meet the measurement quality objective and data quality indicators established by the systematic planning process consistent with procedure PAD-ENM-5003, *Quality Assured Data,* and PAD-ENM-1003, *Developing, Implementing, and Maintaining Data Management Implementation Plans*.

Where, when, and how should the data be collected/generated? See Section 5 of this Work Plan.

Who will collect and generate the data? A team of individuals who are properly trained and skilled in the execution of GWS and sampling procedures will collect samples and collect survey measurements. The field and fixed-base laboratories will generate analytical uranium data.

How will the data be reported? Field data will be recorded on chain-of-custody forms, in field logbooks, and field data sheets. The field and fixed-base laboratories will provide analytical data in an electronic data deliverable (EDD). Project analytical data following verification and assessment will be placed into and reported from the Paducah Oak Ridge Environmental Information System (OREIS). Analytical data will be accessible in PEGASIS, a program designed to provide dynamic mapping and environmental monitoring data display for the DOE Portsmouth/Paducah Project Office (PPPO). GWS measurements will be downloaded from the radiological instrumentation, merged with Global Positioning System (GPS) coordinates, and stored in an excel file.

How will the data be archived? Electronic analytical data will be archived in OREIS in accordance with Section 8.5 (Data and Records Archival) of the Data and Documents Management and Quality Assurance Plan. GWS measurements will be archived on the LATA Kentucky network.

QAPP Worksheet #12-A
Measurement Performance Criteria Table

Sampling will follow the standard operating procedures referenced in Section 5 of the work plan. The following table provides the measurement performance criteria.

Matrix	Soil
Analytical Group[1]	Metals (uranium)
Concentration Level	Low

Sampling Procedure[2]	**Analytical Method/SOP**[3, 4]	**Data Quality Indicators (DQIs)**	**Measurement Performance Criteria**	**QC Sample and/or Activity Used to Assess Measurement Performance**	**QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)**
	SW-846-6200 (XRF)	Precision	RPD–35%	Field Duplicates	S
		Accuracy/Bias-Contamination	No target compounds > QL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
RPD = relative percent difference
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21.
[3] Reference number from QAPP Worksheet #21.
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.

QAPP Worksheet #12-B
Measurement Performance Criteria Table

Sampling will follow the standard operating procedures referenced in Section 5 of the work plan. The following table provides the measurement performance criteria.

Matrix	Soil
Analytical Group[1]	Metals (uranium)
Concentration Level	Low

Sampling Procedure[2]	Analytical Method/SOP[3, 4]	Data Quality Indicators (DQIs)	Measurement Performance Criteria	QC Sample and/or Activity Used to Assess Measurement Performance	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
	SW-846-6020	Precision-Lab	RPD–≤35%	Laboratory Duplicates	A
		Accuracy/Bias	% recovery[6]	Laboratory Sample Spikes	A
		Accuracy/Bias-Contamination	No target compounds > PQL	Method Blanks/Instrument Blanks	A
		Completeness[5]	90%	Data completeness check	S&A

QL = quantitation limit
PQL = project quantitation limit
RPD = relative percent difference
[1] If information varies within an analytical group, separate by individual analyte.
[2] Reference number from QAPP Worksheet #21.
[3] Reference number from QAPP Worksheet #23.
[4] The most current version of the method will be used.
[5] Completeness is calculated as the number of samples planned to be collected divided by the number of sample results that were rejected.
[6] Percent recovery is laboratory-specific, calculated from studies performed every six months. Percent recovery ranges will be provided in the laboratory data packages based on the most current study.

QAPP Worksheet #13
Secondary Data Criteria and Limitations Table

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 2008a. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0108&D2 DOE 2009a. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0225&D1 DOE 2009b. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0188&D2 DOE 2009c. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0227&D0	See reports	Data will be used to assist in planning the activities of the project.	Data have been verified, assessed, and validated (if validation is required). Rejected data will not be used.

QAPP Worksheet #14
Summary of Project Tasks*

Sampling Tasks: The sampling activities are presented in Section 5. The activities will be carried out in accordance with the SOPs in Worksheet #21.

Analysis Tasks: The analysis is presented in Section 5 and Worksheet #18. The analysis will be carried out in accordance with the SOPs in Worksheet #21.

Quality Control Tasks: QC 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: Section 4, Worksheet #13, and Appendix B of the work plan present secondary data.

Data Management Tasks: Data management will be per procedure PAD-ENM-5007, *Data Management Coordination,* and Section 8 of this work plan.

Documentation and Records: Documentation and records will be per procedure PAD-DOC-1009, *Records Management, Administrative Records, and Document Control,* and Section 8 of this work plan.

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

Data Review Tasks: Data review tasks will be per procedure PAD-ENM-5003, *Quality Assured Data,* and Section 8 of this work plan.

* It is understood that SOPs are contractor specific.

QAPP Worksheet #15
Reference Limits and Evaluation Table

Matrix: Soil/Sediment
Analytical Group: Metals (uranium)

Metals	CAS Number	Project Action Limit (mg/kg)	Project Action Limit Reference	Site COPC?[a]	Laboratory-Specific	
					PQLs (mg/kg)	MDLs (mg/kg)
Uranium	7440-61-1	10[b]	Project scoping	Yes	N/A	10

CAS = Chemical Abstracts Service
COPC = chemical of potential concern
MDL = method detection limit
N/A = not applicable
PQL = practical quantitation limit
[a] Analytes marked with COPC are from Table 2.1 of the Risk Methods Document (DOE 2013b).
[b] The PAL for uranium was set to ensure the DQOs, agreed to by the FFA parties, were met using the XRF analytical method. The PAL approaches the PGDP surface soil background concentration of 4.9 mg/kg for uranium, and is below the risk-based NAL of 64.4 mg/kg for the child recreational user (DOE 2011). Finally, an acknowledged XRF subject matter expert confirmed detection at the PAL could be achieved reliably with an XRF calibrated to detect uranium.

QAPP Worksheet #16
Project Schedule/Timeline Table*

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

*Section 10 of the work plan provides the project-specific schedule.

QAPP Worksheet #17
Sampling Design and Rationale

Describe and provide a rationale for choosing the sampling approach (e.g., grid system, biased statistical approach): The sampling approach is described in Section 5 of the work plan.

Describe the sampling design and rationale in terms of which matrices will be sampled: The sampling design is described in Section 5 of the work plan.

- **What analyses will be performed and at what analytical limits?** Uranium will be analyzed by *ex situ* XRF with a minimum detection limit of 10 mg/kg as described in Section 5 of the work plan.
- **Where are the sampling locations (including QC, critical, and background samples)?** The sampling locations will be identified as described in Section 5 and Appendix A of the work plan. No background sampling is planned.
- **How many samples to be taken?** One 5-point composite soil sample will be collected from each of the 25 selected anomalies as described in Section 5 and Worksheet #18 of the work plan.
- **What is the sampling frequency (including seasonal considerations)? (May refer to map or Worksheet #18 for details.)** This is a one-time sampling event.

QAPP Worksheet #18
Sampling Locations and Methods/Standard Operating Procedure Requirements Table for Screening Samples

Sampling Location/ID Number	Matrix	Depth (units)	Analytical Group	Concentration Level	Number of Samples (Identify Field Duplicates)	Sampling SOP Reference	Rationale for Sampling Location
PE-01-03-V-18 PE-01-03-V-24 PF-13-02-R-1 PF-13-02-V-16 PF-18-02-V-19 PF-18-02-V-20 PG-02-03-R-2 PM-26-02-R-3 PP-05-02-R-1a PP-06-03-V-20 PQ-30-03-V-5 PQ-30-03-V-6 PQ-30-03-V-7 PS-26-02-V-1 PU-24-01-V-4 PU-24-01-V-5 PU-24-01-V-6 PV-21-01-V-6 PV-24-01-V-8 PY-13-01-V-2 PY-13-01-V-4 PY-13-01-V-5 PY-14-01-V-6 PY-14-01-V-7 PY-14-01-V-8	Soil	Surface (0–4 inches bgs)	Metals (uranium) 6200 by XRF	Unknown	25+2 field duplicates (minimum of 5%)	See Worksheet #21	See Worksheet #17

ID = identification number
SOP = standard operating procedure
XRF = X-ray fluorescence

QAPP Worksheet #19
Analytical SOP Requirements Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation Method/SOP Reference[1]	Sample Volume[2]	Containers (number, size, and type)[2]	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)
Soil	Metals (uranium)	See Worksheet #18	SW-846-6200 (XRF)	20 grams	TBD	Cool to < 4°C	180 days
Soil	Metals (uranium)	N/A	SW-846-6020	100 grams	4 oz. glass	Cool to < 4°C	6 months

TBD = to be determined
N/A = not applicable
[1] See Analytical SOP References table (Worksheet #23).
[2] Sample volume and container requirements will be specified by the laboratory.

QAPP Worksheet #20
Field Quality Control Sample Summary Table

Matrix	Analytical Group	Concentration Level	Analytical and Preparation SOP Reference	No. of Sampling Locations*	No. of Field Duplicate Pairs	Inorganic No. of MS	No. of Field Blanks	No. of Equip. Blanks	No. of PT Samples	Total No. of Samples to Lab*
Soil	Metals (uranium)	Unknown	See Worksheets #21 and #23	25	5%	N/A	N/A	N/A	N/A	See Worksheet #17

MS = matrix spike
N/A = not applicable
PT = proficiency testing
*Work package documents will identify the sampling locations, matrices, number of samples, and sample identification numbers for samples to be submitted to field laboratory and DOE Consolidated Audit Program (CAP)-approved laboratory.

QAPP Worksheet #21
Project Sampling SOP References Table

Reference Number	Title and Number[a]	Originating Organization[b]	Equipment Type	Modified for Project Work? (Y/N)	Comments
1	PAD-ENM-0023, *Composite Sampling*	Contractor	Sampling	N	
2	PAD-ENM-2300, *Collection of Soil Samples*	Contractor	Sampling	N	
3	PAD-ENM-1001, *Transmitting Data to the Paducah Oak Ridge Environmental Information System (OREIS)*	Contractor	N/A	N	
4	PAD-ENM-2700, *Logbooks and Data Forms*	Contractor	N/A	N	
5	PAD-ENM-2702, *Decontamination of Sampling Equipment*	Contractor	Sampling	N	
6	PAD-ENM-2704, *Trip, Equipment, and Field Blank*	Contractor	Sampling	N	
7	PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*	Contractor	N/A	N	
8	PAD-ENM-5003, *Quality Assured Data*	Contractor	N/A	N	
9	PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance*	Contractor	N/A	N	
10	PAD-ENM-5007, *Data Management Coordination*	Contractor	N/A	N	
11	PAD-ENM-1003, *Developing, Implementing, and Maintaining Data Management Implementation Plans.*	Contractor	N/A	N	
12	PAD-ENR-0034, *XRF Field Lab Analysis of Soils.*	Contractor	Analytical	N	

[a] SOPs are posted to the LATA Kentucky intranet Web site. External FFA parties can access this site using remote access with privileges upon approval.
[b] The work will be conducted by LATA Kentucky staff or a subcontractor. In either case, SOPs listed will be followed.
N/A = not applicable

QAPP Worksheet #22
Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing Activity	Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference*
Geiger Müller	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use and after use	Upon receipt, successful operation	Daily prior to use and after use	Pass/Fail	Return to rental company for replacement	RCT Supervisor	Manufacturer's specifications
Gamma Scintillator or FIDLER with GPS	Annually or as specified by manufacturer	Annually or as needed	Daily prior to use and after use	Upon receipt, successful operation	Daily prior to use and after use	Pass/Fail	Service by manufacturer	RCT Supervisor	Manufacturer's specifications
Field Equipment GPS	Daily check of known point beginning and end of each field day	Per manufacturer's specifications	Measure known control points and compare values	Upon receipt, successful operation	Daily prior to use and after use	Pass/Fail	Service by manufacturer	Field Team Leader	Manufacturer's specifications
XRF	Annually or as specified by manufacturer	Per manufacturer's specifications	Per manufacturer's specifications, SOP and this work plan	Upon receipt, successful operation	Per manufacturer's specifications, SOP and this work plan	Per manufacturer's specifications, SOP and this work plan	Return to rental company for replacement	Field Technician	Manufacturer's specifications and see QAPP Worksheet # 21

*Additional equipment may be needed: additional equipment will follow manufacturer's specifications for calibration, maintenance, inspection, and testing. Calibration data will be documented in logbooks consistent with PAD-ENM-2700, *Logbooks and Data Forms*.
FIDLER = field instrument for detection of low energy
GPS = Global Positioning System
RCT = radiological control technician

QAPP Worksheet #23
Analytical SOP References Table

Reference Number*	Title, Revision Date, and/or Number	Definitive or Screening Data	Analytical Group	Instrument	Organization Performing Analysis	Modified for Project Work? (Y/N)
6020	Inductively Coupled Plasma-Mass Spectrometry	Screening	Metals (uranium)	ICP-MS	TBD	TBD

*Information will be based on laboratory used.

QAPP Worksheet #24
Analytical Instrument Calibration Table

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 DOE Consolidated Audit Program (DOECAP). Laboratory(s) contracted will be DOECAP-audited.						

* Field survey/sampling instrumentation will be calibrated according to manufacturer's instructions.

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

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

* The laboratory is responsible for maintaining instrument and equipment maintenance, testing, and inspection information per their QA Plan. This information is audited annually by DOE Consolidated Audit Program (DOECAP). Laboratory(s) contracted will be DOECAP audited. Field survey/sampling instrumentation will be maintained, tested, and inspected according to manufacturer's instructions.

QAPP Worksheet #26
Sample Handling System

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/Federal Express or United Parcel Service
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample Management/Contracted Laboratory/Field Laboratory
Sample Custody and Storage (Personnel/Organization):	Sample Management/Contracted Laboratory/Field Laboratory
Sample Preparation (Personnel/Organization):	Analysts/Contracted Laboratory/Field Laboratory
Sample Determinative Analysis (Personnel/Organization):	Analysts/Contracted Laboratory/Field Laboratory
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	The fixed-base laboratory will archive samples for four months or less, depending on project-specific requirements. The field laboratory will archive samples until all samples have been analyzed and data collection has been verified.
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	120 days
Biological Sample Storage (No. of days from sample collection):	Not applicable.
SAMPLE DISPOSAL	
Personnel/Organization:	Waste Disposition/DOE Prime Contractor and Subcontractors
Number of Days from Analysis	6 months

QAPP Worksheet #27
Sample Custody Requirements*

Chain-of-custody procedures are comprised of maintaining sample custody and documentation of samples for evidence. To document chain-of-custody, an accurate record of samples must be maintained in order to trace the possession of each sample from the time of collection to its introduction to the laboratory.

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Field sample custody requirements will be per DOE Prime Contractor procedures, PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*; and PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

Laboratory Sample Custody Procedures (receipt of samples, archiving, disposal):

When the samples are delivered to the laboratory, signatures of the laboratory personnel receiving them and the personnel relinquishing them will be completed in the appropriate spaces on the chain-of-custody record. This will complete the sample transfer. It will be the laboratory's responsibility to maintain internal logbooks and records that provide custody throughout sample preparation and analysis process.

Sample Identification Procedures:

Sample identification requirements will be specified in work package documents and will comply with the Data Management Implementation Plan (DMIP) included in Section 8 of the work plan.

Chain-of-custody Procedures:

Chain-of-custody requirements will be per DOE Prime Contractor procedures, PAD-ENM-2708, *Chain-of-Custody Forms, Field Sample Logs, Sample Labels, and Custody Seals*; and PAD-ENM-5004, *Sample Tracking, Lab Coordination, and Sample Handling Guidance.*

* Please note that SOPs are contractor specific.

QAPP Worksheet #28
QC Samples Table

Matrix: Soils
Analytical Group/Concentration Level: Metals (uranium)/unknown
Sampling SOP: See Worksheet #21
Analytical Method/SOP Reference: SW-846-6200 (XRF)
Sampler's Name/Field Sampling Organization: TBD
Analytical Organization: LATA Kentucky
No. of Sample Locations: 25

QC Sample	Frequency/Number*	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective	Data Quality Indicator (DQI)	Measurement Performance Criteria
Instrument blank	Per procedure PAD-ENR-0034 and manufacturer's guidance	PAD-ENR-0034	Check calculation and instrument; reanalyze affected samples	Field technician	Accuracy	Per procedure PAD ENM-5003 *Quality Assured Data*
Field duplicate	Minimum 5%	None	Data reviewer will place qualifiers on samples affected	Project manager or designee	Homogeneity/ Precision	RPD ≤ 50% soils
Standard Reference Materials	Daily before use and at 4-hour intervals	+/- 20% of the true value	Check calculation and instrument; reanalyze standards	Field technician	Accuracy	Manufacturer's instructions
Laboratory confirmation	10%	PAD-ENR-0034	Data reviewer will place qualifiers on samples affected	Project manager or designee	Accuracy	PAD-ENR-0034

* The number of QC samples is listed on Worksheet #20.

QAPP Worksheet #29
Project Documents and Records Table

All project data and information must be documented in a format that is usable by project personnel. The QAPP describes how project data and information shall be documented, tracked, and managed from generation in the field to final use and storage in a manner that ensures data integrity, defensibility, and retrieval.

Sample Collection Documents and Records	On-site Analysis Documents and Records	Off-site Analysis Documents and Records	Data Assessment Documents and Records*	Other
Data logbooks and associated completed sampling forms; sample chains-of-custody	Laboratory data packages, OREIS database, PEGASIS, and associated data packages	OREIS database, PEGASIS, and associated data packages	PAD-ENM-5003, Att. G, Data Assessment Review Checklist and Comment Form	Form QA-F-0004, Management/ Independent Assessment Report

* It is understood that SOPs are contractor specific.
OREIS = Oak Ridge Environmental Information System
PEGASIS = Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System

QAPP Worksheet #30
Analytical Services Table

Matrix	Analytical Group	Concentration Level	Sample Locations/ID Numbers	Analytical SOP	Data Package Turnaround Time	Laboratory/Organization (Name and Address, Contact Person and Telephone Number)	Backup Laboratory/Organization (Name and Address, Contact Person and Telephone Number)
Soil	Metals (uranium)	Unknown	See Worksheet #18	See Worksheet #21	28-day	LATA Kentucky	N/A
Soil	Metals (uranium)	Unknown	See Worksheet #18	See Worksheet #23	28-day	TBD	TBD

ID = identification
N/A = not applicable
TBD = to be determined

QAPP Worksheet #31
Planned Project Assessments Table

LATA Kentucky will ensure that the protocol outlined in the QAPP is implemented adequately. Assessment activities help to ensure that the resultant data quality is adequate for its intended use and that appropriate responses are in place to address nonconformances and deviations from the QAPP. Below is a list of assessments project teams may use.

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	A	Internal	Prime Contractor QA	QA Specialists, Contractor, or Independent Assessor	Project Management, Contractor	Project Management, Contractor	QA Specialist, Contractor
Laboratory Audit	Quarterly	Internal	Prime Contractor Project Management	Project Management or designee, Contractor	Laboratory	Laboratory	QA Specialist, Contractor
Management Assessments	Annual	Internal	Prime Contractor Project Management	Regulatory Management, Contractor	Regulatory Management, Contractor	Regulatory Management, Contractor	QA Specialist, Contractor
Management by Walking Around (MBWA)*	B	Internal	Project Management	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor	Project Management, Contractor
MBWA Follow-up surveillances	Quarterly	Internal	Project Management	Project Management or designee, Contractor	Project Management/Designee, Contractor	Project Management, Contractor	Project Management, Contractor

A = assessment frequency determined by QA Manager and conducted per PAD-QA-1420, *Conduct of Assessments*.
B = assessment frequency determined by regulatory manager and conducted per PAD-QA-1420.
*Reference: PAD-QA-1033 *Management by Walking Around (MBWA) Program*.

QAPP Worksheet #32
Assessment Findings and Corrective Action Responses*

All provisions shall be taken in the field and laboratory to ensure that any problems that may develop shall be dealt with as quickly as possible to ensure the continuity of the project/sampling events. Field modifications to procedures in the QAPP must be approved before the modifications are implemented and then documented. The process controlling procedure modification is PAD-PD-1107, *Development, Approval, and Change Control for LATA Kentucky Performance Documents*. Field modifications are documented through the work control process per PAD-WC-0021. Corrective action in the field may be necessary when the sampling design is changed. For example, a change in the field may include increasing the number or type of samples or analyses, changing sampling locations, and/or modifying sampling protocol. When this occurs, the project team shall identify any suspected technical or QA deficiencies and note them in the field logbook. Listed in Worksheet #32 is how project teams will address assessment findings.

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.)	Time Frame for Response
Management, Independent, and Surveillances	Form QA-F-004, Management/ Independent Assessment Report, and QA-F-0710, Issue Identification Form	Project management, issue owner, contractor	Upon issuance of Form QA-F-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

*It is understood that SOPs are contractor specific.

QAPP Worksheet #33
QA Management Reports Table

Reports to management include project status reports, field and/or laboratory audits, and data quality assessments. These reports will be directed to the QA Manager and Project Manager who have ultimate responsibility for assuring that any corrective action response is completed, verified, and documented.

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)
Field Change Requests	As needed	Ongoing	Field staff	QAPP recipients
QAPP Addenda	As needed	Not Applicable	Project Manager	QAPP recipients
Field Audit Report	TBD as determined by QA Manager	30 days after completion of audit	QA Manager	LATA Kentucky Project Manager QA Manager
Corrective Action Plan	As needed	Within 3 weeks of request	Project Manager	QA Manager

QA = quality assurance
TBD = to be determined

QAPP Worksheet #34
Verification (Step I) Process Table

This section of the QAPP provides a description of the QA activities that will occur after the data collection phase of the project is completed. Implementation of this section will determine whether the data conforms to the specified criteria satisfying the project objectives.

Verification Input	Description[a]	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 review the package adequately. 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,[b] Contractor
Sampling Procedures	Evaluate whether sampling procedures were followed with respect to equipment and proper sampling support using audit and sampling reports, field change requests and field logbooks.	Internal	Sample and Data Management, Project Management, and QA Personnel,[b] Contractor
Laboratory Data	All laboratory data will be verified by the laboratory performing the analysis for completeness and technical accuracy prior to submittal to LATA Kentucky. Subsequently, LATA Kentucky will evaluate the data packages for completeness and compliance.	External/ Internal	Laboratory Manager, LATA Kentucky Sample and Data Management
EDDs	Determine whether required fields and format were provided.	Internal	Sample and Data Management
QAPP	All planning documents will be available to reviewers to allow reconciliation with planned activities and objectives.	Internal	All data users

[a] It is understood that SOPs are contractor specific.
[b] QA specialist performs general QA review.

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

Step IIa/IIb	Validation Input	Description[a]	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*, and PAD-ENM-1003, *Developing, Implementing, and Maintaining Data Management Implementation Plans.* The documentation of this validation will be included in the data assessment packages.	Sample and Data Management 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, and Sample and Data Management, Project, Contractor
IIa	Audits	The audit reports and accreditation and certification records for the laboratory supporting the projects will be considered in the bidding process.	QA Personnel
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

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

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

Step IIa/IIb	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
Not applicable. Validation will not be performed.					

[a] Validation is to be conducted by a qualified individual, independent from sampling, laboratory, project management, or other decision making personnel for the task. This could be an outside party or someone within LATA Kentucky who is not involved in the project.

QAPP Worksheet #37
Usability Assessment[a]

LATA Kentucky shall determine the adequacy of data based on the results of validation and verification. The usability step involves assessing whether the process execution and resulting data meet project quality objectives documented in the QAPP.

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 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 review the package adequately. 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[b] (precision, accuracy, representativeness, comparability, completeness, and sensitivity) will be evaluated per 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 personnel, as verified by 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.

[a] It is understood that SOPs are contractor specific.
[b] PARCCS parameters are also termed data quality indicators.

THIS PAGE INTENTIONALLY LEFT BLANK

7. ENVIRONMENT, SAFETY, AND HEALTH PLAN

This Environment, Safety, and Health (ES&H) Plan has been developed to discuss the general ES&H requirements associated with the *Sitewide Evaluation Work Plan for Anomalies Located Outside the Limited Area at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1288&D1, 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 control documents, work packages, and procedures. Personnel will be familiar with these work control documents prior to performing work in the affected areas.

7.1 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 DOE, EPA, and other applicable regulatory guidance. Brief descriptions of the five ISMS/EMS core functions are provided below.

7.1.1 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.

7.1.2 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 site visits, 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 or work control documents, which serve to provide a control mechanism for all work activities. AHAs or work control documents are detailed, activity-specific evaluations that address each step of the task and/or activity that will be performed. The AHA/work control documents 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/work control documents.

Applicable AHAs/work control documents will be reviewed with the personnel who will perform the work. Participants in this review will sign and date to signify that they understand all hazards, controls, and requirements in the AHAs/work control documents. Copies of the AHAs/work control documents with appropriate signatures shall be maintained at the work location.

7.1.3 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/work control documents
- 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.

7.1.4 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

7.1.5 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.

7.2 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 QA Program. In addition, subcontract requirements will flow down to lower-tier subcontractors, as applicable. Personnel will have the appropriate health and safety training required by OSHA 29 *CFR* § 1910 and 1926, but also will 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.

7.3 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 Health and Safety Representative 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 shall halt activities immediately and instruct other affected workers to pull back from the hazardous area. The FS and/or Health and Safety Representative should be notified immediately, at which time management and/or emergency responders will be notified.

7.4 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 Health and Safety Representative 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 or work control documents, 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, work control documents, 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.

7.5 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 Manager of Projects 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 Health and Safety Representative 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 QA Group 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 Health and Safety Representative with implementation of radiological controls and as-low-as-reasonably-achievable (ALARA) principles. The RCT observes the work area before/during activities for radiological hazards and authorizes entry into and exit from radiological work areas. The RCTs will also perform GWSs.

- 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, and 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/work control documents, where applicable. Field team personnel also participate in the identification of the hazards and development of the work controls to be used during the work.

7.6 SITE COMMUNICATION

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 also may be used; project personnel will be briefed on their use, if necessary.

7.7 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/work control documents 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 and will be changed per manufacturer's recommendation. Hard hats will be worn in accordance with the AHA/work controls document.

- 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.

- 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 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/work control documents.

7.8 MEDICAL SURVEILLANCE

The medical surveillance program provides for baseline, annual, and termination medical examinations for all company 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, if 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.

7.8.1 Exposure Monitoring

Air monitoring, as determined by Industrial Hygiene, 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.

7.8.2 Routine Air Monitoring Requirements

Previous results do not indicate the presence of contamination; however, air monitoring will be performed during the following activities as specified in the AHA/work control documents in the event that contamination is discovered in any anomaly:

- 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.

7.9 RADIOLOGICAL MONITORING

Radiological Control will perform personnel air monitoring during work in radiological 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 dosimeter when working in radiological areas and submit bioassays as required.

7.10 EMERGENCY RESPONSE

7.10.1 Responsibilities

The PM, FS, and Health and Safety Representative 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 Health and Safety Representative 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 Health and Safety Representative or the FS. The Health and Safety Representative 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.

DOE will provide oversight on an ongoing basis for emergency management/recovery activities.

7.10.2 Reporting an Emergency

7.10.2.1 Discovery

The person who discovers an emergency should immediately report it, then attempt to establish control ONLY if the incident is minor in magnitude (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.

7.10.2.2 Emergency Contacts

- ***Fire:*** Fire alarm pull box, plant telephone Bell System 333, or plant radio channel 16.
- ***Medical:*** Plant telephone Bell System 333 or plant radio channel 16.
- ***Security:*** Plant telephone Bell System 6246 or plant radio channel 16.
- ***PSS:*** Plant telephone Bell System 6211 or plant radio channel 16.

If using a cell phone: 270-441-6333 for emergency, for NON-emergency use 270-441-6211.

7.10.3 Initial Emergency Response

When an emergency occurs, the Health and Safety Representative 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.

7.10.4 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, Health and Safety Representative, 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.

7.10.5 Reporting a Spill

When a spill is discovered, the FS or Health and Safety Representative will contact Environmental Compliance, the PSS, and the PM immediately and convey as much information as possible (e.g., material involved, estimated quantity spilled/affected, location, affected personnel, other hazardous conditions).

7.10.5.1 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 Health and Safety Representative 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 Health and Safety Representative 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, Health and Safety Representative, 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.

THIS PAGE INTENTIONALLY LEFT BLANK

8. DATA MANAGEMENT IMPLEMENTATION PLAN

The purpose of this DMIP is to identify and document data management requirements and applicable procedures, expected data types and information flow, and roles and responsibilities for all data management activities associated with the Sitewide Evaluation at the PGDP. Data management provides a system for efficiently generating and maintaining technically and legally defensible data that provide the basis for making sound decisions regarding the environmental and waste characterization at PGDP.

Data management for this project is implemented throughout the life cycle for environmental measurements data. This life cycle occurs from the planning of data for environmental and waste characterization, through the collection, review, and actual 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 and fixed-base analytical data. Analytical data are planned and managed through Paducah Project Environmental Measurements System (PEMS) and transferred to Paducah OREIS for long-term storage and reporting.

To meet current regulatory requirements for DOE environmental management projects, complete documentation of the information flow is established. Each phase of the data management process (planning, collecting, analyzing, managing, verifying, assessing, reporting, consolidating, and archiving) must be appropriately planned and documented. The 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., field and fixed-base 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.

8.1 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 soil; storing, analyzing, and shipping samples, when applicable; and evaluation, verification, validation, when applicable, assessment, and reporting of analytical results.

8.2 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 samples

- Submit samples for analysis
- Process field laboratory analytical data
- Laboratory Contractual Screening
- Verify data
- Validate data, when applicable
- Assess data
- Consolidate, analyze, and use data and records
- Submit data to the Paducah OREIS

Section 8.7 contains a detailed discussion of the activities listed above.

8.3 DATA MANAGEMENT INTERACTIONS

The Data Manager interfaces with the Data Coordinator to oversee the use of Paducah PEMS and to ensure that data deliverables meet DOE's standards. The Data Coordinator enters information into Paducah PEMS related to the field and fixed-based laboratory data once the samples have been delivered and the Lab Coordinator has verified receipt of the samples. The field and fixed-based laboratory hard-copy data and the 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 a field and fixed-based analytical laboratory in the form of a project-specific laboratory SOW. Analytical methods, reporting limits, 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.

8.3.1 Data Needs And Sources

Multiple data types will be generated and/or assessed during this project. These data types include analytical data (including field and fixed-base) and geographic information system (GIS) data.

8.3.2 Historical Data

Historical data for the project includes gamma walkover survey measurements from each of the anomalies and 10% of the DOE reservation and aerial radiation survey report.

8.3.3 Field Data

No field (screening) data will be collected for this project.

8.3.4 Analytical Data

Analytical data for the project consists of field and fixed-based laboratory analyses.

8.3.5 Civil Survey Data Coverage

GPS or standard survey techniques will be used to obtain civil survey data for this project. The Paducah GIS system 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

8.4 DATA FORMS AND LOGBOOKS

Field logbooks, site logbooks, chain-of-custody (COC) forms, data packages with associated 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*.[6] 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.

8.4.1 Field Forms

Sample information is environmental data describing the sampling event and consists of the following: station (or location), date collected, time collected, and other sampling conditions. This information is recorded in logbooks, sample data forms, 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, sample data form, or logbook. The Sampling Team 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

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

8.4.2 Lithologic Description Forms

Lithologic description forms will not be used for this project.

8.4.3 Well Construction Detail Forms

These forms are not necessary for use during this project.

8.4.4 Logbook/Sample Data Forms

Sample data forms are utilized for recording sampling information in the field. Logbooks and sample data forms are kept in accordance with PAD-ENM-2700, *Logbooks and Data Forms*.

8.5 DATA AND DATA RECORDS TRANSMITTALS

8.5.1 Paducah OREIS Data Transmittals

Data to be stored in Paducah OREIS is submitted to the Data Manager prior to reporting. Official data reporting will be generated from data stored in Paducah OREIS.

8.5.2 Data Records Transmittals

Project personnel will make records transfers to the DMC.

8.6 DATA MANAGEMENT SYSTEMS

8.6.1 Paducah PEMS

Paducah PEMS is the data management system that supports the project's sampling and measurement collection activities and generates Paducah OREIS RTL files. The data management staff 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.

8.6.2 Paducah OREIS

Paducah OREIS is the centralized, standardized, quality assured, and configuration-controlled data management system that is the long-term repository of environmental data (measurements and geographic) for Paducah environmental management projects. Paducah OREIS is comprised of hardware, commercial software, customized integration software, an environmental measurements database, a geographic database, and associated documentation. The 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)

8.6.3 Paducah Analytical Project Tracking System

The Paducah Analytical Project Tracking System is the business management information system that manages analytical sample analyses for Paducah environmental projects. The Paducah Analytical Project Tracking System provides cradle-to-grave tracking of sampling and analysis activities. The Paducah Analytical Project Tracking System generates the SOW, tracks collection and receipt of samples by the laboratory, flags availability of the analytical results, and allows invoice reconciliation. The Paducah Analytical Project Tracking System interfaces with Paducah PEMS (output from the Paducah Analytical Project Tracking System is automatically transferred to Paducah PEMS).

8.6.4 PEGASIS

Portsmouth/Paducah Project Office Environmental Geographic Analytical Spatial Information System (PEGASIS) allows access to environmental sampling data and site-specific geographic information system features through the internet. PEGASIS includes analytical sample results from various environmental studies, restoration reports and supporting documents, and maps. Environmental data loaded to Paducah OREIS has been assessed, verified, and validated (if applicable), as specified in PAD-ENM-5003, *Quality Assured Data*. Environmental data from Paducah OREIS is loaded into PEGASIS on a monthly basis. PEGASIS does not contain data related to waste or facility characterization. Access to PEGASIS is available at http://padgis.latakentucky.com/padgis/.

8.7 DATA MANAGEMENT TASKS AND ROLES AND RESPONSIBILITIES

8.7.1 Data Management Tasks

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

8.7.1.1 Plan data collection

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

8.7.1.2 Prepare for sampling activities

Sample location will be based on GWS and inflection point analysis. The data management tasks involved in sample preparation include preparing descriptions of the sample stations, identifying sample containers and preservation, developing field logbooks or sample data forms, preparation of COCs, and coordinating sample delivery to the laboratory. The Lab Coordinator conducts activities associated with the fixed-based analytical laboratories. Coordinates for sample locations will be obtained using a GPS.

8.7.1.3 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, sample data forms, 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 fixed-based 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 or sample data forms. The Data Coordinator enters the information from the COC forms into Paducah PEMS.

8.7.1.4 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 fixed-based analytical laboratories. The Lab Coordinator presents a general sampling schedule to the fixed-based analytical laboratories. The Lab Coordinator also coordinates the receipt of samples and containers with the fixed-based laboratories. The Lab Coordinator ensures that laboratory data packages and EDDs from the field and fixed-based laboratories contain the appropriate information and are in the correct format.

8.7.1.5 Process field measurement and laboratory analytical data

Data packages and EDDs received from the field and fixed-based laboratories 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*.

8.7.1.6 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, 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 field and fixed-based analytical laboratories.

8.7.1.7 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 Section 6, 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.

8.7.1.8 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 validation is not currently planned for this project. Only screening data will be collected for this project.

8.7.1.9 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 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 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 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.

8.7.1.10 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. Once data have been transferred to Paducah OREIS, data will be accessible by the public in PEGASIS, a program designed to provide dynamic mapping and environmental monitoring data display for the DOE PPPO.

8.7.2 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.

8.7.2.1 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 PAD-ENM-5003, *Quality Assured Data*. The Project Manager is responsible to flow down data management requirements to subcontractors as required.

8.7.2.2 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.

8.7.2.3 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.

8.7.2.4 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 field or fixed-based 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.

8.7.2.5 Document management 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.

8.7.2.6 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.

8.7.2.7 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 PAD-ENM-5003, *Quality Assured Data,* are followed.

8.7.2.8 Lab coordinator

For this project, the Lab Coordinator provides contractual screening of data packages and transmittal of data packages to the Paducah DMC.

THIS PAGE INTENTIONALLY LEFT BLANK

9. WASTE MANAGEMENT PLAN

This Waste Management Plan (WMP) provides information for the management and final disposition of waste material that will be generated as a result of sampling and analysis to identify anomalies on DOE-owned and WKWMA-licensed property and confirm DOE origin.

This evaluation will produce the following waste materials covered by this WMP:

- PPE and plastic sheeting
- Miscellaneous sampling and field screening supplies
- Sample residuals
- Decon water

This WMP addresses the management of wastes generated on this project from the point of generation through final disposition. The DOE Prime Contractor will be responsible for waste management activities associated with this project. Standard practices and procedures outlined in this WMP regarding the generation, handling, transportation, and storage of waste will comply with all DOE requirements, RCRA requirements, and TSCA requirements.

The approach outlined in this WMP emphasizes the following objectives:

- Management of the waste in a manner that is protective of human health and the environment;
- Minimization of waste generation;
- Compliance with federal, state, and DOE requirements; and
- Selection of storage and/or disposal alternative(s) for the waste.

Waste management activities must comply with this WMP, applicable procedures, the site Waste Acceptance Criteria (WAC), and the WAC for other specific treatment, storage, and disposal facilities (TSDFs) that are designated to receive the waste. The decision has not been made as to the final TSDF that will be used. Potential off-site TSDFs that may be used include, but are not limited to, Energy*Solutions*, Nevada Nuclear Security Site, Perma-Fix, and Waste Control Specialists. Potential on-site TSDFs that could be used for soils and drill cuttings may include C-746-U Landfill.

A copy of this WMP will be available on-site during fieldwork. During the course of this project, additional PGDP and DOE waste management requirements may be identified. Necessary revisions to the WMP will ensure the inclusion of these additional requirements into the daily activities of waste management personnel.

9.1 WASTE GENERATION AND PLANNING

Waste that is likely to have either hazardous or radiological contamination typically will be stored on-site in containers in CERCLA waste storage areas in accordance with PAD-WD-3010, *Waste Generator Responsibilities for Temporary On-Site Storage of Regulated Waste Materials at Paducah*, during the characterization period and prior to treatment/disposal. Consistent with EPA Policy, the generation, storage, and movement of waste during a CERCLA project and storing it on-site does not trigger the administrative RCRA storage or disposal requirements. On-site waste storage areas will be managed in accordance with the substantive RCRA hazardous waste storage standards. Among the substantive requirements are compatible containers in good condition, regular inspections, containment to control spills or leaks, and characterization of run-on and run-off, either by process knowledge or by sampling.

Final disposition of the materials will depend on final characterization. Sections 9.1.1 through 9.1.4 provide a brief description of each potential waste stream.

9.1.1 Personal Protective Equipment and Plastic Sheeting

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 and plastic will be placed in plastic bags; the bag 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. An estimated total 15 ft^3 of this waste is expected to be generated.

9.1.2 Miscellaneous Sampling and Field Screening 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. An estimated total 7.4 ft^3 of this waste is expected to be generated.

9.1.3 Sample Residuals

Excess soil acquired during sample collection will be handled as IDW. Laboratory sample residuals will be disposed of according to laboratory procedures. An estimated total 7.4 ft^3 of this waste is expected to be generated.

9.1.4 Decon Water

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. Decontamination water will be placed in an appropriate waste container. An estimated total 1.34 ft^3 of this waste is expected to be generated.

9.2 WASTE MANAGEMENT ROLES AND RESPONSIBILITIES

9.2.1 Waste Management Tracking Responsibilities

Waste generated during sampling activities at PGDP will require a comprehensive waste-tracking system capable of maintaining an up-to-date inventory of waste. The inventory database will be used to store data that will enable determination of management, storage, treatment, and disposal requirements for the waste.

9.2.2 Waste Engineer

The Waste Engineer (WE) will ensure that all waste activities are conducted in accordance with PGDP facility requirements and this WMP. Field Engineers also may be designated by the WE to complete the waste management activities. Responsibilities of the WE also include coordinating activities with field

personnel, overseeing daily waste management operations, and maintaining records that contain a complete history of generated waste and the current status of individual waste containers.

The WE will ensure that procurement and inspection of equipment, material, or services critical for shipments of waste to off-site TSDFs are conducted in accordance with appropriate procedures. In addition, the WE will ensure that wastes are packaged and managed in accordance with applicable requirements (e.g., the WAC for the landfill).

Additional responsibilities of the WE include the following:

- Maintaining an adequate supply of labels;
- Maintaining drum inventories at sites;
- Interfacing with all necessary personnel;
- Preparing Requests for Disposal;
- Tracking generated waste;
- Ensuring that drums are properly labeled;
- Coordinating waste recycling, disposal, or transfers;
- Sampling waste containers to characterize wastes;
- Coordinating pollution prevention and waste minimization activities;
- Transferring characterization data to DOE prime contractor's data manager; and
- Ensuring that project temporary waste storage areas are properly established, maintained, and closed.

The WE and waste operators will perform the majority of waste handling activities. These activities will involve coordination with the DOE prime contractor project manager or designee who will perform periodic inspections to verify that drums are labeled in accordance with the WMP guidelines.

The WE will be responsible for ensuring characterization sampling of the waste in accordance with the procedures outlined in this plan. When sampling is complete, the WE will transfer the waste into the waste holding area established for this project, if necessary or into permitted storage.

9.2.3 Coordination with Field Crews

The WE will be responsible for daily coordination with all field crews involved in activities that generate waste. The WE will perform daily rounds of each of the work sites to oversee the waste collection and will verify that procedures used by the field crews comply with the WMP guidelines. Deficiencies will be documented and appropriate direction will be given to the field crews.

9.2.4 Coordination with Treatment, Storage and Disposal Facilities

The waste streams generated may be managed and disposed of in a variety of ways depending on characterization and classification. Waste will be temporarily stored on-site as previously discussed. Waste that is to be shipped to an off-site TSDF must be done so in accordance with applicable DOE Prime Contractor procedures and U.S. Department of Transportation requirements.

9.2.5 Waste Management Training

The WE and other project personnel with assigned waste management responsibilities will be trained and qualified in accordance with DOE Prime Contractor-approved Training Position Descriptions.

9.3 TRANSPORTATION OF WASTE

Transportation of waste on DOE property will be conducted in accordance with applicable DOE, PGDP, and DOE prime contractor policies and procedures. In the event that it becomes necessary to transport known or suspected hazardous waste over public roads, coordination will be initiated with PGDP Security, as necessary, which may result in the temporary closing of roads. Once hazardous wastes are transported from a CERCLA site, they are subject to full RCRA regulation; therefore, all transportation and TSDF requirements under RCRA must be followed. Off-site shipments must be accompanied by a manifest. Off-site disposal of hazardous wastes will occur only at a RCRA facility in a unit in full compliance with the Subtitle C requirements. Transportation of known or suspected hazardous waste on public roads will be conducted in accordance with applicable U.S. Department of Transportation regulations (*CFR* Title 49).

9.4 SAMPLE RESIDUALS

The field and fixed-base analytical laboratories will generate sample residuals and laboratory wastes. The fixed-base laboratory will manage and return waste sample residuals to the project. Nonhazardous wastes generated during analyses will be disposed of by the fixed-base laboratory. All waste generated by the field laboratory will be managed by the project.

9.5 WASTE MINIMIZATION

Waste minimization requirements that will be implemented, as appropriate, include those established by the 1984 Hazardous and Solid Waste Amendments of RCRA; DOE Orders 5400.1, 5400.3, 435.1; and DOE Prime Contractor's requirements. Requirements specified in the DOE Prime Contractor's WMP regarding waste generation, waste tracking, waste reduction techniques, and the waste reduction program, in general, also will be implemented.

To support DOE's commitment to waste reduction, an effort will be made during field activities to minimize waste generation as much as possible, largely through ensuring that potentially contaminated wastes are localized and do not come into contact with any clean media (which could create more contaminated waste). Waste minimization also will be accomplished through waste segregation, immediate containerization of waste, selection of PPE, and waste handling (spill control). Efforts will be made to avoid stockpiling soil waste, use coveralls only when necessary, attempt to reuse coveralls, and segregate visibly soiled coveralls from clean coveralls.

9.6 HEALTH AND SAFETY ISSUES RELATED TO WASTE MANAGEMENT

Waste management activities will be conducted in accordance with health and safety procedures documented in the HASP of this work plan.

10. SCHEDULE

Table 2 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 2014). Also note that the schedule includes business days in lieu of calendar days.

Table 2. Project Planning Schedule

Activity	Date
Issue D1 Work Plan	June 27, 2014
Initiate field activities	September 29, 2014
Complete field activities	March 5, 2015
Issue D1 Sitewide Evaluation Report	April 6, 2015

THIS PAGE INTENTIONALLY LEFT BLANK

11. REFERENCES

CH2M HILL 1992. *Results of the Site Investigation, Phase II, Paducah Gaseous Diffusion Plant*, KY/SUB/13B-97777C P-03/1991/1, CH2M HILL, Southeast, Inc., Oak Ridge, TN, April.

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 1997a. *Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation at Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, Volume 1, DOE/OR/07-1404/V1&D2, U.S. Department of Energy, Paducah, KY, April.

DOE 1997b. *Record of Decision for Waste Area Group 17 at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/OR/06-1567&D1, U.S. Department of Energy, Paducah, KY, September.

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

DOE 2007a. Letter from W. E. Murphie to R. B. Scott, Kentucky Department for Environmental Protection, Frankfort, Kentucky, and D. G. Williams, U.S. Environmental Protection Agency Region IV, Atlanta, Georgia, February 17.

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

DOE 2007c. *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 2008d. *Site Evaluation Report for Soil Pile I at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/0108&D2, U.S. Department of Energy, Paducah, KY, December.

DOE 2009a. *Site Evaluation Report for Addendum 1-B Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/0225&D1, U.S. Department of Energy, Paducah, KY, July.

DOE 2009b. *Site Evaluation Report for Addendum 2 Soil Piles at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/0188&D2, U.S. Department of Energy, Paducah, KY, June.

DOE 2009c. *Site Evaluation Report for Rubble Areas at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/0227&D0, U.S. Department of Energy, Paducah, KY, July.

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.

DOE 2011. *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D2, U.S. Department of Energy, Paducah, KY, May.

DOE 2013b. *Methods for Conducting Risk Assessments and Risk Evaluations at the Paducah Gaseous Diffusion Plant Paducah, Kentucky, Volume 1. Human Health*, DOE/LX/07-0107/&D2/R2/V1, U.S. Department of Energy, Paducah, KY, June.

DOE 2013a. *Programmatic Quality Assurance Project Plan*, DOE/LX/07/1269&D2/R1, U.S. Department of Energy, Paducah, KY, February.

DOE 2014. *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Annual Revision FY* 2014, DOE/LX/07-1292&D2, U.S. Department of Energy, Paducah, KY, February.

EPA (U.S. Environmental Protection Agency) 1988. *Guidance for Conducting Remedial Investigations and Feasibility Studies Under CERCLA*, EPA/540/G-89/004, October.

EPA 1992. *Preparation of Soil Sampling Protocols: Sampling Techniques and Strategies*, EPA/600/R-92/128, July.

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

EPA 2004. *Test Methods for Evaluating Solid Waste: Physical/Chemical Methods*, SW-846, 3rd Edition, U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response, http://www.epa.gov/epaoswer/hazwaste/test/main.htm, Web page updated February 22, 2006, Web page visited May 17, 2006.

EPA 2005a. *Uniform Federal Policy for Implementing Environmental Quality Systems*, EPA-505-F-03-001, March.

EPA 2005b. *Uniform Federal Policy for Quality Assurance Project Plans, Part 1:UFP-QAPP Manual*, EPA-505-B-04-900A, March.

EPA 2005c. *Uniform Federal Policy for Quality Assurance Project Plans, Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities*, EPA-505-B-04-900B, March.

EPA 2005d. *Uniform Federal Policy for Quality Assurance Project Plans, Part 2A: UFP-QAPP Workbook*, EPA-505-B-04-900C, March.

EPA 2006. *Guidance on Systematic Planning Using the Data Quality Objectives Process*, EPA/240/B-06/001, U.S. Environmental Protection Agency, Office of Environmental Information, Washington, DC, February.

IT Corp (International Technology Corporation) 1989. *Preliminary Radiological Characterization of Ogden Landing Road Concrete Rubble Site*, IT/NS-80-131.

KRCEE (Kentucky Research Consortium for Energy and Environment) 2008. *Real Time Technology Application Demonstration Project Final Report*, UK/KRCEE Doc.# P18.32 2008, Kentucky Research Consortium for Energy and Environment, Lexington, KY, December.

ORISE (Oak Ridge Institute for Science and Education) 2012. "Dose Modeling Evaluations and Technical Support Document for the Authorized Limits Request for the DOE-Owned Property Outside the Limited Area, Paducah Gaseous Diffusion Plant, Paducah, Kentucky," DE2013-1060170, Oak Ridge Institute for Science and Education, Oak Ridge, TN., September.

PGDP (Paducah Gaseous Diffusion Plant) 1992. *PGDP Environmental Restoration Health Physics Special Purpose/Routine Radiological Survey Results*, Survey No. 92-SP-317-S.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX A

SURVEY PLAN FOR ANOMALIES LOCATED OUTSIDE THE LIMITED AREA AT THE PADUCAH GASEOUS DIFFUSION PLANT

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE

FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS

AOC	area of concern
cpm	counts per minute
DOE	U.S. Department of Energy
DQO	data quality objective
EPA	U.S. Environmental Protection Agency
FFA	Federal Facility Agreement
GPS	Global Positioning System
GWS	gamma walkover survey
IMC	Individual Measurement Comparison
KRCEE	Kentucky Research Consortium for Energy and Environment
LATA Kentucky	LATA Environmental Services of Kentucky, LLC
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
MDA	minimum detectable activity
OU	operable unit
PGDP	Paducah Gaseous Diffusion Plant
RCT	radiological control technician
XRF	X-ray fluorescence

THIS PAGE INTENTIONALLY LEFT BLANK

METRIC/ENGLISH CONVERSIONS

Metric Unit	Arithmetic Conversion	English Unit
Centimeter (cm)	Divide by 2.54	Inch
Meter (m)	Multiply by 3.28	Feet (ft)
Square meter (m^2)	Multiply by 10.76	Square feet (ft^2)
Kilometer (km)	Divide by 1.61	Mile (mile)
Hectare (ha)	Multiply by 2.47	Acre

THIS PAGE INTENTIONALLY LEFT BLANK

A.1. INTRODUCTION AND PURPOSE

This survey plan will be implemented to evaluate 25 anomalies, Table A.1, from the 534 found during the initial sitewide survey effort (DOE 2011). The locations of anomalies are shown in Figure A.1. To validate the conclusions from the previous 2009-2010 effort (DOE 2011), the Federal Facility Agreement (FFA) parties convened in March and April 2014 and outlined a strategy to select and evaluate 25 anomalies. Figure A.2 shows the locations of the 25 selected anomalies that will be evaluated further by this survey plan. The 25 selected anomalies will be evaluated using gamma walkover surveys, soil sampling, and *ex situ* analysis of soil for uranium by X-ray fluorescence (XRF). Data from gamma walkover surveys (GWSs) and XRF uranium analyses will be used to trigger whether further evaluation of the other anomalies is necessary.

Table A.1. Anomalies Selected for Evaluation

Ranking	Anomaly Name	Area (m^2)	Description
1	PV-21-01-V-6	4,046	dirt mound
2	PG-02-03-R-2	660	dirt mound
3	PM-26-02-R-3	433	chunks of concrete
4	PE-01-03-V-18	91	soil mound, limbs, tree debris
5	PP-06-03-V-20	113	dirt mound
6	PS-26-02-V-1	1,063	dirt mound
7	PP-05-02-R-1a	90	dirt mounds
8	PU-24-01-V-5	3,594	dirt mound
9	PU-24-01-V-4	2,411	dirt mound
10	PY-13-01-V-2	10	concrete/pipe
11	PF-13-02-V-16	1,432	dirt mound
12	PV-24-01-V-8	1,962	dirt mound
13	PY-13-01-V-5	374	concrete
14	PF-13-02-R-1	532	dirt mound, concrete
15	PF-18-02-V-20	306	dirt mound
16	PQ-30-03-V-5	4,248	soil, limbs, debris
17	PY-14-01-V-7	1,351	soil mound, concrete
18	PY-13-01-V-4	170	dirt mound
19	PQ-30-03-V-6	248	soil mound, concrete
20	PE-01-03-V-24	22	soil mound, limbs, tree debris
21	PF-18-02-V-19	357	concrete pipe, dirt mounds
22	PY-14-01-V-8	29	soil mound
23	PY-14-01-V-6	145	soil mound
24	PQ-30-03-V-7	5,686	soil mound, concrete
25	PU-24-01-V-6	1,894	dirt mound, plastic construction fencing
26	PS-19-03-V-7*	120	soil mound
27	PM-26-02-V-7*	1,180	dirt mound
28	PF-26-02-V-11*	122	soil mound

*Contingency location

Note: Three contingency anomalies will be used as alternates, should any of the selected 25 anomalies be inaccessible, contain standing water, or be deemed to be unsafe.

THIS PAGE INTENTIONALLY LEFT BLANK

N
W
E
S

A
B
C
D
E
F
G
H
I
J
K
L
M
N
O
P
Q
R
S
T
U
V
W
X
Y
Z

1990 Exposure Rate

At 1 Meter (µR/Hr)

LAYER

<	5
5 -	7
7 -	9
9 -	12
12 -	30
30 -	80
80 -	250
250 -	800
800 -	1,600

2009 Exposure Rate

µR/Hr

<	3
3 -	5
5 -	7
7 -	9
9 -	12
12 -	30
30 -	80
80 -	250
>	250

500 250 0 500 1,000

Meters

Anomaly

U.S. DEPARTMENT OF ENERGY

DOE PORTSMOUTH/PADUCAH PROJECT OFFICE
PADUCAH GASEOUS DIFFUSION PLANT

LATA Environmental Services of Kentucky, LLC

DATE: 5-30-2012

FIGURE No. C5EC9000GSK001R1sitemap_gamma.mxd

Figure A.1. Anomalies found at PGDP, Outside the Limited Area

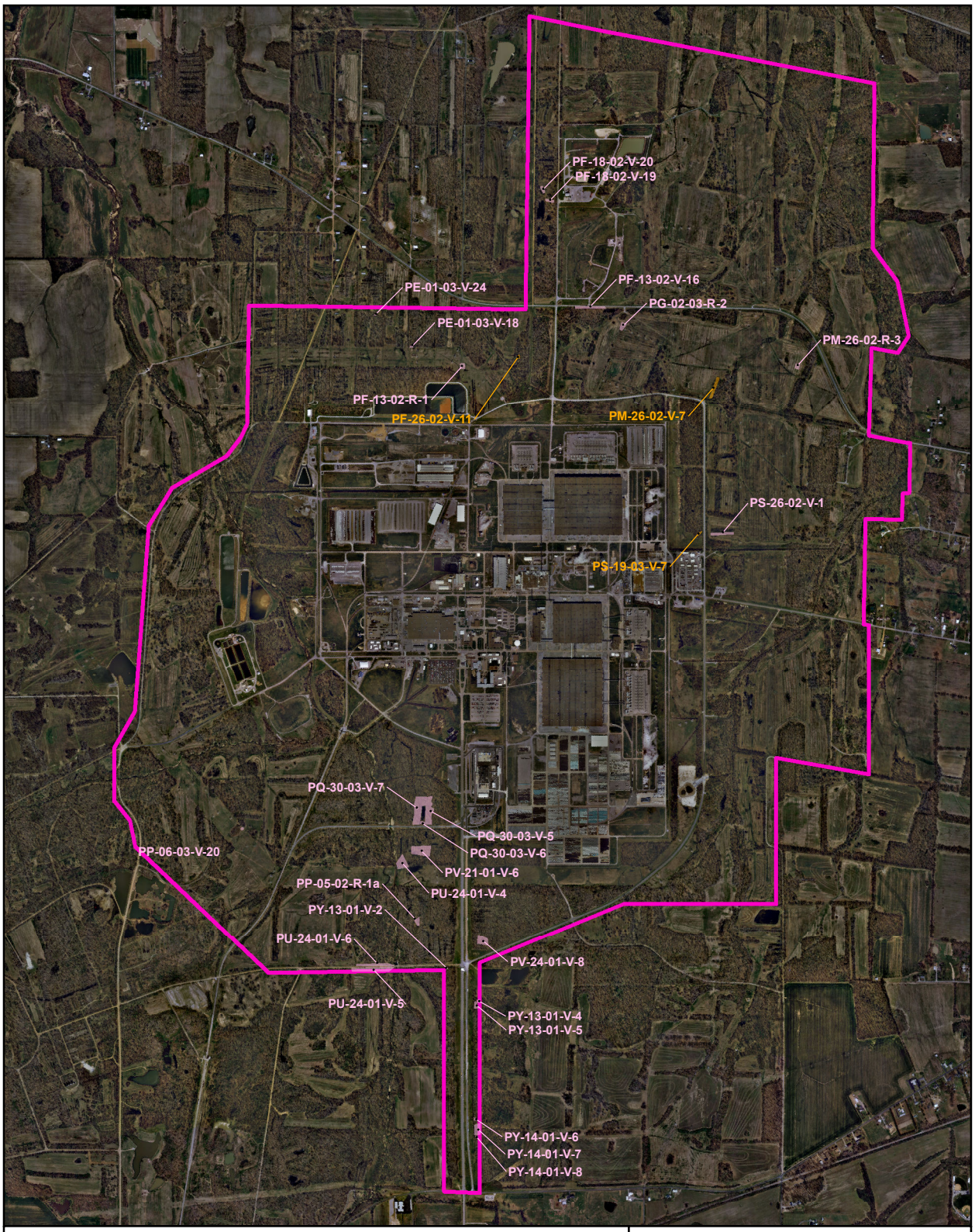


Figure A.2. Selected Anomalies

A.2. SITE DESCRIPTION AND HISTORY

Section 2 of the main text of this document provides this information.

A.3. HISTORICAL DATA REVIEW

Applicable radiological survey records and soil sampling data for the site have been reviewed and evaluated. Data from the 2009-2010 Sitewide Evaluation also have been reviewed and considered in the design of this survey plan. Walkdowns of several of the anomalies were conducted by the FFA parties during April 2014 in support of this survey design.

A.4. GAMMA WALKOVER SURVEY AND DATA ASSESSMENT

A.4.1 SURVEY INPUT PARAMETERS

For the purpose of the survey, uranium is used as a surrogate for other contaminants due to its being the primary radiological constituent found at Paducah Gaseous Diffusion Plant (PGDP). GWS will be conducted for the anomalies to determine the area, areas, single location or a combination of the preceding with the highest count rate(s). Based on the GWS data, soil samples collected from the location with highest count rate will be analyzed by XRF for uranium.

- Prior to a GWS of each anomaly, gamma ray dose rate measurements will be taken around the perimeter of the area to assess potential impacts from activities within the Limited Area.
- GWSs will be conducted by walking lines parallel to one another, where possible, separated by approximately one meter.
- Stakes or other indicators may be used to ensure properly spaced lines.
- GWSs will be conducted at a progression rate of approximately one-half meter per second to ensure a data density of at least one measurement per m^2.
- The detector will be held approximately four to six inches above the ground and moved slowly in a serpentine fashion.
- Surface geometries and media other than soil (such as saturated soils, concrete, etc.) that can impact GWS results will be noted.
- GWS data will be logged along with accompanying Global Positioning System (GPS) information in State Plane Coordinates (in feet).
- The units of measurement for GWSs will be gross cpm.

A.4.2 SURVEY QUALITY CONTROL

Prior to the start of surveys for anomalies with a radiation detector, ten measurements will be taken with a known source in a repeatable geometry. The ten measurements will be used to establish a quality control chart that provides mean and two standard deviations above and below the mean for the radiation detector dataset. At the beginning and end of each survey, the radiation detector will be checked with the original source in the original geometry used to establish the quality control chart. Detector response outside of two standard deviation based on the quality control chart will be evaluated to ensure the radiation detector is within the established control limits. Each radiation detector, used for survey of an anomaly, will have a quality control chart developed prior to use in the field.

Before radiation surveys of anomalies, field work is to begin with the calibration and assessment of all radiation detectors to be utilized for GWS of soils. This step is necessary for establishing quality control for this survey plan. Figure A.3 illustrates the location of the area that is to be used to develop quality control for the radiation detectors. This area was chosen because a quality dataset from Kentucky Research Consortium for Energy and the Environment's (KRCEE's) 2008 Real-Time Demonstration Project is available for the area (KRCEE 2008). Figure A.4 shows the GWS for the area using gross count data from KRCEE's 2008 Real-Time Demonstration (KRCEE 2008). Prior to GWS that are used to establish quality control for radiation detectors, gamma ray dose rate measurements are to be taken and recorded at the perimeter of the area to assess potential impacts from activities within the PGDP Limited Area. To establish quality control for the radiation detectors a GWS for each detector is to be conducted for an area of 200 m^2 within the area shown in Figure A.3. The size of the areas is consistent with grids used for PGDP Soil Operable Unit (OU) Work Plan (DOE 2010). GWS data for each radiation detector is then used to establish the quality control for the detectors. The GWS data is in counts per minute (cpm). If the quality control for a radiation detector falls outside its established two sigma control limit based on the mean, it will be rechecked to determine whether service or recalibration is needed for the radiation detector.

A.4.3 DATA ASSESSMENT AND SELECTION OF SAMPLE LOCATION

The following describes how the survey data will be evaluated and used to select a sample location.

- GWS data will be downloaded each day and the data will be evaluated the next business day following completion of the anomaly survey and any confirmation survey.
- The GWS data will be overlaid on a map of the anomaly.
- Areas of an anomaly where GWS data are incomplete or questionable because of GPS signal or incomplete coverage will undergo additional GWS.
- The GWS data for the anomaly will be analyzed using inflection point analysis.
- Probability Plots will used to determine whether a break/inflection point occurs in the data.
- Data above the break/inflection point will be mapped to determine the location within the anomaly of the data above the inflection point. The analysis may indicate:
    - Case 1: An anomaly with one area with a group of data points with elevated count rate,
    - Case 2: An anomaly with multiple areas with a group data points with elevated count rate,

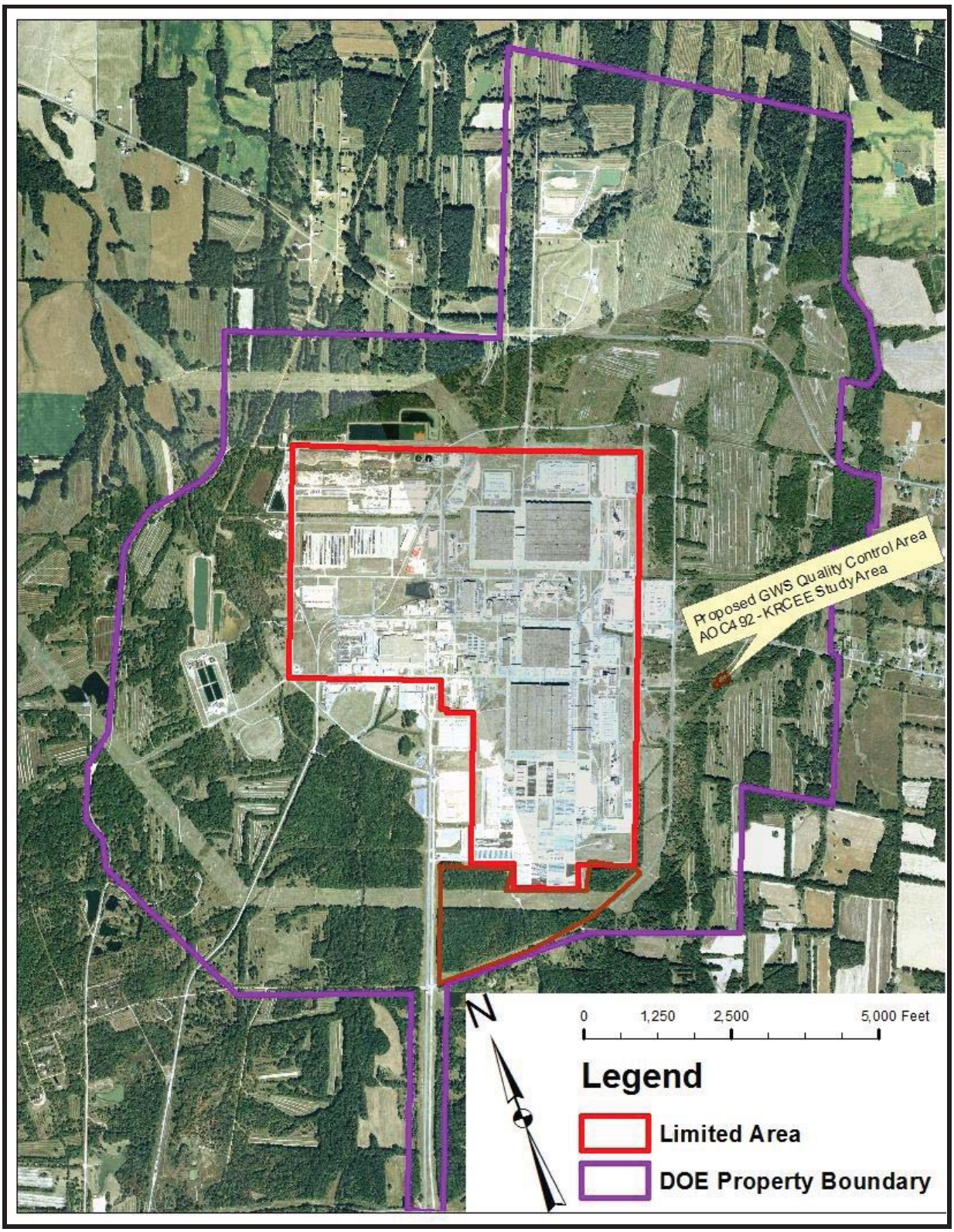


Figure A.3. Quality Control Area within KRCEE Demonstration Project Area

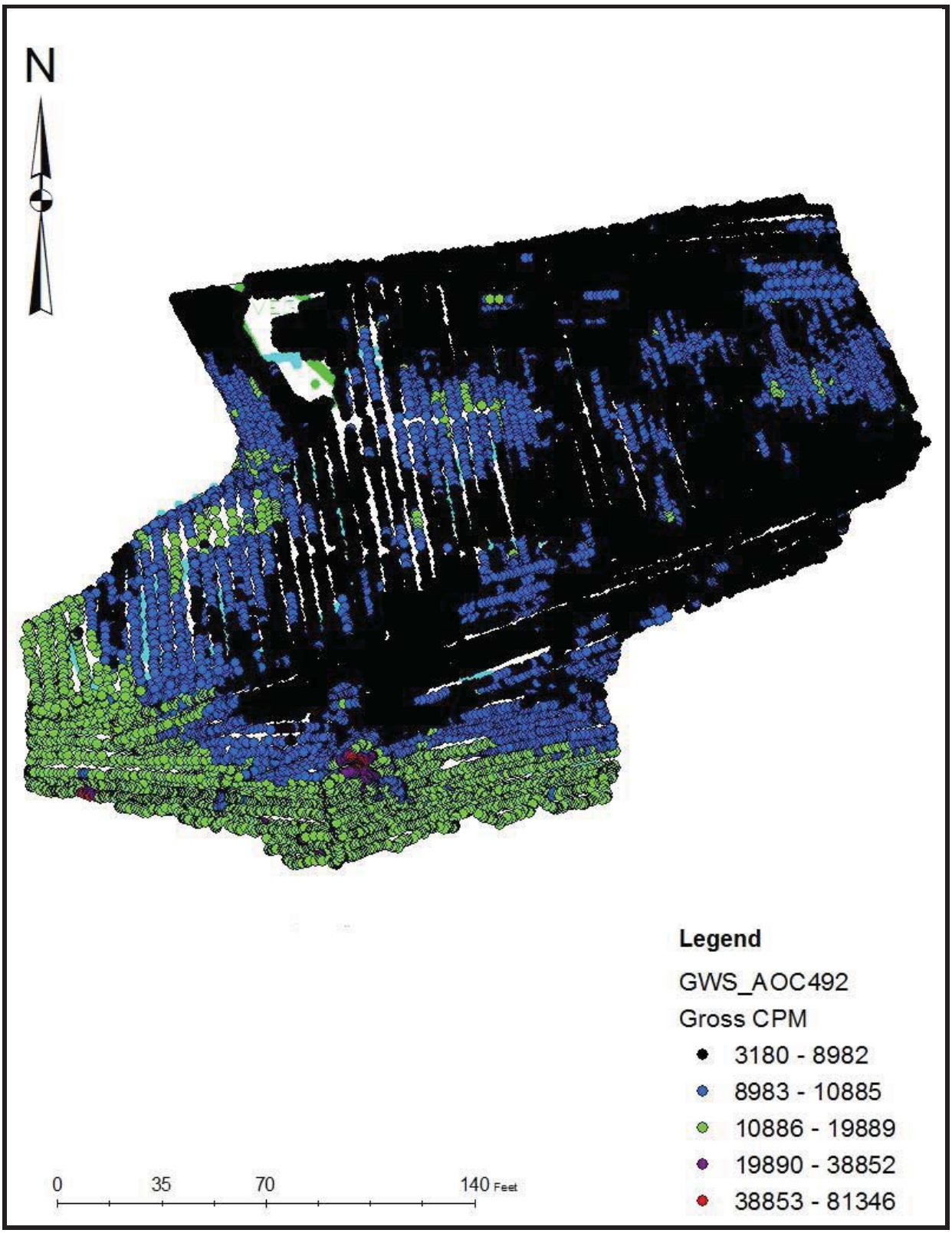


Figure A.4. GWS for AOC 492 and Adjacent Areas using KRCEE Gross Count Data

— Case 3: An anomaly with single area with a single data point with an elevated count rate (no adjacent points with elevated count rate data),

— Case 4: An anomaly with a combination of the above, or

— Case 5: An anomaly with no observed inflection point.

- After survey data is mapped, sample locations will be determined in accordance with the following:

  — Case 1: An anomaly may have a single area with a group of elevated count rate data points. In this case the area will be resurveyed (e.g., conformation) to determine the boundary of the area (e.g., count rates above the break/infection point) and the location with the highest count rate within the area. The location within the area with the highest count rate will be chosen for sampling.

  — Case 2: An anomaly may have multiple areas with a group of elevated count rate data points. The areas will be resurveyed (e.g., conformation) to determine the boundary of the each area (e,g., determined count rate above the break/infection point) and the location with the highest count rate within each area. From the areas, the area with the highest count rate will be chosen for sampling at the location with the highest count rate.

  — Case 3: An anomaly may have a single area with elevated count rate with no adjacent elevated points. The single location with the elevated count rate with no adjacent locations with elevated count rate will be resurveyed using a 5 m × 5 m area centered on the single point. The location within the 5 m × 5 m area with the highest count rate will be chosen for sampling.

  — Case 4: An anomaly may have single areas with a group of elevated count rate data points, multiple areas with a group of elevated count rate data points, and/or a single area with elevated count rate with no adjacent elevated points. Professional judgment will be used to determine sample location with a focus on the location with the highest count rate.

  — Case 5: If no inflection point is observed for the probability plot, data points above the 95th percentile will be mapped and used, along with professional judgment, to determine the location for a judgmental sample.

- If the observed highest location is associated with debris within an anomaly, additional measurements will be conducted to determine if the elevated count rate is from debris or adjacent soil. These additional measurements will not be combined with the initial survey data for mapping or inflection point analysis. The sample location will be determined as discussed above.

- If the highest count rate is associated with debris, the debris will be moved, if possible manually. The area under the debris will be surveyed. If moving the debris manually is not possible, the survey will be considered complete. Surface survey results from the debris will be considered separate from soil GWS. Sample location will be determined as discussed above.

- After a sampling location within an anomaly has been determined, a discussion with the Commonwealth of Kentucky and EPA will be held to gain agreement of the sampling location. The Commonwealth of Kentucky and EPA will send agreement of the sampling location or a proposed

alternate location within 3 business days.[1] If there is continued disagreement about the sampling location, discussions will be held to determine an agreed upon location.

- Surveys will be conducted prior to sampling to ensure accurate sample placement.

A.5. SURVEY PLAN SUMMARY

The DQO steps in Section 3 of the main text provide systematic methodology for defining the criteria that the GWS and sample design should satisfy including types of analyses and measurements, when and where to collect perform measurements, and the decision errors. The survey plan summary is as follows:

- All GWS radiation detectors will be operated and maintained by qualified personnel in accordance with LATA Environmental Services of Kentucky, LLC, (LATA Kentucky) Radiation Safety Program procedures;

- Real-time logged GWS data will be downloaded after completion of the GWS (within three business days) to ensure data are of sufficient quality and quantity to meet the intended use of the data as laid out in the DQOs;

- Radiation detectors will operate under daily quality control to ensure the detectors are operating within control limits; and

- GWS speed, detector height, and integration time shall be maintained throughout the survey to ensure the collection of at a minimum one measurement per m^2.

A.5.1 FIELD APPROACH

Upon receiving authorization from the U.S. Department of Energy (DOE), surveyors from LATA Kentucky will implement this survey plan. A survey team consisting of two surveyors will obtained the specified radiological measurements. Should clearing or mowing be required in order to gain access to anomalies, LATA Kentucky will notify the government furnished services and infrastructure contractor. The GWS supervisor will ensure that data from each anomaly is archived separately and the data files include all specified data. GWS will progress until completion. GWS operations will cease for inclement weather. GWS will not be conducted in areas of standing water.

A.5.2 SAFETY HAZARDS

Safety hazards likely to be encountered during the performance of this survey effort include insects (seasonal), wildlife (seasonal), vegetation, slips, trips, falls, heat/cold stress, falling debris, and driving hazards. All survey efforts conducted in support of this plan will be performed in accordance with established activity hazards analyses and work control documents. Surveyors will use the buddy system at all times and maintain radio communications with the GWS supervisor and the PGDP plant shift superintendent. Surveyors shall report his/her position to the GWS supervisor at regular intervals.

[1] Three business days is an expectation for scheduling purposes.

A.5.3 ANOMALY LOCATIONS

The anomalies selected for further evaluation are listed in Table A.1 and their locations are shown in Figure A.2.

A.5.4 GWS

GWS are performed by moving the detector in a serpentine pattern approximately 1-m wide, while advancing at a rate of approximately 0.5 m/sec. The sensitive area of the detector is maintained as close to the surface as practical, considering the surface conditions; 4 to 6 inches is a reasonable distance. For GWS parallel scanning passes will be made across the anomaly where possible. The GWS coverage is based on guidance in *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM) for providing a high confidence level of collecting data for areas with elevated count rate.

A.5.5 SEQUENCING OF WORK

Upon receiving authorization from DOE, surveyors will begin implementing this survey plan. Data evaluation will be in parallel to the collection effort in order to ensure a timely review of data and to ensure that data gaps are identified while the project is underway. Upon completion of the GWS and data collection for an anomaly, the project team will evaluate the data and determine whether further surveys of the anomaly are necessary.

A.6. DATA MANAGEMENT

Data collected in support of this effort shall be managed as follows.

- A new data file is created for each anomaly.
- If multiple instruments are used on an individual anomaly, unique data files for each instrument will be created.
- Data files shall include time stamps with both date and time collected.
- Data files shall include X and Y coordinates in State Plane coordinate system (in feet).
- Data files shall be archived on the network in a dedicated folder. Access will be restricted to project team members.

  A written GWS record shall be prepared for each anomaly that includes data file name, instrument, surveyor, and area specific information. The GWS also should include a narrative of any unusual condition or material noted for the anomaly. If sketches or photographs of the anomalies are produced, these should be attached to the written survey record. A copy of the written survey record shall be provided to the project manager.

A.7. ANALYSES AND DATA REPORTING SCHEDULE

Data will be reported in the Sitewide Evaluation Report to be issued in accordance with the project schedule.

A.8. DATA REPORTING

The GWS supervisor shall routinely report the progress and results to the project manager. Data reporting shall include the number of completed GWS for the anomalies, the number of anomaly surveys in progress, and the location of the highest count rate in each anomaly.

A.8.1 IN-PROCESS DATA REVIEW

The GWS supervisor will routinely review data to determine if the DQOs of this survey plan are being met. Additionally, the review will ensure that data gaps are identified and corrected during the GWS of each anomaly.

A.8.2 DATA PRESENTATION METHODOLOGY

Data collected in support of this survey plan, including but not limited to GWS data, inflection point analysis, mapping of data, area of highest count rate, and quality control will be presented in a written report upon completion of the project. A copy of the written report will be included with the project final report.

A.8.3 DATA ARCHIVAL

Data files, written surveys, instrument calibration records, and surveyor training records shall be archived electronically with the Site Evaluation Report.

A.9. REFERENCES

DOE 2011. *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-0228&D2, U.S. Department of Energy, Paducah, KY, May.

KRCEE (Kentucky Research Consortium for Energy and Environment) 2008. *Real Time Technology Demonstration Project Final Report*, UK/KRCEE Doc.# P18.32 2008, December.

THIS PAGE INTENTIONALLY LEFT BLANK

ATTACHMENT A1

TOTAL SURFACE CONTAMINATION MEASUREMENT PARAMETERS AND SURVEY METHOD

THIS PAGE INTENTIONALLY LEFT BLANK

A1.1. INTRODUCTION

During the performance of GWSs of soil anomalies, concrete rubble may be encountered. In order to characterize the concrete rubble, direct measurements of surface radioactivity will be performed. This survey plan provides the details necessary to ensure the project data quality objectives (DQOs) are met. The purpose of this survey plan is to establish a mechanism through which concrete and asphalt that is encountered during the GWS can be characterized for surface contamination. Concrete and asphalt surfaces found to be contaminated in excess of DOE limits will be controlled accordingly, if not already controlled as a contaminated surface. Survey results from surface scans will not be considered when determining sampling locations.

The DQOs and survey design have been developed and include current knowledge of historical processes and existing radiological data associated with the concrete rubble and anomalies. This information has been used along with DOE Prime Contractor procedures in determining guidelines and action levels for this survey. Surface scans will be performed with surface contamination instrumentation such as Geiger-Mueller and phoswich detectors. Due to the nature of surface scanning, these measurements will be documented using traditional survey reports. Dataloggers with GPS equipment will not be used for this application.

A1.2. RADIOLOGICAL HISTORY

Radioactivity levels on surfaces associated with the concrete rubble found in the anomalies are not expected to exceed DOE surface contamination criteria. A review of the process history associated with the anomalies reveals no evidence indicating that contamination is present on these materials (i.e., elevated radiological reading, visual release, or process knowledge).

A1.3. CONTAMINANTS AND CRITERIA

For the radiological surveys of the surfaces of the concrete rubble, the predominant radiological contaminant is expected to be processed uranium. The isotopic ratios are expected to be natural or depleted uranium. The most likely source of contamination would be incidental contact with plant-derived materials that were in contact with the concrete before it was rubblized.

The applicable DOE surface contamination criteria, for unrestricted release are acceptable to demonstrate that objects with potential uranium surface contamination may be free released. These values are as follows:

5,000 dpm/100 cm^2 total beta/gamma
1,000 dpm/100 cm^2 removable beta/gamma

5,000 dpm/100 cm^2 total alpha (uranium)
1,000 dpm/100 cm^2 removable alpha (uranium)

Because direct alpha measurements on porous or heavily oxidized surfaces may be affected adversely by surface conditions (i.e., roughness, cracks, pores) and coverings (i.e., dirt, oil, paint, moisture), alpha

measurements cannot be used reliably to determine contamination levels on weathered surfaces, concrete, wood, and other items that may have shallow subsurface contamination. An alternative is to use beta/gamma measurements as a surrogate for alpha measurements. The ratio of beta/gamma emissions to alpha emissions from processed natural uranium is 1.6 to 1 and for depleted uranium the beta/gamma to alpha ratio is greater than 2.0 to 1. Information presented in NUREG/CG-1507 and DOE Prime Contractor procedures demonstrate that beta/gamma detectors, calibrated with Tc-99, are able to detect and accurately measure uranium contamination on concrete surfaces, unless the surface is extremely weathered, damaged, or has a surface covering exceeding several mg/cm^2. As such, direct beta/gamma measurements are capable of identifying the presence of uranium contamination for natural and depleted uranium isotopic abundances and will be used as a surrogate measurement for alpha contamination levels for surveying porous items potentially contaminated with such materials.

In the case of wood, concrete, and other porous surfaces, the use of the surface contamination limits for scanning may not provide an appropriate level of assurance for determining compliance with free release status. This is due to the effective porosity of the material and the potential for volumetric contamination due to the absorption of radioactively contaminated substances (oils, water, etc.). Also, because of the possibility that contamination may exist inside inaccessible areas or that surface conditions might adversely affect measurement accuracy, a guideline of indistinguishable from background will be applicable for scanning measurements of porous items. Areas found to have radioactivity levels in excess of the indistinguishable from background criteria will be assessed further using static measurements.

For the purpose of the survey of anomaly associated concrete, results will be compared to the following:

- Scans and/or momentary observations that do not indicate activity exceeding the Individual Measurement Comparison (IMC) levels when using beta/gamma instrumentation and methods capable of measuring contamination to levels below the DOE limits outlined above, and

- A population of static measurements with each value less than the applicable DOE limits shown below. Total beta/gamma measurements will be used as a surrogate to demonstrate compliance with the uranium limit. As enriched uranium is not suspected, a 1 to 1 ratio provides a conservative estimate of uranium surficial concentration.

  – 5,000 dpm/100 cm^2 total beta/gamma
  – 5,000 dpm/100 cm^2 total alpha (uranium)

Indistinguishable from background is based on the concepts recommended by MARSSIM and NUREG/CR-1507.

Table A1.1 indicates the IMC levels that are considered by DOE to be detectable by a surveyor (based on audible response) by scanning or momentary observations for a range of instrument background count rates. Because the actual background likely will differ from the values in this table, an IMC must be determined for the actual detector background; this is performed by interpolation, using a graphical plot of IMC versus background. A graphical plot is included in Figure A1.1.

Table A1.1. Detectable Count Rates as a Function of Instrument Background

Background (cpm)	IMC Level (cpm)	Background (cpm)	IMC Level (cpm)
1	5	100	170
2	8	150	240
4	12	200	300
6	15	250	380
10	20	300	450
20	40	400	600
30	60	500	700
40	80	600	800
60	110	1,000	1,300
80	130		

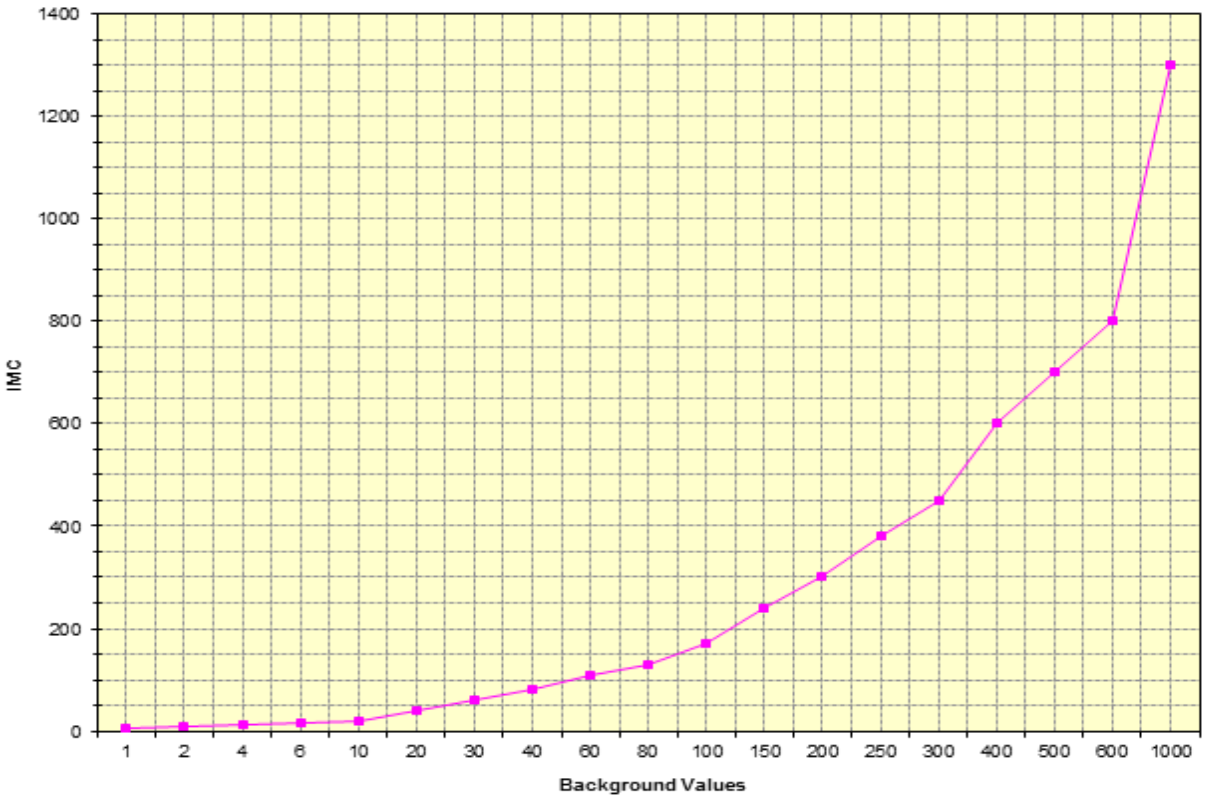


Figure A1.1. Individual Measurement Comparison

This survey plan has established a null hypothesis for concrete rubble with the potential for surface contamination. The null hypothesis remains the same for each type of material: the activity exceeds DOE limits with the survey having acceptable Type I and Type II decision errors of 0.05.

The Sign Test will be used for concrete rubble. For the null hypothesis to be disproven, each total beta/gamma measurement must be less than the limit provided above.

The process of demonstrating compliance with criteria is discussed further in Section A1.4.

A1.4. SURVEY APPROACH

A1.4.1 GENERAL

Surveys shall be performed by trained radiological control technicians (RCTs) who follow standard, approved, written procedures of the DOE Prime Contractor and use properly calibrated instruments sensitive to the potential contaminants.

Although NUREG-1575, MARSSIM, only addresses the design of surveys for detecting and monitoring surface contamination of building surfaces and land areas, this survey plan design and implementation is consistent with concepts and terminology used in the MARSSIM. In other words, the DQO process and graded approach that are integrated within the MARSSIM process are used in this plan to assure defensible data is generated in a cost-effective manner.

A1.4.2 SURVEY SPECIFIC DATA QUALITY OBJECTIVES

This section provides additional DQOs specific to the survey of concrete rubble. Radiological criteria for unrestricted release have been established by DOE and are not reconsidered. The objective for the radiological surveys is to demonstrate, at a 95% confidence level, that any radiological levels on concrete rubble satisfy those release criteria (Section A1.3). Measurement methods should have detection sensitivities minimum detectable activity (MDAs) that are < 75% of the applicable criterion. In addition to the measures indicated here and in Section A1.5, the quality assurance/quality control measures described in Section A1.8 will be followed.

A1.4.3 INSTRUMENTATION

Survey instrumentation shall be appropriate for the type of radiation being measured, and count times, survey methods, and calculations used to determine activity levels shall be such that detection sensitivities (MDA) should be < 75% of the applicable release criterion. Table A1.2 identifies instruments typically used for these types of surveys. Sensitivities are for nominal operating parameters. Actual backgrounds and associated distinguishable activity levels will be determined for the specific instrument and methods used at the time of the survey.

Table A1.2. Typical Instruments and Sensitivities

Detector Model	Meter Model	Application	Typical Bkgd. (cpm)	IMC (cpm)	Sensitivity (Lc) (dpm/100 cm^2)	
					Scanning	Static Count (1 minute)
44-9	3 or equivalent	Beta/gamma scan and measurement	50	95	2,500	530

A1.4.4 DEMONSTRATING RELEASE CRITERIA ARE MET

A1.4.4.1 Area Classification

The classification of concrete rubble is based on the results of scoping surveys and process history. Anomaly associated concrete rubble addressed in this plan is not expected to exceed DOE limits for

surface contamination. As such, concrete rubble will be surveyed in accordance with Class 3 requirements.

Class 3

Class 3 is that category least likely to be contaminated. These are items where it is extremely unlikely that they will exceed a small percent of DOE limit. Examples would include items located within controlled facilities, but have no history of use within radiological areas. It also would include items that previously have been surveyed and found to have no detectable surface contamination.

Concrete found in remote areas outside of the Limited Area usually is considered to be Class 3 unless a scoping survey indicates otherwise. Class 3 items will undergo a 10% surface scan of accessible surfaces.

MARSSIM indicates that the maximum survey unit size for a Class 3 area is unlimited; therefore, one survey unit per anomaly will be established for this effort.

If, during the performance of the radiological survey, contamination is detected at levels exceeding the Class 3 criteria, the survey unit will be reclassified and surveyed at a more rigorous level.

A1.4.4.2 Determining the Number of Survey Points

The Sign test will be used for porous materials due to the direct comparison with DOE surface contamination limits.

Due to the unknown quantity of concrete rubble that will be encountered in the selected anomalies, at least 1 direct measurement of beta/gamma contamination will be made for every 1 m^2 of accessible surface area. For rubble smaller with an accessible surface area smaller than 1 m^2, one direct measurement will be performed per item.

A1.5. SURVEY IMPLEMENTATION

A1.5.1 POROUS MATERIALS

Concrete rubble will be accessed during the performance of gamma walkover survey conducted at the selected anomalies. In accordance with the anomaly survey plan, 25 of the anomalies will be subjected to a gamma walkover survey. If concrete rubble is identified during the gamma walkover survey, surveyors (i.e., RCTs) also will conduct surveys of the rubble.

- Access the surfaces to be surveyed and assure that the surfaces are free of any material that might interfere with meaningful contamination measurements.

- Perform a beta/gamma one-minute timed count to determine the ambient background radiation levels in the area in which the survey is being conducted. Be sure to ensure that the probe is not in contact with potentially contaminated materials at the time of the measurements. Record the readings on the survey form in counts per minute (cpm). The background value shall be recorded on the survey and used as the reference background for this survey unit and for determining the IMC.

- Accessible surfaces of every concrete rubble item will be scanned for potential beta/gamma emitting surface contaminants. Class 3 is utilized as the base assumption, requiring a 10% scan of the accessible surface.

- During the scan, if any areas having count rates in excess of the IMC values established in Table A1.1 are discovered, perform a timed one-minute count for beta/gamma activity in the area of highest activity. If during the scan, a result exceeds the IMC, the material will be reclassified and a more rigorous scan will be performed. Results exceeding the IMC but with static measurements less than the 50% of the DOE limits will be scanned at 50%. Results exceeding the IMC but with static measurements less than the 75% of the DOE limits will be scanned at 100%. Rubble with results exceeding DOE limits will be managed accordingly and 100% of the accessible surface area will be scanned.

- If no areas of elevated count rate are discovered, obtain timed one-minute direct measurements at random locations.

- For items with an accessible surface area larger than 1 m^2, at least one timed count will be made per meter. Every piece of concrete rubble should have at least one timed measurement of beta/gamma contamination.

Scan results will be reported on the survey. The survey will denote the amount and locations of the scan and the results. An example in the comments section might be, "10% surface scan performed of anomaly 22 consisting of 10 pieces of concrete rubble. The scan focused on areas of visible discoloration and gouges. Background reading was 60 cpm. All beta/gamma scan readings were less than the IMC of 110 cpm."

A1.6. EVALUATING SURVEY RESULTS

Survey data will be reviewed to assure all aspects of this plan have been followed. Survey data will be evaluated to assure proper instrument performance and acceptable quality assurance/quality control data. Data will be reviewed by the RCT Supervisor to ensure completeness, to ensure proper implementation of program quality control requirements, and to ensure that areas are properly controlled per DOE regulations.

If the survey results satisfy the release criteria established in Section A1.3, the null hypothesis is disproven.

A1.7. DOCUMENTATION

Results of surface contamination measurements of concrete rubble will be provided in the project final report.

A1.8. QUALITY ASSURANCE

Survey instruments and methods specified in applicable RADCON operating and technical procedures previously have been documented as to their ability to provide a 95% confidence level in detection of surface contamination at levels, which meet the requirements of this protocol. Supporting data will be provided on each survey form.

The GWS supervisor will review, evaluate, and validate the survey results including assessment of the quality assurance/quality control information and data.

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX B

SUMMARY OF PREVIOUS WORK

THIS PAGE INTENTIONALLY LEFT BLANK

CONTENTS

THIS PAGE INTENTIONALLY LEFT BLANK

FIGURES

TABLE

THIS PAGE INTENTIONALLY LEFT BLANK

ACRONYMS

AOC	area of concern
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
cpm	counts per minute
DOE	U.S. Department of energy
EI	environmental indicator
GWS	gamma walkover survey
HAS	historic site assessment
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
OU	operable unit
PGDP	Paducah Gaseous Diffusion Plant
RCRA	Resource Conservation and Recovery Act
RSL	Remote Sensing Laboratory
SER	site evaluation report
SMP	Site Management Plan
SWMU	soil waste management unit
WKWMA	West Kentucky Wildlife Management Area

THIS PAGE INTENTIONALLY LEFT BLANK

B.1 INTRODUCTION

The U.S. Department of Energy (DOE) conducted a sitewide scoping survey under the Soils Operable Unit (OU). The sitewide scoping survey was implemented by doe to collect data and information that could be used to identify potentially unknown contaminated areas originating from the Paducah Gaseous Diffusion Plant (PGDP) that potentially require 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.

B.2 BACKGROUND

Section 2 of the main text of this document describes the Site Background and Physical Settings. According to the Site Management Plan (SMP) (DOE 2014), the "scope of the project includes a survey of DOE-owned property outside the limited/controlled area. A sitewide evaluation will be performed to identify any potentially unknown contaminated areas requiring further CERCLA evaluation and to develop information usable when completing the RCRA EIs process."

The following were the key planning assumptions included in the SMP (DOE 2014):

(1) A flyover radiological survey has been conducted for a 25 square miles area.

(2) A visual walkover survey covered DOE-owned property that is outside the controlled area and not currently a solid waste management unit (SWMU)/area of concern (AOC) (approximately 2,676 acres). DOE property licensed to WKWMA and areas owned by WKWMA identified as anomalies in the flyover also will be surveyed.

(3) Visual observation was 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 covered at least 10% of the property identified above (approximately 240 acres). All identified anomalies have been scanned regardless of what percentage of land they cover.

(5) All anomalies have been documented on a map and in a database, including location, description, photographs, and data.

(6) Analytical sampling has been conducted if the radiological scan indicates contamination (i.e., 2 × instrument background) or a release is identified visually.

(7) Information will be documented in a sitewide evaluation report (SER). SWMU assessment reports 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 (pre-GDP Shutdown). A separate removal action will not be performed.

An anomaly is defined as any area that exhibits two times instrument radiological background and/or is a pile, dip, debris, or other potential man-made disturbance.

The scope of the Sitewide Evaluation Work Plan was accomplished under DOE authority.

B.3 OBJECTIVES

The objective of the sitewide evaluation was to identify anomalies that potentially were from PGDP activities in areas outside the Limited Area and within the WKWMA property. Figures B.1 and B.2 illustrate areas being evaluated through implementation of the sitewide evaluation. The sitewide evaluation work plan was designed to use visual surveys, radiation drive-over surveys (open areas), aerial photographic and aerial radiation surveys, and walkover radiation surveys to obtain data to support the following objectives:

(1) Identify anomalies on DOE-owned and WKWMA-owned property and confirm DOE origin. DOE origin was determined on DOE-owned property by radiological and visual walkover surveys where radiological readings are greater than twice instrument background, where a release was identified visually, or where an anomaly was identified by process knowledge.

(2) DOE origin was determined on WKWMA-owned property by (1) elevated gamma ray dose rates from the aerial radiological survey or if identified by the aerial photographs; and (2) then radiation and visual walkover surveys where radiation instrument readings are greater than twice instrument background, or where a release can be identified visually, or where an anomaly can be identified by process knowledge.

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

(4) 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.

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

If areas were found using visual surveys, radiation drive-over surveys (open areas), aerial photographic and aerial radiation surveys, and walkover radiation surveys that contained contaminants from PGDP activities, a further evaluation under CERCLA would be necessary.

If an anomaly was suspected to contain material related to PGDP activities through visual inspection, the presence or absence of contamination related to plant process activities would be determined. The above Sitewide Evaluation Work Plan steps are consistent with the scoping survey typically used to identify potential areas of contamination in large areas. The Sitewide Evaluation Work Plan, therefore, noted that results of scoping surveys, identified anomalies, and assessments could be utilized in future planning and decisions.

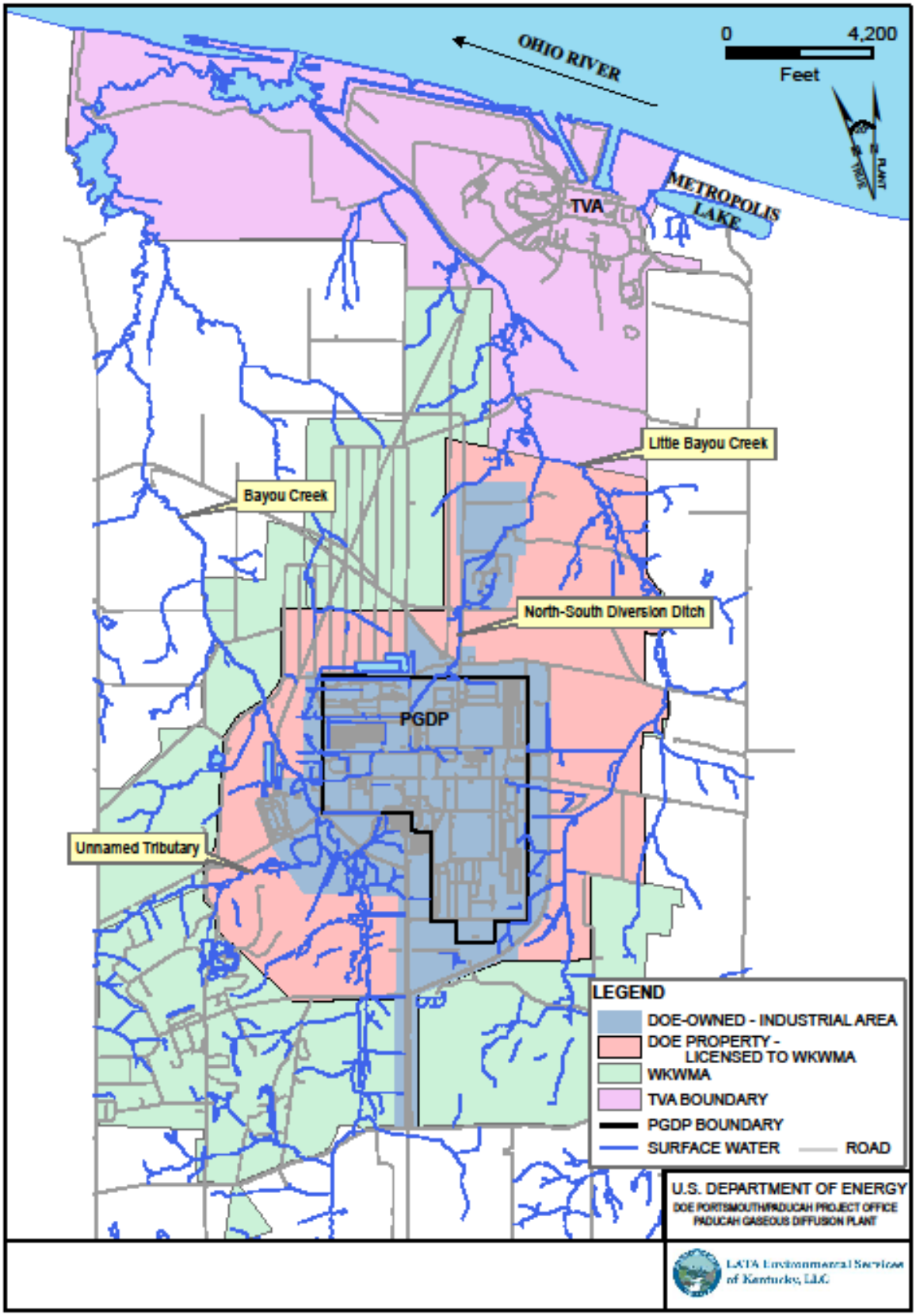


Figure B.1. PGDP and Surrounding Area

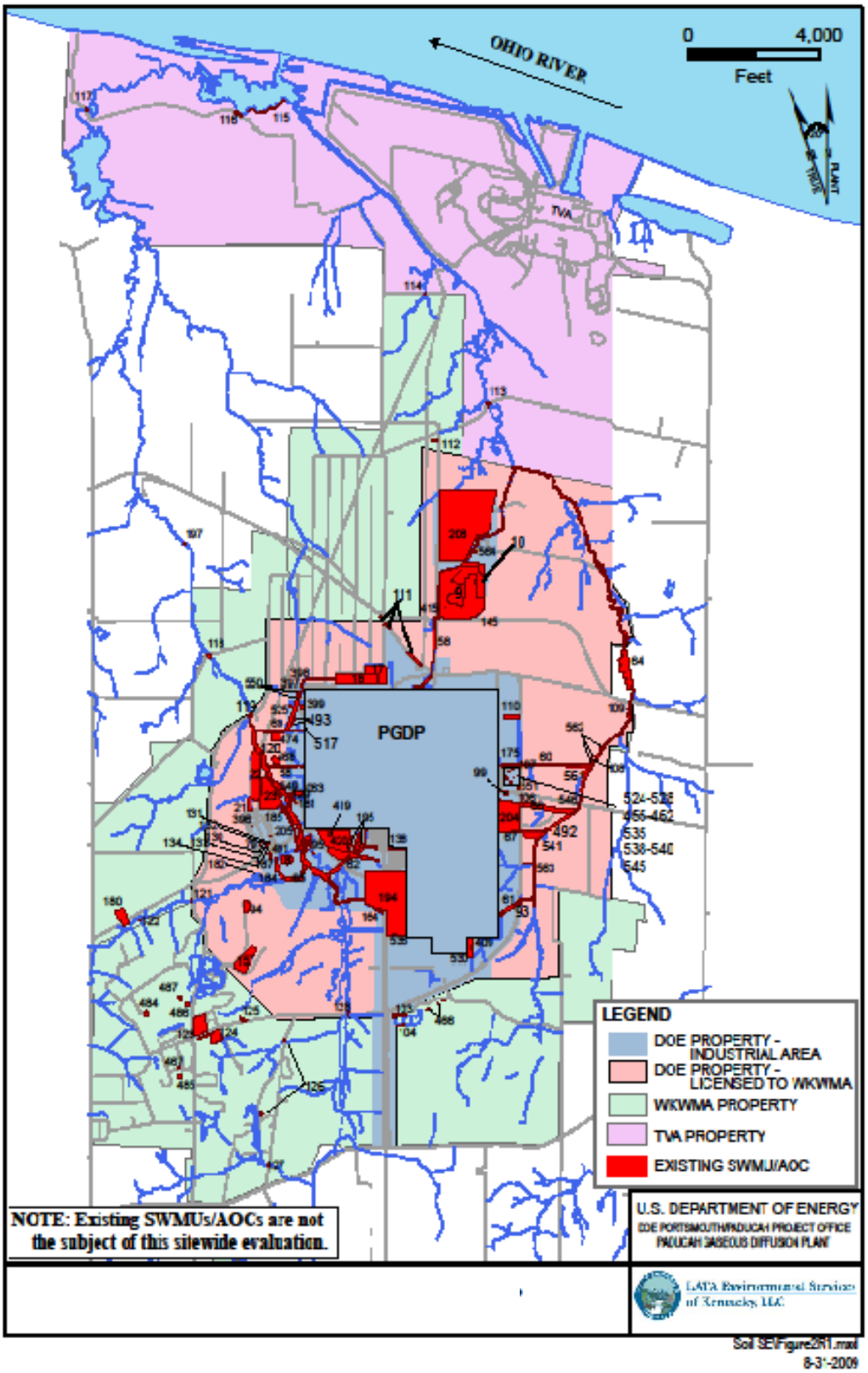


Figure B.2. Existing SWMUs/AOCs outside of the DOE Limited Area at PGDP

B.4 PHYSICAL SETTING

Figures B.1 and B.2 illustrate areas surrounding PGDP and existing SWMUs and AOCs outside of the Limited Area. DOE owns 3,423 acres with 650 acres comprising the Limited Area at PGDP. DOE licenses 1,986 acres (Figure B.1) outside the Limited Area to the Commonwealth of Kentucky's Department of Fish and Wildlife Resources. The SWMUs and AOCs shown in Figure B.2 (in red) were not subject to the activities conducted under the work plan because these SWMUs and AOCs will be or have been investigated under other CERCLA sampling and analysis plans.

Potential areas outside the Limited Area and within the WKWMA property are most likely bare soil areas, soil piles, and debris areas. Figure B.2 illustrates the majority of the areas are located along surface water drainages (i.e., PGDP outfalls, Bayou and Little Bayou Creeks, an unnamed tributary, and the North-South Diversion Ditch) and roadways. These areas are being addressed as part of other projects.

Historical site assessment (HSA) indicated areas listed in the above paragraph most likely could have been contaminated through PGDP plant process activities. Areas investigated as part of the sitewide evaluation were away from these surface water drainages and roadways and are not suspected to be contaminated based upon the HSA. For example, investigation conducted by (1) DOE at Soil Pile I (DOE 2008), (2) KRCEE at AOC 492 (KRCEE 2008), and (3) the Commonwealth of Kentucky for area of interest (AOI) support the supposition that contamination would not be expected away from these areas (KYRHB 2009). The work plan for the sitewide evaluation is consistent with MARSSIM (DOE 2000) and with information in *Decommissioning Health Physics, A Handbook for MARSSIM Users* (Abelquist 2001) in that an efficient survey was designed to scope potential anomalies outside the Limited Area. The HSA provides the basis for considering the areas covered by the sitewide evaluation to be classified as a Class 3 Area. Based on the HSA, the potential for having residual contamination is low in the areas covered by the sitewide evaluation; if contamination did exist, it would be expected to be significantly below release criteria.

B.5 SCOPING SURVEYS

In order to identify and evaluate the existence of contamination at unknown anomalies, scoping surveys were conducted under the Sitewide Evaluation Work Plan (DOE 2011a). Scoping surveys employed walkover radiation surveys, drive-over radiation surveys of open areas, and visual walkover surveys to identify anomalies outside the Limited Area. The MARSSIM guidance (DOE 2000) was used to aid in developing the Sitewide Evaluation Work Plan.

The sitewide evaluation employed visual surveys in conjunction with scoping radiation surveys outside the Limited Area, shown in pink and blue in Figure B.2. DOE-owned property, shown in pink and blue in Figure B.2, was evaluated with 100% visual and a minimum of 10% by a scoping radiation survey (drive-over in open areas). The visual surveys were carried out by visually observing and physically locating a potential anomaly and recording the location, physical size, type of anomaly, any other information, and performing a topographic survey. All visually identified anomalies outside the Limited Area had gamma walkover surveys (GWSs) conducted with the minimum, maximum, and average count rate recorded for the anomaly.

Conducting GWSs of the anomalies observed during the visual walkover survey is consistent with previous scoping/evaluation of debris and soil piles conducted at PGDP. Therefore, in addition to

coverage of 10% of the area outside the Limited Area, GWSs using a 2×2 NaI detector were conducted for all visually identified anomalies.

An aerial radiation survey, Figure B.3, was used to identify potential anomalies on the WKWMA property. This aerial survey was conducted in 2009 by the National Nuclear Security Administration's Remote Sensing Laboratory (RSL), which is maintained and operated by National Security Technologies, LLC, at Nellis Air Force Base in Las Vegas, Nevada, and Andrews Air Force Base, Maryland (DOE 2011b). Results of the 2009 aerial survey were compared to aerial radiation survey conducted in 1990. The earlier aerial radiation survey was conducted by the RSL.

Aerial color photographs were taken from a height of greater than 5,000 ft when the foliage was dormant and covered approximately 32 square miles around PGDP. The area was photographed and mapped at a scale of 1 inch = 100 ft and with 2 ft minimum topographic contours. A digital elevation model was developed from the collected high resolution aerial photographs. Using this information a three-dimensional model was created. This information also aided in the identification of soil and debris areas, including the estimation of waste volumes, if needed.

B.6 VISUAL WALKOVER SURVEY

During January and March 2009 visual walkover surveys were conducted except for areas that were not accessible due to an ice storm in 2009. Visual walkover surveys were completed for these excluded areas during the following year.

The visual walkover survey covered areas outside the Limited Area. The visual walkover survey did not cover areas that presently are identified as a SWMU/AOC. The intent of the visual walkover survey was to identify piles, spills, buried materials, and other anomalies that potentially are of PGDP origin.

As with previous historical visual walkovers for the soil piles, the visual walkover survey provided information/data related to the anomaly's location, physical size, type, and other information. Information related to the visual walkover survey is provided in Table B.1 located at the end of this appendix.

B.7 RADIATION AND VISUAL INVESTIGATION FINDINGS

Implementation of the sitewide evaluation visual and GWS established the presence of 633 anomalies (DOE 2011b). After cosswalking the anomalies with previously identified anomalies, 99 were found to be part of previous evaluations/investigations and were removed. Therefore, 534 new anomalies were found as a result of implementation of the Sitewide Evaluation Work Plan. Visually identified anomalies that were removed previously were identified as part of the Soil Piles Addendum 2, Waste Area Group 17, existing SWMUs/AOCs, or known existing structures (e.g., Kentucky Ordinance Works bunkers).

The GWS data for identified anomalies from implementation of the Sitewide Evaluation Work Plan is provided in Table B.1. The average counts per minute (cpm) for anomalies ranged from 1,000 cpm to 24,000 cpm. The 1,000 cpm was for anomaly PJ-08-04-V-1, a plastic bucket. The 24,000 cpm was for anomaly PM-26-02-R-2, concrete blocks.

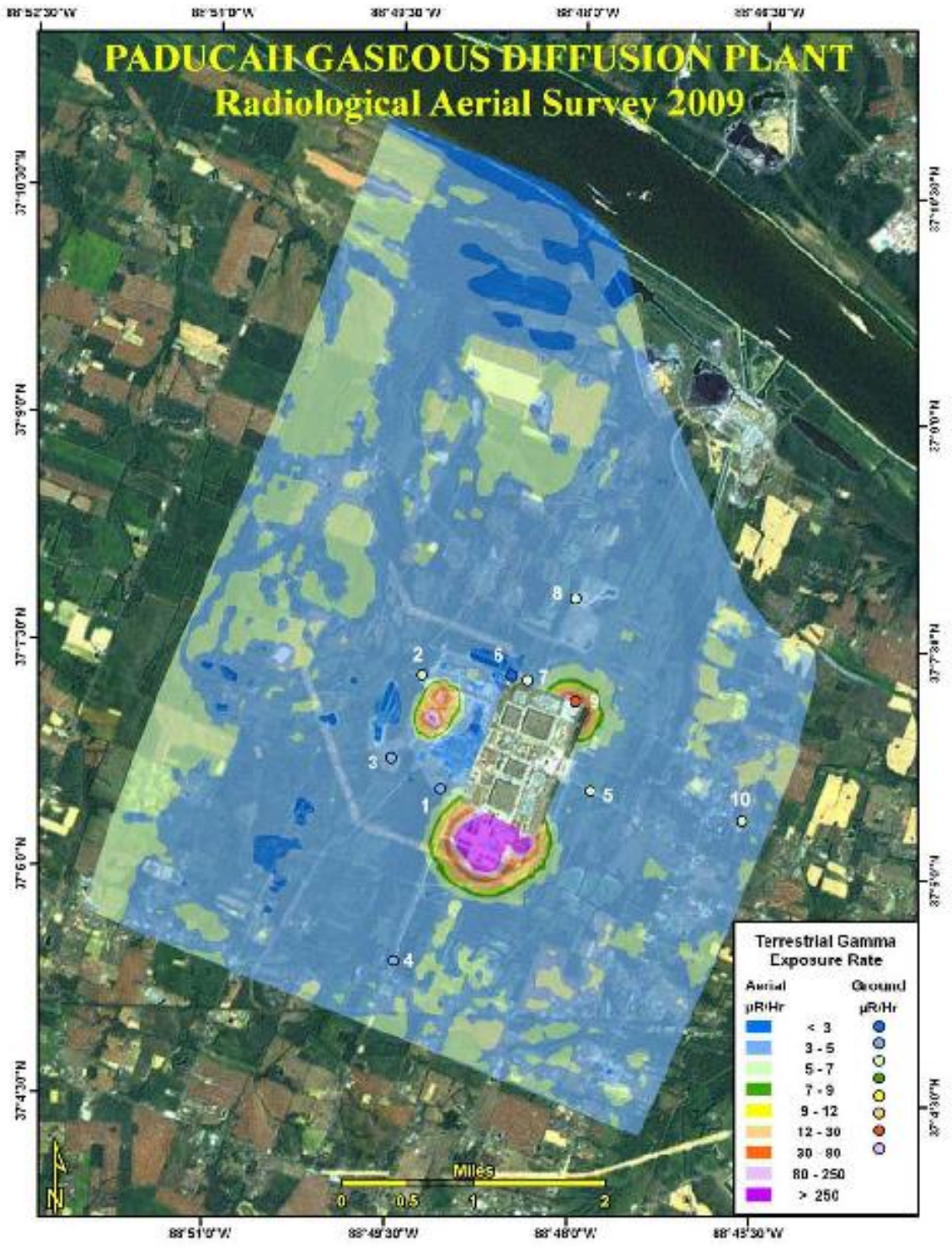


Figure B.3. DOE 2009 Aerial Survey Area

B.8 AERIAL RADIATION SURVEY

The aerial radiation survey was conducted to assess areas within and adjacent to the PGDP. The aerial radiation survey was conducted in October and November 2009 and used an array of sodium iodide detectors mounted on a helicopter. The area covered by the aerial radiation survey was 24 square miles and is shown in Figure B.3. The aerial radiation survey covered both DOE owned property and the WKWMA property. The intent was to update previous aerial surveys conducted in 1976 and 1990 and provide data that could potentially be used in ongoing radiation evaluation of areas on and around PGDP.

The result of the aerial radiation survey is presented in the contour map shown in Figure B.4. In order to validate the data from the aerial measurements, exposure rate measurements were taken with a pressurized ionization chamber (see DOE 2000, Appendix H, Description of Field Survey and Laboratory Analysis Equipment) at 10 specific locations on the ground. As is evident from Figure B.4, the gamma ray dose rates for areas that are away from cylinder yards where processed uranium is stored, are consistent with what is expected for background rates in the PGDP area (LATA Kentucky 2014).

The aerial radiation survey demonstrates that there does not appear to be anomalies away from the cylinder yards. Furthermore, the gamma ray dose rates observed outside of the cylinder yards are consistent with the gamma ray dose rates observed for areas at the away from the cylinder yards at PGDP (LATA Kentucky 2014).

B.9 REFERENCES

Abelquist, Eric W. 2001. *Decommissioning Health Physics, A Handbook for MARSSIM Users*, ISBN-10 503 0761 7, Institute of Physics Publishing, Philadelphia, PA.

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

DOE 2011a. *Sitewide Evaluation Work Plan at the Paducah Gaseous Diffusion Plant Paducah, Kentucky*, DOE/LX/07-0228&D2, U.S. Department of Energy, Paducah, KY, May.

DOE 2011b. *Sitewide Evaluation Report for the Soils Operable Unit at the Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, DOE/LX/07-1256&D1, U.S. Department of Energy, Paducah, KY, June.

DOE 2014. *Site Management Plan, Paducah Gaseous Diffusion Plant, Paducah, Kentucky, Annual Revision—FY 2014*, DOE/LX/07-1292&D2, U.S. Department of Energy, Paducah, KY, February.

KRCEE (Kentucky Research Consortium for Energy and Environment) 2008. *Real Time Technology Application Demonstration Project Final Report*, UK/KRCEE Doc#. P18.32 2008, Kentucky Research Consortium for Energy and Environment, Lexington, KY.

KYRHB (Kentucky Radiation Health Branch) 2009. *Characterization and Assessment of Areas of Interest*, Kentucky Radiation Health Branch, Radiation/Environmental Monitoring Section, Frankfort, KY, May.

Figure B.4. Gamma Ray Dose Rates for Aerial Survey

LATA Kentucky (LATA Environmental Services of Kentucky, LLC) 2014. *Annual Report on External Radiation Monitoring for Calendar Year 2013, Paducah Gaseous Diffusion Plant, Paducah, Kentucky*, PAD-RAD-0621, LATA Environmental Services of Kentucky, LLC, Kevil, KY, March.

NRC (Nuclear Regulatory Commission) 1998. *A Nonparametric Statistical Methodology for the Design and Analysis of Final Status Decommissioning Surveys*, NUREG 1505, Washington, DC, June.

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PU-24-01-V-5	x	15,000	17,000				dirt mound	743685.3565	1933952.2674
PU-24-01-V-6	x	13,000	15,000				dirt mound, plastic construction fencing	743735.6517	1934030.7449
PY-14-01-V-8	x	16,000	19,000				soil mound	744172.0354	1930750.0428
PY-14-01-V-6	x	15,000	18,000				soil mound	744253.8593	1931032.8835
PU-24-01-V-4	x	14,000	18,000				dirt mound	744720.6235	1935464.2394
PY-13-01-V-2	x	15,000	17,000				concrete pipe	744749.6589	1933545.8706
PY-13-01-V-5	x	16,000	19,000				concrete	744968.9498	1932799.4482
PY-13-01-V-4	x	15,000	18,000				dirt mound	745049.4286	1932839.7040
PV-21-01-V-6	x	2,800	3,900	1/19/2010	10-BOP-03989-S	Used shielded probe due to high background readings.	dirt mound	745164.2250	1935562.7301
PV-21-01-V-5	x	14,000	16,000				dirt mound	745205.4651	1935251.4774
PV-21-01-V-7	x	16,000	23,000				concrete, dirt mounds	745440.0118	1935419.4233
PV-24-01-V-8		16,000	14,000				dirt mound	745480.5301	1933795.0827
PS-19-03-V-17		7,000	8,000	3/19/2010	10-BOP-04191-S		trash, paper, plastic	751365.5360	1938470.6750
PA-15-03-V-1	x	9,000	9,400	3/15/2010	10-BOP-04180-S		soil mound	752851.6086	1945666.254
PA-15-03-V-2	x	9,000	9,200	3/15/2010	10-BOP-04180-S		soil mound	753022.7939	1945615.123
PA-15-03-V-3	x	9,000	9,500	3/15/2010	10-BOP-04180-S		soil mound	753203.5744	1945573.335
PA-15-03-V-4	x	8,000	8,600	3/15/2010	10-BOP-04180-S		soil mound	752781.5008	1946049.323
PA-15-03-V-6	x	8,800	9,000	3/15/2010	10-BOP-04180-S		soil mound	752641.38	1946020.498
PA-15-03-V-7	x	7,800	8,500	3/15/2010	10-BOP-04180-S		soil mound	752693.4222	1945872.539
PA-15-03-V-8	x	8,000	8,500	3/15/2010	10-BOP-04180-S		soil mound	752885.3575	1946505.849
PA-15-03-V-9	x	8,800	9,000	3/15/2010	10-BOP-04181-S		soil mound	753038.9038	1947054.296
PB-13-02-V-1	x	9,800	10,600	2/13/2009	09-BOP-03163-S	No elevated readings found.	dirt mound	751767.0547	1946868.542
PB-13-02-V-2	x	10,100	11,400	2/13/2009	09-BOP-03162-S	No elevated reading found.	dirt mound	753591.1792	1946230.796
PD-04-03-V-1	x	8,000	9,500	3/4/2009	09-BOP-03095-S	No elevated reading found.	dirt mound	743802.4258	1942549.435
PD-05-03-V-17	x	9,600	10,800	3/5/2010	10-BOP-04148-S	No significant readings found.	soil mound	744664.7998	1942467.606
PD-05-03-V-18	x	10,300	10,600	3/5/2010	10-BOP-04148-S	No significant readings found.	Metal Pipe	744577.629	1942602.277
PD-12-04-V-1	x	6,500	6,800	4/12/2010	10 BOP-04319-S	No high readings found.	soil mound	744265.922	1942463.271
PD-12-04-V-2	x	5,800	6,000	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	744199.6022	1942188.237
PE-01-03-V-18	x	8,900	10,800	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	748098.3877	1943467.032
PE-01-03-V-19	x	9,900	10,900	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747912.9567	1943543.387
PE-01-03-V-20	x	9,400	9,900	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747564.4659	1943696.64
PE-01-03-V-21	x	9,300	9,700	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747525.5145	1943713.073
PE-01-03-V-22	x	9,800	10,500	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747355.9844	1943770.004
PE-01-03-V-23	x	8,700	9,300	3/1/2010	10-BOP-04128-S	No high readings found.	Barrel strapped to tree	747459.6279	1943949.509
PE-01-03-V-24	x	10,000	15,000	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747730.004	1944184.765
PE-01-03-V-25	x	9,700	10,000	3/1/2010	10-BOP-04128-S	No high readings found.	soil mound, limbs, tree debris	747637.6275	1944303.488
PE-02-03-V-1	x	10,000	10,400	3/2/2010	10-BOP-04124-S	No significant readings found.	soil mound, limbs, tree debris	747249.9216	1944487.744
PE-02-03-V-10	x	6,400	6,800	3/2/2010	10-BOP-04125-S	No significant readings found.	rail road ties and pipe	746545.5759	1944420.984
PE-02-03-V-11	x	8,200	8,600	3/2/2010	10-BOP-04125-S	No significant readings found.	wood planks	746676.576	1944677.164

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PE-02-03-V-12	x	92,00	10,200	3/2/2010	10-BOP-04125-S	No significant readings found.	concrete culvert	746699.9184	1944762.804
PE-02-03-V-13	x	10,600	11,800	3/2/2010	10-BOP-04141-S	No significant readings found.	soil mound, limbs, tree debris	746295.0623	1944239.436
PE-02-03-V-14	x	9,400	10,500	3/2/2010	10-BOP-04141-S	No significant readings found.	soil mound, limbs, tree debris	745914.8209	1943924.541
PE-02-03-V-15	x	10,500	11,100	3/2/2010	10-BOP-04141-S	No significant readings found.	soil mound, limbs, tree debris	745614.185	1943537.542
PE-02-03-V-16	x	9,400	9,800	3/2/2010	10-BOP-04141-S	No significant readings found.	concrete culvert	745602.479	1943417.736
PE-02-03-V-17	x	10,000	10,900	3/2/2010	10-BOP-04141-S	No significant readings found.	Square pond.	745511.3306	1943376.034
PE-02-03-V-18	x	10,600	11,200	3/2/2010	10-BOP-04141-S	No significant readings found.	soil mound, limbs, tree debris	745798.8802	1943482.746
PE-02-03-V-19	x	9,500	10,500	3/2/2010	10-BOP-04141-S	No significant readings found.	soil mound, limbs, tree debris, barbed wire	746446.4052	1943651.937
PE-02-03-V-2	x	9,600	10,400	3/2/2010	10-BOP-04124-S	No significant readings found.	Metal Pipe	747120.2266	1944152.707
PE-02-03-V-3	x	9,800	10,200	3/2/2010	10-BOP-04124-S	No significant readings found.	soil mound, limbs, tree debris	746995.3473	1943942.516
PE-02-03-V-4	x	7,700	8,000	3/2/2010	10-BOP-04124-S	No significant readings found.	rail road ties	746429.1486	1944166.827
PE-02-03-V-5	x	9,700	10,300	3/2/2010	10-BOP-04124-S	No significant readings found.	soil mound, limbs, tree debris	746356.3591	1944215.426
PE-02-03-V-6	x	8,400	8,600	3/2/2010	10-BOP-04124-S	No significant readings found.	soil mound, limbs, tree debris	746488.5271	1944336.034
PE-02-03-V-7	x	7,300	7,500	3/2/2010	10-BOP-04125-S	No significant readings found.	wood bench	746461.9819	1944419.697
PE-02-03-V-8	x	6,500	7,000	3/2/2010	10-BOP-04125-S	No significant readings found.	gravel	746583.5115	1944414.316
PE-02-03-V-9	x	6,500	6,800	3/2/2010	10-BOP-04125-S	No significant readings found.	gravel	746607.1289	1944461.123
PE-03-03-V-1	x	7,800	8,200	3/3/2010	10-BOP-04142-S	No significant readings found.	soil mound at end of path	746582.6053	1943318.253
PE-03-03-V-10	x	8,300	8,800	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound, limbs, tree debris	747435.8641	1943357.597
PE-03-03-V-11	x	8,700	9,000	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound around depression filled with water	747232.46	1942986.258
PE-03-03-V-12	x	9,000	10,200	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound, limbs, tree debris	747426.9701	1943090.857
PE-03-03-V-13	x	8,800	9,800	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound around depression filled with water	747392.3491	1943015.307
PE-03-03-V-14	x	7,400	7,600	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound, limbs, tree debris	747311.4487	1942924.45
PE-03-03-V-15	x	7,200	8,300	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound, limbs, tree debris	747614.7867	1943215.163
PE-03-03-V-2	x	8,300	8,500	3/3/2010	10-BOP-04142-S	No significant readings found.	soil mound around depression filled with water	746744.1779	1943197.211
PE-03-03-V-3	x	8,300	8,500	3/3/2010	10-BOP-04142-S	No significant readings found.	small soil mounds with ice storm debris	746820.5373	1943354.771
PE-03-03-V-4	x	8,000	8,700	3/3/2010	10-BOP-04142-S	No significant readings found.	soil mound, limbs, tree debris	746855.0411	1943574.017
PE-03-03-V-5	x	7,900	8,000	3/3/2010	10-BOP-04142-S	No significant readings found.	small depression	747190.5011	1943458.183
PE-03-03-V-6	x	8,200	8,500	3/3/2010	10-BOP-04142-S	No significant readings found.	small depression	747193.5523	1943347.76
PE-03-03-V-7	x	8,400	8,800	3/3/2010	10-BOP-04142-S	No significant readings found.	metal fence post	747255.1142	1943317.734
PE-03-03-V-8	x	7,600	8,100	3/3/2010	10-BOP-04142-S	No significant readings found.	depression	747173.8348	1943043.838
PE-03-03-V-9	x	8,500	9,600	3/3/2010	10-BOP-04127-S	No significant readings found.	soil mound	747391.6838	1943361.152
PE-05-03-V-1	x	10,600	13,000	3/5/2010	10-BOP-04126-S	No significant readings found.	soil mound	747727.8724	1943185.877
PE-05-03-V-12	x	10,100	10,900	3/5/2010	10-BOP-04147-S	No significant readings found.	concrete	745411.8321	1943040.087
PE-05-03-V-13	x	9,700	10,600	3/5/2010	10-BOP-04147-S	No significant readings found.	concrete, soil mounds	745322.4359	1943066.563
PE-05-03-V-14	x	10,600	11,100	3/5/2010	10-BOP-04147-S	No significant readings found.	bare soil	745401.713	1943017.914
PE-05-03-V-15	x	9,100	9,300	3/5/2010	10-BOP-04147-S	No significant readings found.	concrete, soil mounds	745084.8449	1942732.526
PE-05-03-V-16	x	9,000	9,200	3/5/2010	10-BOP-04147-S	No significant readings found.	soil mound	744957.2513	1942592.009
PE-05-03-V-19		8,000	8,300	3/5/2010	10-BOP-04148-S	No significant readings found.	soil mound	744868.907	1942949.523
PE-05-03-V-2	x	10,400	10,900	3/5/2010	10-BOP-04126-S	No significant readings found.	soil mound	747860.1071	1943137.676

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PE-05-03-V-20		10,500	10,700	3/5/2010	10-BOP-04148-S	No significant readings found.	soil mound	745563.5431	1942692.65
PE-05-03-V-3	x	9,700	10,600	3/5/2010	10-BOP-04126-S	No significant readings found.	soil mound	747843.7363	1942997.017
PE-05-03-V-4	x	9,700	10,300	3/5/2010	10-BOP-04126-S	No significant readings found.	soil mound	747814.0619	1942895.027
PE-05-03-V-5	x	9,400	10,000	3/5/2010	10-BOP-04126-S	No significant readings found.	soil mound	747751.3881	1942799.56
PE-05-03-V-6	x	9,900	10,800	3/5/2010	10-BOP-04126-S	No significant readings found.	depression	747896.7809	1942832.206
PE-05-03-V-7	x	8,900	10,100	3/5/2010	10-BOP-04126-S	No significant readings found.	bucket of soil	747972.5196	1942956.996
PE-09-02-V-12	x	9,200	10,000			No gamma scan performed. Area is unaccessible.	Dirt Mounds, Misc. Debris	745143.6009	1943317.59
PE-09-02-V-17	x	7,400	8,600	5/5/2009	09-BOP-02708-S		rail road ties, soil	746454.1987	1944150.016
PE-09-02-V-2	x	9,100	10,400	2/9/2009	09-BOP-03157-S	No elevated readings found.	Dirt Mounds, Misc. Debris	747346.5076	1943417.84
PE-09-02-V-24	x	9,600	10,200	2/9/2009	09-BOP-03159-S	No elevated readings found.	dirt mounds	747643.9706	1943641.956
PE-09-02-V-3	x	4,400	4,800	2/9/2009	09-BOP-03140-S	No elevated readings found.	dirt mound	746784.723	1943140.385
PE-09-02-V-5	x	8,000	8,800	2/9/2009	09-BOP-03156-S	No elevated readings found.	concrete, well, manhole	746377.9252	1943787.555
PE-09-02-V-6	x	8,000	8,700	1/27/2010	10-BOP-04013-S		Metal Beams, Rail Road Tracks, Dirt Mounds.	745129.8292	1942683.459
PE-09-02-V-7	x	7,900	10,100	5/5/2009	09-BOP-02708-S		Soil, holding ponds, cable	744750.6696	1942344.805
PE-09-02-V-8	x	9,200	10,000			No gamma scan performed. Area is unaccessible.	Concrete, Dirt Mounds.	745390.4009	1943014.874
PF-01-03-V-1	x	10,100	10,800	3/1/2010	10-BOP-04111-S	No significant readings found.	depression	749146.4647	1943387.651
PF-01-03-V-10	x	10,600	11,000	3/1/2010	10-BOP-04113-S	No significant readings found.	pipe	749267.95	1943654.732
PF-01-03-V-11	x	10,500	11,000	3/1/2010	10-BOP-04113-S	No significant readings found.	plastic bucket, wood, moss covered solidified substance	749077.3901	1943793.632
PF-01-03-V-12	x	10,600	11,200	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	748705.9564	1943503.545
PF-01-03-V-13	x	9,600	10,100	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	748671.1999	1943412.677
PF-01-03-V-14	x	9,600	9,900	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	748620.7771	1943287.713
PF-01-03-V-15	x	10,100	10,800	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	748424.7345	1943330.191
PF-01-03-V-16	x	10,200	10,900	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	748206.6014	1943437.821
PF-01-03-V-17	x	9,400	9,600	3/1/2010	10-BOP-04128-S	No high readings found.	concrete pipe	748221.4961	1943844.002
PF-01-03-V-2	x	10,200	11,000	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	749132.5874	1943259.549
PF-01-03-V-3	x	9,600	9,800	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	749244.9694	1943157.112
PF-01-03-V-4	x	9,800	10,500	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	749009.2127	1943285.385
PF-01-03-V-5	x	8,100	9,000	3/1/2010	10-BOP-04111-S	No significant readings found.	concrete pipe	748844.3492	1943141.932
PF-01-03-V-6	x	9,800	10,000	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	748838.8735	1943220.102
PF-01-03-V-7	x	9,600	10,200	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	748845.5211	1943461.706
PF-01-03-V-8	x	9,900	10,400	3/1/2010	10-BOP-04111-S	No significant readings found.	soil mound	748882.1296	1943531.023
PF-01-03-V-9	x	7,900	8,500	3/1/2010	10-BOP-04113-S	No significant readings found.	soil mound	749096.2361	1943614.143
PF-05-03-V-10	x	9,500	10,200	3/5/2010	10-BOP-04137-S		soil mound	748265.6541	1942993.018
PF-05-03-V-11	x	10,100	11,000	3/5/2010	10-BOP-04137-S		soil mound, limbs, tree debris	748597.4727	1942797.129
PF-05-03-V-8	x	10,300	10,800	3/5/2010	10-BOP-04137-S		soil mound, rail road ties	748078.4206	1943065.613
PF-05-03-V-9	x	10,400	11,000	3/5/2010	10-BOP-04137-S		soil mound, limbs, tree debris	748185.6668	1943024.801
PF-11-03-V-25	x	8,600	9,300	1/12/2010	10-BOP-03923-S		dirt mounds	748804.4684	1942141.141
PF-12-02-V-1	x	7,200	8,200	8/24/2009	10-BOP-03309-S		concrete pipe	748163.8967	1943857.093

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PF-12-02-V-10	x	10,000	6,000	4/15/2009	10-BOP-02629-S		dirt mound	750276.9601	1943197.416
PF-12-02-V-11	x	7,000	7,000	4/21/2009	10-BOP-02689-S		dirt mound	751116.8139	1942609.658
PF-12-02-V-12	x	7,000	8,000	4/21/2009	09-BOP-02688-S		dirt mound	750888.4123	1942700.268
PF-12-02-V-13	x	7,000	8,000	4/21/2009	09-BOP-02688-S		dirt mound	750678.2749	1942695.987
PF-12-02-V-2	x	8,000	8,500	1/13/2010	10-BOP-03926-S		dirt mound	748256.5989	1944066.314
PF-12-02-V-3	x	8,300	9,000	1/12/2010	10-BOP-03923-S		dirt mound	749114.6494	1943715.643
PF-12-02-V-4	x	6,000	6,000	4/15/2009	09-BOP-02629-S		dirt mound, grappler, barrel	750067.3633	1943018.864
PF-12-02-V-5	x	6,000	6,000	4/15/2009	09-BOP-02629-S		dirt mound, buried railroad ties	749966.1764	1942780.507
PF-12-02-V-6	x	6,000	6,000	4/15/2009	09-BOP-02629-S		dirt mound	749923.0993	1942652.535
PF-12-02-V-7	x	10,000	10,600	1/11/2010	10-BOP-03906-S		dirt mound	749715.5242	1942233.061
PF-12-02-V-8	x	8,100	9,000	1/12/2010	10-BOP-03923-S		pipe	749709.1824	1942141.378
PF-12-02-V-9	x	6,000	6,000	4/15/2010	09-BOP-02629-S		pipe	750131.7635	1943059.359
PF-13-02-R-1	x	15,000	18,000				dirt mound, concrete	748766.6411	1942847.139
PF-13-02-R-2	x	14,000	17,000				dirt mound	750942.0825	1945172.178
PF-13-02-V-14	x						concrete pipe, dirt mounds	748786.2278	1943199.036
PF-13-02-V-15	x	9,800	10,500	1/13/2010	10-BOP-03926-S		dirt mound	748971.1057	1942818.577
PF-13-02-V-16	x	9,500	11,300	1/11/2010	10-BOP-03906-S		dirt mound	751123.4423	1942954.765
PF-13-02-V-18	x	10,500	12,000	1/11/2010	10-BOP-03906-S		dirt mound	751012.9657	1945167.456
PF-18-02-V-19	x	13,000	14,000				concrete pipe, dirt mounds	751163.4988	1944869.881
PF-18-02-V-20	x	14,000	15,000				dirt mound	751121.6873	1945086.884
PF-18-02-V-21	x	9,308	9,455			No gamma scan performed. Area is inaccessible.	dirt mound	751213.8906	1945223.058
PF-18-02-V-22	x	9,925	10,215			No gamma scan performed. Area is inaccessible.	dirt mound	751468.7786	1945250.122
PF-18-02-V-23	x	10,174	11,414			Performed gamma scan in accessible area. Unable to determine western boundary.	dirt mounds, railroad ties, concrete	750937.899	1943985.67
PF-24-02-V-1	x	10,600	10,800	2/24/2010	10-BOP-04107-S	No coordinates found.	soil mound, limbs, tree debris	750703.9019	1943042.831
PF-24-02-V-2	x	10,800	11,200	2/24/2010	10-BOP-04107-S	No coordinates found.	soil mounds	751012.3147	1942725.247
PF-24-02-V-3	x	9,600	9,900	2/24/2010	10-BOP-04107-S	No coordinates found.	soil mound	750981.2698	1942646.803
PF-24-02-V-4	x	10,800	11,000	2/24/2010	10-BOP-04107-S	No coordinates found.	gravel	751076.0593	1942644.272
PF-24-02-V-5	x	10,200	10,600	2/24/2010	10-BOP-04107-S	No coordinates found.	soil mound	751105.552	1942776.008
PF-24-02-V-6	x	10,800	11,000	2/24/2010	10-BOP-04107-S	No coordinates found.	soil mound	751115.8958	1942914.881
PF-24-02-V-9	x	9,900	10,100	2/24/2010	10-BOP-04108-S	No coordinates found.	soil mound	750646.8807	1942694.46
PF-25-02-V-10	x	9,200	10,200	2/25/2010	10-BOP-04110-S		barrel, crushed	750111.8509	1942291.558
PF-26-02-V-1	x	8,800	9,500	2/26/2010	10-BOP-04102-S		soil mound	750282.5487	1943223.159
PF-26-02-V-10	x	8,800	8,900	2/26/2010	10-BOP-04102-S		barrel	749781.0209	1942657.447
PF-26-02-V-11	x	8,800	10,300	2/26/2010	10-BOP-04102-S		soil mound	749701.3635	1942640.665
PF-26-02-V-12	x	8,800	9,300	2/26/2010	10-BOP-04102-S		soil mound	749820.4378	1942883.729
PF-26-02-V-14	x	8,800	8,900	2/26/2010	10-BOP-04102-S		soil mound	749378.0981	1942766.567
PF-26-02-V-15	x	8,800	9,800	2/26/2010	10-BOP-04102-S		soil mound	749556.2821	1943008.694
PF-26-02-V-16	x	8,800	9,500	2/26/2010	10-BOP-04102-S		soil mound	749479.8791	1943085.397

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PF-26-02-V-17	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound with pond	749345.9496	1943123.827
PF-26-02-V-18	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound, limbs, tree debris	749260.6151	1942973.581
PF-26-02-V-19	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound	749018.1503	1942756.996
PF-26-02-V-2	x	8,800	8,900	2/26/2010	10-BOP-04102-S		soil mound	750157.3997	1943048.309
PF-26-02-V-20	x	8,800	8,800	2/26/2010	10-BOP-04102-S		concrete	748995.5936	1942872.758
PF-26-02-V-21	x	8,800	8,900	2/26/2010	10-BOP-04102-S		soil mound	749078.7857	1942865.434
PF-26-02-V-22	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound	748959.7394	1942923.86
PF-26-02-V-23	x	8,800	8,800	2/26/2010	10-BOP-04102-S		concrete, metal	749147.3732	1942982.01
PF-26-02-V-24	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound	749094.8631	1943029.345
PF-26-02-V-3	x	8,800	9,400	2/26/2010	10-BOP-04102-S		soil mound, limbs, tree debris	750078.621	1943130.117
PF-26-02-V-4		8,800	9,400	2/26/2010	10-BOP-04102-S			750043.1204	1943036.311
PF-26-02-V-5	x	8,800	9,900	2/26/2010	10-BOP-04102-S		soil mound beside depression	749970.7393	1942969.923
PF-26-02-V-6	x	8,800	9,400	2/26/2010	10-BOP-04102-S		soil mound	749991.4515	1942915.682
PF-26-02-V-7	x	8,800	8,900	2/26/2010	10-BOP-04102-S		soil mound, lumber	749946.95	1942794.63
PF-26-02-V-8	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound	749903.2099	1942671.633
PF-26-02-V-9	x	8,800	8,800	2/26/2010	10-BOP-04102-S		soil mound	749767.9064	1942368.545
PG-02-03-R-2	x	16,000	18,000				dirt mound	751510.7395	1942465.398
PG-17-02-V-5	x	9,700	10,200	2/18/2010	10-BOP-04090-S		soil mound	754538.7702	1943140.844
PG-17-02-V-6	x	9,900	10,100	2/18/2010	10-BOP-04090-S		concrete	754474.3943	1942969.693
PG-17-02-V-7	x	9,600	9,900	2/18/2010	10-BOP-04088-S		soil mound	754424.1461	1942830.873
PG-17-02-V-8	x	10,000	10,200	2/18/2010	10-BOP-04088-S		concrete	754304.3927	1942603.894
PG-17-02-V-9	x	10,500	11,100	2/18/2010	10-BOP-04088-S		soil mound	754269.753	1942452.827
PG-19-02-V-1	x	9,400	10,200	3/5/2010	10-BOP-04136-S		soil and gravel mound	752806.9787	1942331.597
PG-19-02-V-2	x	10,000	10,900	3/5/2010	10-BOP-04136-S		soil mound	753363.4947	1942600.019
PG-19-02-V-3	x	9,800	10,600	3/5/2010	10-BOP-04136-S		soil mound	753436.5037	1942641.745
PG-19-02-V-4	x	10,400	11,200	3/5/2010	10-BOP-04136-S		soil mound	753567.7794	1943111.366
PG-19-02-V-5	x	10,100	10,400	3/5/2010	10-BOP-04136-S		soil mound	753903.6265	1943656.273
PG-24-02-V-7	x	9,800	10,900	3/5/2010	10-BOP-04136-S		soil mound	751214.5948	1942760.711
PG-24-02-V-8	x	10,000	10,400	2/24/2010	10-BOP-04107-S		soil mound	751177.6726	1942638.581
PH-12-02-V-1	x	8,500	8,900	2/16/2010	10-BOP-04065-S	No coordinates found.	soil mound by monitoring well	756495.1216	1943644.456
PH-16-02-V-1	x	8,300	8,700	2/16/2010	10-BOP-04065-S	No significant reading found.	soil mounded by pond/depression	756285.2477	1943485.474
PH-16-02-V-3	x	7,400	7,700	2/16/2010	10-BOP-04065-S	No significant reading found.	soil mound	756053.446	1943602.088
PH-16-02-V-4	x	8,000	8,300	2/16/2010	10-BOP-04065-S	No significant reading found.	soil mound	756052.6792	1943671.57
PH-16-02-V-5	x	7,500	7,800	2/16/2010	10-BOP-04065-S	No significant reading found.	soil mound by pond/depression	755810.7624	1943593.81
PH-16-02-V-6	x	9,200	9,000	2/18/2010	10-BOP-04090-S		soil mound, rail road ties	754875.8486	1943826.065
PH-17-02-V-1	x	10,200	10,500	2/18/2010	10-BOP-04090-S		soil mound	755206.9165	1943449.524
PH-17-02-V-10		9,900	10,500	2/18/2010	10-BOP-04088-S			754837.514	1942942.963
PH-17-02-V-11		9,600	9,700	2/18/2010	10-BOP-04088-S			754906.6622	1942791.854
PH-17-02-V-12	x	10,200	10,700	2/18/2010	10-BOP-04088-S		soil mound	755664.9914	1942278.629
PH-17-02-V-3	x	9,200	9,800	2/18/2010	10-BOP-04090-S		soil mound	754765.1762	1943375.504
PH-17-02-V-4	x	10,100	11,300	2/18/2010	10-BOP-04090-S		soil mound, limbs, tree debris	754647.8569	1943414.646
PH-19-02-V-2	x	7,800	8,400	1/17/2009	09-BOP-03083-S		dirt mound	755203.5919	1944434.129

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PI-04-03-V-1	x	9,400	10,300	7/6/2009	09-BOP-03250-S	No elevated readings found.	dirt mound	741314.5243	1939120.069
PI-04-03-V-2	x	10,500	11,200	7/6/2009	09-BOP-03251-S	No elevated readings found.	dirt mound	741341.219	1939283.597
PI-06-04-V-1	x	4,500	5,100	4/6/2010	10-BOP-04278-S	No high readings.	soil mound	741020.2149	1939078.237
PI-06-04-V-2	x	7,500	8,000	4/6/2010	10-BOP-04278-S	No high readings.	concrete	741030.0246	1939131.139
PI-06-04-V-3	x	8,800	9,000	4/6/2010	10-BOP-04278-S	No high readings.	soil mound	741247.6895	1939247.733
PI-06-04-V-4	x	8,800	9,200	4/6/2010	10-BOP-04278-S	No high readings.	soil mound	741335.1306	1939196.415
PJ-04-03-V-5	x	9,500	10,600	6/3/2009	09-BOP-02981-S		dirt mound	741635.7241	1939626.239
PJ-04-03-V-6	x	8,600	9,000	6/3/2009	09-BOP-02981-S		dirt mound	741631.1572	1939551.702
PJ-04-03-V-7	x	9,400	9,800	1/26/2010	10-BOP-03997-S		dirt mound	742941.5975	1941956.546
PJ-04-03-V-8	x	9,300	9,600	1/26/2010	10-BOP-03997-S		dirt mound	743116.3624	1942245.714
PJ-05-02-R-1	x	7,200	9,500	2/5/2009	09-BOP-03086-S	No elevated readings found in items surveyed.	(snow fencing, lumber, metal cables, fence post, buckets, pipes)	744118.2523	1940980.612
PJ-05-02-V-1	x	6,200	8,400	2/5/2009	09-BOP-03085-S		Concrete and metal culvert	744076.5424	1941760.325
PJ-08-04-V-1	x	1,000	11,000	4/8/2010	10-BOP-04318-S	No high readings found.	plastic bucket	742251.3843	1940116.009
PJ-08-04-V-10	x	6,800	7,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	743308.9436	1940470.894
PJ-08-04-V-11	x	7,800	8,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	743393.3522	1940712.075
PJ-08-04-V-12	x	8,500	9,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742219.7814	1940345.78
PJ-08-04-V-13	x	7,500	7,800	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742884.6108	1941916.624
PJ-08-04-V-14	x	7,000	7,200	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742729.3046	1941936.686
PJ-08-04-V-15	x	8,200	8,600	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742807.6234	1941778.188
PJ-08-04-V-16	x	8,500	8,800	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742856.9553	1941443.659
PJ-08-04-V-17	x	7,600	8,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	743001.188	1941523.28
PJ-08-04-V-18	x	8,000	8,200	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	743734.4372	1942242.781
PJ-08-04-V-19		7,700	8,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound, concrete	743803.9741	1942226.271
PJ-08-04-V-2	x	10,500	11,000	4/8/2010	10-BOP-04318-S	No high readings found.	metal culvert	742422.4509	1940202.338
PJ-08-04-V-3	x	8,000	8,500	4/8/2010	10-BOP-04318-S	No high readings found.	concrete	742516.8759	1940173.437
PJ-08-04-V-4	x	6,500	7,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742471.2035	1940129.569
PJ-08-04-V-5	x	8,000	8,800	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound by pond/depression	742872.5609	1939586.381
PJ-08-04-V-6	x	8,500	9,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742811.3281	1939692.265
PJ-08-04-V-7	x	7,800	8,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742848.9583	1939821.941
PJ-08-04-V-8	x	8,500	9,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	742707.4917	1940399.732
PJ-08-04-V-9	x	6,500	7,000	4/8/2010	10-BOP-04318-S	No high readings found.	soil mound	743187.7155	1940547.577
PJ-12-04-V-1	x	7,500	8,000	4/12/2010	11 BOP-04319-S	No high readings found.	metal	744124.9429	1941163.991
PJ-12-04-V-10	x	8,500	8,800	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	744517.8542	1940657.92
PJ-12-04-V-11	x	8,400	8,800	4/12/2010	11 BOP-04319-S	No high readings found.	concrete	744427.8252	1940893.446
PJ-12-04-V-12	x	7,500	8,100	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	744492.2749	1940848.983
PJ-12-04-V-13	x	7,000	7,300	4/12/2010	11 BOP-04319-S	No high readings found.	trash, paper, plastic	744550.0431	1940827.905
PJ-12-04-V-14	x	8,000	8,500	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	744640.3012	1940947.872
PJ-12-04-V-16	x	8,200	8,800	4/12/2010	12 BOP-04320-S	No high readings found.		744346.722000000000	##########
PJ-12-04-V-2	x	5,500	5,800	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	744247.5759	1941000.184
PJ-12-04-V-5	x	8,500	9,200	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	743811.0259	1939541.165

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PJ-12-04-V-6	x	8,400	8,600	4/12/2010	11 BOP-04319-S	No high readings found.	concrete	743788.7609	1939667.851
PJ-12-04-V-7	x	8,600	8,800	4/12/2010	11 BOP-04319-S	No high readings found.	concrete	743772.9742	1939649.588
PJ-12-04-V-8	x	7,000	7,200	4/12/2010	11 BOP-04319-S	No high readings found.	soil mound	743925.7973	1939982.46
PJ-12-04-V-9	x	7,500	7,800	4/12/2010	11 BOP-04319-S	No high readings found.	depression	743995.729	1940013.154
PK-04-02-R-1	x	14,000	18,000				dirt mound, tarps	744679.7611	1942126.071
PK-04-02-V-1	x	14,000	16,000				steel beams, concrete, metal pipe, dirt mounds, misc. debris	744832.5688	1942046.753
PK-11-03-V-1		9,000	9,300	3/11/2010	10-BOP-04163-S			745378.9716	1942743.787
PK-11-03-V-2	x	7,000	7,500	3/11/2010	10-BOP-04163-S	Railroad ties. No high readings found.	soil mound	744906.7225	1942290.145
PK-11-03-V-3	x	10,500	11,000	3/11/2010	10-BOP-04163-S	Concrete slab. No high readings found.	concrete, metal	744944.3156	1941436.013
PK-17-03-V-5	x	9,000	98,000	4/21/2009	09-BOP-02740-S		dirt mounds, concrete, pipe, misc. debris	745793.3855	1942978.98
PL-11-03-V-4	x	10,000	11,000				concrete block	749503.9236	1941834.689
PL-13-03-R-1	x	18,000	24,000				dirt mounds, buried concrete	751156.5446	1941240.601
PL-13-03-V-5	x	4,600	5,500	1/6/2010	10-BOP-03895-S	Used shielded probe due to high background readings.	dirt mound, gravel	751452.7301	1941037.113
PL-24-02-V-10	x	9,000	9,500	2/24/2010	10-BOP-04108-S		metal, wood, limbs, tree debris	750527.5584	1941807.7
PL-24-02-V-11	x	10,400	10,500	2/24/2010	10-BOP-04108-S		clay pipe	750351.377	1941444.492
PL-25-02-V-1	x	9,700	10,200	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound	749451.6108	1941853.351
PL-25-02-V-11	x	9,600	10,400	2/25/2010	10-BOP-04110-S	No coordinates found.	soil mound	749978.1894	1942166.099
PL-25-02-V-2	x	10,200	10,800	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound	749197.7852	1942010.911
PL-25-02-V-3	x	9,800	10,000	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound	749190.3813	1942141.134
PL-25-02-V-5	x	10,200	10,500	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound, limbs, tree debris	749813.2065	1941947.156
PL-25-02-V-6	x	8,800	9,200	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound, limbs, tree debris	749765.6649	1942016.762
PL-25-02-V-7	x	7,700	7,500	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound	749607.4267	1942057.605
PL-25-02-V-8	x	6,400	6,900	2/25/2010	10-BOP-04109-S	No coordinates found.	soil mound	749565.3418	1942133.121
PL-25-02-V-9	x	9,700	10,600	2/25/2010	10-BOP-04110-S	No coordinates found.	soil mound, limbs, tree debris	749674.6648	1942242.631
PL-26-02-V-2	x	2,500	2,700	2/3/2010	10-BOP-04029-S	Used shielded probe due to high background readings.	dirt mound	751098.8473	1941425.787
PL-26-02-V-3	x	2,300	2,400	2/3/2010	10-BOP-04029-S	Used shielded probe due to high background readings.	dirt mound	751269.2753	1941409.059
PM-13-03-V-11	x	11,000	13,400	3/13/2009	10-BOP-03071-S		dirt mounds, metal pipe, misc. debris	751851.5454	1939662.153
PM-16-03-V-1	x	10,500	11,000	3/16/2010	10-BOP-04185-S	No high readings found.	chevron oil can	753767.529	1939931.233
PM-16-03-V-2	x	7,000	7,500	3/17/2010	10-BOP-04185-S	No high readings found.	concrete, metal	753921.6281	1939780.301
PM-16-03-V-3	x	9,500	10,500	3/18/2010	10-BOP-04185-S	No high readings found.	soil mound, limbs, tree debris	753849.2906	1939784.909
PM-16-03-V-4	x	10,000	10,600	3/19/2010	10-BOP-04185-S	No high readings found.	soil mound, concrete, tree debris	753938.673	1939747.587
PM-16-03-V-5	x	10,000	10,500	3/20/2010	10-BOP-04185-S	No high readings found.	soil mound	754057.1153	1939738.084
PM-16-03-V-6	x	8,500	9,000	3/21/2010	10-BOP-04185-S	No high readings found.	concrete	754074.591	1939681.079
PM-16-03-V-7	x	7,800	8,000	3/22/2010	10-BOP-04185-S	No high readings found.	rip rap, soil mound	754560.9654	1939348.66
PM-16-03-V-8	x	9,600	10,300	3/23/2010	10-BOP-04185-S	No high readings found.	soil mound	753695.9133	1939770.097
PM-16-03-V-9	x	10,800	11,300	3/24/2010	10-BOP-04185-S	No high readings found.	soil mound	753662.0328	1939679.149

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PM-17-03-V-10	x	4,000	4,500	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	concrete	752022.0879	1940254.302
PM-17-03-V-11	x	3,500	4,000	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751946.2488	1940009.554
PM-17-03-V-12	x	5,000	5,500	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	concrete	751836.8691	1940329.856
PM-17-03-V-13	x	4,000	5,000	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751797.6881	1940062.013
PM-17-03-V-14	x	4,800	5,300	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751696.7831	1940002.205
PM-17-03-V-15	x	4,500	5,000	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751664.1929	1939965.653
PM-17-03-V-16	x	4,000	4,800	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751771.0238	1939887.758
PM-17-03-V-17	x	3,500	4,000	3/17/2010	10-BOP-04188-S	Used shielded probe due to high background readings. No coordinates found.	soil mound, limbs, tree debris	751880.6072	1939841.302
PM-17-03-V-18	x	3,500	4,000	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound, limbs, tree debris	751757.1219	1939560.834
PM-17-03-V-19	x	3,500	4,000	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound	751643.7986	1939735.406
PM-17-03-V-20	x	4,500	5,000	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound	751542.955	1939818.48
PM-17-03-V-21	x	5,000	5,500	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound, limbs, tree debris	751556.8021	1939405.939
PM-17-03-V-22	x	4,500	5,000	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound	751618.13	1939510.33
PM-17-03-V-23	x	4,500	5,000	3/17/2010	10-BOP-04211-S	Used shielded probe due to high background readings.	soil mound	751693.2382	1939415.216
PM-17-03-V-3	x	4,000	4,500	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	752142.94	1940622.245
PM-17-03-V-4	x	4,000	5,000	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	752114.5969	1940753.234

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PM-17-03-V-5	x	4,000	4,500	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound, metal, trash, wood	752104.0615	1940799.921
PM-17-03-V-6	x	4,000	5,000	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	752005.666	1940692.21
PM-17-03-V-7	x	4,000	5,000	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751938.4893	1940669.029
PM-17-03-V-8	x	4,000	4,500	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	metal culvert	751900.407	1940683.538
PM-17-03-V-9	x	5,000	5,500	3/17/2010	10-BOP-04187-S	Used shielded probe due to high background readings. No coordinates found.	soil mound	751814.6828	1940542.162
PM-19-02-V-6	x	n/a	n/a				square pond	752845.0823	1942051.291
PM-19-02-V-7	x	9,000	10,000	05/20/09	09-BOP-02894-S		soil mound	752577.1632	1942235.401
PM-19-03-V-1	x	10,500	11,500	3/19/2010	10-BOP-04190-S	No coordinates found.	soil mound	751651.7343	1939277.36
PM-19-03-V-2	x	10,500	11,500	3/19/2010	10-BOP-04190-S	No coordinates found.	soil mound	751387.9829	1939215.329
PM-19-03-V-3	x	9,500	10,000	3/19/2010	10-BOP-04190-S	No coordinates found.	soil mound	751363.5348	1939161.501
PM-19-03-V-4	x	10,500	11,000	3/19/2010	10-BOP-04190-S	No coordinates found.	depression	751449.9585	1939130.603
PM-23-03-V-1	x	4,500	5,000	3/23/2010	10-BOP-04212-S	Used lead shield due to high background from cylinder yard.	soil mound by concrete barricade	751779.6556	1940606.658
PM-23-03-V-2	x	4,500	5,000	3/23/2010	10-BOP-04212-S	Used lead shield due to high background from cylinder yard.	chip mulch and soil	751695.2234	1940386.313
PM-25-02-V-1	x	11,500	12,000	1/6/2010	10-BOP-03895-S		dirt mound	752024.0311	1939628.996
PM-25-02-V-2	x	11,300	12,000	1/5/2010	10-BOP-03888-S		dirt mound	751912.4877	1939280.125
PM-25-02-V-3	x	10,500	11,400	1/6/2010	10-BOP-03895-S		dirt mound	752727.7663	1939310.896
PM-25-02-V-4	x	8,500	9,600	2/25/2009	09-BOP-03071-S		dirt mound, bucket	753807.3697	1939967.498
PM-26-02-R-1	x	21,000	23,000				concrete blocks	751649.8092	1941724.918
PM-26-02-R-2	x	24,000	26,000				concrete blocks	751918.4682	1941105.929
PM-26-02-R-3	x	18,000	22,000				bricks	753983.9282	1940746.947
PM-26-02-V-10	x	11,000	12,000	1/5/2010	10-BOP-03888-S		dirt mound	752847.4726	1940618.834
PM-26-02-V-5	x	11,200	12,400	1/5/2010	10-BOP-03888-S		concrete, dirt mounds.	751567.1367	1941503.112
PM-26-02-V-6	x	8,800	9,800	2/3/2010	10-BOP-04029-S		dirt mound	752140.5855	1941135.419
PM-26-02-V-7	x	12,600	13,200	12/20/2009	09-BOP-03848-S		dirt mound	752555.3049	1940935.617
PM-26-02-V-8	x	9,000	10,000	05/20/09	09-BOP-02894-S	No gamma scan performed.	dirt mounds covered in tree limbs inside wooded area	752541.2161	1942201.991
PM-26-02-V-9	x	9,000	10,000	5/20/2009	09-BOP-02894-S		trash can, fence, debris	751795.3068	1941750.349
PN-18-02-V-1	x	9,396	9,812				soil mound	755336.1138	1941869.286
PN-18-02-V-2	x	9,249	9,584				soil mound	755524.1764	1941810.309
PN-19-02-V-8	x	10,000	10,250				soil mound	754953.8691	1941698.868

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PO-06-04-V-1	x	9,000	9,500	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741175.0817	1936231.287
PO-06-04-V-10	x	9,000	9,500	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741083.761	1937388.463
PO-06-04-V-11	x	9,200	9,800	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741240.4126	1936987.381
PO-06-04-V-12	x	9,500	9,700	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741346.0318	1937090.539
PO-06-04-V-13	x	7,800	8,000	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	740912.1698	1937885.177
PO-06-04-V-2	x	6,000	7,000	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741092.3788	1936551.131
PO-06-04-V-3	x	7,000	7,800	4/6/2010	10-BOP-04279-S	No high readings found.	concrete	741128.3272	1936627.452
PO-06-04-V-4	x	7,800	8,000	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	741106.948	1936663.453
PO-06-04-V-5	x	5,800	6,000	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	740849.8645	1937124.734
PO-06-04-V-6	x	8,000	9,000	4/6/2010	10-BOP-04279-S	No high readings found.	concrete	740845.7277	1937243.809
PO-06-04-V-7	x	7,500	8,300	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	740932.5756	1937601.372
PO-06-04-V-8	x	8,800	9,100	4/6/2010	10-BOP-04279-S	No high readings found.	metal pipe	740980.6182	1937411.047
PO-06-04-V-9	x	8,500	8,800	4/6/2010	10-BOP-04279-S	No high readings found.	soil mound	740921.3289	1937348.713
PP-01-04-V-5	x	8,982	9,155				soil mound	743837.2903	1935836.665
PP-01-04-V-6	x	9,527	9,828				soil mound	742714.6236	1935810.552
PP-01-04-V-8	x	7,200	8,500	4/2/2010	10-BOP-04262-S		soil mound	744389.1868	1938097.77
PP-02-03-V-2	x	8,000	8,400	2/1/2010	10-BOP-04010-S		dirt mound, brick	742002.8494	1938648.915
PP-02-03-V-4	x	9,300	10,100	1/27/2010	10-BOP-03998-S		dirt mound	743076.1042	1936299.053
PP-02-03-V-5	x	8,600	8,900	1/27/2010	10-BOP-03998-S		dirt mound	742783.4861	1935833.623
PP-02-03-V-6	x	8,800	9,500	1/27/2010	10-BOP-03998-S		dirt mound	743173.1083	1936046.614
PP-02-03-V-7	x	9,200	9,900	1/27/2010	10-BOP-03998-S		dirt mound	743408.4732	1935935.423
PP-02-04-V-1	x	8,600	9,800	2/1/2010	10-BOP-04010-S		soil mound, limbs, tree debris	744329.247	1937757.061
PP-02-04-V-13	x	8,700	9,200	2/1/2010	10-BOP-04010-S		soil mound	742877.5767	1938200.126
PP-02-04-V-14	x	8,000	8,500	4/2/2010	10-BOP-04262-S		soil mound	742806.2641	1938268.861
PP-02-04-V-2	x	8,400	9,400	4/2/2010	10-BOP-04262-S		depression	744028.6869	1937750.149
PP-02-04-V-21	x	7,900	8,500	4/2/2010	10-BOP-04262-S		soil mound	742872.5412	1937822.077
PP-02-04-V-3	x	7,500	8,100	4/2/2010	10-BOP-04262-S		soil mound	743941.4184	1937940.14
PP-02-04-V-4	x	7,900	8,900	4/2/2010	10-BOP-04262-S		concrete	743734.6852	1938017.303
PP-02-04-V-5	x	7,400	7,800	4/2/2010	10-BOP-04262-S		soil mound	743685.9714	1938122.114
PP-02-04-V-7	x	8,500	8,800	4/2/2010	10-BOP-04262-S		soil mound	743500.9038	1938038.226
PP-02-04-V-8	x	7,300	7,700	4/2/2010	10-BOP-04262-S		soil mound	743266.8219	1938054.606
PP-02-04-V-9	x	7,300	8,200	4/2/2010	10-BOP-04262-S		depression	743228.0317	1938034.064
PP-03-03-V-10	x	7,200	7,500	4/2/2010	10-BOP-04262-S		dirt mounds	743432.9073	1937433.705
PP-03-03-V-11	x	7,700	8,300	4/2/2010	10-BOP-04262-S		dirt mounds	743399.9852	1936986.952
PP-03-03-V-12	x	8,000	8,200	4/2/2010	10-BOP-04262-S		dirt mounds	743227.3712	1936914.535
PP-03-03-V-13	x	8,100	8,900	4/2/2010	10-BOP-04262-S		dirt mounds, concrete	742752.861	1936189.097
PP-03-03-V-14	x	8,000	8,000	4/2/2010	10-BOP-04262-S		dirt mounds	742649.066	1937088.776
PP-03-03-V-15	x	8,600	9,000	2/12/2010	10-BOP-04023-S		dirt mounds	742599.2598	1936802.219
PP-03-03-V-16	x	8,800	9,600	2/1/2010	10-BOP-04010-S		pipe, dirt mound	741748.0205	1935858.855
PP-03-03-V-18	x	7,400	8,200	2/1/2010	10-BOP-04010-S		dirt mounds	742881.2037	1937804.608
PP-03-03-V-8	x	8,200	9,300	2/2/2010	10-BOP-04022-S		dirt mounds	743756.4621	1937853.467
PP-03-03-V-9	x	8,300	9,000	2/2/2010	10-BOP-04022-S		dirt mounds	743554.5962	1937937.031

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PP-05-02-R-1	x	15,000	17,000				dirt mound	744644.9959	1934537.87
PP-05-02-R-1	x	15,000	17,000				dirt mounds	744657.409	1940049.54
PP-05-04-V-1	x	7,500	7,800	4/5/2010	10 BOP-04277-S	No high readings found.	soil, limbs, debris	742973.8245	1938005.345
PP-05-04-V-5	x	8,700	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	soil, concrete	741549.1909	1935872.595
PP-05-04-V-7	x	8,500	8,800	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741549.123	1936034.126
PP-06-03-V-20	x	9,500	11,500	3/6/2009	09-BOP-03021-S		dirt mound	742440.6569	1937011.671
PP-06-03-V-21	x	9,500	10,500	3/6/2009	09-BOP-03021-S		small soil mound with fragments of clay pipe on mound	741976.1893	1937268.429
PP-06-03-V-22	x	9,000	9,300	4/13/2010	10-BOP-04321-S		dirt mound, concrete	743157.5011	1938930.996
PP-06-04-V-1	x	8,800	9,000	4/6/2010	10-BOP-04279-S	No high readings found.	soil, concrete	741749.6544	1936289.589
PP-06-04-V-2	x	5,000	5,500	4/6/2010	10-BOP-04279-S	No high readings found.	depression	741506.1729	1936414.54
PP-06-04-V-3	x	8,800	9,000	4/6/2010	10-BOP-04279-S	No high readings found.	concrete	741551.8729	1937970.52
PP-13-04-V-1	x	8,200	8,600	4/13/2010	10-BOP-04321-S	No high readings found.	soil mound	743175.0242	1938857.16
PP-13-04-V-2	x	9,000	9,500	4/13/2010	10-BOP-04321-S	No high readings found.	soil mound	743018.9091	1938756.161
PP-13-04-V-3	x	8,000	8,600	4/13/2010	10-BOP-04321-S	No high readings found.	rock, soil mound	743043.6078	1938924.857
PP-13-04-V-4	x	9,000	9,300	4/13/2010	10-BOP-04321-S	No high readings found.	soil mound	742515.9658	1938668.336
PP-13-04-V-5	x	8,500	8,700	4/13/2010	10-BOP-04321-S	No high readings found.	concrete	742011.6014	1938696.196
PP-31-03-V-10	x	8,500	9,500	3/31/2010	10-BOP-04276-S	No high readings found.	soil mound	744021.5055	1936661.614
PP-31-03-V-2	x	7,000	7,500	3/31/2010	10-BOP-04276-S	No high readings found.	depression	745128.2205	1938136.786
PP-31-03-V-3	x	7,000	7,600	3/31/2010	10-BOP-04276-S	No high readings found.	concrete	744894.4047	1937657.576
PP-31-03-V-4	x	7,500	8,000	3/31/2010	10-BOP-04276-S	No high readings found.	concrete	744886.3725	1937925.092
PP-31-03-V-5	x	6,800	7,000	3/31/2010	10-BOP-04276-S	No high readings found.	concrete	744838.6945	1937825.876
PP-31-03-V-7	x	7,500	7,800	3/31/2010	10-BOP-04276-S	No high readings found.	concrete	744651.3211	1937507.761
PQ-01-04-V-2	x	8,254	8,254	4/1/2010	10-BOP-04257-S	No significant readings found.	concrete	744628.0049	1938521.893
PQ-01-04-V-3	x	7,358	7,358	4/1/2010	10-BOP-04257-S	No significant readings found.	soil mound	744587.1999	1938447.065
PQ-01-04-V-5	x	6,239	6,239	4/1/2010	10-BOP-04257-S	No significant readings found.	soil mound	744529.7066	1938265.432
PQ-30-03-V-1	x	13,400	13,600	3/30/2010	10-BOP-04243-S		soil mound	745817.7981	1936206.415
PQ-30-03-V-10	x	10,000	10,600	3/30/2010	10-BOP-04275-S	No significant readings found.	depression	745666.6892	1936629.116
PQ-30-03-V-11	x	9,200	10,000	3/30/2010	10-BOP-04275-S	No significant readings found.	metal	745496.0084	1936838.622
PQ-30-03-V-12	x	10,600	12,000	3/30/2010	10-BOP-04275-S	No significant readings found.	soil mound	744931.2405	1936967.755
PQ-30-03-V-13	x	10,000	10,400	3/30/2010	10-BOP-04275-S	No significant readings found.	soil mound	744963.3422	1937081.778
PQ-30-03-V-14	x	9,200	9,800	3/30/2010	10-BOP-04275-S	No significant readings found.	soil mound	745075.4857	1937226.457
PQ-30-03-V-15	x	10,000	10,600	3/30/2010	10-BOP-04275-S	No significant readings found.	metal	745283.582	1937289.537
PQ-30-03-V-16	x	9,600	9,900	3/30/2010	10-BOP-04275-S	No significant readings found.	depression	745441.98	1937360.505
PQ-30-03-V-2	x	1,200	12,800	3/30/2010	10-BOP-04243-S		soil mound	745713.8922	1935952.753
PQ-30-03-V-3	x	9,000	9300	3/30/2010	10-BOP-04243-S		soil mound	745696.2731	1935835.231
PQ-30-03-V-4	x	10,800	11,400	3/30/2010	10-BOP-04243-S		soil mound	745527.4572	1935898
PQ-30-03-V-5	x	10,200	12,000	3/30/2010	10-BOP-04243-S		soil, limbs, debris	745456.48	1936123.824
PQ-30-03-V-6		10,200	12,000	3/30/2010	10-BOP-04243-S			745281.5617	1935975.191
PQ-30-03-V-7	x	11,400	12,200	3/30/2010	10-BOP-04243-S		concrete	745311.8684	1936250.667
PQ-30-03-V-8	x	10,000	10,200	3/30/2010	10-BOP-04243-S		concrete	745101.3521	1936111.904
PQ-30-03-V-9	x	10,800	11,400	3/30/2010	10-BOP-04275-S	No significant readings found.	soil mound	745084.5864	1936424.717

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PQ-31-03-V-1	x	7,500	7,800	3/31/2010	10-BOP-04276-S	No high readings found.	concrete/rock	745389.4571	1937635.318
PQ-31-03-V-2	x	7,500	7,800	3/31/2010	10-BOP-04276-S	No high readings found.	soil mound	745032.2997	1937347.341
PR-13-03-V-1	x	10,500	12,200	3/13/2009	09-BOP-03033-S		AOC 107?	750278.5021	1935958.746
PR-13-04-V-1	x	9,500	10,000	4/13/2010	10-BOP-04321-S	No high readings found.	soil mound	750971.4351	1936709.41
PR-14-04-V-1	x	8,500	8,700	4/14/2010	10-BOP_04323-S	No high readings found.	concrete	751250.888	1937204.964
PR-14-04-V-2	x	9,000	9,200	4/14/2010	10-BOP_04323-S	No high readings found.	soil mound	751130.821	1936443.066
PR-14-04-V-3	x	9,000	9,500	4/14/2010	10-BOP_04323-S	No high readings found.	metal	750740.6049	1935878.894
PR-19-03-V-10	x	8,500	9,000	3/19/2010	10-BOP-04191-S	No coordinates found.	concrete	751246.8998	1938930.73
PR-19-03-V-11	x	7,000	8,000	3/19/2010	10-BOP-04191-S	No coordinates found.	telephone pole, concrete	751230.6502	1938900.377
PR-19-03-V-12	x	8,000	8,500	3/19/2010	10-BOP-04191-S	No coordinates found.	concrete, rip rap	751223.2509	1938849.15
PR-19-03-V-15	x	8,000	9,000	3/19/2010	10-BOP-04191-S	No coordinates found.	metal pipe	751020.6621	1938579.568
PR-19-03-V-16	x	7,000	8,000	3/19/2010	10-BOP-04191-S	No coordinates found.	concrete	751155.318	1938541.265
PR-19-03-V-9	x	10,000	11,000	3/19/2010	10-BOP-04191-S	No coordinates found.	depression	751360.6165	1938929.556
PR-29-03-V-1	x	10,200	10,800	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound	750357.7271	1935566.348
PS-16-03-V-10	x	9,500	10,000	3/16/2010	10-BOP-04186-S	No coordinates found.	tire	753826.4622	1938742.984
PS-16-03-V-11	x	9,800	11,000	3/16/2010	10-BOP-04186-S	No coordinates found.	soil mound	753736.2078	1938333.371
PS-16-03-V-12	x	7,800	8,000	3/16/2010	10-BOP-04186-S	No coordinates found.	concrete	753035.414	1936836.981
PS-16-03-V-13	x	7,500	7,800	3/16/2010	10-BOP-04186-S	No coordinates found.	concrete	753000.2011	1936858.707
PS-16-03-V-14		10,000	10,600	3/16/2010	10-BOP-04186-S	No coordinates found.	concrete	752991.3852	1937007.79
PS-17-03-V-2		7,000	7,500	3/16/2010	10-BOP-04183-S	No coordinates found.	soil mound	753986.4091	1938180.268
PS-19-03-V-13	x	8,000	9,000	3/19/2010	10-BOP-04189-S	No coordinates found.	concrete	751324.65	1938715.601
PS-19-03-V-14	x	9,000	10,000	3/19/2010	10-BOP-04189-S	No coordinates found.	concrete	751347.146	1938691.698
PS-19-03-V-20	x	9,000	9,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751452.0589	1938234.863
PS-19-03-V-21	x	9,500	10,000	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751668.478	1938143.7
PS-19-03-V-22	x	10,000	10,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751843.9915	1938098.344
PS-19-03-V-23	x	8,500	9,000	3/19/2010	10-BOP-04189-S	No coordinates found.	concrete	751923.3735	1938121.755
PS-19-03-V-24	x	9,500	10,000	3/19/2010	10-BOP-04189-S	No coordinates found.	barbed wire	752791.8423	1937637.979
PS-19-03-V-25	x	9,000	9,500	3/19/2010	10-BOP-04189-S	No coordinates found.	metal	752790.3341	1937134.565
PS-19-03-V-26	x	9,000	9,500	3/19/2010	10-BOP-04189-S	No coordinates found.	depression	752690.1886	1936966.456
PS-19-03-V-27	x	9,000	9,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	752632.4171	1936920.429
PS-19-03-V-28	x	9,500	10,000	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	752514.9462	1937045.543
PS-19-03-V-29	x	10,000	10,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	752475.4535	1937103.012
PS-19-03-V-5	x	10,500	11,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751482.2819	1938975.445
PS-19-03-V-6	x	10,000	11,500	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751569.0199	1939088.847
PS-19-03-V-7	x	8,500	10,000	3/19/2010	10-BOP-04189-S	No coordinates found.	soil mound	751407.0084	1938754.411
PS-19-03-V-8	x	10,000	10,500	3/19/2010	10-BOP-04189-S	No coordinates found.	trash, plastic	751409.2364	1938902.899
PS-23-03-V-11	x	9,500	9,800	3/23/2010	10-BOP-04212-S	No high readings found.	depression	752763.9985	1936313.003
PS-23-03-V-12	x	8,500	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752670.9573	1936044.932
PS-23-03-V-13	x	8,500	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	trash, plastic	752564.8581	1936074.036
PS-23-03-V-14	x	9,000	9,500	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752590.8377	1935875.71
PS-23-03-V-15	x	9,500	10,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752564.7249	1935814.59
PS-23-03-V-3	x	8,500	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	trash, paper, plastic	753355.9235	1936296.908

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PS-23-03-V-4	x	8,000	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound, concrete	752946.9141	1936355.657
PS-23-03-V-5	x	9,000	10,000	3/23/2010	10-BOP-04212-S	No high readings found.	concrete, telephone poles	752881.1551	1936316.711
PS-23-03-V-6	x	8,500	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752845.9222	1936209.267
PS-23-03-V-7	x	9,000	10,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752821.9728	1936145.479
PS-23-03-V-8	x	9,500	10,000	3/23/2010	10-BOP-04212-S	No high readings found.	concrete	752680.0603	1935851.282
PS-23-03-V-9	x	10,000	10,500	3/23/2010	10-BOP-04212-S	No high readings found.	trash, paper, plastic	752634.7491	1935736.87
PS-26-02-V-1	x	8,300	10,000	2/26/2009	09-BOP-03071-S		dirt mound	751763.889	1938610.136
PS-26-02-V-2	x	9,000	10,000	5/20/2009	09-BOP-02894-S		dirt mound	753800.5882	1938291.084
PS-26-02-V-3	x	9,000	10,000	5/20/2009	09-BOP-02894-S		dirt mound	753596.1595	1938022.085
PS-27-02-V-4	x	9,000	10,000	5/20/2009	09-BOP-02894-S		dirt mound	753022.696	1937955.473
PS-27-02-V-5	x	9,327	9,651				dirt mound	753563.4055	1937071.915
PS-27-02-V-6	x	8,400	7,000	2/27/2009	09-BOP-03009-S		metal pipe	751816.1499	1936680.792
PS-27-02-V-7	x	5,500	6,400	2/27/2009	09-BOP-03009-S		concrete	751792.6067	1936742.974
PS-28-02-V-1		8,500	9,000	1/27/2010	10-BOP-040135		dirt mound	752570.3315	1934151.312
PS-28-02-V-10	x	9,000	10,000	5/20/2009	09-BOP-02894-S		dirt mound	753164.6971	1938171.491
PS-28-02-V-8	x	8,700	9,000	1/14/2010	10-BOP-03936-S		dirt mound, plastic	751254.0887	1937468.815
PS-28-02-V-9	x	8,700	9,000	1/14/2010	10-BOP-03936-S		dirt mound, concrete, pipe	751348.8989	1937400.462
PT-13-04-V-1	x	9,000	9,500	4/13/2010	10-BOP-04321-S	No high readings found.	concrete	754561.0779	1937841.402
PT-17-03-V-1	x	9,000	9,500	3/17/2010	10-BOP-04187-S	No coordinates found.	soil mound	754297.2031	1938234.135
PU-02-03-V-10	x	10,000	10,600	1/26/2010	10-BOP-03996-S		dirt mound	742889.374	1934331.054
PU-02-03-V-7	x	10,400	11,000	1/26/2010	10-BOP-03996-S		dirt mound	743203.6673	1935520.36
PU-02-03-V-8	x	9,600	10,000	1/26/2010	10-BOP-03996-S		dirt mound	744388.4909	1935183.131
PU-05-04-V-1	x	9,000	9,500	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound, concrete	742271.6113	1935524.488
PU-05-04-V-10	x	8,800	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	concrete	741533.436	1935743.697
PU-05-04-V-2	x	9,000	97,000	4/5/2010	10 BOP-04277-S	No high readings found.	concrete	742079.8538	1935411.517
PU-05-04-V-3	x	9,000	9,300	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741791.6677	1935269.306
PU-05-04-V-4	x	8,500	8,800	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741630.8734	1935322.1
PU-05-04-V-5	x	8,600	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	742041.6492	1935535.625
PU-05-04-V-6	x	8,500	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741746.0678	1935842.007
PU-05-04-V-7	x	8,500	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	742378.6672	1935759.615
PU-05-04-V-8	x	9,000	9,500	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741909.761	1935794.166
PU-05-04-V-9	x	8,800	9,000	4/5/2010	10 BOP-04277-S	No high readings found.	soil mound	741912.051	1935640.79
PV-29-03-V-12	x	10,000	10,300	3/29/2010	10-BOP-04241-S		soil mound	747200.8016	1934020.438
PV-29-03-V-13	x	9,400	9,800	3/29/2010	10-BOP-04241-S		concrete	747578.7175	1933661.84
PV-29-03-V-14	x	10,200	10,600	3/29/2010	10-BOP-04241-S		concrete	747141.6062	1933621.541
PV-29-03-V-17	x	10,200	11,200	3/29/2010	10-BOP-04242-S		soil mound	746491.6623	1934217.821
PV-29-03-V-18	x	9,900	10,400	3/29/2010	10-BOP-04242-S		soil mound	746726.2015	1934120.303
PV-29-03-V-19	x	9,300	1,000	3/29/2010	10-BOP-04242-S		concrete	746589.0079	1933886.932
PV-29-03-V-22	x	10,000	10,800	3/29/2010	10-BOP-04242-S		depression	746166.3319	1935141.052
PV-29-03-V-23	x	9,000	9,400	3/29/2010	10-BOP-04242-S		concrete	746288.7605	1935134.806
PV-29-03-V-8	x	10,800	11,500	3/29/2010	10-BOP-04241-S		soil mound	747820.2174	1933660.778
PW-13-03-V-5	x	2,822	5,800	3/13/2009		Shielded probe used.	dirt mound	750016.6325	1935156.103

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PW-13-04-V-1	x	8,700	9,100	4/13/2010	10-BOP-04321-S	No high readings found.	concrete	749652.1524	1932757.989
PW-13-04-V-2	x	11,000	11,500	4/13/2010	10-BOP-04321-S	No high readings found.	soil mound	750125.0523	1933966.876
PW-13-04-V-3	x	10,500	11,000	4/13/2010	10-BOP-04321-S	No high readings found.	soil, metal	750220.8458	1933952.726
PW-13-04-V-4	x	9,000	9,300	4/13/2010	10-BOP-04321-S	No high readings found.	metal pipe	749928.7328	1932683.298
PW-17-03-V-8	x	3,500	4,000	1/14/2010	10-BOP-03936-S	Used shielded probe due to high background readings.	dirt mound	748927.9534	1933911.026
PW-24-03-V-11	x	10,500	12,000	3/24/2010	10-BOP-04213-S		soil mound	750671.5995	1934575.396
PW-24-03-V-12	x	5,000	5,500	3/24/2010	10-BOP-04213-S	Lead shield used, no high readings found.	soil mound	748056.3973	1933417.946
PW-24-03-V-13	x	3,500	4,000	3/24/2010	10-BOP-04213-S	Lead shield used, no high readings found.	concrete	748492.3955	1933252.402
PW-24-03-V-14	x	3,500	4,000	3/24/2010	10-BOP-04213-S	Lead shield used, no high readings found.	soil, limbs, tree debris	748621.5694	1933207.589
PW-24-03-V-15	x	3,500	4,000	3/24/2010	10-BOP-04213-S	Lead shield used, no high readings found.	soil, limbs, tree debris	748679.3055	1933171.969
PW-24-03-V-16	x	2,500	3,000	3/24/2010	10-BOP-04213-S	Lead shield used, no high readings found.	soil, limbs, tree debris	749123.8493	1932978.914
PW-26-03-V-1		11,200	11,600	3/26/2010	10-BOP-04263-S		soil, limbs, tree debris	749188.484	1933475.269
PW-26-03-V-10	x	9,800	11,400	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	748332.7387	1933989.23
PW-26-03-V-11	x	9,800	10,200	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	748487.3095	1933920.071
PW-26-03-V-12	x	11,100	12,000	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	748722.0597	1933972.082
PW-26-03-V-14	x	9,800	10,200	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	750081.4871	1935527.514
PW-26-03-V-15	x	10,000	10,500	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	749967.1087	1935210.935
PW-26-03-V-16	x	12,000	12,400	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	749887.371	1935035.56
PW-26-03-V-2	x	10,500	10,700	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749464.4086	1933193.218
PW-26-03-V-3	x	10,200	10,700	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749605.323	1933320.237
PW-26-03-V-4	x	10,600	11,100	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749382.4843	1933564.269
PW-26-03-V-5	x	10,800	11,100	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749516.7212	1933666.287
PW-26-03-V-6	x	12,600	13,000	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749047.6168	1933640.453
PW-26-03-V-7	x	12,900	13,200	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749279.2945	1933747.431
PW-26-03-V-8	x	12,700	13,100	3/26/2010	10-BOP-04223-S		soil, limbs, tree debris	749463.4608	1933999.772
PW-26-03-V-9		9,300	10,800	3/30/2010	10-BOP-04280-S	No unusual readings found.	soil, limbs, tree debris	748159.0996	1934069.266
PW-28-02-V-1	x	8,800	10,500	2/28/2009	09-BOP-03033-S		metal pipe	750828.9715	1934957.14
PW-28-02-V-2	x	8,200	10,100	2/28/2009	09-BOP-03070-S		red brick on south side of well	750420.9887	1934214.452
PW-28-02-V-3	x	2,500	3,000	1/19/2010	10-BOP-03966-S	Used shielded probe due to high background readings.	concrete, dirt mounds	749900.5994	1933500.905
PW-28-02-V-4	x	2,300	3,000	1/19/2010	10-BOP-03966-S	Used shielded probe due to high background readings.	dirt mound	749467.5496	1933363.881
PW-29-03-V-2	x	11,700	12,600	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound by pond/depression	750461.9723	1935398.343
PW-29-03-V-3	x	10,200	10,800	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound	750206.0351	1935198.992
PW-29-03-V-4	x	10,900	11,100	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound	750197.873	1935141.359
PW-29-03-V-5	x	9,800	10,300	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound, limbs, tree debris	750320.1471	1935038.688

Table B.1. Gamma Walkover Scoping Survey Data for Observed Anomalies (Continued)

Anomaly Name	Photo	2×2 NaI probe average cpm	2×2 NaI probe max cpm	Date Surveyed	DOE Survey #	Comments	Description	X State Plane (ft)	Y State Plane (ft)
PW-29-03-V-6	x	10,200	12,400	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound	750396.8838	1935054.766
PW-29-03-V-7	x	10,800	12,000	3/29/2010	10-BOP-04234-S	No significant readings found.	soil mound	750328.9637	1934889.575
PX-23-03-V-10	x	10,000	10,500	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound, limbs, tree debris	752622.153	1935561.369
PX-23-03-V-16	x	8,000	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound, limbs, tree debris	752518.7001	1935704.787
PX-23-03-V-17	x	8,000	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	concrete	752356.8638	1935328.06
PX-23-03-V-17A		8,000	9,000	3/23/2010	10-BOP-04212-S	No high readings found.	concrete	752343.9409	1935343.489
PX-23-03-V-18	x	9,000	9,500	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752251.0996	1935006.779
PX-23-03-V-19	x	7,500	8,000	3/23/2010	10-BOP-04212-S	No high readings found.	soil mound	752164.0148	1934770.743
PX-24-03-V-1		8,000	8,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752447.03	1935314.225
PX-24-03-V-10	x	8,500	9,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752259.0208	1934269.58
PX-24-03-V-2		8,500	9,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752402.8499	1935144.593
PX-24-03-V-3	x	8,500	9,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752374.3943	1935076.044
PX-24-03-V-4	x	9,800	10,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752365.476	1935029.435
PX-24-03-V-5	x	8,500	95,000	3/24/2010	10-BOP-04013-S	No high readings found.	trash can	752495.374	1935043.156
PX-24-03-V-6	x	7,500	8,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752324.6132	1934932.033
PX-24-03-V-7	x	7,500	8,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752215.2886	1934664.725
PX-24-03-V-8	x	8,000	8,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752122.9634	1934478.661
PX-24-03-V-9	x	8,500	9,000	3/24/2010	10-BOP-04013-S	No high readings found.	soil mound	752068.3785	1934342.616
PY-14-01-V-7	x	16,000	19,000				soil mound, concrete	744226.042	1930858.487

THIS PAGE INTENTIONALLY LEFT BLANK