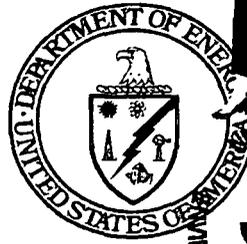


# MOUND

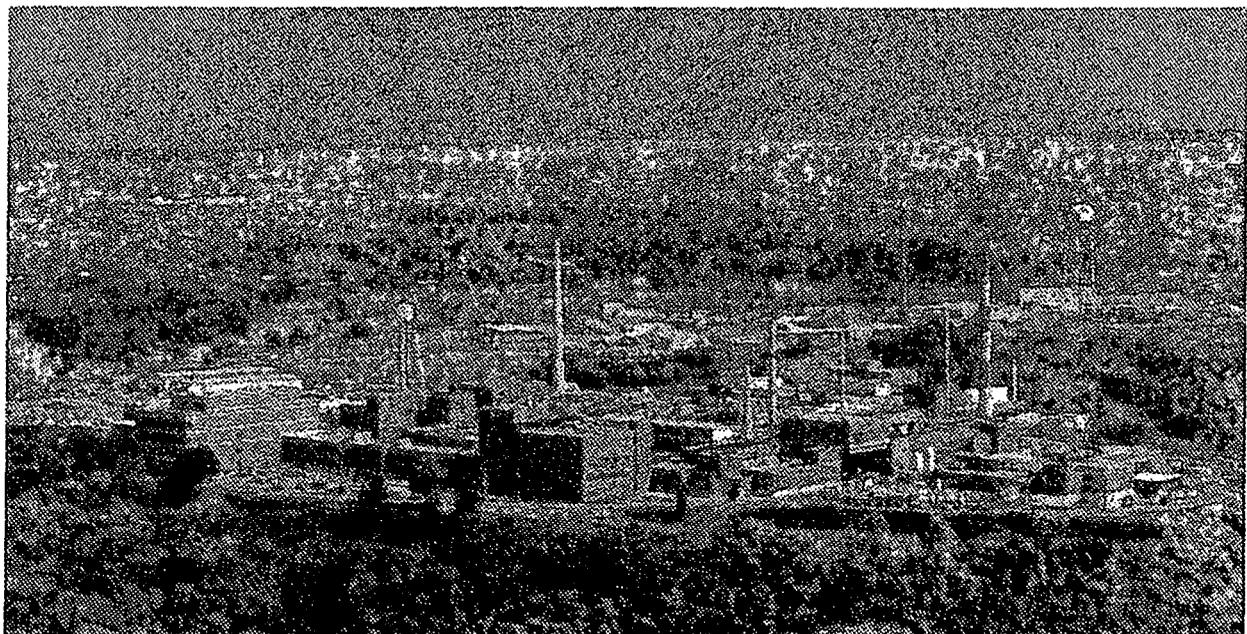


Environmental  
Restoration  
Program



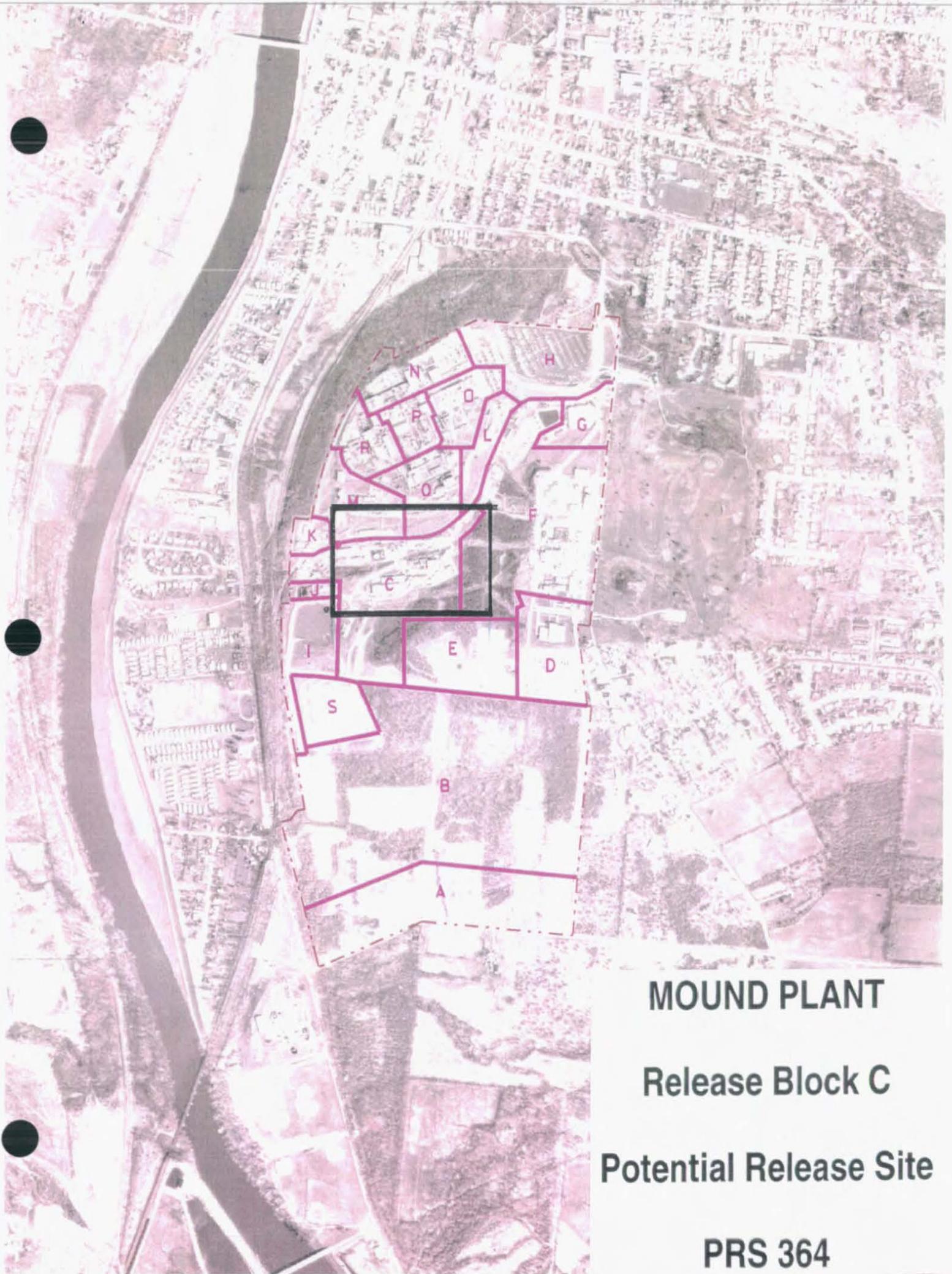
OhioEPA

## MOUND PLANT Potential Release Site Package PRS # 364



PRS 364

REV	DESCRIPTION	DATE
0 PUBLIC RELEASE	Available for comment.	Dec. 19, 1996
1 FINAL		

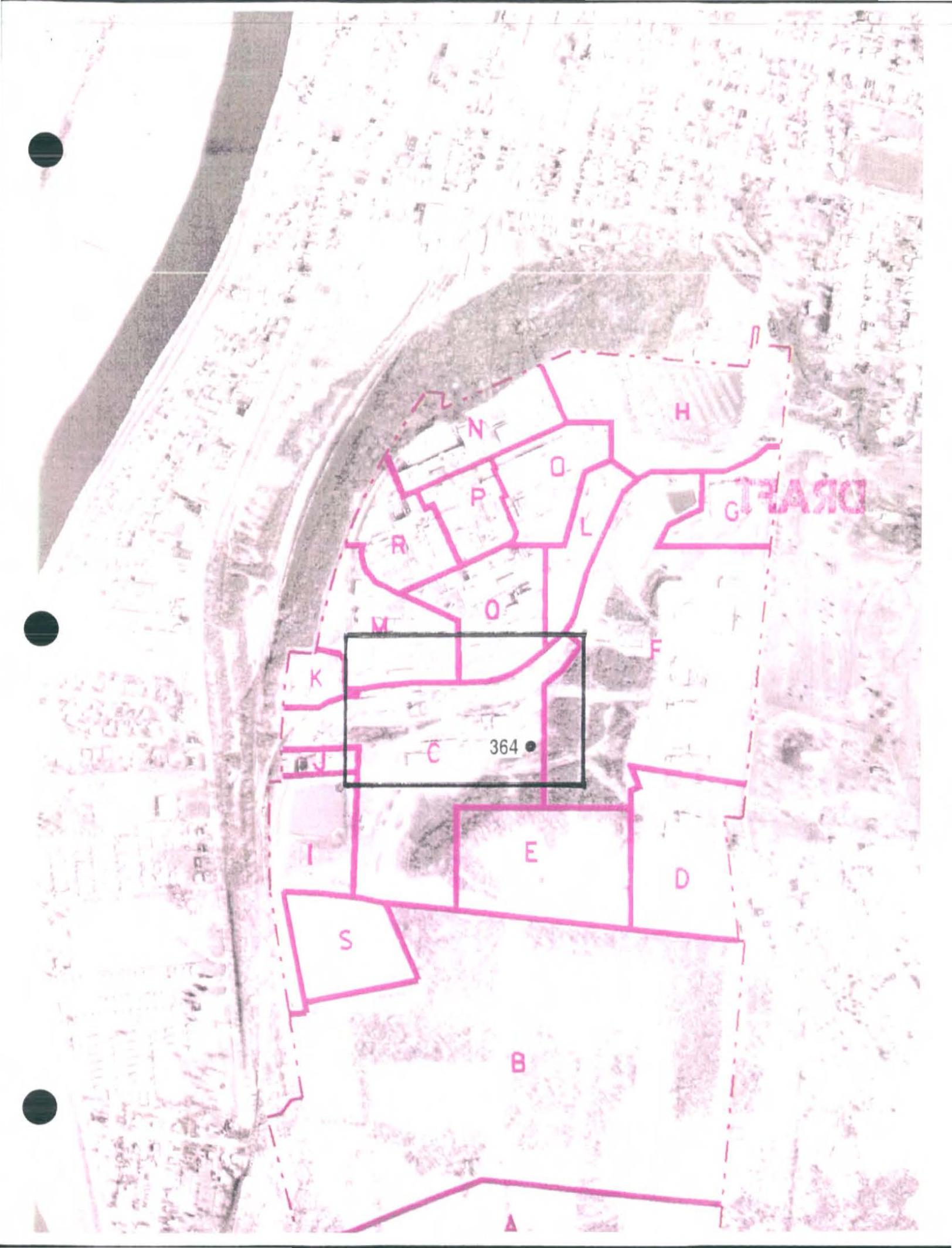


**MOUND PLANT**

**Release Block C**

**Potential Release Site**

**PRS 364**



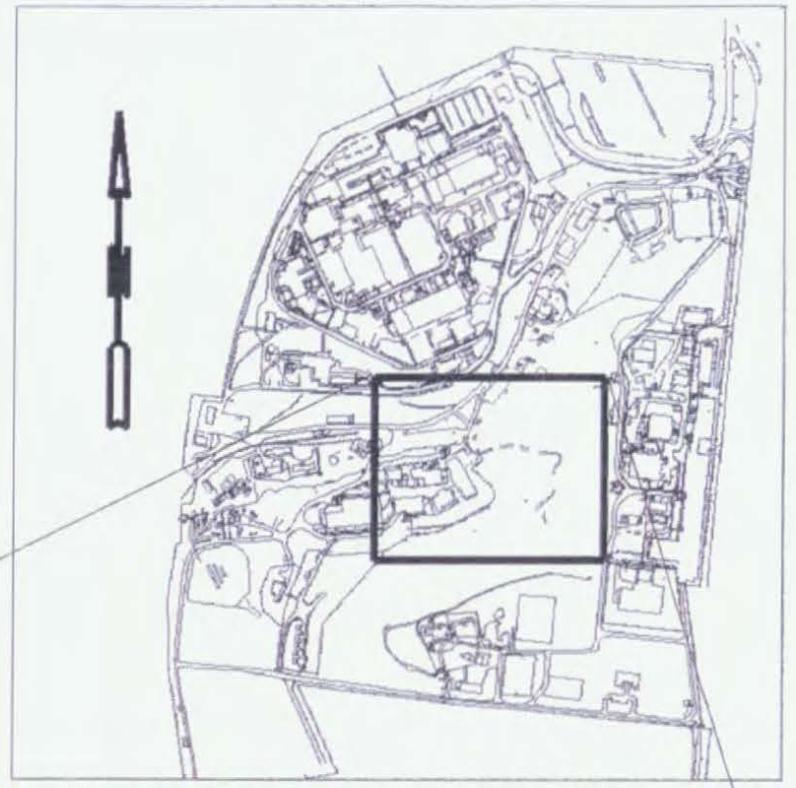
DRAFT

C 364 •

# Mound Plant Release Block C

Potential Release Site

## PRS 364







## PRS 364

### PRS HISTORY:

PRS 364, an area of soil just to the south of Building 49, was identified as a potential release site as a result of hydrocarbon detections obtained during a PETREX passive soil gas survey in 1994.<sup>2,3</sup>

No radiological or hazardous activities are known to have occurred at this PRS. However, the Building 49 Solvent Storage Shed (PRS 87) is located approximately 200 feet north of PRS 364. From 1985 to 1990, the shed was used to store trichloroethene (TCE), alcohol (pumped from Building 49 to 55 gallon drums housed in the shed), Freon, and hexane (contained in 5 gallon cans).

### CONTAMINATION:

1. In 1983, the *Radiological Site Survey*<sup>1</sup> investigated one surface sample (S0679) in the vicinity of PRS 364. The sample was analyzed for plutonium-238 via Mound Soil Screening and radiochemical analysis, and for thorium via Mound Soil Screening. Sampling results showed:  
No evidence of radiological concentrations in excess of Mound ALARA (25 pCi/g for plutonium) or regulatory limits (5 pCi/g for thorium).<sup>1,6</sup>
2. In 1994, the *OUS, Operational Area Phase I Investigation*<sup>2,3</sup> analyzed PRS 364 for Volatile Organic Compounds (VOCs) and Semi-Volatile Organic Compounds (SVOCs). The PETREX passive soil gas results showed relatively high detections of aromatic, petroleum and halogenated hydrocarbons. In particular, pronounced levels of light aromatics and ethylbenzene/xylenes were detected.

Radiological data indicated levels of Pu-238 at 4 pCi/g and Th-232 at 0.9 pCi/g. These are below the 25 pCi/g Mound ALARA (As Low As Reasonably Achievable) guideline criteria for Pu-238 and the 5 pCi/g regulatory guideline criteria for Th-232.

3. In 1996, the *Soil Gas Confirmation Investigation*<sup>4</sup> sampled within 25 feet of PRS 364 (see map on page 26.1). Sample number 000011 were taken over a depth of 1 to 3 feet and analyzed for volatiles, semivolatiles, PCBs, pesticides, metals, radionuclides, and explosives. Results of the investigation showed:  
All concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives in the soils at PRS 364 were below their respective ALARA, regulatory, or 10<sup>-6</sup> Risk Based Guideline Criteria.<sup>4,5,6</sup>

**READING ROOM REFERENCES:**

- 1) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 6-8)
- 2) OU5, Operational Area Phase I Investigation, Non-AOC Field Report, Volume I, Final, June 1995. (pages 9-10)
- 3) OU5, Operational Area Phase I Investigation, Non-AOC Field Report, Volume II, Final, June 1995. (pages 11-21)
- 5) Risk-Based Soil Guidelines, Final, Revision 3, December 1995.

**OTHER REFERENCES:**

- 4) Further Assessment, Soil Gas Confirmation Sampling, May 1996. (pages 22-31)
- 6) Code of Federal Regulations, 40 CFR 192.12 and 40 CFR 192.41.

**PREPARED BY:**

Irwin D. Dumtschin, Member of EG&G Technical Staff  
George Liebson, Member of EG&G Technical Staff

**MOUND PLANT  
PRS 364  
SOIL CONTAMINATION -**

**RECOMMENDATION:**

Potential Release Site (PRS ) 364 was identified due to elevated qualitative PETREX hydrocarbon levels. During the 1996 Soil Gas Confirmation Investigation all concentrations of volatile, semivolatile, PCBs, pesticides, metals, radionuclides, and explosives, in the soils related to this PRS, were below their applicable  $10^{-6}$  Risk Based Guideline Criteria, ALARA, regulatory, or background levels. Therefore, NO FURTHER ASSESSMENT is recommended.

**CONCURRENCE:**

DOE/MB:

Arthur W. Kleinrath 11/20/96  
Arthur W. Kleinrath, Remedial Project Manager (date)

USEPA:

Timothy J. Fischer 11/20/96  
Timothy J. Fischer, Remedial Project Manager (date)

OEPA:

Brian K. Nickel 11/20/96  
Brian K. Nickel, Project Manager (date)

**SUMMARY OF COMMENTS AND RESPONSES:**

Comment period from \_\_\_\_\_ to \_\_\_\_\_

- No comments were received during the comment period.
- Comment responses can be found on page \_\_\_\_\_ of this package.

**REFERENCE MATERIAL**  
**PRS 364**

**ENVIRONMENTAL RESTORATION PROGRAM**

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

**MOUND PLANT  
MIAMISBURG, OHIO**

**June 1993**

**DEPARTMENT OF ENERGY  
ALBUQUERQUE FIELD OFFICE**

**ENVIRONMENTAL RESTORATION PROGRAM  
EG&G MOUND APPLIED TECHNOLOGIES**

**FINAL**



Map Location <sup>a</sup>	Coordinates		MRC ID No.	Mo-Yr	Depth (inch)	Pu-238 (pCi/g)	Thorium <sup>b</sup> (pCi/g)	Tritium (pCi/mL)	Co-60 (pCi/g)	Cs-137 (pCi/g)	Ra-226 (pCi/g)	Am-241 (pCi/g)
	South	West										
C0169	3575	2720	2473	08-83	18	0.07	b					
			2474	08-83	36	0.03	b					
			2475	08-83	54	0.21	b					
S0687	3575	2770	5830	07-84	0	0.38	b					
S0668	3575	2870	5831	07-84	0	0.02	b					
			2837	10-83	0	0.02	b					
C0170	2700	3000	8264	10-84	72	0.24	b					
			8264	10-84	162	0.03	b					
(The same MRC ID was given for both depths.)												
S0670	2705	3175	4029	10-83	0	0.34	b					
S0671	2725	3075	4118	10-83	0	5.74	b					
S0672	2725	3300	4027	10-83	0	0.43	b					
S0673	2775	3275	4043	10-83	0	0.08	b	0.15				
S0674	2775	3375	4028	10-83	0	0.54	b					
S0675	2800	3100	7196	09-84	0	0.28	b					
S0676	2825	3150	7193	09-84	0	0.09	b					
S0677	2850	3075	7197	09-84	0	0.11	b					
S0678	2850	3151	4030	10-83	0	0.21	b				0.98	
 S0679	2875	3175	7194	09-83	0	0.05	b					
S0680	2900	3275	7195	09-84	0	0.34	b					

<sup>a</sup>Map locations are given using a "C" to designate core locations and an "S" to designate surface locations.

<sup>b</sup>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

Environmental Restoration Program

**OPERABLE UNIT 5  
OPERATIONAL AREA PHASE I INVESTIGATION  
NON-AOC FIELD REPORT**

**MOUND PLANT  
MIAMISBURG, OHIO**

**VOLUME I - TEXT**

**June 1995**

**Final (Revision 0)**



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

**EG&G Mound Applied Technologies**



Environmental Restoration Program

**OPERABLE UNIT 5  
OPERATIONAL AREA PHASE I INVESTIGATION  
NON-AOC FIELD REPORT**

**MOUND PLANT  
MIAMISBURG, OHIO**

**VOLUME II - APPENDICES A-G**

**June 1995**

**Final (Revision 0)**

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



**EG&G Mound Applied Technologies**

# FIDLER DATA

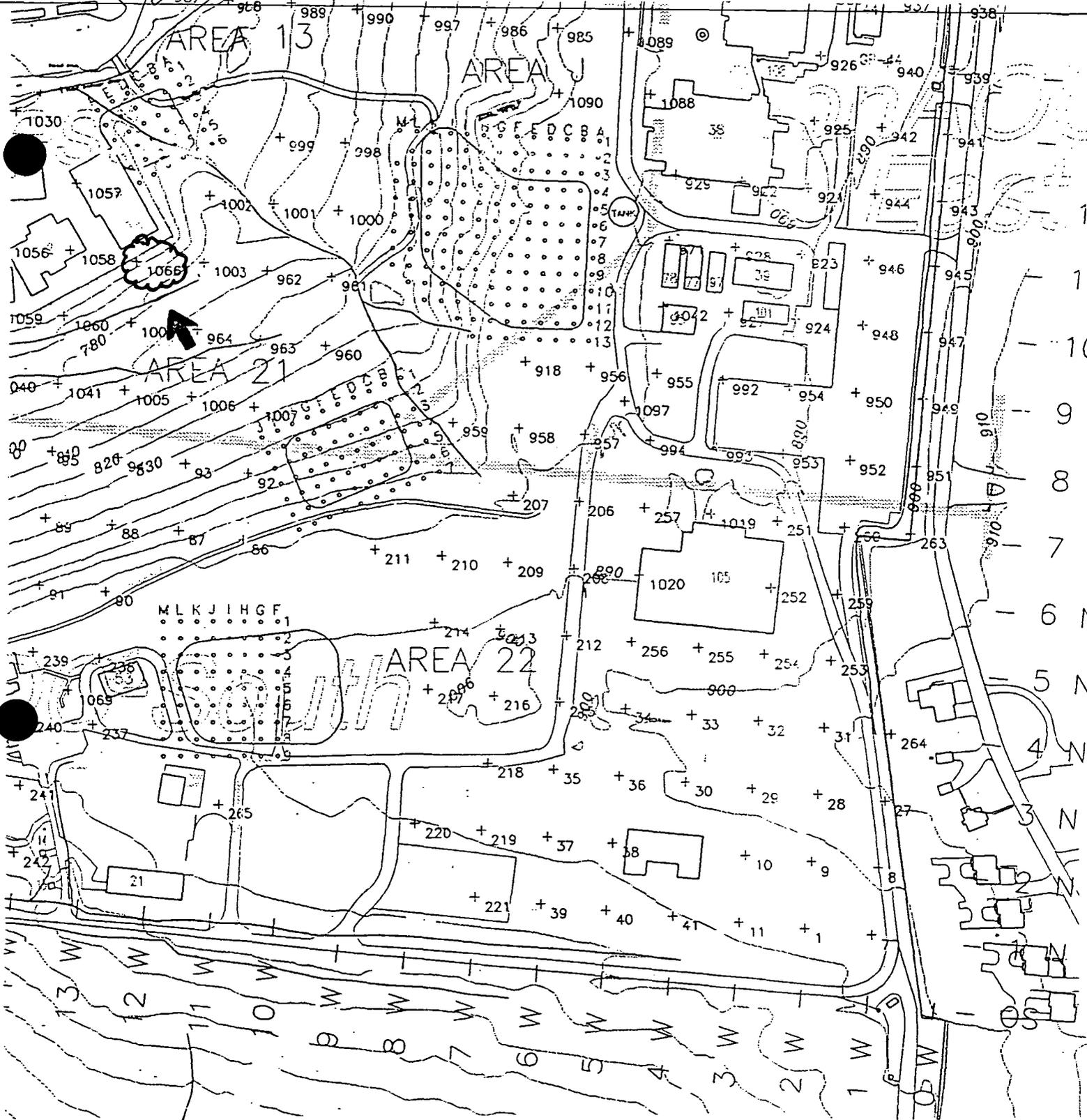
## APPENDIX D

### RADIOLOGICAL DATA (FIDLER SURVEY MOUND SOIL SCREENING FACILITY DATA) FOR NON-AOC POINTS

SMPID	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
	Contamination Criteria CH1	FIDLER Readings CH1	Contamination Criteria CH2	FIDLER Readings CH2	FIDLER Readings Out Channel	Plutonium - 238		Thorium - 232	
	Units: CPM	Units: CPM	Units: KCPM	Units: KCPM	Units: KCPM	Units: pCi/g		Units: pCi/g	
	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	RESULTS	Note:	RESULTS	Note:
09N10	213.2	90	13.13	10.0	NC	25	b	0.9	a
09N11	213.2	70	13.13	4.5	NC	8	a	0.9	a
09N12	213.2	140	13.13	9.0	NC	18	a	1.2	a
09N13	213.2	140	13.13	9.0	NC	7	a	1.5	a
09N14	130	110	6.5	6.0	NC	14	a	0.8	a
09N15	130	105	6.5	6.0	NC	7	a	0.8	a
09N16	130	60	6.5	4.5	NC	11	a	0.6	a
09N17	130	80	6.5	4.5	NC	2	a	1.1	a
09N18	130	80	6.5	4.5	NC	NC		NC	
09N19	130	70	6.5	4.0	NC	NC		NC	
09N20	130	75	6.5	4.5	NC	NR		NR	
09N21	157.3	95	8.45	4.0	NC	NR		NR	
09N22	117.0	80	8.71	6.0	NC	NC		NC	
09N25	157.3	50	8.45	4.0	NC	WIPE	c	WIPE	c
09N26	157.3	80	8.45	4.0	NC	NR		NR	
09N27	143	100	6.63	7.5	NC	13	a	0.6	a
10N01	253.5	180	12.48	9.5	NC	4	a	1	a
10N02	122.2	100	5.59	4.0	NC	WIPE	c	WIPE	c
10N03	130	90	6.5	5.0	NC	WIPE	c	WIPE	c
10N04	130	80	6.5	3.0	NC	1	a	0	a
10N05	122.2	85	5.59	5.0	NC	11	a	0.9	a
10N10	213.2	70	13.13	8.5	NC	12	a	0.8	a
10N11	213.2	110	13.13	6.5	NC	2	a	0.6	a
10N12	213.2	90	13.13	9.5	NC	21	a	1.1	a
10N13	130	115	6.5	5.5	NC	4	a	0.9	a
10N14	130	50	6.5	4.5	NC	0	a	0	a
10N15	130	85	6.5	5.0	NC	0	a	0.6	a
10N16	130	60	6.5	4.0	NC	WIPE	c	WIPE	c
10N17	130	80	6.5	6.0	NC	0	a	0	a

Mound Plant, ER Program  
Revision 0

OUS Phase 1 Non-AOC Field Report  
March 1995



**PETREX DATA (RELATIVE)**

Drawn by:  
 JCS  
 Checked By:  
 Date:  
 November 2, 1994  
 File Name:

Project #:  
 2114E

NonAOC/Operable Unit-5  
 USDOE Mound Facility  
 Miamisburg, Ohio

Two samples, #50 and #220, demonstrated mild interference to the identification of petroleum hydrocarbons due to the presence of terpenes. Terpenes are hydrocarbon compounds derived from plant resins. Terpenes may enter the soil gas naturally through plant growth or may be released into the environment as components of products containing terpenes (e.g., turpentine, natural oils, etc.). The recorded response levels yielded by these two samples for aromatic hydrocarbons and total petroleum hydrocarbons do not accurately reflect the level of these compounds in the soil gas due to this interference. Thus, the data are excluded from reporting and replaced with the letter "T" in Table 1 and on Plate 2 and 4. Despite this interference, and taking into account the effects of terpenes on the samples, it is apparent that only very low relative levels of aromatic hydrocarbons and total C<sub>5</sub> to C<sub>11</sub> petroleum hydrocarbons may be present in the soil gas at the collection points of these two samples.

Halogenated organic compounds were detected rarely in the soil gas within the NonAOC-South, but several occurrences are notable (see the mass spectra of samples #25, #86, #94, and #1069). A pronounced level of tetrachloroethene (PCE) was detected in sample #94. Pronounced levels of trichloroethene (TCE) were detected in samples #239, and #1069; and a pronounced level of dichlorobenzene was detected in sample #25. A low but distinct occurrence of trichlorotrifluoroethane (Freon-113) was also detected in sample #86.

### 8.2.2 NonAOC-West

Elevated levels of petroleum hydrocarbons were detected at numerous points within the NonAOC-West. Two distinct combinations of petroleum hydrocarbons were observed. One combination of compounds (exemplified by the mass spectra of samples #1025 and #1085) was typical of the composition of vapor derived from partially weathered light or medium weight fuels such as gasoline or diesel fuel. The soil gas at these points contained particularly high levels of the C<sub>7</sub> and C<sub>8</sub> aromatics toluene and ethylbenzene/xylenes. Samples #963, #964, #1001, #1025, #1026, #1043, #1048, #1056, #1059, #1061, #1062, #1066, #1084, #1085, and #1093 demonstrated the most pronounced levels of the light aromatics and other compounds commonly found in light and medium weight fuels. The purity of occurrence of light weight aromatics, and ethylbenzene/xylenes in particular, in samples #1026, #1046, #1048, #1056, #1059, #1062, #1066, and #1084 may alternately be an indication of the occurrence in the subsurface of components of industrial solvents or paint thinners (see the mass spectrum of sample #1059). Samples #961, #1008, #1015, #1022, #1035, #1041, and #1071 demonstrated elevated levels of combinations of hydrocarbons which are typical of the composition of vapor derived from weathered medium to heavy weight fuels or oils (see the mass spectra of samples #1035 and #1071). Each of these seven samples contained elevated levels of compounds, particularly cycloalkenes/dienes, ranging from C<sub>4</sub> to C<sub>14</sub> in weight.

## PETREX DATA (RELATIVE)

~~The majority of the soil gas samples from the NonAOC-West demonstrated only mildly elevated levels of light weight aromatics, alkanes, cycloalkanes/alkenes, and cycloalkenes/dienes. All of these compounds are components of fuels or oils and, thus, may have originated through dispersion and migration, over time, from the same occurrences of weathered fuels or oils indicated by the samples named above. The collection points of samples containing the highest levels of petroleum hydrocarbons may correspond to source areas or former points of release of petroleum products.~~

Prominent levels of halogenated hydrocarbons were detected rarely within the NonAOC-West. The highest levels of PCE were detected in samples #1024, and #1028. The highest levels of TCE were detected in samples #1010, #1058, #1066, and #1096. A mildly elevated level of dichlorobenzene was detected in sample #963. Trace levels of trichloroethane (TCA) were detected in samples #964, #1001, and #1021. Low levels of trichlorofluoromethane (Freon-11) were detected in samples #964, #969, #997, #1004, #1007, #1028, #1034, #1060, and #1092 (see the mass spectrum of sample #1004).

Five samples from the NonAOC-West yielded a high response to ions derived from petroleum hydrocarbons which have the same atomic mass as the principal ions derived from the halogenated hydrocarbons also targeted by this survey (see response to total halogenated hydrocarbons in Table 2 and Plate 5). This high response and coincidence of atomic masses has masked response to halogenated hydrocarbons of similar or lesser magnitude in these samples. Of these five, only samples #1022 and #1071 contain levels of hydrocarbons capable of masking levels of halogenated hydrocarbons greater than 100,000 ion counts. To determine whether elevated levels of halogenated organics may also be present in these two samples, sample duplicates have been submitted for TD-GC/MS analysis. Chromatographic separation of individual compounds in each sample afforded by this analytical process should resolve between elevated levels of any halogenated compounds and petroleum hydrocarbons. TD-GC/MS analysis of these five samples is pending. Results will be reported as a separate document as soon as they are available.

### 8.2.3 NonAOC-East

~~Numerous soil gas samples from the NonAOC-East showed similar combinations of petroleum hydrocarbons. Samples #909, #911, #919, and #1067 demonstrated the most elevated levels of a combination of compounds typical of the vapor of weathered light to medium weight fuels. Furthermore, samples #912, #928, and #929 exhibited singularly high levels of toluene and ethylbenzene/xylenes which could indicate the presence in the subsurface of the components of solvents or thinners. Samples #923, #925, #946, #948, #953, #993, and #994 contained elevated levels of a combination of C<sub>4</sub> to C<sub>14</sub> hydrocarbons typical of the composition of vapor from weathered medium to heavy weight fuels or oils. Soil gas samples representative of the balance of the NonAOC-East principally demonstrated only low relative levels of a combination of light weight aromatics, alkanes, and cycloalkanes/alkenes which are common to most petroleum products. Similar to the findings for the NonAOC-West, results of the survey of the NonAOC-East suggest the presence of source areas or points of release of various petroleum products and~~

## PETREX DATA (RELATIVE)

The areal distribution of halogenated hydrocarbons in the soil gas is displayed in Plate 5. PCE was detected much more frequently in the soil gas than were the other halogenated organics. Thus, the majority of the elevated responses to Total Halogenated Hydrocarbons shown in Tables 1 through 5 and on Plate 5 principally reflects the presence of PCE in the soil gas. Significant exceptions to this rule were the occurrence of pronounced levels of TCE at the collection points of samples #239, #956, #976, #1010, #1058, **1066**, #1069, #1077, and #1096 (grid coordinates 4N14W, 9N6W, 20N10W, 9N21W, 10N14W, **10N13W**, 3½N13½W, 19N10¼W, and 8N25W, respectively); dichlorobenzene at the collection point of sample #25 (grid coordinate 2N18W); and chloroform at the collection point of samples #887 and #890 (from grid coordinates 20N7W and 18N8W). The highest levels of PCE were detected in the soil gas at the collection points of samples #94, #775, #941, #1024, and #1077 (at grid coordinates 7N13W, 26¼N2¼W, 13N1W, 12N18W, and 19N10¼W).

~~The occurrence of elevated levels of TCE and dichlorobenzene in the soil gas at sampling points #25 and #239 is the most salient feature of the distribution of halogenated compounds within the NonAOC-South. Although the structure nearest the collection point of sample #239 may relate to a source of halogenated compounds, the collection point of sample #25 appears to be isolated from any potential source and thus may show impact due to past land use.~~

The occurrence of high levels of halogenated compounds in the center of the NonAOC-West may relate to nearby operations within neighboring Buildings No. 49 and No. 2. Similarly, the zone of elevated halogenated hydrocarbons located immediately to the northwest, nearby Buildings No. 36, No. 59, and No. 63 may also relate to local operations. The distribution of halogenated organics in the soil gas throughout the NonAOC is limited and suggests that any occurrence of halogenated organics in the in the subsurface is the result of localized small scale releases.

Prominent occurrences of halogenated hydrocarbons in the soil gas at points in the south of in the NonAOC-East and the NonAOC-North generally appear distant from existing structures from which they may originate. Thus, these occurrences may derive from past land use.

## 10.0 CONCLUSIONS

From the findings of this Petrex soil gas survey the following conclusions may be drawn:

1. Elevated levels of petroleum hydrocarbons occur in the subsurface in many areas of the NonAOC and are likely the result of the release of any of various grades of fuels. However, the potential exists for some occurrences of aromatics to derive from releases of solvents or thinners.
2. The Fuel Area, Area-61, and large portions of the NonAOC-East demonstrate the greatest potential impact to the subsurface by hydrocarbons. Aromatic hydrocarbons which are components of most fuels show the greatest areal distribution within the NonAOC and may pose the greatest risk to subsurface media quality. Principal source areas of petroleum hydrocarbons within the NonAOC

## PETREX DATA (RELATIVE)

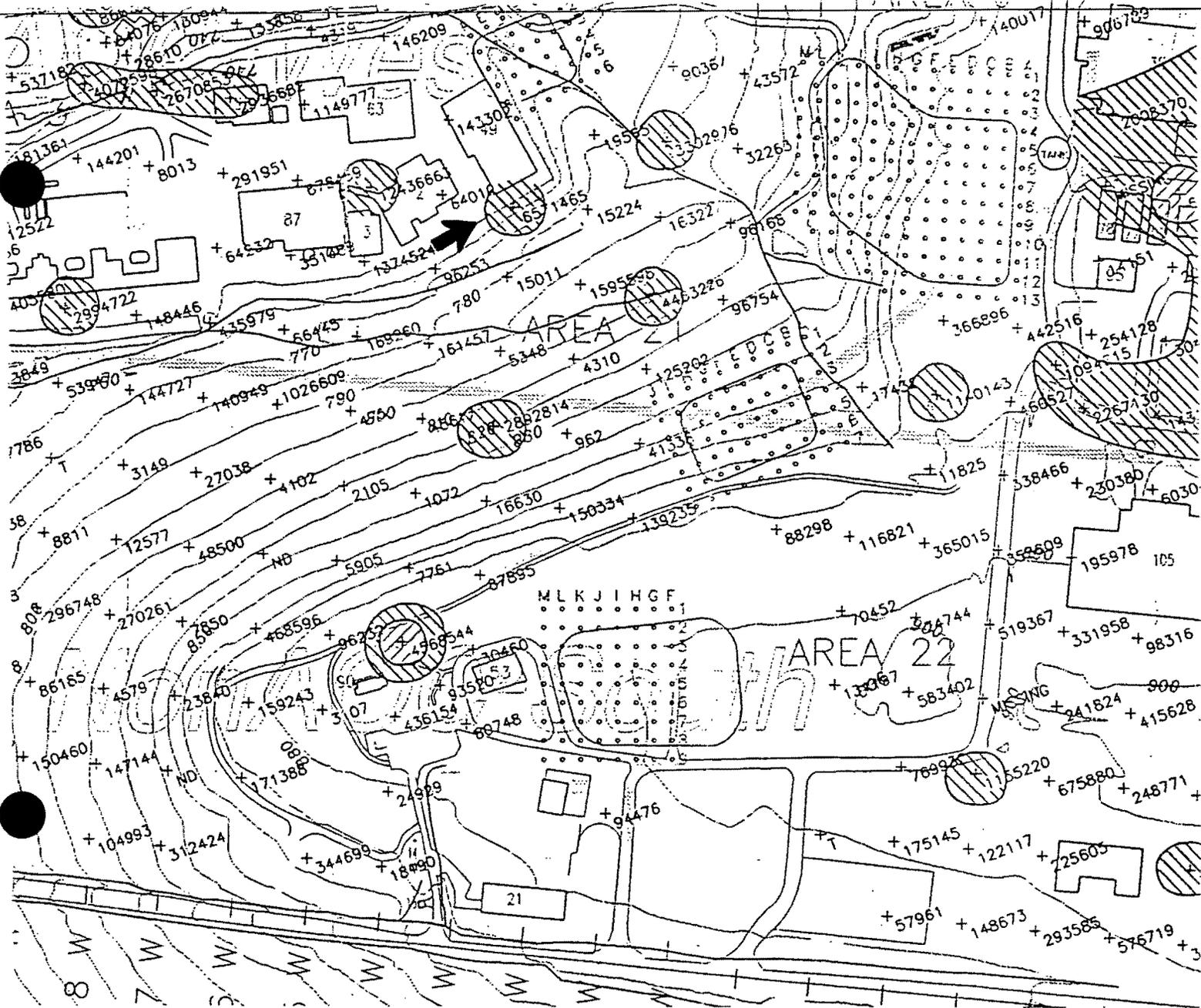
storage tank within the Fuel Area, Building No. 61 or operations within Building No. 61, and operations throughout the central portion of the NonAOC-East. Potential sources of petroleum hydrocarbons from outside the NonAOC may exist to the north of the NonAOC-West and to the north of the NonAOC-North.

3. Elevated levels of hydrocarbons detected in the soil gas in the southwestern portion of the NonAOC-East may relate to anomalous levels of these same compounds detected in the earlier survey of AOC-J. Elevated levels of hydrocarbons at numerous locations in the far western sector of the NonAOC-West may relate to the occurrence of hydrocarbons in the soil gas detected in the surveys of AOC-3 and Area-SDB.
4. Elevated levels of halogenated hydrocarbon compounds occur in the subsurface within the NonAOC, but mostly only in numerous small zone which suggest only very limited subsurface impact. The locations of specific source areas of most of the halogenated compounds detected within the NonAOC are unclear. Sources of the majority of the occurrences of halogenated hydrocarbons detected in this survey likely relate to past land use.
5. The areal distribution of halogenated hydrocarbons in the soil gas site wide suggests that these compounds, where they occur in the subsurface, are not subject to widespread subsurface dispersion or migration.
6. Any verification of soil gas results for petroleum hydrocarbons should include quantitative testing of soil and groundwater from the collection points of samples #94 (at 7N13W) and #239 (at 4N14W) within the NonAOC-South; samples #1015 (at 13N26W), #1022 (at 12N21W), #1056 (at 10N15W), #1085 (at 14N15W), and #1093 (at 9½N24½W) within the NonAOC-West; samples #919 (at 11N2W), #928 (at 11N4W), and #946 (at 11N2W) within the NonAOC-East; and samples #853 (at 26N4W), #974 (at 27N5W), and #1014 (at 16N13W) within the NonAOC-North. Within Area-61 and the Fuel Area, quantitative testing should include soil and groundwater from the collection points of samples #771, #786, #1072, #1074, and #1075.

→ 7. Any verification of soil gas results for halogenated hydrocarbons should include quantitative testing of soil and groundwater from the collection points of samples #25 (at 2N18W) and #239 (at 4N14W) from within the NonAOC-South; samples #956 (at 9N6W), #1028 (at 12N17W), and #1066 (at 10N13W) within the NonAOC-West; sample #941 (at 13N1W) from the NonAOC-East; and samples #890 (at 18N8W), #901 (at 15N12W), and #976 (at 20N10W) from within the NonAOC-North. Within Area-61 and the Fuel Area, quantitative testing should include soil and groundwater from the collection points of samples #778 and #1077.

8. The environmental significance of the existence of petroleum hydrocarbons and halogenated hydrocarbons in the subsurface can only be evaluated through quantitative testing of soil and groundwater.

## PETREX DATA (RELATIVE)



**PETREX DATA (RELATIVE)**

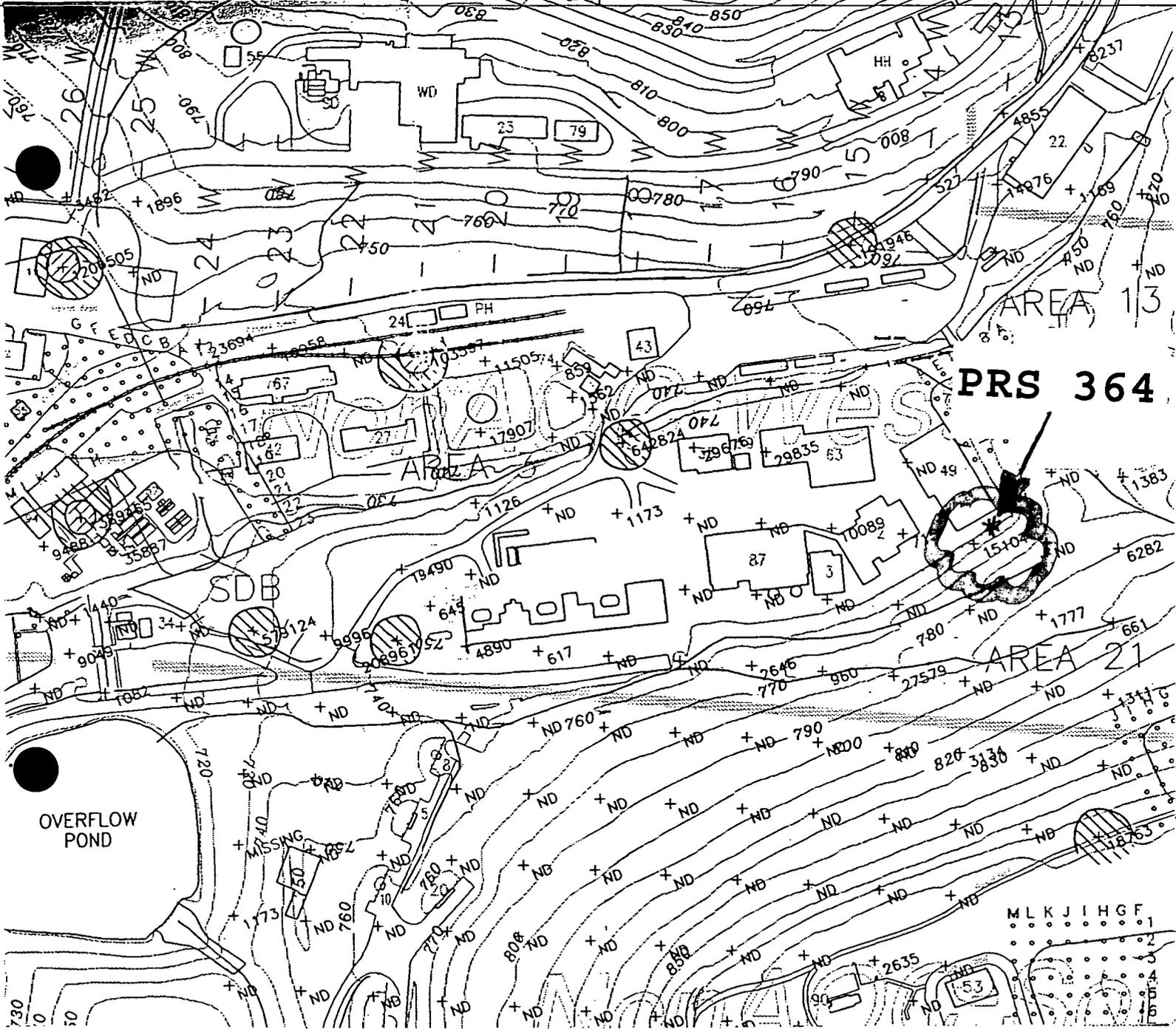
- Features:
- + PETREX Sample Location
  - ND Not Detected
  - T Denotes interference by terpenes; see text.

Relative Response	
Total Aromatic Hydrocarbons	
Plate 2	

NonAOC/Operable Unit-5

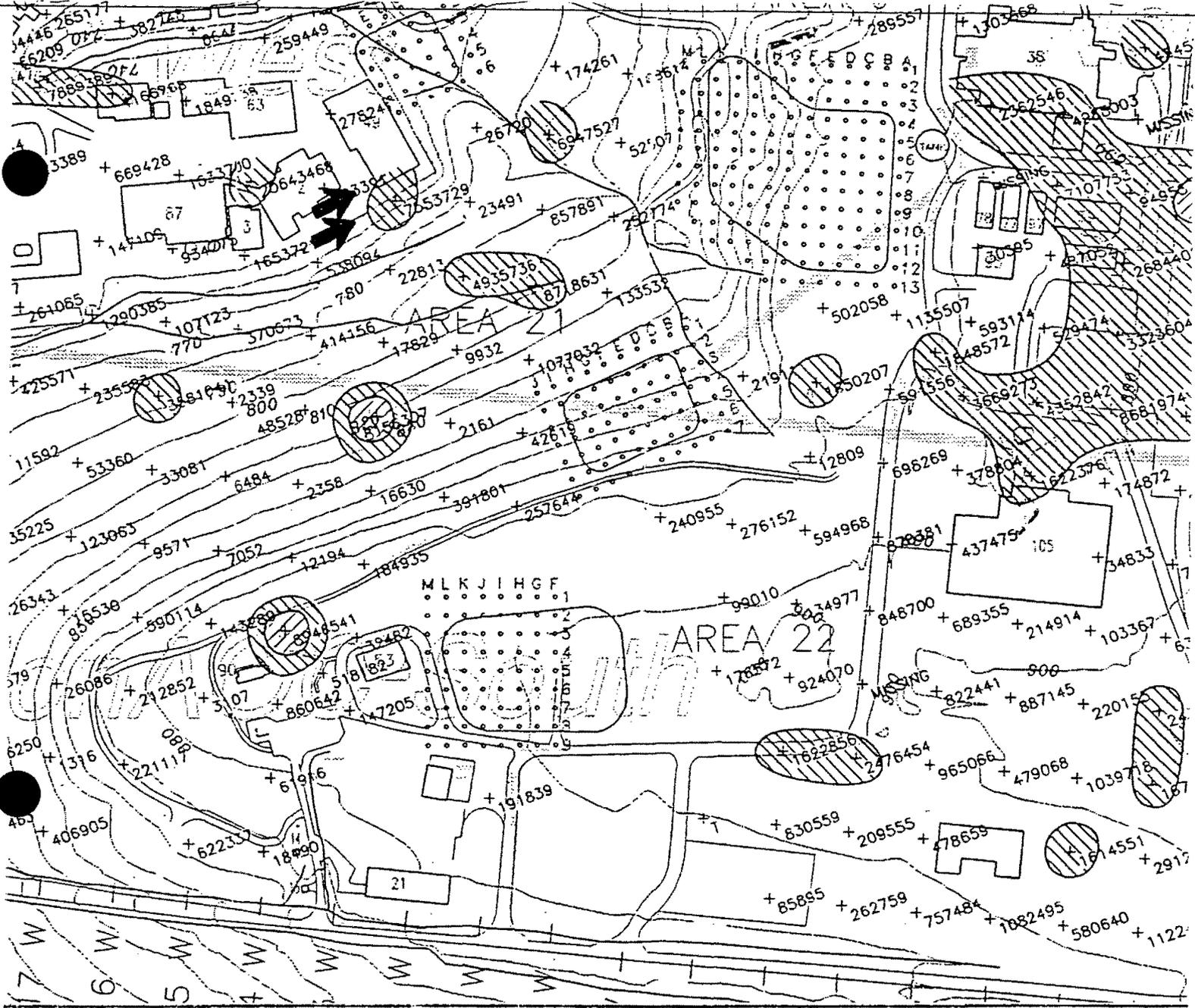
USDOE Mound Facility  
Miamisburg, Ohio

		Relative Resp
		NonA
NonAOC-South	NonAOC-West	
≥ 4,200,000 850,000-4,199,999	≥ 20,000,000 2,600,000-19,999,999	



LEGEND				
Relative Response Values (in ion counts):				
NonAOC-South	NonAOC-West	NonAOC-East	NonAOC-North	Area 61
⊗ ≥ 70,000	⊗ ≥ 1,000,000	⊗ ≥ 300,000	⊗ ≥ 800,000	⊗ ≥ 1,400,000
⊗ 7,000-69,999	⊗ 100,000-999,999	⊗ 30,000-299,999	⊗ 80,000-799,999	⊗ 180,000-1,399,999

Relative Response  
 Total Semivolatile  
 Hydrocarbons  
  
 Plate 3



Features:

- + PETREX Sample Location
- T Denotes interference by terpenes; see text.

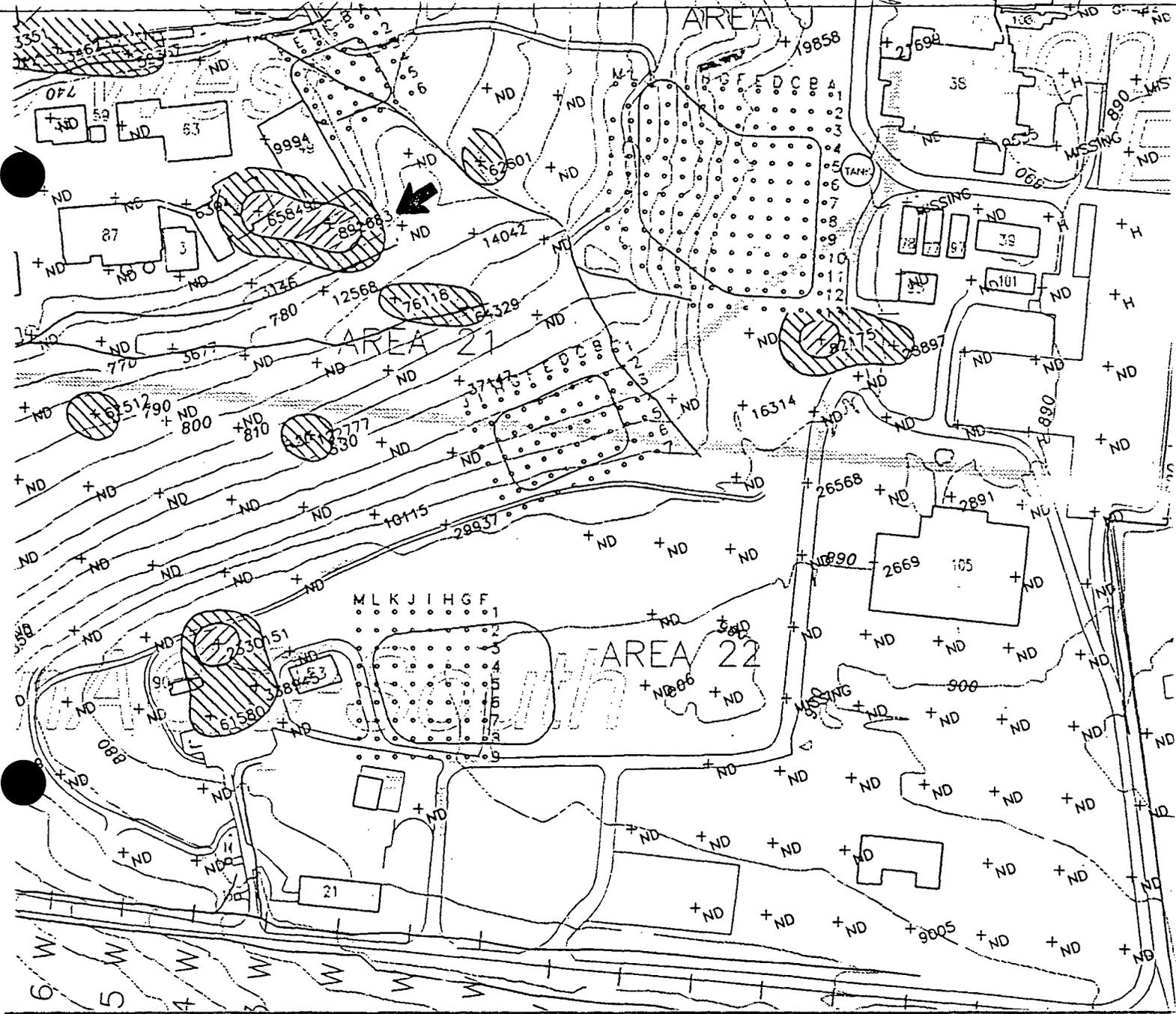
Relative Response  
Total C5-C11  
Petroleum Hydrocarbons

Plate 4

**PETREX DATA (RELATIVE)**

AO/Operable Unit-5  
DOE Mound Facility  
Miamisburg, Ohio

Relative Response Value		
NonAOC-South	NonAOC-West	NonAOC-East
≥ 8,000,000	≥ 29,000,000	≥ 11,500,000
1,500,000-7,999,999	3,000,000-28,999,999	1,600,000-11,499,999



Features:

- + PETREX Sample Location
- ND Not Detected
- H Denotes interference by petroleum hydrocarbons; see text.

Relative Response  
Total Halogenated  
Hydrocarbons

Plate 5

### PETREX DATA (RELATIVE)

Operable Unit-5  
 und Facility  
 isburg, Ohio

Relative Response Values (in )		
NonAOC-South	NonAOC-West	NonAOC-East
≥ 500,000 50,000-499,999	≥ 500,000 50,000-499,999	≥ 80,000 20,000-79,999

**MOUND**



**Environmental  
Restoration  
Program**

## **Further Assessment**

### **Soil Gas Confirmation Sampling**

**Mound Plant  
Miamisburg, Ohio**

**May 1996**

**Revision 0**

**Department of Energy**

**EG&G Mound Applied Technologies**

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**Table I.1 Soil Analyte List**

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Volatile Organic Compounds

Acetone	Dibromochloromethane	4-Methyl-2-Pentanone
Benzene	1,1-Dichloroethane	Styrene
Bromodichloromethane	1,2-Dichloroethane	1,1,2,2-Tetrachloroethane
Bromoform	1,1-Dichloroethene	Tetrachloroethene
Bromomethane	1,2-Dichloroethene (total)	1,1,1-Trichloroethane
2-Butanone	1,2-Dichloropropane	1,1,2-Trichloroethane
Carbon Disulfide	cis-1,3-Dichloropropene	Trichloroethene
Carbon Tetrachloride	trans-1,3-Dichloropropene	Toluene
Chlorobenzene	Ethylbenzene	Vinyl Acetate
Chloroethane	2-Hexanone	Vinyl Chloride
Chloroform	Methylene Chloride	Xylenes (total)
Chloromethane		

Semivolatile Organic Compounds

Acenaphthene	Chrysene	Hexachlorobenzene
Acenaphthylene	Dibenz(a,h)anthracene	Hexachlorobutadiene
Anthracene	Dibenzofuran	Hexachlorocyclopentadiene
Benzo(a)anthracene	1,2-Dichlorobenzene	Hexachloroethane
Benzo(a)pyrene	1,3-Dichlorobenzene	Indeno(1,2,3-cd)pyrene
Benzo(b)fluoranthene	1,4-Dichlorobenzene	Isophorone
Benzo(g,h,i)perylene	3,3-Dichlorobenzidine	2-Methylnaphthalene
Benzo(k)fluoranthene	2,4-Dichlorophenol	2-Methylphenol
bis(2-Chloroethoxy)methane	Diethylphthalate	4-Methylphenol
bis(2-Chloroethyl)ether	2,4-Dimethylphenol	Naphthalene
bis(2-Ethylhexyl)phthalate	Dimethylphthalate	2-Nitroaniline
4-Bromophenyl-phenylether	Di-n-butylphthalate	3-Nitroaniline
Butylbenzylphthalate	Di-n-octylphthalate	4-Nitroaniline
Carbazole	4,6-Dinitro-2-methylphenol	Nitrobenzene
4-Chloroaniline	2,4-Dinitrophenol	2-Nitrophenol
4-Chloro-3-methylphenol	2,4-Dinitrotoluene	4-Nitrophenol
2-Chloronaphthalene	2,6-Dinitrotoluene	N-Nitroso-di-n-propylamine
2-Chlorophenol	Fluoranthene	N-Nitroso-diphenylamine
4-Chlorophenyl-phenylether	Fluorene	2,2-oxybis(1-Chloropropane)
Pentachlorophenol	Pyrene	2,4,5-Trichlorobenzene
Phenanthrene	1,2,4-Trichlorobenzene	2,4,6-Trichlorobenzene
Phenol		

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**Table I.1 Soil Analyte List (Continued)**

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Pesticides/PCB's

Aroclor-1016	Delta-BHC	Endosulfan II
Aroclor-1221	Gamma-BHC	Endosulfan sulfate
Aroclor-1232	alpha-Chlordane	Endrin
Aroclor-1242	gamma-Chlordane	Endrin aldehyde
Aroclor-1248	4,4'-DDD	Endrin ketone
Aroclor-1254	4,4'-DDE	Heptachlor
Aroclor-1260	4,4'-DDT	Heptachlor epoxide
Aldrin	Dieldrin	Methoxychlor
Alpha-BHC	Endosulfan I	Toxaphene
Beta-BHC		

Inorganics

Aluminum	Copper	Potassium
Antimony	Cyanide	Selenium
Arsenic	Iron	Silver
Barium	Lead	Sodium
Beryllium	Lithium	Thallium
Bismuth	Magnesium	Tin
Cadmium	Manganese	Vanadium
Calcium	Mercury	Zinc
Chromium	Molybdenum	Nitrate/Nitrite
Cobalt	Nickel	Explosives (USATHAMA,PETN)

Radionuclides

Americium-241	Plutonium-238	Thorium-230
Bismuth-207	Plutonium-239/240	Thorium-232
Bismuth-210	Potassium-40	Uranium-234
Cesium-137	Radium-226	Uranium-235
Cobalt-60	Thorium-228	Uranium-238

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## 1.2. SAMPLE NUMBERING SCHEME

The sample identification numbers were assigned by Mound to each location in the following format: XXX-AAA-#####. For each location, the first three characters were SGC, identifying the sample as part of the soil gas confirmation study. The next three characters represented the area from which each sample was taken:

A03 = Area 3  
A07 = Area 7  
A13 = Area 13  
A21 = Area 21  
A22 = Area 22  
SDB = Area SDB  
AOJ = Area AOJ  
NAC = Non-AOC areas (Area of Concern)  
SAN = Sanitary area

The final six digits were a sequential number beginning with 000001. The samples related to this study begin with 000001 and end with 000102. Due to an error in surveying, samples 000099 and 000100 were taken from the wrong locations. The sites were resurveyed and the samples were taken again, renamed as 000101 and 000102. No other problems arose with the sample identification.

## 1.3 SURVEYING

Prior to this sampling event, surveying relocated each of the 100 sites based on coordinates from a previous soil gas sampling event. Surveyors from Barge, Waggoner, Sumner and Cannon, of Miamisburg, Ohio, completed the task, using a benchmark map of approximately 50 locations with state plane coordinates provided by EG&G. Each point was relocated with an accuracy of  $\pm 6$  inches and identified with either a 3-foot stake with orange flagging tape and the sample identification number or a pin driven into the ground through orange flagging with the sample identification number written on the flagging. The surveyed sampling locations are shown on Figure 1.1.

## 1.4 UTILITIES CLEARANCE/VARIANCES

After surveying, all sites were checked for the presence of underground utilities by EG&G personnel. The requirement states that sample sites must be located five feet or more from utilities. Situations in which the 5-foot rule was not met were handled in one of three ways: 1) **relocations** - sample sites were placed 5 feet or more from utility markings and normal sampling procedures were followed; 2) **hand-digging** - the VOC sample soil was collected using the core sampler, which was driven only to the depth necessary to collect the VOC sample, and the remaining soil was collected using a hand auger; or 3) **variances to the 5-foot clearance requirement** - some sites were located near visible utilities, so after safe clearance was established, normal sampling procedures were followed. Alternatively, some locations had underground utilities at relatively deeper depths. At these locations, normal sampling procedures were followed except that digging/coring was limited to two feet instead of the established three feet. No utilities were damaged during the sampling event.

Some locations had no utility interference but still could not be sampled to three feet due to "refusal"--an inability to drive the sampler deeper. This usually indicates that bedrock or large gravel has been reached. In such cases, multiple shallow cores were taken.

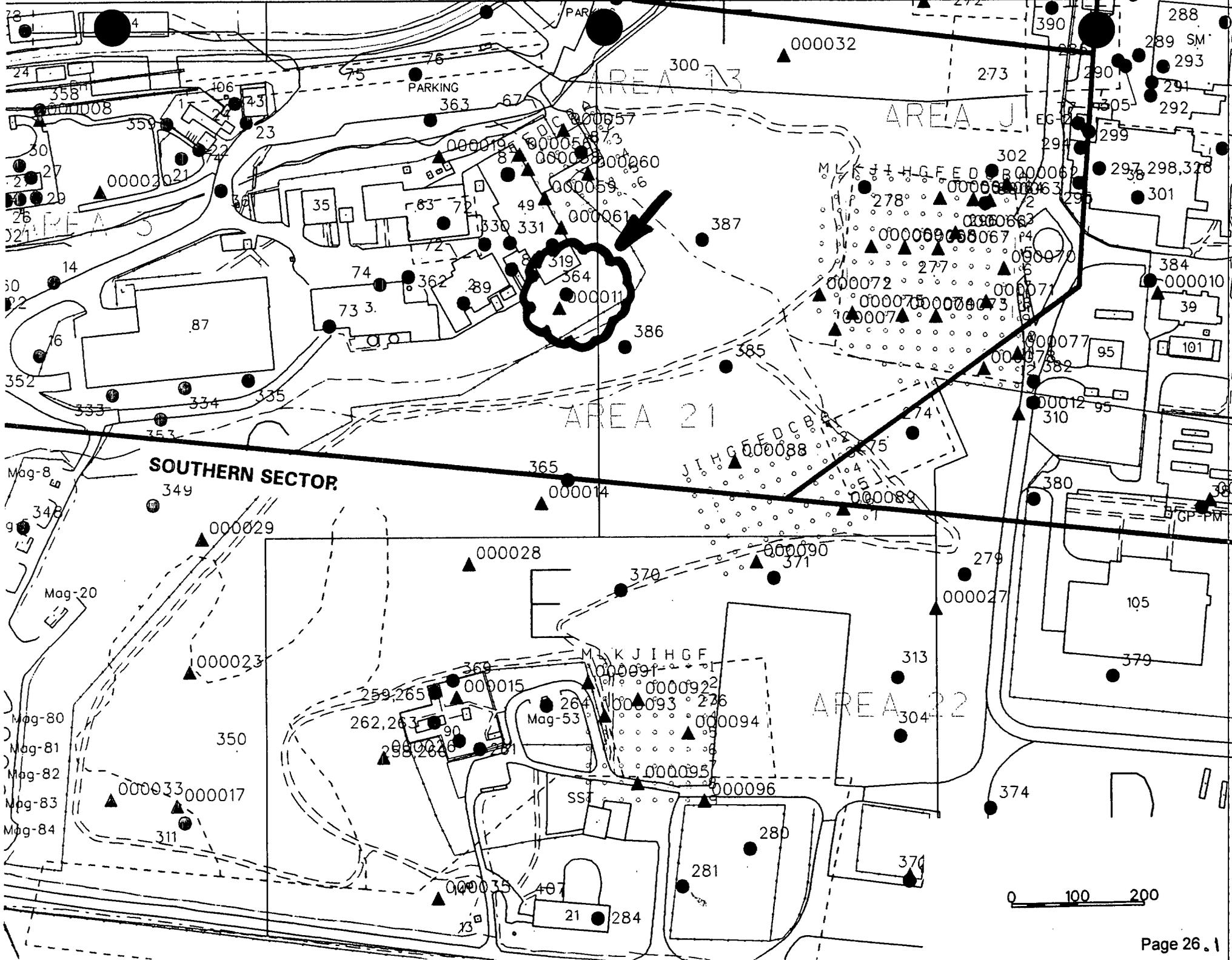
A complete list of sites with variances to the original soil gas sampling location or depth can be found in Table I.2.

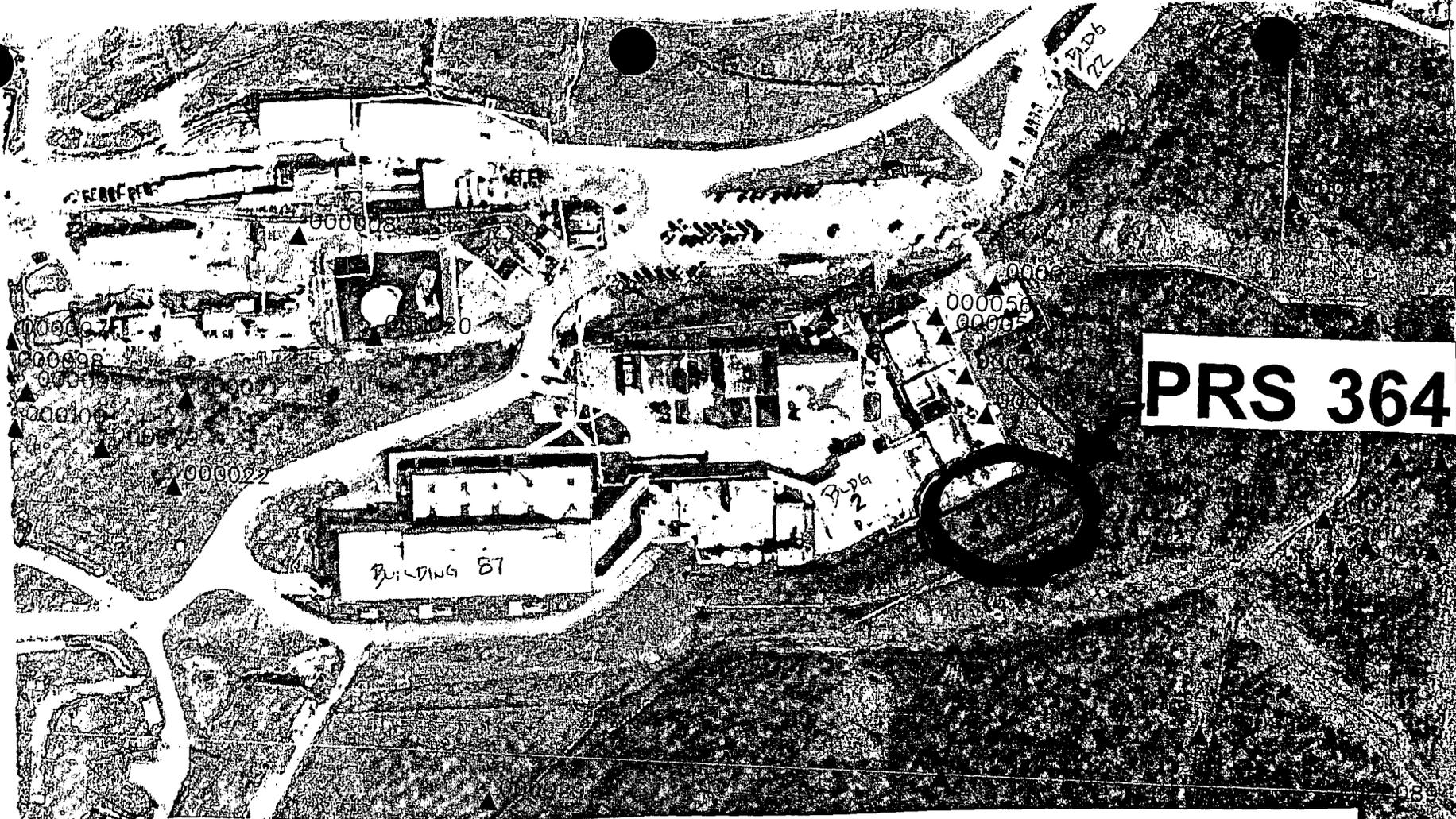
## 1.5 SOIL SAMPLING METHODOLOGY

Soil was collected at each location using either a van-mounted Geoprobe® rig equipped with a core sampler, an electric hammer equipped with a core sampler, or a hand auger. The device chosen depended upon the particulars of the location. Acetate liners were used in the Geoprobe® core barrel and the hand-held core sampler. The liners were cut open with utility knives, using a new blade at each site.

The first six inches of the core, designated for radionuclide analysis, were removed using a clean, stainless steel scoop and placed in a clean stainless steel bowl to be homogenized. Soil was cut from between the 6-inch and 1-1/2 foot depth and placed directly into jars appropriate for volatile organic compound (VOC) analysis, leaving as little headspace as possible. The remaining soil was then placed into another clean stainless steel bowl. If necessary to obtain sufficient sample volume, another core was taken, and the above process was repeated. When enough soil was collected to fill all the sample jars, the contents of both bowls were individually homogenized and used to fill their respective containers. The jars were labeled prior to being filled. Each sample was then secured with a custody seal, sealed in a plastic bag and stored in a refrigerator in Building 19. Radiological samples were delivered to the Mound Environmental Laboratory for screening. Several duplicate radiological samples were collected and set aside for later analysis by the Mound wet chemistry laboratory. After screening clearance was obtained from the Mound Environmental Laboratory, the samples were sealed in coolers and shipped to off-site contract laboratories for analysis. The contract laboratory for radionuclide analysis was Quanterra Environmental Services in Richland, Washington. All other analyses were completed by Roy F. Weston, Incorporated Laboratory in Lionville, Pennsylvania.

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*The following tables contain the Soil Gas Confirmation Sampling results. Sampling was performed for the following categories of contaminants:*

- Volatiles*
- Semivolatiles*
- PCBs/pesticides*
- Metals*
- Radionuclides*
- Explosives*

*If no results are given for the contaminant categories listed above, then no detects were found for that category of contaminants.*

Table A.1 Soil Gas Confirmation Detected Volatile Organic Compounds (cont.)

ANALYTE	SGC NAC 000010	SGC NAC 000011	SGC NAC 000012	SGC NAC 000013	SGC NAC 000014	SGC NAC 000015	Background	10 <sup>-6</sup> Construction Worker Guidelines
VOLATILES (µg/Kg)								
Acetone							NA	105000000
1,2-Dichloroethene (total)						96	NA	21500000
2-Butanone			8 J	10 J			NA	46500000
Benzene						2 J	NA	8900
Carbon Disulfide				4 J			NA	1400000
Chloroform							NA	NA
Chloromethane	4 J						NA	NA
Ethylbenzene						1 J	NA	480
Methylene Chloride	8						NA	NA
Tetrachloroethene							NA	10500000
Toluene		2 J				28	NA	1250000
Trichloroethene				7		3 J	NA	41000
Xylene (total)					1 J	4 J	NA	215000000

J - Numerical value is an estimated quantity  
 NA - Value not available  
 D - Sample was diluted  
 C - Estimated due to error in calibration  
 µg/kg - micrograms per kilogram

Table A.2. Soil Gas Confirmation Detected Semivolatile Organic Compounds (cont.)

ANALYTE	SGC NAC 000008	SGC NAC 000009	SGC NAC 000010	SGC NAC 000011	SGC NAC 000012	SGC NAC 000015	Background	10 <sup>6</sup> Construction Worker Guidelines
SEMIVOLATILES (µg/Kg)								
Acenaphthene							NA	NA
Acenaphthylene							NA	NA
Anthracene							NA	32000000
Benzo(a)anthracene	57 J				18 J		NA	4100
Benzo(a)pyrene	65 J				21 J		NA	410
Benzo(b)fluoranthene	67 J				22 J		NA	4100
Benzo(g,h,i)perylene	26 J						NA	NA
Benzo(k)fluoranthene	58 J				17 J		NA	41000
Bis(2-ethylhexyl)phthalate		71 J		36 J	35 J		NA	215000
Butylbenzylphthalate							NA	21500000
Carbazole							NA	NA
Chrysene	68 J		20 J		22 J		NA	410000
Di-n-butyl phthalate							NA	10500000
Di-n-octyl phthalate							NA	21500000
Dibenz(a,h)anthracene							NA	410
Dibenzofuran							NA	NA
Diethyl phthalate							NA	NA
Fluoranthene	110 J		31 J		38 J		NA	42500000
Fluorene							NA	NA
Indeno(1,2,3-cd)pyrene	36 J						NA	4100
2-Methylnaphthalene							NA	NA
Naphthalene						61 J	NA	NA
Phenanthrene	53 J						NA	NA
Phenol							NA	65000000
Pyrene	120 J		31 J	20 J	37 J		NA	32000000

J - Numerical value is an estimated quantity  
 NA - Value not available  
 D - Sample was diluted  
 C - Estimated due to error in calibration  
 µg/kg - micrograms per kilogram

Table A.4. Soil Gas Confirmation Detected TAL Inorganics (cont.)

ANALYTE	SGC NAC 000007	SGC NAC 000008	SGC NAC 000009	SGC NAC 000010	SGC NAC 000011	SGC NAC 000012	Background	10 <sup>6</sup> Construction Worker Guidelines
INORGANICS (mg/kg)								
Aluminum	10200	2820	18700	7300	10300	13100	19000	NA
Antimony		0.27 B	0.91 B	0.21 B	1.2 B		NA	425
Arsenic	1.9 B	3.2	11.1	7.2	2.2 B	1.9 BJ	8.6	320
Barium	26.2 B	23.2 B	163	64.7	13.5 B	78.4	180	75000
Beryllium	0.28		0.9 B	0.34	0.36 B	0.44	1.3	0.7
Bismuth			0.85 B		0.99 B		NA	NA
Cadmium	0.33 B	0.22 B	6	0.62 B	5.2	6.0	2.1	1050
Calcium	83900	113000	5940	41500	90800	127000 J	310000	NA
Chromium	14.3	5.7	20.3	12	11.9	17.3	20	1050000
Cobalt	11 B	3.3 B	13	7.9 B	13.7	12.7 J	19	NA
Copper	16.2	13.9	19.2	17.4	16.6	21.3 J	26	NA
Cyanide							ND	21400
Iron	23000	7660	29400	17300	25600	27900	35000	NA
Lead	7.2	5.9	22.2	16.5	5.7	9.3 J	48	NA
Lithium	3.2 B	8.2 B	14.7 B	9.2 B	27.3	25.3	26	NA
Magnesium	21600	47900	4500	16700	12300	19900 J	40000	NA
Manganese	493	256	728	604	908	658	1400	135000
Mercury							NC	320
Molybdenum	0.63 B	1.4 B	1.8 B	2.3 B	0.58 B	1.3 B	27	NA
Nickel	22.6	8.1 B	24.5	16.5	21.6	26.4	32	21500
Potassium	1590	463 B	1420	794 B	2210 B	1630	1900	NA
Selenium					0.31 B		NA	NA
Silver							1700	5500000
Sodium	246 B	341 B	1010 B	82 B	288 B	2490 J	240	NA
Thallium							460	NA
Tin		4.5 B	1.5 B			1.6 B	20	NA
Vanadium	14.2	7.4	42.7	19.2	15.8	22.4	25	7500
Zinc	53.8	36.6	71.8	299	59.9	68.5	140	320000

Table A.6. Soil Gas Confirmation Detected Radionuclides (cont.)

ANALYTE	SGC NAC 000008	SGC NAC 000009	SGC NAC 000010	SGC NAC 000011	SGC NAC 000012	SGC NAC 000013	SGC NAC 000014	Background	10 <sup>6</sup> Construction Worker Guidelines
RADIONUCLIDES (pCi/g)									
Americium-241					-0.238	0.0694		ND	4.95
Bismuth-207					0.0292	-0.0304		ND	0.175
Bismuth-210					0.0355	0.0297		ND	NA
Cesium-137					0.0371	0.0175	0.826	0.42	0.46
Cobalt-60					0.0547	-0.0280		NC	0.1
Plutonium-238	0.0826	0.0233	0.107	0.0718	0.101	0.0107	0.671	0.13	5.5
Plutonium-239/240					0.00154	-0.000127	0.0206	0.18	5.5
Potassium-40	7.72	12.9	15.0	17.8	15.5	4.65	22.5	37	NA
Radium-226	0.571	0.764	0.917	0.778	0.592	0.263	1.10	2	0.14
Thorium-228	0.678	0.779	0.914	0.913	0.697	0.247	1.18	1.5	0.85
Thorium-230	0.541	1.09	1.27	0.902	0.803	0.359	1.09	1.9	44
Thorium-232	0.554	0.838	0.708	0.830	0.769	0.210	1.08	1.4	50
Uranium-234	0.361	0.712	0.897	0.882	0.693	0.378	0.866	1.1	37.5
Uranium-235			0.0459		0.0231	0.0183	0.0548	0.11	3.35
Uranium-238	0.414	0.774	1.06	0.871	0.681	0.424	1.01	1.2	11