Department of Energy

Portsmouth/Paducah Project Office
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Lexington, Kentucky 40513
(859) 219-4000

JUN 11 2009

PPPO-03-265-09

Ms. Maria Galanti
Ohio Environmental Protection Agency
Southeast District Office
2195 Front Street
Logan, Ohio 43138

Dear Ms. Galanti:

SAMPLING AND ANALYSIS PLAN FOR DESIGN OF INTERIM MEASURES AT THE X-701B SOLID WASTE MANAGEMENT UNIT AT THE PORTSMOUTH GASEOUS DIFFUSION PLANT

Enclosed for your review and approval is the Sampling and Analysis Plan for Design of Interim Measures at the X-701B Solid Waste Management Unit.

The Department of Energy (DOE) would appreciate the Ohio Environmental Protection Agency's expedited review and approval, so that field work may begin promptly.

If you have any questions or require additional information, please contact Melda Rafferty of my staff at (740) 897-5521.

Sincerely,

William E. Murphie
Manager
Portsmouth/Paducah Project Office

Enclosure:
Sampling and Analysis Plan for Design of Interim Measures at the X-701B SWMU

cc w/enclosure:
Administrative Records

cc w/o enclosure:
W. A. Franz, LPP/PORTS
D. Kozlowski, PPPO/LEX
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R. Bonczek, PPPO/LEX
PPPO Records, LEX

DOE/PPPO/03-0094&D1

Sampling and Analysis Plan for Design of Interim Measures at the X-701B Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

DOE/PPPO/03-0094&D1

Sampling and Analysis Plan for Design of Interim Measures at the X-701B Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio

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Prepared by
CDM, a Joint Venture
Under subcontract LPP 05SC003

Prepared for the
U.S. Department of Energy
Portsmouth/Paducah Project Office

LATA/PARALLAX PORTSMOUTH, LLC
managing the
Environmental Remediation Activities at the
Portsmouth Gaseous Diffusion Plant
under contract DE-AC24-05OH20192
for the
U.S. DEPARTMENT OF ENERGY

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FIGURES

TABLES

ACRONYMS

bgs	below ground surface
COC	contaminant of concern
DOE	U.S. Department of Energy
DPT	direct push technology
IM	interim measure
ISCO	in-situ chemical oxidation
ISMS	Integrated Safety Management System
LLW	low level waste
LPP	LATA/Parallax Portsmouth, LLC
NPDES	National Pollutant Discharge Elimination System
Ohio EPA	Ohio Environmental Protection Agency
PCB	polychlorinated biphenyl
PEMS	Project Environmental Measurements System
PORTS	Portsmouth Gaseous Diffusion Plant
PPE	personal protective equipment
PRG	preliminary remediation goal
QAPP	Quality Assurance Project Plan
QA/QC	quality assurance/quality control
RCRA	Resource Conservation and Recovery Act
SAP	Sampling and Analysis Plan
SOP	standard operating procedures
SWMU	Solid Waste Management Unit
Tc-99	Technetium 99
TCE	Trichloroethene
USEPA	United States Environmental Protection Agency
VOC	volatile organic compound

1. INTRODUCTION

This Sampling and Analysis Plan (SAP) presents the strategy to support design of interim measures for corrective action at the X-701B solid waste management unit (SWMU) in Quadrant II at the Portsmouth Gaseous Diffusion Plant (PORTS). The SWMU is shown on Figure 1. The X-701B Holding Pond was used since the beginning of plant operations in 1954 until November 1988. The pond was designed for neutralization and settlement of acid waste from several sources. Trichloroethene (TCE) was also discharged to the pond. Two sludge retention basins were located west of the Holding Pond.

A contaminated groundwater plume extends east from the X-701B Holding Pond to Little Beaver Creek. The groundwater plume appears to emanate from a spoon-shaped area of residual soil contaminants; the oval bowl of the spoon is at the west source area, and the handle extends to the east. Groundwater contaminants are primarily TCE, with other volatile organic compounds (VOCs) and radionuclides (principally Tc-99). Groundwater corrective action at the X-701B area is being accomplished under the Ohio Environmental Protection Agency (Ohio EPA) *Decision Document for the X-701B SWMU in Quadrant II of the US DOE Portsmouth Facility* (Ohio EPA 2003) with collection and treatment, monitoring, and in-situ chemical oxidation (ISCO). A series of ISCO injections have been made in accordance with the *Work Plan for the Groundwater Remediation of the X-701B Solid Waste Management Unit* (DOE 2006). Soil sampling and analysis have been performed after each injection.

Unconsolidated sediments beneath the SWMU include soil of the Minford and Gallia formations, which extend approximately 31 ft below ground surface (bgs). The initial interface of the underlying Sunbury Shale formation, from a few inches to generally less than one-foot thick, which is weathered and soil-like, will also be characterized as soil. These formations extend approximately 31 ft bgs at the unit, except beneath the Pond and Pond Banks where the depth is shallower. Groundwater beneath the X-701B area is generally encountered in unconsolidated sediments at depths ranging from 12 to 15 ft bgs. Soil in the unsaturated and saturated zones will be characterized by this SAP because both zones will be encountered during implementation of interim measures. Current data indicate that saturated soil, in particular saturated soil near the shale, serves as a continuing source of residual TCE to groundwater.

A new effort to accelerate groundwater remediation includes design of interim measures to deliver and mix appropriate chemical oxidants with contaminated soil in order to degrade organic constituents such as TCE that reside in the soil matrix. Residual TCE in soil, particularly at and above the weathered shale layer 30 ft bgs, serves as a continuing source of groundwater contamination. This SAP provides the strategies and technical approach to soil characterization including approximate sample locations, sample type, sample collection procedures, and laboratory analytical methods.

1.1 PURPOSE AND SCOPE

The purpose of the investigation described by this SAP is to support design of an interim measure to accelerate groundwater corrective action. In addition to the investigation described by this SAP, the interim measure will entail remedial design, installation of sheet pile, dewatering, soil excavation, segregation of soil that will not be treated, soil treatment with oxidant, soil replacement, removal of sheet pile and subsequent monitoring. Implementation of this SAP will characterize soil contaminants and assess oxidant demand in the source area of the X-701B SWMU. Results of this investigation will be used to design soil oxidation treatment intended to accelerate TCE groundwater remediation at the unit and identify other parameters of concern as described below. Results will also be used to identify soil that may be segregated from treatment and to confirm historical data that soil above 10 feet bgs is suitably handled as unregulated material.

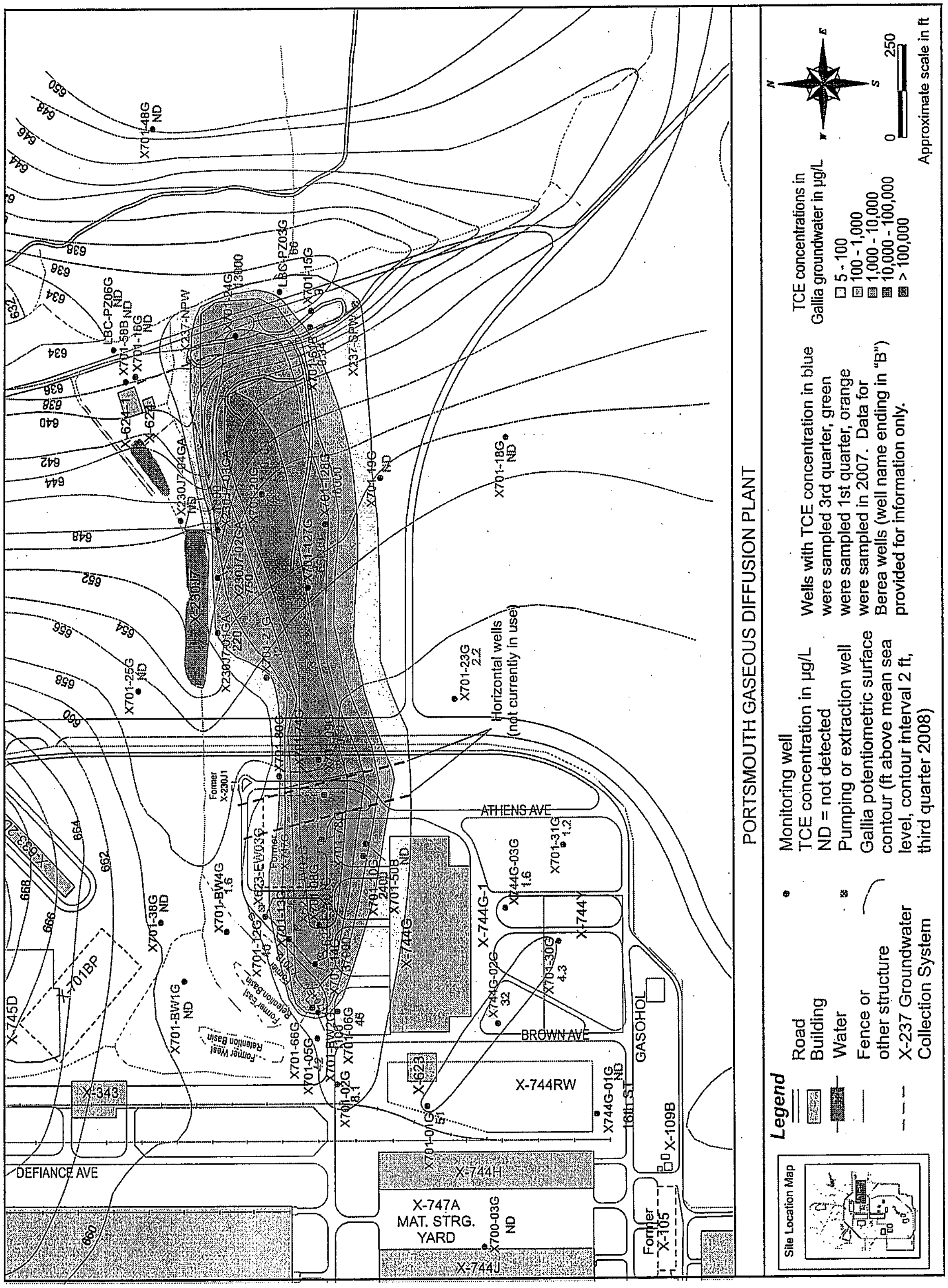

Figure 1. X-701B Solid Waste Management Unit (SWMU)

In order to design appropriate interim measures for soil treatment, soil will be characterized throughout the area of investigation for the parameters and concerns that will be addressed by the design. These parameters include the following: soil contaminants and concentrations that will be encountered; effectiveness and efficiency of oxidant treatments; geotechnical and constructability properties; waste management; environmental, health and safety concerns; and potential for contaminant mobilization. Based on existing data, constituents of concern in soil at the unit include TCE; technetium primarily in the Pond, Pond Banks and potentially in the Precious Metals Yard; uranium, which will be sampled at coincident locations with technetium; total oxidant demand of the natural soil/weathered shale and of organic contaminants such as TCE; polychlorinated biphenyls (PCBs) (except for the Precious Metals Yard) because they are mobilized by TCE; and within certain areas of the unit (Pond, Pond Banks, and former X-747G Precious Metals Yard) soil will also be characterized for the metals arsenic, beryllium and nickel.

Additional samples may be collected for determination of other physical properties that are necessary to support the design and constructability of the interim measure.

2. SCOPE OF WORK

This section describes the field sampling plan and laboratory chemical analysis for characterization of soils in the contaminant source area of the X-701B SWMU. In general, soil samples from the unsaturated and saturated zones will be collected on a grid pattern using direct push technology to the top of bedrock at approximately 31 ft bgs.

Laboratory chemical analysis will be conducted using fixed base laboratory analyses. Field screening methods, laboratory analytical test methods and quality assurance/quality control will be appropriate for design of the interim measure. This investigation is not intended to delineate the complete nature and extent of contamination, or to support regulatory closure.

2.1 GEOPHYSICAL SURVEY

A geophysical, or sub-site survey of the investigation area will be conducted to identify underground utilities and other obstructions before the sampling locations are finalized.

2.2 SOIL CHARACTERIZATION SAMPLING AND ANALYSIS

2.2.1 Soil Sampling

The investigation will employ soil sampling using direct push technology, and the soil samples will be analyzed at a fixed base laboratory.

Figure 2 depicts the planned layout of soil boring locations. The sampling locations are distributed laterally on a grid pattern that covers the spoon-shaped source area and areas beyond the spoon. The grid pattern of 90 soil borings extends between proposed location S-01 at coordinates E10227.34 and N10510.12, and location S-90 at coordinates E10956.37 and N10699.62. With a nominal grid spacing of 48.0 ft north-south and 51.0 ft east-west, the 90 proposed borings cover an area of approximately 4 acres. The area between any four contiguous borings on the grid pattern is 2,445 square ft. The Pond, Pond Banks and Precious Metals Yard are shown on Figure 2.

Table 1 summarizes for each boring location the soil sample depth and analytical parameters that are included in this SAP; however, the strategy for selection of specific samples to be analyzed is best described in the narrative of this SAP.

If a boring location or soil sample interval cannot be sampled within five feet laterally or one foot vertically of a proposed location, then an alternative location will be selected upon mutual agreement between DOE and Ohio EPA.

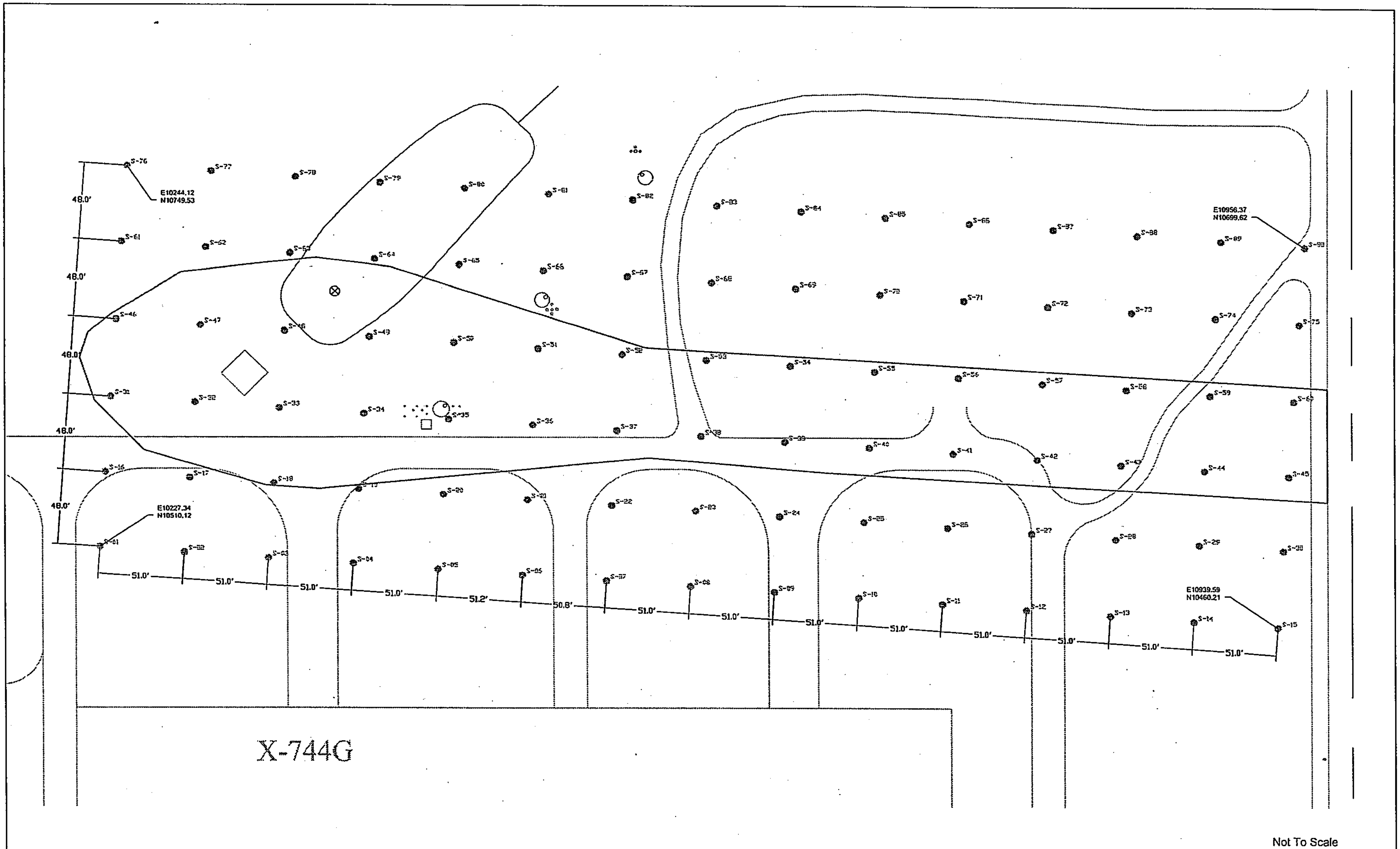

Figure 2
X-701B Soil Sampling Plan

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
S-01	2[1]								
	15				1	1	1	1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-02	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-03	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-04	2[1]								
	15							1	
	25				1	1	1	1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-05	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-06	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-07	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft					1	1	1	1
	WS[2]							1	1
S-08	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-09	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-010	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]					1	1	1	1
S-011	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-012	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
S-013	2[1]								
	15					1	1	1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-014	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-015	2[1]								
	15							1	1
	25				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-016	2[1]								
	15							1	
	25					1	1	1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-017	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-018	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1
S-019	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft					1	1	1	1
	WS[2]							1	1
S-020	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-021	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-022	2[1]								
	15				1			1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]					1	1	1	1
S-023	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-024	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
		Samples To Be Taken							
S-025	2[1]								
	15					1	1	1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-026	2[1]								
	15							1	
	25				1			1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-027	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-028	2[1]								
	15							1	
	25					1	1	1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-029	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-030	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-031	2[1]								
	15							1	1
	25				1			1	
	WS[2] minus 1 ft					1	1	1	1
	WS[2]							1	1
S-032	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-033	2[1]					1	1		
	15				1			1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-034	2[1]					1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-035	2[1]								
	15							1	1
	25				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-036	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
S-037	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]					1	1	1	1
S-038	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-039	2[1]								
	15							1	1
	25				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-040	2[1]								
	15					1	1	1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-041	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-042	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-043	2[1]								
	15							1	1
	25					1	1	1	
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1
S-044	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-045	2[1]								
	15							1	1
	25				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-046	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft				1	1	1	1	1
	WS[2]							1	1
S-047	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-048 shallower[5]	2[1]	1	1	1		1	1		
	8							1	
	13							1	1
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken: Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
S-049 shallower[5]	2[1]	1	1	1		1	1		
	8							1	1
	13							1	
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-050	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-051	2[1]								
	15				1			1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-052	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]					1	1	1	1
S-053	2[1]	1	1	1		1	1		
	15							1	1
	25				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-054	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-055	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-056	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-057	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-058	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-059	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-060	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs [3]	Technetium [4]	Uranium [4]	TCE	Oxidant Demand
S-061	2[1]								
	15				1	1	1	1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-062	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-063 shallower[5]	2[1]	1	1	1		1	1		
	8							1	1
	13				1			1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-064 shallower[5]	2[1]	1	1	1		1	1		
	8							1	
	13							1	1
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-065 shallower[5]	2[1]	1	1	1		1	1		
	8							1	1
	13							1	
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1
S-066	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-067	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-068	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-069	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-070	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-071	2[1]	1	1	1		1	1		
	15				1			1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-072	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1

Table 1

X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs[3]	Technetium[4]	Uranium[4]	TCE	Oxidant Demand
S-073	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-074	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-075	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-076	2[1]								
	15							1	
	25					1	1	1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-077	2[1]								
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1
S-078	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-079 shallower[5]	2[1]	1	1	1		1	1		
	8							1	1
	13							1	
	WS[2] minus 1 ft							1	1
	WS[2]				1			1	1
S-080 shallower[5]	2[1]	1	1	1		1	1		
	8							1	
	13				1			1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-081	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-082	2[1]								
	15							1	
	25							1	1
	WS[2] minus 1 ft				1			1	1
	WS[2]							1	1
S-083	2[1]	1	1	1	1	1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-084	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1

Table 1
X-701B Soil Characterization Analysis Matrix

Location	Depth bgs (ft)	Samples To Be Taken							
		Arsenic	Beryllium	Nickel	Total PCBs[3]	Technetium[4]	Uranium[4]	TCE	Oxidant Demand
S-085	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-086	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-087	2[1]	1	1	1		1	1		
	15							1	1
	25							1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-088	2[1]	1	1	1		1	1		
	15							1	
	25							1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-089	2[1]								
	15							1	1
	25					1	1	1	
	WS[2] minus 1 ft							1	1
	WS[2]							1	1
S-090	2[1]								
	15							1	
	25				1			1	1
	WS[2] minus 1 ft							1	1
	WS[2]							1	1

Note 1 Analyze initial sample from this boring at 2 feet; compare result for Metals, Uranium and/or Technetium to PRG; then, If sample from 2 feet exceeds PRG, analyze additional sample at 4 feet and compare to PRG; then, If sample from 4 feet exceeds PRG, analyze additional sample at 10 feet.

Note 2 "WS" denotes Weathered Shale at the Gallia-Sunbury interface.

Note 3 Target depth of PCB sample for analysis will be selected from depth with the highest TCE result. If sufficient sample is not available at the indicated depth, then soil collected adjacent above the indicated depth will be submitted for analysis.

Note 4 If sufficient sample is not available at the indicated depth, then soil collected adjacent to and above the indicated depth will be submitted for analysis.

Note 5 Borings in the Pond and Pond Banks will be shallower than other borings because of topography. The sample intervals at these shallower borings are different than intervals at other borings.

The following paragraphs describe for each parameter of concern the strategy for soil sampling and analysis. In general, sample locations and depths for each parameter of concern were selected based on historical detections that exceed preliminary remediation goals and on the design needs for the interim measure.

The metals arsenic, beryllium and nickel in soil will be characterized for design based on historical detections at concentrations of concern, which generally were at shallow depths. Specific boring locations within the X-701B Pond, X-701B Pond Banks, and former X-747G Precious Metals Yard will be characterized for arsenic, beryllium and nickel. As shown on Table 1, the initial soil sample at some of these borings will be collected/analyzed at two feet bgs; if results at the two-feet bgs sample do not exceed the preliminary remediation goals (PRGs) for these metals, then no additional samples from that boring will be analyzed; if results exceed the PRGs, then an additional sample will be analyzed at four feet bgs. If results at the four-feet bgs sample exceed PRGs, then a final sample will be analyzed at 10 feet bgs. Samples will be collected for metals at these three intervals. Samples from the shallowest interval will be submitted for analysis. Deeper samples will be appropriately stored pending analytical results.

PCBs in soil will be characterized for design because of historical detections at the unit, and because PCBs are mobilized by TCE. Soil sample locations throughout the unit, excluding the Precious Metals Yard, particularly in the Pond and Pond Banks, will be characterized at depths from 15 feet bgs to the weathered shale. In order to assess the potential for PCBs mobilized by TCE, the depth of PCB soil sample for analysis from the boring will be selected from the depth with the highest TCE concentration. This will require that the sample to be analyzed for PCBs from each boring be selected after receipt and evaluation of TCE analytical results. Samples will be collected for PCBs at these intervals and appropriately stored pending TCE results. Borings that will be sampled for PCBs will be drilled and sampled first. Based on soil data collected after recent ISCO injections for groundwater remediation, it is anticipated that greater TCE concentrations will be found at depth and in lower permeability materials. It is therefore anticipated that samples for PCB analysis would generally be from the lower depths.

Technetium has historically been detected at soil concentrations above PRGs in the area of the Holding Pond and Pond Banks. Historically, technetium has been detected in the Pond and Pond Banks in shallow soil samples 2 to 6 feet bgs, except in the southwest Pond and Pond Banks where technetium was detected at depths of 8 to 30 feet bgs. Technetium will also be sampled at the Precious Metals Yard to supplement historical data. Samples have been selected for analysis of technetium at various depths, as shown on Table 1. The soil samples at borings in the Pond, Pond Banks and Precious Metals Yard will be collected/analyzed at two feet bgs; if results at a two-feet bgs sample do not exceed the preliminary remediation goal (PRG), then no additional samples from that boring will be analyzed; if results exceed the PRG, then an additional sample will be analyzed at four feet bgs. If results at the four-feet bgs sample exceed PRG, then a final sample will be analyzed at 10 feet bgs.

Uranium has historically been detected at soil concentrations above the PRG at locations throughout the area of investigation and at depths throughout the soil column. Historically, uranium in the Precious Metals Yard has been detected above the PRG at shallow depths. Samples have been selected for analysis of uranium at various depths as shown in Table 1. The soil samples at borings in the Pond, Pond Banks and Precious Metals Yard will be collected/analyzed at two feet bgs; if results at a two-feet bgs sample do not exceed the preliminary remediation goal (PRG), then no additional samples from that boring will be analyzed; if results exceed the PRG, then an additional sample will be analyzed at four feet bgs. If results at the four-feet bgs sample exceed PRG, then a final sample will be analyzed at 10 feet bgs.

TCE in soil will be characterized since it is the primary constituent of concern in soil and groundwater that will be addressed by the interim measure. TCE may be present in the unsaturated and saturated zones as a non-aqueous phase liquid on or between soil particles; sorbed to soil particles; dissolved in soil moisture; and as vapor in pore spaces. TCE in source zones may be present as DNAPL, but such DNAPL is notoriously difficult to find. TCE may be present as DNAPL that accumulated in pore spaces, partitions into air and soil and is driven by hydrostatic forces; and may be present as discontinuous residual DNAPL that is typically immobile, often a source of long-term continuing dissolution and subject to capillary forces. Because TCE is a primary constituent of concern and because of its oxidant demand, soil samples throughout the investigation area will be characterized for TCE from mid-depth to the weathered shale. Based on soil data collected after recent ISCO injections for groundwater remediation, it is anticipated that greater TCE concentrations will be found at depth and in lower permeability materials.

Oxidant demand will be characterized for design because it is a key component of the chemical oxidation treatment technology of the interim measure. Oxidant demand of natural organic materials in soil and rock often significantly exceeds the demand of organic contaminants such as TCE. Soil samples throughout the investigation area from the mid-depth to the Sunbury shale will be characterized for total oxidant demand. In particular, the thin layer of weathered shale on top of the Sunbury shale is a target of the interim measure.

All samples will be scanned in the field for radioactivity levels with a handheld radiation meter (such as LUDLUM 12 or equivalent) to assess radiological contamination before containerizing samples.

2.2.2 Sampling Procedures

Field sampling activities will be conducted in accordance with the latest revisions on file of the following CDM and LATA/Parallax Portsmouth, LLC (LPP)-PORTS technical standard operating procedures (SOP):

CDM SOP 1-2	Sample Custody
CDM SOP 1-4	Subsurface Soil Sampling
CDM SOP 2-1	Packaging and Shipping Environmental Samples
CDM SOP 2-2	Guide to Handling Investigation-Derived Waste
LPP-PORTS-GWS-006	Decontamination of Sampling Equipment
LPP-PO-1623	Sample Shipping of Non-Hazardous Samples to Off-Site Laboratories
LPP-PORTS-GWS-009	Field Log Books
LPP-ER-N004	Direct Push Technology (DPT) Drilling, Sampling, & Micro Well Installation

Because these samples are being collected and analyzed to support interim measure design, the mass of sample required for analysis of TCE and oxidant demand is considerably larger than usual. The sample for TCE analysis will typically be 150 to 200 grams; the sample for oxidant demand could approach 600 grams. For comparison, the sample for PCB analysis is typically 20 to 50 grams. The quantity of sample obtained from the weathered shale layer may be limited to only a few inches in the sampling core. Therefore, a sampling priority is established for analysis first of TCE, then of oxidant demand, and then of PCBs. This priority is based on the focus of this interim measure, which is TCE oxidation. Sample containers for other analytical parameters will be filled from the remaining soils adjacent to and above the horizon sampled for TCE, oxidant demand and PCBs.

As standard practice, the investigative borings will be filled with bentonite/grout to prevent surface runoff from migrating to the subsurface.

2.2.3 Laboratory Analysis

Laboratory chemical analyses will be conducted at a fixed-base laboratory for the analytes listed in the table below with corresponding test methods.

Table 2. X-701B Soil Characterization Analytes and Test Methods

Analyte Group	Laboratory Test Method
TCE	SW-846 8260 with extraction Method 5035 modified
PCBs	SW-846 8082
Metals (As, Be, and Ni)	SW-846 ICP Method 6010/6020
Oxidant Demand	Appropriate method developed with laboratory
Uranium	Approved method per laboratory QA Plan
Technetium-99	Approved method per laboratory QA Plan

Samples for analysis of TCE by Method 8260 will be prepared by Method 5035 with a modified solvent extraction procedure. A larger mass of soil sample, typically 150 to 200 grams (wet weight), will be extracted in 250 milliliters of methanol with physical shaking, settling and separation. The goal of collecting and extracting a larger mass of sample is to measure the total mass of TCE contained in the soil mass, whether dissolved, adsorbed or held in pore space.

2.3 LABORATORY AND FIELD QUALITY ASSURANCE/QUALITY CONTROL MEASURES

Quality Assurance/Quality Control (QA/QC) measures will be implemented in accordance with Section 3 of this SAP. Field QC measures will include samples collected or prepared in the field during sampling activities and submitted to the laboratory to assess the quality of the sample collection process, sample handling and shipment, and sample analysis (for total measurement error). For purposes of this SAP, field QC samples include field duplicates and field/rinsate blanks.

- Field Duplicate – One field duplicate will be submitted for every twenty samples that are collected. Field duplicates will be analyzed for the same analytical parameters as the design characterization samples being collected. The purpose of analyzing field duplicate samples is to measure precision, which is a function of variance in sample composition, sampling techniques and analytical techniques. (Reference SW-846 Chapter 9 Sampling Plan QC Procedures). Field duplicate samples will be collected in the same manner as design characterization samples.

- Field/Rinsate Blanks – One field blank and one rinsate blank will be collected for every thirty samples that are collected. A field blank is collected at a specific sampling location by filling a laboratory-provided container (container will include preservative, if appropriate) with laboratory-provided water that meets or exceeds the standards for deionized ultra-filtered water. A rinsate blank is a sample of deionized ultra-filtered water that has been used to rinse decontaminated sampling equipment. The field and rinsate blanks will be analyzed for all analytes of concern for the sampling location. The purpose of field and rinsate blanks is to verify that the presence of a given analyte in a sample is not due to a source of external contamination (e.g., water used in the decontamination process, contaminated sampling equipment, airborne contamination from an adjacent facility or operation, etc.). (Reference SW-846 Chapter 9 Sampling Plan QC Procedures).

For the purposes of this SAP, laboratory QA measures are those checks that an analyst routinely runs to determine the precision and accuracy of the analytical methods and equipment (method error). Laboratory QA measures typically include blanks, standards, duplicates, standard reference materials, and standard additions (matrix spikes). The QA measures will be specified in the contract with the laboratory that performs the analysis of samples collected for this scope of work.

The Quality Assurance Program Plan (QAPP) and Quality Implementation Plan requirements will be applied to all activities in a manner consistent with the nature of the work performed and the requirements applicable to each work activity. The QAPP establishes the responsibilities and requirements which personnel are committed to in the performance of day-to-day work activities. Procedures have been developed to establish the methods used to accomplish specific elements of the QAPP. These procedures typically fall into two categories: administrative (covering generic topics such as training, reviews, document control, nonconformance reporting, and records), and technical (covering such topics as sampling and engineering).

2.4 SAMPLE MANAGEMENT

All sampling and data management activities including generation of field chain-of-custody documentation, labeling of sample containers, and generation of laboratory chain-of-custody documentation will be performed using the Project Environmental Measurements System (PEMS).

3. QUALITY ASSURANCE/QUALITY CONTROL

QA/QC measures will be communicated to the project team through planning documents, procedures, work instructions and thorough training and orientation meetings. Management and project assessments will verify that adequate QA/QC controls are in place to perform the sampling task. Prior to commencement of work activities, management will make certain that project staff are properly trained and qualified.

The DOE Prime Contractor's QA program will provide the appropriate resources to facilitate quality work. The QA Program includes a framework for achieving quality, contains explanations of various elements that may be applicable to project work, and includes procedures to effectively implement the elements. Inclusion of the applicable quality elements and procedures during project planning helps build quality into the project. Certain quality procedures assist in properly dealing with problems if they arise during project activities. The key quality elements are planning the project, qualification of personnel, technical review of project work, procurement of technical services and measurement, assessment of the work, and rapid correction of problems.

The QA Program also includes a QA staff that is available to provide information and guidance in quality matters and to assist in meeting QA requirements. QA and project staff share a common goal to achieve high quality project products and results. The QA staff will work to customize the QA procedures to identify the quality measures that will be most helpful to this project. A QA staff member will work with the project team to achieve these common goals in this regard.

During project execution, the adequacy of QA/QC measures will be assessed by team members, and management, to determine if the scope of work and governing documents are being implemented effectively. All team members and workers are responsible for identifying, and reporting project difficulties, and for suggesting improvements to work processes. If necessary, QA/QC measures will be modified using the change control process and communication to the project team. Lessons learned and other feedback will be provided to foster continuous improvement.

4. WASTE MANAGEMENT

Waste materials that are generated during soil characterization will be managed in accordance with applicable state, federal and DOE Site requirements. Waste management will include activities such as waste sample collection, waste characterization, storage, transportation and disposal. All wastes will be characterized and shipped to an appropriate treatment and/or disposal facility. Both liquid and solid waste will be generated during this investigation.

Liquid waste will include decontamination water and other waste waters generated as a result of soil sampling activities. All decontamination water and waste waters will be containerized and treated at existing, permitted on-site groundwater treatment facilities prior to discharge through permitted National Pollutant Discharge Elimination System (NPDES) outfalls.

Soil sample extraction using methanol will generate liquid laboratory waste. All laboratory waste will be containerized and managed appropriately.

Solid waste will include excess soil from soil sampling, and contaminated personal protective equipment (PPE). Solid waste will be stored in a 90-day Resource Conservation and Recovery Act (RCRA) storage area and/or RCRA Part B permitted storage area pending waste characterization. Solid waste will be transported off site to an appropriate disposal facility. Consistent with past practice for X-701B, excess soil from a depth above 10 feet bgs will be managed on site as unregulated soil. The PPE such as clothing and gloves may be decontaminated to a RCRA-clean standard (Ohio Administrative Code 3745-270-45) and surveyed by radiological control personnel. PPE that meets radiological off-site release criteria will be disposed at a sanitary landfill. If radiological contamination is found, the waste will be containerized and sent to an approved off-site facility for disposal. Low level waste (LLW) and PCB/LLW will be characterized and sent to an approved off-site disposal facility.

Wastes will be appropriately characterized by sampling and analysis to determine appropriate treatment/disposal requirements. Specific waste characterization procedures and methods will be dependent on waste acceptance criteria of receiving facilities.

5. ENVIRONMENT, HEALTH AND SAFETY

The Environmental, Health and Safety Program is designed to minimize the number of injuries and illnesses, with an ultimate goal of zero accidents and injuries. The appropriate supervision, training, and PPE will be provided to keep employees safe. Management and staff share responsibility for health and safety, and all levels are accountable for specific health and safety activities. Full participation by, and cooperation with, all employees are crucial to the overall success of the environmental, health and safety program for this project. Principles that will be adhered to during performance of this work include:

- Occupational injuries and illnesses are preventable;
- Preventing occupational injuries and illnesses is one of the highest responsibilities;
- Providing safe working conditions in the field and the office is a priority;
- Employees have the right to information and training;
- Working safely is a condition of continued employment and is a shared responsibility between management and staff; and
- The project cannot succeed unless injuries and exposures are mitigated, managed and prevented.

Safety is the responsibility of each employee. Ultimately, however, the successful implementation of the Environmental, Health and Safety Program depends on the integrated activities of the managers, health and safety staff, and employees. Compliance with applicable health and safety regulations will be achieved through training, oversight and coordination of all health and safety functions.

A primary consideration for all operations is the health and safety of its personnel. Protection of the public and the environment are also important considerations in developing and implementing the Environmental, Health and Safety Program. Application of standard health and safety procedures by trained personnel reduces the possibility of injury or exposure.

Manager and employee cooperation is required in all health and safety matters. The objective is to implement an Environmental, Health and Safety Program that minimizes accidents, injuries and illnesses.

The Integrated Safety Management System (ISMS) integrates safety into management and work practices at all levels so that missions are accomplished efficiently while protecting the worker, the public, and the environment. Those involved with this SAP must be committed to this System and must recognize that it is fundamental to successful execution of work. ISMS provides a formal, organized process to ensure the safe conduct of work. The principles of ISMS will be integrated into all environmental, health and safety programs on site.

6. REFERENCES

DOE 2006. *Work Plan for the Groundwater Remediation of the X-701B Solid Waste Management Unit at the Portsmouth Gaseous Diffusion Plant, Piketon, Ohio,* DOE/PPPO/03-0020&D3, LATA/Parallax Portsmouth, LLC, Piketon, Ohio.

Ohio EPA 2003. *Decision Document for the X-701B SWMU in Quadrant II of the US DOE Portsmouth Facility, Piketon, Ohio,* December 2003.

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