Environmental Restoration Program

OPERABLE UNIT 5
OPERATIONAL AREA PHASE I INVESTIGATION
AREA 22 FIELD REPORT

MOUND PLANT
MIAMISBURG, OHIO

VOLUME I - TEXT

June 1995

Final (Revision 1)

U.S. Department of Energy
Ohio Field Office

EG&G Mound Applied Technologies

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FIGURES

TABLES

VOLUME II

ACRONYMS

AOC	area of concern
CC	contamination criteria
cpm	counts per minute
DOE	U.S. Department of Energy
DQO	data quality objectives
ER	Environmental Restoration
FIDLER	field instrument for the detection of low-energy radiation
kcmp	counts per minute x 1000
FSP	Field Sampling Plan
NERI	Northeast Research Institute LLC
OU	Operable Unit
PCE	tetrachloroethene
pCi/g	picocuries per gram
Pu-238	plutonium-238
QA/QC	Quality Assurance/Quality Control
QAPjP	Quality Assurance Project Plan
RI	Remedial Investigation
RI/FS	remedial investigation/feasibility study
SM/PP	Special Metallurgical/Plutonium Processing
SOP	Standard Operating Procedure
SVOC	semi-volatile organic
RDG	FIDLER reading
TCE	trichloroethene
Th-232	thorium-232

ACKNOWLEDGEMENTS

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1. INTRODUCTION

Area 22 has been identified as an area of concern (AOC) within the Operational Area of Operable Unit (OU) 5 (see Figure 1.1). The purpose of this Field Report is to present the results of the radiological and soil gas reconnaissance surveys conducted in Area 22 as part of a larger OU5 Phase 1 Investigation and identify potential areas of radiological and chemical contamination within Area 22. The data gathered during the Phase 1 Investigation is not Remedial Investigation (RI) quality and therefore no conclusions can be extracted from the results.

The Phase 1 reconnaissance investigation (radiological and soil gas surveys), as summarized in this report, provides a qualitative screen that can be used to determine a strategy for directing Phase 2 and possible Phase 3 investigations. A Phase 2 investigation will be conducted to gather RI quality data from locations with probable contamination, as found during the Phase 1 reconnaissance investigation. This information will be used to refine the data quality objectives (DQOs) to determine if an additional round of sampling (Phase 3) is necessary. The phased approach to data gathering is part of an overall strategy to conduct a remedial investigation/feasibility study (RI/FS) for OU5.

The following sections briefly describe the scope of the Area 22 Field Report, provide a site description, and review the site land use history. The final section presents the organization of the remainder of the report.

1.1. SCOPE

The scope of the Area 22 Field Report is to present the field work performed and data collected at Area 22 during the Phase 1 investigation conducted in June and July, 1994. Relevant data available from previous studies is also integrated into this report. This work was conducted in accordance with the Operable Unit 5, South Property, Remedial Investigation/Feasibility Study Work Plan (DOE 1993a) and the Operable Unit 5, South Property, Remedial Investigation/Feasibility Study Sampling and Analysis Plan (DOE 1993b).

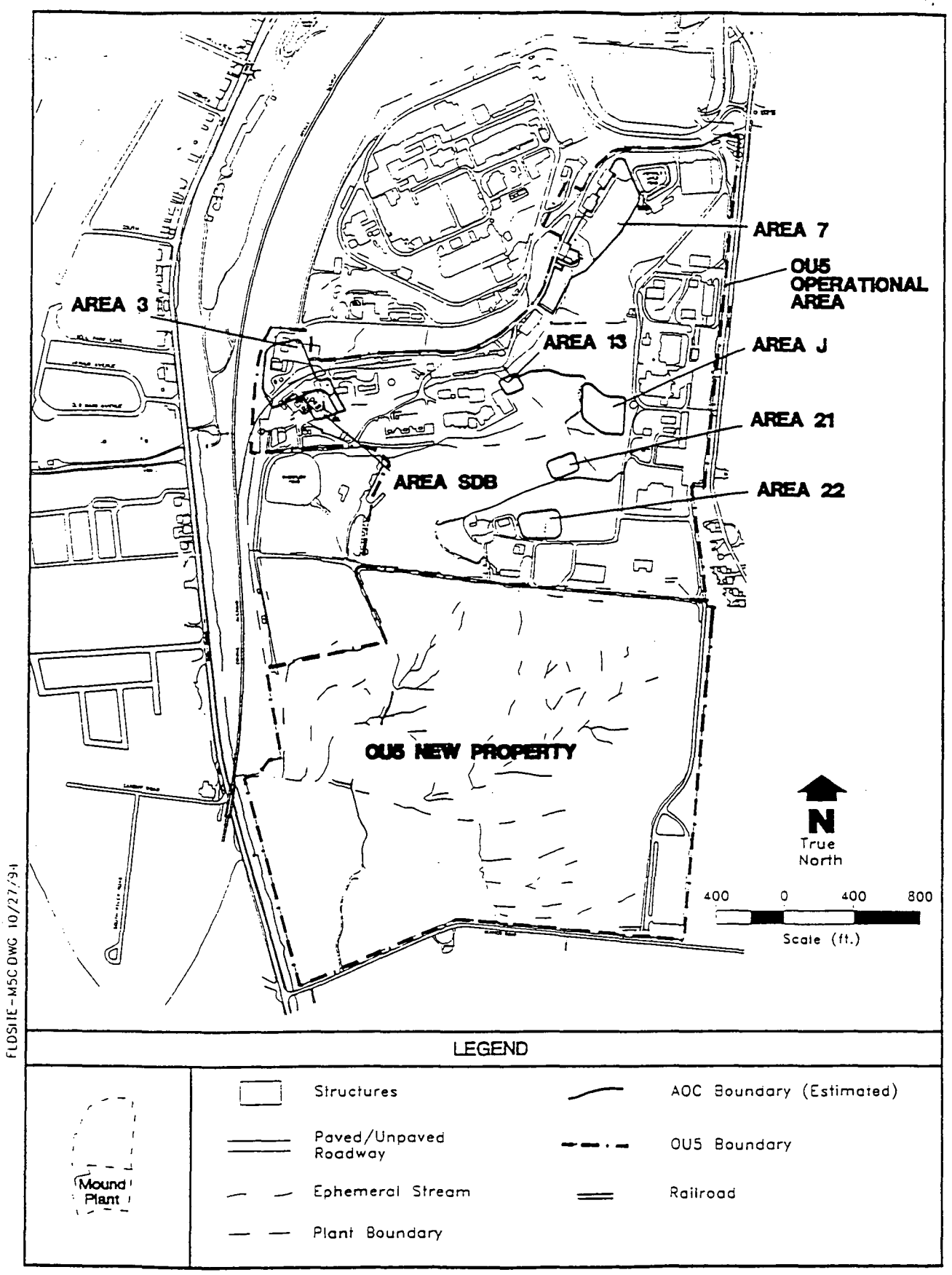

Figure 1.1. Site Map of Operable Unit 5 Areas of Concern

1.2. SITE DESCRIPTION

Area 22, approximately 175 feet by 200 feet (35,000 ft^2), is located on the southwest part of the Special Metallurgical/Plutonium Processing (SM/PP) hill near Building 53 (see Figure 1.2). Along the eastern edge of the Area is a large concrete pad used to store rolloff boxes. Area 22 contains many small piles of excavated soil from past construction activities at the Mound Plant. The Area is topographically flat and vegetation consists of grasses, shrubs, and small trees with concrete rubble and other construction debris exposed at the surface. A major portion of the Area is roped off and designated as a radiological area. Previous investigations (DOE 1992a) show that bedrock ranges from two to seven feet below ground surface.

1.3. SITE HISTORY

Area 22, also referred to as the "orphan soils" area, was historically used to store contaminated soil and debris excavated from other areas at the Mound Plant. Soil contaminated with polonium-210 and contaminants associated with its production (e.g., cobalt-60) was deposited in Area 22 in 1985 (DOE 1992b). The contamination in the soil resulted from a waste linebreak west of the HH building (DOE 1992b).

Area 22 was first identified during the gamma survey conducted under the Site Survey Project (Stought et. al 1988).

1.4. REPORT ORGANIZATION

The remainder of this report presents the results of the Phase 1 investigation for Area 22. Section 2 summarizes field activities performed and data collected during the radiological and the soil gas surveys. It also compares relevant data from previous investigations with Phase 1 investigation data. References are provided in Section 3. Survey maps, field logbooks, radiological data, and the soil gas data are included in Appendices A, B, C, and D respectively, contained in Volume II of this report.

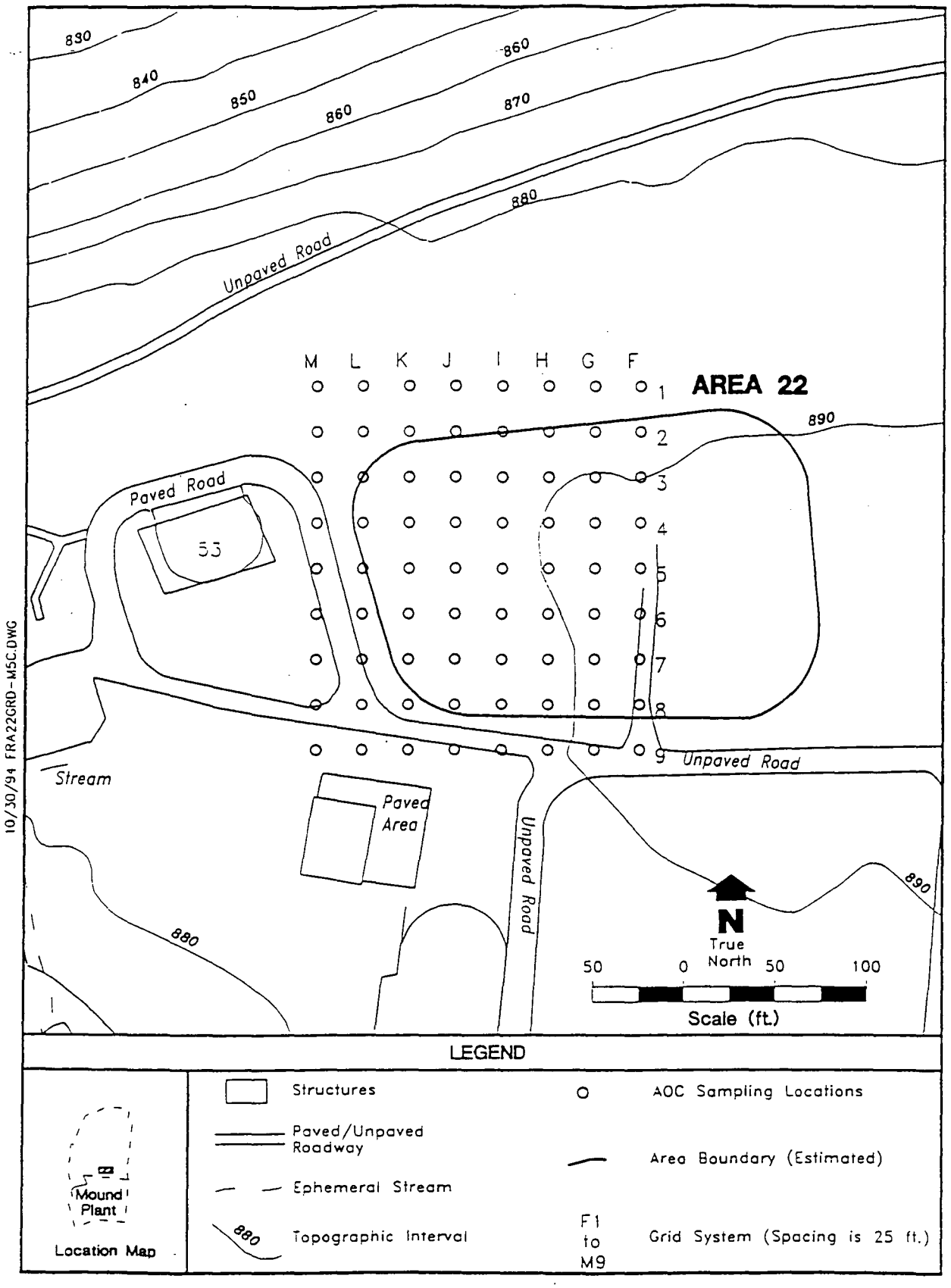

Figure 1.2. The Estimated Boundary of Area 22

2. FIELD ACTIVITIES AND DATA SUMMARY

Phase 1 field activities were conducted to characterize areas of contamination, if any, that may require further sampling under Phase 2 and Phase 3 investigative programs. In Area 22, Phase 1 reconnaissance activities consisted of:

- a field instrument for the detection of low-energy radiation (FIDLER) survey to detect surface radiological contamination, and surface soil samples sent to the Mound Soil Screening Facility to further detect possible surface radiological contaminants; and
- a soil gas survey to detect subsurface volatile and semi-volatile organic chemical contamination.

The radiological screening was conducted to detect the presence of plutonium-238 (Pu-238) and thorium-232 (Th-232) in Area 22. The soil gas survey was conducted to detect total aromatic hydrocarbons, total semi-volatile compounds (SVOCs), lubricants such as light oil and greases, and total volatile halogenated compounds.

The data collection points for the FIDLER survey, the soil screening activities, and the soil gas survey were established over the estimated Area 22 boundary on a 25 foot grid system (see Figure 1.2). The land survey map of Area 22 (Appendix A) shows those points within the area located by a registered surveyor. Prior to sampling, all transverse lines of the grid system were cleared of trees and underbrush and the remaining sample locations were marked with survey stakes.

The following sections describe the field activities and analyses performed, and the results of the Phase 1 investigation.

2.1. RADIOLOGICAL (FIDLER) SURVEY

2.1.1. Field Work Performed and Procedures

A FIDLER survey was performed over Area 22 on July 12 and 13, 1994, following the Mound Standard Operating Procedure (SOP) 6.7, Near Surface and Soil Screening for Low-Energy Gamma Radiation Using the FIDLER.

Prior to beginning the survey, Bicron FIDLER #2 (instrument #3400, probe #3611) was calibrated and the grid location F6 was established as the background station. For the second day's activities, the background station was established at grid point, L5 and I4. Background and standard source checks for Pu-238 and Th-232 were performed daily and readings were recorded on the card attached to the FIDLER and in the field logbook (Appendix B). The standard deviations and the contamination criteria (CC) were calculated for the Out Channel, Channel 1, and Channel 2.

Due to its ability to detect a wider range of isotopes than either Channel 1 or 2, the Out Channel was selected for screening surface radiological contamination within Area 22. The Out Channel detects low energy gamma rays and x-rays, while Channel 1 primarily detects Pu-238, and Channel 2 primarily detects Th-232.

In cleared areas, each 25 foot by 25 foot grid block was subdivided into 25, five feet by five feet sections. These sections were surveyed in a serpentine fashion at a rate of 20 feet per minute. An Out Channel reading was taken in each section and recorded in the field logbook. If the readings exceeded the CC for the Out Channel, the section was divided into quadrants (northwest, northeast, southwest, and southeast). The point of highest concentration of the elevated readings was then located in one of these quadrants. After one minute stabilization periods, Channel 1 and 2 readings were taken at the point of highest concentration and recorded in the field logbook. Additionally, Out Channel readings were taken near the point of highest concentration to determine the extent of the elevated readings. When the Out Channel reading fell below the CC, the distance from the point of highest concentration was estimated in feet and recorded in the logbook.

Where grid blocks could not be surveyed in a serpentine fashion due to thick vegetation, all Channel readings were recorded at each stake. The FIDLER operator then walked between stakes perpendicular to Row 1, (i.e., F1 to F9, G1 to G9, etc. as shown in Figure 1.2 or Appendix B, Plate 1) at a rate of 20 feet per minute in the Out Channel mode. No readings were recorded for the sweep, unless the CC was exceeded. When this occurred, the FIDLER crew located the point of highest concentration of that area by identifying where the highest readings were detected. Channel 1 and Channel 2 readings were taken at the point of highest concentration location after one minute stabilization period and recorded in the field logbook. The FIDLER was then slowly moved radially around the point of highest concentration until the reading dropped below the CC, thereby defining the area of elevated readings. The size of that area was recorded by distance and direction from the point of highest concentration.

2.1.2. Quality Assurance Summary Report

The field and data analysis variances are summarized in the following subsections.

2.1.2.1. Field Variance Report

The FIDLER survey was completed with no variances from the OU5 Quality Assurance Project Plan (QAPjP) (DOE 1993b). Two minor variances from the SOP 6.7. occurred, involving check sources, scanning rates, and screening techniques.

The first minor variance was the use of Pu-238 and Th-232 sources for the daily source check as opposed to the americium-241 source specified in SOP 6.7. The second variance from SOP 6.7, the inability to screen the entire area in a serpentine fashion, occurred due to thick vegetation. In blocks where it was not possible to screen in a serpentine fashion, screening was conducted at and between grid points. For Area 22, 44 percent was screened in the serpentine fashion, 28 percent partially screened in the serpentine fashion, and 28 percent screened at grid points only.

2.1.2.2. Data Analysis Variance Report

FIDLER survey data were not formally validated. However, all logbook entries were checked for accuracy, completeness, and format. One error was found in the calculations used to determine the contamination criteria. These values were recalculated and compared to the collected data. Several additional areas were identified as having elevated radilological activity based on the recalculated Out Channel CC. Because these corrections were made following the completion of the survey, no Channel 1 or Channel 2 readings were taken at these locations identified as having elevated Out Channel readings.

2.1.3. Health and Safety Summary Report

The FIDLER survey was conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993c), and the Environmental Restoration Program Site-Specific Health and Safety Plan for OU5 Operational Area - Area 22. Health and safety issues were discussed and resolved during daily tailgate safety briefings conducted by the Site Health and Safety Officer and documented in the Site Manager

Logbook (Appendix B). Additionally, field personnel were scanned with a beta/gamma survey meter when exiting Area 22.

No accidents or safety violations occurred during the FIDLER survey. Additionally, a health and safety surveillance was conducted on August 23, 1994; no safety variances were found.

2.1.4. Presentation of Data

Appendix C contains all radiological data collected during the Phase 1 investigation. It includes data from the FIDLER survey and analytical results of soil samples sent to the Mound Soil Screening Facility.

The FIDLER survey located several areas of elevated surface radiological activity as summarized in Table II.1 and shown in Figure 2.1. Two areas showing the highest activity were located at grid locations G7 and I7.5. At location G7, the Out Channel reading was 17 kcpm and Th-232 was detected at 15 kcpm (Channel 2 CC = 7.7 kcpm). The area of elevated radiological activity was determined to be approximately one ft. in diameter

At location I7.5, the Out Channel reading was 34 kcpm, Pu-238 was detected at 130 cpm (Channel 1 CC = 73.6 cpm), and Th-232 was detected at 29 kcpm (Channel 2 CC = 7.8 kcpm). The area of elevated radiological activity was determined to be approximately 14 feet in diameter.

Surface soil samples, collected as part of the soil gas survey (see Section 2.2.1), were analyzed for Pu-238 and Th-232. Concentrations of Th-232 exceeding the Mound Plant Soil Screening Facility's lower detection limit of 2.0 pCi/g was detected at 1 of the 72 sample locations (see Table II.2). Concentrations of Pu-238 at or exceeding the Mound Plant Soil Screening Facility's lower detection limit of 25 pCi/g were detected at 21 of the 72 sample locations (see Table II.2). Figure 2.2 displays the grid locations where concentrations of Pu-238 equal or exceed 25 pCi/g and presents the concentration contours where Pu-238 exists at concentration from 25-50 pCi/g and at concentrations greater than 50 pCi/g. As displayed in Figure 2.2, there are four locations represented by three areas where the Pu-238 concentration exceeds 50 pCi/g. Additionally, surface soil sample results indicate that Pu-238 contamination exceeds the estimated Area 22 boundary on the northwest side.

Table II.1. Summary of Elevated Surface Radiological Activity in Area 22 (FIDLER Survey)
Page 1 of 2

Grid Location	Out Channel Reading (kcpm)	Out Channel CC (kcpm)
F1-01 to F2-25	9.0 - 11.5	8.6
G1-01 to G1-25	10.5 - 11.5	
H1	11.0	10.2
J1	12.0	
K1	12.0	
K1-03 to K1-08, K1-13 to K1-18, K1-23 to K1-25	11.5 - 12.5	
L1-01 to L1-25	11.0 - 12.5	
F2-01 to F2-25	10.0 - 12.0	8.6
G2-01 to G2-25	9.5 - 11.5	
J2	12.0	10.2
K2-01 to K2-07, K2-10, K2-11, K2-14 to K2-17, K2-23 to K2-24	11.0 - 12.0	
L2-01 to L2-15, L2-17 to L2-23	10.5 - 12.0	
F3-01 to F3-25	10.0 - 11.5	8.6
G3-01 to G3-25	9.5 - 11.0	
K3-03 to K3-08, K3-13 to K3-15, K3-17, K3-18, K3-23, K3-24	10.5 - 12.5	10.2
L3-01 to L3-03, L3-10	10.5 - 11.0	
F4-01 to F4-17	10.0 - 12.0	8.6
G4-01, G4-03, G4-05 to G4-16	9.0 - 11.5	
H4-01 to H4-25	9.5 - 11.5	
J4	9.5	9.3
K4-01 to K4-03, K4-08, K4-13, K4-18 to K4-23, K4-25	9.5 - 10.5	
F5-11 to F5-25	9.0 - 10.5	8.6

Table II.1. Summary of Elevated Surface Radiological Activity in Area 22 (FIDLER Survey)
Page 2 of 2

Grid Location	Out Channel Reading (kcpm)	Out Channel CC (kcpm)
G5-11 to G5-13, G5-15, G5-17 to G5-25	9.0 - 10.0	8.6
H5-01 to H5-25	9.0 - 11.5	
J5	9.5	9.3
G6	10.0	8.6
H6-02 to H6-25	9.0 - 12.0	
L6-07, L6-14 to L6-17, L6-25	10.5 - 11.0	10.2
G7	17.0	8.6
I7	13.0	9.3
I7.5	34.0	9.3
I7-20	11.0	10.2

CC contamination criteria
kcpm counts per minute x 1000

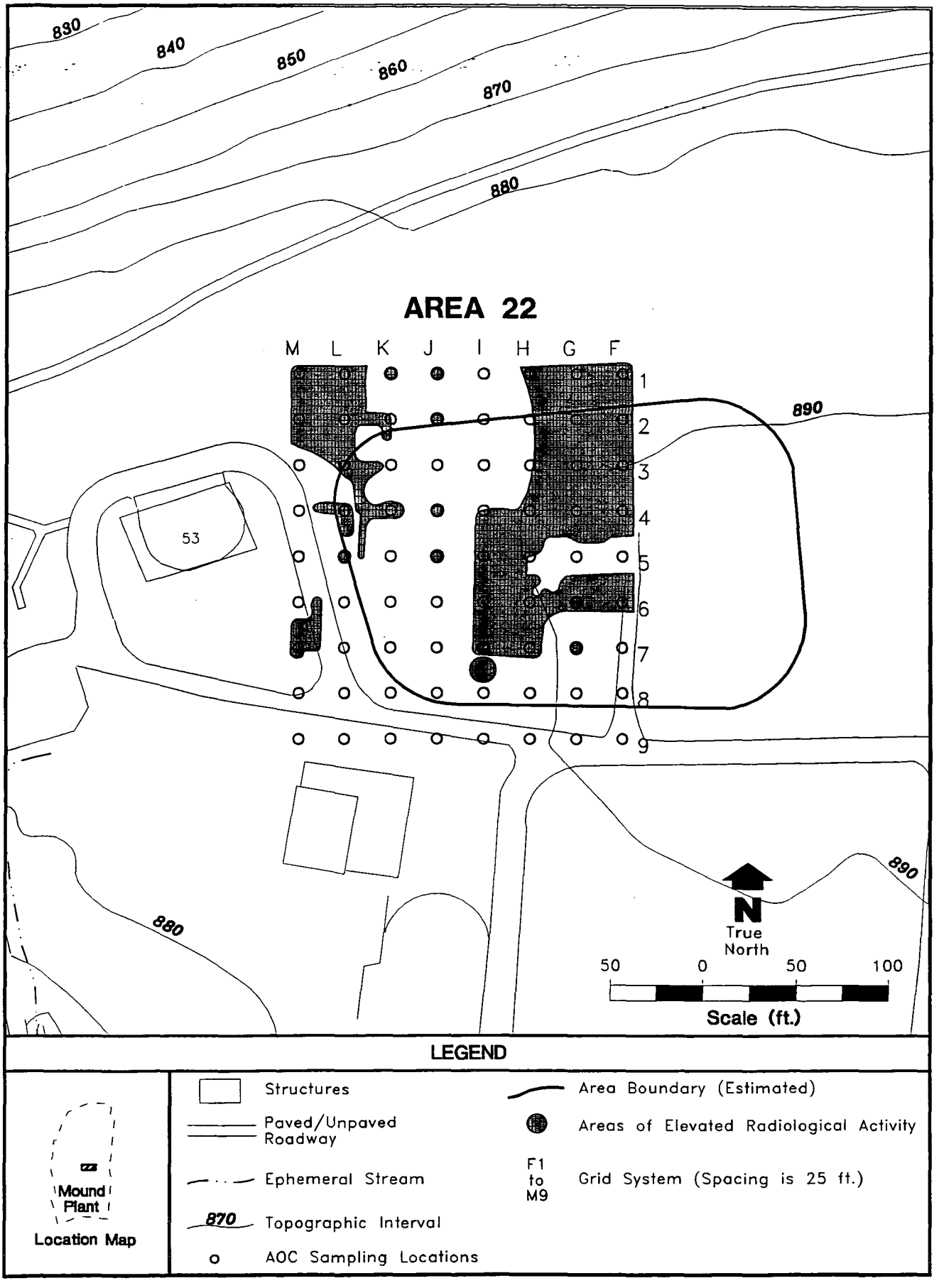

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Table II.2. Summary of Elevated Surface Radiological Activity in Area 22 (Mound Soil Screening Facility Data)

Grid Location[a]	Mound Soil Screening Facility Data	
	Plutonium-238 (pCi/g)	Thorium-232 (pCi/g)
G3	28	ND
G7	37	ND
H2	33	ND
H4	34	ND
H5	26	ND
H7	31	ND
I4	25	ND
I5	27	ND
I7	27	ND
J1	25	ND
J2	31	ND
J3	39	ND
J4	29	3.10
J5	56	ND
J6	81	ND
J7	34	ND
K3	40	ND
K4	67	ND
L1	25	ND
L3	27	ND
M3	51	ND

a - See Figure 2.2 for grid location point.

ND = Radiological contamination below the Mound Plant Soil Screening Facility's lower detection limit.

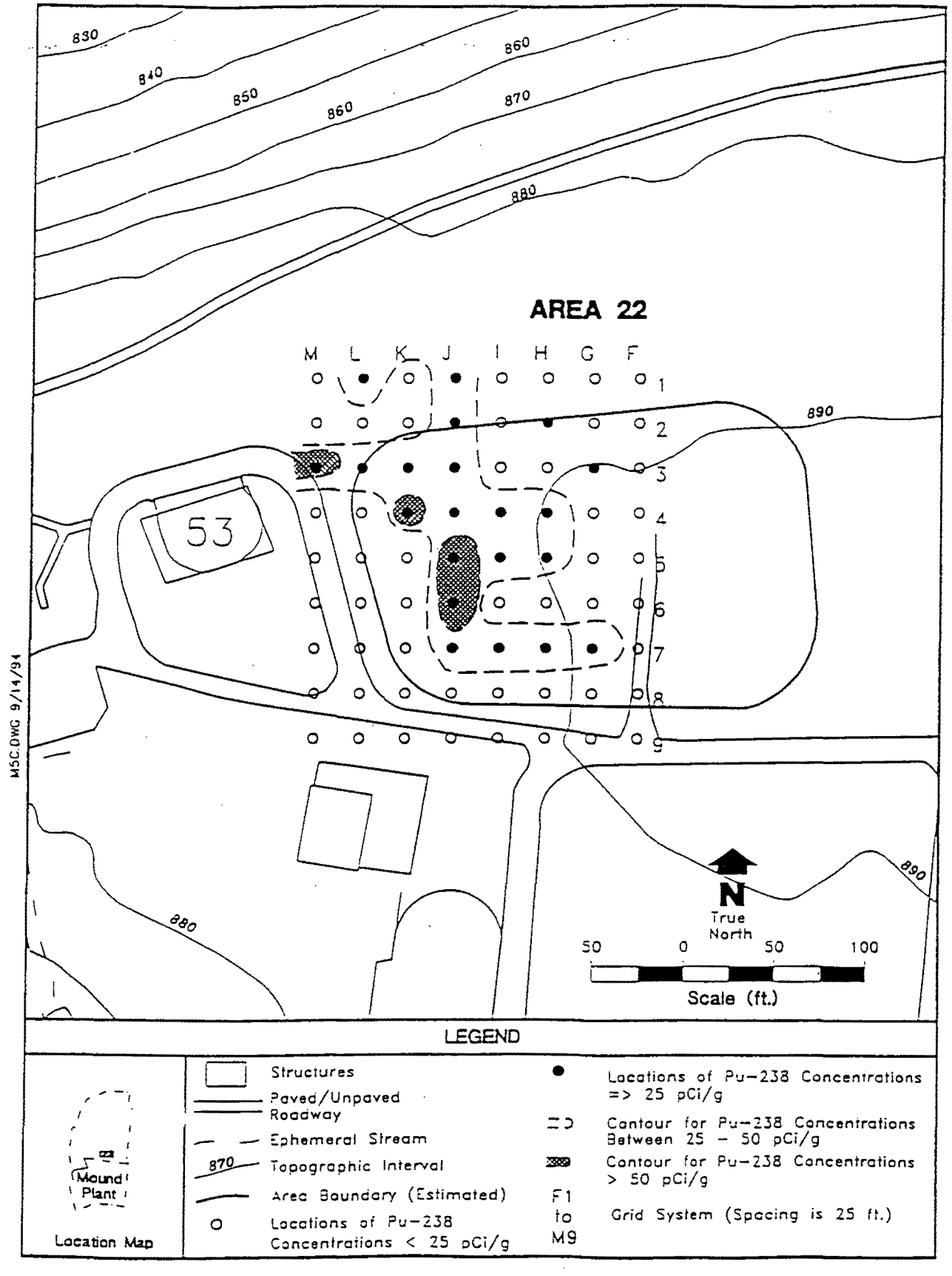

Figure 2.2. Locations of Elevated Surface Soil Radiological Activity (Pu-238)

2.1.5. Comparison with Historical Radiological Data

Surface soil samples collected in Area 22 during the Site Survey Project (Stought et. al 1988) were analyzed for Pu-238 and screened for Th-232 using a FIDLER. Additionally, some samples were further analyzed for tritium, cobalt-60, cesium-137, radium-226, and americium-241 (DOE 1992b). The results of the surface soil sampling conducted under the Site Survey Project (DOE 1992b) are presented in Table II.3 (DOE 1992b). The corresponding sampling locations are shown in Figure 2.3.

None of the surface samples collected showed elevated levels of Pu-238 and thorium. Cobalt-60 was detected in samples S0787 and S0790 at 143 and 54 pCi/g, respectively. The same samples showed radium-226 present in concentrations of 0.4 and 0.7 pCi/g. Sample S0787 also contained 7.0 pCi/g of cesium-137.

In contrast to the 1988 Site Survey Project, the results from the soil sample screening for Area 22 during the Phase 1 investigation indicate the presence of Pu-238 in the surface soil. Pu-238 was detected at levels greater than 25 pCi/g at 21 of the 72 sample locations (see Figure 2.2). Th-232 was detected at levels greater than 2.0 pCi/g at 1 of the 72 sample locations. Elevated radiological activity in Area 22 is also indicated by the Phase 1 FIDLER survey results.

2.2. SOIL GAS SURVEY

2.2.1. Field Work Performed and Procedures

A soil gas survey was performed over Area 22 from June 22, 1994 to July 13, 1994, per the OU5 QAPjP, Attachment 1, SOP for Petrex Environmental Surveys (DOE 1993b). The survey was completed over the grid system established for Area 22 (see Figure 1.2).

2.2.1.1. Installation

Two sets of time calibration samplers (timers) and 32 data samplers were installed on June 22, 1994. The remaining 40 data samplers were installed on June 28 and June 29, 1994. Locations of the timers and the data samplers are shown in Appendix D, Plate 1. The samplers and timers were installed at depths

Table II.3. Summary of Historical Radiological Data Collected in Area 22 (Mound Site Survey Project, 1983-1985)

Surface Location[a]	Plant Coordinates South	West	MRC ID No.	Mo-Yr	Depth (inch)	Plutonium-238 (pCi/g)	Thorium[b] (pCi/g)	Tritium (pCi/mL)	Cobalt-60 (pCi/g)	Cesium-137 (pCi/g)	Radium-226 (pCi/g)	Americium-241 (pCi/g)
S0787	3550	3400	9807	06-85	0	NR	NR	NA	143	7.0	0.4	LDL
S0775	3575	3350	2883	10-83	0	1.61	b	0.99				
S0773	3500	3200	2887	10-83	0	1.67	b	0.15				
S0790	3560	3390	9810	06-85	0	NR	NR	NA	54	LDL	0.7	LDL

[a]Surface locations are shown in Figure 2.3.
[b]A "b" indicates that the total thorium concentration was less than the background level of 2.0 pCi/g, using FIDLER screening. Therefore, radiochemical analysis was not performed.
FIDLER - field instrument for the detection of low-energy radiation
LDL - The measured concentration was below the lower detection limit, estimated to be 0.5 pCi/g for cobalt-60, cesium-137, and americium-241; and 1 pCi/g for radium-226.
MRC ID - Monsanto Research Corporation identification
NR - No result given
pCi/g - picocuries per gram
pCi/mL - picocuries per milliliter

Source: DOE, 1992b

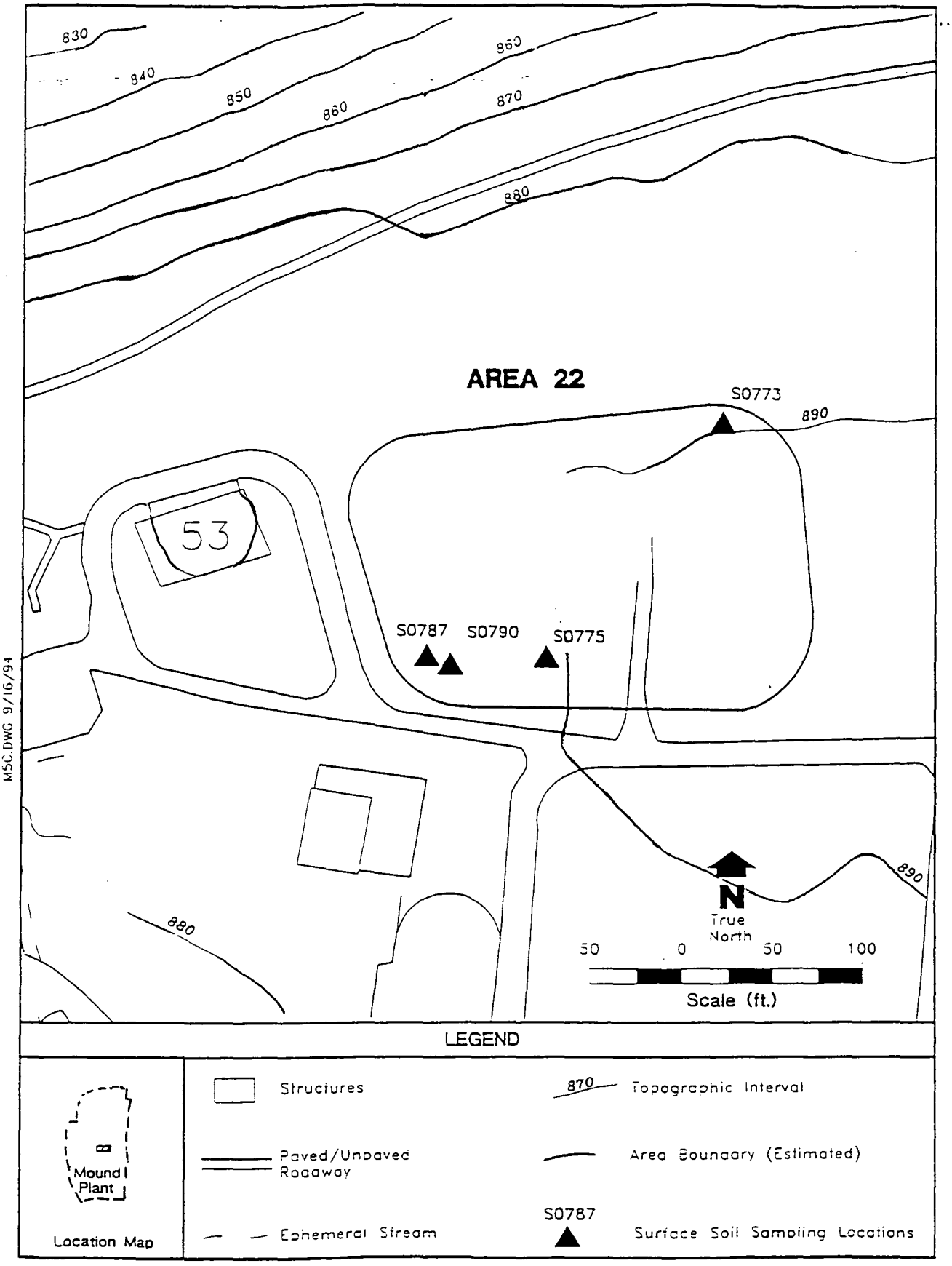

Figure 2.3. Surface Sampling Locations for Historical Radiological Data (Mound Site Survey Project, 1983-1985)

between 12-18 inches using an electric hammer drill and a 18 x 1.5 inch steel/tungsten carbide-tipped drill bit.

After each use, the drill bit was washed in a phosphate free detergent solution with a synthetic scrub brush, rinsed with deionized water, and allowed to air dry.

A FIDLER was used to monitor placing of all samplers and timers. Soil samples were collected from each of the locations for analysis at the Mound Soil Screening Facility. Results of the soil screening analyses are summarized in Section 2.1.4 and presented in their entirety in Appendix C.

2.2.1.2. Retrieval

On June 29, 1994, one timer from each of the two timer sets of timers was extracted, examined and sent to Northeast Research Institute LLC (NERI) for analysis. The timer analysis indicated low to moderate levels of petroleum hydrocarbons, terpenes, and C_9 alkylbenzenes. NERI recommended an exposure time of 10 to 14 days per sampler. All samplers were extracted from July 7 to July 13, 1994. Two of the samplers (H8 and F5) broke during extraction on July 7, and July 13, 1994, respectively. The sample wires were retrieved and immediately placed in clean test tubes. The samplers were wiped and prepared for shipment. On July 18, 1994, the samplers were sent to NERI for analysis.

2.2.2. Quality Assurance Summary Report

Field and laboratory analysis variances are summarized in the following subsections.

2.2.2.1. Field Variance Report

The soil gas survey was completed with no variances from the OU5 QAPjP (DOE 1993b). Minor variances from the SOP for Petrex Environmental Surveys and the Field Sampling Plan (FSP) (DOE 1993b) included decontamination procedures, timers and travel blanks.

One minor variance from the SOP, per instruction from NERI, was the elimination of the methanol rinse step from the decontamination process used for cleaning drill bits. The change was recommended by NERI.

Minor variances from the FSP occurred with sampler numbers, timers, and travel blanks. The first variance was a decrease from 117 to 72 samplers installed in Area 22 because 45 of the sampling points were located on a concrete pad covered with soil disposal boxes. These points were deleted from the Area. The second variance was a decrease in the number of timers installed in Area 22. The FSP requires five timers for an area this size, whereas NERI suggested that two timers were sufficient. The third variance from the FSP was the use of the travel blanks. As instructed by NERI, travel blanks were returned with the samplers only. No travel blanks accompanied the timers as written in the FSP. The FSP requires that travel blanks be returned with the timers and samplers, whereas NERI instructed that travel blanks be returned with samplers only.

2.2.2.2. Laboratory Data Variance Report

The analytical data was not formally validated. However, logbook entries were checked for accuracy, completeness, and format. On August 29, 1994, a report was submitted by NERI. On August 30, 1994, reported data and accompanying text were reviewed and changes submitted to NERI. A final report was received on September 1, 1994. Sample locations shown on Plate 1 of the NERI report (Appendix D) were checked against the field map to confirm that all sampling locations were correctly plotted; no errors were found. Ion count values for aromatic hydrocarbons, volatile halogenated compounds, SVOCs, and lubricants listed in Appendix D, Table 1, were checked for plot accuracy on Plates 2 through 5 of Appendix D; no errors were found.

2.2.3. Health and Safety Summary Report

The soil gas survey was conducted according to the OU5 South Property RI/FS Health and Safety Plan (DOE 1993c), and the ER Program Site-Specific Health and Safety Plan for OU5 Operational Area - Area 22. All sampling locations were checked for underground utilities to avoid severing utility lines while digging. Finally, health and safety issues were discussed and resolved during daily tailgate safety briefings conducted by the Site Health and Safety Officer and documented in the Site Manager Logbook (Appendix B).

All soil gas locations were screened using a FIDLER to avoid digging in radioactively-contaminated soil. Because Area 22 is considered a radioactively-contaminated area, the soil gas survey team submitted 24-hour urine samples for gamma scanning per Mound protocol for intrusive activities.

No accidents or safety violations were reported during the soil gas survey. A health and safety surveillance was conducted on August 23, 1994; no variances were found.

2.2.4. Presentation of Data

The Report of Findings of the Petrex soil gas survey is presented in Appendix D. The report discusses the Petrex method, the scope of work, method quality assurance/quality control (QA/QC), and results. Appendix D, Plates 1 through 5, show sample locations and significant ion counts of targeted compounds. Ion count values are the unit of measure assigned by the mass spectrometer to the relative intensities associated with each compound. These intensity levels do not represent actual concentrations. Soil gas data are considered semiquantitative in that multiple sources in soil and/or groundwater cannot be differentiated.

NERI was instructed to provide analytical data for four general classes of compounds in order to assess the potential for the presence of subsurface contamination:

- total aromatic hydrocarbons;
- SVOCs;
- total oil and grease range hydrocarbons (lubricants); and
- total halogenated compounds.

2.2.4.1. Distribution of Total Aromatic Hydrocarbons

Total aromatic hydrocarbons are reported as the combined level of C_6 to C_{15} aromatic, or benzene based hydrocarbon compounds. These aromatics are common components of gasoline, diesel fuel, heating oil, kerosene, and solvents.

Elevated levels of aromatics are present in the soil gas principally in the southern portion of Area 22 (Appendix C, Plate 2). Three sampling points outside this Area, to the northwest, showed elevated levels of aromatics. With the exceptions of samples #62 and #64, it is the C_7 and C_8 aromatics that are most prevalent in these areas.

2.2.4.2. Distribution of Total Semivolatile Hydrocarbons

Naphthalene, C_{11} through C_{15} alkyl naphthalenes, and C_{12}, C_{14}, and C_{16} polycyclic hydrocarbons are reported as total semi-volatile hydrocarbons. These compounds are constituents of creosote, coal tar, and other heavy, high boiling point fraction petroleum products.

The highest relative levels of SVOCs detected in soil gas were from samples #62 and #64, located in the southcentral portion of Area 22. Anomalous though less elevated levels of SVOCs were detected at two other points to the north and northeast (Appendix D, Plate 3).

2.2.4.3. Distribution of Total Oil and Grease Range Hydrocarbons

Total oil and grease range hydrocarbons detected are C_{13}, C_{14}, and C_{15} alkanes, cycloalkanes, alkenes, cycloalkenes, dienes, and alkynes. These hydrocarbons are common constituents of oils and greases but are also found in heavy fuels and heating oils.

Soil gas from samples #62 and #64 contained elevated levels of oil and grease range hydrocarbons. These sample points are in the southcentral portion of Area 22 and are displayed in Appendix D, Plate 4.

2.2.4.4. Distribution of Total Halogenated Hydrocarbons

Total halogenated hydrocarbons are reported as the combined levels of trichlorethene (TCE) and tetrachloroethene (PCE). TCE and PCE are most often used as solvents in degreasing, stripping, or dry cleaning operations.

As shown in Appendix D, Plate 5, total halogenated hydrocarbons were found in soil gas from the central, northern, and eastern portions of Area 22. The highest relative level came from sample #179 (grid point G5), located along the eastern edge of the area. PCE was detected much more frequently than was TCE. However, given the length of sampler exposure, halogenated hydrocarbons levels are low.

In summary, data from the Area 22 soil gas survey suggest that:

1. Petroleum hydrocarbons exist in the subsurface soil along the southern boundary and at limited isolated points to the northwest. Because the Petrex method is very sensitive to volatile organic and SVOCs, even the highest levels of hydrocarbons detected may represent concentrations that are not environmentally significant.

2. PCE is the principal halogenated hydrocarbon detected and was found at grid point G5 in the east central portion of the area. Given the sensitivity of the Petrex method to halogenated volatile organic compounds, even the level of PCE found may represent a concentration that is not environmentally significant.

2.2.5. Comparison with Historical Chemical Data

No historical data is available concerning the lateral and vertical distribution of any potential chemical contaminants in Area 22 (DOE 1993d). Therefore, no comparison with the Phase 1 investigation results can be made.

3. REFERENCES

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