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ENVIRONMENTAL RESTORATION PROGRAM

DECONTAMINATION AND DECOMMISSIONING PROGRAM OPERABLE UNIT 6, VERIFICATION SAMPLING AND ANALYSIS OU6, AREA 19 RADIOACTIVE WASTE LINES, AND AREA 14 RADIOACTIVE WASTE LINE BREAK SAMPLING AND ANALYSIS PLAN

Mound Plant
Miamisburg, Ohio

FINAL
(Revision 0)

Prepared For:
EG&G MOUND APPLIED TECHNOLOGIES
AND
THE U.S. DEPARTMENT OF ENERGY

Prepared By:

An Employee-Owned Company

Science Applications International Corporation
1321 Research Park Drive
Dayton, Ohio 45432

SEPTEMBER 1993

REFERENCE US

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93-0020

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LIST OF ACRONYMS

ALARA	As Low As Reasonably Achievable
ARAR	Applicable or Relevant and Appropriate Requirement
BOA	Basic Ordering Agreement
CERCLA	Comprehensive Environmental Response, Compensation & Liability Act
CLP	Contract Laboratory Program
COC	Contaminant of Concern
D&D	Decontamination and Decommissioning (Program)
DOE	U.S. Department of Energy
DQO	Data Quality Objectives
EPA	U.S. Environmental Protection Agency
ER	Environmental Restoration
FFA	Federal Facility Agreement
FID	Flame-ionization detector
FIDLER	Field Instrument for the Detection of Low-Energy Radiation
GRASP	General Radiochemical Analytical Services Protocol
HSP	Health & Safety Plan
IDM	Investigative Derived Material
LSA	Low Specific Activity
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NPL	National Priorities List
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
PID	Photoionization detector
PRGs	Preliminary Remediation Goals
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RTG	Radioisotopic Thermoelectric Generator
SAP	Sampling and Analysis Plan
SM/PP	Special Metallurgical/Plutonium Processing
SOPs	Standard Operating Procedures
SOW	Statement of Work
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
TCL	Target Compound List
TRU	Trans~~ura~~nic
VOC	Volatile Organic Compounds
VWP	Verification Work Plan
WD	Waste Disposal
WDA	Waste Disposal Annex
WTS	Waste Transfer System

ACKNOWLEDGEMENTS

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PREFACE

This SAP was prepared in accordance with the instructions contained in Section 5 of the OU6 Verification Work Plan (DOE, [FINAL], August, 1992), with the exceptions noted below, to accomplish the verification sampling and analysis activities in the former waste transfer system designated as Area 19, and in the site of the 1969 wasteline break (Area 14). The exceptions taken to the OU6 Verification Work Plan in the preparation of this document are:

- Section 5.1.1

  1. Presampling. No short time lead samples will be taken prior to the start of the full verification sampling activities. **Rationale:** Areas 19 and 14 are inactive areas that have been remediated by the Decontamination and Decommissioning (D&D) Program and are ready for verification sampling and analysis activities. No Plant operations, accidental releases or other events have occurred subsequent to the D&D activities (DOE, 1990; Argonne, 1990) that would have introduced or re-introduced contaminants into Areas 19 and 14.

  2. Tank sites. No tank site identification or planning information is included in the SAP. **Rationale:** There are no above ground or below ground tanks located in Areas 19 and 14. Consequently, no sampling modifications are anticipated to be necessary due to the absence of tank sites in either area.

- Section 5.1.2, subparagraph 1:

  3. Cleanup criteria. No cleanup criteria for Areas 19 and 14 will be established under the verification sampling and analysis activities to be conducted under this SAP. **Rationale:** Cleanup criteria for OU6 and the remainder of the Mound Plant (with the exception of the DOE cleanup goals for Pu^{238} and Th^{232} in soils used by D&D) will be established in the future under the site-wide (OU9) work plan activities. Some of the applicable or relevant and appropriate requirements (ARARs) that may be applied to OU6 in general, or to Areas 19 and 14 in particular, are discussed in Section 4 of the OU6 Verification Work Plan.

- Section 5.1.2, subparagraph 3:

4. Statistical justification. A sampling strategy justification and calculation for each analyte involved in the verification of Areas 19 and 14 will not be addressed in this SAP. **Rationale:** The sampling strategy justification and calculations contained in Section 2 of this SAP are applicable to the analyte group to be addressed in the verification sampling and analysis activities. Consequently, a sampling strategy justification and calculation for each analyte involved in the Area 19 and 14 verification is not necessary.

- Section 5.1.2, subparagraph 5:

5. Mound Plant SOPs. The EG&G Mound Plant standard operating procedures (SOPs) applicable to the Area 19 and 14 verification sampling and analysis activities with the exception of SOPs 1.12, 6.11, and 6.16 will not be appended to this SAP. **Rationale:** Only those SOPs that have been previously approved will be used to accomplish the verification sampling and analysis activities in Areas 19 and 14. Section 5.1.1, page 5-2, second paragraph, eighth sentence of the OU6 Verification Work Plan indicates that only those SOPs that are not included in the companion QAPjP or Health and Safety Plan (HSP) must be attached to this SAP. All applicable Mound Plant SOPs, with the exception of those noted above, are appended to the OU9 QAPjP and are incorporated by reference to that document.

1. INTRODUCTION

This Sampling and Analysis Plan (SAP), together with the Operable Unit 6 (OU6) Quality Assurance Project Plan (QAPjP) (DOE, 1992f), specifies the field sampling, laboratory analysis and associated quality assurance/quality control (QA/QC) requirements for the verification sampling and analysis activities to be conducted in OU6, Area 19 (radioactive waste lines) and Area 14 (radioactive waste line break), in accordance with the OU6 Verification Work Plan (VWP), (except where noted in the preface to this SAP).

The objectives of the SAP are as follows:

1. Verify from the results of the radiochemical analysis of site soils that the DOE decontamination and decommissioning (D&D) operations for OU6, Areas 19 and 14, met the cleanup goals (i.e., concentrations of plutonium-238 are below the D&D goal of 100 pCi/g [if possible, below the "as low as reasonably achievable" (ALARA) goal of 25 pCi/g] and isotopic thorium concentrations individually are below 5 pCi/g from the surface to 15 cm, and less than 15 pCi/g at depths greater than 15 cm) and provide a basis for further D&D action if the cleanup goals were not met;

2. Determine from the radiochemical, organic and inorganic analysis of verification samples if Areas 19 and 14 contain other radioactive or non-radioactive (chemical) contaminants (i.e., the type of contamination) associated with the solutions transported through the waste transfer system (WTS) from the plutonium processing operations on the Special Metallurgical/Plutonium Processing (SM/PP) Hill to the WD Building and address the following questions;

    - Do Areas 19 and 14 contain chemical contamination at concentrations above known action levels or above applicable or relevant and appropriate requirements (ARARs)?

    - What is the extent of the residual contamination in Area 19 and 14 soils following D&D cleanup activities?

3. Provide remedial investigation (RI) quality environmental data obtained through sampling and analysis under Comprehensive Environmental Response, Compensation and Liability Act (CERCLA)-based, regulatory agency approved procedures to support a future feasibility study and risk assessment to address the residual risk from radioactive and/or chemical contaminants remaining in Areas 19 and 14 following D&D cleanup operations.

Since approximately 70% of the costs to determine if site soils are chemically contaminated are associated with non-laboratory activities (i.e., developing sampling plans, conducting site preparation activities, collecting the samples, providing appropriate levels of QA/QC and safety support, managing the samples, validating the analytical data and reporting the results), combining the radiological and non-radiological sampling under the verification sampling and analysis efforts can achieve significant cost savings. Therefore, if chemical contamination is not found in Area 19/14 samples these areas can be considered

clean from a non-radiological contamination standpoint, thus saving RI/FS resources for use at other Mound Plant sites. If chemical contamination is found in the verification samples an evaluation of the data will determine if follow-on RI/FS activities are required to characterize the nature and extent of the contamination.

Verification sampling and analysis activities, as specified in Section 4 of the OU6 QAPjP, are designed to address residual radioactive and chemical contamination remaining in soils, sediments and standing water following D&D cleanup operations. These activities are not intended to address groundwater contamination or the environmental dynamics associated with contaminant transport via surface water runoff events, via the air pathway or via the site biota. Consequently, additional remedial investigation/feasibility study (RI/FS) activities may be required to fully characterize the nature and extent of contamination in Areas 19 and 14, depending upon the results of the verification sampling and analysis activities, the required levels of cleanup (i.e., future cleanup standards) and the results of future risk assessments.

The balance of this section presents relevant background information for the Mound Plant, a site description of the areas, a summary of all previous sampling and analysis activities in Areas 19 and 14, and a discussion of contaminants that have been identified from earlier studies. Section 2 contains the sampling objectives and supporting rationale. Section 3 describes the sample locations and number of samples that will be obtained to accomplish the verification sampling/analyses. Section 4 presents the sample designation scheme that will be used. Section 5 discusses the sampling equipment that will be employed and the procedures that will be used to obtain the environmental samples required to meet the objectives stated above. Section 6 describes the sample handling procedures that will be used and the analyses that will be conducted by the laboratory. Section 7 describes how the data obtained during the verification sampling and analysis activities for OU6, Areas 19 and 14, will be evaluated, and Section 8 lists the appropriate references used in preparing this document.

1.1. BACKGROUND

1.1.1. Mound Plant

The U.S. Department of Energy's (DOE) Mound Plant is an integrated research, development and production facility that has been in operation since the end of World War II. As shown in Figures 1.1 and 1.1a, the Mound Plant is located partially within the City of Miamisburg, Ohio, approximately 10 miles southwest of the City of Dayton, Ohio. The plant property includes 306 acres of land situated on two hills overlooking the Great Miami River. The Mound Plant is presently operated for the DOE by EG&G Mound Applied Technologies, and manufactures non-nuclear and tritium-containing components for nuclear weapons. It also produces small heat sources fueled by various radioactive isotopes for space and defense programs.

Mound Plant operations have historically contributed radiological and non-radiological (chemical) contaminants to the environment both within and beyond the reservation boundaries. Based upon an analysis of these historic releases to the environment, the Mound Plant was placed on the National Priorities List (NPL) under CERCLA in November, 1989. In response to the listing on the NPL, the DOE and the U.S. Environmental Protection Agency (EPA) entered into a Federal Facility Agreement (FFA) which became effective on October 12, 1990. This FFA subsequently became a tri-party agreement with the addition of the Ohio EPA as a signatory agency on July 15, 1993. Under terms of the FFA, the DOE has implemented a Remedial Investigation/Feasibility Study (RI/FS) and is required to conduct interim actions, as appropriate, to protect public health, public welfare and the environment.

To implement the RI/FS more effectively, the Mound Plant and its surrounding environs were originally divided into nine Operable Units (OUs), (a detailed discussion of these OUs is contained in the OU9 Work Plan). Subsequent redistribution has eliminated OUs 3,7, and 8 so that only six OUs are currently active. OU6 includes areas known to contain radioactive contaminants that are being addressed under the Mound Plant's D&D Program. Some of these areas have been remediated by the D&D Program and are awaiting verification sampling. D&D activities are in progress in some of the other OU6 areas or are scheduled for cleanup in the future (DOE, 1992c).

1.1.1.1. Plutonium Processing Operations

During the 1960s and 1970s plutonium-238 processing, fabrication, and recovery operations associated with the production of radioactive thermal generators (RTGs) resulted in the generation of both solid and

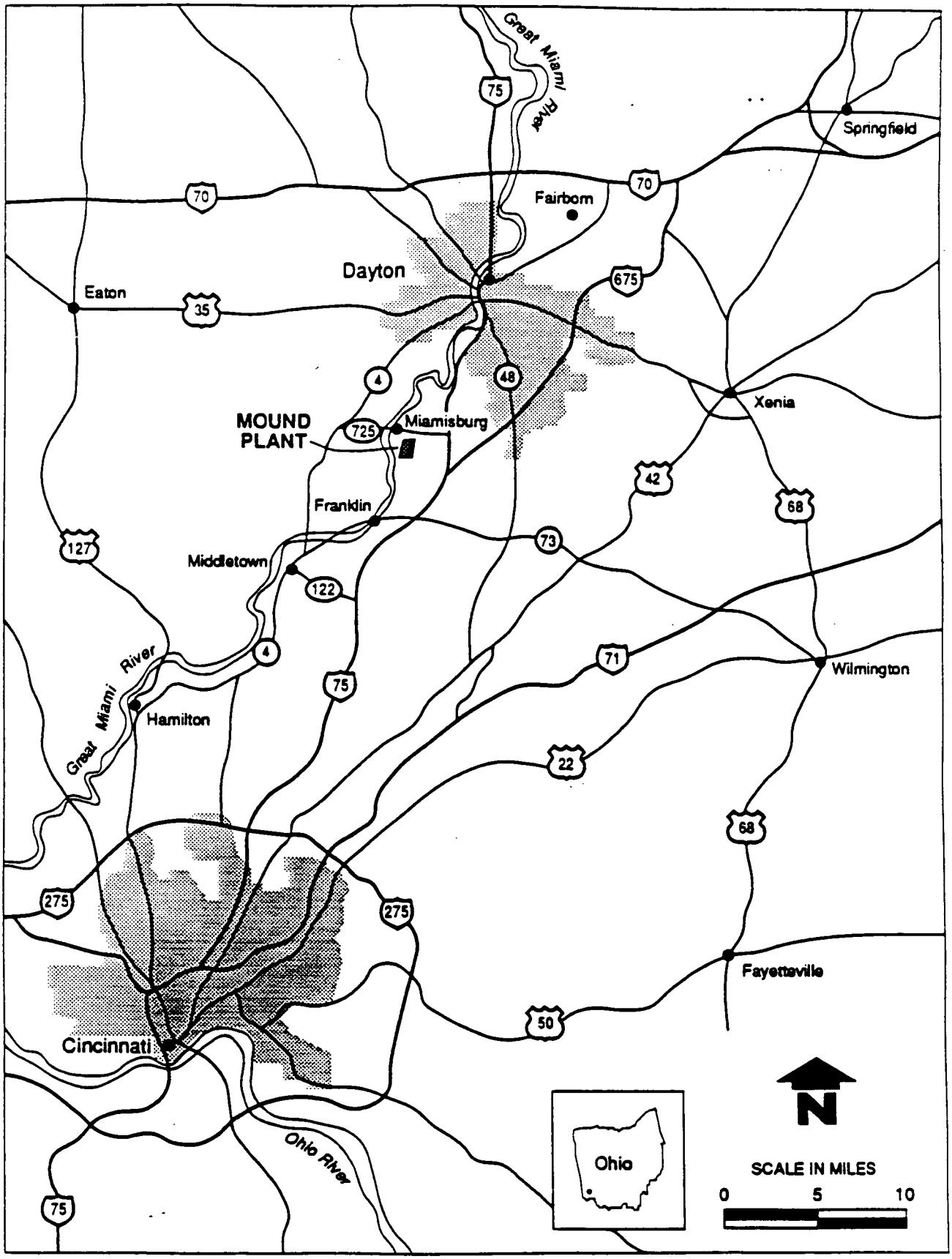


Figure 1.1. Location of Mound Plant, Miamisburg, Ohio.

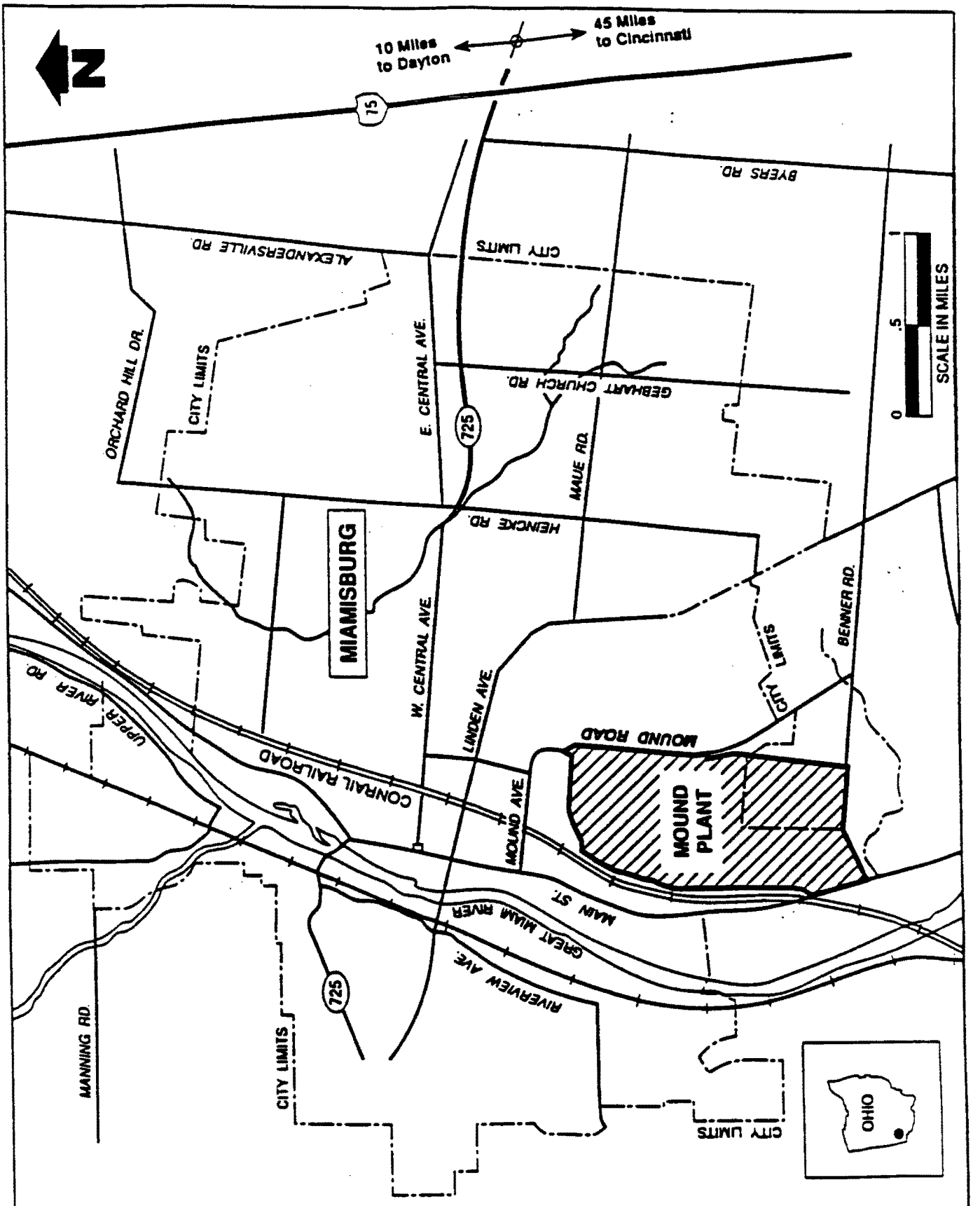
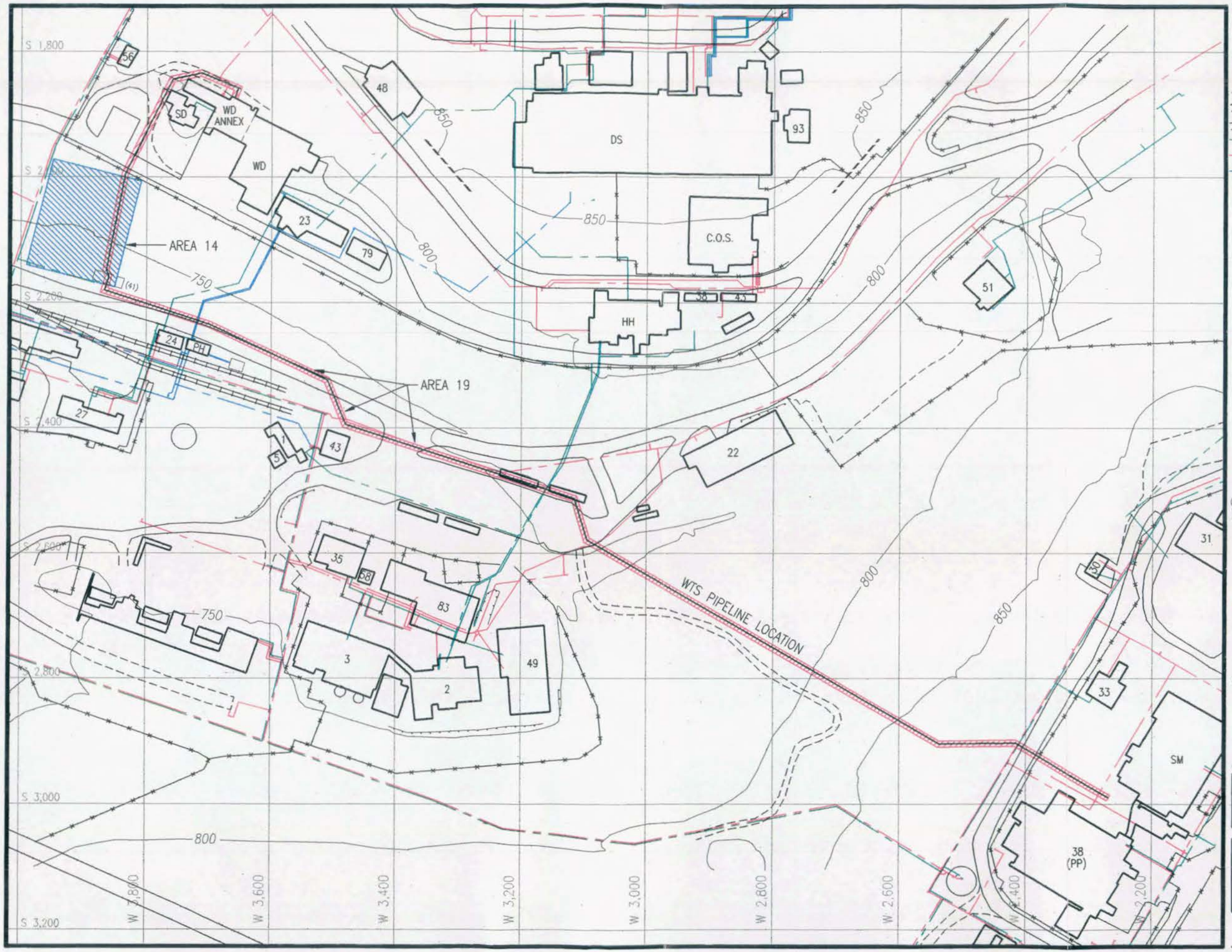


Figure 1.1a. Location of Mound Plant, Miamisburg, Ohio.

liquid waste streams from glove box and other operations that required recovery, reprocessing (for additional plutonium recovery), treatment, storage, packaging, transport and disposal. Chemicals used in the recovery operations included nitric and hydrofluoric acids, hydroxylamine, sodium carbonate, ferrous sulfamate and sodium hydroxide. When the SM Building became operational in 1961, a waste treatment facility was installed in the SM-1 room.

For the next six years, all recoverable plutonium-containing wastewater generated in the SM Building was processed for plutonium recovery and treated in the SM-1 waste disposal facility, or packaged in drums and stored in the SM drum storage area. The wastes were categorized as high-risk wastes (plutonium content > 10,000 pCi/g) and low-risk wastes (plutonium content < 10,000 pCi/g), which were stored and treated separately. Approximately 100 gallons of high-risk waste was processed in the SM-1 facility on a daily basis (DOE, 1992a). The wastes contained nitric and hydrofluoric acids, plutonium-238, and trace quantities of the radionuclides contained in the original plutonium material (americium-241, neptunium-289, and uranium-234). Trace metals were present in the waste as a result of leaching various pieces of equipment and tools with nitric acid to recover plutonium or to decontaminate the tools/equipment. The cations present in the waste included ammonium (NH_4^+), sodium (Na^+), tantalum (Ta^{+3}), molybdenum (Mo^{+6}), iron (Fe^{+2}), chromium (Cr^{+3}), nickel (Ni^{+2}) and lead (Pb^{+2}) (from the neoprene leaded gloves). These cations were greatly diluted when combined with other waste streams. The waste also contained concentrations of nitrate (NO_3^{-3}), sulfate (SO_4^{-2}) and fluoride (F^-) anions (DOE, 1992a).

During the period from 1966 through 1967, Building 38 (PP Building), the Waste Disposal Annex (WDA) Building and the Waste Transfer System (WTS) were constructed to meet the increasing needs of the plutonium processing programs at the Mound Plant. The WTS consisted of a series of holding tanks, a lift station (Building 41, subsequently demolished), and steel transfer pipes connecting the SM and PP Buildings to the WDA Building. The former lift station (Building 41) was located at the end of the gravity feed portion of the WTS, at the southeast corner of Area 14 (see Figure 1.2). The transfer pipes consisted of a 1.5-inch pipe to transfer the high-risk waste, and a 2-inch pipe to transfer the low-risk waste. The depth below ground surface of these lines varied from approximately 4 feet to 8 feet as shown in Figure 1.3. The low-risk line was in service from 1967 until September, 1974, and the high-risk line was used during the period from 1967 until April, 1976 (DOE, 1992a).



LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- DEMINERALIZED WATER
- FIRE PROTECTION WATER
- SANITARY WATER

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "BATTELLE & ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 50 100 150 300
SCALE: 1" = 150'

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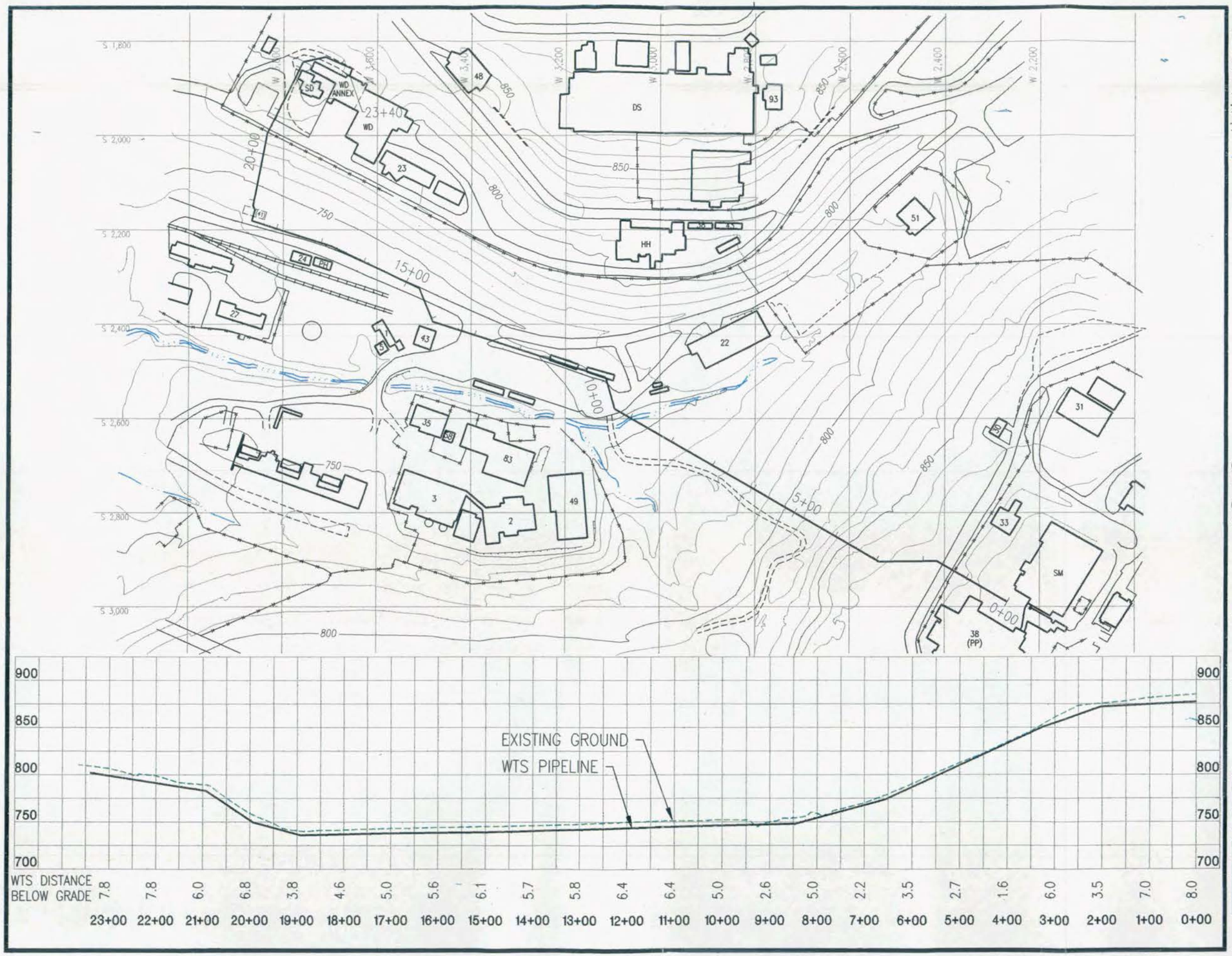
MOUND AREA 19 & 14
MIAMISBURG, OHIO

Figure 1.2
MOUND AREA 19 & 14 RELATIVE TO WTS PIPELINE & BLDGS.

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\380FIG12.PLT

SHT 1 OF 1	\93046\DWGS\380FIG12	N/A
DRAWING #	CAD FILE #	ROT. ANGLE



LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- + 25 EXIST. BOREHOLE
- EXIST. DITCHLINE

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) PROFILE DATA WAS TAKEN FROM DWGS. PROVIDED BY WOOLPERT CONSULTANTS DATED 2/19/85.

25°30'49"
PLANT NORTH
TRUE NORTH

0 100 200 400
HORIZONTAL SCALE: 1" = 200'

0 50 100 200
VERTICAL SCALE: 1" = 100'

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MOUND AREA 19
MIAMISBURG, OHIO

Figure 1.3
PLAN PROFILE OF WTS PIPELINE

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	/93046/PLOT/440PROF.PLT

SHT 1 OF 1	/93046/DWGS/440PROF.DWG	N/A
DRAWING #	CAD FILE #	ROT. ANGLE

1.1.1.2. Decontamination and Decommissioning (D&D)

Leaks in the WTS, including a rupture of the high-risk line in 1969, resulted in the abandonment of the WTS in 1976. The original Area 19 was created when the former WTS pipeline between the SM/PP Hill and the former lift station was removed and the surrounding soils along the former pipeline were remediated by the Mound Plant D&D Program.

Building 41 (former lift station) was completely dismantled by the Mound Plant D&D Program on a piece-by-piece basis, with all contaminated materials containerized and shipped off-site for disposal. All material was scanned for radioactivity using Field Instruments for the Detection of Low-Energy Radiation (FIDLER) survey instruments. Samples of the material with elevated FIDLER readings were screened for radioactivity at the Mound Plant Soil Screening Facility. This material was classified as transuranic (TRU) or low specific activity (LSA) waste and disposed of off-site. Upon removal of the structure, the foundation was excavated. The soil beneath Building 41 was removed to bedrock, containerized, and shipped off-site. A layer of bentonite was placed in the open excavation above the bedrock and a layer of concrete was placed on top of the bentonite. The excavation was subsequently filled with clean backfill from an off-site source.

The rupture in the high-risk waste line of the WTS occurred between the former lift station (Building 41) and the WDA Building. The hillside area where the rupture occurred is designated as Area 14. During the cleanup operations that followed this event, approximately 964 cubic feet of contaminated soil was removed and shipped off-site. While the cleanup activities were in progress, a major rain storm occurred that transported some of the radioactively contaminated soils from the open excavations downgradient, across the Mound Plant boundary, and into the Miami-Erie Canal (OU4). In August of 1974 additional soil removal actions were initiated to reduce the level of Pu^{238} contamination remaining on the hillside where the rupture occurred. During these additional cleanup operations, approximately 2,700 cubic feet of soil containing approximately 35 curies of radioactive contamination was excavated, containerized, and shipped off-site for disposal (D. R. Rogers, MRC, September 15, 1975).

A portion of the area north of the Waste Disposal (WD) Building (see Figure 1.2) was excavated (15 feet wide by 15 feet long) to a depth of approximately 7 feet to remove the two underground lines and their cleanouts. The cleanouts had previously leaked (they were on the pressure side of the lift pumps in Building 41) and the soil was contaminated under the lines. Excavation continued in one foot increments

and the soil was screened for radioactive contamination. Excavation was discontinued at a depth of approximately 11 feet and an exemption (see note below) to abandon further excavations was granted by the Mound Plant D&D Program. A second area adjacent to the first was excavated (15 feet wide by 30 feet long) to a depth of approximately 7 feet to remove dual underground waste transfer lines and their cleanouts. The contaminated soils under the removed lines were excavated in one foot increments and the soil was screened for radioactive contamination between each increment. The excavation was terminated at a depth of approximately 12 feet and an exemption to abandon further excavations was granted by the Mound Plant D&D Program. The bottom of each excavation was sealed with a four-inch layer of Bentonite clay and refilled/compacted with clean fill from off-site. A second layer of Bentonite was placed approximately three feet from the top of the excavation. The excavation areas were backfilled with clean soil from an off-site source. Soil contamination in both excavations was reduced to < 5,000 pCi/g of plutonium (DOE, 1992c).

(Note: The "exemption to abandon further excavation was granted by the Mound Plant D&D Program" refers to the need to cease excavation activities to preclude compromising the integrity of the foundation for the WD Building. During the D&D excavation activities to remove contaminated soil surrounding the WTS cleanouts (sampling area 19-1) the field crew encountered the foundation for the WD Building. To avoid damage to the foundation and to preserve the integrity of the WD Building, digging activities were terminated and an exemption to abandon further excavation was issued by the Mound Plant D&D Program. Soil screening data obtained from samples collected at the bottom of the excavation indicated that DOE cleanup levels had not been achieved when the exemption was granted.)

1.1.2. Site Descriptions

The areas to undergo verification sampling and analysis as described in this SAP are shown in Figure 1.2 and defined below:

- Area 19: The length of the trench excavated by D&D to remove the WTS piping that extended from the Special Metallurgical (SM) and Plutonium Processing (PP) buildings on the SM/PP Hill through the former lift station (Building 41) to the WD and WDA buildings on the Main Hill.

- Area 14: The area upslope from the former lift station (Building 41) where the break occurred in the radioactive waste line in 1969.

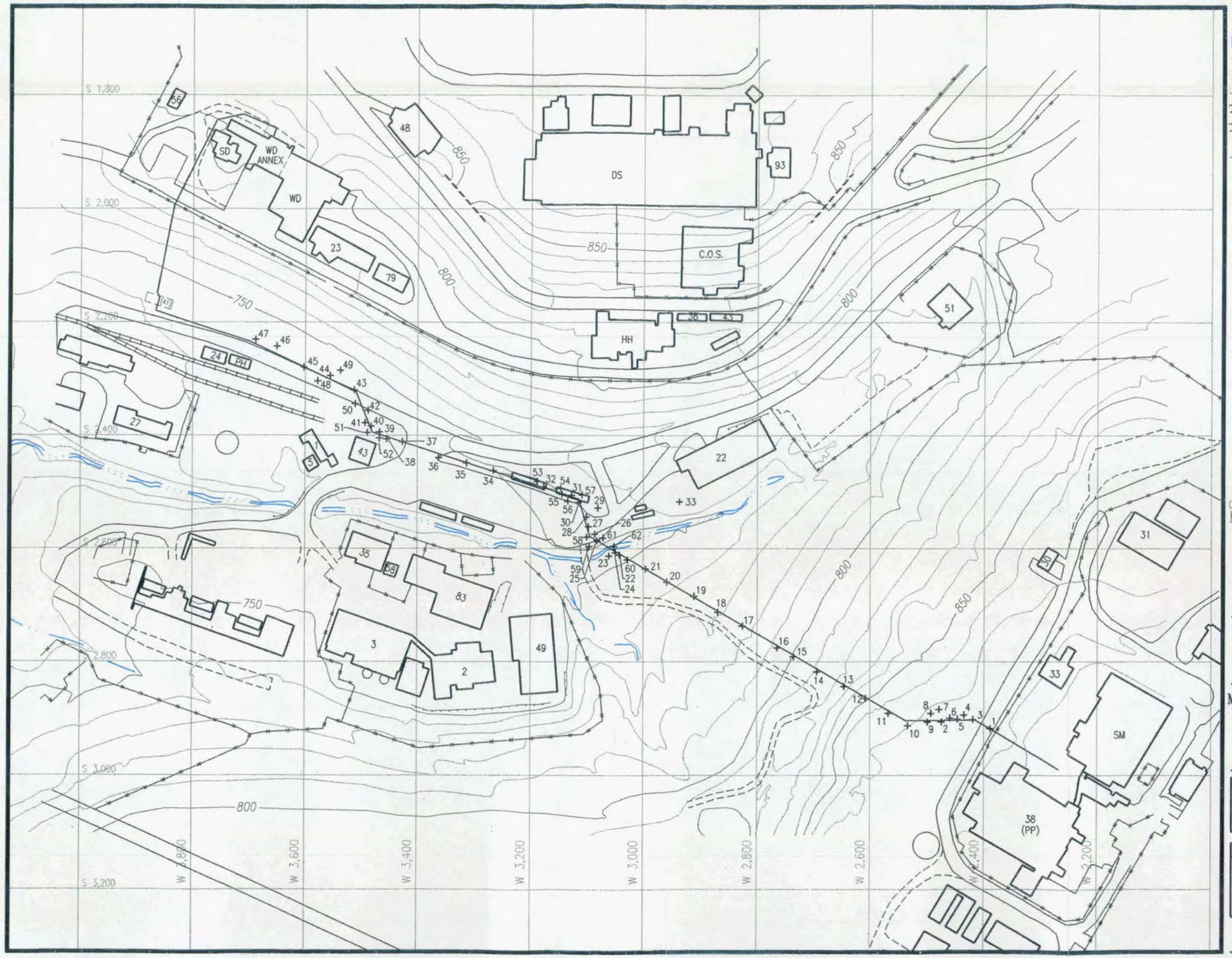
- The section of the WTS pipeline north of the WD Building where leaks in the pipeline and cleanouts occurred.

The WTS has been removed by D&D, contaminated soils have been remediated, and the entire length of former pipeline and the leak areas are ready for verification sampling and analysis activities. If the results of verification sampling and analysis show that the D&D Program cleanup goals for Areas 19 and 14 have been met, and a future risk assessment determines that no harmful levels of radionuclides or chemical contaminants remain, no further characterization efforts will be required. Follow-on sampling and analysis efforts may be required if the results of the verification sampling/analysis activities indicate that additional field work is needed to determine the nature and extent of the residual contamination remaining in the soils following the D&D cleanup. Any residual risk posed by the nature and extent of contaminants remaining in Areas 19 and 14 soils following the D&D cleanup operations will be addressed in a future risk assessment and feasibility study, (specific to OU6) with supporting data from the RI/FS of other Mound Plant OUs.

1.2. PREVIOUS SAMPLING IN AREA 19

1.2.1. 1986 Verification Study

A study to verify the cleanup of Area 19 was performed by the Battelle Memorial Institute in 1986. This study (the "Battelle Study") included the analysis of 248 soil samples collected from 62 locations along the length of the former pipeline from the SM/PP Hill to the former lift station (Building 41). Samples were taken approximately every 50 feet except where contamination had previously been detected from monitoring during excavation to remove the pipeline, and from monitoring following backfilling. At these locations, the sampling interval was reduced to every 15 feet. Since decontamination work was in progress between the former lift station (Building 41) and the WD Building (pressurized segment of the pipeline), the Battelle study did not examine that segment. One surface sample and three subsurface (greater than 6 inches beneath the land surface) samples at varying depths to eight feet deep were obtained at each sampling location (Table I.1). The verification sampling was performed after the trench was backfilled (DOE,1992b). With only a few exceptions, the results of the verification study indicated that the greatest depth at which Pu^{238} contamination was found to exceed 25 pCi/g was approximately 3 to 4 feet (Stenhouse and Kirsch, 1986). The verification study concluded that more than 90 percent of the samples analyzed were below the 100 pCi/g goal. Samples obtained at site numbers 7, 14, 22 and 23 contained Pu^{238} in excess of 100 pCi/g (see Figure 1.4. and Table I.1.). The contaminated soil around the



LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- +25 EXIST. BOREHOLE
- EXIST. DITCHLINE

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "BATTELLE & ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 50 100 150 300
SCALE: 1" = 150'

SAIC
Science Applications International Corporation

MOUND AREA 19
MIAMISBURG, OHIO

Figure 1.4

MOUND AREA 19 VERIFICATION SAMPLING POINTS STENHOUSE AND KIRSCH (BATTELLE 1986)

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\440BORE.PLT

SHT 1 OF 1	\93046\DWGS\440BORE	N/A
DRAWING #	CAD FILE #	ROT. ANGLE

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study") (Page 1 of 6)

Test Hole Number[a]	Maximum Concentration Plutonium-238 (pCi/g)[b]	Elevation (feet)	Depth of Sample (feet)
1	bdl bdl bdl bdl	877.1	surface 1-2 2-3 6-7
2	bdl bdl bdl bdl	873.0	surface 3-4 4-5 6-7
3	bdl bdl bdl bdl	875.8	surface 3-4 4-5 8-9
4	bdl bdl bdl bdl	874.7	surface 2-3 4-5 7-8
5	bdl bdl bdl bdl	874.4	surface 3-4 4-5 6-7
6	26 bdl 24 bdl	873.8	surface 2-3 4-5 7-8
7	81 181 42 33	872.5	surface 4-5 5-6 7-8
8	35 28 21 46	869.8	surface 2-3 7-8 8-9
9	bdl bdl bdl bdl	866.0	surface 2-3 5-6 7-8
10	bdl bdl bdl bdl	858.9	surface 3-4 4-5 6-7
11	bdl bdl bdl bdl	846.2	surface 3-4 5-6 7-8

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study")
(Page 2 of 6 Cont'd)

12	bdl bdl bdl bdl	833.7	surface 1-2 4-5 5-6
13	23 bdl bdl 21	824.4	surface 2-3 5-6 7-8
14	bdl 23 410 34	812.8	surface 2-3 5-6 7-8
15	bdl bdl bdl bdl	802.4	surface 2-3 5-6 8-9
16	bdl bdl bdl bdl	795.0	surface 2-3 4-5 6-7
17	bdl bdl bdl bdl	778.6	surface 1-2 3-4 4-5
18	26 bdl 22 26	769.5	surface 1-2 3-4 4-5
19	22 bdl bdl bdl	762.9	surface 3-4 4-5 6-7
20	bdl bdl bdl bdl	760.0	surface 2-3 3-4 8-9
21	24 bdl bdl bdl	753.6	surface 4-5 6-7 7-8
22	bdl 1057 41 bdl	748.4	surface 3-4 4-5 5-6
23	26 114 185 bdl	748.4	surface 2-3 3-4 8-9

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study")
(Page 3 of 6 Cont'd)

24	bdl bdl bdl bdl	746.2	surface 3-4 4-5 7-8
25	bdl bdl bdl 26	751.3	surface 1-2 2-3 3-4
26	bdl bdl bdl bdl	751.9	surface 1-2 5-6 6-7
27	bdl bdl bdl bdl	751.8	surface 3-4 4-5 5-6
28	bdl bdl bdl bdl	752.1	surface 1-2 3-4 4-5
29	bdl bdl bdl bdl	753.5	surface 3-4 5-6 7-8
30	bdl bdl bdl 21	752.1	surface 1-2 3-4 4-5
31	bdl bdl 31 22	750.7	surface 1-2 6-7 7-8
32	bdl bdl 24 bdl	750.2	surface 1-2 4-5 5-6
33	bdl bdl bdl 23	749.8	surface 4-5 5-6 8-9
34	27 bdl bdl 21	749.7	surface 3-4 4-5 7-8
35	26 bdl 26 bdl	748.2	surface 2-3 5-6 6-7

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study")
(Page 4 of 6 Cont'd)

36	bdl 22 bdl bdl	747.6	surface 3-4 4-5 7-8
37	bdl 26 28 24	746.6	surface 3-4 5-6 7-8
38	bdl 49 50 23	745.4	surface 1-2 2-3 4-5
39	bdl 26 24 bdl	745.4	surface 6-7 7-8 8-9
40	bdl 35 29 38	745.0	surface 2-3 3-4 5-6
41	bdl 21 bdl 23	744.8	surface 2-3 3-4 8-9
42	bdl bdl bdl 24	745.6	surface 3-4 5-6 7-8
43	bdl bdl bdl 24	744.9	surface 3-4 4-5 5-6
44	bdl 38 bdl bdl	744.1	surface 2-3 4-5 5-6
45	bdl bdl bdl bdl	744.0	surface 3-4 4-5 6-7
46	bdl bdl bdl bdl	744.6	surface 4-5 6-7 7-8
47	36 bdl bdl bdl	743.1	surface 2-3 3-4 5-6

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study")
(Page 5 of 6 Cont'd)

48	bdl bdl bdl bdl	744.2	surface 1-2 2-3 3-4
49	bdl bdl bdl bdl	745.5	surface 5-6 6-7 8-9
50	bdl bdl bdl 27	745.2	surface 2-3 3-4 7-8
51	89 bdl 26 bdl	744.9	surface 1-2 2-3 6-7
52	bdl 41 bdl bdl	744.9	surface 2-3 6-7 7-8
53	22 26 bdl 22	750.2	surface 3-4 4-5 5-6
54	25 26 23 26	750.7	surface 2-3 3-4 4-5
55	bdl bdl bdl 25	750.9	surface 2-3 3-4 6-7
56	bdl bdl bdl bdl	751.4	surface 2-3 3-4 6-7
57	bdl bdl 22 bdl	751.3	surface 3-4 4-5 8-9
58	bdl bdl bdl bdl	751.4	surface 2-3 3-4 5-6
59	bdl bdl bdl bdl	750.4	surface 2-3 3-4 6-7

Table I.1. Sampling Locations for Verification Survey of Former Waste Transfer System Pipeline (Stenhouse and Kirsch, 1986: "Battelle Study")
(Page 6 of 6 Cont'd)

60	bdl 21 27 bdl	751.9	surface 2-3 3-4 6-7
61	bdl 29 bdl bdl	751.5	surface 1-2 3-4 4-5
62	21 50 bdl bdl	NG	surface 3-4 4-5 5-6

Reference: Stenhouse and Kirsch (Battelle), 1986

[a] Not all of the coordinates resulted in the placement of sampling points near the WTS (Area 19), suggesting that some locations were sampled in other areas or that the coordinates are in error.

[b] bdl: below detection limit of 20 pCi/g for a 400 second count.

Absolute errors are not provided for each Pu-238 activity value. As a guideline, the following minimum errors (at the ±1 σ level) may be taken for various Pu-238 activity levels. These errors depend on how much thorium is present; the first ± value is calculated for a thorium concentration of 1 pCi/g and the other ± value for 10 pCi/g thorium:

25 pCi/g Pu-238: ±8 pCi/g; ±38 pCi/g
50 pCi/g Pu-238: ±9 pCi/g; ±38 pCi/g
100 pCi/g Pu-238: ±9 pCi/g; ±37 pCi/g

sample sites showing the highest Pu^{238} concentrations, sample sites 14 and 22 (410 and 1057 pCi/g, respectively), was subsequently removed by the D&D program. The contaminated soil around boring numbers 7 and 23 were not further excavated because the average concentration of plutonium contamination was below the cleanup standard. Samples taken of the excavation walls at site numbers 14 and 22 showed Pu^{238} levels to be below the 100 pCi/g cleanup level after additional excavation by D&D was completed (Stenhouse and Kirsch, 1986 - the "Battelle Study").

1.2.2. Soil Gas Study

A soil gas survey was conducted in 1987 as part of the Mound Plant Stage 1, Area B and Main Hill Seeps Remedial Investigation (DOE, 1989). Ten of the 16 soil gas sampling points were located in the western portion of Area 19, spaced at about 100-foot intervals along the service road that runs parallel to the former WTS pipeline. The soil gas samples were analyzed for vinyl chloride, 1,2-trans-dichloroethene, trichloroethane, benzene, toluene, and ethylbenzene. All of these compounds were detected in concentrations ranging from 0.01 to 2.04 µg/L at Area 19. Although soil gas measurements cannot provide quantitive measurements of contaminants in soil, they do provide qualitative information on the types and distribution of contaminants that may be present at the site.

1.2.3. Mound Plant Site Survey Report

Between 1982 and 1985 a site survey was conducted at the Mound Plant to provide an assessment of the types, concentrations, and distribution of radioactive materials in the soils at the Mound Plant (Stought, et al., 1988). The objectives of this survey were to further characterize the 19 sites previously identified as being contaminated, and to identify and characterize any additional major sites having levels of contamination exceeding 10 pCi/g for Pu^{238} of soil. Twenty-two areas were surveyed in this study, including Area 14. Although Area 19 was not specifically sampled during this survey, some of the areas traversed by the WTS at its beginning and end points (i.e., Areas 4, 14, 12 and 17) were included.

The site survey included approximately 16,000 surface gamma readings, 1,100 surface soil samples for analysis, and 1,200 core soil samples for analysis. Of the 31 surface and subsurface soil samples collected at Area 14, six exceeded the target value of 10 pCi/g of plutonium. Of these six samples, four surface samples reportedly ranged between 10 and 99 pCi/g (Stought, et al., 1988).

The site survey resulted in the elimination of three of the original 19 areas from the list of "contaminated area" and the addition of three sites that had not previously been listed. The general conclusion drawn from this survey is that most of the soil at the Mound Plant holds such low levels of radioactive contamination that minimal remedial action is warranted.

1.2.4. Reconnaissance Sampling Survey

A total of eight surface and subsurface soil samples were collected within Area 19 during the OU6 reconnaissance sampling survey conducted in 1989 (DOE, 1992d) reconnaissance sampling survey. These samples were obtained within the path of the waste lines based upon the 1986 verification study discussed in Section 1.2.1 above. All eight samples were analyzed for Target Compound List (TCL) and Target Analyte List (TAL) constituents. The results of the laboratory analysis of these samples are shown in Table I.2. The analyses indicate that the presence of non-radioactive contaminants in the Mound Plant D&D Program soil areas is limited. There appears to be no systematic organic chemical contamination of the D&D areas in general, and no specific patterns of organic chemical contamination within a single area. Since much of the sampling was done on a biased sampling basis from the standpoint of prior information, the data should provide at least conservative, if not worst-case, values (DOE, 1992d). The maximum Pu^{238} and Th^{232} concentrations found were 68 and 1.6 pCi/g, respectively (DOE, 1992d).

1.2.5. D&D Cleanup Activities, WTS Hillside

During the period from May, 1989 through January, 1991, D&D cleanup operations were completed on the WTS hillside (Area 14 and surrounding area) and documented in a series of release packages. The available D&D data indicates that the levels of Pu^{238} remaining, following the D&D activities, ranged from 1 to 106 pCi/g. All Th^{232} values were less than 2 pCi/g (DOE, 1990).

1.2.6. 1990 Verification Study

In August, 1990, a study was performed by the Argonne National Laboratory. The purpose of this study was to determine if the remediation of Pu^{238} contaminated soil in the area between the former lift station (Building 41) and the WD Building met the Mound Plant D&D Program 100 pCi/g cleanup criterion. A minimum sample size of 30 surface and 30 subsurface soil samples were determined (see Figures 1.5 and 1.6). Their locations were chosen at random using a statistical sampling strategy and collected within the WTS section from the ridgeline south to the former lift station (Building 41). An additional seven

Table I.2. Soil Chemistry Data (Page 1 of 6)

Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47595.23 E: 46513.98	0 - 3	Acenaphthylene	8/04/89	ug/kg	J	220	750	2
		Anthracene	8/04/89	ug/kg	J	120	750	2
		Benzo(A)anthracene	8/04/89	ug/kg	J	450	750	2
		Benzo(A)pyrene	8/04/89	ug/kg	J	110	750	2
		Benzo(B)fluoranthene	8/04/89	ug/kg	J	590	750	2
		Benzo(G,H,I)perylene	8/04/89	ug/kg	J	310	750	2
		Benzo(K)fluoranthene	8/04/89	ug/kg	J	430	750	2
		Chrysene	8/04/89	ug/kg	J	520	750	2
		Dibenz(A,H)anthracene	8/04/89	ug/kg	J	130	750	2
		Fluoranthene	8/04/89	ug/kg		790	750	2
		Indeno(1,2,3-CD)pyrene	8/04/89	ug/kg	J	270	750	2
		N-Nitrosodiphenylamine	8/04/89	ug/kg	JB	110	750	2
		Phenanthrene	8/04/89	ug/kg	J	290	750	2
		Plutonium-238	8/04/89	pCi/g		20	-	-
		Pyrene	8/04/89	ug/kg		900	750	2
		Thorium-232	8/04/89	pCi/g		0.8	-	-
N: 47604.85 E: 46510.64	0 - 3	N-Nitrosodiphenylamine	8/04/89	ug/kg	JB	53	400	1
		Plutonium-238	8/04/89	pCi/g		68	-	-
		Thorium-232	8/04/89	pCi/g		1.1	-	-
N: 47705.33 E: 46444.2	2 - 5	Arsenic, Total	8/17/89	mg/kg		6.2	0	1
		Lead, Total	8/17/89	mg/kg		10.4	0	1
N: 47616.5 E: 46517.77	5 - 8	N-Nitrosodiphenylamine	8/04/89	ug/kg	JB	66	390	1
		Plutonium-238	8/04/89	pCi/g		29	-	-
		Thorium-232	8/04/89	pCi/g		1.2	-	-

Table I.2. Soil Chemistry Data (Page 2 of 6)

Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47593.92 E: 46544.97	2 - 5	Acenaphthylene	8/04/89	ug/kg	J	230	810	2
		Anthracene	8/04/89	ug/kg	J	220	810	2
		Benzo(A)anthracene	8/04/89	ug/kg	J	430	810	2
		Benzo(A)pyrene	8/04/89	ug/kg	J	370	810	2
		Benzo(B)fluoranthene	8/04/89	ug/kg	J	430	810	2
		Benzo(G,H,I)perylene	8/04/89	ug/kg	J	260	810	2
		Benzo(K)fluoranthene	8/04/89	ug/kg	J	360	810	2
		Chrysene	8/04/89	ug/kg	J	480	810	2
		Dibenz(A,H)anthracene	8/04/89	ug/kg	J	120	810	2
		Fluoranthene	8/04/89	ug/kg		1000	810	2
		Indeno(1,2,3-CD)pyrene	8/04/89	ug/kg	J	250	810	2
		N-Nitrosodiphenylamine	8/04/89	ug/kg	JG	110	810	2
		Phenanthrene	8/04/89	ug/kg	J	470	810	2
		Plutonium-238	8/04/89	pCi/g		14	-	-
		Pyrene	8/04/89	ug/kg		890	810	2
		Thorium-232	8/04/89	pCi/g		1.2	-	-
N: 47705.33 E: 46444.2	2 - 5	Arsenic, Total	8/17/89	mg/kg		5.5	0	1
		Lead, Total	8/17/89	mg/kg		10	0	1
N: 47386.73 E: 46939.8	3 - 6	1,1,1-Trichloroethane	8/01/89	ug/kg	J	1	5	1
		2-Butanone	8/01/89	ug/kg		13	11	1
		4-Methyl-2-Pentanone	8/01/89	ug/kg	J	6	11	1
		Acetone	8/01/89	ug/kg	B	42	11	1
		Aluminum, Total	8/01/89	mg/kg		11700	0	1
		Arsenic, Total	8/01/89	mg/kg		6.4	0	1
		Barium, Total	8/01/89	mg/kg	*	440	0	1

Table I.2. Soil Chemistry Data (Page 3 of 6)

Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47386.73 E: 46939.8	3 - 6	Benzoic Acid	8/01/89	ug/kg	J	68	1800	1
		Beryllium	8/01/89	mg/kg	B	0.9	0	1
		Cadmium, Total	8/01/89	mg/kg		3.2	0	1
		Calcium, Total	8/01/89	mg/kg		4680	0	1
		Chromium, Total	8/01/89	mg/kg		13.2	0	1
		Cobalt, Total	8/01/89	mg/kg		16	0	1
		Copper, Total	8/01/89	mg/kg		14.7	0	1
		Dichloromethane-Methylene Chloride	8/01/89	ug/kg	B	57	5	1
		Ethylbenzene	8/01/89	ug/kg	J	2	5	1
		Iron, Total	8/01/89	mg/kg		25800	0	1
		Lead, Total	8/01/89	mg/kg	N	4.5	0	1
		Magnesium, Total	8/01/89	mg/kg		3060	0	1
		Manganese, Total	8/01/89	mg/kg		1180	0	1
		Nickel, Total	8/01/89	mg/kg		33.4	0	1
		Plutonium-238	8/01/89	pCi/g		35	-	-
		Potassium, Total	8/01/89	mg/kg		1580	0	1
		Sodium, Total	8/01/89	mg/kg		1910	0	1
		Thallium, Total	8/01/89	mg/kg	B	0.19	0	1
		Thorium-232	8/01/89	pCi/g		1.1	-	-
		Toluene	8/01/89	ug/kg	J	3	5	1
		Vanadium, Total	8/01/89	mg/kg		15.7	0	1
		Zinc, Total	8/01/89	mg/kg	*	257	0	1
N: 47388.54 E: 46957.98	3 - 4	1,1,1-Trichloroethane	8/01/89	ug/kg	J	2	7	1
		2-Butanone	8/01/89	ug/kg	J	2	13	1
		Acetone	8/01/89	ug/kg	B	19	13	1
		Aluminum, Total	8/01/89	mg/kg		9820	0	1

Table I.2. Soil Chemistry Data (Page 4 of 6)

Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47388.54 E: 46957.98	3 - 4	Arsenic, Total	8/01/89	mg/kg		10.3	0	1
		Barium, Total	8/01/89	mg/kg	*	573	0	1
		Beryllium	8/01/89	mg/kg	B	1.1	0	1
		Cadmium, Total	8/01/89	mg/kg		4.3	0	1
		Calcium, Total	8/01/89	mg/kg		35300	0	1
		Chromium, Total	8/01/89	mg/kg		18.2	0	1
		Cobalt, Total	8/01/89	mg/kg		13.2	0	1
		Copper, Total	8/01/89	mg/kg		17.2	0	1
		Dichloromethane-Methylene Chloride	8/01/89	ug/kg	B	16	7	1
		Fluoranthene	8/01/89	ug/kg	J	51	460	1
		Iron, Total	8/01/89	mg/kg		21200	0	1
		Lead, Total	8/01/89	mg/kg	N	15.1	0	1
		Magnesium, Total	8/01/89	mg/kg		16200	0	1
		Manganese, Total	8/01/89	mg/kg		452	0	1
		Nickel, Total	8/01/89	mg/kg		32.3	0	1
		Plutonium-238	8/01/89	pCi/g		21	-	-
		Potassium, Total	8/01/89	mg/kg	B	1290	0	1
		Pyrene	8/01/89	ug/kg	J	61	460	1
		Silver, Total	8/01/89	mg/kg		4.2	0	1
		Sodium, Total	8/01/89	mg/kg		2630	0	1
		Thallium, Total	8/01/89	mg/kg	B	0.58	0	1
		Thorium-232	8/01/89	pCi/g		1.6	-	-
		Toluene	8/01/89	ug/kg	J	2	7	1
		Vanadium, Total	8/01/89	mg/kg		20.7	0	1
		Zinc, Total	8/01/89	mg/kg	*	349	0	1

Table I.2. Soil Chemistry Data (Page 5 of 6)

Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47182.28 E: 47035.72	5 - 8	Acetone	8/01/89	ug/kg	B	14	12	1
		Aluminum, Total	8/01/89	mg/kg		16000	0	1
		Arsenic, Total	8/01/89	mg/kg		5.5	0	1
		Barium, Total	8/01/89	mg/kg	*	521	0	1
		Beryllium	8/01/89	mg/kg		1.1	0	1
		Cadmium, Total	8/01/89	mg/kg		3.8	0	1
		Calcium, Total	8/01/89	mg/kg		19500	0	1
		Chromium, Total	8/01/89	mg/kg		19.8	0	1
		Cobalt, Total	8/01/89	mg/kg		18.6	0	1
		Copper, Total	8/01/89	mg/kg		14.6	0	1
		Dichloromethane-Methylene-Chloride	8/01/89	ug/kg	B	16	6	1
		Iron, Total	8/01/89	mg/kg		31400	0	1
		Lead, Total	8/01/89	mg/kg	N	14.8	0	1
		Magnesium, Total	8/01/89	mg/kg		5630	0	1
		Manganese, Total	8/01/89	mg/kg		1500	0	1
		Nickel, Total	8/01/89	mg/kg		43	0	1
		Plutonium-238	8/01/89	pCi/g		0	-	-
		Potassium, Total	8/01/89	mg/kg		2010	0	1
		Silver, Total	8/01/89	mg/kg		3	0	1
		Sodium, Total	8/01/89	MG/G		2280	0	1
		Thorium-232	8/01/89	pCi/g		1.0	-	-
		Vanadium, Total	8/01/89	mg/kg		17.5	0	1
		Zinc, Total	8/01/89	mg/kg	*	299	0	1
N:[2] E:	2 - 5	Plutonium-238	8/17/89	pCi/g		8	-	-
		Thorium-232	8/17/89	pCi/g		0.4	-	-

Table I.2. Soil Chemistry Data (Page 6 of 6)

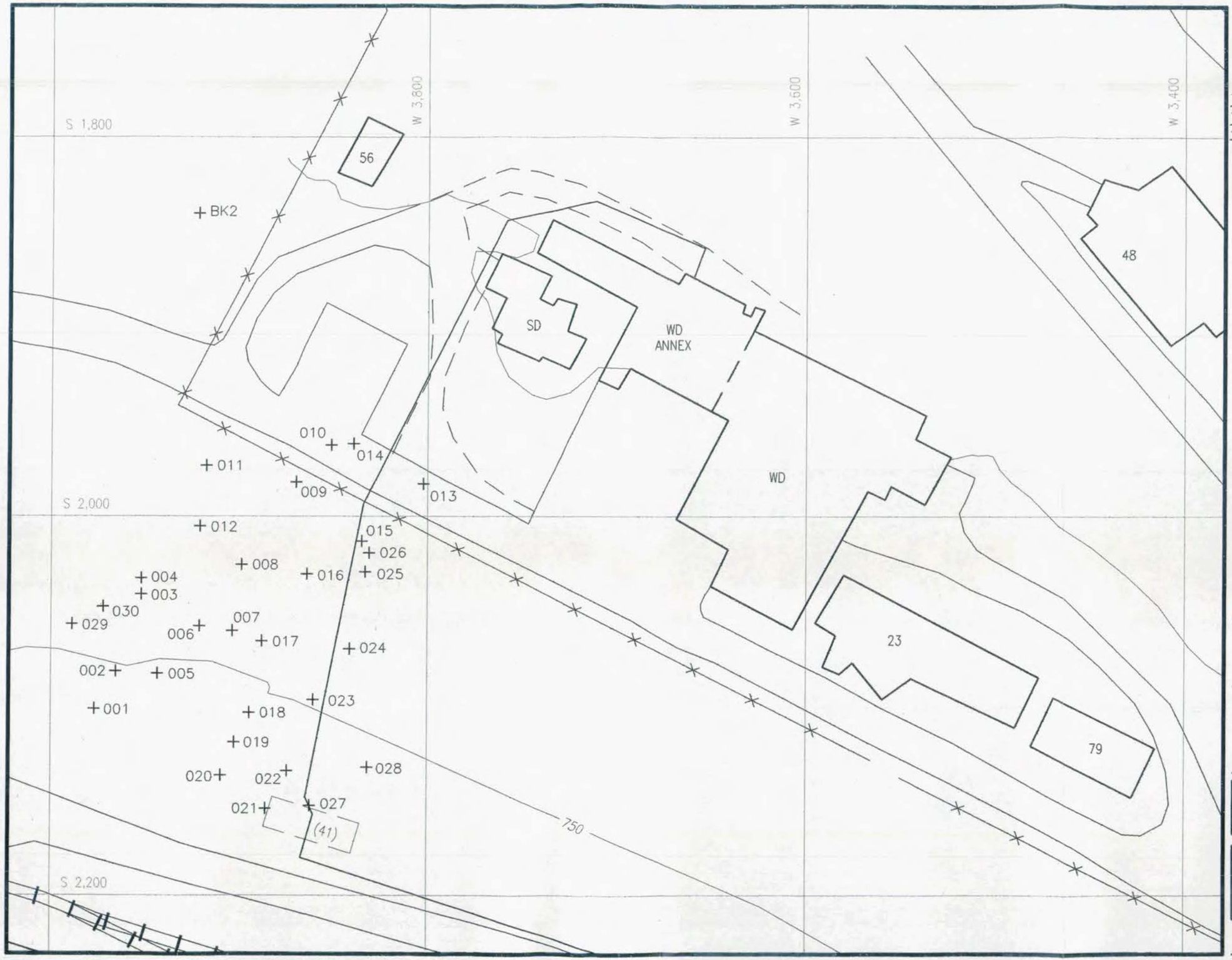
Coordinates	Depth Range (Ft)	Parameter Name	Date	Units of Measure	PVQ	Parameter Value	Detection Limit[1]	Dilution Factor
N: 47295.71 E: 47805.22	3 - 5	Thorium-232	8/06/89	pCi/g		0.5	-	-
		Toluene	8/06/89	ug/kg	B	7	6	1
		Trichloroethene	8/06/89	ug/kg	J	1	6	1
		Vanadium, Total	8/06/89	mg/kg		20.7	0	1
		Zinc, Total	8/06/89	mg/kg	N	263	0	1
		Acetone	8/07/89	ug/kg	J	2	12	1
		Dichloromethane-Methylene Chloride	8/07/89	ug/kg	JB	5	6	1

Parameter Value Qualifiers (PVQ):
J = Present below detection limit
B = Present in blank
JB = Present below detection limit in blank
* = control limits not applicable
N = present below detection limit, sample not spiked

pCi/g Picocuries per gram
ug/kg Micrograms per kilogram
mg/kg Milligrams per kilogram

Source: Reconnaissance Sampling Report, Decontamination and Decommissioning Areas, OU6, Draft Final (Rev. 0), April 1992.

Notes: [1] Detection limits as provided in referenced report.
[2] Correct coordinates not provided in referenced report.



LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- SURFACE SAMPLE

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 25 50 100
SCALE: 1" = 50'

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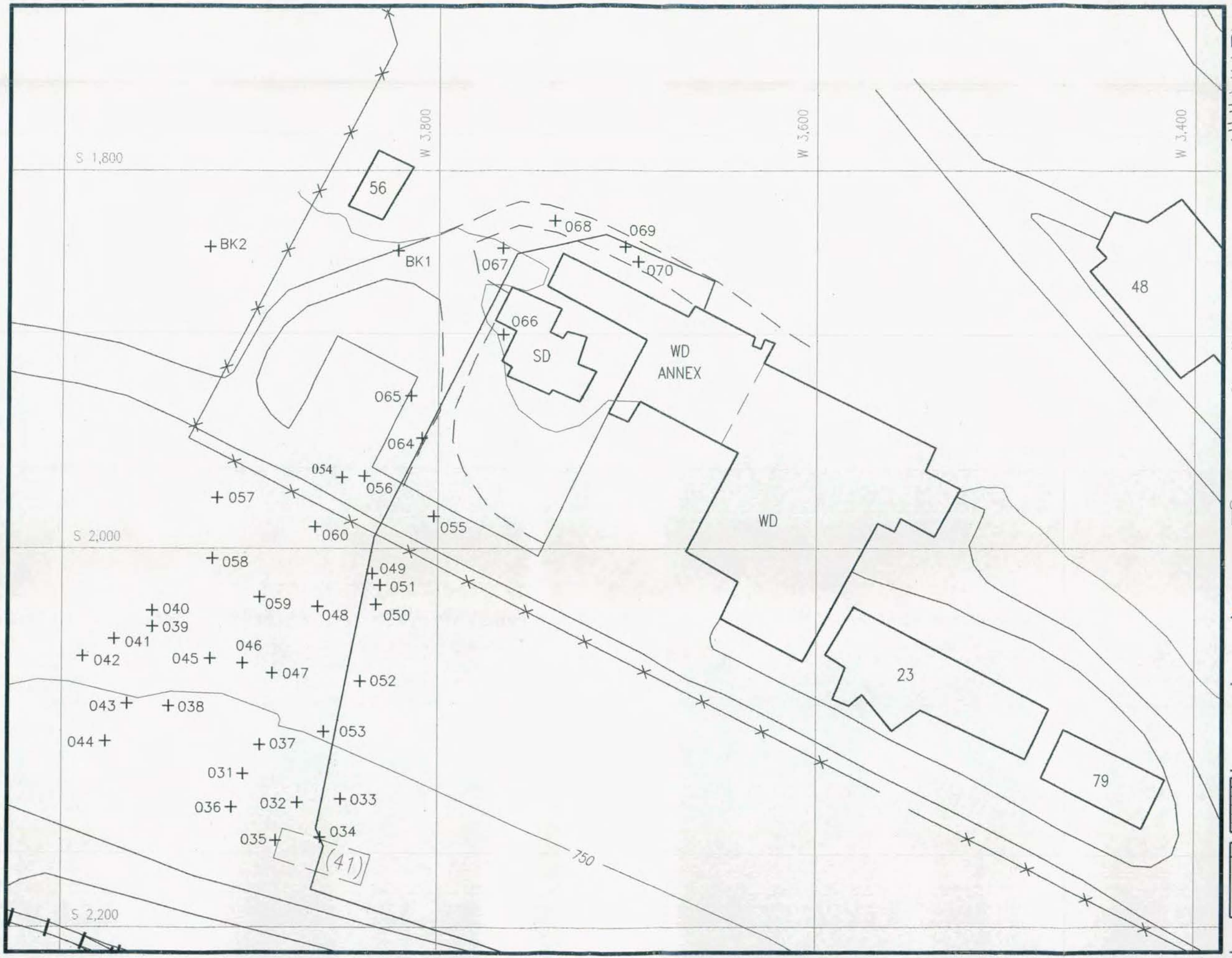
MOUND AREA 19
MIAMISBURG, OHIO

Figure 1.5
ARGONNE STUDY
SURFACE PLUTONIUM
SAMPLING LOCATIONS

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\440SURF.PLT

SHT 1 OF 1	\93046\DWGS\440SURF	N/A
DRAWING #	CAD FILE #	ROT. ANGLE



LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- SUB-SURFACE SAMPLE

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 25 50 100
SCALE: 1" = 50'

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MOUND AREA 19
MIAMISBURG, OHIO

Figure 1.6
ARGONNE STUDY
SUBSURFACE PLUTONIUM SAMPLING LOCATIONS

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\440SUB.PLT

SHT 1 OF 1	\93046\DWGS\440SUB.DWG	N/A
DRAWING #	CAD FILE #	ROT. ANGLE

subsurface samples, plus three background samples, were collected from the WD section from the ridgeline north to the WD Building (see Figure 1.6). The maximum Pu^{238} concentration found was 240 ± 30 pCi/g at a depth of approximately 2 feet. A statistical analysis of the data obtained during this study supported the conclusion that the actual mean of the WTS area surface soil concentration was no greater than 13 pCi/g, and the subsurface concentration was no greater than 29 pCi/g. The data from the WD section showed that Pu^{238} concentrations in subsurface soils ranged from 0.4 to 2 pCi/g, with a mean concentration value of 0.9 pCi/g. Consequently, the study indicated that the D&D cleanup activities had successfully met the goal of 100 pCi/g or less (Argonne National Laboratory, ANL/ESH/TS-90/105, August, 1990).

1.2.7. Verification Report of Area 14

In 1992 a portion of Area 14, proposed for a petroleum fuel storage area, was investigated under the OU6 Verification Work Plan (by Roy F. Weston, Inc.). The purpose of this investigation was to determine if D&D cleanup operations were complete and to evaluate the nature and extent of any contamination remaining in the area following the D&D activities. Part of the former WTS was contained within this area. To accomplish the verification sampling, a 3-element by 5-element grid was established as shown in Figure 1.7. Each square within the sampling grid was approximately 33 feet by 33 feet in size. Soil samples were collected at each of the grid nodes at a depth of 18 to 24 inches in order to comply with regulatory guidance (DOE, 1992e). All samples obtained were analyzed for volatiles, semivolatiles, PCBs, pesticides, metals and the sulfate, chloride, nitrate, nitrite, and cyanide anions under EPA Contract Laboratory Program (CLP) protocols. All the data received from the laboratory was validated. Of the 124 organic compounds included in the laboratory analyses of the soil samples, only bis(2-ethylhexyl)phthalate, carbon disulfide, and dieldrin were quantified above the detection limits (at concentrations just slightly above the detection limit for each compound). Sixteen of the metals involved in the laboratory analyses were identified above the detection limit. All 16 are naturally occurring in the soils and rocks at concentrations normal for the region (DOE, 1992e, Table V.6). The maximum Pu^{238} and Th^{232} concentrations found were 38 pCi/g and 2 pCi/g, respectively, well within the D&D cleanup goals of 100 pCi/g and 5 pCi/g for these isotopes (DOE, 1992e).

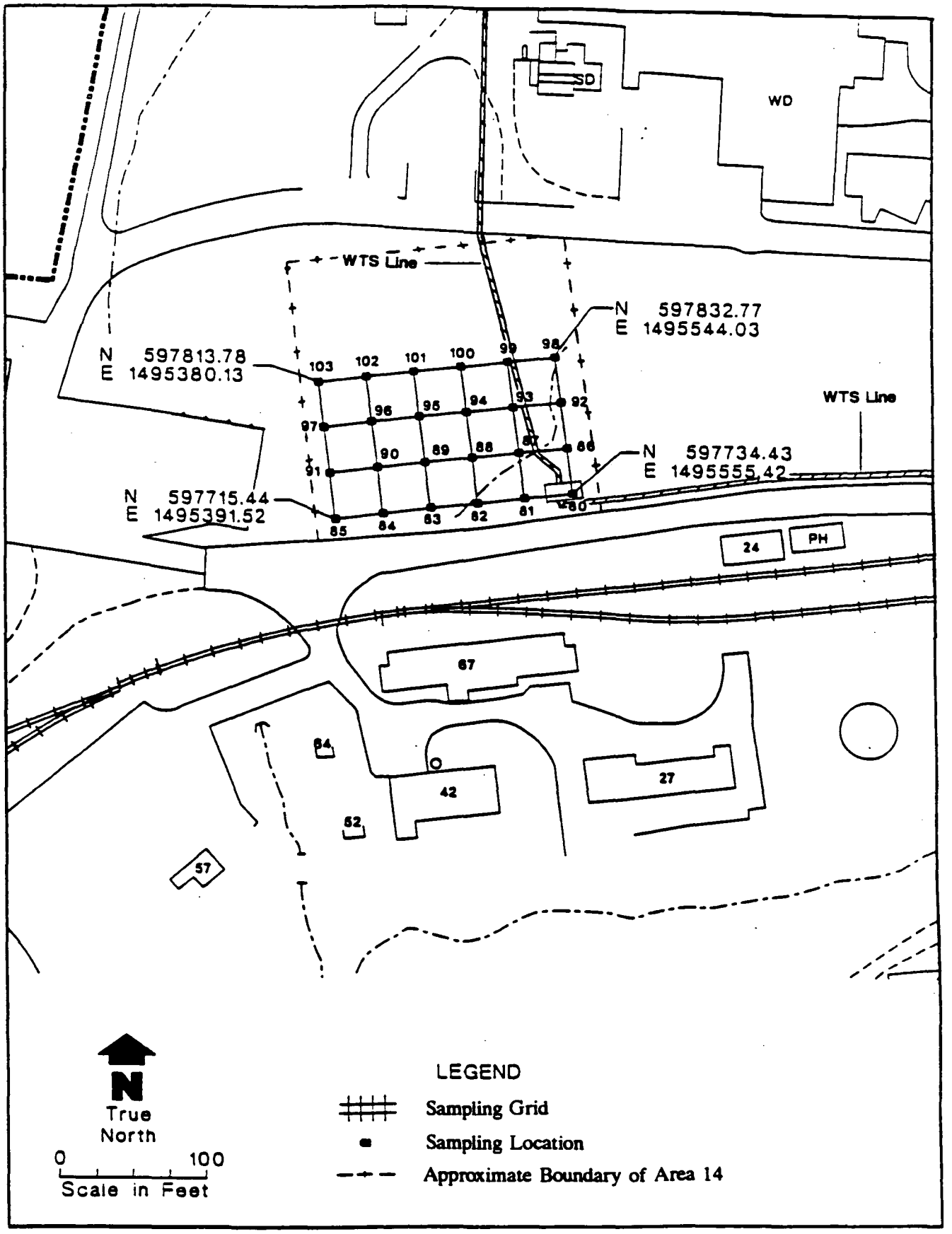


Figure 1.7. Sampling Locations in Area 14 from the 1992 D&D Verification Study (DOE 1992e).

1.3. SUSPECTED SOURCES OF CONTAMINATION AND SUSPECTED CONTAMINANTS

Based upon the historical data available, the sources of contaminants expected to be found in Areas 19 and 14 include materials from the glove box lines in the SM and PP Buildings, the wash water, rinse water, decontamination solutions, shower water, leachate solutions, and aqueous wastes generated during plutonium recovery and processing operations. The volume of low-risk aqueous waste that was delivered to the WDA building was estimated to be between 100,000 and 200,000 gallons annually.

High-risk wastes from plutonium production and recovery were either basic or acidic, depending on where they were generated in the process. Basic waste was generated when ammonium hydroxide was used to precipitate plutonium from solution. Acidic waste was generated in leaching and dissolution operations, and contained nitric and hydrofluoric acids. Acidic and basic wastes both contained nitrate and fluoride. Other chemicals used in the recovery operations included hydroxylamine, sodium carbonate, ferrous sulfamate, and sodium hydroxide.

Trace metals were present in the acidic waste as a result of leaching various pieces of equipment and tools with nitric acid in an effort to recover plutonium on contaminated tools and equipment. These cations included sodium, tantalum, molybdenum, iron, chromium, and nickel. Lead was also present in the waste from the leaching of neoprene leaded gloves.

The low-risk wastewater from plutonium operations in Building 38 originated mostly outside the glove box lines. Mop and wash water was collected in a 5,000-gallon above-ground tank adjacent to the SM Building. Shower water was collected in a 3,000-gallon below-ground tank, originally installed for use in the SM Building. These tanks were pumped through the low-risk side of the WTS to the WDA or WD Building for processing. Other constituents in the low-risk wastes, based upon a late 1970s study, included cooling water; trace amounts of methanol, ethanol, and isopropanol; detergents; shower water; and janitorial wastes (floor wax, wax removers, toilet bowl cleaners, paints, sawdust, acetone, and trace quantities of trichloroethane) (DOE, 1992a).

2. SAMPLING OBJECTIVES AND PROPOSED RATIONALE

2.1. SCOPE

As discussed in Section 1, the primary objectives of the OU6 D&D Verification Work Plan, (DOE, 1992c) are to verify cleanup after the soil is removed and to provide additional data to allow the determination of the risk posed by residential radiological and chemical contamination. The information gained from the proposed sampling design described in the SAP will allow the Mound Plant to determine: (1) if the WTS area has been successfully remediated by D&D below the 100 pCi/g cleanup level, and (2) if any residual chemical or radiological contamination exists in Areas 19 and 14. The objectives of this SAP, as described in Section 1, are designed to fulfill this scope. To meet the SAP objectives, the guidance specified in the Methods for Evaluating the Attainment of Cleanup Standards, Volume 1, Soils and Solid Media (EPA 230/02-89-042, February 1989) was used. This document was developed by EPA to provide project managers with sampling and analysis methods for evaluating whether a soils remediation effort has been successfully concluded. It provides a technical interpretation methodology that can be applied to determine if a cleanup standard in soils has been attained. This guidance provides a technical interpretation of what sampling and data analysis methods are acceptable for verifying "attainment" of a cleanup standard in soils and solid media.

This methodology divides the decision making process associated with the technical interpretation of attainment of a cleanup standard into the following steps:

- specification of the sample areas
- identification of sample handling and collection procedures
- identification of the contaminants to be tested
- establishment of cleanup standards
- specification of the appropriate statistical parameter
- decision making with uncertainty
- determination of the sample size and locations.

2.2. THE DECISION MAKING PROCESS

2.2.1. Specification of the Sample Areas

The first decision that needs to be made is the extent of the sampling area to be investigated. This decision concerns both the areal extent and depth of contamination. The operational history of the WTS line and the results from the previous studies that were described in Section 1 of this SAP were used to develop a rationale for determining the sampling area. These data are shown in Table II.1.

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	**Sample Location**	**South Coordinate**	**West Coordinate**	**Depth (m)**	**Pu^{238} pCi/g[2]**
Gravity Section	1	2917.99	1389.22	Surface Subsurface[3]	0.0 0.0[3]
Gravity Section	2	2905.89	2474.63	Surface Subsurface	0.0 0.0
Gravity Section	3	2901.81	2419.20	Surface Subsurface	0.0 0.0
Gravity Section	4	2893.98	2435.14	Surface Subsurface	0.0 0.0
Gravity Section	5	2901.09	2446.61	Surface Subsurface	0.0 0.0
Gravity Section	6	2899.40	2459.51	Surface Subsurface	26.0 8.0
Gravity Section	7	2884.00	2478.77	Surface Subsurface	81.0 85.3
Gravity Section	8	2890.94	2492.89	Surface Subsurface	35.0 31.7
Gravity Section	9	2906.29	2498.91	Surface Subsurface	0.0 0.0
Gravity Section	10	2912.81	2533.61	Surface Subsurface	0.0 0.0
Gravity Section	11	2891.07	2567.69	Surface Subsurface	0.0 0.0
Gravity Section	12	2864.84	2607.83	Surface Subsurface	0.0 0.0
Gravity Section	13	2843.67	2646.08	Surface Subsurface	23.0 7.0
Gravity Section	14	2817.72	2694.28	Surface Subsurface	0.0 155.7
Gravity Section	15	2791.35	2735.84	Surface Subsurface	0.0 0.0
Gravity Section	16	2775.76	2764.85	Surface Subsurface	0.0 0.0
Gravity Section	17	2736.96	3825.90	Surface Subsurface	0.0 0.0

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	**Sample Location**	**South Coordinate**	**West Coordinate**	**Depth (m)**	**Pu^{238} pCi/g[2]**
Gravity Section	18	2712.64	2869.02	Surface Subsurface	26.0 16.0
Gravity Section	19	2684.47	2910.83	Surface Subsurface	22.0 0.0
Gravity Section	20	2659.29	2958.42	Surface Subsurface	0.0 0.0
Gravity Section	21	2635.91	2996.07	Surface Subsurface	24.0 0.0
Gravity Section	22	2611.46	3042.02	Surface Subsurface	0.0 366.0
Gravity Section	23	2613.27	3060.62	Surface Subsurface	26.0 99.7
Gravity Section	24	2607.32	3049.10	Surface Subsurface	0.0 0.0
Gravity Section	25	2586.23	3081.72	Surface Subsurface	0.0 8.7
Gravity Section	26	2574.70	3085.81	Surface Subsurface	0.0 0.0
Gravity Section	27	2561.41	3096.70	Surface Subsurface	0.0 0.0
Gravity Section	28	2544.13	3200.38	Surface Subsurface	0.0 0.0
Gravity Section	29	2528.50	3080.17	Surface Subsurface	0.0 0.0
Gravity Section	30	2518.45	3114.58	Surface Subsurface	0.0 7.0
Gravity Section	31	2505.45	3126.78	Surface Subsurface	0.0 17.7
Gravity Section	32	2490.97	3176.97	Surface Subsurface	0.0 8.0
Gravity Section	33	2517.09	2936.47	Surface Subsurface	0.0 7.7
Gravity Section	34	2461.90	3266.02	Surface Subsurface	27.0 7.0

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	**Sample Location**	**South Coordinate**	**West Coordinate**	**Depth (m)**	**Pu^{238} pCi/g[2]**
Gravity Section	35	2448.51	3312.99	Surface Subsurface	26.0 8.7
Gravity Section	36	2438.96	3362.09	Surface Subsurface	0.0 7.3
Gravity Section	37	2410.91	3426.84	Surface Subsurface	0.0 26.0
Gravity Section	38	2406.09	3455.03	Surface Subsurface	0.0 40.7
Gravity Section	39	2393.77	3467.81	Surface Subsurface	0.0 16.7
Gravity Section	40	2383.51	3482.24	Surface Subsurface	0.0 34.0
Gravity Section	41	2377.83	3493.48	Surface Subsurface	0.0 14.7
Gravity Section	42	2355.72	3487.74	Surface Subsurface	0.0 8.0
Gravity Section	43	2319.78	3513.25	Surface Subsurface	0.0 8.0
Gravity Section	44	2294.67	3555.80	Surface Subsurface	0.0 12.7
Gravity Section	45	2279.81	3602.66	Surface Subsurface	0.0 0.0
Gravity Section	46	2242.47	3650.82	Surface Subsurface	0.0 0.0
Gravity Section	47	2230.57	3688.55	Surface Subsurface	36.0 0.0
Gravity Section	48	2304.08	3577.89	Surface Subsurface	0.0 0.0
Gravity Section	49	2285.48	3537.70	Surface Subsurface	0.0 0.0
Gravity Section	50	2344.32	3510.81	Surface Subsurface	0.0 9.0
Gravity Section	51	2395.15	3489.36	Surface Subsurface	89.0 8.7

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	**Sample Location**	**South Coordinate**	**West Coordinate**	**Depth (m)**	**Pu^{238} pCi/g[2]**
Gravity Section	52	2404.77	3468.02	Surface Subsurface	0.0 13.7
Gravity Section	53	2481.14	3188.67	Surface Subsurface	22.0 16.0
Gravity Section	54	2492.90	3146.88	Surface Subsurface	25.0 25.0
Gravity Section	55	2503.36	3144.19	Surface Subsurface	0.0 8.3
Gravity Section	56	2516.19	3134.08	Surface Subsurface	0.0 0.0
Gravity Section	57	2504.63	3108.15	Surface Subsurface	0.0 7.3
Gravity Section	58	2579.94	3099.82	Surface Subsurface	0.0 0.0
Gravity Section	59	2596.64	3095.49	Surface Subsurface	0.0 0.0
Gravity Section	60	2620.15	3027.87	Surface Subsurface	0.0 16.0
Gravity Section	61	2581.59	3071.20	Surface Subsurface	0.0 9.7
Gravity Section	62	2596.55	3051.79	Surface Subsurface	21.0 16.7
Pressure Section	001	2101.93	3976.73	Surface	1.0
Pressure Section	002	2082.03	3965.28	Surface	11.0
Pressure Section	003	2041.36	3952.02	Surface	20.0
Pressure Section	004	2032.83	3952.11	Surface	2.4
Pressure Section	005	2083.31	3943.31	Surface	8.4
Pressure Section	006	2058.15	3921.26	Surface	1.8
Pressure Section	007	2060.65	3903.76	Surface	4.9
Pressure Section	008	2025.66	3898.78	Surface	5.9
Pressure Section	009	1981.80	3869.75	Surface	2.0
Pressure Section	010	1962.33	3850.97	Surface	1.8

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	Sample Location	South Coordinate	West Coordinate	Depth (m)	Pu^{238} pCi/g[2]
Pressure Section	011	1973.11	3917.74	Surface	9.4
Pressure Section	012	2005.25	3921.10	Surface	15.0
Pressure Section	013	1982.82	3802/20	Surface	4.8
Pressure Section	014	1961.55	3839.17	Surface	20.0
Pressure Section	015	2013.24	3834.85	Surface	27.0
Pressure Section	016	2030.65	3863.79	Surface	3.5
Pressure Section	017	2065.98	3887.91	Surface	4.6
Pressure Section	018	2103.81	3894.54	Surface	54.0
Pressure Section	019	2020.87	3904.35	Surface	3.6
Pressure Section	020	2136.72	3909.69	Surface	20.0
Pressure Section	021	2154.30	3885.74	Surface	23.0
Pressure Section	022	2134.39	3874.28	Surface	1.7
Pressure Section	023	2096.99	3860.33	Surface	3.7
Pressure Section	024	2070.19	3841.13	Surface	9.2
Pressure Section	025	2029.53	3832.86	Surface	10.0
Pressure Section	026	2019.36	3830.80	Surface	4.1
Pressure Section	027	2152.74	3862.13	Surface	10.0
Pressure Section	028	2132.48	3831.55	Surface	22.0
Pressure Section	029	2047.82	3972.09	Surface	0.8
Pressure Section	030	2057.13	3988.80	Surface	1.4
Pressure Section	031	2020.87	3904.35	0.6[4]	16.0
Pressure Section	032	2134.39	3874.28	0.5	2.9
Pressure Section	033	2132.48	3851.35	0.6	13.0
Pressure Section	034	2152.74	3862.13	0.5	32.0
Pressure Section	035	2154.30	3885.74	0.5	33.0
Pressure Section	036	2136.72	3909.69	0.5	12.0
Pressure Section	037	2103.81	3894.54	0.6	240.0
Pressure Section	038	2083.31	3943.31	0.6	1.1

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	Sample Location	South Coordinate	West Coordinate	Depth (m)	Pu^{238} pCi/g[2]
Pressure Section	039	2041.36	3952.02	0.5	32.0
Pressure Section	040	2032.82	3952.11	0.5	2.7
Pressure Section	041	2047.82	3972.09	0.5	12.0
Pressure Section	042	2057.13	3988.80	0.6	13.0
Pressure Section	043	2082.03	3965.28	0.6	11.0
Pressure Section	044	2101.93	3976.73	0.6	5.7
Pressure Section	045	2058.15	3921.26	0.5	9.2
Pressure Section	046	2060.65	3903.76	0.5	0.1
Pressure Section	047	2065.98	3887.91	0.4	0.3
Pressure Section	048	2030.65	3863.79	0.5	2.1
Pressure Section	049	2013.24	3834.85	0.6	0.4
Pressure Section	050	2029.53	3832.86	0.6	4.8
Pressure Section	051	2019/36	3830.80	0.6	4.7
Pressure Section	052	2070.19	3841.13	0.2	32.0
Pressure Section	053	2096.99	3860.33	0.5	61.0
Pressure Section	054	1962.33	3850.97	0.6	0.7
Pressure Section	055	1982.82	3802.20	0.5	0.3
Pressure Section	056	1961.55	3839.17	0.6	3.7
Pressure Section	057	1973.11	3917.74	0.5	5.1
Pressure Section	058	2005.25	3920.10	0.5	2.9
Pressure Section	059	2025.66	3894.78	0.5	2.2
Pressure Section	060	1981.80	3969.75	0.3	2.5
Pressure Section	061	1842.22	3821.76	2.9	2.8
Pressure Section	062	1840.24	3922.13	0.6	0.3
Pressure Section	063	1842.22	3821.76	3.4	0.3
Pressure Section	064	1941.29	3808.59	3.1	0.6
Pressure Section	065	1918.90	3814.62	2.3	1.5
Pressure Section	066	1886.49	3765.69	2.3	0.4

Table II.1. Area 19 Verification Sampling Statistics Battelle and Argonne Data[1]					
Site	**Sample Location**	**South Coordinate**	**West Coordinate**	**Depth (m)**	**Pu^{238} pCi/g[2]**
Pressure Section	067	1840.91	3765.96	4.1	0.5
Pressure Section	068	1826.34	3738.65	4.1	2.0
Pressure Section	069	1840.29	3701.26	4.1	1.2
Pressure Section	070	1848.05	3694.36	4.6	0.4
Pressure Section	071	1840.24	3922.13	Surface	1.5

Notes: [1] Sources of Data:
Stenhouse and Kirsch, 1986 (Gravity Section) ("Battelle Data")
Argonne National Laboratory, 1990 (Pressure Section) ("Argonne Data")

[2] Values below analytical detection limits are set to zero.

[3] "Subsurface" values are averaged from three sample depths, ranging between 1 and 9 feet beneath the surface, at each location.

[4] Numerical values of depth are in meters.

Based on the previous studies and operational history, there are three distinct areas along the WTS line that will exhibit differential levels of contamination which will each require a different sampling strategy:

1. Area 19-1 - WTS cleanouts north of the WD building,
2. Area 19-2 - Hillside location of 1969 pipeline rupture (Area 14),
3. Area 19-3 - WTS pipeline from SM/PP Hill to WD Building.

The "as-built" profile data for the WTS is shown in Figure 1.3. Each of these areas is discussed in detail below.

The first area (Area 19-1) is located north of the WD building where the original WTS lines and cleanouts, which had exhibited previous leaking, were located. Contaminated soils were removed to a depth of approximately 12 feet from a trench that was 15 feet wide by 15 feet long (DOE 1992c), and the excavation was capped with bentonite and backfilled with clean soil. The area was not remediated to the cleanup standards of 100 pCi/g below a depth of 12 feet. Samples in this area will need to be collected starting at the lower clay cap (12 foot level) and continuing down to a depth where the plutonium

concentration is below 100 pCi/g or bedrock is encountered. The dimensions of the sampling grid are 50 feet by 60 feet, with grid lines spaced 5 feet apart. The specific sample size and sample locations for Area 19-1 are discussed in Section 2.2.7.

The second area (Area 19-2) includes Area 14, and is located on the hillside between the WD building and the lift station where the 1969 rupture and subsequent rainstorm during cleanup activities spread contamination toward and into the Miami-Erie Canal. The area is approximately 200 feet in length and 150 feet wide. The original WTS line ran along the eastern boundary of Area 14 (see Figure 1.2). Since the OU6 Work Plan requires that verification sampling be conducted following D&D, and since the WTS line is within Area 14, Area 14 will be sampled in conjunction with the verification activities for Area 19. Samples will be collected at both surface and subsurface locations. The specific sample size and sample locations for Area 19-2 are discussed in Section 2.2.7.

The third area (Area 19-3) is the entire WTS line (gravity section plus pressure section) from the SMPP Hill to the WD Building, a distance of approximately 2500 feet. Using available photographs, as-built drawings, and D&D documentation, the original route of the WTS will be surveyed and staked. As discussed previously, the depth of the WTS pipeline ranged from 4 to 8 feet. To ensure that contamination resulting from leakage of the line is addressed, all samples will be collected at depths ranging from approximately 1 to 20 feet below the surface. If bedrock is encountered at a depth less than 20 feet the second sample will be obtained immediately above the soil-bedrock interface. Metal contaminants from leaking pipes would move downward and thus would be detected in soil samples collected below the WTS line. The specific sample size and sample locations for Area 19-3 are discussed in Section 2.2.7.

2.2.2. Identification of Sample Handling and Collection Procedures

Surface and subsurface soil samples will be collected using hand-held and power augers, as well as hollow-stem auger drilling rigs following the guidance contained in Standard Operating Procedures (SOPs) 4.1 and 5.1 of the OU9 QAPjP (DOE, 1992g). Laboratory analyses of all the samples obtained in this manner will be conducted using the analytical methods indicated in Table II.2.

2.2.3. Identification of the Contaminants to be Tested

As discussed in Section 1, based on the historical data and operational records, the expected sources of contamination to be found in Areas 19 and 14 include the contaminants from the glove box lines in the SM and PP buildings, wash water, rinse water, decontamination solutions, shower water, leachate

Table II.2 OU6, Area 19 and 14 Analytes - Quantitation Limits and PRGs

OU6 COC[1]	Analytical Method	Quant. Limit[2]	PRG[3] ug/kg
Acenaphthene	CLP SOW	330	na
Acetone	CLP SOW	10	2.7E+07[d]
Ammonia	E350.1	ns	na
Anthracene	CLP SOW	330	na
Arsenic	CLP SOW	2,000	3.7E+02[e]
Benzene	CLP SOW	5	2.2E+04[e]
Benzo (a) anthracene	CLP SOW	330	na
Benzo (a) pyrene	CLP SOW	330	na
Benzo (b) fluoranthene	CLP SOW	330	na
Benzo (k) fluoranthene	CLP SOW	330	na
Benzo (g,h,i) perylene	CLP SOW	330	na
Bis (2-ethylhexyl) phthalate	CLP SOW	330	na
Calcium	CLP SOW	1.0E+06	na
Carbon Disulfide	CLP SOW	5	2.7E+07[d]
Carbon Tetrachloride	CLP SOW	5	4.9E+03[e]
Chloroform	CLP SOW	5	1.0E+05 [d]
Chrysene	CLP SOW	330	na
Dibenzo (a,h) anthracene	CLP SOW	330	na
Diethyl Benzene	CLP SOW	20	na
Ethylbenzene	CLP SOW	5	na
Fluoride	E340.2	25	1.6E+07[d]
Hexane	CLP SOW	10	1.6E+07[d]
Indeno (1,2,3-cd) phenanthrene	CLP SOW	330	na
Methylene Chloride	CLP SOW	5	8.5E+04[e]
Methyl Ethyl Ketone	CLP SOW	10	1.4E+07[d]
Methyl Isobutyl Ketone	CLP SOW	10	1.4E+07[d]
N-Nitroso-Di-n-phenylamine	CLP SOW	330	1.3E+06[d]

Table II.2 OU6, Area 19 and 14 Analytes - Quantitation Limits and PRGs

OU6 COC[1]	Analytical Method	Quant. Limit[2]	PRG[3] ug/kg
PCBs	CLP SOW	33	8.3E+01[e]
Phenanthrene	CLP SOW	330	na
Phenol	CLP SOW	330	1.6E+08[d]
Potassium	CLP SOW	1.0E+06	na
Pyrene	CLP SOW	330	8.1E+06[d]
Sodium	CLP SOW	1.0E+06	na
Tetrachloroethane	CLP SOW	5	3.2E+03[e]
Toluene	CLP SOW	5	5.4E+07[d]
Trichloroethane	CLP SOW	5	2.4E+07[d]
Trichloroethene	CLP SOW	5	5.8E+04[e]
Xylene	CLP SOW	5	5.4E+08[d]
Aluminum	CLP SOW	4,000	na
Antimony	CLP SOW	2,000	1.1E+05[d]
Cadmium	CLP SOW	1,000	1.4E+05[d]
Chromium	CLP SOW	2,000	1.4E+06[d]
Cobalt	CLP SOW	10,000	na
Cyanide	CLP SOW	2,000	5.4E+06[d]
Copper	CLP SOW	5,000	na
Iron	CLP SOW	20,000	na
Lead	CLP SOW	600	na
Lithium	CLP SOW	10,000	na
Magnesium	CLP SOW	1.0E+06	na
Manganese	CLP SOW	3,000	2.7E+07[d]
Mercury	CLP SOW	40	8.1E+04[d]
Molybdenum	CLP SOW	2,000	na
Nickel	CLP SOW	8,000	5.4E+06[d]
Selenium	CLP SOW	1,000	1.4E+06[d]

Table II.2 OU6, Area 19 and 14 Analytes - Quantitation Limits and PRGs

OU6 COC[1]	Analytical Method	Quant. Limit[2]	PRG[3] ug/kg
Silver	CLP SOW	2,000	1.4E+06[d]
Tantalum	CLP SOW/6010	ns	na
Vanadium	CLP SOW	2,000	1.9E+06[d]
Zinc	CLP SOW	4,000	5.4E+07[d]
Nitrate-Nitrite	E353.2	2,000	2.7E+07
Chloride	SW9250	5,000	na
Sulfate	E375.2	50,000	na
Americium-241	E901.0#	1 pCi/g	2.3 pCi/g
Plutonium-238/239/240	E907.0#	1 pCi/g	(a)
Thorium-228/230/232	E907.0	1 pCi/g	(b)
Tritium	E906.0#	50 pCi/g	14 nCi/g
Uranium-234/235/238	E907.0	0.6 pCi/g	(c)

Notes:

1 - OU6 Contaminants of Concern derived from Tables IV.1 and IV.2 of the OU6 Verification Work Plan and modified per Table II.3
2 - ug/kg (except where noted in table)
3 - Calculated using Risk Assessment Guidance for Superfund (RAGS), Vol. I, Part B
ns - none specified
na - not available
(a) 3.5 pCi/g for Pu^{238}, 3.3 pCi/g for $Pu^{239,240}$
(b) 7.4 fCi/g for Th^{228} plus daughters, 52 pCi/g for Th^{230}, 14 fCi/g for Th^{232} plus daughters
(c) 46 pCi/g for U^{234}, 0.17 pCi/g for U^{235} plus daughters, 1.1 pCi/g for U^{238} plus daughters
(d) Residential Soil Noncarcinogenic
(e) Residential Soil Carcinogenic
USEPA Contract Laboratory Program (CLP) General Radiochemical Analytical Services Protocol (GRASP) Statement of Work (SOW), CLP-M-9XX (Draft) will be provided to the analytical laboratories as an additional reference to insure proper application of these drinking water methods to the analysis of radionuclides in soils.

solutions, and aqueous wastes generated during plutonium recovery and processing operations. The contaminants of concern to be sampled for include those resulting from plutonium processing activities and chemicals that are commonly used for related activities (e.g., solvents), or their derivatives. The contaminants of concern (COCs), developed from the COCs specified in Tables IV.1 and IV.2 of the OU6 VWP (as derived from the OU9 COCs), are listed in Table II.3.

2.2.4 Establishment of Cleanup Standards

According to the OU6 D&D Verification Work Plan, (DOE, 1992c), the D&D Program will remove radioactively contaminated soil in accordance with D&D program cleanup protocols. These protocols currently are set at 100 pCi/g plutonium and 5 pCi/g thorium in surface soil and 15 pCi/g thorium in subsurface soil (below 15 cm). Cleanup standards for other potential radiological and non-radiological contaminants are not available.

2.2.5. Selection of the Appropriate Statistical Parameter

The EPA guidance (1989) for determining the statistical parameter to be used for comparison with the cleanup standard recommends that both the variability in the sampling data and the number of non-detects be examined. If more than 50 percent of the data indicates non-detects, either the upper percentile or the median (depending on the data variability) should be used as the statistical parameter for comparison with the cleanup standard. If less than 50 percent of the data contains non-detects and relatively low variability, then the guidance indicates the mean should be the statistical parameter selected for comparison with the cleanup standard. The available historical data for Areas 19 and 14 indicate there are fewer than 50 percent non-detects for radionuclides. Consequently, the mean concentration of radioactive contaminants, computed from the Area 19 verification data, will be used to support the development of the sampling strategy.

2.2.6. Decision Making with Uncertainty

The validity of the decision that a site meets the cleanup standard depends on how well the samples represent the site, how accurately the soil samples are analyzed, and inherent differences in soil samples, all of which are subject to variation. This variation introduces uncertainty into the decision concerning the attainment of a cleanup standard. As a result of this uncertainty, one may decide that the site is clean when in fact it is not clean (a false positive finding, Type I error - represented by the symbol Alpha). It is important to reduce the chance of a false positive decision to as low a level as possible given the constraints of increased sampling costs with reduced levels of Alpha.

Table II.3 OU6 Contaminants of Concern[1]

OU6 COC	Analyte for Area 19 and 14 (Y/N)	Analytical Method[2]	Rationale for Excluding
Acenaphthene	Y	=	N/A
Acetone	Y	=	N/A
Acetonitrile	N		a
Acrylonitrile	N		a
Ammonia	Y	=	c
Anthracene	Y	=	N/A
2-benzyl-4-chlorophenol	N		a
(triazole) sodium molybdate	N		a
Arsenic	Y	=	N/A
Benzene	Y	=	N/A
Benzo (a) anthracene	Y	=	N/A
Benzo (a) pyrene	Y	=	N/A
Benzo (b) fluoranthene	Y	=	N/A
Benzo (g,h,i) perylene	Y	=	N/A
Benzo (k) fluoranthene	Y	=	N/A
Bis (2-ethylhexyl) phthalate	Y	=	N/A
Calcium	Y	=	N/A
Carbon Disulfide	Y	=	N/A
Carbon Tetrachloride	Y	=	N/A
Chloroform	Y	=	N/A
Chrysene	Y	=	N/A
Cresols (methylphenol)	N		a
Dibenzo (a,h) anthracene	Y	=	N/A
Diethyl Benzene	Y	=	N/A
Ethylbenzene	Y	=	N/A
Fluoride	Y	=	N/A

Table II.3 OU6 Contaminants of Concern[1]

OU6 COC	Analyte for Area 19 and 14 (Y/N)	Analytical Method[2]	Rationale for Excluding
Freon-TF (Freon 113)	N		a
Hexane	Y	=	N/A
High Explosives			
PETN	N		a
RDX	N		a
HMX	N		a
Indeno (1,2,3-cd) phenanthrene	Y	=	N/A
Iodomethane	N		a
Methylene Chloride	Y	=	N/A
Methyl Ethyl Ketone	Y	=	N/A
Methyl Isobutyl Ketone	Y	=	N/A
N-Nitroso-Di-n-phenylamine	Y	=	N/A
bis (tributylin) oxide	N		a
PCBs	Y	=	N/A
Phenanthrene	Y	=	N/A
Phenol	Y	=	N/A
Potassium	Y	=	N/A
Pyrene	Y	=	N/A
Sodium	Y	=	N/A
Tetrachloroethane	Y	=	N/A
Toluene	Y	=	N/A
Tribromomethane	N		a
Trichloroethane	Y	=	N/A
Trichloroethene	Y	=	N/A
Xylene	Y	=	N/A
Aluminum	Y	=	N/A

Table II.3 OU6 Contaminants of Concern[1]

OU6 COC	Analyte for Area 19 and 14 (Y/N)	Analytical Method[2]	Rationale for Excluding
Antimony	Y	=	N/A
Beryllium	N		a
Bismuth	N		a
Cadmium	Y	=	N/A
Chromium	Y	=	N/A
Cobalt	Y	=	N/A
Cyanide	Y	=	N/A
Copper	Y	=	N/A
Iron	Y	=	N/A
Lead	Y	=	N/A
Lithium	Y	=	N/A
Magnesium	Y	=	N/A
Manganese	Y	=	N/A
Mercury	Y	=	N/A
Molybdenum	Y	=	N/A
Nickel	Y	=	N/A
Selenium	Y	=	N/A
Silver	Y	=	N/A
Tantalum	Y	CLP SOW/6010	N/A
Vanadium	Y	=	N/A
Zinc	Y	=	N/A
Actinium-227	N		a
Americium-241	Y	E901.0#	N/A
Bismuth-207	N		a
Bismuth-210m	N		a
Cesium-137	N		a

Table II.3 OU6 Contaminants of Concern[1]

OU6 COC	Analyte for Area 19 and 14 (Y/N)	Analytical Method[2]	Rationale for Excluding
Cobalt-60	N		a
Plutonium-238/239/240	Y	E907.0#	N/A
Radium-226	N		a
Strontium-90	N		a
Thorium-228/230-232	Y	E907.0	N/A
Tritium	Y	E906.0#	N/A
Uranium-234/235/238	Y	E907.0	N/A
Rare earths	N		d
Nitrate-Nitrite	Y	=	N/A
Nitrite	N		e
Chloride	Y	=	N/A
Sulfate	Y	=	N/A
Cadmium-113	N		a
Neptunium-237	N		b
Neptunium-239	N		f
Nickel-59	N		a
Nickel-63	N		a
Plutonium-236	N		g,a
Plutonium-241	N		h,a
Plutonium-242[n]	N		i,a
Polonium-209[n]	N		a
Polonium-210[n]	N		j
Protactinium-231[n]	N		a
Radon-222[n]	N		a
Silver-108[n]	N		a
Thorium-227[n]	N		a

Table II.3 OU6 Contaminants of Concern[1]

OU6 COC	Analyte for Area 19 and 14 (Y/N)	Analytical Method[2]	Rationale for Excluding
Tin-121[n]	N		a
Uranium-232/233/236[n]	N		k,l,m

Notes:
1 - OU6 Contaminant of Concern list derived from Tables IV.1 and IV.2 of the OU6 Verification Work Plan.
2 - If different from that specified in the OU6 QAPjP
= - Method as specified in OU6 QAPjP
N/A Not applicable
a - Not ever used in this area (based on process knowledge)
b - Daughter of americium-241
c - Gaseous compound, not likely to exist in soil matrix - analyze for NH_4^+
d - Not present in detectable concentrations (based on thorium content in area soils)
e - No available method for analysis in soil matrix
f - Parent of plutonium-239
g - Parent of uranium-232
h - Parent of americium-241
i - Parent of uranium-238
j - Decayed to lead-206 (half-life = 138.4 days)
k - Parent of thorium-228
l - Daughter of protactinium-233 - daughter of neptunium-237 (see note b)
m - Parent of thorium-232
n - Possible radioactive contaminant at Mound Plant
- USEPA Contract Laboratory Program (CLP) General Radiochemical Analytical Services Protocol (GRASP) Statement of Work (SOW), CLP-M-9XX (Draft) will be provided to the analytical laboratories as an additional reference to insure proper application of these drinking water methods to the analysis of radionuclides in soils.

In direct terms, a false positive is the chance of deciding that Areas 19 and 14 are clean when they, in fact, still contain levels of the contaminant above the cleanup standard. For these areas, Alpha was set at .05. With Alpha set at this value, Areas 19 and 14 could be considered clean when, in fact, they are actually not clean 5 percent of the time.

The converse of a false positive decision is a false negative decision (Type II error - represented by the symbol Beta). A false negative occurs when Areas 19 and 14 are determined to need additional cleanup when, in fact, they meet the standard. For these areas, Beta was set at .20. This means that Areas 19 and 14 could be declared unclean when, in fact, they are actually clean, 20 percent of the time.

2.2.7. Determination of the Sample Size and Locations

As discussed earlier, a random sampling strategy will be applied to Areas 19 and 14. Random samples will be collected within each of three areas, (areas 19-1, 19-2, and 19-3) as discussed in Section 2.2.1.

The sample sizes proposed below will represent the sample sizes for each of these three areas, and will be based on the historical plutonium data collected by Battelle and Argonne as discussed in Section 1.2. The lack of adequate historical coverage for chemical sampling precludes an estimate of the mean concentration (or the variance), and thus does not enable a sampling size to be based on chemical results. Since plutonium is the primary contaminant of concern and was the primary contaminant in both the high risk and low risk waste streams, the estimates of sample size based on historical plutonium concentrations should serve to adequately address chemical contamination. The radiological contamination is determined to be of primary concern since the historical data indicates chemical concentrations at non-detect or slightly above detection limit levels.

All sample size determinations will be based on the levels of uncertainty discussed in Section 2.2.6 and the difference between the expected population mean (based on historical data) and the cleanup standard discussed in Section 2.2.4. EPA (1989) recommends using the following equation (6.7) for determining sample size:

$$\text{sample size} = [(Z_1 + Z_2)]^2 / T^2 \text{ , where}$$

$$T = (\text{Cleanup Standard - Sample Mean}) / \text{Standard Deviation}$$

$$Z_1 = (1\text{-Beta}); \; Z_2 = (1\text{-Alpha})$$

In the first area (area 19-1), north of the WD building, there are no estimates of the concentrations of plutonium below the clay caps that were installed 12 feet below the surface. For this reason, a sample size cannot be estimated based on EPA's equation. Since the area has not been characterized below the 12 foot level, three boreholes will be excavated at the randomly selected locations (within a 60-foot by 50-foot grid with 5-foot spacings) shown in Figure 2.1.

LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- EXIST. SAMPLE LOCATION
- ALTERNATE SAMPLE LOCATION
- PROPOSED SAMPLE LOCATION

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "BATTELLE & ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 5 10 20 40

SCALE: 1" = 20'

SAIC
Science Applications International Corporation

MOUND AREA 19
MIAMISBURG, OHIO

Figure 2.1
PROPOSED SAMPLING LOCATIONS FOR AREA 19-1

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\380FIG21.PLT

SHT 1 OF 1 DRAWING # | \93046\DWGS\380FIG21.DWG CAD FILE # | N/A ROT. ANGLE

A sample size of three boreholes was chosen to provide adequate coverage over the relatively small area 19-1 (the original excavation was 15 feet wide by 15 feet long to a depth of 12 feet). A single sample will be taken at the six-foot level in each borehole (to confirm the absence of contamination in the backfill material), and then a sample will be collected every three feet starting at the 12 foot level. Sampling will continue until bedrock is encountered.

In the second area (area 19-2), radioactive wasteline leak (Area 14), a simple random sampling strategy will be used. As reported in Table II.4, the mean plutonium concentration (surface and subsurface) was 12.9 pCi/g with a standard deviation of 35.8. Using EPA's equation (6.7) and a cleanup standard of 100 pCi/g, with Alpha set to .05, and beta set to .20, a sample size of less than 1 is calculated.

When Alpha is set equal to 0.01 and Beta remains at 0.20, the number of samples calculated using equation 6.7 is approximately 1. Based on the historical data illustrated in Table II.1, there are a few sites, particularly in the south eastern area, that had elevated levels of plutonium contamination. To adequately cover Area 19-2 (approximately 200 feet by 150 feet) a 25 foot grid will be overlain on the area and a simple random sample of 10 grid intersections will be selected as illustrated in Figure 2.2. A sample size of 10 boreholes is needed to obtain adequate coverage of Area 19-2. At each selected grid location, a borehole will be excavated and a maximum of four samples will be collected (depending upon the depth to bedrock in the area). The first sample will be a surface sample which will measure any remaining surface contamination. The second sample in each borehole will be collected at the six-foot level to measure any residual contamination following D&D cleanup activities. The third sample will be collected at an intermediate depth (approximately 13 feet, unless bedrock is encountered), and the fourth sample will be obtained at the 20 foot level, or just above bedrock (whichever is more shallow), to measure any potential leakage from the original WTS line (maximum depth of burial was approximately 6 feet in this area).

Table II.4. Area 19 Verification Sampling Statistics from Historical Data for Plutonium-238

Sample Groupings	Number of Samples	Min* (pCi/g)	Max (pCi/g)	Mean (pCi/g)	Standard Deviation (pCi/g)
Overall Summary	195	0.0	366.0	12.9	35.8
Average Subsurface Summary	102	0.0	366.0	16.7	46.9
Average Surface Summary	93	0.0	89.0	8.78	15.9
Gravity Leg Summary	124	0.0	366.0	13.2	38.8
Pressure Leg Summary	71	0.1	240.0	12.3	29.9
Gravity Subsurface Summary	62	0.0	366.0	18.3	51.7
Gravity Surface Summary	62	0.0	89.0	8.2	17.8
Pressure Subsurface Summary	40	0.1	240.0	14.2	38.8
Pressure Surface Summary	31	0.8	54.0	9.9	11.2

* Non detect values set to zero for all 1986 verification data (Stenhouse & Kirsch)

LEGEND:

- EXIST. BUILDING
- EXIST. FENCE
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- PLUTONIUM < 25 pCi/g
- PLUTONIUM ≥ 25 pCi/g
- ALTERNATE SAMPLING LOCATION
- PROPOSED SAMPLING LOCATION

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "BATTELLE & ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 25 50 100
SCALE: 1" = 50'

Science Applications International Corporation

MOUND AREA 19
MIAMISBURG, OHIO

PROPOSED SAMPLING LOCATIONS FOR AREA 19-2

Figure 2.2

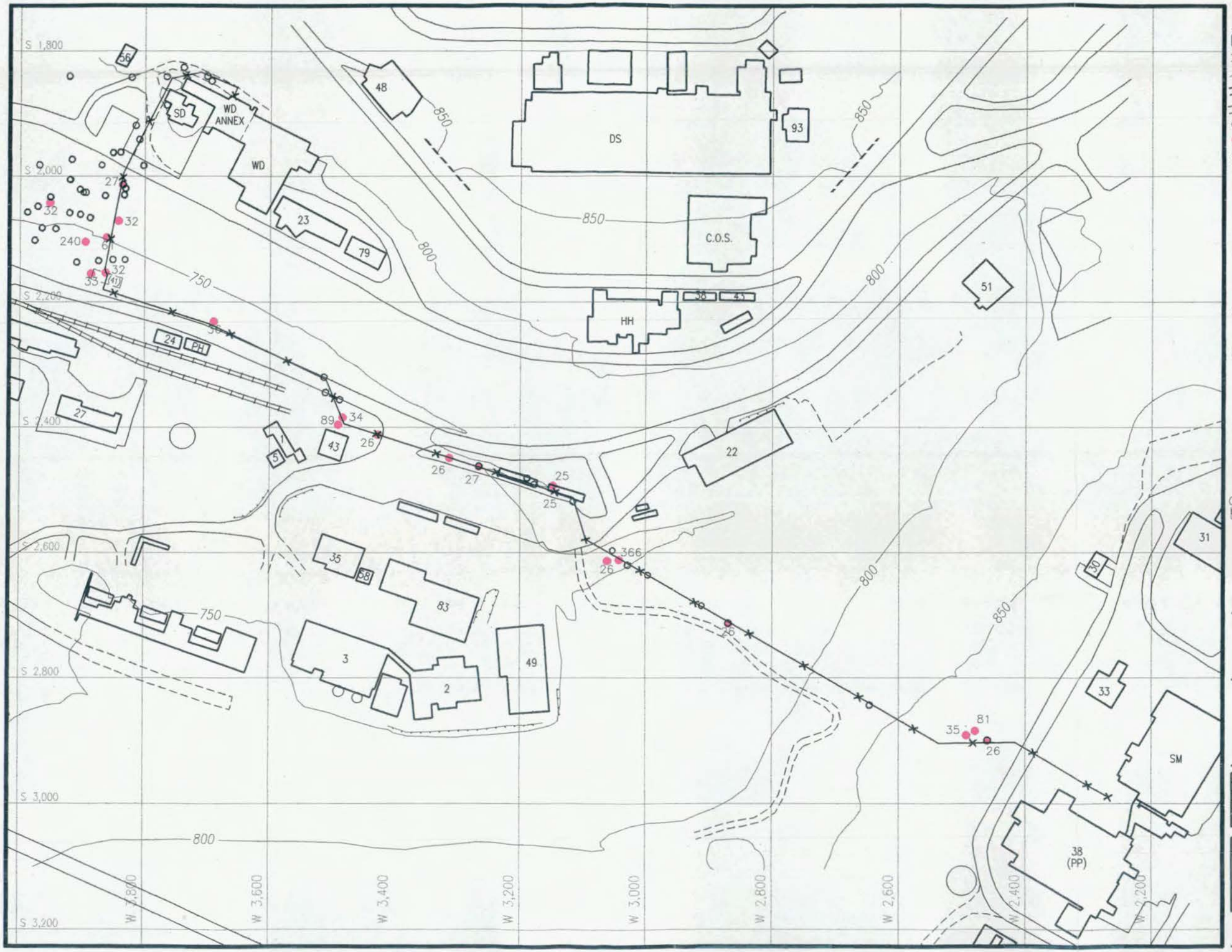
REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\330519-2.PLT

SHT 1 OF 1	\93046\DWGS\330519-2	N/A
DRAWING #	CAD FILE #	ROT. ANGLE

In the third area (area 19-3) a systematic random sampling strategy will be used to cover the entire length of the line. As reported in Table II.4, the mean plutonium concentration (surface and subsurface) is 12.9 pCi/g with a standard deviation of 35.8 Using equation 6.7 and a cleanup standard of 100 pCi/g, with Alpha set at .05 and beta set at .20, a sample size less than 1 is calculated for Area 19-3. When Alpha is set equal to 0.01 and Beta remains at 0.20, the number of samples calculated using equation 6.7 is approximately 1.5. As in Area 19-2, the small calculated sample size is due to the relatively high cleanup standard of 100 pCi/g as compared to the historical mean concentration of 12.9 pCi/g. As in Area 19-2, the historical data illustrated in Table II.1 indicates that a few sites were identified during previous verification activities (in the gravity leg, between the SM/PP Hill and the lift station) which approached or exceeded the 100 pCi/g cleanup level (particularly at boreholes 7, 14, 22, and 23). In addition, since the former WTS is approximately 2500 feet long, the sample size must be large enough to adequately cover this distance. Initially, a borehole will be drilled at the approximate location of the former underground storage tanks for the high-risk and low-risk wastes. A sample of the backfill material will be collected at a depth of one foot and a second sample will be taken just above bedrock (at a depth of approximately 5 to 6 feet). Elevated levels of plutonium (greater than 25 pCi/g) are intermixed with lower levels of plutonium in intervals ranging from 100 to 450 feet. To ensure that both elevated and lower levels are sampled, the minimum distance between boreholes along the WTS line will be 100 feet. Dividing 2500 feet by 100 feet produces a sample size of 25 along the WTS line. The number 38 was randomly drawn from a table of random numbers between 1 and 100, and this number will serve as the starting distance from the former underground storage tanks between the SM and PP buildings. The second borehole will be drilled 38 feet from the tank location, as illustrated in Figure 2.3. From that point, 23 additional boreholes will be drilled at 100 foot increments along the route of the WTS line (138 feet, 238 feet, 338 feet, etc.), giving a total of 25 boreholes in Area 19-3.

A sample will be collected at the bedrock/soil interface or 20 feet (maximum depth of the former WTS was 17 feet) if bedrock is not encountered, within each of the boreholes along the pipeline, determined from as-built drawings and available photographs of the WTS. Prior to collecting this sample, a second sample will be obtained from the backfill material at a depth determined by randomly selecting a number between 1 and 17. A minimum 3-foot distance will be maintained between the backfill sample and the lowest sampling point. The randomly selected number will be rejected and a new number will be selected if this minimum interval cannot be maintained due to the depth to bedrock in the sampling area.



LEGEND:

- EXIST. BUILDING
- EXIST. RAILROAD TRACKS
- 850 EXIST. CONTOUR
- EXIST. PAVED ROAD
- EXIST. GRAVEL ROAD
- ○ PLUTONIUM < 25 pCi/g
- ● PLUTONIUM ≥ 25 pCi/g
- × PROPOSED BORING

DATA SOURCE:

1.) CONTOUR INFORMATION WAS TAKEN FROM DWG. NO. CFE22321 BY THE MONSANTO RESEARCH CORP., DATED 01-17-86.

2.) BASE MAP FEATURES WERE TAKEN FROM PLATE 1 OF 2 BY WESTON ENGINEERING CONSULTANTS.

3.) SOIL BORING DATA FROM "BATTELLE & ARGONNE" HISTORICAL DATA.

25°30'49"
PLANT NORTH
TRUE NORTH

0 50 100 150 300
SCALE: 1" = 150'

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MOUND AREA 19
MIAMISBURG, OHIO

Figure 2.3
PROPOSED SAMPLING LOCATIONS FOR AREA 19-3

REVISION	DRAWN BY:	CHKD. BY:	DATE:
0	R. BEELER		08-11-93

XREFERENCES	PLOT FILES
	\93046\PLOT\380F1023.PLT

SHT 1 OF 1	\93046\DWGS\380F1023.DWG	N/A
DRAWING #	CAD FILE #	ROT. ANGLE

3. SAMPLE LOCATION AND FREQUENCY

As determined in Section 2.2.7, approximately 102 soil samples (excluding QA/QC samples) will be obtained from 38 separate soil borings to accomplish the verification sampling and analysis activities in Areas 19 and 14. Three soil borings will be excavated near the former location of the WTS line north of the WD Building (Area 19-1) and a minimum of two soil samples will be obtained from each boring at depths of 6 feet and 12 feet beneath the surface (see Figure 2.1). Additional samples beyond the 12 foot depth will be collected at 3 foot intervals until bedrock is encountered.

In the second sampling area (Area 19-2) a maximum of 40 soil samples will be obtained from 10 randomly selected intersections within a 25 foot grid pattern overlain on the area (see Figure 2.2). Up to four samples will be collected from each soil boring location (depending upon the depth to bedrock in the soil boring sites); one at the surface, one at a depth of 6 feet, the third sample at a depth of 13 feet, and the fourth sample at bedrock or at a depth of 20 feet if bedrock is not encountered at that depth. If bedrock is encountered at the intermediate depth (i.e., 13 feet), only three samples will be obtained. Similarly, only two samples will be collected if bedrock is encountered at a depth of 6 feet or less.

Approximately 50 samples will be obtained from the former WTS pipeline (Area 19-3). The first soil boring will be drilled at the approximate location of the former underground storage tanks for the high-risk and low-risk wastes (between the SM and PP Buildings). Two samples will be obtained, one at a depth of approximately one foot and the second in the 18-inch sampling interval just above bedrock. The second soil boring will be drilled at a distance of 38 feet (a randomly selected distance) from the initial borehole, and a soil sample will be collected in the backfill at a depth to be determined from a random number table. A minimum distance of 3 feet will be maintained between the backfill sample and the second sample that will be taken just above the fill/bedrock interface or at a maximum depth of 20 feet if bedrock is not encountered. If the first sample depth, selected from the table of random numbers, does not maintain the 3-foot interval, another random number will be selected. This process will be repeated, as necessary to ensure that the two samples are not obtained from the same sampling depth. An additional 46 samples will be obtained at 100 foot intervals along the length of the former WTS pipeline (see Figure 2.3), using the same sampling scheme described for the second borehole.

The exact sampling locations will be determined in the field on the basis of distance measurements, accessibility, utilities, and other site factors. If unusual conditions are encountered during the borehole excavations (e.g., a significant change in lithology, discolored/stained soils, unusual odors, groundwater), additional samples from the affected area may also be collected for analysis. These circumstances will be noted in the field logs and the information will be made available to ER Program personnel. The estimated number of samples to be collected during the verification sampling and analysis activities in Areas 19 and 14 is shown in Table III.1.

All samples collected will be analyzed for the following parameters:

(1) Target Compound List volatile organics, semivolatile organics, and pesticides/PCBs;
(2) Target Analyte List metals, including bismuth, tin, lithium, and molybdenum;
(3) Fluoride, chloride, sulfate, nitrate-nitrite, and ammonia;
(4) Tritium; and
(5) Radionuclides, including gamma spectrometry and isotopic plutonium, thorium, and uranium as specified in Table II.2.

A 300 gram sample obtained at each sample location will be collected in a container provided by Mound for radiological soil screening at the Mound facility. Sample quantities, container types, holding times and methods of analysis are summarized in Table V.1.

Table III.1. Area 19 and 14 Verification Samples

Location	Sample No.[1]	Depth[2]		Location	Sample No.[1]	Depth[2]
19-1a	1-4	6,12,15,18*		19-3g	65,66	a,b
19-1b	5-8	6,12,15,18		19-3h	67,68	a,b
19-1c	9-12	6,12,15,18		19-3i	69,70	a,b
19-2a#	13-16	0,6,13,20*		19-3j	71,72	a,b
19-2b#	17-20	0,6,13,20		19-3k	73,74	a,b
19-2c#	21-24	0,6,13,20		19-3l	75,76	a,b
19-2d#	25-28	0,6,13,20		19-3m	77,78	a,b
19-2e#	29-32	0,6,13,20		19-3n	79,80	a,b
19-2f#	33-36	0,6,13,20		19-3o	81,82	a,b
19-2g#	37-40	0,6,13,20		19-3p	83,84	a,b
19-2h#	41-44	0,6,13,20		19-3q	85,86	a,b
19-2i#	45-48	0,6,13,20		19-3r	87,88	a,b
19-2j#	49-52	0,6,13,20		19-3s	89,90	a,b
19-3a	53,54	1, ≈ 5		19-3t	91,92	a,b
19-3b	55,56	a,b		19-3u	93,94	a,b
19-3c	57,58	a,b		19-3v	95,96	a,b
19-3d	59,60	a,b		19-3w	97,98	a,b
19-3e	61,62	a,b		19-3x	99,100	a,b
19-3f	63,64	a,b		19-3y	101,102	a,b

Notes:

1 Specific sample designations will be established as specified in Section 4 of the SAP
2 feet below ground level
* depth may be less if bedrock is encountered
# Area 19-2 includes Area 14
a depth of sample will be between the surface and a depth of 17 feet; exact depth will be determined for each location using a random number table.
b dependent upon depth to bedrock; maximum depth = 20 feet

4. SAMPLE DESIGNATIONS

In order to assure consistency with the OU6 Verification Work Plan and the OU6 QAPjP, the Area 19 and 14 verification sampling program will adopt the same field sample identification scheme. This sample numbering system provides information on the site name, the sample matrix, location, and the interval sampled. Individual samples are numbered according to a unique site (X), sample location (Y), and sample (Z) identifier: MNDXX-YYYY-ZZZZ. Table IV.1. more clearly illustrates the sample identification scheme.

Soil samples collected during this verification sampling will be numbered using the site identifier MND14, and will begin with location 0001. The first number in the four digit sample identifier (ZZZZ) will be used to signify whether the sample is a primary or quality control sample. The prefix 0 will be used to identify a primary sample. The second number in the sample identifier will define the sample matrix. A sample matrix identifier of 2 will be used for any surface water or groundwater samples, while identifiers 1 and 0 are reserved for sediment and soil, respectively. However, it is anticipated that only soil samples will be collected in this investigation, so virtually all primary samples will have a matrix identifier of 0. The remaining two sample identifier digits will be used to designate the depth at the beginning of the sampling interval.

Quality control samples will be assigned an area or investigation identifier, a sample location number, and a sample round number. The first number in the four digit sample round identifier (ZZZZ) will be used to designate the type of control sample according to the numbering scheme listed in Table IV.1. Duplicate samples, trip blanks, and ambient blanks will be assigned prefixes 1, 2, and 3, respectively, while equipment blanks will be identified by the prefix 4.

The following examples will serve to better illustrate the identification scheme:

MND14-3107-0001	defines a soil sample at a depth of 1 foot
MND14-3108-0001	designates the next sample location
MND14-3108-1001	describes a field duplicate of sample 0001
MND14-3108-2000	defines a trip blank
MND14-3108-0000	designates a surface soil sample
MND14-3108-0005	designates a sample at the 5 foot depth interval

Table IV.1. Operable Unit 6 Field Sampling Identification Plan

Field Samples:	
Sample Matrix	Identification Scheme
Groundwater	MNDXX-YYYY-Z2ZZ
Surface Water	MNDXX-YYYY-Z2ZZ
Sediment	MNDXX-YYYY-Z1ZZ
Soil	MNDXX-YYYY-Z0ZZ
Field Quality Control Samples:	
Sample	Identification Scheme
Primary Sample	MNDXX-YYYY-0ZZZ
Trip Blank	MNDXX-YYYY-2ZZZ
Sample Bank Blank/Ambient Blank	MNDXX-YYYY-3ZZZ
Duplicate	MNDXX-YYYY-1ZZZ
Equipment Blank	MNDXX-YYYY-4ZZZ
Bottle Blank (Air)	MNDXX-YYYY-6ZZZ

Notes:

MND = Mound Plant
XX = Sample area identifier: XX = 14 for Area 19 and 14 samples
YYYY = Sample location number
ZZZZ = Type sample and sample round or depth

Quality control samples will be assigned a sample location number and sample round of the last sample of the associated sample group.

Many of the Operable Unit 6 areas have been previously assigned area identifiers. These same identifiers will be used for verification sampling to aid in sample and data management.

5. SAMPLING EQUIPMENT AND PROCEDURES

5.1. SITE PREPARATION

Prior to the start of field sampling activities, the locations indicated in Figures 2.1, 2.2, and 2.3 will be identified and surveyed in the field, staked, cleared, and checked for utilities. Once the actual locations have been established, the stakes will be labeled with the sample identification information (see Section 4). Upon completion of the field sampling activities, each sample site will be precisely located by a licensed surveyor. The establishment of vertical control will be achieved at a precision of $\pm$ 0.01 feet. Horizontal control will be achieved to the nearest $\pm$ 0.1 foot and the horizontal locations will be reported using the Ohio State Plane (1983) and the Mound Plant Coordinate Systems. The vertical and horizontal location data corresponding to each sample site will be recorded on hard copy and electronic media for future reference.

5.2. FIELD SAMPLING EQUIPMENT

Approximately 102 surface and subsurface soil samples (excluding QA/QC samples) will be obtained from Areas 19 and 14 at approximately 38 locations during the verification sampling following D&D activities. Subsurface samples will be acquired by drilling test borings using either hollow-stem augering or hand augering techniques, as described in Section 5.3.3. Soil core samples will be obtained by driving a split-barreled sampler through and ahead of the augers. The following equipment will be used to obtain the subsurface soil samples:

- Truck mounted hollow-stem auger drill rig
- Hand-operated auger
- Hollow-stem auger flights
- Split-barreled soil samplers
- Stainless steel mixing bowls
- Stainless steel spoons

5.3. FIELD SAMPLING PROCEDURES

Field Sampling procedures used during the verification sampling will comply with the requirements of the Mound Plant Environmental Restoration Standard Operating Procedures (SOPs) which are appended to the OU9 Site-Wide Work Plan (DOE 1991e) and the OU6 Areas 19 and 14 SAP. The SOPs applicable

to this field investigation are contained in Appendix B of the OU9 QAPjP or Appendix A of the SAP. These SOPs, which will be strictly followed by all members of the field team, include:

- SOP 1.1 General Instructions for Field Personnel
- SOP 1.3 Sample Control and Documentation
- SOP 1.4 Sample Containers and Preservation
- SOP 1.5 Guide to Handling, Packaging, and Shipping of Samples
- SOP 1.6 General Equipment Decontamination
- SOP 1.7 Sampling for Removable Alpha Contamination
- SOP 1.8 Personnel Decontamination - Level D Protection
- SOP 1.9 Personnel Decontamination - Level C Protection
- SOP 1.10 Personnel Decontamination - Level B Protection
- SOP 1.12 Air Particulate Sampling with a Real-Time Aerosol Monitor
- SOP 1.15 Guide to Management of Investigation-Derived Material
- SOP 2.4 Sampling Monitoring Wells with a Bucket-Type Bailer
- SOP 2.9 Surface Water Sampling
- SOP 4.1 Soil Boring
- SOP 5.1 Soil and Rock Borehole Logging and Sampling
- SOP 5.2 Soil Sampling with a Spade and Scoop
- SOP 5.3 Subsurface Soil Sampling with Hand Auger and Thin-Wall Sampler
- SOP 6.1 Health and Safety Monitoring of Combustible Gas Levels
- SOP 6.2 Health and Safety Monitoring of Organic Vapors with a Photoionization Detector
- SOP 6.3 Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector
- SOP 6.4 Total Alpha Surface Contamination
- SOP 6.7 Near-Surface and Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER
- SOP 6.11 Beta-Gamma Radiation Measurements using a Geiger-Mueller Detector
- SOP 6.15 Measurement of Gamma Ray Field Using a Sodium Iodide (NaI) Detector
- SOP 6.16 Heat Stress Monitoring

5.3.1. Health and Safety Monitoring

All field work performed during the verification sampling program will comply with guidelines established in the OU6 D&D Health and Safety Plan (HSP) (DOE 1992c) and the site-specific HSP (see Appendix B). Based on the results of previous sampling in Areas 19 and 14, it is anticipated that field activities will proceed using modified level D personal protection equipment. However, if field air monitoring with organic vapor detectors, combustible gas/oxygen level instruments, or particulate samplers indicate the need for upgrading to a higher level of protection, all field activities will cease and the verification sampling program will be re-evaluated or modified to accommodate the higher levels. In addition to these air monitoring devices, soils will be field screened for low level radiation by Mound personnel using a FIDLER instrument. EG&G Mound Health Physics personnel will oversee the radiological monitoring procedures. Guidelines for personal protection are outlined in SOPs 1.8, 1.9, and 1.10.

The following instruments will be used at each sampling site during the verification sampling program to ensure that personal health and safety are not compromised. The general procedures for the calibration and proper usage of these instruments are detailed in SOPs 6.1, 6.2, 6.4, and 6.7 in the OU9 QAPjP and SOPs 1.12, 6.3, 6.11, 6.15 in Appendix A of this document.

- Photoionization (PID) or flame-ionization (FID) organic vapor detector
- Combustible Gas Indicator/Oxygen meter
- Geiger Mueller Counter or similar counter
- Field Instrument for the Detection of Low-Energy Radiation (FIDLER)
- Particulate Air Sampler
- Sodium Iodide Detector for measurement of Gamma Ray Field

These instruments will be used to monitor the ambient air quality and work zone air quality. Additionally, they will be used to screen potential vapors emanating from inside the hollow-stem augers and from the samples as they are retrieved, and to detect any significant radiation hazard levels.

A task-specific health and safety analysis for Area 19 is contained in Section 1.2.1 of the site-specific HSP that is included as Appendix B.

5.3.2. Decontamination

Personnel and sampling equipment will be decontaminated during the verification sampling program in order to prevent cross-contamination between samples and sampling locations. Personnel will be decontaminated as specified in SOPs 1.8, 1.9 and 1.10, and the OU6 and site-specific HSP before leaving the work area.

Equipment decontamination will be conducted according to Mound Plant Environmental Restoration Program SOP 1.6. Water used for decontamination will be collected in Department of Transportation approved 55-gallon drums with lids, gaskets, and locking rings. Subsequent handling of this investigative derived material (IDM) will be conducted according to SOP 1.15, Guide to Management of Investigation-Derived Material. At the completion of the sampling program, the drums will be staged on-site until the results of the laboratory analyses of the samples is available to determine the proper disposal option.

5.3.3. Soil Sampling

Before any subsurface soil boring activities are conducted, subsurface digging permits and appropriate utility clearances will be obtained from EG&G Construction Management personnel. A truck-mounted hollow-stem auger rotary drilling rig or hand-operated auger will be used to drill the soil sampling boreholes, per SOP 4.1 and 5.3. It may be necessary to use a hand-held auger for borings (per SOP 5.3) on the SM/PP hillside, on the relatively steep slopes within Area 14, and in the vicinity of the creek bed adjacent to the test fire parking lot. In either case, no fluids will be used to advance the augers or to drive the soil sampling devices since these methods would agitate or contaminate the samples, compromising their integrity.

Where proposed boring sites are accessible to a truck-mounted rig, 4 1/2 inch I.D. hollow-stem augers and 3-inch O.D. by 24 inch long split-barrel samplers will be used. Although the specific brand of drill rig has not been determined, it will be comparable to a Mobile B-61 or CME-55. Where hand auguring can be readily accomplished, a 3 1/4 inch stainless steel auger will be used. The sample will be acquired by hammering a 2 1/2 inch O.D. by 12 inch long stainless steel split-barrel sampler at the target depth.

If rocks or other obstructions are encountered where hand auguring is necessary, the boreholes will be advanced using a two-person motorized auger unit and 2 1/4 inch I.D. hollow-stem augers. Soil samples will be acquired by driving a 2 inch O.D. by 24 inch long split-barrel sampler through the augers. The sampler will be driven with a 140 lb. hammer using a motorized cathead attached to a tripod.

Subsurface soil samples will be collected from each of the proposed boring locations at depths ranging from 1 to 20 feet. Continuous core samples will not be obtained. Discrete, two foot long core samples will be acquired at the sample depths specified in Section 3. Upon retrieval, each sample core will be field screened using the field instruments listed in Section 5.1. Following the field screening, random portions of the two foot core will be quickly collected and sealed in the appropriate containers for VOC analyses. The remaining core will be composited in a stainless steel bowl and placed in appropriate containers for the balance of the chemical and radiological analyses, as specified in Table V.1.

A split for examination of radiological activity by the Mound Plant screening facility will also be collected. Each soil sample collected will be logged according to the criteria outlined in SOP 5.1. The expanded analysis of Areas 19 and 14 soils (over the analyte list shown in Table II.2) is being accomplished to address the uncertainty regarding the types of contaminants that may be present. The amount of soil and sample containers necessary for the required analyses is shown in Table V.1.

5.3.4. Field Quality Control Samples

In order to evaluate field quality control, equipment rinsate blanks, ambient blanks, sample bank blanks, and trip blanks will be collected in accordance with the OU6 QAPjP. Rinsate blanks will be used to evaluate the success of the equipment decontamination process. After decontamination, the sampling equipment will undergo a final rinse with distilled/deionized water. This rinsate will be collected and analyzed for the same parameters as the primary soil samples collected. One equipment rinsate sample will be obtained for at least every ten soil samples collected. Ambient blanks will be used to evaluate the presence of ambient VOC contaminants at the sampling site. Ambient blanks will be prepared from distilled/deionized water at the sampling site, and will be analyzed for the same VOC parameters as the soil samples. At least one ambient blank will be obtained for each twenty soil samples collected for VOC analysis. Sample bank blanks monitor for VOCs potentially present in the environment where samples are commonly handled before shipment. Sample bank blanks are prepared with distilled/deionized water in sample vials, and placed in the sample handling location while samples are being prepared for shipment. One sample bank blank will be analyzed for each twenty soil samples collected for VOC analysis.

In addition, a trip blank will accompany each shipping container sent to the laboratory for VOC analysis. Trip blanks are supplied by the laboratory and are analyzed for VOCs only. A temperature blank, a 40-ml vial of deionized water, will accompany all containers shipped to the laboratories to monitor sample cooler temperatures. The analytical laboratory will use this temperature blank to record the temperature of the

Table V.1. Sample Container (Type/Sample Size), Preservation and Holding Times for Soils

Analyte	Method	Container[a] Type/(Sample Size)	Preservation	Holding Time[b]
VOCs	CLP SOW[c] Mod D	Amber glass vial with teflon-lined lid (120 g)	Cool 4°C	14 days
SVOCs	CLP SOW Mod D	Amber glass jar with teflon-lined lid (100 g)	Cool 4°C	7 days extraction, 40 days for analysis[d]
PCBs/Pesticides	CLP SOW Mod D	Amber glass jar with teflon-lined lid (100 g)	Cool 4°C	7 days extraction, 40 days for analysis[d]
Metals (including cyanide and tantalum)	CLP SOW Mod A	Wide-mouth polyethylene bottle (400 g)	Cool 4°C	6 months; 28 days for mercury; 14 days for cyanide
Fluoride	E340.2	Wide-mouth polyethylene bottle (50 g)	Cool 4°C	28 days
Nitrate-Nitrite Chloride Sulfate	E353.2 SW9250 E375.2	Wide-mouth polyethylene bottle (100 g)	Cool 4°C	28 days
Ammonia	E350.1	Wide-mouth polyethylene bottle (50 g)	Cool 4°C	28 days
Tritium	E906.0#	Wide-mouth glass bottle (250 g)	None	N/A
Radionuclides Gamma Spectrometry $Pu^{238/239/240}$ $Th^{228/230/232}$ $U^{234/235/238}$	 E901.1# E907.0# E907.0# E907.0#	Wide-mouth nalgene bottle (750 g)	None	N/A

Note: Holding times for CLP analyses are based on "Laboratory Data Validation Functional Guidelines for Evaluating Organics Analyses," EPA, July 1, 1988 and "Laboratory Data Validation Functional Guidelines for Evaluating Inorganics Analyses," EPA, February 1, 1988.

a - Sample containers will be certified clean by the laboratory according to EPA standards
b - From date of collection
c - Latest version
d - From date of extraction

- USEPA Contract Laboratory Program (CLP) General Radiochemical Analytical Services Protocol (GRASP) Statement of Work (SOW), CLP-M-9XX (Draft) will be provided to the analytical laboratories as an additional reference to insure proper application of these drinking water methods to the analysis of radionuclides in soils.

CLP - Contract Laboratory Program
SOW - Statement of Work
EPA - U.S. Environmental Protection Agency

cooler at the time of sample receipt. The temperature should be 4°C ± 2°C, as specified in the OU6/OU9 QAPjP.

In order to evaluate sampling reproducibility and sample matrix effects, field duplicate samples and samples for matrix spike/matrix spike duplicate (MS/MSD) analyses will be collected in accordance with the OU6 QAPjP. Field duplicate samples will be collected to evaluate the reproducibility of the field sampling techniques; MS/MSD samples will be collected to monitor the effects of the sample matrix on the analytical results. It is not possible to obtain true duplicate soil samples since the medium is typically not homogeneous. The duplicate sample will be collected from the homogenized sample fraction (following VOC sample collection). Duplicates and MS/MSD samples will be analyzed for the identical constituents as the primary samples. One field duplicate sample will be collected for every ten environmental samples, and one MS/MSD sample will be collected for every twenty environmental samples.

5.3.5. Sample Handling

All soil samples will be handled, packaged, and shipped as described in SOPs 1.3 through 1.5. A description of sample containers, preservation requirements, and holding times for soils is presented in Table V.1. A discussion of the sample handling methods is provided in Section 6.

5.3.6. Borehole Abandonment

After sampling at each boring location, the borehole will be abandoned and appropriately sealed by grouting from the bottom of the boring to the ground surface. This will be accomplished by placing a side-discharge tremie pipe at the bottom of the borehole and pumping grout through the pipe until undiluted grout flows from the boring at the ground surface. The grout will consist of a neat cement with 4 lbs of commercial bentonite and approximately 7.5 gallons of water for every 94 lb bag of cement. The amount of grout placed in the borehole will be logged and compared to the volume of the hole to assist in determining if bridging has occurred. After the grout has set (about 72 hours), any depression in the grout due to settlement will be filled with an identical grout mixture. All specifications and procedures for borehole abandonment will comply with the Mound Plant Well Decommissioning and Abandonment Plan.

6. SAMPLE HANDLING AND ANALYSES

Soil samples obtained from this verification sampling program of Areas 19 and 14 will be submitted to the Mound Plant screening facility for radiological activity determination, and to independent laboratories for analyses of radiological and chemical constituents in accordance with the OU6/OU9 QAPjPs and Tables II.2 and V.1 of this SAP. Upon collection, soil samples reserved for laboratory analyses will be sealed in the containers specified in Table V.1. After labeling the individual containers with the appropriate information, they will be immediately prepared for shipment to the laboratory. All sample documentation and control forms will be completed by the sample manager and the samples will be shipped the same day or within 24 hours following collection. All shipping coolers will have custody seals intact before leaving control of the field team leader. Chain of custody documentation will follow the samples from their time of collection, through shipment and laboratory analyses in accordance with the OU6 QAPjP.

The soil samples obtained from the 38 boring locations will be handled according to the following Mound Plant Environmental Restoration SOPs:

- SOP 1.3 Sample Control and Documentation;
- SOP 1.4 Sample Containers and Preservation; and
- SOP 1.5 Guide to Handling, Packaging, and Shipping of Samples

Figure 6.1. illustrates the sample label that will be used for each sample obtained during the investigation. Custody seals will be utilized on all shipping coolers to deter tampering and to determine if the coolers have been tampered with during shipment. A sample chain of custody form will be maintained and included with each shipment. The chain of custody form will be initiated in the field and signed by the field team leader. A carbon copy of this document will be retained by the field sampling QA personnel before the samples leave his/her custody. A signature documenting each transferral of the samples will be required. Figure 6.2 provides an example of the chain of custody form intended for use in this investigation. A detailed summary of applicable analytical methods, sample container requirements, minimum sample volumes/weights and other sample handling specifications for the various parameters that may be included in the verification sampling and analysis activities is presented in Table V.1.

SAIC 301 Laboratory Rd., Oak Ridge, TN 37830

Sample No.: _____ Project No.: _____
Location: _____
Station: _____
Sample Media: _____
Sample Type: _____
Analysis: _____
Preservative: _____ Volume: _____
Rad Screen: _____ Units: _____
Sample Date/Time: ____ / ____ / ____ ____ : ____
Comments: _____
_____ Collector's Initials: _____

CUSTODY SEAL

Person Collecting Sample _____ Sample No. _____
(signature)

Date Collected _____ Time Collected _____

Figure 6.1. Soil Sample Label and Chain of Custody Seal

Figure 6.2. Example of the Chain of Custody Form

Science Applications International Corporation
An Employee-Owned Company

Chain of Custody Record

Date _____ Page _____ of _____

Shipment No _____

Name _____
Address _____
Phone Number _____
Project Manager _____
Project Name _____
Job/P.O. No. _____

Sampler (Signature) (Printed Name)

Requested Parameters

NO OF CONTAINERS

Laboratory Name _____
Address _____
Phone _____
Contact Name _____

OBSERVATIONS, COMMENTS, SPECIAL INSTRUCTIONS

Laboratory No	Matrix	Sample No.	Date	Time	Site/Zone

Relinquished by	Date	Received by	Date
Signature		Signature	
Printed Name	Time	Printed Name	Time
Company		Company	
Relinquished by	**Date**	**Received by**	**Date**
Signature		Signature	
Printed Name	Time	Printed Name	Time
Company		Company	

Total Number of Containers:

Instructions

1. Fill out form completely except for shaded areas (lab use only)
2. Complete in ballpoint pen. Draw one line through errors and initial
3. Request analyses using EPA method numbers only. Consult the project QAPP for instructions. Complete as shown
4. Reference all field QC samples to the applicable site or zone
5. Note all applicable preservatives
6. Group all sample containers and requested analyses from one sampling location together. Do not list individually

Shipment Method

SAIC Location (circle)

Washington, D.C.
1710 Goodridge Dr., McLean, VA 22102
(703) 734-2500

Oak Ridge
800 Oak Ridge Tnpk., Oak Ridge, TN 37830
(615) 482-9031

Paramus
One Sears Drive, Paramus, NJ 07652
(201) 599-0100

Dayton
1321 Research Park Drive, Dayton, OH 45432
(513) 429-6550

Columbus
655 Metro Place South, Suite 745, Dublin, [redacted]3017
(614) 793-7600

Cincinnati
635 West 7th St., Suite 403, Cincinnati, OH 45203
(513) 723-2600

Science Applications International Corporation

White (Laboratory) Pink (Project Manager) Yellow (Project Office) Goldenrod (Field Project Manager)

7. DATA EVALUATION

Analytical data from the laboratory analyses of Area 19 and 14 soils will be validated following the procedures described in the OU6/OU9 QAPjPs. Once the data has been validated, the results will be evaluated to determine if the D&D activities have been successful in terms of meeting the D&D cleanup goals for plutonium and thorium. The data will also be evaluated to determine if Areas 19 and 14 contain residual chemical or other radiological contamination. In addition, the results will be used to support future CERCLA feasibility studies, risk assessments and records of decision (ROD).

7.1 Verification of D&D Cleanup in Area 19 and Area 14

As discussed in Section 1, the first objective of this SAP is to verify that the D&D operations performed by the Mound Plant D&D Program in Areas 19 and 14 met the cleanup goals of the D&D program. To meet this objective, statistical procedures will be used, following EPA's (1989) guidance, for determining whether the mean concentration in the samples collected in Areas 19-1, 19-2 and 19-3 have attained the designated cleanup standards.

After the radiological data have been collected, analyzed, validated and stored in a centralized data base, summary statistics (the mean and standard deviation of the mean) will be calculated for each of the three areas for both plutonium and thorium concentration values. Following EPA's (1989) guidance for concentrations measured below the detection limit, the detection limit will be used in calculating these summary statistics for each area. Since the mean of the sampling data is only an estimate of the mean contamination of the entire sample area (the population), an upper one-sided confidence interval will be calculated (using equation 6.8, page 6-11, in EPA (1989)) which will provide a range of values within which the true population mean concentration is located. A one-sided confidence interval and the following 4-part decision rule will be used to test whether each individual area (19-1, 19-2 and 19-3) has attained the cleanup standard.

Decision Rule Number 1

IF

1. The upper 95 percent confidence interval is less than the cleanup standard of 100 pCi/g for plutonium-238 for all soils,

AND

2. The upper 95 percent confident interval is less than the cleanup standard of 5 pCi/g for thorium isotopes for all surface soils,

AND

3. The upper 95 percent confidence interval is less than the cleanup standard of 15 pCi/g for thorium isotopes for all subsurface soils,

THEN

4. The area will be declared clean from a D&D perspective, otherwise the area will be declared not clean and additional D&D remediation activities will need to be performed.

If the upper 95 percent confidence intervals are greater than the cleanup standards stated in the decision rule, the data from the verification sampling and analysis program will be further evaluated to determine the location and frequency of additional samples to be collected to determine the magnitude and extent of remaining radiological contamination. This evaluation will include the nature of the contaminants, the frequency of detection, concentration values, lateral and vertical distribution, potential sources, and any other contributing factors that may become evident in the analysis of the sample results.

7.2 Evaluation of Potential Chemical or Other Radiological Contamination

As discussed in Section 1 of this SAP, the second objective is to determine if Areas 19 and 14 contain other radioactive or chemical contaminants normally associated with the WTS operations. To meet this second objective, EPA's Risk Assessment Guidance for Superfund (RAGS) Volume 1 (1989) will be used to determine whether the concentration of other potential contaminants in the samples collected in Areas 19-1, 19-2 and 19-3 exceed ARARs, background concentrations (if known), or established PRGs.

After the chemical and other radiological data have been collected, analyzed, validated and stored in a centralized data base, summary statistics (frequency of detection, the arithmetic mean and standard deviation of the mean) will be calculated for each of the three areas for each potential contaminant of concern (COC). The list of potential COCs will be evaluated using the following decision rule (EPA, 1989).

Decision Rule Number 2

Potential COCs will be considered for further evaluation if:

1. The COC is positively detected (above the detection limit) in at least one soil sample,

OR

2. The COC is identified, but the exact concentration is unknown (i.e., J-qualified data),

OR

3. The COC is detected at levels significantly higher than the same chemicals detected in the QA/QC blank samples,

OR

4. The COC is detected at levels significantly higher than naturally occurring levels of the same chemical (i.e., background).

The list of potential COCs resulting from the stated decision rule will be evaluated to characterize the nature and extent of residual chemical and other radiological contamination in area soils.

If the evaluation of the radiological and chemical data from Areas 19 and 14 verification sampling and analysis activities indicate that the D&D cleanup goals have been met (using decision rule number 1) and that no elevated levels of chemical or other radiological contamination exist (using decision rule number 2), no further remedial activity will be indicated. The RI quality data will be archived for future comparison to Mound Plant cleanup levels and/or background concentrations, when they have been determined, to support a future feasibility study, risk assessment, and ROD.

8. REFERENCES

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APPENDIX A

SOP 1.10	Personnel Decontamination - Level B Protection
SOP 6.3	Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector
SOP 6.4	Total Alpha Surface Contamination Measurements
SOP 6.15	Measurement of Gamma-Ray Fields Using a Sodium Iodide (NaI) Detector

STANDARD OPERATING PROCEDURE 1.10

PERSONNEL DECONTAMINATION--LEVEL B PROTECTION

1. PURPOSE

To describe the equipment and procedures required for decontamination of persons who have performed field activities in Level B protective clothing.

2. DISCUSSION

The Field Sampling Plan (FSP) or Work Plan (WP) provides information about the scope and details of a specific operation. Refer to the FSP or WP Health and Safety Plan for recommendations about the level of protection worn to enter a site and the criteria for upgrading or downgrading to other levels of protection.

Protective clothing and equipment must be worn by personnel when known or suspected hazardous substances are involved. The necessary equipment and procedures for decontaminating personnel in Level B protection are addressed in this SOP. The procedures include maximum and minimum decontamination measures.

The establishment of decontamination lines is site specific. These lines depend upon the types of contamination and the work performed. When the decontamination line is no longer required, contaminated wash and rinse solutions and articles must be contained and disposed of appropriately. Disposal must follow installation requirements and any applicable state and federal regulations.

3. PROCEDURES

3.1. Associated Procedures

Before every operation, a review of the SOPs 1.1-1.10 is necessary. These SOPs contain information on the performance of field activities. They should be consulted for specific information on equipment and supplies; sample collection, preservation, packaging, and shipping; decontamination procedures; and documentation requirements. Other procedures directly associated with this SOP are listed below.

SOP No.	SOP Title
1.1	General Instructions for Field Personnel
1.6	General Equipment Decontamination
1.8	Personnel Decontamination--Level D Protection
1.9.	Personnel Decontamination--Level C Protection

3.2. Preparation

3.2.1. Office

A. Review the FSP or WP and SOPs listed in Section 3.1.

B. The selection of the appropriate level of personnel decontamination is site specific and determined by the site health and safety coordinator. Consult the site Health and Safety Plan for the level of protection. Considerations for selection include work activity, known or suspected contaminants, previous experience at the site, and the installation of health and safety requirements specified by the facility's management company.

C. The site Health and Safety Plan should include details of the plans for ultimate disposal of protective clothing, waste water, and potentially contaminated articles. The packaging and disposal procedures must be approved by the installation authorities responsible for waste disposal. Inform all onsite personnel about the proper disposal of protective clothing and decontamination solutions.

D. Appendix 5.1 includes recommendations for equipment and supplies used in maximum decontamination measures. Appendix 5.2 includes recommendations for equipment and supplies used in minimum decontamination measures. These appendixes contain general equipment guidelines. The selection of equipment must be site specific to incorporate unusual work activities or site features. Detailed information is in the FSP or WP.

3.2.2. Documentation

A. Obtain a logbook from the QA officer.

B. There are no forms required to document decontamination procedures and the degree of documentation attained.

3.2.3. Field

A. Before field activities begin, establish site work zones to reduce the accidental spread of hazardous substances. The establishment of work zones is site specific and coordinated with the site health and safety coordinator at the time the site Health and Safety Plan is prepared. Considerations for establishing work zones should include wind direction, weather conditions, emergency situations, changes in site activities, and access.

B. Appendix 5.3 shows an example of a maximum decontamination layout for Level B protection. Appendix 5.4 shows an example of the minimal decontamination layout for Level B protection.

NOTE: These layouts may be modified according to site-specific conditions.

3.3. Operation

3.3.1. Maximum Decontamination Measures

The maximum decontamination measures for Level B are described in Appendix 5.5. These measures are guidelines and may be modified according to site-specific conditions.

3.3.2. Modification of Maximum Decontamination Measures

Depending upon site-specific conditions and circumstances, modifications to the maximum decontamination measures may be permissible. Two example situations in which the maximum decontamination measures may be modified are described below.

A. Situation 1--The individual entering the contamination reduction zone is expected to be minimally contaminated. Extremely toxic or skin-corrosive materials are not present. Outer gloves and boot covers are worn. The inner gloves and boots are not contaminated.

   The following decontamination stations described in Appendix 5.5 would be utilized in this situation: Station Numbers 1, 4-8, 10-12, and 15-19.

B. Situation 2--The individual entering the contamination reduction zone is expected to be minimally contaminated. Extremely toxic or skin-corrosive materials are not present. Outer gloves and boot covers are worn. The inner gloves and boots are not contaminated. The individual needs a new air tank and will return to the exclusion zone.

   The following decontamination stations described in Appendix 5.5 would be utilized in this situation: Station Numbers 1, and 4-9.

3.3.3. Minimum Decontamination Measures

The minimum decontamination measures for Level B are described in Appendix 5.6. These measures are only guidelines and may be modified according to site-specific conditions.

3.4. Postoperation

3.4.1. Field

At the completion of field activities, all contaminated wash and rinse water, decontamination solutions, and contaminated articles must be properly disposed of. The disposal must follow installation requirements and any applicable state and federal regulations. The site manager or field team leader is responsible for the safe disposal of contaminated materials. Planning for proper disposal should be included during office preparations before field activities begin.

3.4.2. Documentation

A. Record radiological measurements in the logbook before leaving the site.

B. There are no forms required to document decontamination procedures and the degree of decontamination attained.

3.4.3. Office

All unused or properly decontaminated equipment will be returned to the equipment manager. The equipment manager should be informed of all stock items that need to be ordered to replenish the inventory.

4. SOURCES

NIOSH, OSHA, USCG and EPA. 1985. "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." Prepared by the National Institute for Occupational Safety and Health (NIOSH), Occupational Safety and Health Administration (OSHA), U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (EPA). U.S. Department of Health and Human Services, Public Health Service, Centers for Disease Control, NIOSH report, October 1985. Washington, D.C.: U.S. Government Printing Office.

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5. APPENDIXES

5.1. Equipment and Supplies for Maximum Decontamination Measures for Level B

5.2. Equipment and Supplies for Minimum Decontamination Measures for Level B

5.3. Maximum Decontamination Layout for Level B Protection

5.4. Minimum Decontamination Layout for Level B Protection

5.5. Maximum Measures for Level B Decontamination

5.6. Minimum Measures for Level B Decontamination

APPENDIX 5.1

EQUIPMENT AND SUPPLIES FOR MAXIMUM DECONTAMINATION MEASURES FOR LEVEL B

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-handled, Soft-bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
or
High-pressure Spray Unit
b. Water
c. 2-3 Long-handled, Soft-bristled Scrub Brushes

Station 4:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 5:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools

Station 6:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 7:
a. Containers (20-30 Gallons)
b. Decon Solution or Detergent Water
c. 2-3 Long-handled, Soft-bristled Scrub Brushes

Station 8:
a. Containers (20-30 Gallons)
or
High-pressure Spray Unit
b. Water
c. 2-3 Long-handled, Soft-bristled Scrub Brushes

Station 9:
a. Air Tanks
b. Tape
c. Boot Covers
d. Gloves

Station 10:
a. Containers (20-30 Gallons)
b. Plastic Liners
c. Bench or Stools
d. Boot Jack

Station 11:
a. Rack
b. Drop Cloths
c. Bench or Stools

Station 12:
a. Table

Station 13:
a. Basin or Bucket
b. Decon Solution
c. Small Table

Station 14:
a. Water
b. Basin or Bucket
c. Small Table

Station 15:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 16:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 17:
a. Containers (20-30 Gallons)
b. Plastic Liners

Station 18:
a. Water
b. Soap
c. Small Table
d. Basin or Bucket
e. Field Showers
f. Towels

Station 19:
a. Dressing Trailer Needed in Inclement Weather
b. Tables
c. Chairs
d. Lockers
e. Cloths

Sources: NIOSH, OSHA, USCG and EPA, October 1985.
U.S. EPA, November 1984.

APPENDIX 5.2

EQUIPMENT AND SUPPLIES FOR MINIMUM DECONTAMINATION MEASURES FOR LEVEL B

Station 1:
a. Various Size Containers
b. Plastic Liners
c. Plastic Drop Cloths

Station 2:
a. Containers (20-30 Gallons)
b. Decon Solution
c. Rinse Water
d. 2-3 Long-handled, Soft-bristled Scrub Brushes

Station 3:
a. Containers (20-30 Gallons)
b. Plastic Lines
c. Bench or Stools

Station 4:
a. Air Tanks or Masks and Cartridges, Depending Upon the Concentration and Types of Airborne Contamination
b. Tape
c. Boot Covers
d. Gloves

Station 5:
a. Containers
b. Plastic Liners
c. Bench or Stools

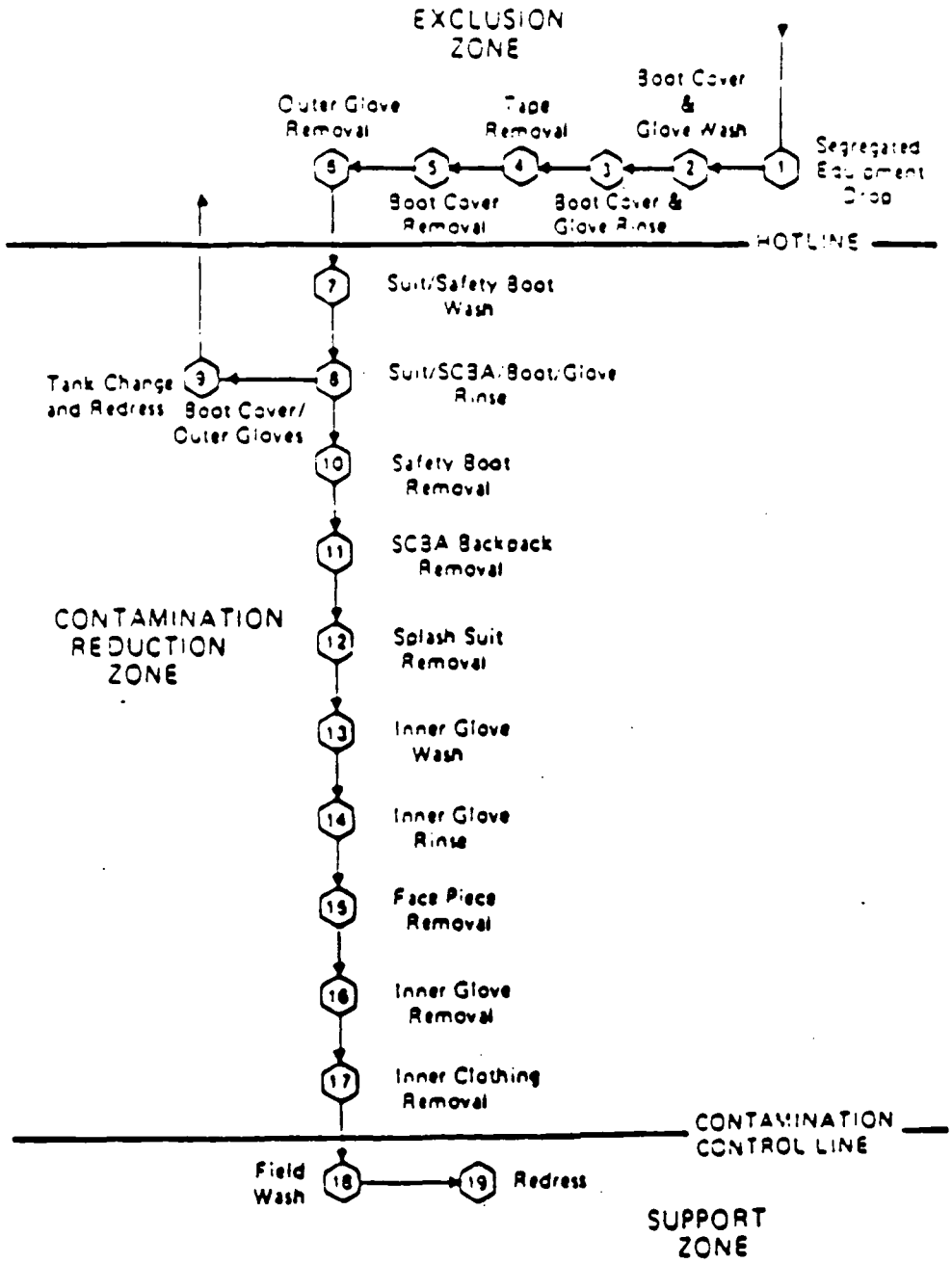
Station 6:
a. Plastic Sheets
b. Basin or Bucket
c. Soap and Towels
d. Bench or Stools

Station 7:
a. Water
b. Soap
c. Tables
d. Wash Basin or Bucket

Sources: NIOSH, OSHA, USCG and EPA, October 1985.
U.S. EPA, November 1984.

APPENDIX 5.3

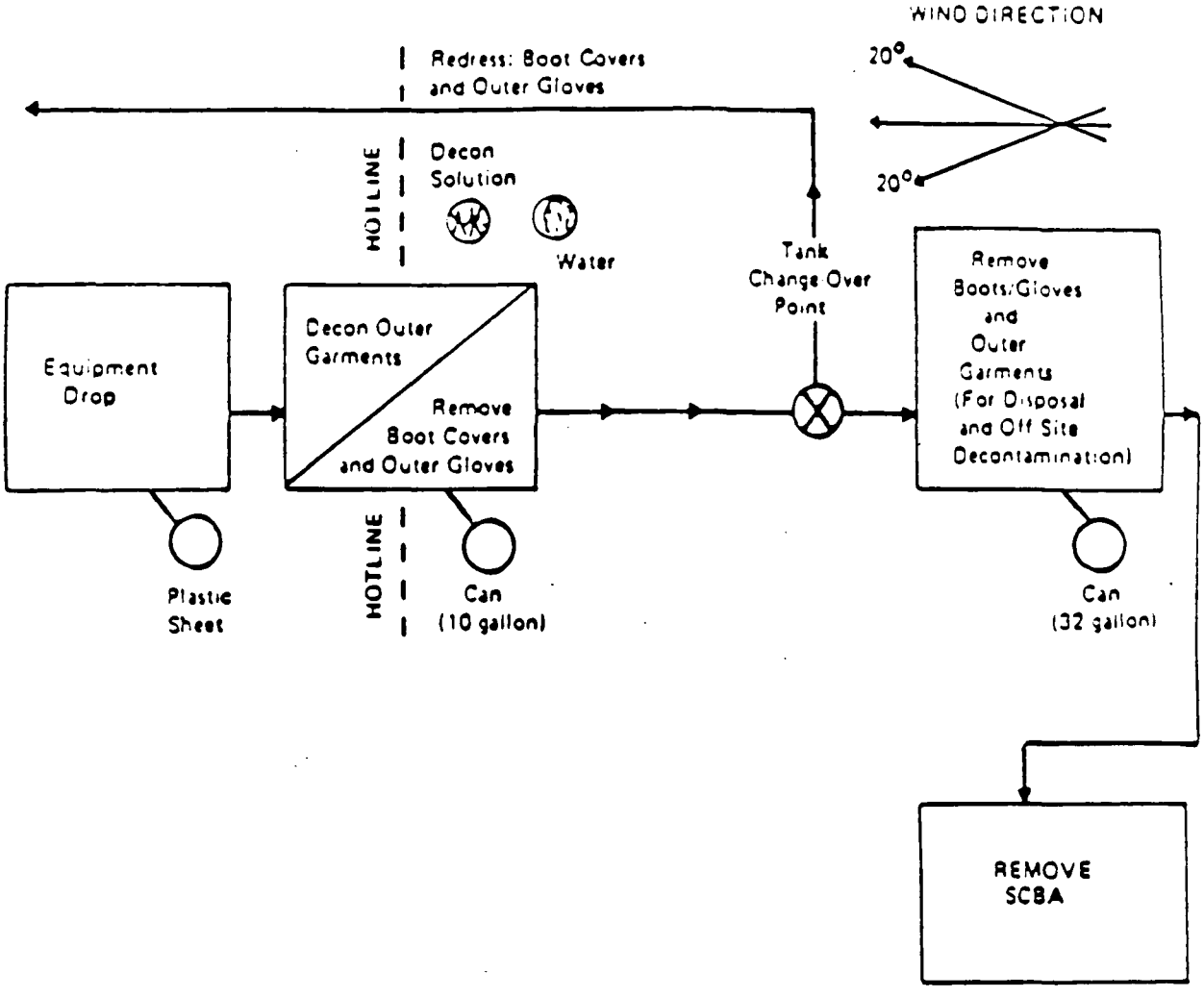
MAXIMUM DECONTAMINATION LAYOUT FOR LEVEL B PROTECTION



SOURCES: NIOSH, OSHA, USCG, and EPA, October 1985
U.S. EPA, November 1984

APPENDIX 5.4

MINIMUM DECONTAMINATION LAYOUT FOR LEVEL B PROTECTION



SOURCES. NIOSH,OSHA,USCG, and EPA, October 1985
U.S. EPA, November 1984

APPENDIX 5.5

MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1:	Segregated Equipment Drop	1.	Deposit equipment used at the site (tools, sampling devices and containers, monitoring instruments, radios, and clipboards) on plastic drop cloths or in different containers with plastic liners. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2:	Boot Cover and Glove Wash	2.	Scrub outer boot covers and gloves with decon solution or detergent and water.
Station 3:	Boot Cover and Glove Rinse	3.	Rinse off decon solution from station 2 using copious amounts of water.
Station 4:	Tape Removal	4.	Remove tape around boots and gloves and deposit in container with plastic liner.
Station 5:	Boot Cover Removal	5.	Remove boot covers and deposit in container with plastic liner.
Station 6:	Outer Glove Removal	6.	Remove outer gloves and deposit in container with plastic liner.
Station 7:	Suit and Safety Boot Wash	7.	Wash chemical-resistant splash suit, SCBA, gloves, and safety boots. Scrub with long-handled scrub brush and decon solution. Wrap SCBA regulator (if belt-mounted type) with plastic to keep out water. Wash backpack assembly with sponges or cloths.

APPENDIX 5.5, Continued

MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 8:	Suit, SCBA, Boot, and Glove Rinse	8. Rinse off decon solution using copious amounts of water.
Station 9:	Tank Change	9. If worker leaves exclusion zone to change air tank, this is the last step in the decontamination procedure. The worker's air tank is exchanged. New outer gloves and boot covers are put on, and joints are taped. The worker returns to duty.
Station 10:	Safety Boot Removal	10. Remove safety boots and deposit in container with plastic liner.
Station 11:	SCBA Backpack Removal	11. While still wearing face piece, remove backpack and place on table. Disconnect hose from regulator valve.
Station 12:	Splash Suit Removal	12. With the assistance of a helper, remove splash suit. Deposit in container with plastic liner.
Station 13:	Inner Glove Wash	13. Wash inner gloves with decon solution.
Station 14:	Inner Glove Rinse	14. Rinse inner gloves with water.
Station 15:	Face Piece Removal	15. Remove face piece. Deposit in container with plastic liner. Avoid touching face with fingers.
Station 16:	Inner Glove Removal	16. Remove inner gloves and deposit in lined container.

APPENDIX 5.5, Concluded

MAXIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 17:	Inner Clothing Removal	17. Remove inner clothing. Place in container with liner. Do not wear inner clothing away from the site, because there is a possibility that small amounts of contaminants might have been transferred in removing the outer clothing. Begin a gross alpha radiation survey, when applicable.
Station 18:	Field Wash	18. Shower if highly toxic, skin-corrosive, or skin-absorbable materials are known or suspected to be present. Wash hands and face if shower is not available.
Station 19:	Redress	19. Put on clean clothes.

Sources: NIOSH, OSHA, USCG and EPA, October 1985.
U.S. EPA, November 1984.

APPENDIX 5.6

MINIMUM MEASURES FOR LEVEL B DECONTAMINATION

Station 1:	Equipment Drop	1.	Deposit equipment used at the site (tools,sampling devices and containers, monitoring instruments, radios, and clipboards) on plastic drop cloths. Segregation at the drop reduces the probability of cross-contamination. During hot weather operations, a cool-down station may be set up within this area.
Station 2:	Outer Garment, Boots, and Gloves Wash and Rinse	2.	Scrub outer boots, outer gloves, and chemical-resistant splash suit with decon solution or detergent water. Rinse off with water.
Station 3:	Outer Boot and Glove Removal	3.	Remove outer boots and gloves. Deposit in container with plastic liner.
Station 4:	Tank Change	4.	If worker leaves exclusive zone to change air tank, this is the last step in the decontamination procedure. The worker's air tank is exchanged. New outer gloves and boot covers are put on, and joints are taped. The worker returns to duty.
Station 5:	Boots, Gloves and Outer Garment Removal	5.	Boots, chemical-resistant splash suit, and inner gloves removed and deposited in separate containers lined with plastic.
Station 6:	SCBA Removal	6.	SCBA backpack and face piece are removed. Avoid touching face with fingers. SCBA is deposited on plastic sheets.
Station 7:	Field Wash	7.	Hands and face are thoroughly washed. Shower as soon as possible.

Sources: NIOSH, OSHA, USCG and EPA, October 1985.
U.S. EPA, November 1984.

STANDARD OPERATING PROCEDURE 6.3

HEALTH AND SAFETY MONITORING OF ORGANIC VAPORS WITH A FLAME IONIZATION DETECTOR

1. PURPOSE

To describe the equipment and proper method for environmental monitoring of toxic gases and vapors using a portable flame ionization detector (FID).

2. DISCUSSION

The Field Sampling Plan (FSP) or Work Plan (WP) provides information on the scope of the given operation and the applicability of this procedure to the work activities.

An FID is useful as a general screening tool to detect the presence of most organic vapors. It can be used to detect pockets of gaseous hydrocarbons in depressions or confined spaces, to screen drums or other containers for the presence of trapped vapors, or to screen an area for the presence of elevated levels of vapor-phase organics.

The FID is similar to a photoionization detector (PID) in application, but cannot detect certain inorganic vapors that are detected by the PID. However, the PID is unable to respond to certain low molecular weight hydrocarbons (like methane and ethane) that are readily detected by FID instruments. Appendix 5.1 describes the application comparisons between an FID organic vapor analyzer and a PID.

The FID will respond to most organic vapors as they form positively charged ions when burned in a hydrogen flame. The magnitude of the response is a function of the detector sensitivity and the ionization properties of the particular compound, as well as its concentration. As a result, the response must be compared with the response generated by a known concentration of a standard gas. The sample concentration is then reported as the parts-per-million (ppm) equivalent of the standard gas. Most units are calibrated with methane; however, almost any gaseous hydrocarbon that produces a response can be used. Many models also have built-in calibration circuits to ensure that the electronic response remains constant in all ranges.

2.1. FID Instrument Limitations

A. The FID does not respond to nongaseous organic compounds like some pesticides, polynuclear aromatic hydrocarbons (PNAs), and polychlorinated biphenyls (PCBs).

B. Most portable FIDs rely on the sample gas to supply the combustion air to the detector flame, so they are designed to operate in ambient atmospheres with oxygen concentrations of approximately 21%. This design precludes the sampling of process vents, poorly ventilated or sealed containers, or any sample gas hydrocarbon concentration sufficient to reduce the available oxygen or saturate the detector. Optional equipment is available that supplies oxygen from a compressed gas bottle or introduces sample gas through a dilution system with a known dilution factor.

C. Concentrations beyond the greatest scale factor of the instrument or in excess of 30% of the lower explosive limit (LEL) of the sample component require system modification. If system modifications are required, consult the manufacturer's operating manual.

D. Certain FID instruments have negligible response to carbon monoxide (CO) and carbon dioxide (CO_2). Their structure precludes the production of appreciable ions in the detector flame so other organic materials may be analyzed in the presence of CO and CO_2.

E. As with the PID, the FID responds differently to different compounds. Appendix 5.2 contains a list of the relative sensitivities of one FID model to some common organic compounds. Because the instrument is factory calibrated to methane, all relative responses are given in percentages with methane at 100. Therefore, the identity of the chemical of interest must be ascertained before its concentration can be determined. In addition, the unit requires a trained individual to maintain and operate the unit.

F. In general, the FID is more sensitive to hydrocarbons than to any other chemical class. Compounds containing oxygen, such as alcohols, ethers, aldehydes, carbolic acid and esters, give a lower response than that observed for hydrocarbons. This is particularly noticeable with compounds having a high ratio of oxygen to carbon, such as the lower members of each series which have one, two or three carbons. With compounds containing higher numbers of carbons, the effect is diminished to such an extent that the response is similar to that of the corresponding hydrocarbons.

Nitrogen-containing compounds (e.g., amines, amides, and nitriles) respond in a manner similar to that observed for oxygenated materials. Halogenated compounds also show a lower relative response compared with hydrocarbons. Materials containing no hydrogen, such as carbon tetrachloride, give the lowest response; the presence of hydrogen in the compounds results in higher relative responses. Thus, $CHCl_3$ gives a much higher response than CCl_4. As in the other cases, when the carbon to halogen ratio is 5:1 or greater, the response will be similar to that observed for simple hydrocarbons.

2.2. Regulatory Limitations

A. International Air Transport Association (IATA) Dangerous Goods Regulations (2.9.2, Jan 1992) prohibit carrying compressed hydrogen gas on passenger aircraft. When the FID instrument is transported on a passenger aircraft, the hydrogen gas contained in the instrument must be emptied before loading.

B. Transport of an FID or extra cylinders of hydrogen gas or calibration gas by cargo aircraft must comply with the regulations stipulated in 49 CFR, Parts 100-177.

C. Appendix 5.6 describes the procedure for transporting an FID with a hydrogen tank. Consult the shipper for any recent changes in this procedure.

3. PROCEDURE

3.1. Associated Procedures

Information that applies to most field activities is provided in SOPs 1.1-1.10. In addition to the FSP or WP, those SOPs provide guidance that may supplement the information in this procedure. They should

be consulted as necessary to obtain specific information about equipment and supplies; sample collection, preservation, packaging, and shipping; decontamination procedures; and documentation requirements. Procedures directly associated with this SOP are listed below.

SOP No.	SOP Title
1.1	General Instructions for Field Personnel
1.6	General Equipment Decontamination

3.2. Preparation

3.2.1. Office

A. Review the FSP or WP and SOPs listed in Section 3.1.

B. Coordinate schedules/actions with the installation staff.

C. Obtain appropriate permission for property access.

D. Contact the carrier that will transport samples to obtain information on regulations and specifications.

E. Assemble the equipment and supplies listed in Appendix 5.3. Perform the functional checks described below. The purpose of these checks is to verify that an instrument will function properly (for example, the batteries are serviceable and the instrument can be zeroed and calibrated) in the field. If problems develop, obtain a replacement unit and perform the same functional checks.

1. Turn the instrument on and allow adequate warmup time.

2. Check the battery charge level indicator. If it is not fully charged, recharge the battery as described in the manual.

3. Turn on the pump and check for leaks by covering the sample inlet and observing the rotameter. The indicator ball should drop to zero.

4. With the pump operating, open the hydrogen gas storage tank valve and the supply regulator to allow fuel gas to flow into the detector chamber.

5. Depress the igniter switch, observe the indicator needle for positive response, and listen for a pop. if the flame fails to light, depress the igniter switch again. Once the detector flame is lit, the unit is ready for use. Before lighting the detector flame, always be sure that the carrier gas flow (usually sample gas) is started.

6. If the instrument has internal calibration capability, perform the instrument calibration according to the procedures described in the operating manual.l

7. If the instrument has an alarm mode, set the alarm at the desired concentration.

3.2.2. Documentation

A. Obtain a logbook from the logbook coordinator.

B. Record results of the equipment check in the logbook.

C. Obtain a sufficient number of the appropriate ER Program data collection forms (see INDEX TO SOPs).

D. Consult the ER Program data administrator for a current list of information management codes, location IDs, and sample numbers used in the completion of data forms.

E. Record the calibration data on the Photoionization Detector Field Data form (Appendix 5.3). See Appendix 5.4 (Data Form Completion) for instructions.

3.2.3. Field

Before using the FID in the field, perform the following instrument checks to ensure that the equipment was not damaged during transport:

A. Follow the instrument checkout procedures described in Section 3.2.1.E.

B. If calibration to a specific hydrocarbon species is desired, complete this procedure according to the manufacturer's operating instructions.

C. Calibrate the FID daily before each use in the field.

3.3. Operation

3.3.1. Field Measurements of Organic Vapors

As with any field instrument, accurate results depend on the operator's knowledge of the operator's manual. The instructions in the manual should be followed explicitly in order to obtain accurate results.

A. Hold the sample probe in the area in question. The low sample rate allows for only very localized readings.

B. A slow sweeping motion should help prevent the bypassing of problem areas. Make sure the batteries are recharged within the time frame specified in the operator's manual. The usual length of the operating time between charges is 8 to 12 hours.

C. During drilling activities, perform FID monitoring at 5-ft intervals downhole, at the headspace, and in the breathing zone. In addition, where elevated organic vapor levels are encountered, monitoring may be performed in the breathing zone during actual drilling. When the activity does not require drilling (like surface sampling), readings may only be recorded in the breathing zone. Consult the Health and Safety Plan for the specific monitoring instructions.

D. In many areas in and adjacent to Mound Plant, organic vapors in subsurface are suspected to be from methane gas. All positive readings on OVA will be followed by installation of charcoal filters. Readings, both with and without the filter, will be recorded in logbooks. All organic vapors except methane will be absorbed by the filter.

After collecting the readings, STOP WORK and notify project manager of the measurements. The project manager will provide further instructions. Site geologic conditions may require use of double casings as described in SOP 4.1.1.

E. Some units have alarms that signal the operator if the detector flame goes out. If the alarm sounds, evacuate the work area, relight the flame in a known safe area, and reenter the site.

F. Monitor fuel and combustion air supply gauges regularly to ensure sufficient gas supplies.

G. High background readings after prolonged use may indicate that the sample probe or in-line filters (in front of detector) need to be cleaned. Use pipe cleaners to clean the probe and clean air blown backwards through the probe to clean the filters. Do not use organic solvents because the detector may be saturated by the solvent.

H. Perform the routine maintenance described in the operating manual. Because the unit contains pressurized gas supplies, also perform leak-check procedures regularly. Leaking hydrogen gas is explosive.

I. Concentrations beyond the maximum full-scale capability of the instrument or in excess of 30% LEL of the sample component require system modification. Similar modification may be necessary for sampling in oxygen-deficient atmospheres. This usually entails increasing the combustion air to the detector by sample dilution or by an independent air supply. A dilution system is the apparatus required to supply a filtered, controlled air supply for analyzers that use the sample gas stream as the source of combustion air. A dilution system can dilute a gas stream by ratios up to 100:1 through the selection of various critical orifices.

3.4. Postoperation

3.4.1. Field

A. When the activity is completed or at the end of the day, carefully clean the outside of the FID with a damp disposable towel to remove any visible dirt. Return the FID to a secure area and place on charge.

B. Ensure that all equipment is accounted for, decontaminated (see SOP 1.6, General Equipment Decontamination), and ready for shipment.

C. If necessary, make sure all survey or sampling locations are properly staked and that the location ID is readily visible on the location stake.

3.4.2. Documentation

A. Complete logbook entries, verify the accuracy of entries, and sign/initial all pages.

B. Review data collection forms for completeness.

3.4.3. Office

A. Deliver original forms and logbooks to the document control officer (with copies to the site manager and files) for eventual delivery to the Department of Energy.

B. Inventory equipment and supplies. Repair or replace all broken or damaged equipment. Replace expendable items. Return equipment to the equipment manager and report incidents of malfunction or damage.

C. Charge the instrument batteries.

D. If necessary, replenish supplies of the NBS traceable calibration gas.

4. SOURCES

Foxboro Analytical (A Division of The Foxboro Company). 1985. "Instruction and Service Manual, Century Systems Portable Organic Vapor Analyzer, Model OVA-128." New Haven, Connecticut.

CFR 49. 1985. Code of Federal Regulations, Title 49, U.S. Department of Transportation, Parts 100-177. November 1, 1985. Washington, D.C.: U.S. Government Printing Office.

EPA. 1984. "Characterization of Hazardous Waste Sites - A Methods Manual: Volume II, Available Sampling Methods, Second Edition," U.S. Environmental Protection Agency document EPA-600/4-84-076, December 1984. Environmental Monitoring Systems Laboratory, Office of Research and Development, Las Vegas, Nevada,.

5. APPENDIXES

5.1. Comparison of the FID and PID

5.2. Relative Sensitivities of the FID to Some Common Organic Compounds

5.3. Equipment and Supplies Checklist

5.4. Flame Ionization Detector Field Data Form

Data Form Completion

5.6. Shipment of OVA-128 and Hydrogen Tank

APPENDIX 5.1

COMPARISON OF THE FID AND PID

	FID	PID
Response	Responds to many organic gases and vapors, especially low molecular weight hydrocarbons	Responds to many organic and some inorganic gases and vapors, especially heavy hydrocarbons.
Application	In survey mode, detects total concentrations of gases and vapors. In GC mode, identifies and measures specific compounds.	In survey mode, detects total concentrations of gases and vapors. Some identification of compounds possible if GC column and standards are used.
Limitations	Does not respond to gases and vapors with a higher ionization potential than the flame detector. No temperature control.	Does not respond to methane or aliphatic chlorinated solvents. Does not respond properly in the presence of water vapor or high humidity. Does not detect a compound if the probe (lamp) has a lower energy than the compound's ionization potential.
Calibration gas	Methane and others	Benzene (1,3- butadiene) and others
Ease of operation	Requires experience to interpret correctly, especially in GC mode.	Fairly easy to use and interpret. More difficult in the GC mode.
Detection limits	0.1 ppm (methane)	0.1 ppm (benzene), depends on lamp voltage.
Response time	2-3 sec (survey mode)	3 sec for 90% of total concentration
Maintenance	Periodically clean and inspect particle filters, valve rings, and burner chamber. Check calibration and pumping system for leaks. Recharge battery after each use.	Clean UV lamp frequently. Check calibration regularly. Recharge battery after each use.
Useful range	0-1000 ppm	0-2000 ppm
Service life	8 hrs; 3 hrs with strip chart recorder	10 hrs; 5 hrs with strip chart recorder

APPENDIX 5.2

RELATIVE SENSITIVITIES OF THE FID TO SOME COMMON ORGANIC COMPOUNDS

Compound	Relative Response
Methane	100
Ethane	90
Propane	64
n-Butane	61
n-Pentane	100
Ethylene	85
Acetylene	200
Benzene	150
Toluene	120
Acetone	100
Methyl ethyl ketone	80
Methyl isobutyl ketone	100
Methanol	15
Ethanol	25
Isopropyl alcohol	65
Carbon tetrachloride	10
Chloroform	70
Trichloroethylene	72
Vinyl chloride	35

Source: Foxboro Analytical, 1985.

APPENDIX 5.3

EQUIPMENT AND SUPPLIES CHECKLIST

_____ Flame ionization detector (FID)

_____ Probe extension

_____ Operating manual

_____ Battery charger

_____ Spare batteries

_____ Jeweler's screwdriver for adjustments and calibration

_____ Refueling hose for hydrogen cylinder

_____ NBS traceable calibration gas

APPENDIX 5.4

FLAME IONIZATION DETECTOR FIELD DATA FORM

FLAME IONIZATION DETECTOR FIELD DATA

FACILITY CODE _____ LOG DATE _____

LOCATION ID _____ LOCATION TYPE _____

LOGGER CODE _____ FIELD REP _____

FLAME IONIZATION DETECTOR INSTRUMENT :

MANUFACTURER _____ MODEL _____

SERIAL NO _____

DATE/TIME CALIBRATED _____ ACCEPTANCE CODE _____

CALIBRATION GASES :	
TYPE/CYLINDER ID NO	CONCENTRATION (PPM)
1	1
2	2

COMMENTS _____

TIME (HH:MM)	SAMPLE ID	OBSERVED READING (ppm)					DRILLING DEPTH (FT)	COMMENTS
		DH	HS	BZ	D	OT		

ACCEPTANCE CODES: A-ACCEPTABLE R-RECONNAISSANCE U-UNACCEPTABLE N-NOT DETERMINED

LOCATION TYPES:
BH - BOREHOLE
TP - TEST PIT
SS - SOIL SAMPLE
SB - SAMPLE BOTTLE
SL - SURFACE LOCATION
WL - WELL
OT - OTHER (EXPLAIN)

OBSERVED READING:
DH - DOWNHOLE
HS - HEADSPACE
BZ - BREATHING ZONE
D - DURING DRILLING (BZ)
OT - OTHER

COMPLETE BOLDED DATA FOR ENTRY INTO TIMS
FID-042 (1/88)

_____ FORM COMPLETED BY/DATE

_____ TECHNICAL REVIEWER/DATE

APPENDIX 5.5

DATA FORM COMPLETION

Use a pen with black ink that is not water soluble (not a felt-tip pen). Make an entry in each blank. Where there is no data entry, enter UNK for Unknown, NA for Not Applicable, or ND for Not Done. If any procedure was not performed as prescribed, give the reason for the change or omission on the form. To change an entry, draw a single line through it, add the correct information above it, and initial the change.

FLAME IONIZATION DETECTOR FIELD DATA FORM

1. Facility Code. Five-character code abbreviating the facility name where program activity is being conducted. The first three characters indicate the facility, and the remaining two numbers designate the specific site within the facility.

2. Log Date. The date the information recorded on the form was obtained in the format DD-MMM-YY (01-JAN-88).

3. Location ID. Four-character code assigned sequentially to each borehole, test pit, or surface location where physical, chemical, biological, radiological, and other measurements are taken.

4. Location Type. Two-character code identifying where the samples were taken. There is one location type for each location ID. Location types include those listed below.

   BH--Borehole

   TP--Test Pit

   SL--Surface Location

   WL--Well

   SB--Sample Bottle

   SS--Soil Sample

   OT--Other (explain)

5. Logger Code. Three-character or four-character code identifying the company responsible for collecting the information recorded on the form.

6. Field Rep. The name of the field representative.

7. Manufacturer. Manufacturer's name on flame ionization detector (FID) instrument used.

8. Model. Model of FID instrument.

9. Serial No. Serial No. of FID instrument.

10. Date/Time Calibrated. The day and time when the FID instrument was calibrated. Calibration should be performed daily.

11. Acceptance Code. One- character code assigned by the site manager.

12. Calibration Gases

    a. Type/Cylinder ID No. The identification of the calibration gas and the lot number on the cylinder.

    b. Concentration (ppm). The concentration of the calibration gas in parts per million (ppm).

13. Comments. Any additional information.

14. Time (HH:MM). Time when a field measurement was taken in the 24-hr clock format of hours:minutes (for example, 08:37 for 8:37 a.m. and 19:12 for 7:12 p.m.)

Conversion Table

Conventional Time	24-Hr Time
1:00 a.m.	1:00
12:00 Noon	2:00
1:00 p.m.	13:00
2:00 p.m.	14:00
3:00 p.m.	15:00
4:00 p.m.	16:00
5:00 p.m.	17:00
6:00 p.m.	18:00
7:00 p.m.	19:00
8:00 p.m.	20:00
9:00 p.m.	21:00
10:00 p.m.	22:00
11:00 p.m.	23:00
12:00 Midnight	24:00

15. Sample ID. When samples are being taken while FID monitoring is being performed, the identification number or code assigned to a particular sample like 01 is correlated with the observed readings and appropriate drilling depth if drilling is being performed. This is useful in selecting samples for analyses and in the correlation of laboratory data with FID measurements.

16. Observed Reading (ppm). FID reading at the respective location ID in the units indicated on the meter. When the calibration gas and the gas being measured for the environment are the same, the meter reads in parts per million. Measurements can be made in the breathing zone, downhole, at the headspace, or other specified locations.

17. Drilling Depth (Ft). FID monitoring is performed every 5 ft during any type of drilling. The depth of the drilling is listed in feet and can be given as the most recent interval (like 5-10) or as the ending depth (like 10).

18. Comments. Any additional information, such as type of gas being measured, if this determination can be made (for example, by labels on drums).

APPENDIX 5.6

SHIPMENT OF OVA-128 AND HYDROGEN TANK

An organic vapor analyzer (OVA) is typically shipped with a charged cylinder and a supplementary hydrogen tank to a hazardous waste site as part of the safety monitoring requirements for site characterization. The OVA and the hydrogen tank must be shipped so as to protect their integrity and to protect against potential damage or injury that may be caused from leakage/breakage of the equipment. Regulations addressing the packaging, labeling, and shipping of an OVA and a hydrogen tank are described in 49 CFR Parts 171-178.
The packaging and labeling requirements for shipment of the OVA and the hydrogen tank are summarized in the following paragraphs.

A. Organic Vapor Analyzer

The OVA must be placed in its own case or in a box to minimize damage during handling and transportation. The following labels must be placed on the container before shipping.

1. A Flammable Gas label (red and white label)
2. A Danger label (orange and black label)
3. A label no smaller than 1 inch along each dimension with Hydrogen clearly written on it
4. A label stating Inside Packages Comply with Prescribed Specifications

Personnel engaged in shipping OVAs must note that a U.S. DOT exemption is applicable to the shipment of the OVA and must be attached to the shipping papers. In addition, personnel should note that it is preferable to transport all hazardous materials on cargo aircraft (for example, Emory or Federal Express).

B. Hydrogen Tank

The hydrogen tank must be secured with a safety cap. Because the tank needs to be shipped in a vertical position (safety cap on the up end), personnel may package the tank in a box for stability and further security. It should be noted that the hydrogen tank may be shipped without a box as long as the tank can remain in an upright position. If the hydrogen tank is packaged in a box, the shipper must ensure that the box has been securely taped. The following labels must be placed on the tank or container before shipping. Personnel involved in shipping hydrogen tanks must note that hydrogen tanks cannot be shipped by passenger aircraft or rail.

1. A Flammable Gas label (red and white label)
2. A Danger label (orange and black label)
3. A label no smaller than 1 inch with UN1049 clearly written on it
4. A label no smaller than 1 inch with Hydrogen clearly written on it
5. Labels with This End Up on the container or tank point pointing toward the safety cap
6. A Cargo Aircraft Only label
7. A label stating Inside Packages Comply with Prescribed Specifications

STANDARD OPERATING PROCEDURE 6.4

TOTAL ALPHA SURFACE CONTAMINATION MEASUREMENTS

1. PURPOSE

To provide guidance for determining levels of total surface alpha contamination on equipment, vehicles, and personnel that have been in contact with material that was potentially contaminated with alpha-emitting radionuclides.

2. DISCUSSION

The Field Sampling Plan (FSP) or Work Plan (WP) provides information on the scope of a given operation, related health and safety requirements, and the applicability of this procedure to the activities.

Equipment and vehicles must be monitored for surface contamination before release for unrestricted use from a radiologically controlled area. Levels of surface alpha contamination on equipment will be determined and compared to release criteria presented in DOE Order 5480.11. These criteria are based on U.S. Nuclear Regulatory Commission Regulatory Guide 1.86 and presented as either total average, total maximum, or removable. Total average measurements are based on portable instrument surveys for alpha contamination over a 1 m^2 area. Total maximum measurements are based on portable instrument surveys for alpha contamination over a 100 cm^2 area. Removable contamination is defined as that amount of surface alpha activity that may be transferred to a soft, dry filter paper after wiping 100 cm^2 areas of the surface with moderate pressure. The swipe is then counted in a stationary radiation detector to determine removable alpha activity.

The primary alpha-emitting radionuclide of concern at the Mound Plant is plutonium-238. In some areas, isotopes of natural uranium and thorium are also of concern. In some instances, these plutonium, uranium, and thorium sources may contaminate some equipment surfaces concurrently. It is therefore necessary to select the surface contamination limits based on the most restrictive radionuclide, plutonium-238. For plutonium-238 and other transuranics, the surface contamination limits are as follow:

Nuclide	Average	Maximum	Removable
Plutonium-238	100 dpm/100 cm^2	300 dpm/100cm^2	20 dpm/100 cm^2

Activity per unit area is reported in units of disintegrations per minute (dpm) over a 100 cm^2 surface area. Natural uranium and thorium isotopes have significantly higher release limits than plutonium-238, thus are bounded by plutonium-238 limits. It is important to note that due to the characteristics of portable alpha detection instruments, it is generally not possible to statistically detect 20 dpm/100 cm^2 on a potentially contaminated surface. Therefore, removable alpha contamination measurements must be made on all equipment used in a radiologically controlled area of the Mound site. These measurements are addressed in SOP 1.7, Sampling for Removable Alpha Contamination.

All equipment must be decontaminated to levels that are as low as reasonably achievable and below the applicable release criterion in all cases. Personnel must be monitored for

contamination before leaving a controlled area and decontaminated to the lowest reasonably achievable levels.

High-voltage plateau curves and National Bureau of Standards (NBS) traceable source calibrations must be performed on the detector semiannually to ensure proper operation. Alpha detector counting efficiencies must be determined daily before using the instrument for contamination monitoring. The counting efficiency also must be determined following any adjustments or repairs on the instrument. The counting efficiency is used to convert instrument readings to a measure of activity in units of dpm per 100 cm^2.

3. PROCEDURE

3.1. Associated Procedures

Information that applies to most field activities is provided in SOPs 1.1-1.10. In addition to the FSP or WP, those SOPs provide guidance that may supplement the information in this procedure. They should be consulted as necessary to obtain specific information about equipment and supplies; sample collection, preservation, packaging, and shipping; decontamination procedures; and documentation requirements. Procedures directly associated with this SOP are listed below.

SOP No.	SOP Title
1.1	General Instructions for Field Personnel
1.6	General Equipment Decontamination
1.7	Sampling for Removable Alpha Contamination
6.11	Beta-Gamma Radiation Measurements Using a Geiger-Mueller Detector

3.2. Preparation

3.2.1. Office

A. Review the FSP or WP and SOPs listed in Section 3.1.

B. Coordinate schedules/actions with the installation staff.

C. Obtain appropriate permission for property access.

D. Assemble the equipment and supplies listed in Appendix 5.1. Ensure the proper operation of all field equipment. Ensure that the alpha scintillator and the ratemeter/scaler have current calibrations.

3.2.2. Documentation

A. Obtain a logbook from the QA officer.

B. Record results of the equipment check in the logbook.

C. Obtain a sufficient number of the appropriate ER Program data collection forms (see INDEX TO SOPs).

D. Consult the ER Program data administrator for a current list of codes used in the completion of data forms.

3.2.3. Field

A. Complete the Daily Alpha Efficiency Check form (Appendix 5.2) by following instructions in Appendix 5.4, Data Form Completion.

B. Perform a daily 10-min background count and a 1-min alpha source count during use and record the results on the Daily Alpha Efficiency Check form. To perform a background count, place the probe on a clean, uncontaminated surface and record the number of counts accumulated over a period of 10 min. To perform a check source count, place the alpha source in the detector tray or against the detector surface and record the number of counts accumulated per minute (cpm).

C. Calculate the counting efficiency (E) using the formula shown below.

$$E = \frac{(\text{source cpm}) - (\text{background cpm})}{(\text{source dpm})}$$

D. While counting samples or performing surveys, the alpha probe may be contaminated, causing the background count rate to increase. If this is suspected, repeat the 10-min background count. If the background count rate is more than 50% above the average value, the detector should be cleaned.

3.3 Operation

3.3.1 Total Alpha Survey

A. Complete the Total Alpha Contamination Survey Data form by following instructions in Appendix 5.4, Data Form Completion.

B. List the items to be surveyed in the first column on the form. Items must be identified as specifically as possible with serial numbers, model numbers, license numbers, or other forms of unique descriptions. If the items to be surveyed need to be labeled with the assigned identification number, use an indelible marker, spray paint, or some type of permanent marker. Use a separate line of the form to list each area surveyed on the items.

C. List the surveyor's name, date of survey, and identification number of the monitoring instrument/detector.

D. Switch the instrument on, check the batteries for adequate power, and check the instrument for damage. Record the instrument daily background, efficiency, and calibration factor in the appropriate spaces. The instrument background and efficiency should be determined at least once during each operational day.

E. Monitor potentially contaminated surfaces by passing the probe face along each surface at a rate of 5 cm/sec or less. Without touching it, hold the probe face as close as possible to the surface being monitored and not more than 0.5 cm away. Be careful not to damage the Mylar face of the probe. Hold the probe steady at any area that appears to indicate an elevated reading. Record the highest reading for each separate area of the item monitored, listing a description of each area in the space provided under the first column.

F. When monitoring potentially contaminated skin and clothing surfaces, hold the probe face as close as possible to the surface being monitored, no more than 0.5 cm away. Move the probe along the surface at a rate of 5 cm/sec or less. At a minimum, monitor the areas listed below.

1. Both sides of each hand

2. Tops, sides, and bottoms of shoes or boots

3. The torso of the body, both front and back

4. All loose equipment (for example, papers, clipboards, and hand-carried tools)

G. Instrument readings will fluctuate during monitoring. Investigate any significant elevation of the meter reading by holding the meter in the suspected area. A noticeable elevation in the meter reading identifies contamination that may need to be removed.

H. Multiply each instrument reading (cpm) by the calibration factor to obtain the contamination level in dpm/100 cm^2.

I. If the radiologically controlled area is known or suspected to contain plutonium-238, perform the swipe or smear survey procedure. See SOP 1.7, Sampling for Removable Alpha Contamination.

J. Wash contaminated skin and equipment with water and soap. Contaminated clothing may be removed and laundered at an appropriate facility.

K. Give the survey results to the personnel responsible for releasing equipment. Equipment that fails to meet the release limits must undergo additional decontamination according to SOP 1.6, General Equipment Decontamination, and must be resurveyed.

3.4. Postoperation

3.4.1. Field

A. Turn the power off.

B. Ensure that all equipment is accounted for, decontaminated (see SOP 1.6, General Equipment Decontamination), and ready for shipment.

3.4.2. Documentation

A. Record any uncompleted work (like additional monitoring) in the logbook.

B. Complete logbook entries, verify the accuracy of entries, and sign/initial all pages.

C. Review data collection forms for completeness.

3.4.3. Office

A. Deliver original forms and logbooks to the document control officer (with copies to the site manager and files) for eventual delivery to the Department of Energy.

B. Inventory equipment and supplies. Repair or replace all broken or damaged equipment. Replace expendable items. Return equipment to the equipment manager and report incidents of malfunction or damage.

4. SOURCE

NRC. 1974. Regulatory Guide 1.86, "Termination of Operating Licenses for Nuclear Reactors." U. S. Regulatory Commission, Washington, D.C.: U.S. Government Printing Office.

5. APPENDIXES

5.1. Equipment and Supplies Checklist

5.2. Daily Alpha Efficiency Check Form

5.3. Total Alpha Contamination Survey Data Form

5.4. Data Form Completion

APPENDIX 5.1

EQUIPMENT AND SUPPLIES CHECKLIST

_____ Alpha scintillation probe (Ludlum 43-5 or the equivalent)

_____ Ratemeter/scaler (Ludlum Model 3 or the equivalent)

_____ Alpha check source (Am-241 or the equivalent)

_____ Data forms

_____ Voltage meter

_____ Hand-held calculator

_____ Tape measure

APPENDIX 5.2

DAILY ALPHA EFFICIENCY CHECK FORM

DAILY ALPHA EFFICIENCY CHECK

FACILITY CODE _____ FIELD REP _____

LOGGER CODE _____ ACCEPTANCE CODE _____

RATEMETER/SCALER:

MODEL NO _____ SERIAL NO _____ CALIBRATION DATE _____

WINDOW OUT THRESHOLD _____ HIGH VOLTAGE _____ BATTERY _____

ALPHA SCINTILLATION PROBE:

MODEL NO _____ SERIAL NO _____ CALIBRATION DATE _____

SOURCE:

SERIAL NO _____ ISOTOPE _____ ACTIVITY _____ DPM

LOG DATE	TIME (HH:MM)	COUNTING TIME (MIN)	BACKGROUND CPM	GROSS COUNTS	GROSS CPM	NET CPM	EFFICIENCY (NET CPM/DPM)

ACCEPTANCE CODES: A–ACCEPTABLE R–RECONNAISSANCE U–UNACCEPTABLE N–NOT DETERMINED

COMPLETE BOLDED DATA FOR ENTRY INTO TIMS
DAE-103 (3/88)

_____ FORM COMPLETED BY/DATE

_____ TECHNICAL REVIEWER/DATE

APPENDIX 5.3

TOTAL ALPHA CONTAMINATION SURVEY DATA FORM

TOTAL ALPHA CONTAMINATION SURVEY DATA

FACILITY CODE **LOG DATE**

LOGGER CODE FIELD REP

RATEMETER/SCALER: **ACCEPTANCE CODE**

MODEL NO SERIAL NO CALIBRATION DATE

WINDOW OUT THRESHOLD HIGH VOLTAGE BATTERY

ALPHA PROBE:

MODEL NO SERIAL NO EFFICIENCY CPM/DPM

PROBE FACE AREA[1] CALIBRATION FACTOR[2] (DPM/100cm²) / CPM

ARE TRANSURANICS PRESENT OR SUSPECTED? (YES/NO)

IF YES -- SWIPES ARE REQUIRED

ITEM SURVEYED (SPECIFY)	GROSS COUNTS	COUNT TIME	NET CPM	CONTAMINATION[3] LEVEL (IN DPM/100cm²)	MEETS TOTAL SURFACE RELEASE LIMIT (100 dpm/cm²) / (YES/NO)	SWIPE NECESSARY (YES/NO)

1 LUDLUM MODEL 43-1 PROBE FACE AREA = 83.0cm² LUDLUM MODEL 43-5 PROBE FACE AREA = 78.5 cm²

2 CALIBRATION FACTOR = (100/PROBEFACE AREA (cm²))/EFFICIENCY(CPM/DPM)

3 CONTAMINATION LEVEL = (NET CPM)(CALIBRATION FACTOR)

ACCEPTANCE CODES: A ACCEPTABLE R RECONNAISSANCE U UNACCEPTABLE N NOT DETERMINED

COMPLETE BOLDED DATA FOR ENTRY INTO TIMS
IAC 128 (6/92)

FORM COMPLETED BY/DATE TECHNICAL REVIEWER/DATE

APPENDIX 5.4

DATA FORM COMPLETION

Use a pen with black ink that is not water soluble (not a felt-tip pen). Make an entry in each blank. Where there is no data entry, enter UNK for Unknown, NA for Not Applicable, or ND for Not Done. If any procedure was not performed as prescribed, give the reason for the change or omission on the form. To change an entry, draw a single line through it, add the correct information above it, and initial the change.

DAILY ALPHA EFFICIENCY CHECK

1. Facility Code. Five-character code abbreviating the facility name where program activity is being conducted. The first three characters indicate the facility, and the remaining two numbers designate the specific site within the facility.

2. Field Rep. The name of the field representative.

3. Logger Code. Three-character or four-character code identifying the company responsible for collecting the information recorded on the form.

4. Acceptance Code. One-character code assigned by the site manager.

5. Ratemeter/Scaler Model No. The model number of the ratemeter/scaler.

6. Ratemeter/Scaler Serial No. The serial number of the ratemeter/scaler.

7. Ratemeter/Scaler Calibration Date. The date when the ratemeter/scaler was last calibrated.

8. Window. The window is in the out position unless otherwise specified.

9. Threshold. The adjustment for the lower energy level of the discriminator shown on the calibration sticker.

10. High Voltage. The voltage that is applied to the alpha scintillation probe shown on the calibration sticker. This voltage is determined semiannually using a voltage plateau.

11. Battery. The battery voltage reading at the beginning of the measurement.

12. Alpha Scintillation Probe Model No. The model number of the alpha detector probe.

13. Alpha Scintillation Probe Serial No. The serial number of the alpha probe.

14. Alpha Scintillation Probe Calibration Date. The date the probe was last calibrated.

15. Source Serial No. The serial number of the radiation source.

16. Source Isotope. The identity of the radioactive isotope contained in the source given as element and mass number, like Am-241.

17. Source Activity. The activity of the radioactive source in disintegrations per minute (dpm). If the check source activity is given in microcuries (μCi), it can be converted to dpm using 1 μCi = 2.22×10^{6} dpm.

18. Log Date. The date the information recorded on the form was obtained in the format DD-MMM-YY (01-JAN-88).

19. Time (HH:MM). The time the efficiency was determined using the 24-hr clock in the format hours:minutes.

20. Counting Time (Min). The time in minutes over which the scaler counts. Enter N/A if using a ratemeter.

21. Background cpm. The count rate with no source present.

22. Gross Counts. The number of pulses recorded by the scaler during the counting time. Enter N/A if using a ratemeter.

23. Gross cpm. The count rate with the source present given in pulses per minute.

24. Net cpm. Net counts per minute (cpm) equals gross cpm minus background cpm.

25. Efficiency (Net cpm/dpm). The ratio of the observed count rate to the true disintegration rate.

$$\text{Efficiency} = \frac{\text{Net cpm}}{\text{Source dpm}}$$

APPENDIX 5.4, Continued

TOTAL ALPHA CONTAMINATION SURVEY DATA FORM

1. Facility Code. Five-character code abbreviating the facility name where program activity is being conducted. The first three characters indicate the facility, and the remaining two numbers designate the specific site within the facility.

2. Log Date. The date the information recorded on the form was obtained in the format DD-MMM-YY (01-JAN-88).

3. Logger Code. Three-character or four-character code identifying the company responsible for collecting the information recorded on the form.

4. Field Rep. The name of the field representative.

5. Acceptance Code. One-character code assigned by the site manager.

6. Ratemeter/Scaler Model No. The model number of the ratemeter/scaler.

7. Ratemeter/Scaler Serial No. The serial number of the ratemeter/scaler.

8. Ratemeter/Scaler Calibration Date. The date when the ratemeter/scaler was last calibrated.

9. Window. The window will be in the out position unless otherwise specified.

10. Threshold. The adjustment for the lower energy level of the discriminator shown on the calibration sticker.

11. High Voltage. The voltage applied to the alpha detector shown on the calibration sticker.

12. Battery. The battery voltage reading at the beginning of the measurement.

13. Alpha Probe Model No. The model number of the alpha detector probe.

14. Alpha Probe Serial No. The serial number of the alpha detector probe.

15. Alpha Probe Efficiency. The ratio of observed net count rate to the known disintegration rate of the check source from the Daily Alpha Efficiency Check form (Appendix 5.2).

16. Probe Face Area. The surface area of the Mylar window on the alpha scintillation detector in square cm. Values for Ludlum Models 43-1 and 43-5 are listed at the bottom of the form.

17. Calibration Factor. Factor that takes the detector efficiency and surface area into account to convert from cpm to dpm per 100 cm^2. The calibration factor in (dpm/100cm^2)/cpm equals (100/Probe Face Area in cm^2)/efficiency in cpm/dpm.

18. Are transuranics present or suspected (Yes/No). Answer based on historical data and Safety Plan review.

19. Item Surveyed (Specify). A description or identification number of the article surveyed. A separate line on the form is used to list and describe each area to be surveyed on the article.

20. Gross Counts. The total counts collected during the counting period.

21. Count Time. The time (in minutes) during which the counts were collected.

22. Net cpm. Gross count cpm minus background cpm.

23. Contamination Level (in dpm/100cm^2). This is calculated by multiplying the net cpm by the calibration factor.

    Contamination level = (Net cpm) (Calibration Factor)

24. Meets Release Limit (Yes/No). If the contamination level is greater than the applicable release limit, a no is written here. If the contamination level is less than the release limit, a yes is written here.

25. Swipe Necessary (Yes/No). If the total alpha contamination level exceeds the applicable removable contamination criteria, a swipe must be performed to determined the activity contribution of fixed and loose contamination. If item 18 is Yes, all locations will require a swipe.

STANDARD OPERATING PROCEDURE 6.15

MEASUREMENT OF GAMMA-RAY FIELDS USING A SODIUM IODIDE (NaI) DETECTOR

1. PURPOSE

To describe the procedure for making count-rate measurements of a gamma-ray field with a sodium iodide (NaI) detector.

2. DISCUSSION

The Field Sampling Plan (FSP) or Work Plan (WP) provides information on the scope of a given operation, related health and safety requirements, and the applicability of this procedure to the activities.

Gamma radiation field strengths may be used to indicate contamination by gamma emitters. Elevated count-rate data must be carefully interpreted because uncontaminated areas can demonstrate high readings if they are next to an area contaminated with gamma emitters.

Using this procedure, it is possible to identify area or point sources of gamma-emitting radionuclides and determine whether an observed reading is due to shine from an adjacent source. These techniques are outlined in Sections 3.3.2 and 3.3.3. It should be noted that these are considered gross screening techniques only, rather than determinate measures.

Count-rate data from a sodium iodide (NaI) detector can be converted to exposure rate (μR/hr) measurements if the detector has been correlated with a calibrated, pressurized ionization chamber (PIC). See SOP 6.9, Correlation of a Sodium Iodide Detector to the Pressurized Ionization Chamber.

3. PROCEDURE

3.1. Associated Procedures

Information that applies to most field activities is provided in SOPs 1.1-1.10. In addition to the FSP or WP, those SOPs provide guidance that may supplement the information in this procedure. They should be consulted as necessary to obtain specific information about equipment and supplies; sample collection, preservation, packaging, and shipping; decontamination procedures; and documentation requirements. Procedures directly associated with this SOP are listed below.

SOP No.	SOP Title
1.1	General Instructions for Field Personnel
1.6	General Equipment Decontamination

6.9	Exposure Rate Measurements Using a Pressurized Ionization Chamber
6.10	Correlation of a Sodium Iodide Detector to the Pressurized Ionization Chamber

3.2. Preparation

3.2.1. Office

A. Review the FSP or WP and SOPS listed in Section 3.1.

B. Coordinate schedules/actions with the installation staff.

C. Obtain appropriate permission for property access.

D. Assemble the equipment and supplies listed in Appendix 5.1. Ensure the proper operation of all field equipment. Ensure current calibration of the probe and the ratemeter/scaler.

E. Obtain PIC correlation data if these have been determined for the surveyed area.

3.2.2. Documentation

A. Obtain a logbook from the QA officer.

B. Record results of the equipment check and calibration in the logbook.

C. Obtain a sufficient number of the appropriate ER Program data collection forms (see INDEX TO SOPs).

D. Consult the ER Program data administrator for a current list of codes and location IDs used in the completion of data forms.

3.2.3. Field

A. Visually inspect the equipment, including the connector cable, for breakage.

B. Check the battery charge. If necessary, replace the batteries.

C. Set the threshold to the value given on the calibration sticker (usually 100 volts).

D. Set the detector voltage to the value given on the calibration sticker. The operating voltage for an NaI probe is usually 700 to 1000 volts.

E. Set the window to the out position (gross mode).

F. Note the response of the detector to the check source.

3.3. Operation

3.3.1. Count-Rate Measurements

A. Record the gamma count-rate measurements taken with the NaI detector on the Gamma Ray Count-Rate Data form (Appendix 5.2). Instructions to complete the form are in Appendix 5.4.

B. Turn on the instrument.

C. Hold the detector first at a height of 3 ft above the ground (waist height), then at the ground surface if an above-background level is noted. Allow the ratemeter/scaler to integrate the count rate for at least 10 sec.

D. Record the results on the Gamma Ray Count-Rate Data form.

3.3.2. Recognizing Area and Point Sources

A. Walk slowly in the area of interest, holding the NaI detector waist high and note the count rate. Determine the location of the highest observed gamma count rate (sometimes called the HOG).

B. At the HOG, compare the count rate obtained at waist height with the count rate obtained at ground level. If both count rates are above background and increase rapidly as the detector is held closer to the ground surface, the anomalous area may be an isolated hot spot with an area of only a few square feet. If the HOG is broad in extent and there is no difference in the count rate at ground level and waist height, the anomalous area probably is not highly localized.

3.3.3. Recognizing Gamma Shine from Nearby Anomalies

Walk slowly in the area of interest, holding the NaI detector at waist height. If the count rate increases while leaving the area of interest, some of the gamma count rate observed at the area of interest may be due to shine from an adjacent gamma source. If the count rate increases as the height of the detector above the ground increases, some of the gamma count rate at the area of interest may be due to shine.

3.4. Postoperation

3.4.1. Field

A. Turn all switches to the off position.

B. Ensure that all equipment is accounted for, decontaminated (see SOP 1.6, General Equipment Decontamination), and ready for shipment.

C. If necessary, make sure all survey or sampling locations are properly staked and the location ID is readily visible on the location stake.

3.4.2. Documentation

A. Record any uncompleted work (like additional monitoring) in the logbook.

B. Complete logbook entries, verify the accuracy of entries, and sign/initial all pages.

C. Review data collection forms for completeness.

3.4.3. Office

A. Deliver original forms and logbooks to the document control officer (with copies to the site manager and files) for eventual delivery to the Department of Energy.

B. Inventory equipment and supplies. Repair or replace all broken or damaged equipment. Replace expendable items. Return all field equipment to the equipment manager and identify any operational problems from previous use.

C. Ensure that all radiological sources and standards have been stored in a locked area.

4. SOURCE

Ludlum. 1982. "Instruction Manual Model 2220 Portable Scaler Ratemeter." Ludlum Measurements, Inc. April 1982. Sweetwater, Texas.

5. APPENDIXES

5.1. Equipment and Supplies Checklist

5.2. Gamma Ray Count-Rate Data Form

5.3. Data Form Completion

APPENDIX 5.1

EQUIPMENT AND SUPPLIES CHECKLIST

_____ Portable ratemeter/scaler, Ludlum 2220 (or equivalent)

_____ Sodium iodide (NaI) gamma scintillometer, Ludlum 44-10 (or equivalent)

_____ D-cell batteries (4)

_____ Connector cable

_____ Hand-held calculator

_____ Gamma check source

APPENDIX 5.2

GAMMA RAY COUNT-RATE DATA FORM

GAMMA RAY COUNT-RATE DATA

(USING SCINTILLOMETER)

PAGE 1 OF ___

FACILITY CODE _____ FIELD REP _____

LOGGER CODE _____ LOG DATE _____

ACCEPTANCE CODE _____ SITE AREA CORRELATION NO _____

RATEMETER/SCALER MANUFACTURER _____ VOLTAGE _____

MODEL NO _____ SERIAL NO _____ CALIBRATION DATE _____

WINDOW OUT THRESHOLD _____ BATTERY _____

PROBE MANUFACTURER _____

MODEL NO _____ SERIAL NO _____ CALIBRATION DATE _____

SOURCE CHECK DATE/TIME _____

LOCATION ID	COORDINATES (FT)		METER READING (CPM)		EXPOSURE RATE (μR/hr)	
	NORTH	EAST	SURFACE	3 FT	SURFACE	3 FT

ACCEPTANCE CODES: A–ACCEPTABLE R–RECONNAISSANCE U–UNACCEPTABLE N–NOT DETERMINED

COMPLETE BOLDED DATA FOR ENTRY INTO TMS
SED–100 (2/88)

FORM COMPLETED BY/DATE _____

TECHNICAL REVIEWER/DATE _____

GAMMA RAY COUNT-RATE DATA

(USING SCINTILLOMETER)

PAGE ___ OF ___

FACILITY CODE _____ FIELD REP _____

LOGGER CODE _____ LOG DATE _____

LOCATION ID	COORDINATES (FT)		METER READING (CPM)		EXPOSURE RATE (μ R/hr)	
	NORTH	EAST	SURFACE	3 FT	SURFACE	3 FT

COMPLETE BOLDED DATA FOR ENTRY INTO TRIS

SED-100 (3/88)

APPENDIX 5.3

DATA FORM COMPLETION

Use a pen with black ink that is not water soluble (not a felt-tip pen). Make an entry in each blank. Where there is no data entry, enter UNK for Unknown, NA for Not Applicable, or ND for Not Done. If any procedure was not performed as prescribed, give the reason for the change or omission on the form. To change an entry, draw a single line through it, add the correct information above it, and initial the change.

1. Facility Code. Five-character code abbreviating the facility name where program activity is being conducted. The first three characters indicate the facility, and the remaining two numbers designate the specific site within the facility.

2. Field Rep. The name of the field representative.

3. Logger Code. Three-character or four-character code identifying the company responsible for collecting the information recorded on the form.

4. Log Date. The date that information recorded on the form was obtained in the format DD-MMM-YY (01-JAN-88).

5. Acceptance Code. One-character code assigned by the site manager.

6. Site Area Correlation No. The number assigned to the PIC scintillometer correlation data set by the site health and safety coordinator.

7. Ratemeter/Scaler Manufacturer. The manufacturer of the ratemeter/scaler in use.

8. Voltage. The voltage that is applied to the detector. The voltage value is set to the value given on the calibration sticker.

9. Ratemeter/Scaler Model No. The model number of the ratemeter/scaler.

10. Ratemeter/Scaler Serial No. The serial number of the ratemeter/scaler.

11. Ratemeter/Scaler Calibration Date. The date when the ratemeter/scaler was last calibrated.

12. Window. The window will be in the out position unless otherwise specified.

13. Threshold. The adjustment for the lower energy level of the discriminator. The threshold value is set to the value shown on the calibration sticker.

14. Battery. The battery charge reading at the beginning of the measurement.

15. Probe Manufacturer. The manufacturer of the sodium iodide (NaI) probe.

16. Probe Model No. The model number of the NaI probe.

17. Probe Serial No. The serial number of the NaI probe.

18. Probe Calibration Date. The date when the NaI probe was last calibrated.

19. Source Check Date/Time. The date and time that the detector response to a gamma source was last checked.

20. Location ID. Four-character code assigned sequentially to each borehole, test pit, or surface location where physical, chemical, biological, radiological, and other measurements are taken.

21. Coordinates (Ft). The coordinates of the measurement location in feet. The format is north and east.

22. Meter Reading (CPM). The count rate in counts per minute. There are two fields. One field is for readings at ground level, and the other is for readings at 3 ft above the ground.

23. Exposure Rate. The exposure rate in microR/hour (μR/hr). In order to make entries into these fields, it is necessary to determine the count rate to exposure rate conversion factor for the area of the site under investigation. A calibrated microR meter can also be used for entries in these fields. One field is for readings at ground level, and the other is for readings at 3 ft above the ground.

APPENDIX B

HEALTH AND SAFETY PLAN

ENVIRONMENTAL RESTORATION PROGRAM

OPERABLE UNIT 6, DECONTAMINATION AND DECOMMISSIONING VERIFICATION WORK PLAN AREA 19 AND AREA 14 SITE SPECIFIC HEALTH AND SAFETY PLAN

MOUND PLANT
MIAMISBURG, OHIO

REVISION 0

Prepared for:

U.S. DEPARTMENT OF ENERGY
EG&G MOUND APPLIED TECHNOLOGIES

Prepared by:

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August 1993

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INTRODUCTION

The purpose of this site specific health and safety plan is to identify hazards and requirements unique to Area 19 and Area 14 within OU6. This plan complies with 29 CFR 1910.120(b)(4) requirements for a site specific health and safety plan and is an appendum to the OU6 Health and Safety Plan.

1. TASK/OPERATION SAFETY AND HEALTH RISK ANALYSIS

1.1. SITE DESCRIPTION

In 1966 and 1967, Building 38 (PP Building) and an annex on the Waste Disposal (WD) Building (WDA) were constructed to meet the increasing needs of the plutonium processing programs at the Mound Plant.

In 1967, a Waste Transfer System (WTS) consisting of a series of holding tanks, a pumping station (Building 41) and steel transfer pipes connecting the SM Building to the WDA Building was constructed using a 1.5 inch pipe to transfer the high-risk waste, and a 2-inch pipe to transfer the low-risk waste.

Leaks in the WTS, including a rupture of the high-risk pipe in 1969, in the pressurized section between Building 41 and the WDA Building, resulted in the abandonment of the WTS in 1976. The WTS was removed during the period from 1982 through 1986 by the D&D Program, and all soil contaminated above the cleanup goal (100 pCi/g) was subsequently removed. The entire length of the WTS is now known as Area 19 and Area 14 and awaits verification sampling and analysis.

Area 19 and Area 14 presently consists of the soils that surrounded two underground radioactive waste transfer lines. The depth below ground surface of these lines varied from approximately 4 feet to 17 feet. The low-activity line was in service from 1967 until September 1974, and the high-activity line was used during the period from 1967 until April 1976.

Based upon the historical data available, the sources of contaminants expected to be found in Area 19 and Area 14 included the glove box lines in the SM and PP Buildings and the wash water, rinse water, decontamination solutions, shower water, leachate solutions and aqueous wastes generated during plutonium recovery and processing operations.

The low-risk wastewater from plutonium operations in Building 38 largely originated outside the glove box lines. Mop and wash water were collected in a 5,000-gallon above-ground tank adjacent to the SM Building. Shower water was collected in the 3,000-gallon below-ground tank, originally installed for use in the SM Building. These tanks were pumped through the low-risk side of the WTS to the WDA or WD Building for processing. Other constituents in the low-risk wastes, based upon a late 1970s study, included cooling water; trace amounts of methanol, ethanol and isopropanol; detergents; shower water; and janitorial wastes (floor wax, wax removers and toilet bowl cleaners), paints, sawdust, acetone and trace

quantities of radionuclides contained in the original plutonium.

1.2. TASK DESCRIPTION

The scope of work for the verification sampling and analysis of Area 19 and Area 14 includes the length of the trench excavated by D&D to remove the waste transfer system (WTS) piping that extended from the Special Metallurgical (SM) and Plutonium Processing (PP) buildings on the SM/PP Hill through the former lift station (Building 41) to the Waste Disposal (WD) Building/Waste Disposal Annex (WDA) on the Main Hill.

1.2.1. Task-By-Task Risk Analysis

This subsection lists each proposed task, identifies potential hazards, and estimates likelihood of exposure. Modified Level D personal protective equipment (PPE) will be worn for all tasks (refer to Section 3 of this plan). Upgrades will be based upon the results of monitoring or as determined by the Site Health and Safety Coordinator (SHSC).

Task: Soil Sampling/Drilling

Likelihood of Exposure: Moderate to High

Potential Hazards:

A drill rig has several moving parts which may allow for entanglement and pinch points. The wire cables may fail under extreme stress or misuse and act as a whip, severely injuring workers. Impact noises are a concern and may require the use of hearing protection. Vehicular traffic in Area 19 and Area 14 could present a hazard to the workers. Barricades and the buddy system will be used to increase worker protection from vehicular traffic hazards. Low and high voltage utilities could present an electrocution hazard. EG&G Mound Plant construction officials will scan the area and provide a clearance to drill. Potential for slipping and falling down the uneven terrain on the side of the hill is high. Fall protection may be required. Drill rigs may not be able to be used on the side of the hill. An assessment will be made prior to work activities. The potential for drowning exists for work near the pond (Area 14). Life vests will be worn for any work at the edge of the water or for work in the water (depths greater than three feet only). Radiological and chemical hazards may occur when drilling disturbs the soil. The drill rig can stir up dust, increasing the possibility of worker exposure through inhalation of radiological and chemical contaminants. An EG&G Mound Health Physics surveyor will be monitoring worker exposures to radiation and will make recommendations for increased levels of radiological protection as necessary.

The likelihood of exposure to chemical contaminants is low. Monitoring will indicate worker exposure levels and actions will be based upon the levels indicated. Heat or cold stressors may be present dependent upon the weather, work area, and level of PPE worn. The SHSC will monitor each work area for the potential of heat or cold hazards and brief workers accordingly.

Task: Hand Augering

Likelihood of Exposure: Moderate

Potential Hazards:

The hazards are similar to those for a drilling operation. A powered hand auger could present the operator with entanglement and pinch point hazards but to a lesser degree than a drill rig. A powered hand auger is heavy and will require use of two workers to operate it. A non-powered hand auger reduces the probability of physical injury. Exposure to impact or continuous noise above OSHA limits for unprotected workers should not occur. Vehicular hazards in Area 19 and Area 14 may exist. Barricades and the buddy system will be used to increase worker protection from vehicular traffic hazards. Low and high voltage utilities could present an electrocution hazard. EG&G Mound Plant construction officials will scan the area and provide a clearance to drill. Potential for slipping and falling down the uneven terrain on the side of the hill is high. Fall protection may be required. An assessment will be made prior to work activities. The potential for drowning exists for work near the pond. Life vests will be worn for any work at the edge of or in water greater than three feet deep. The hand auger may generate dusts increasing the likelihood for inhalation of radiological and chemical contaminants. An EG&G Mound Health Physics surveyor will be monitoring worker exposures to radiation and will make recommendations for increased levels of radiological protection as necessary. Heat or cold stressors may be present dependent upon the weather, work area, and level of PPE worn. The SHSC will monitor each work area for the potential of heat or cold hazards and brief workers accordingly.

Task: Decontamination

Likelihood of Exposure: Low

Potential Hazards:

Slippery surfaces may increase the chance of falling. Slip resistant boots or boot covers should be used. A potential exists for direct contact with the radioactive and chemical contaminants which may enter the body through accidental ingestion or dermal absorption. Precaution should be exercised during decontamination activities to prevent contact with the decontamination solutions and spillage. Heat or cold

stressors may be present dependent upon the weather, work area, and level of PPE worn. The SHSC will monitor each work area for the potential of heat or cold hazards and brief workers accordingly.

Task: Air Sampling

Likelihood of Exposure: Low

Potential Hazards:

Exposure to impact noises may occur if air sampling takes place in the immediate vicinity of the hollow stem auger drill rig. Entanglement hazards may exist if the individual samples at the drill rig while the auger is in motion. Exposure to vehicular traffic hazards in Area 19 and Area 14 will be controlled with the use of barricades and a buddy system. Potential for slipping and falling down the uneven terrain on the side of the hill is high. Fall protection may be required. An assessment will be made prior to work activities. A slight possibility for exposure to radioactive and chemical contaminated dusts exists. Monitoring will indicate the need for additional PPE. Heat or cold stressors may be present dependent upon the weather, work area, and level of PPE worn. The SHSC will monitor each work area for the potential of heat or cold hazards and brief workers accordingly.

Table 1.1. Task/Hazards

Task	Physical Hazards	Radiological Hazards	Chemical Hazards
Soil Sampling/Drilling	Moving/rotating parts, impact noises, vehicular traffic, electrocution, heat or cold stress, slip/fall hazards, drowning.	Inhalation of or accidental ingestion of radioactive contaminated dust.	Fluoranthene, Pyrene, gasoline and diesel fuels.
Hand Augering	Moving/rotating parts, vehicular traffic, electrocution, heat or cold stress, heavy lifting, slip/fall hazards, drowning.	Inhalation of or accidental ingestion of radioactive contaminated dust.	Fluoranthene, Pyrene, gasoline and diesel fuels.
Decontamination	Heat or cold stress, slippery surfaces.	Inhalation of or accidental ingestion of radioactive contaminated dust.	Hexane, methanol Fluoranthene, Pyrene
Air Sampling	Moving/rotating parts, impact noises, vehicular traffic, heat or cold stress, slip/fall hazards.	Inhalation of or accidental ingestion of radioactive contaminated dust.	Hydrogen, Fluoranthene, Pyrene, isobutylene, methane.

2. WORKER TRAINING

Section 5 of the OU6 Health and Safety Plan lists the training requirements for personnel at a hazardous waste site.

Table II.1. Site Specific Training for OU6 Area 19 and Area 14

	Mandatory	Optional (Dependent Upon Site Conditions)
Visitors	- Mound Plant Visitor Orientation	40 hour OSHA training (Visitors will not be allowed in the exclusion zone without this training.)
Workers	- Mound Plant Visitor Orientation - 40 hour OSHA training and 8 hour annual refresher training - OSHA Hazard Communication Training - General Employee Radiological Training	- Respirator use, care, and maintenance - First Aid and CPR
On-Site Managers and Supervisors	- Mound Plant Visitors Orientation - 40 hour OSHA training and 8 hour annual refresher training - 8 hour OSHA training for supervisors and managers - OSHA Hazardous Communication Training	- Respirator use, care, and maintenance - First Aid and CPR

3. REQUIRED PPE FOR OU6 AREA 19 AND AREA 14

As stated in Section 1.2.1 of this plan, Modified Level D protection will be worn for investigation and sampling activities. However if levels of contamination exceed 10% of the derived air concentration (DAC) for radiation, or if organic vapors are greater than 1 part per million (PPM) above background protection levels could increase as specified in Table VI.1 of the OU6 Health and Safety Plan. The following are protective equipment level requirements that may be required. It is very unlikely that level B will be required; however, it has been inserted for quick reference.

Modified Level D should include:

- Tyvek or another type of disposable coverall, when dusty or dirty operations are being performed
- Saranex coverall, when muddy or wet conditions are present
- nitrile gloves
- steel-toed safety boots
- disposable slip resistant boot covers, where appropriate
- hard hats, safety glasses
- hearing protection, life vests, and fall protection (as needed)
- electrical shock insulating equipment i.e., rubber mats, gloves, hoods and line hoses (as needed).

If needed, Level C protective equipment should include:

- full-face, air-purifying, cartridge-equipped respirators
- chemical-resistant clothing (overalls and long-sleeved jacket, hooded one- or two-piece chemical splash suit, disposable chemical resistant one-piece suit)
- Saranex coverall, when muddy or wet conditions are present
- latex inner gloves
- nitrile outer gloves
- steel-toed safety boots with disposable slip resistant latex or polyvinyl chloride boot covers
- hard hats

- hearing protection, life vests, and fall protection (as needed)
- electrical shock insulating equipment i.e., rubber mats, gloves, hoods and line hoses (as needed).

If needed, level B protective equipment should include:

- positive pressure, full-facepiece self-contained breathing apparatus (SCBA) or supplied-air respirator with escape SCBA
- chemical-resistant clothing (overalls and long-sleeved jacket, hooded one- or two-piece chemical splash suit, disposable chemical-resistant one-piece suit)
- Saranex suit when muddy or wet conditions are present
- latex inner gloves
- nitrile outer gloves
- steel-toed boots with disposable latex or polyvinyl chloride boot covers
- hard hats
- hearing protection, life vests and fall protection (as needed)

If level C PPE is required, the SHSC will be present to oversee the activities. If level B PPE is required the Health and Safety Manager will be present to oversee the activities. Subcontractors will follow requirements for PPE as stated in this plan and provide their own equipment and clothing. The EG&G Mound Plant Health Physics department will provide the appropriate respirators, medical examination (if respirators are required) and a respirator fit test.

All protective equipment and clothing will be decontaminated for future use or disposed of in accordance with Standard Operating Procedure (SOP) 1.15 "Guide to Waste Management (Rev.1)."

4. MEDICAL SURVEILLANCE REQUIREMENTS

The medical surveillance requirements are the same as stated in the OU6 Health and Safety Plan, Section 7.

5. FREQUENCY AND TYPES OF AIR MONITORING

Airborne contaminants can present a threat to the health and safety of workers. Identification and quantification of these contaminants through air monitoring is essential. Reliable measurements of airborne contaminants are useful for:

- Selecting PPE
- Delineating areas where protection is needed
- Assessing the potential health effects of exposure
- Determining the need for specific medical monitoring.

This section describes the factors to consider when conducting air monitoring. It presents strategies for assessing airborne contamination and describes instruments and methods for measuring exposures.

Each work location will be surveyed with the appropriate instrument before work activities begin and periodically while the work continues. Measurement data will be recorded on the appropriate SOP form. Refer to Table V.1 for a listing of appropriate SOPs. Completed forms will be filed in the document control file, and completed copies of these forms will be transmitted to the Mound Plant.

5.1. MONITORING INSTRUMENTS

The purpose of air monitoring is to identify and quantify airborne contaminants to determine the level of PPE. Initial screening for identification is often qualitative; i.e., the contaminant or class it belongs to is determined to be present, but the concentration (i.e., quantification) will have to await further testing. Two methods are available for identifying and/or quantifying airborne contaminants:

- The onsite use of direct-reading instruments
- Laboratory analysis of air samples obtained by bag sampling, filter, sorbent, or wet-contaminant collection methods.

Table V.1. Mound Plant ER Program Standard Operating Procedures for Health and Safety Monitoring

SOP No.	Title
1.1	General Instructions for Field Personnel (Rev. 2)
1.6	General Equipment Decontamination (Rev. 2)
1.7	Sampling for Removable Alpha Contamination (Rev.1)
1.8	Personnel Decontamination--Level D Protection (Rev. 1)
1.9	Personnel Decontamination--Level C Protection (Rev. 1)
1.10	Personnel Decontamination--Level B Protection (Rev.)
1.12	Air Particulate Sampling with a Real-Time Aerosol Monitor (Rev. 0)
1.15	Guide to Waste Management (Rev. 1)
6.1	Health and Safety Monitoring of Combustible Gas Levels (Rev. 1)
6.2	Health and Safety Monitoring of Organic Vapors with a Photoionization Detector (Rev. 1)
6.3	Health and Safety Monitoring of Organic Vapors with a Flame Ionization Detector (Rev. 2)
6.4	Total Alpha Surface Contamination
6.7	Near Surface and Soil Sample Screening for Low-Energy Gamma Radiation Using the FIDLER (Rev.0)
6.11	Beta-Gamma Radiation Measurements Using a Geiger-Mueller Detector (Rev. 0)
6.15	Measurement of Gamma Ray Field Using a Sodium Iodide (NaI) Detector
6.16	Heat Stress Monitoring (Rev. 0)

Reference: DOE 1992

FIDLER - Field instrument for the detection of low-energy radiation

5.1.1. Direct Reading Instruments

Some direct-reading instruments can detect contaminants in concentrations down to one ppm; however, quantitative data are difficult to obtain when multiple contaminants are present. One advantage of direct-reading instruments is that they provide information at the time of sampling, enabling rapid decision making for PPE selection or evacuation. The main disadvantage of direct-reading instruments is that they may detect other interference substances in addition to the substance they are designed to detect. Consequently, the readings may be false. The instruments' manuals should be referenced for interference substances.

Direct-reading instruments should be operated by qualified individuals who are familiar with the instruments' operating principles and limitations. This individual should be able to interpret the data correctly. The following guidelines may facilitate accurate recording and interpretation:

- Calibrate instruments according to the manufacturers' specifications before and after each use. Instrument calibrations will be recorded on the appropriate SOP form or in the field logbook.
- Develop calibration curves if the instrument manufacturer has not provided them.
- An instrument reading of "zero" should be recorded as "no instrument response" or "not detected" because quantities of chemicals may be present that are not detectable by the instrument.

Tables V.2 and V.3 list several direct-reading instruments and the conditions and/or substances they measure. The photoionization detector (PID) and the flame ionization detector (FID) are the most commonly used instruments in the field. The colorimetric indicator tubes are frequently used to assist in determining specific contaminants or groups of contaminants that are present at elevated levels above background.

5.1.2. Laboratory Analysis

In order to detect relatively low-level concentrations of contaminants, long-term or "full shift" personal air samples will be analyzed by an approved laboratory. Full shift air samples for some chemicals may be collected with passive dosimeters, or by means of pulling the air from the worker's breathing zone through an air pump filter or sorbent media.

Table V.2. Some Direct-Reading Instruments for General Survey
Page 1 of 3

Instrument	Hazard Monitored	Application	Detection Method	Limitations	Ease of Operation	General Care and Maintenance	Typical Operating Times
Combustible Gas Indicator (CGI)	Combustible gases and vapors	Measures the concentration of a combustible gas or vapor.	A filament, usually made of platinum, is heated by burning the combustible gas or vapor. The increase in heat is measured.	Accuracy depends, in part, on the difference between the calibration and sampling temperatures. Sensitivity is a function of the differences in the chemical and physical properties between the calibration gas and the gas being sampled. The filament can be damaged by certain compounds such as silicones, halides, tetraethyl lead, and oxygen-enriched atmospheres. Does not provide a valid reading under oxygen-deficient conditions.	Effective use requires that operator understand the operating principles and procedures.	Recharge or replace battery. Calibrate immediately before use.	Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

Table V.2. Some Direct-Reading Instruments for General Survey
Page 2 of 3

Instrument	Hazard Monitored	Application	Detection Method	Limitations	Ease of Operation	General Care and Maintenance	Typical Operating Times
Flame Ionization Detector (FID) with Gas Chromatography Option	Many organic gases and vapors.	In survey mode, detects the total concentrations of many organic gases and vapors. In gas chromatography (GC) mode, identifies and measures specific compounds. In survey mode, all the organic compounds are ionized and detected at the same time. In GC mode, volatile species are separated.	Gases and vapors are ionized in a flame. A current is produced in proportion to the number of carbon atoms present.	Does not detect inorganic gases and vapors, or some synthetics. Sensitivity depends on the compounds. Should not be used at temperatures less than 40°F (4°C). Difficult to absolutely identify compounds. High concentrations of contaminants or oxygen-deficient atmospheres require system modification. In survey mode, readings can be only reported relative to the calibration standard used.	Requires experience to interpret data correctly, especially in the GC mode. Specific identification requires calibration with the specific analyte of interest.	Recharge or replace battery. Monitor fuel and/or combustion air supply gauges. Perform routine maintenance as described in the manual. Check for leaks.	8 hours; 3 hours with strip chart recorder.
Gamma Radiation Survey Instrument	Gamma radiation.	Environmental radiation monitor.	Scintillation detector.	Does not measure alpha. Can measure beta radiation if apprpriate probe is used.	Extremely easy to operate, but requires experience to interpret data. Rugged, good in field use.	Must be calibrated annually at a specialized facility.	Can be used for as long as the battery lasts, or for the recommended interval between calibrations, whichever is less.

Table V.2. Some Direct-Reading Instruments for General Survey
Page 3 of 3

Instrument	Hazard Monitored	Application	Detection Method	Limitations	Ease of Operation	General Care and Maintenance	Typical Operating Times
Ultraviolet (UV) Photoionization Detector (PID)	Many organic and some inorganic gases and vapors.	Detects total concentrations of many organic and some inorganic gases and vapors. Some identification of compounds is possible if more than one probe is used.	Ionizes molecules using UV radiation; produces a current that is proportional to the number of ions.	Does not detect methane. Does not detect a compound if the probe used has a lower energy level than the compound's ionization potential. Response may change when gases are mixed. Other voltage sources may interfere with measurements. Readings can only be reported relative to the calibration standard used. Response is affected by high humidity.	Effective use requires that the operator understand the operating principles and procedures, and be competent in calibrating, reading, and interpreting the instrument.	Recharge or replace battery. Regularly clean lamp window. Regularly clean and maintain the instrument and accessories.	10 hours; 5 hours with strip chart recorder.

Table V.3. Some Direct-Reading Instruments for Specific Survey

Instrument	Hazard Monitored	Application	Detection Method	Limitations	Ease of Operation	General Care and Maintenance	Typical Operating Times
Direct-Reading Colorimetric Indicator Tube	Specific gases and vapors.	Measures concentrations of specific gases and vapors.	The compound reacts with the indicator chemical in the tube, producing a stain whose length or color change is proportional to the compound's concentration.	The measured concentration of the same compound may vary among different manufacturers' tubes. Many similar chemicals interfere. Greatest sources of error are (1) how the operator judges stain's end-point, and (2) the tube's limited accuracy. Affected by high humidity.	Minimal operator training and expertise required.	Do *not* use a previously opened tube even if the indicator chemical is not stained. Check pump for leaks before and after use. Refrigerate prior to use to maintain shelf life of about 2 years. Check expiration date of tubes. Calibrate pump volume at least quarterly. Avoid rough handling which may cause channeling.	Can be used indefinitely because a power source is not used.
Oxygen Meter	Oxygen (O_2)	Measures the percentage of O_2 in air.	Uses an electrochemical sensor to measure the partial pressure of O_2 in the air and converts that reading to O_2 concentration.	Must be calibrated prior to use to compensate for altitude and barometric pressure. Certain gases, especially oxidants such as ozone, can affect readings. Carbon dioxide (CO_2) poisons the detector cell.	Effective use requires that the operator understand the operating principles and procedures.	Replace detector cell according to manufacturer's recommendations. Recharge or replace batteries prior to expiration of the specified interval. If the ambient air is more than 0.5% CO_2, replace the O_2 detector cell frequently.	8 to 12 hours are typical battery powered hours available.

A major disadvantage of full shift air monitoring is the time it takes to receive the results from the laboratory. Often times work conditions have changed and the contaminants measured may or may not be present again.

5.1.3. Site Monitoring

The SHSC will coordinate monitoring of worker exposure. Pre-entry monitoring will be conducted to identify any immediately dangerous to life and health (IDLH) and other dangerous conditions, such as flammable or explosive atmospheres, oxygen-deficient environments, and highly toxic levels of airborne contaminants. Monitoring instruments may include a PID or FID, CGI, oxygen meter, particulate air sampling, Geiger Mueller counter with Beta pancake probe, and FIDLER (EG&G Mound Plant). Colorimetric tubes may also be used.

Site conditions and atmospheric conditions may change following the pre-entry monitoring. For this reason, monitoring will be done initially, repeated at the end of each soil boring removal and when:

- work begins on a different portion of the site
- different contaminants are being handled
- a substantially different type of operation is initiated
- workers are in areas of obvious liquid contamination or dusty conditions exist in contaminated soil areas.

5.2. SPECIFIC CONTAMINANTS TO BE MONITORED

Previous site characterization surveys have indicated a potential for fluoranthene, pyrene and plutonium-238 contamination to be present (DOE 1986). The known organics that could be present have unknown ionization potentials and therefore PID detection may not be possible. Pyrene has a TWA of .2 mg/m^3 which indicates the necessity to conduct particulate monitoring. Fluoranthene does not have a known TWA. Geiger Mueller counters with beta probes will be used to count Beta radiation. A Mound Plant Health Physics Surveyor will monitor for potential low energy gamma radioactive contamination with a FIDLER and/or other instrumentation. They will also use an alpha scintillometer to measure alpha contamination. Table VIII.3 in Section 8 of the OU6 Health and Safety Plan lists exposure standards for radioactive contaminants.

6. SITE CONTROL MEASURES

The purpose of site control is to minimize potential contamination of workers, protect the public from the site's hazards and to prevent vandalism. Several site control procedures have been implemented to reduce worker and public exposure to chemical, physical, biologic, and safety hazards:

- Control or work zones are indicted on Figure 6.1 of this plan.
- A site map is provided in Figure 6.2.
- A buddy system will be used.
- Decontamination procedures have been established for equipment and personnel (see Section 10 for specific requirements).
- Site security measures will be required.
- Communication networks have been established.
- Safe work practices will be mandated.

6.1. SITE WORK ZONES

To reduce the accidental spread of hazardous substances by workers from the contaminated area to the clean area, zones have been delineated on the site where different types of operations will occur. The establishment of work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency. The work zones are indicated on Figure 6.1.

6.1.1. Exclusion Zone

The exclusion zone is the area where contamination is likely to be present. The outer boundary of this zone will be clearly marked by lines, hazard tape, rope, or fencing.

The personnel working in the exclusion zone may include the Onsite Task Manager (OTM), SHSC, Field Work Manager, Field Investigation Team members, and a Mound Plant Health Physics Surveyor. Other

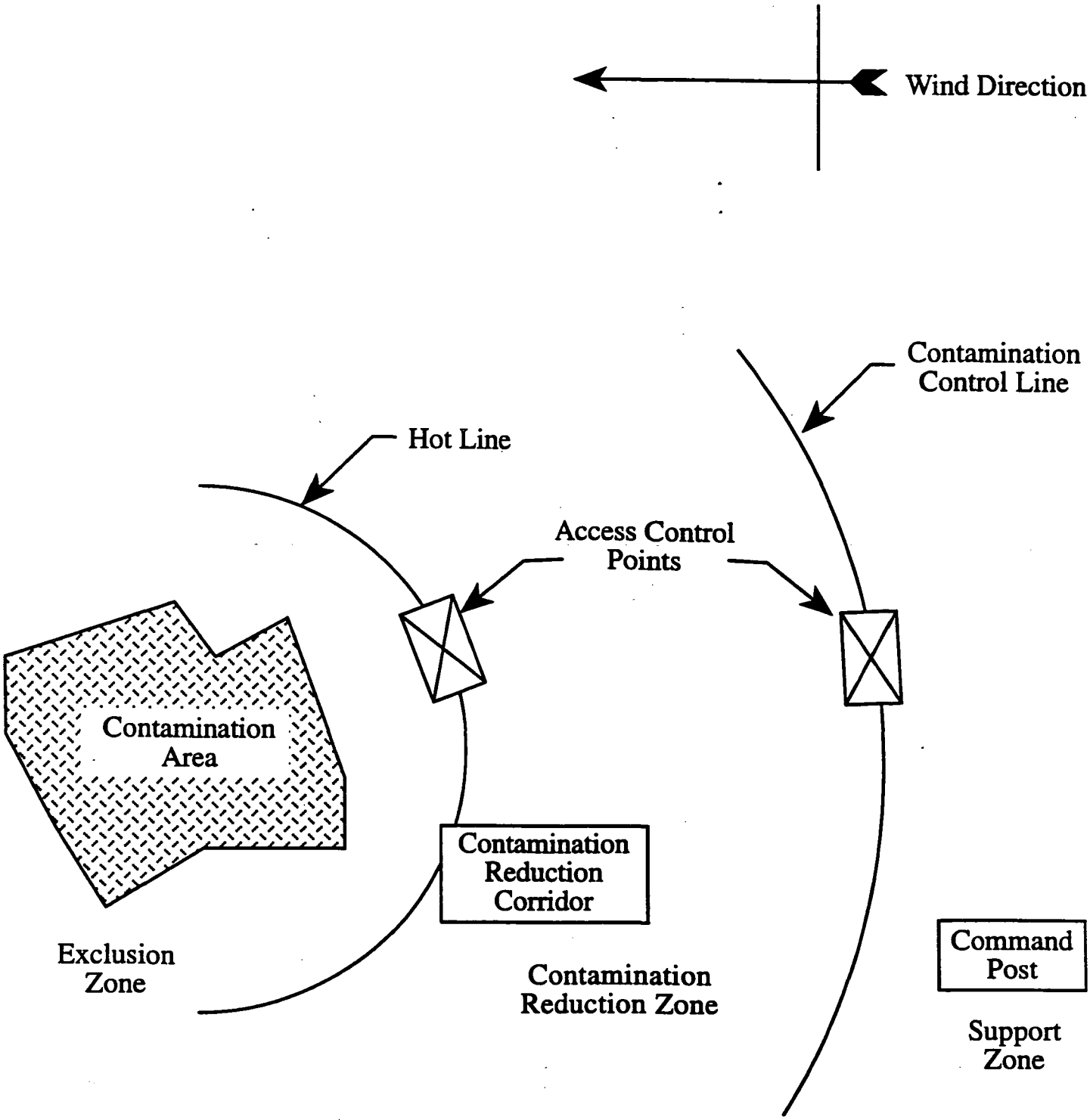

Figure 6.1. Site Control Zones

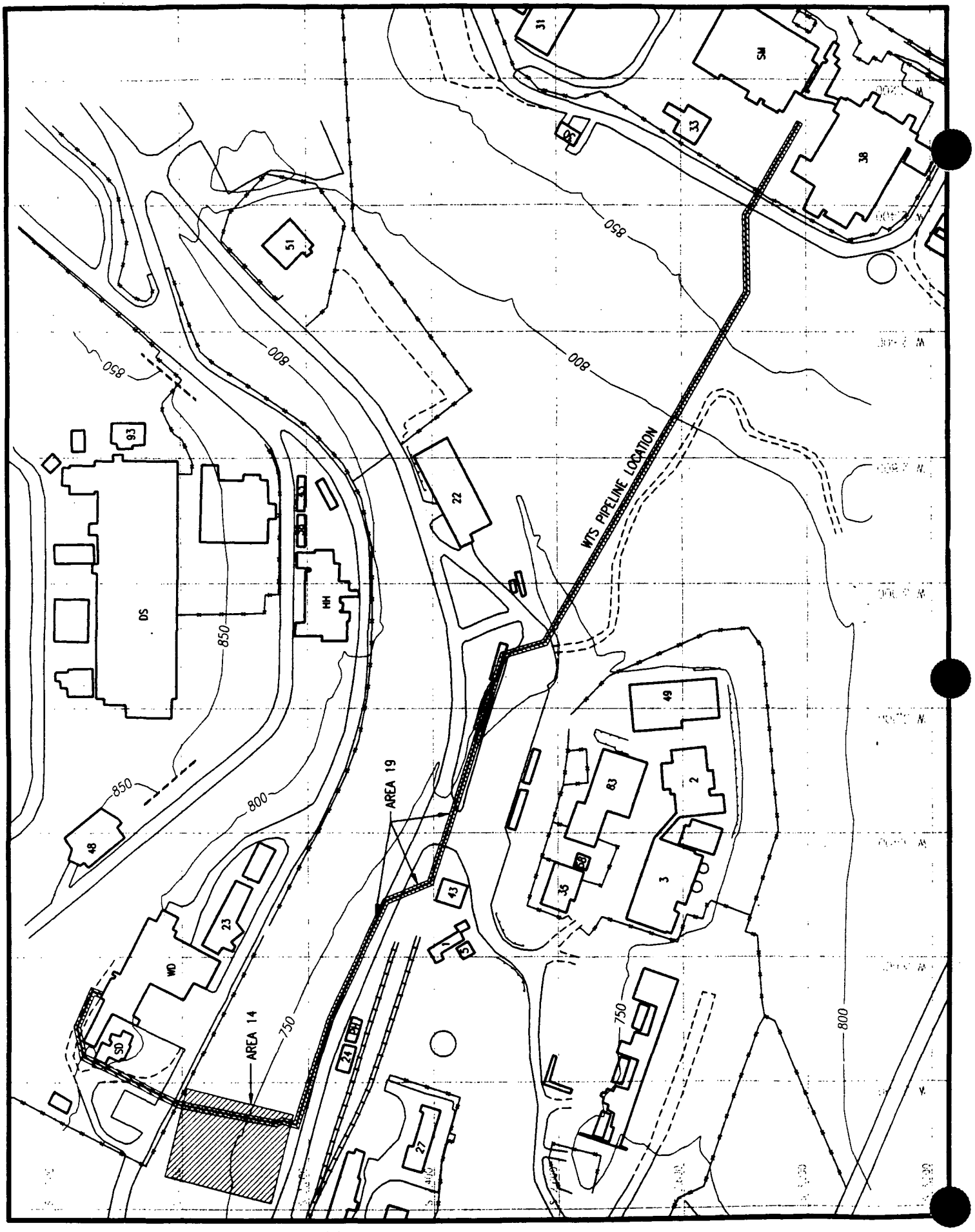

Figure 6.2. Area 19 and Area 14 Site Location Map

personnel may be required in the exclusion zone depending upon the conditions. All personnel within the exclusion zone will wear the level of personal protection required and have the necessary training.

6.1.2. Contamination Reduction Zone

The contamination reduction zone is the transition area between the contaminated area and the clean area. This zone is designed to reduce the probability that the clean support zone will be contaminated or affected by other site hazards. The boundary between the contamination reduction zone and the exclusion zone is called a "hotline." Decontamination procedures will take place in a designated area within the contamination reduction zone. Personnel entering the contamination reduction zone will be required to wear the PPE prescribed for this area.

6.1.3. Support Zone

The support zone is the location of the administrative and other support functions needed to keep the operations running smoothly. Any work that need not be performed in the exclusion or contamination reduction zone should be performed in the support zone. Personnel may wear normal work clothes within this area.

Support zone personnel are responsible for alerting the proper agencies in the event of an emergency. All emergency phone numbers, evacuation maps, vehicle keys, first aid kits, additional equipment and supplies will be kept in this area.

6.2. BUDDY SYSTEM

Activities conducted in the exclusion zone will require the use of a buddy system. The buddy will be able to:

- provide assistance to workers
- observe workers for signs of exposure to chemicals, heat or cold, and traffic hazards
- periodically check the integrity of workers protective clothing
- notify others in the event of an emergency.

6.3. SITE ENTRY AND VISITORS

Site security is necessary to prevent unauthorized personnel from entering control zones. Access to the Mound Plant is controlled by EG&G Mound Plant security officials. Personnel entering the site will first be cleared through security. Personnel will report to the support zone to sign in and receive an entry briefing. Access to the work control zones will be monitored by the OTM, SHSC, or other designated individual. In some cases sampling activities may take place inside security islands, in which case an EG&G Mound Plant security guard will be present at all times.

6.4. COMMUNICATION SYSTEMS

Two sets of communication systems are established: internal communication among field workers and onsite personnel and external communication between onsite and off-site personnel.

Internal communication is used to pass along safety and health information, communicate work changes, and to maintain site control. The Mound Plant does not allow the use of two-way radios for this purpose. Therefore, direct verbal communication is necessary. Visual or audible signals can be used if they have been prearranged and each worker understands the meaning of such signals.

External communication is used to coordinate emergency response, report to management, and to maintain contact with essential off-site personnel. A telephone will be located at the trailer within the support zone to contact the appropriate emergency personnel.

6.5. SOPs

The Health and Safety SOPs applicable to Area 19 and Area 14 work are listed in Table V.1 of this plan. The actual SOPs are attached to the OU9 Quality Assurance Project Plan (QAPjP).

6.6. IDENTIFICATION OF NEAREST EMERGENCY MEDICAL ASSISTANCE

First aid kits will be available at the site for treating minor first aid injuries. Additional first aid treatment is available from Mound Plant Paramedics by calling 911 on a Mound office phone or 865-4040 on any other phone. In the event of a serious injury, the victim will be transported to Sycamore Hospital located in Miamisburg. Directions to the hospital (Figure 6.3) and emergency contact numbers will be posted at the site in prominent locations.

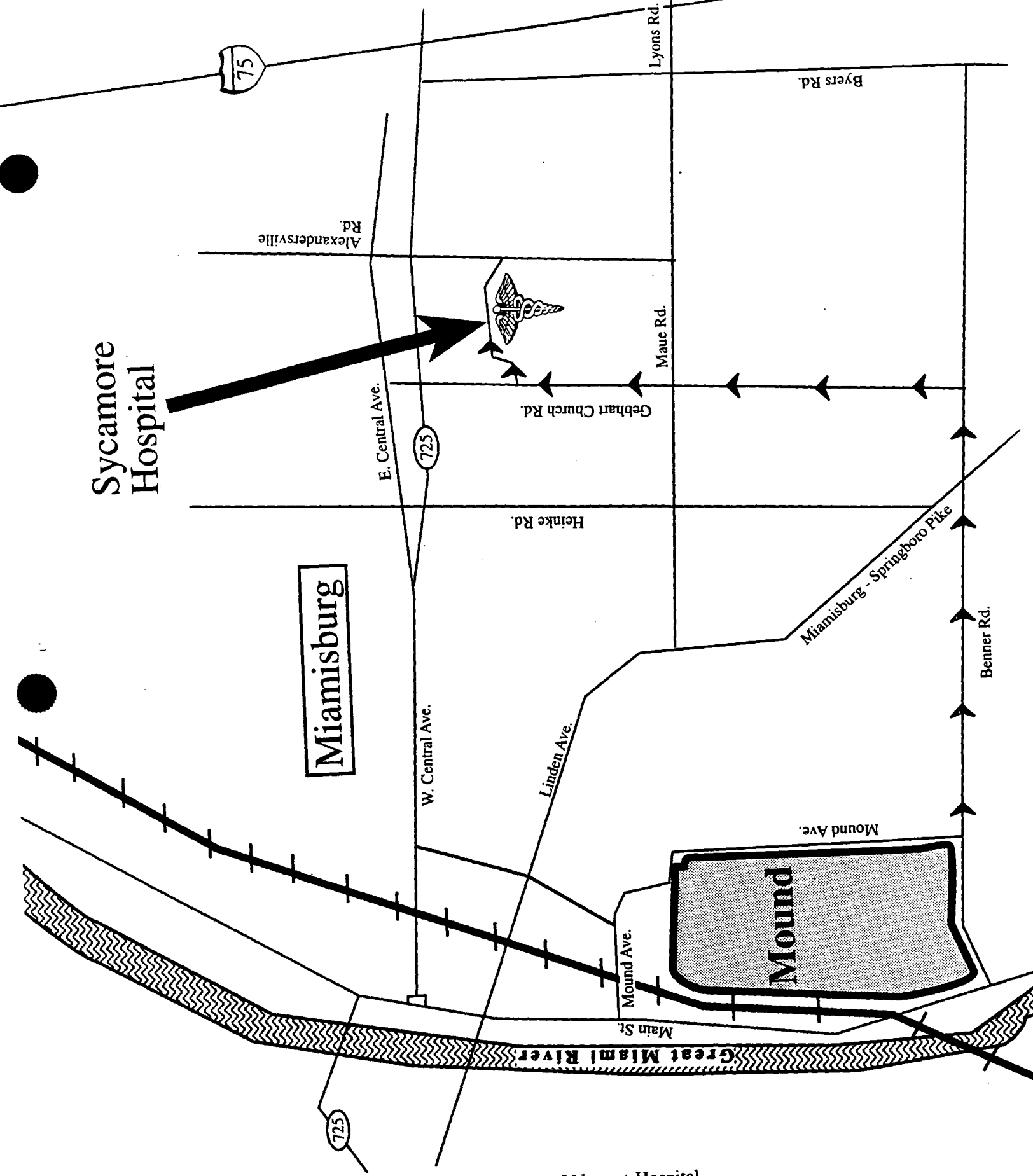

Figure 6.3. Location of Nearest Hospital

7. DECONTAMINATION PROCEDURES

Decontamination procedures are the same for Area 19 and Area 14 as listed in Section 10 of the OU6 Health and Safety Plan with one exception. Additional reference has been made to SOP 1.10 "Personal Decontamination - Level B Protection" (should this level of protection become necessary).

8. CONTINGENCY PLANS

8.1. EMERGENCY CONTACTS

Persons and organizations to contact in case of emergencies at Mound Plant are given in Figure 8.1. This emergency contact form will be posted in prominent locations at the work site. An emergency notification flowchart form will be posted in prominent locations at the work site. In an emergency, contacts and evacuation will be coordinated through the security or health physics escort, who will be carrying a two-way radio. A telephone will also be available in the support zone. Mound Plant emergency personnel will be contacted to contain and clean up all spills and releases (Section 8.3).

8.2. EVACUATIONS

Evacuations may be required under certain circumstances; for example, fire, explosion, release of toxic or hazardous materials, multiple injuries, tornadoes, etc. If an evacuation becomes necessary, personnel will be alerted by vehicle or portable air horns. The SHSC will instruct personnel where to meet. In most circumstances, it will be upwind of the potential hazard. A head count will be taken, and applicable emergency procedures will be followed.

8.3. SPILLS

In the event of a hazardous material spill, notify the Mound Plant fire department (911 or 865-4040) immediately. The subcontractor OTM is responsible for notifying the proper authorities and overseeing emergency response actions during an emergency, until response teams arrive. The contractor OTM will complete a spill accident report unless directed otherwise by Mound Plant Officials. Field workers may take additional steps (below) to mitigate or cleanup the spill if there are no life threatening hazards present:

<u>Mitigation</u>

- Seal open or leaking container (e.g., turn drum upright, replace container lid, etc.).
- Place protective barriers over or adjacent to spill area.
- Assure that workers and anyone in the vicinity are a safe distance away from the spill area.
- Perform lifesaving methods on injured persons.

SITE HEALTH AND SAFETY COORDINATOR:

NAME: Teresa Fort *CALL:* (513) 429-6756

SAIC Trailer at Mound Plant *CALL:* (513) 866-0299

INSTALLATION RADIOLOGICAL AND INDUSTRIAL SAFETY, ENVIRONMENT, SAFETY AND HEALTH MANAGER:

NAME: John Lemming *CALL:* (513) 865-3689

INSTALLATION ER PROGRAM MANAGER

NAME: Charles Freidman *CALL:* (513) 865-4541

24-HOUR INSTALLATION HEALTH/SAFETY *CALL:* 911 Onsite

FIRE - CALL: 911 or 865-4040 - Coordinate Through The Mound Plant Escort.

AMBULANCE - CALL: 911 or 865-4040 - Coordinate Through the Mound Plant Escort

POISON CENTER - CALL: National Poison Control Center, (404) 588-4400

SECURITY- CALL: 911 or 865-4040 - Coordinate Through the Mound Plant Escort

POLICE - CALL: 911 or 865-4040 - Coordinate Through the Mound Plant Escort

YOU ARE LOCATED AT: To Be Discussed at Each Site

THE NEAREST TELEPHONE IS LOCATED AT: Mound Plant Escort

THE NEAREST EMERGENCY MEDICAL SERVICES ARE LOCATED AT:

Medical Services Onsite, *CALL* 911 or 865-4040 - Coordinate Through the Mound Plant Escort

Sycamore Hospital, *CALL* 865-8721 or 865-8791.

Figure 8.1. Emergency Contacts

Cleanup (preliminary)

- Put on appropriate protective equipment before attempting cleanup.
- Obtain a container for disposal of cleanup materials.
- Use appropriate aids (absorbent cloths, sponges, blankets, etc.) to remove the spilled material and place into disposal container.
- The Mound Plant fire department will be responsible for final cleanup of the spill.

8.4. CONTINGENCY PLANS

Emergency-response contingency plans in this subsection will be followed during field investigations. Personnel working onsite will be familiar with these plans and will acknowledge same by signing a HSP documentation approval sheet. Evacuation plans and routes will be established on a site-specific basis and discussed with field personnel before field activities begin.

8.4.1. Fire/Explosion

A fire emergency will be handled by evacuating the work area and immediately notifying the Mound Plant fire department. Only if a fire appears to be small and easily extinguishable will field personnel attempt to put out the fire with available fire extinguishers. The Mound Plant fire department will be notified of any fires. If an explosion occurs, all personnel will be evacuated unless otherwise directed, and no one will reenter the work area until it has been cleared by Mound Plant emergency personnel.

8.4.2. Personnel Injuries

In case of minor injuries to personnel, first-aid treatment will be initiated by trained personnel in the field. First-aid treatment is available from Mound Plant paramedics. In case of serious injuries, the victim will be transported to Sycamore Hospital as soon as possible. The subcontractor OTM will coordinate the transportation of victims with the emergency response teams before the project begins. Directions to the hospital will be posted with the emergency contact form at prominent locations at the work sites.

Injuries in contaminated areas require additional steps to address possible contamination of the injured person. The SHSC will contact Mound Plant paramedics for injuries in potentially contaminated areas. Responses will vary, depending on the severity of the injury and the extent of contamination, and will be

determined by the SHSC and by Mound Plant paramedics. Personal injuries to SAIC employees will be reported on SAIC's Supervisors Accident Investigation Report. A copy of this report may be found in the Appendix to OU6 HSP. Injuries will also be reported in accordance with the OSHA and Worker Compensation requirements. "Release to Return to Work" forms will be completed prior to permitting an injured employee to return to work.

In accordance with OSHA's Bloodbone Pathogens Rule (29 CFR 1910.1030), first aid personnel will wear protective equipment to minimize exposure to bleeding injuries. All clothing and equipment contaminated with blood will be properly disposed or decontaminated. Incidents involving exposures to blood will be documented on a first aid log sheet.

8.4.3. Emergency Equipment

The field investigation teams at each site will have available the following types of emergency equipment:

- fire extinguishers
- communication equipment (cellular phones, etc.)
- first aid supplies (including snake bite and bee sting kit)
- disposable gloves
- CPR face mask
- blankets
- flashlights
- rope
- emergency eye wash (as appropriate)
- first aid log sheet
- oral thermometer

Field personnel should be trained in the use of emergency equipment. (See Section 5 of the OU6 HSP.)

9. CONFINED SPACE ENTRY PROCEDURES

The requirements for confined space entry are the same as those in Section 13 of the OU6 Health and Safety Plan.

10. REFERENCES

CFR 1991. "Occupational Safety and Health Standards for General Industry." Occupational Safety and Health Administration 29CFR 1910.120.

DHHS 1985. "Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities." U.S. Department of Health and Human Services. October 1985.

DOE 1986. "Verification Survey of the WTS Excavation Area at the Mound Facility." Stenhouse, M.J. and Kirsh, G.E., Battelle Columbus Division, Columbus, Ohio. October 1986.

EPA. 1988. "Standard Operating Safety Guides." U.S. Environmental Protection Agency, Washington, D.C. July 1988.

OU6 HSP. "Operable Unit 6 Decontamination and Decommissioning Verification Work Plan Health and Safety Plan (Draft Final)." Science Applications International Corporation, Dayton, Ohio. January 1993.

OU6 SAP. "Decontamination and Decommissioning Program Operable Unit 6, Area D - Acid Leach Bed Verification Sampling and Analysis Plan (Draft Final)." Science Applications International Corporation, Dayton, Ohio. January 1993.

OU6 FSP. "Decontamination and Decommissioning Program Operable Unit 6, Area 19 and Area 14 - Waste Transfer System Field Sampling Plan (Working Draft, Revision 0)." Science Applications International Corporation, Dayton, Ohio. March 1993.

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AREA 19

Science Applications International Corporation
An Employee-Owned Company

February 14, 1994

513.940126.501

Mr. Alan Spesard
OU5/6 Manager
EG&G Mound Applied Technologies
P.O. Box 3000
Miamisburg, Ohio 45343-3000

Reference: BOA 52264, Task Order 18080

Subject: Electronic Copy of OU6 Areas 19 and 14 Final Sampling and Analysis Plan (SAP)

Dear Mr. Spesard:

Enclosed is one electronic copy of the OU6 Areas 19 and 14 Final SAP. According to our records this deliverable was not sent to you with your Final copy of Area 19 and 14 SAP that was submitted on September 29, 1993. There are three (3) disks. One contains the text of the document in Word Perfect 5.1 format. The other two (2) are for the figures of the report. One is in Postscript format for printing using standard printers. The other is in AutoCad format for color enhancements.

Please contact me immediately if this delay has caused you any inconvenience. If you have any questions or problems, please contact me or Denny Reed at (513) 429-2699.

Sincerely,
SCIENCE APPLICATIONS INTERNATIONAL CORPORATION

Michael D. Giordano
Project Manager

MDG/clm

c: Rick Christopher
Monte Williams
Ronnie Harrison

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