

MOUND



**Environmental
Restoration
Program**

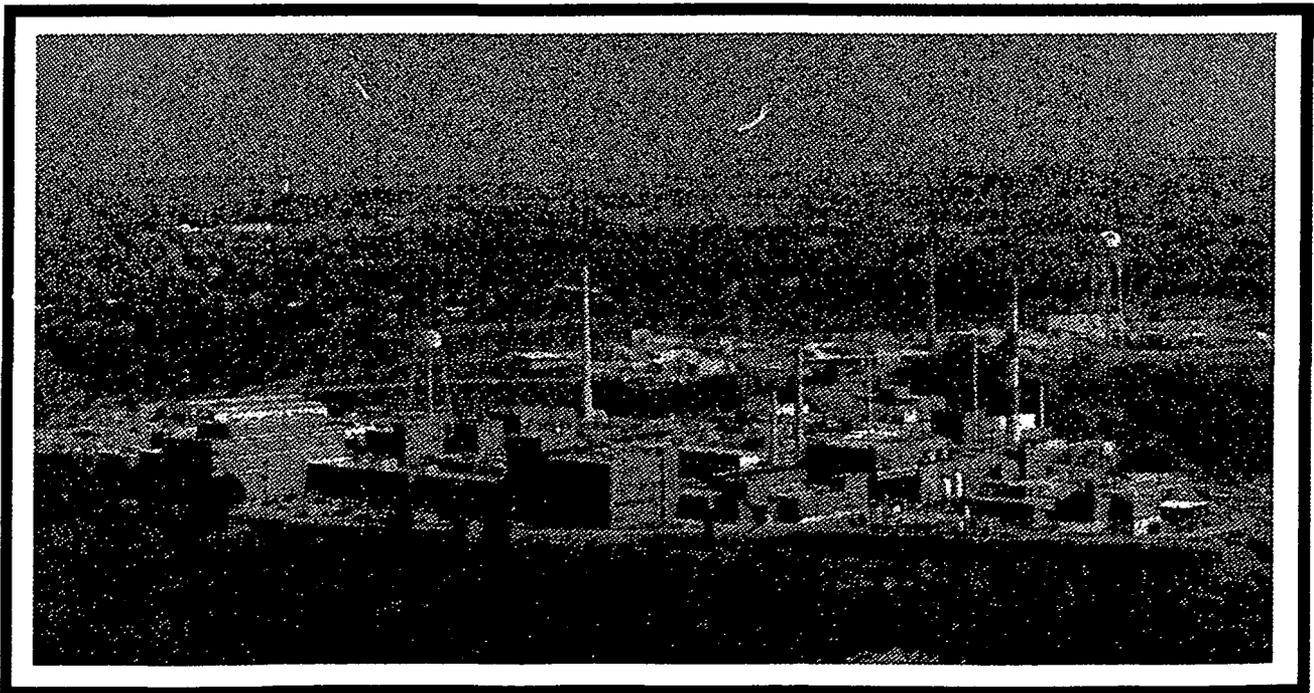


OhioEPA

MOUND PLANT

Potential Release Site Package

PRS # 244



MOUND



Environmental
Restoration
Program

MOUND PLANT POTENTIAL RELEASE SITE PACKAGE

Notice of Public Review Period

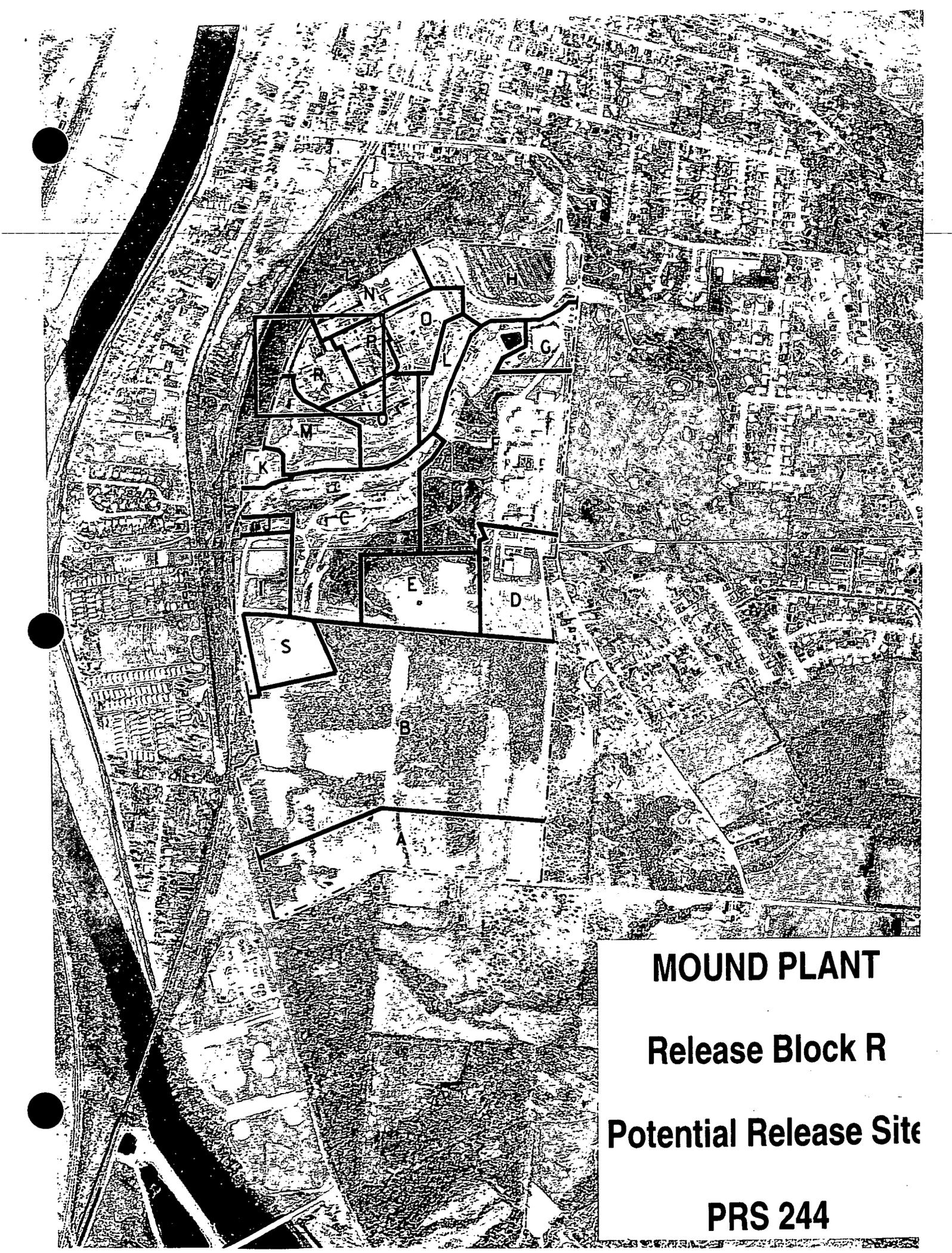


The following potential release site (PRS) packages will be available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio beginning January 30, 1997. Public comment will be accepted on these packages from January 30, 1997, through March 6, 1997.

- PRS 244: Soil Contamination - B Building**
- PRS 273: Soil Contamination - Area 12 (SM/PP Hillside)**
- PRS 309: Soil Contamination - Radiological Survey Site Location S0307**
- PRS 315/316/319: Waste Transportation Vehicles, Trash Dumpsters,
Epoxy Resin Waste Storage Site - Building 49**
- PRS 332: Waste Oil Tank - Building G (used engine oil)**
- PRS 338: Septic Tank - Building 29**
- PRS 400: Soil Contamination**
- PRS 401: Soil Contamination**

Questions can be referred to Mound's Community Relations at (937) 865-4140.

REV	DESCRIPTION	DATE
<p>0</p> <p>PUBLIC RELEASE</p>	<p>Available for comment.</p>	<p>Dec. 17, 1996</p>
<p>1</p> <p>FINAL</p>	<p>Comment period expired. No comments. Recommendation page annotated.</p>	<p>Mar. 11, 1997</p>

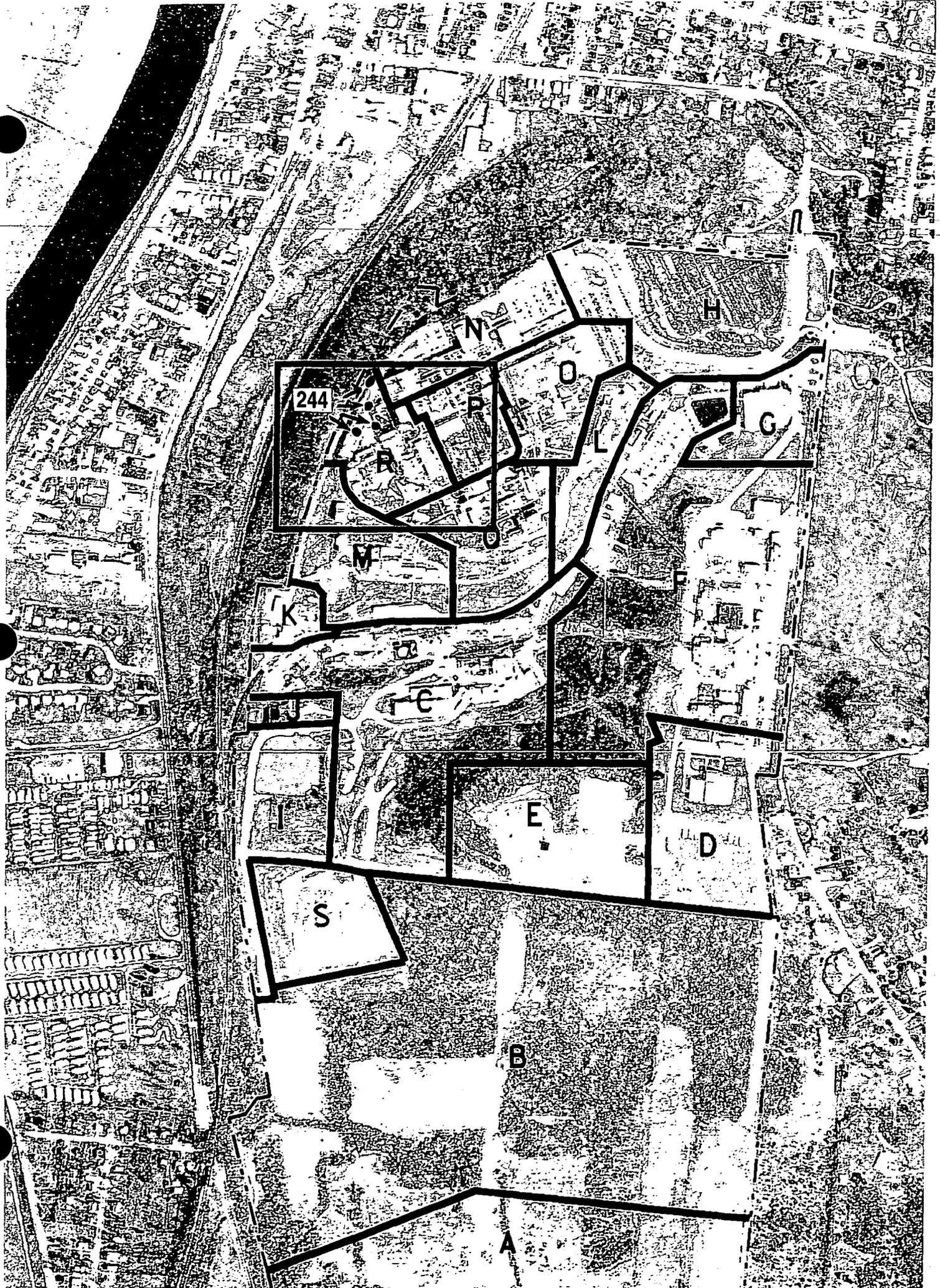


MOUND PLANT

Release Block R

Potential Release Site

PRS 244



244

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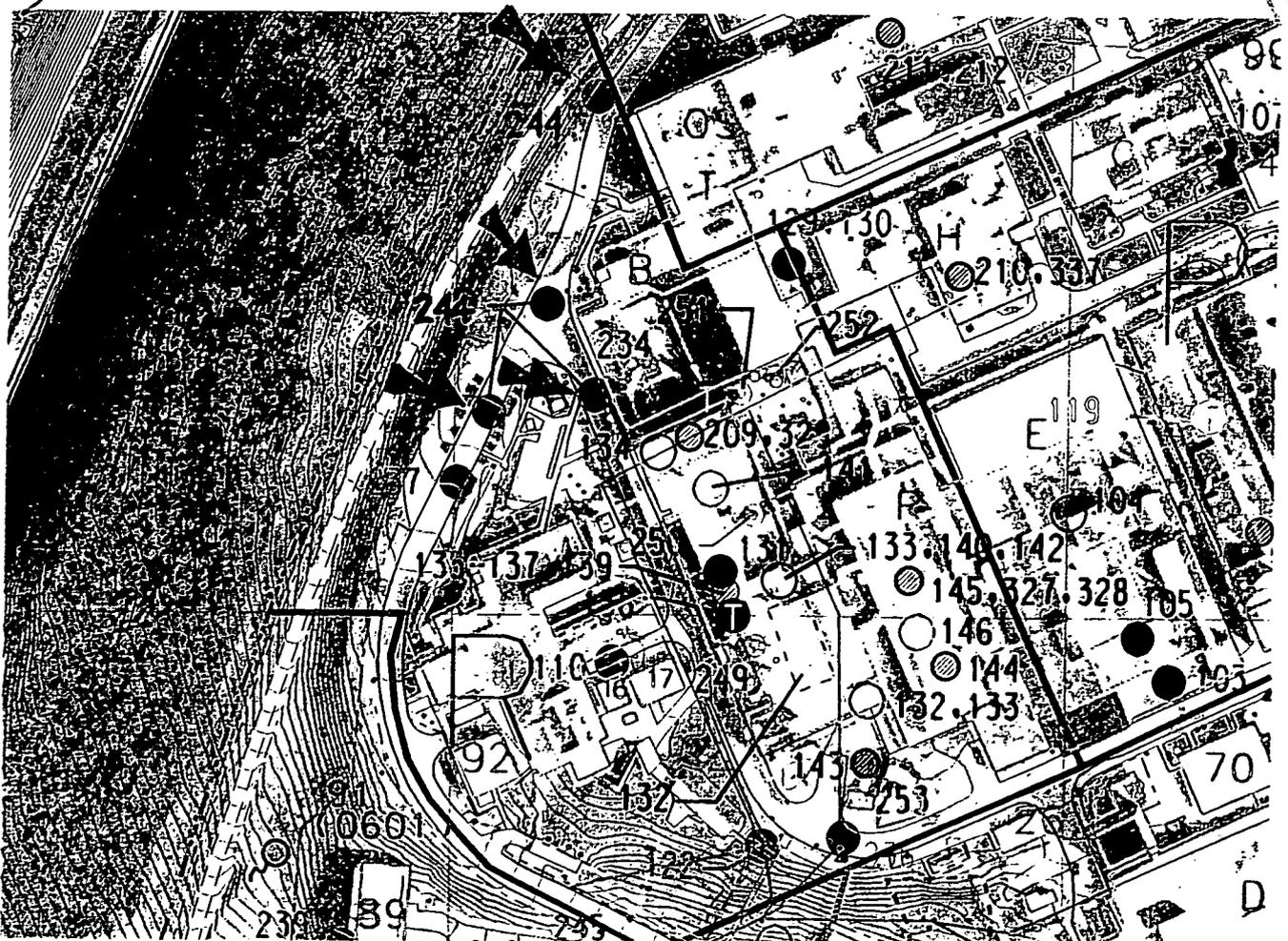
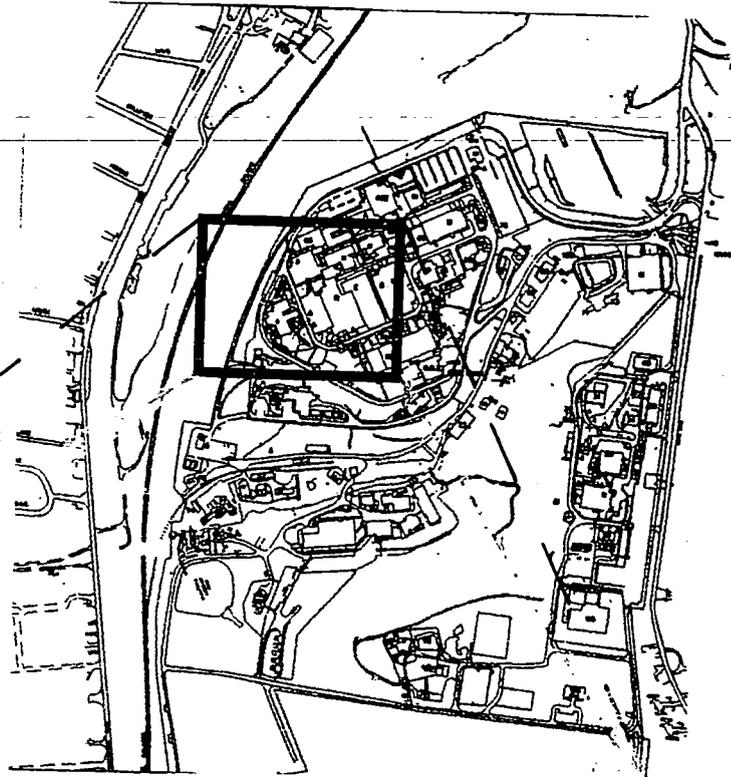
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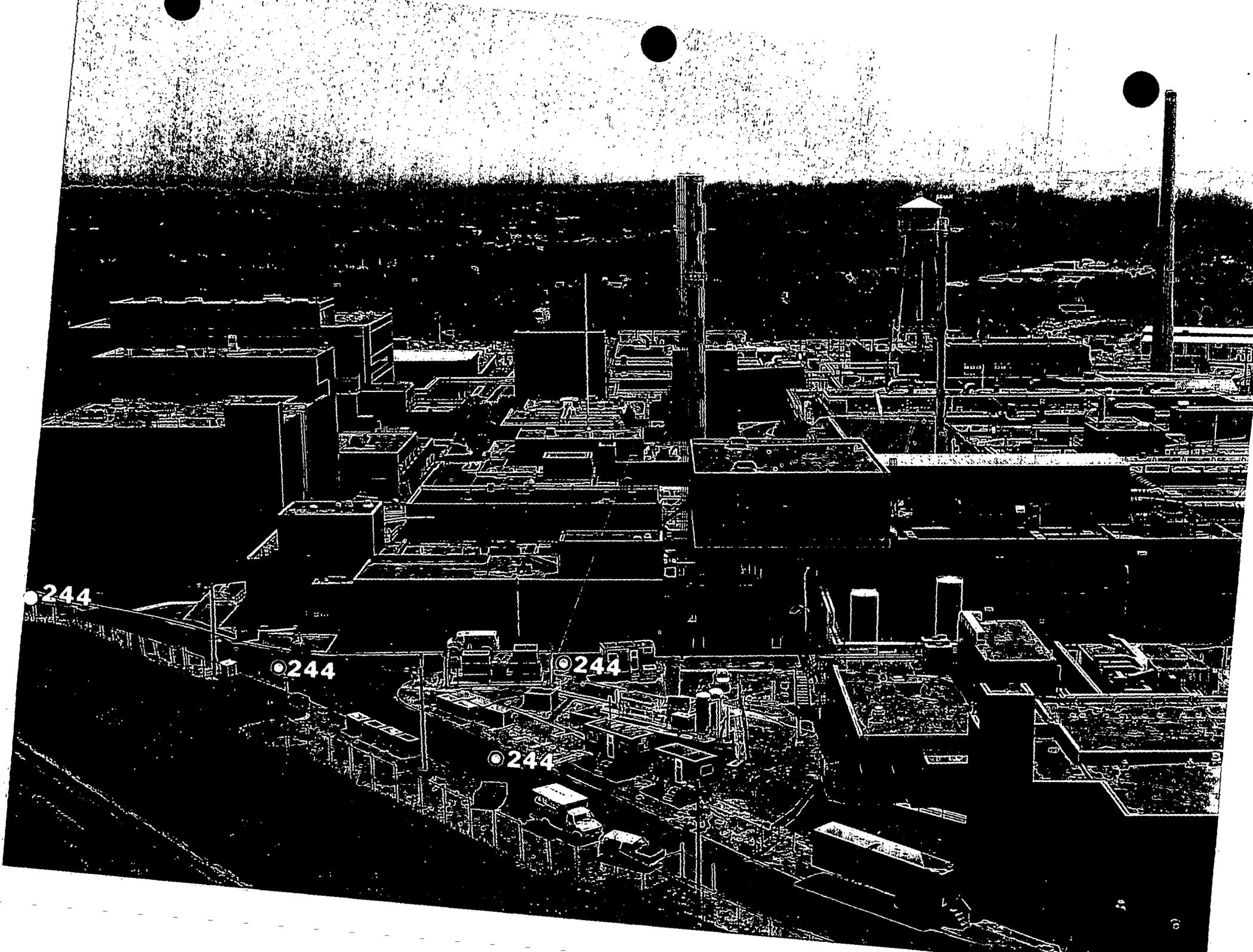
MOUND PLANT

Release Block R

Potential Release Site

PRS 244





244

244

244

244

PRS 244

PRS HISTORY:

PRS 244 is the soils area surrounding the Mound plant road located west of B Building and OSW Building. Volatile Organic Chemical (VOC) contamination was detected at four sampling locations from this area during the 1992 Site Soil Gas Survey.⁴

No hazardous or radioactive activities or processes are known to have occurred at the PRS 244 soils area.

Two buildings are adjacent to the PRS 244 soils area. OSW Building is an office/administration building. B Building is a former process building. Most of the rooms in this building have been closed by the Mound Plant shut down. Office areas and two rooms used by industrial hygiene are currently in use. During the period from the late 1940's to the early 1950's, B Building was the site of research on the biological effects of polonium and actinium.³ In the mid 1950's, B Building was converted to a manufacturing site for explosive components.³ In 1994, VOC contaminated soils on the east side of B Building were remediated via soil vapor extraction (ref. PRS 129/130).

CONTAMINATION:

D) SOIL GAS SURVEY⁴

A) **Investigation** - The 1992 Site Soil Gas Survey investigated VOCs by soil gas/gas chromatography.

- Eight types of VOCs were investigated.
- Six samples were taken in the vicinity of PRS 244 all at a 5 foot depth.
- Four sample locations had soil gas VOC detections (samples #1076, 1077, 1079, and 1080).

B) RESULTS

Results for which Contaminant Concentrations can be Compared to Guideline Values:

Contamination	Maximum Concentration Detected	Guideline Criteria (Calculated) ⁵
1,1,1 Trichloroethane	148 ppb (soil gas)	173,400 ppb (soil gas)
Toluene	27 ppb (soil gas)	414,600 ppb (soil gas)

NOTE: ppb = parts per billion

Other Results:

- 1,1,2-Trichloro-1,2,2-trifluoroethane (Freon 113) was detected. The maximum soil gas concentration was 2,934 ppb. There is no guideline value for Freon 113 contamination.

II) RADIOLOGICAL SITE SURVEY²

A) INVESTIGATION - The 1983 Radiological Site Survey analyzed soil for radioactivity via Mound Soil Screening, radiochemistry, and gamma spectroscopy.

- Three surface samples (S0134, S0144, and S0173) were taken in the vicinity of PRS 244.
- Samples were analyzed for plutonium-238 via Mound Soil Screening and radiochemical analysis, and for thorium via Mound Soil Screening.

B) RESULTS

Contamination	Maximum Concentration Detected	Guideline Criteria
Plutonium	0.47 pCi/g	25 pCi/g (Mound ALARA in surface soil)
Thorium	Less than 2 pCi/g	5 pCi/g (40CFR192) ⁶

NOTE: ALARA = As low as reasonably achievable, pCi/g = picocuries/gram

READING ROOM REFERENCES:

- 1) OU9, Site Scoping Report: Volume 12 - Site Summary Report, December 1994. (pages 6-8)
- 2) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey. (pages 9-16)
- 3) OU9, Site Scoping Report: Volume 7 - Waste Management. (pages 17-20)
- 4) Reconnaissance Sampling Report Soil Gas Survey & Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill, February 1993. (pages 21-29)

OTHER REFERENCES:

- 5) Comparison of Actual Soil Gas Values with Calculated Acceptable Soil Gas Values. (pages 30-32)
- 6) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.

PREPARED BY:

George Liebson, Member of EG&G Technical Staff

**MOUND PLANT
PRS 244
SOIL CONTAMINATION - B BUILDING**

RECOMMENDATION:

Potential Release Site (PRS) 244 was designated as a PRS because of the detection of volatile organic compounds (VOCs) in four sampling locations surrounding the Mound Plant road located west of B Building and OSW Building during the 1992 Soil Gas Survey.

The contaminants of concern detected during the 1992 Soil Gas Survey were toluene and 1,1,1 trichloroethane. Calculations were performed converting the toluene and 1,1,1 trichloroethane 10^{-6} Risk Based Guideline Value (given in mg contaminant per kg soil) to a corresponding 10^{-6} Risk Based Guideline Value for soil gas concentrations (parts contaminant per parts soil gas). The results of the calculation showed that the toluene detection was more than 15,000 times less than its guideline criteria and the 1,1,1 trichloroethane detection was more than 1,000 times less than its guideline criteria. Additionally, in 1983, three surface samples taken in the vicinity of PRS 244 showed plutonium-238 at a maximum concentration of 0.47 pCi/g and thorium-232 at a maximum concentration of less than 2 pCi/g. Both below their respective guideline criteria of 25 pCi/g and 5 pCi/g.

Therefore, since neither the 1992 Soil Gas Survey nor the 1983 Radiological Site Survey found any contaminants above their acceptable guideline criteria and since there is no additional laboratory data or history of evidence of contamination, PRS 244 requires NO FURTHER ASSESSMENT.

CONCURRENCE:

DOE/MB:

Arthur W. Kleinrath 12/17/96
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA:

Timothy J. Fischer 12/17/96
Timothy J. Fischer, Remedial Project Manager (date)

OEPA:

Brian K. Nickel 12/17/96
Brian K. Nickel, Project Manager (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 1/30/97 to 3/6/97



No comments were received during the comment period.



Comment responses can be found on page _____ of this package.

REFERENCE MATERIAL
PRS 244

Environmental Restoration Program

**OPERABLE UNIT 9 SITE SCOPING REPORT:
VOLUME 12 – SITE SUMMARY REPORT**

**MOUND PLANT
MIAMISBURG, OHIO**

December 1994

Final

**U.S. Department of Energy
Ohio Field Office**



EG&G Mound Applied Technologies

Table A.1. Comprehensive Tabulation of Potential Release Sites

Description of History and Nature of Waste Handling						Hazardous Conditions and Incidents			Environmental Data		
No.	Site Name	Location	Status	Potential Hazardous Substances	Ref	Releases	Media	Ref	Analytes ^a	Results	Ref
241	Northwest Parking Lots	D-7	Grounds	Toluene, Freon-113, Trichloroethene	12	Indicated by Soil Gas Survey	S	12	1	SGS ^b Table B.4 Locations 1002, 1007, 1008, 1009, 1010, 1014, 1101, 1102, 1106, 1109, 1110	12
242	VOC Potential Hot Spot Location 1016	D-7	Grounds	Toluene, Trichloroethene	12				1	SGS ^b Table B.4	12
243	VOC Potential Hot Spot Location 1064	E-7	Grounds	Toluene	12						
244	VOC Potential Hot Spot Locations 1076, 1077, 1079, and 1080	E-6	Grounds	Toluene, Freon-113, 1,1,1-Trichloroethane	12						
245	VOC Potential Hot Spot Location 1085	F-6	Grounds	Freon-113, Trichloroethene, 1,1,1-Trichloroethane	12						
246	VOC Potential Hot Spot Locations 1117 and 1118	G-7	Grounds	Tetrachloroethene	12						
247	VOC Potential Hot Spot Location 1129	F-8	Grounds	Freon-113, Trichloroethene, 1,1,1-Trichloroethane, Tetrachloroethene	12	Indicated by soil gas survey	S	12	1	SGS ^b Table B.4	12
248	HH Building Stack	F-7	In service	Polonium-210, Tritium	4, 18	None suspected beyond routine emissions	A	4, 18	Emissions reported in Annual Environmental Monitoring Reports		18
	W Building Stack (NCPDF)	E-6	In service	Tritium	4, 18						
	W Building Stack (SW1C)	E-6	In service	Uranium-238	4, 18						
	W Building Stack (HEFS)	E-6	In service	Tritium	4, 18						
	B Building Stack	E-6	Inactive	Polonium-210, Tritium	4, 18						
	T Building WEST Stack	F-6	In service	Tritium, Plutonium-238, 239, Uranium-238	4, 18						
	T Building EAST Stack	E-7	In service	Tritium, Plutonium-238, Uranium-238	4, 18						
	WD Building Stack (ALR)	F-6	In service	Plutonium-238	4, 18						

^aAnalyte List Codes
^bSGS, Soil Gas Survey
^cRSS, Radiological Site Survey

Table A.2. Assignment of Regulatory Authorities to Potential Release Sites and Recommendations for Further Action

No.	Site Name	Location	Status	Operational Jurisdiction			SWMU	Historic Activities		Further Action Recommended	FFA OU
				Regulated Units	Regulatory Authority	Spill Response		Evidence Of Release	Response Authority		
240	Site Survey Project Potential Hot Spot Location 80472	G-6	Grounds	/	AEA	/	/	Yes	AEA	Yes	6
241	Northwest Parking Lots	D-6 D-7	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
242	VOC Potential Hot Spot Location 1016	D-7	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
243	VOC Potential Hot Spot Location 1064	E-7	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
244	VOC Potential Hot Spot Locations 1076, 1077, 1079 and 1080	E-6	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
245	VOC Potential Hot Spot Location 1085	F-6	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
246	VOC Potential Hot Spot Locations 1117 and 1118	G-7	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
247	VOC Potential Hot Spot Location 1129	F-8	Grounds	/	AEA	/	/	Yes	CERCLA	Yes	2
248	HH Building Stack	F-7	In Service	NESHAP	CAA	AEA	/	No	NA	OM	/
249	SW Building Stack (NCPDF)	F-6	In Service	/	/	/	/	No	NA	OM	/
250	SW Building Stack (SW1C)	F-6	In Service	NESHAP	CAA	AEA	/	No	NA	OM	/
251	SW Building Stack (HEFS)	F-6	In Service	/	/	/	/	No	NA	OM	/
252	B Building Stack	E-6	Inactive	/	AEA	AEA	/	No	AEA	D&D	/
253	T Building WEST Stack	F-7	In Service	/	/	/	/	No	NA	OM	/
254	T Building EAST Stack	F-7	In Service	/	/	/	/	No	NA	OM	/
255	VD Building Stack (ALB)	F-6	In Service	NESHAP	CAA	AEA	/	No	NA	OM	/
	VD Building Stack (AHR)	F-6	In Service	/	/	/	/	No	NA	OM	/
	VD Building Stack (ISS)	F-6	In Service	/	/	/	/	No	NA	OM	/
	Area H Open Burn Unit (Pyrotechnic Waste Disposal Area)	I-7	In Service	/	/	/	SWMU	No	NA	OM	/
	Pyrotechnic Waste Shed	I-7	In Service	HWMUs included in Part B application	RCRA	RCRA	SWMU	No	NA	OM	/
	Thermal Treatment Unit	I-7	Inactive	/	/	/	SWMU	No	NA	OM	/
	Trash Burner	I-7	Historical	/	NA	NA	SWMU	No	CERCLA	No	5
	Retort	I-7	In Service	HWMU included in Part B application	RCRA	RCRA	SWMU	No	NA	OM	/

Environmental Restoration Program

**OPERABLE UNIT 9, SITE SCOPING REPORT
VOLUME 3 - RADIOLOGICAL SITE SURVEY**

**MOUND PLANT
MIAMISBURG, OHIO**

June 1993

FINAL

**Department of Energy
Albuquerque Field Office**

Environmental Restoration Program
EG&G Mound Applied Technologies



The drilling and sampling were performed using an auger drill rig and a 2-ft, split-barrel sampler. As the split-barrel sampler was removed from the borehole, it was monitored for radioactivity contamination by Mound Plant health physics personnel using a FIDLER to detect radioactivity contamination that would pose a hazard to the workers present. After the soil was removed from the sampler and placed in sample containers, field team members wearing gloves brushed the remaining soil out of the sampler. The gloves were then monitored with an alpha scintillometer before the split-barrel sampler was used again. However, no standard decontamination was performed.

The core locations are shown in Plate 1. The core locations were surveyed by a licensed surveyor after drilling was completed. The available reports submitted to Mound Plant by the drilling subcontractors are presented in Appendix B.

2.1.4. Sample Analyses

2.1.4.1. FIDLER Screening

In order to identify samples with concentrations of plutonium-238 exceeding 25 pCi/g and total thorium exceeding 2 pCi/g, all of the soil samples collected were pulverized and then screened using a Bicon® FIDLER at the Mound Plant Soil Screening Facility, known as trailer 15 at the time of the Site Survey Project. The Soil Screening Facility is now located in the H Building at Mound Plant (Plate 1). The minimum detectable activity at which plutonium-238 can be reliably detected at the Mound Plant screening facility is estimated to be 25 pCi/g (Draper 1986b). The detection of plutonium-238 at lesser concentrations (12-25 pCi/g) was unreliable and had an estimated error of ± 75 percent. The estimated error decreased with increasing sample activity; for samples with 25 to 100 pCi/g of plutonium-238, the estimated error was ± 35 percent, and for samples with > 100 pCi/g, the estimated error was ± 30 percent (Casella and Bishop 1984). The minimum detectable activity for thorium from FIDLER screening was estimated to be about 2 pCi/g (Stought et al. 1988). The Mound Plant procedure for screening soil samples is provided in Appendix A.

2.1.4.2. Radiochemical Analysis for Plutonium-238

Because of the high error (± 75 percent) involved in the FIDLER screening of samples containing less than 25 pCi/g of plutonium-238, all soil samples were radiochemically analyzed by Mound Plant for plutonium-238. The lower detection limit (LDL) for plutonium-238 by this method was estimated to be 0.01 pCi/g, with a relative precision (two standard deviations) of 25 percent. The overall precision of the plutonium-238 measurements was reported to be about 18 percent (DOE 1991b). The Mound

Plant procedure for the radiochemical analysis of soil samples for plutonium-238 is provided in Appendix A.

2.1.4.3. Radiochemical Analysis for Thorium

Samples with thorium concentrations in excess of 2 pCi/g by FIDLER screening were also radiochemically analyzed for thorium, resulting in the radiochemical analysis of about 12 percent of the samples. The LDLs for the thorium isotopes using radiochemical procedures were estimated to be

- 0.3 pCi/g for thorium-228, with a relative precision of 60 percent;
- 0.3 pCi/g for thorium-230, with a relative precision of 30 percent; and
- 0.1 pCi/g for thorium-232, with a relative precision of 70 percent.

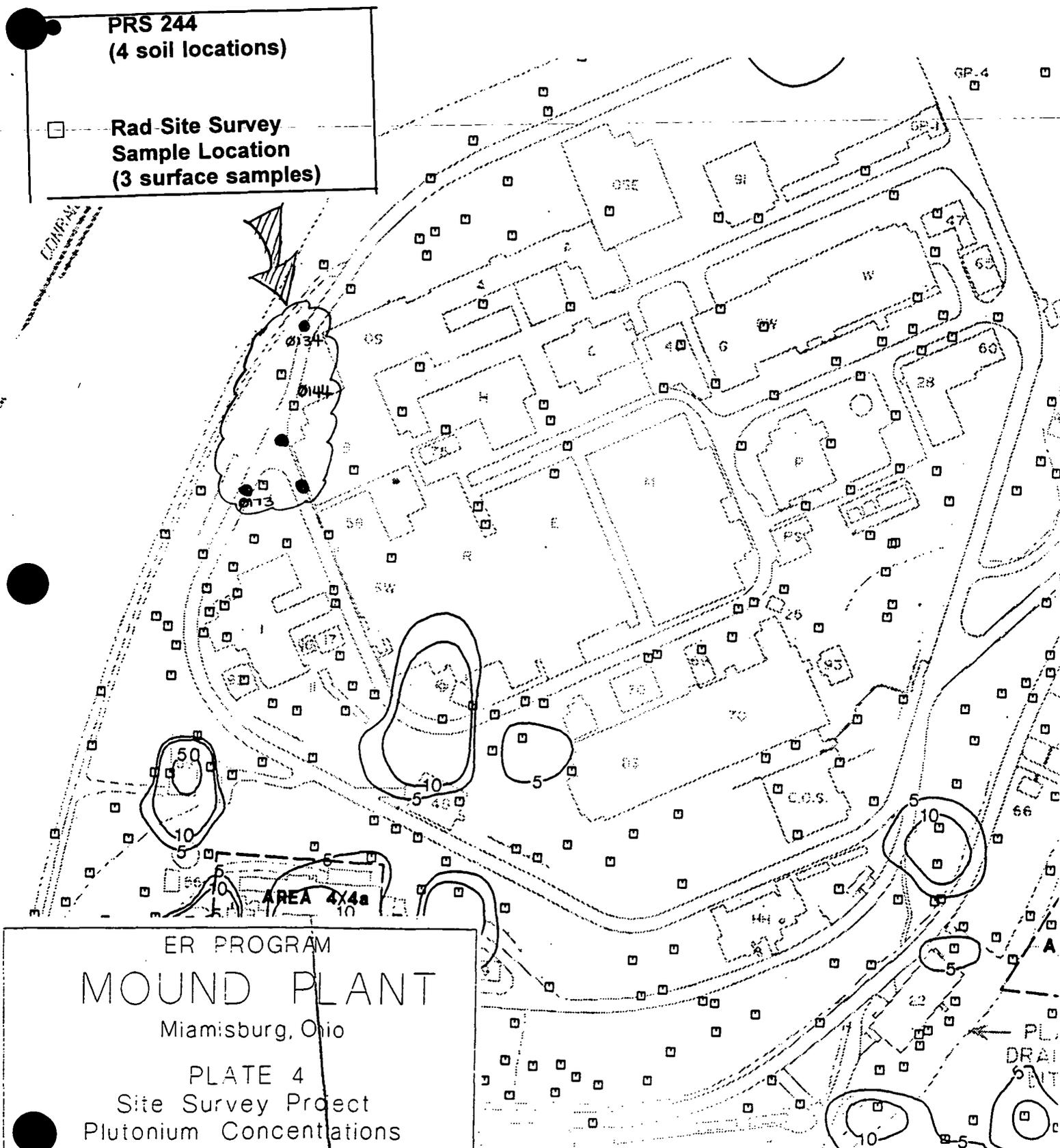
The overall precision for the thorium measurement was reported to be about 25 percent. The thorium results were reported in pCi of total thorium per gram of soil, isotopes were not identified. The Mound Plant procedure for the radiochemical analysis of soil samples for thorium is provided in Appendix A.

2.1.4.4. Gamma Spectroscopy

Gamma spectroscopy was performed by Mound Plant on approximately 350 (18 percent) of the soil samples in order to verify the identity of the radionuclides present when screening indicated the presence of gamma-emitting radionuclides, but little excess plutonium or thorium was identified by radiochemical analysis. Gamma spectroscopy is capable of detecting a variety of gamma-emitting radionuclides; the radionuclides detected in samples collected during the Site Survey Project included cobalt-60, cesium-137, radium-226, actinium-227, and americium-241. No other gamma-emitting radionuclides with gamma energies below 1.5 millielectron volts (MeV) were detected, although the project report stated that subsequent sampling and analysis in some areas indicated bismuth-207 and bismuth 210m. No polonium-210 peaks were detected in the Site Survey Project samples, confirming that polonium-210, which was used at Mound Plant in the 1950s, is no longer present due to radioactive decay (half-life of 138.4 days). The LDLs for cesium-137, cobalt-60, and americium-241 were given with the original data, and were estimated to be 0.5 pCi/g for each. The LDLs for radium-226 and actinium-227 were estimated to be 1.0 pCi/g for both (Stought 1990). The Mound Plant procedure for gamma spectroscopy is provided in Appendix A.

PRs 244
(4 soil locations)

Rad Site Survey
Sample Location
(3 surface samples)



ER PROGRAM
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Miamisburg, Ohio
PLATE 4
Site Survey Project
Plutonium Concentrations
Prepared for
Site Scoping Report: Volume 3,
Radiological Site Survey

- PRS 244
(4 soil locations)
- Rad Site Survey
Sample Location
(3 surface samples)

POSSIBLE
ELEVATED
THORIUM

AREA 23

AREA 20

ER PROGRAM
MOUND PLANT

Miamisburg, Ohio

PLATE 5

Site Survey Project
 Thorium Concentrations

Site Scoping Report: Volume 3,
 Radiological Site Survey

Map Location ^a	Coordinates		MRC ID No.	Mo-Yr	Depth (Inch)	Pu-238 (pCi/g)	Thorium ^b (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
	South	West										

C0251	0980	2850	8509	12-84	36	0.05	b					
S0124	1050	2945	4071	10-83	0	0.30	b	0.75				
S0125	1125	2970	4072	10-83	0	0.25	b					
S0128	1150	2820	4073	08-83	0	0.40	b					
S0127	1000	3050	4075	10-83	0	0.30	b					
S0128	1050	3250	4077	10-83	0	0.26 ^c	b					
S0129	1075	3025	4074	10-83	0	0.51	b	0.20				
S0130	1075	3075	7101	09-84	0	0.95	b					
S0131	1075	3100	4076	10-83	0	0.26	b					
S0132	1100	3100	7100	09-84	0	0.67	b					
S0133	1100	3225	4078	10-83	0	0.03	b					
S0134	1175	3375	4079	10-83	0	0.47	b					
S0135	1225	2670	3033	10-83	0	0.64	b					
C0250	1255	2930	8395	12-84	36	0.01	b					
S0137	1350	2720	6177	08-84	0	0.18 ^c	b					
S0138	1375	2795	6178	08-84	0	0.12	b					
S0139	1400	2670	3034	10-83	0	0.23	b					
S0140	1425	2845	3037	10-83	0	0.36	b					
S0141	1450	2770	6179	08-84	0	0.68	b					

E-8

Map Locallon ^a	Coordinates		MRC ID No.	Mo-Yr	Depth (Inch)	Pu-238 (pCi/g)	Thorium ^b (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
S0142	1500	2695	6181	08-84	0	0.43	b					
S0143	1200	3050	3049	10-83	0	0.46	b	1.34				
S0144	1225	3375	3045	10-83	0	0.03	b	6.33				
S0145	1250	3175	6182	08-84	0	0.02	b					
S0146	1300	3225	6183	08-84	0	0.64	b					
S0147	1350	3175	3047	10-83	0	0.02	b					
S0148	1350	3325	3046	10-83	0	0.20	b					
S0149	1375	3025	3044	10-83	0	0.15	b					
S0150	1400	3025	3048	10-83	0	0.06 ^c	b					
C0252	1445	3015	8400	12-84	36	0.13	b					
S0152	1475	3050	6184	08-84	0	0.20	b					
S0153	1475	3175	6185	08-84	0	0.20	b					
S0154	1495	3325	6186	08-84	0	0.03	b					
S0155	1550	2770	3090	10-83	0	0.54	b					
S0156	1600	2645	3095	10-83	0	0.27 ^c	b					
C0253	1670	2715	8396	12-84	36	0.11	b					
S0158	1675	2645	3094	10-83	0	0.73	b					
S0159	1750	2645	6210	08-84	0	0.17	b					
S0160	1775	2620	6209	08-84	0	0.17	b					

E 0

Map Location ^a	Coordinates		MRC ID No.	Mo-Yr	Depth (Inch)	Pu-238 (pCi/g)	Thorium ^b (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
	South	West										
S0161	1775	2795	3093	10-83	0	1.19	b					
S0162	1775	2845	6206	08-84	0	0.62	b					
S0163	1775	2870	6207	08-84	0	0.34	b					
S0164	1505	3175	3096	10-83	0	0.25	b					
S0165	1750	3300	6211	08-84	0	0.22 ^c	b					
S0166	1750	3350	4000	10-83	0	34.50	b					
S0167	1775	3225	6212	08-84	0	0.81	b					
S0168	1775	3275	3099	10-83	0	1.76	b	12.73				
S0169	1790	3010	8424	11-84	0	0.05	b					
S0170	1790	3025	3097	10-83	0	0.41	b					
S0171	1790	3200	3098	10-83	0	1.87	b					
S0172	1285	3555	4081	10-83	0	0.17	b	1.65				
S0173	1315	3465	3050	10-83	0	0.17 ^c	b					
C0254	1325	3630	8415	11-84	36	0.22	b					
S0175	1375	3580	9845	06-85	0	NR	NR		82	10	0.8	LDL
S0176	1375	3590	3051	10-83	0	2.82	b					
S0177	1385	3510	3055	10-83	0	1.17	b					

^aMap locations are given using a "C" to designate core locations and an "S" to designate surface locations.

^bA "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

pCi/g - picocuries per gram

pCi/mL - picocuries per milliliter

DEC

ENVIRONMENTAL RESTORATION PROGRAM

**OPERABLE UNIT 9
SITE SCOPING REPORT:
VOLUME 7 - WASTE MANAGEMENT**

**MOUND PLANT
MIAMISBURG, OHIO**

July 1992

**DEPARTMENT OF ENERGY
ALBUQUERQUE FIELD OFFICE**

**ENVIRONMENTAL RESTORATION PROGRAM
TECHNICAL SUPPORT OFFICE
LOS ALAMOS NATIONAL LABORATORY**

**DRAFT FINAL
(REVISION 0)**

metal chips were filtered to remove beryllium. Most beryllium machining was dry, however, and an extensive dust recovery system was employed. The air from the immediate area of beryllium machining was exhausted to a filter system to remove fine particulate. The beryllium dust was recycled to the Brush Beryllium Co., Cleveland, Ohio.

The assembly of the alpha emitted and target material required an inerting atmosphere. The assembled sources were placed in tantalum or stainless steel containers that were welded closed using tungsten inert gas welding or electron beam welding.

Sources were shipped from Mound to customers in 55-gallon steel drums. The drums containing the source were initially filled with water. The water leaked from the drums on occasion and was later replaced with paraffin; however, the risk of fire from using paraffin resulted in replacement with discs made from a plastic material such as formica or melamine. These packing containers were returned to Mound and reused.

The plutonium-239 neutron source production operations generated some wastes that created historical environmental problems. The radioactive work areas and waste streams within the production area of the R Building were not well controlled. On one occasion in September 1960, radioactive waste that should have been placed in the controlled containers went into the ordinary trash. When the error was discovered through inventory control, the historic landfill was surveyed with radiation instruments and several square feet of contaminated soil were removed. A piece of plutonium-239 had apparently been burned with the combustible trash. Immediate steps were taken to correct the problem. All trash from the plutonium source production rooms was thereafter dealt with as radioactive waste and disposed of by drumming for off-plant burial (Earner 1991). Shortly thereafter, the entire plutonium-239 neutron source production program was transferred to the MCC commercial facilities in Dayton.

2.14. BIOLOGICAL STUDIES

Studies of the biological effects of polonium were initially conducted as part of the Dayton Project and moved to the B Building at Mound in 1949. Research work focused on the chronic and acute effects of polonium. Research on actinium metabolism and tumor incidence began in 1952 (MCC 1952b). This program largely involved experiments with rats, although other small animals were also used including dogs, cats, rabbits, and mice. By February 1955, the program was halted (MCC 1955d). By June of 1955, the program was entirely transferred to ANL. The experimental program conducted at Mound paralleled work performed at the University of Rochester (Fink 1950). The experiments at the University of Rochester dealt with polonium, radium, and plutonium. Overall, the experiments

The lithium hydride stability studies involved the use of furnaces capable of high-temperature operation under controlled atmospheres. These studies were also performed in a dry box. The development of analytical methods for lithium hydride, deuteride, and tritide focused on the following analytes: Kjeldahl nitrogen; total hydrogen, deuterium, and tritium; lithium isotopic ratios; carbon, hydroxide, chloride, oxygen, sodium, potassium, and calcium; and free and isotopic lithium (Rhinehammer-1965).

2.15.2. Waste Generation

Compared with the size of the programs, the wastes generated by them were few. Lithium metal, lithium hydride, deuteride, tritide, hydrogen, deuterium, and tritium represent the majority of the waste produced in these studies. The analytical method development work used methanol, sulfuric and hydrofluoric acids, ethylbromide, Karl Fisher reagent, mercury, hydrochloric acid, silver nitrate, hydrobromic acid, barium hydroxide, and Nessler reagent.

Based on activity levels, tritium-contaminated aqueous wastes would be treated and disposed of as discussed in the tritium section. Gaseous waste containing hydrogen, tritium, and deuterium would be sent to the effluent removal system to recover tritium.

Lithium metal, lithium hydride, and deuteride are extremely reactive metals and had to be reacted with water to produce a waste that could be stored or undergo further treatment. The disposal of such wastes reportedly took place at Mound. In the mid-1950s, lithium hydride materials were reported as being disposed of by burning in the swampy area along the lower reach of the plant drainage ditch. The highly reactive materials were simply reacted with the water and allowed to burn. This area was referred to as Area C in the CEARP Installation Assessment (DOE 1986). After Building 34 was constructed in the mid-1960s, the disposal activity was moved to the standing water pond at the historic landfill site, known as Area B (DOE 1992g). Any associated contamination at these areas would be dependent on the effectiveness of the isotope separation operation.

2.16. DETONATORS AND EXPLOSIVES

In July 1955, plans and proposals were prepared for a detonator facility to be constructed at Mound. Plans were made to use Building I for explosive manufacturing, and Building B was to be used for inert manufacturing (Brawley 1955). In August 1956, Mound was directed to begin work on detonator assemblies required for the weapons program (MCC 1960). Thus began a long-lived program in the development and production of detonators, igniters, and actuators; in the research, development, and manufacture of pyrotechnic material and devices; and in the surveillance testing of explosive components. These programs involved research and development of plastic, adhesive, and ceramic

materials. Research, production, and testing included devices containing small quantities of energetic materials. The program began in the E, I, and SW buildings. In E Building, the plastics development program involved process improvement studies, new material investigations, evaluation of commercially produced plastic, and adhesive chemistry studies. In addition, detonator pilot plant operations and physical studies of high explosives were carried out. The detonator program was expanded into the SW Building in 1960. Explosive manufacturing was planned to take place in the I Building.

In 1961, the explosive program undertook the study of explosive purification. This program was conducted in Building 1 (Rhinehammer 1961).

2.16.1. Process Descriptions

2.16.1.1. Plastics Research

Plastics research at Mound conducted in the late 1950s and early 1960s was directed toward the development of a process for blending diallyl phthalate powders and filler materials into resins whose chemical and physical properties met certain performance standards and could be molded easily. Asbestos fibers, micas and china clays, and man-made materials such as Dacron were evaluated. Various pigments such as titanium dioxide were also evaluated (Eichelberger 1961a). The process involved formulation, followed by injection molding and physical testing of the finished products. Testing included tensile strength, impact resistance, and residual volatile contents. Formulations typically included Dapon 35, ter-butyl perbenzoate, benzoyl peroxide, 10-undecenoic acid, and acetone. Typical batches ranged from 15 g to 15 pounds (Eichelberger 1961b).

2.16.1.2. Adhesives Research

In the early 1960s, research conducted on adhesives was directed toward the reevaluation of all previous work on polyurethane and polyurethane-epoxy copolymer systems. Dozens of formulations were studied throughout the program, including effects of polyol content on epoxy-modified polyurethanes and the effects of di-epoxide modifiers on polyurethanes and the adiprene-ferric acetyl acetone-polyol systems. The polyols used were typically 1,3-butanediol, 1,4-butanediol, 1,2,6-hexanetriol, 1,5-pentanediol, and 1,1,1-trimethylpropane. Normal formulations required 20 to 30 g of Adiprene resin and 0.02 to 0.2 g of catalyst. Many formulations of commercial adhesives and epoxy compounds were evaluated. Some required solvents such as methyl ethyl ketone. Other amine curing agents, such as 4,4-methylene-bis-(2-chloroaniline), also known as MOCA, were also used. The adhesive formulations were evaluated for elastomer properties, cure times, pot life, viscosity, and application characteristics (Eichelberger 1961b).

Environmental Restoration Program

**RECONNAISSANCE SAMPLING REPORT
SOIL GAS SURVEY AND GEOPHYSICAL
INVESTIGATIONS, MOUND PLANT
MAIN HILL AND SM/PP HILL**

**REPORT
APPENDICES A, B AND D**

**MOUND PLANT
MIAMISBURG, OHIO**

February 1993

**Department of Energy
Albuquerque Field Office**

Environmental Restoration Program
EG&G Mound Applied Technologies



2. SOIL GAS SURVEY

2.1. SOIL GAS SAMPLING AND ANALYSIS PROCEDURE

All soil gas sampling was performed by driving 5-foot sections of drill rod and steel points into the subsurface and drawing soil vapor to a gas collection system mounted on a soil gas collection rig. As described in Appendix A of the February 1992 work plan, a vacuum pump draws soil vapors through the sampling apparatus at a flow rate of 100 ml/min. After at least three purge volumes have been vacuumed, a sample cartridge containing a 3-layer carbon sorption tube is attached and used to collect the soil gas sample.

During this investigation, most soil gas probes were installed using a truck-mounted hydraulic hammer. A few locations required manual hammering due to rig access difficulty; however, all sample collection activities were consistent and utilized the truck-mounted soil gas collection rig. Soil gas sampling depths varied according either to planned objectives or to probe penetration refusal which was frequently caused by shallow bedrock or the presence of buried rock/debris.

The five groundwater samples collected during this study were retrieved using 3/8-inch stainless steel bailers and nylon cord lowered down the inside of each probe. Each water sample was carefully poured into laboratory-prepared 40 ml VOA vials for subsequent analysis. Water samples were collected at sample locations 1065 and 1105 (Main Hill at 5 feet in depth), 2036 (Area 7 at 5 feet), and 4157 and 4160 (Building 51 at 25 feet).

All sampling equipment was decontaminated between locations using the procedures described in the work plan. Following the collection of each sample, the probes were pulled from the ground and the remaining hole backfilled with bentonite pellets.

All soil vapor and groundwater samples were analyzed in an on-site mobile laboratory for VOCs using U.S. EPA Method 8021. During the first 10-day field work shift the samples were analyzed for the six compounds described in the PAW. These included Freon 11, 1,2-dichloroethene (cis and trans), TCE, 111TCA, and toluene. Peaks on the gas chromatograph curves showed the presence of additional solvent-type VOCs. Consequently, the laboratory chemist added standards for Freon 113 and PCE, which were the most prevalent of the additional VOCs detected. Quality control samples were collected and analyzed throughout the field effort to monitor VOC interference, check data accuracy, and instrument calibrations, and evaluate purging efficiencies.

Prior to each day's soil gas sampling, field blanks of the entire sampling apparatus were taken and analyzed to check background contamination in the sampling system and cartridges. Duplicate soil gas or shallow groundwater samples were collected from each sampling location. Duplicate analyses were performed on at least 10% of the samples collected. For trip blanks, an unused sample cartridge was transported into the field with the sampling equipment. The trip blank cartridge was handled in the same manner as a sample, but a sample was not collected through this cartridge. The trip blank was returned to the lab with the other samples and analyzed. For ambient blanks, a randomly selected sampling cartridge was analyzed at the first daily location to detail interferences from cartridges or the analytical system.

Table II.1 summarizes the sample identification plan along with a description of quality control samples.

2.2. SAMPLE LOCATIONS AND DEPTHS

Table II.2 summarizes the sampling effort performed during this investigation, including a description of the collection dates, locations, depths, QA/QC identifications, and miscellaneous comments. The samples identified in Table II.2 were analyzed by the mobile laboratory. The variability of the identifications presented in the table is due to the discretion of the laboratory chemist, who for quality control purposes, would analyze some or all of the investigative, duplicate, or quality control samples collected at each location. Factors such as sample volume and sample dilution dictated whether the investigative or duplicate sample was analyzed. For ease of presentation, the base map included as Plate A is divided into six individual base maps within the text. These six base maps consist of Main Hill West, Main Hill East, Area J, Building 51 and Area 7, Main Parking Lot, and southwest of Main Hill. Sample locations within each of these areas are illustrated on Figures 2.1 through 2.6, respectively.

The discretionary sample locations and target depths were selected following completion of the sampling effort described in the PAW. Preliminary analytical results were distributed to personnel from U.S. EPA, OEPA, DOE, EG&G, and WESTON for review. Discussions were then held to select the additional 45 discretionary sample locations. Rationale for selection included the characterization of undefined areas, the better definition of nearby detected vapors, and the vertical profiling of contaminated areas.

Some deviations from the original work plan occurred during the field effort. The most common deviation was sampling depth, which was controlled by soil gas probe refusal depth. Table II.3 summarizes these deviations.

Table II.1 SAMPLE IDENTIFICATION PLAN

INVESTIGATIVE SAMPLES:	
Sample Matrix	Identification Scheme
Soil Vapor	MND-01-WXXX-YZZZ
QUALITY CONTROL SAMPLES:	
Type	Identification Scheme
Duplicate	MND-01-WXXX-1ZZZ
Trip Blank	MND-01-WXXX-2ZZZ
Ambient Blank (at 1st daily location)	MND-01-WXXX-3ZZZ
Field Blank (at lab each day)	MND-01-WXXX-5ZZZ

Explanations:

- MND = Mound Plant
 01 = Reconnaissance Sample
 W = General sample location, where
 1 = Main Hill
 2 = Area 7 and Main Parking Lot
 3 = Area J
 4 = Building 51 Area
 5 = Southwest of Main Hill
- X = Specific sample location
 Y = Quality control sample type
 Z = Sample depth

Table B.2. SUMMARY OF DATA IDENTIFICATIONS, LOCATIONS, AND DEPTHS

SAMPLE	DATE	LOCATION	SAMPLE DEPTH (FEET)	QA/QC
MND-01-1066-1005	8/11/92	Main Hill		Duplicate
MND-01-1067-0005	8/11/92	Main Hill	5	
MND-01-1069-1005	8/12/92	Main Hill		Duplicate
MND-01-1070-0005	8/12/92	Main Hill	5	
MND-01-1070-1005	8/12/92	Main Hill		Duplicate
MND-01-1070-2000	8/12/92	Main Hill		Trip Blank
MND-01-1071-0003	8/12/92	Main Hill	3	
MND-01-1071-3001	8/12/92	Main Hill		Ambient Blank
MND-01-1071-5000	8/12/92	Main Hill		Field Blank
MND-01-1072-0005	8/12/92	Main Hill	5	
MND-01-1072-1005	8/12/92	Main Hill		MS/MSD
MND-01-1074-0005	8/12/92	Main Hill	5	
MND-01-1074-1005	8/12/92	Main Hill		Duplicate
MND-01-1075-0005	8/12/92	Main Hill	5	
MND-01-1076-0005	8/12/92	Main Hill	5	
MND-01-1077-0005	8/12/92	Main Hill	5	
MND-01-1078-0005	8/13/92	Main Hill	5	
MND-01-1079-0005	8/13/92	Main Hill	5	
MND-01-1080-0005	8/13/92	Main Hill	5	
MND-01-1080-2000	8/13/92	Main Hill		Trip Blank
MND-01-1081-0005	8/13/92	Main Hill	5	
MND-01-1081-5000	8/13/92	Main Hill		Field Blank
MND-01-1082-0005	8/13/92	Main Hill	5	
MND-01-1082-1005	8/13/92	Main Hill		MS/MSD
MND-01-1083-0005	8/13/92	Main Hill	5	
MND-01-1083-1005	8/13/92	Main Hill		Duplicate
MND-01-1084-0005	8/13/92	Main Hill	5	
MND-01-1085-0005	8/13/92	Main Hill	5	
MND-01-1086-0005	8/13/92	Main Hill	5	
MND-01-1087-0005	8/13/92	Main Hill	5	
MND-01-1088-0005	8/13/92	Main Hill	5	
MND-01-1089-0005	8/13/92	Main Hill	5	
MND-01-1090-0005	8/13/92	Main Hill	5	
MND-01-1091-0005	8/14/92	Main Hill	5	
MND-01-1092-0005	8/14/92	Main Hill	5	
MND-01-1092-2000	8/14/92	Main Hill		Trip Blank
MND-01-1093-0005	8/15/92	Main Hill	5	
MND-01-1093-3002	8/14/92	Main Hill		Ambient Blank
MND-01-1093-5000	8/14/92	Main Hill		Field Blank
MND-01-1094-0005	8/14/92	Main Hill	5	
MND-01-1095-0002	8/14/92	Main Hill	2	
MND-01-1095-1002	8/14/92	Main Hill		MS/MSD
MND-01-1096-0003	8/14/92	Main Hill	3	
MND-01-1096-1003	8/14/92	Main Hill		Duplicate
MND-01-1097-0002	8/14/92	Main Hill	2	
MND-01-1098-0004	8/15/92	Main Hill	4	
MND-01-1099-0008	8/15/92	Main Hill	5	
MND-01-1099-2000	8/15/92	Main Hill		Trip Blank
MND-01-1100-0004	8/15/92	Main Hill	4	
MND-01-1100-2000	8/15/92	Main Hill		Trip Blank
MND-01-1100-3001	8/15/92	Main Hill		Ambient Blank
MND-01-1100-5000	8/15/92	Main Hill		Field Blank
MND-01-1101-0005	8/16/92	Main Hill	5	
MND-01-1101-3002	8/16/92	Main Hill		Ambient Blank
MND-01-1101-5000	8/16/92	Main Hill		Field Blank
MND-01-1102-0005	8/16/92	Main Hill	5	
MND-01-1102-1005	8/16/92	Main Hill		MS/MSD
MND-01-1103-0005	8/16/92	Main Hill	5	
MND-01-1103-1005	8/16/92	Main Hill		Duplicate
MND-01-1104-0003	8/16/92	Main Hill	3	
MND-01-1105-0005w	8/17/92	Main Hill	5	
MND-01-1105-1005w	8/17/92	Main Hill		Duplicate
MND-01-1105-2000w	8/17/92	Main Hill		Trip Blank
MND-01-1105-5000w	8/17/92	Main Hill		Field Blank
MND-01-1106-0003	8/16/92	Main Hill	3	
MND-01-1107-1005	8/16/92	Main Hill		Duplicate
MND-01-1108-0005	8/16/92	Main Hill	5	
MND-01-1109-0005	8/16/92	Main Hill	5	
MND-01-1110-0005	8/16/92	Main Hill	5	
MND-01-1110-2000	8/17/92	Main Hill		Trip Blank
MND-01-1111-0005	8/17/92	Main Hill	5	
MND-01-1111-5000	8/17/92	Main Hill		
MND-01-1112-0005	8/17/92	Main Hill		

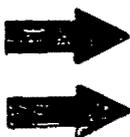


TABLE II.4. SUMMARY OF POSITIVE DETECTIONS—MAIN HILL
(ppb)

SAMPLE ID	SAMPLE DATE	FREON 11	FREON 113	TRAN-12DCE	CIS-12DCE	111TCA	PCE	TCE	TOLUENE
MND-01-1002-1003	28 JUL 92	----	----	----	----	----	----	----	40
MND-01-1003-0005	28 JUL 92	----	----	----	----	----	----	----	3*
MND-01-1005-0005	28 JUL 92	----	----	----	----	----	----	----	21*
MND-01-1007-0005	29 JUL 92	----	----	----	----	----	----	2	----
MND-01-1008-0005	29 JUL 92	----	----	----	----	----	----	----	5
MND-01-1008-1005	29 JUL 92	----	----	----	----	----	----	----	3
MND-01-1009-0005	29 JUL 92	----	----	----	----	----	----	4	19
MND-01-1010-0005	29 JUL 92	----	----	----	----	----	----	----	13
MND-01-1014-0005	29 JUL 92	----	----	----	----	----	----	----	8
MND-01-1016-0003	30 JUL 92	----	----	----	----	----	----	2	8
MND-01-1046-0005	4 AUG 92	----	----	----	----	2	----	168	3*
MND-01-1047-0005	4 AUG 92	----	----	----	----	7	----	4	----
MND-01-1048-0005	4 AUG 92	----	----	----	----	6	----	4	----
MND-01-1050-0003	4 AUG 92	----	----	----	----	----	----	8	----
MND-01-1050-1003	4 AUG 92	----	----	----	----	----	----	17	27*
MND-01-1051-0003	4 AUG 92	----	----	----	----	----	----	8	5*
MND-01-1052-0003	4 AUG 92	----	----	----	----	----	----	----	13*
MND-01-1053-0002	5 AUG 92	2	----	----	----	----	----	----	447
MND-01-1054-0005	5 AUG 92	4	----	----	----	7	----	226*	11
MND-01-1055-1005	5 AUG 92	----	----	----	----	----	----	4*	5
MND-01-1057-0005	5 AUG 92	----	----	----	----	----	----	----	24
MND-01-1062-0003	5 AUG 92	----	----	----	----	13	----	6	----
MND-01-1064-0005	11 AUG 92	----	----	----	----	----	----	----	19
MND-01-1066-0005	11 AUG 92	----	----	----	----	6	----	----	228
MND-01-1067-0005	11 AUG 92	----	----	----	----	----	----	11	133
MND-01-1069-1005	12 AUG 92	----	----	----	----	----	----	----	37
MND-01-1070-0005	12 AUG 92	----	----	----	----	----	----	----	5
MND-01-1070-1005	12 AUG 92	----	----	----	----	----	----	----	5
MND-01-1072-0005	12 AUG 92	----	----	----	----	----	----	----	108
MND-01-1074-0005	12 AUG 92	----	799	----	----	----	1191	----	5
MND-01-1074-1005	12 AUG 92	----	812	----	----	----	1117	----	5
MND-01-1076-0005	12 AUG 92	----	2834	----	----	148	----	----	----
MND-01-1077-0005	12 AUG 92	----	----	----	----	----	----	----	27
MND-01-1079-0005	13 AUG 92	----	13	----	----	----	----	----	----
MND-01-1080-0005	13 AUG 92	----	13	----	----	----	----	----	----
MND-01-1086-0005	13 AUG 92	----	47	----	----	----	----	----	----
MND-01-1093-0005	15 AUG 92	----	**131000	247	40800	----	----	**34780	53*
MND-01-1094-0005	14 AUG 92	----	83	13	485	----	----	978	----
MND-01-1097-0002	14 AUG 92	----	----	----	----	----	----	6	8
MND-01-1099-0005	15 AUG 92	----	----	----	----	----	----	4	8*
MND-01-1101-0005	16 AUG 92	----	----	----	----	----	----	----	8
MND-01-1102-0005	16 AUG 92	----	----	----	----	----	----	----	13
MND-01-1106-0003	16 AUG 92	----	----	----	----	----	----	6	----
MND-01-1106-0005	16 AUG 92	----	----	----	----	----	----	6	----
MND-01-1109-0005	16 AUG 92	----	----	----	----	----	----	8	13
MND-01-1110-0005	16 AUG 92	----	----	----	----	----	----	----	255

SOIL GAS DATA
(ABSOLUTE)

TABLE II.4. SUMMARY OF POSITIVE DETECTIONS--MAIN HILL
(ppb)

SAMPLEID	SAMPLE DATE	FREON 11	FREON 113	TRAN-12DCE	CIS-12DCE	111TCA	PCE	TCE	TOLUENE
MND-01-1113-0005	17 AUG 92	---	---	---	---	---	---	11	---
MND-01-1114-0005	17 AUG 92	---	9	---	---	315	10	357	5*
MND-01-1114-1005	17 AUG 92	---	---	---	---	259	9	283	3*
MND-01-1115-0005	17 AUG 92	---	---	---	---	56	---	13	---
MND-01-1117-0005	18 AUG 92	---	---	---	---	---	12	8	---
MND-01-1117-1005	18 AUG 92	---	---	---	---	---	15	9	---
MND-01-1118-0005	18 AUG 92	---	---	---	---	---	3	---	---
MND-01-1119-0005	18 AUG 92	---	---	---	---	---	---	---	213
MND-01-1122-0005	18 AUG 92	801	13	---	---	---	---	---	---
MND-01-1123-0005	18 AUG 92	---	---	---	---	---	---	---	5*
MND-01-1124-0005	18 AUG 92	---	---	---	---	---	---	---	8884*
MND-01-1127-0005	18 AUG 92	---	---	---	---	---	4	---	27*
MND-01-1129-0005	18 AUG 92	---	10	---	---	37	12	4	11*
MND-01-1190-0005	24 SEP 92	240	477	---	---	---	---	---	3*
MND-01-1190-1005	24 SEP 92	287	707	---	---	---	---	---	3*
MND-01-1192-0005	24 SEP 92	---	---	---	---	---	---	---	5*
MND-01-1193-0005	24 SEP 92	---	---	---	---	---	---	---	16*
MND-01-1196-0005	25 SEP 92	---	---	---	---	---	---	4	64
MND-01-1197-0002	25 SEP 92	---	---	---	---	---	---	23	5
MND-01-1198-0008	25 SEP 92	---	24	13	518	33	---	474	5
MND-01-1199-0002	25 SEP 92	---	10218	---	120	---	---	479	---
MND-01-1201-0007	25 SEP 92	---	4716	13	811	---	---	130	48
MND-01-1201-1007	25 SEP 92	---	5895	---	612	---	---	117	43
MND-01-1202-0002	25 SEP 92	---	6419	66	2499	9	---	1921	3
MND-01-1202-1002	25 SEP 92	---	9301	41	1706	---	---	1737	---
MND-01-1203-0002	25 SEP 92	---	1475	---	334	---	---	45	192
MND-01-1204-0005	25 SEP 92	---	453	---	---	---	---	11	5
MND-01-1205-0005	25 SEP 92	---	---	---	---	---	---	---	21
MND-01-1206-0005	26 SEP 92	---	---	---	---	---	---	---	23142
MND-01-1207-0005	26 SEP 92	---	---	---	---	---	---	---	90
MND-01-1227-0005	28 SEP 92	---	10	---	---	---	---	---	4788
MND-01-1228-0005	28 SEP 92	---	---	---	---	---	---	---	11
MND-01-1230-0005	28 SEP 92	---	---	---	---	---	---	---	13
MND-01-1230-1005	28 SEP 92	---	---	---	---	---	---	---	5
MND-01-1231-0005	28 SEP 92	---	48	---	---	---	34	21	5
MND-01-1232-0005	28 SEP 92	---	4	---	---	---	13	8	24
MND-01-1233-0002	29 SEP 92	---	29	---	---	---	---	---	72
MND-01-1233-1002	29 SEP 92	---	29	---	---	---	---	---	84

NOT LISTED
IN REFERENCE
1195
WAS
NOT LISTED

Notes:

- Only sample locations having positive detections are shown.
- *: Associated trip, ambient, equipment or field blank contained specified compound.
- B: Indicates blank sample.
- w: Indicates water sample.
- ** : Freon 113 & TCE Off-Scale

SOIL GAS DATA (ABSOLUTE)

COMPARISON OF ACTUAL SOIL GAS
VALUES WITH CALCULATED
ACCEPTABLE SOIL GAS VALUES

SCREENING POTENTIAL RELEASE SITES BASED ON SOIL GAS READINGS

Soil gas readings can be utilized in the PRS screening process to identify potential release sites that may present a potential soil contamination problem for volatile organics. The soil gas survey that was conducted at Mound as part of the "Reconnaissance Sampling Report--Soil Gas Survey and Geophysical Investigations, Mound Plant Main Hill and SM/PP Hill" investigated 8 volatile compounds. The concentrations of these compounds in the in the vapor phase within the pore spaces of the soil can be correlated to the actual soil contaminant concentrations by utilizing a method developed by ICF Kaiser Engineers. This technique has been used with US EPA Region IX approval at a large Superfund site contaminated with many of the same chemicals found at relatively low levels in soils at the Mound Plant.

The soil concentration can be estimated from the soil gas values by the following equation:

$$C_t = (C_g/P_b) * [(P_b * K_d / H) + [p_w / H] + [p_t - p_w]]$$

where

C _g	concentration of volatile chemical concentrations as soil vapor in ng/ml
P _b	Bulk density of the soil in g/ml
K _d	soil/water partition coefficient in ml/g
H	Dimensionless Henry's Law Constant
p _w	water filled porosity
p _t	total porosity
C _t	target soil concentration in ng/g or ug/kg (ppb)

The technique that Mound Plant will use for screening a PRS, is to compare the soil gas values obtained at a PRS with soil gas concentrations that are known to be below any regulatory or health based level of concern. The risk based guideline values for the Mound Plant (DOE, December 1995) soils are based upon 10⁻⁶ risk levels or a hazard index of 1. These values correspond to direct soil exposure to persons who's activities place them at the highest risk, in particular inhalation and ingestion by a Mound Plant construction worker.

Another potential exposure path must be considered, however. The potential for some of the organic contaminants to leach into ground water must be considered in developing protective soil screening levels. A "Mound Plant Soil Screening Level" paper explains the calculation of soil screening levels. For all of the chemicals that the soil gas survey identified, the calculated soil screening level soil concentrations are below the standard guideline values, therefore they are more conservative and are appropriate to be used as the basis for the soil gas calculations.

By re-arranging the equation, and using either the soil guideline values or the soil screening levels as the target soil concentration, a soil gas concentration can be calculated; this calculated soil gas concentration can be compared to the actual observed soil gas values:

$$C_g = (P_b * C_t) / [(P_b * K_d / H) + [p_w / H] + [p_t - p_w]]$$

The values of the soil specific and chemical parameters for this equation are summarized as follows:

P _b	1.6	Bulk density of the soil in g/ml
p _w	0.15	water filled porosity
p _t	0.43	total porosity
foc	0.02	fraction organic material in soil (used in developing the SSL values)

Typical chemicals that are detected with soil gas sampling are:					
NAME	H	Kd	Calculated Acceptable Soil Screening Level Value	Calculated Acceptable Soil Gas Reading	Calculated Acceptable Soil Gas Reading
		ml/g	mg/kg (ppm)	ng/ml	ppb
Toluene	2.52E-01	3.42	22.06	1.56E+03	414600
Trichloroethene (TCE)	4.35E-01	2.24	0.07	1.26E+01	2400
111 Trichloroethane (TCA)	7.63E-01	2.2	3.01	9.46E+02	173400
Trans-1,2 Dichloroethene (DCE)	2.29E-01	1	0.70	1.41E+02	35700
cis-1,2 Dichloroethene (DCE)	1.85E-01	2.78	0.31	1.97E+01	5000
Freon 11	NA	NA			
Freon 113	NA	NA			
Tetrachloroethene (PCE)	7.09E-01	2.78	0.09	2.13E+01	3100

na not available

IF THE SOIL GAS READING IS BELOW THE VALUES IN THE CALCULATED SOIL GAS READING COLUMN (SHADED), THEN THERE IS NO THREAT TO GROUNDWATER FROM THIS PRS.

The soil screening level values are calculated using the Soil Screening Methodology. The Potential Release Site is assumed to be more than 100 meters from a potential drinking water source with an aquifer thickness of 15 meters and a source size of 10 meters. The hydraulic gradient is assumed to be 0.01 which is conservative for most of the Mound Plant PRSs. In special instances where the PRS lies less than 100 meters from a potential drinking water source, or the hydraulic gradient is much less than 0.01, new SSL values and new acceptable soil gas values will be calculated for that particular PRS.