Admin Record
3005-9809160001

BWX Technologies, Inc.
Babcock & Wilcox, a McDermott company

Babcock & Wilcox of Ohio, Inc.
1 Mound Road
P.O. Box 3030
Miamisburg, Ohio 45343-3030
(937) 865-4020

ESC-207/98
September 14, 1998

98-TC/09-14

Director, Miamisburg Environmental Management Project
U.S. Department of Energy
P.O. Box 66
Miamisburg, OH 45343-0066

ATTENTION: Dewain Eckman

SUBJECT: Contract No. DE-AC24-97OH20044
PRS 412: DELIVERY OF FINAL POTENTIAL RELEASE SITE DATA PACKAGE

REFERENCE: Statement of Work Requirement C.7.1e -- Regulator Reports

Dear Mr. Folker:

The attached Potential Release Site Data Package for PRS 412 has been authorized for release to USEPA, OEPA, ODH, MMCIC, and the public reading room by Art Kleinrath of MEMP. This revision of the PRS package includes the responsiveness summary for the public review. Delivery of this document completes the development of this PRS package.

Please advise if additional copies are required. If you require further information, please contact Dave Rakel at extension 4203.

Sincerely,

David A. Rakel for

Linda R. Bauer, Ph.D.
Department Manager, Environmental Safeguards & Compliance

LRB/nmg

Enclosures as stated

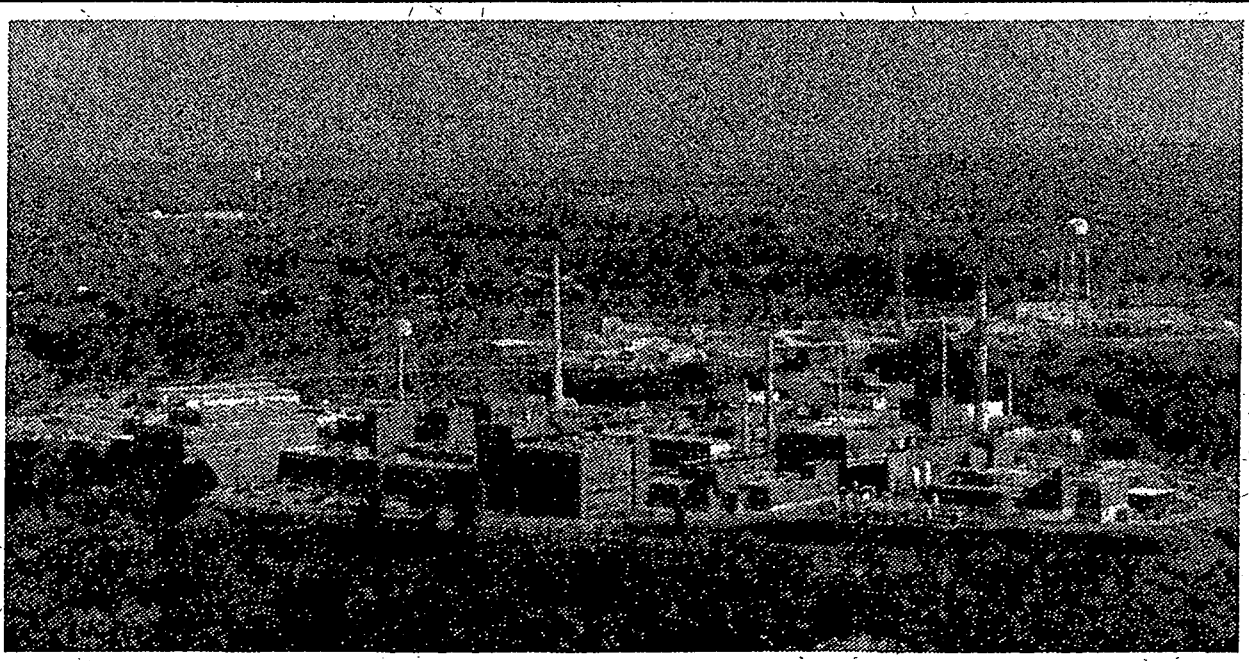
cc: T. Fischer, USEPA, (1) w/attachment
B. Nickel, OEPA, (1) w/attachment
L. Anderson, OEPA, (1) w/attachment
R. Vandergrift, ODH, (1) w/attachment
T. Tracy, DOE HQ, (1) w/attachment
O. Vincent, DOE/MEMP, (1) w/attachment
A. Kleinrath, DOE/MEMP, (1) w/attachment
D. Bird, MMCIC, (1) w/attachment
J. Price, B&W, (1) w/attachment
Public Reading Room, (5) w/attachment
Administrative Record, (2) w/attachment
DCC, w/o attachment

3005-9809160001

MOUND

Environmental
Restoration
Program

MOUND PLANT
Potential Release Site Package
PRS # 412



MOUND

Environmental Restoration Program

MOUND PLANT
PRS DATA PACKAGE
Notice of Public Review Period

The following Potential Release site (PRS) Data Packages will be available for public review in the CERCLA Public Reading Room, 305 E. Central Ave., Miamisburg, Ohio beginning April 15, 1998. Public comment will be accepted on these packages from April 15, 1998, through May 15, 1998.

PRS 412: Soil Contamination - Radiological

Written comments may be sent to U.S. Department of Energy, c/o Jane Greenwalt, P.O. Box 66, Miamisburg, Ohio 45343-0066 or by E-Mail to: *jane.greenwalt@em.doe.gov*

Questions can be referred to DOE Office of Public Affairs at (937) 865-3116

PRS 412

REV	DESCRIPTION	DATE
PUBLIC RELEASE **0**	Available for comments.	**Mar. 25, 1998**
FINAL RELEASE **1**	Comment period expired. Comments. Recommendation page annotated.	**Aug. 27, 1998**

The Mound Core Team
P.O. Box 66
Miamisburg, Ohio 45343-0066

July 22, 1998

Mr. Tim Taulbee
120 Fairfield Court
Springboro, Ohio
45066

Dear Mr. Taulbee:

Thank you for your comments on PRS 412. The Core Team, consisting of the U.S. Department of Energy Miamisburg Environmental Management Project (DOE-MEMP), U.S. Environmental Protection Agency (USEPA), and the Ohio Environmental Protection Agency (OEPA), appreciates the input provided by the public stakeholders of the Mound facility. The public stakeholders have significantly contributed to the forward progress that has been made establishing the safety of the Mound property prior to its return to public use after remediation and residual risk evaluation.

Should the responses to comments require additional detail, please contact Art Kleinrath at (937) 865-3597 and we will gladly arrange a meeting or telephone conference.

Sincerely,

DOE/MEMP: Arthur W. Kleinrath
Arthur W. Kleinrath, Remedial Project Manager

USEPA: Timothy J. Fischer
Timothy J. Fischer, Remedial Project Manager

OHIO EPA: Brian K. Nickel
Brian K. Nickel, Project Manager

Comment:

From the provided picture of this PRS, it appears to be in the middle of the road. Is the actual boundary of PRS 412 an area encompassing the Underground Radioactive Material Area?

Response:

PRS 412 was created due to the presence of 42 pCi of thorium at the core sample location of C0033. The location of C0033 is within the Underground Radioactive Material Area. In the actual design of clean up all available information will be used including that used in the designating of the Underground Radioactive Material Area.

Comment:

A strip of elevated gamma readings were observed by the INEEL warthog in the ditchline just east of the PRS 412 location, will the remedial action include this area?

Thanks for bringing these data to our attention. The information obtained from INEEL is attached. The information will be used in the design of this remedial action.

Comment:

Since further assessment sampling will not be performed before the removal action, how will Mound insure that the extent of the subsurface contamination will be known before removal for cost estimates and personnel protective equipment.

Response:

The Core Team shares your concern about the extent of contaminants and personal protection equipment,. Real time field monitoring that allows remediation workers to evaluate the extent and nature of contamination, along with appropriate personnel protection equipment, will be needed for this action. In addition, the action will be designed to address the questions raised by the fact that the full extent of the contamination is not known at this time. These topics will be addressed in the Action Memo (which will be available for public comment), the Work Plan, and the Verification Sampling Plan for the Removal Action.

Comment:

If I recall correctly, there was some discussion as to the origin of the contamination. Some suspicions were that it was due to migration from the Building 31 area. If precursor core sampling is planned, will the core sampling focus on locating the source term?

Response:

Characterization sampling would focus on isolating the thorium in the vicinity of PRS 412 and the hot spot C0033. If the characterization information or data generated during the removal action field work indicates the origin or direction of origin of PRS 412, that information will be pursued as appropriate. There is a great deal of sampling information from the vicinity of Building 31. PRS 266 and PRS 267 are located nearby. PRS 267 has been designated Further Assessment. The Further Assessment of PRS 267 may resolve the speculation that Building 31 is the source of the contamination near PRS 412.

Lockheed Martin Idaho Technologies Company | **DRAFT**

INTERDEPARTMENTAL COMMUNICATION

Date:	March 20, 1997		
To:	Reva Hyde	MS 3765	6-0741
From:	Nick Josten	MS 2107	6-7691
Subject:	PRELIMINARY SUMMARY OF IN SITU Pu-238 MAPPING AT MOUND PLANT - NEJ-01-97		

This letter has been prepared to provide a summary of data and preliminary conclusions stemming from two days of field work at the Pu-238 contaminated Miami-Erie Canal adjacent to the DOE Mound Plant in Ohio. Our objective in this work was to establish a performance baseline for in situ mapping of Pu-238 contamination using a CaF_2 radiation sensor. A Final Report is being prepared.

Background

The INEEL constructed a custom radiation sensor based on six 2 in x 2 in CaF_2 detectors supplied by the WAG-7 Environmental Restoration Program. CaF_2 exhibits good sensitivity to L x-ray radiation in the vicinity of the 17 keV x-ray emitted by Pu-238, with little sensitivity to higher energy x-rays or gamma radiation. The six CaF_2 detectors were set up with two energy windows, one near 17 keV to detect Pu-238, and a second to measure changes in background radiation. The sensor was shipped to Mound Plant along with a four-wheeled deployment cart (Figure 1).

Upon arrival at Mound Plant, the cart and sensor were assembled and checked out using available test sources. During this testing, it was discovered that four of the six CaF_2 detectors were not correctly tuned for Pu-238 detection and were contributing substantial noise to the system. The cause of this problem could not be determined so the four malfunctioning detectors were disconnected and the sensor was operated with the remaining two.

Field work was conducted in a portion of the canal designated as Grid 15S. Grid 15S originally contained soil mounds from historic dredging of the canal. The dredge piles were recently removed by excavation under the ongoing Canal remediation, but surveys indicated that residual Pu-238 remained. The field testing procedure was to map the in situ distribution of residual Pu-238 using the cart mounted CaF_2 sensor and to collect samples as necessary to verify mapping results.

For the field testing, the CaF_2 sensor was mounted on the cart six inches above the ground and traversed along 32 ft long scan lines parallel to the Miami-Erie Canal. A total of 21 lines were scanned 1 ft apart giving a total survey area of 32 ft x 20 ft. A second survey was conducted over the same area but with scan lines running perpendicular to the canal. The purpose of the second survey was to verify that the in situ measurements were repeatable. The CaF_2 sensor

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continuously measured the ambient x-ray radiation field and produced two channels of output in counts/sec. The measured values were displayed as they were acquired, once per second, on a console in view of the cart operator.

Following the work at Grid 15S, a gross gamma-ray sensor was mounted on the cart in place of the CaF_2 sensor. This system was used to survey a 45 ft x 16 ft area near Mound Plant's Building 88 that was suspected to contain Th-232 contamination.

Results

1. The INEEL CaF_2 detector measured increased Pu-238 L x-ray radiation over an area approximately 4 - 6 ft wide near the edge of and parallel to the Miami-Erie canal (Figure 2). In this area, x-ray fields were measured at 16 - 20 c/s (± 5 c/s) compared with 9 - 14 c/s (± 5 c/s) in background areas. The signal to noise ratio is low, suggesting that this feature represents the approximate detection limit of the CaF_2 detector. By averaging data within 2 ft x 2 ft squares, which is effectively the same as increasing detector count times, noise levels were reduced with only a minor loss in spatial resolution. Figure 3 shows the smoothed data, which accentuate the area of high L x-ray flux.

2. The approximate detection limit for the CaF_2 detector in pCi/g was estimated based on 16 samples collected within the survey area (Figure 4). The 9 samples within the high L x-ray flux zone have a median Pu-238 activity concentration of 117 pCi/g and a mean activity concentration of 384 pCi/g. If the median Pu-238 activity concentration from the samples is taken as the best approximation of bulk Pu-238 levels throughout the contaminated zone, we can conclude that the detection limit of the current CaF_2 detector is in the range of 100 - 150 pCi/g.

3. A more detailed comparison between the in situ x-ray measurements and sampling results implies a complex relationship between the two assay methods. Figures 4 compares CaF_2 detector response with sample activity concentrations along lines perpendicular and parallel to the high Lx-ray zone. The perpendicular profile (Figure 5a) shows background Lx-ray fields at 10 - 12 c/s and maximum x-ray fields at 18 - 19 c/s, i.e. a factor of two increase. Corresponding Pu-238 levels from samples increase from a background 13 - 19 pCi/g to a maximum of 1793 pCi/g, i.e. a factor of more than 100 increase. The parallel profile (Figure 5b) shows x-ray fields varying between 14 - 20 c/s or between 1.5 to 2 times background. Sampled Pu-238 levels show the same general pattern of highs and lows along this trend but the activity concentrations range from 1 to over 100 times background. These large variations in activity concentrations occur over short distances and suggest an element of random or chaotic distribution of Pu-238. On the other hand, in situ measurements made with the CaF_2 detector imply more uniform or smoothly varying Pu-238 distribution.

4. Mapping of the high flux area was achieved in real time, with the CaF_2 sensor mounted on the hand pushed cart and scanned across the area at a line scan rate averaging 0.5 ft/s. The initial scan required 63.6 minutes, covered 640 ft^2, and produced 1146 independent measurements of the L x-ray radiation field (Figure 6). This corresponds to an average of about 6 seconds and two

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independent measurements per square foot. We estimate that 2/3 of the scan time was used for turning and aligning the cart as required to use its internal navigation system. An optimized data collection system could easily reduce scan times to about 2 seconds per square foot without reducing sensitivity or spatial resolution.

5. The in situ gross gamma-ray map generated from data collected with the plastic scintillator near Building 88 is shown in Figure 7. The map image reveals the Th-232 to be highly localized in a series of hot spots along a linear trend with the most prominent hot spot occupying approximately 175 sq ft. The INEEL plastic scintillator is heavily shielded, which enhances the sharpness of the measured gamma-ray field changes as the sensor moves on or off contaminated soils. This factor, combined with the fact that over 350 independent measurements were made uniformly on the site (Figure 8) suggests that the map images are accurate representations of Th-232 distribution. If the scintillator was calibrated for Th-232 it would be possible to estimate the Th-232 activity concentration in pCi/g.

Conclusions

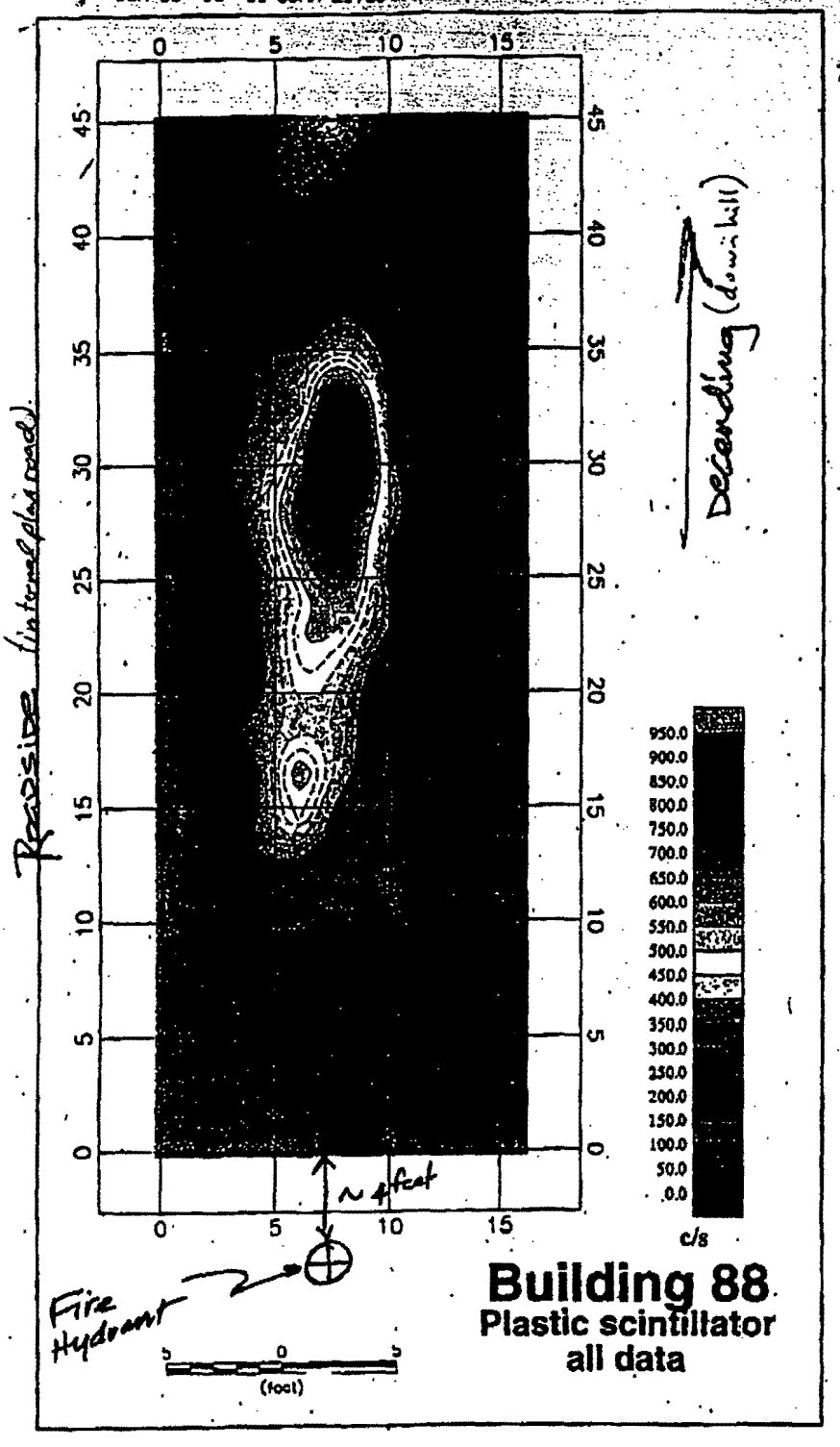
Field tests with the INEEL CaF_2 sensor at the Miami-Erie Canal suggest that the difficult problem of detecting Pu-238 in situ and in real time should be achievable at levels low enough to be useful as a field screening tool. Demonstrated advantages of the in situ method include 1) the higher speed at which results are available for review and use, and 2) vastly improved spatial resolution of Pu-238 distribution because of the greatly increased data density.

The detection limit of the CaF_2 detector in pCi/g is not clearly discernible from sample results because sample activity concentrations varied erratically over short distances. Nonetheless, it is reasonable to conclude that this limit is in the 100 - 150 pCi/g range. Perhaps more important is the observation that the in situ sensor tends to respond to bulk changes in contamination levels averaged over large surface areas (~4 sq ft) while sampling can be sensitive to very localized changes. This difference, which is fundamental to the two methods, should be at the core of discussions concerning their most beneficial use in the remediation process.

The INEEL CaF_2 sensor performance can be further improved by retuning the 4 defective detectors and refining the method used to measure the Pu-238 window and the background window. Theoretically, detection limits should be decreased nearly a factor of two through addition of the four detectors alone.

The much easier problem of detecting high energy gamma-rays in situ was illustrated by data collected for Th-232 contamination near Building 88. The large area, heavily shielded INEEL plastic scintillator was a clear improvement over the plastic scintillator used during the Area 7 Removal Action in 1995. The new sensor is capable of very rapid, high resolution characterization of contaminant distribution and is very amenable to quantitative analysis because of its high sensitivity and narrow focus.

Figure 7


Roadside (internal plasroad)
Descending (downhill)
~4 feet
Fire Hydrant
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c/s
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Building 88
Plastic scintillator
all data

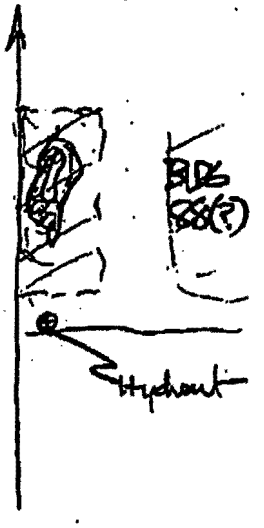
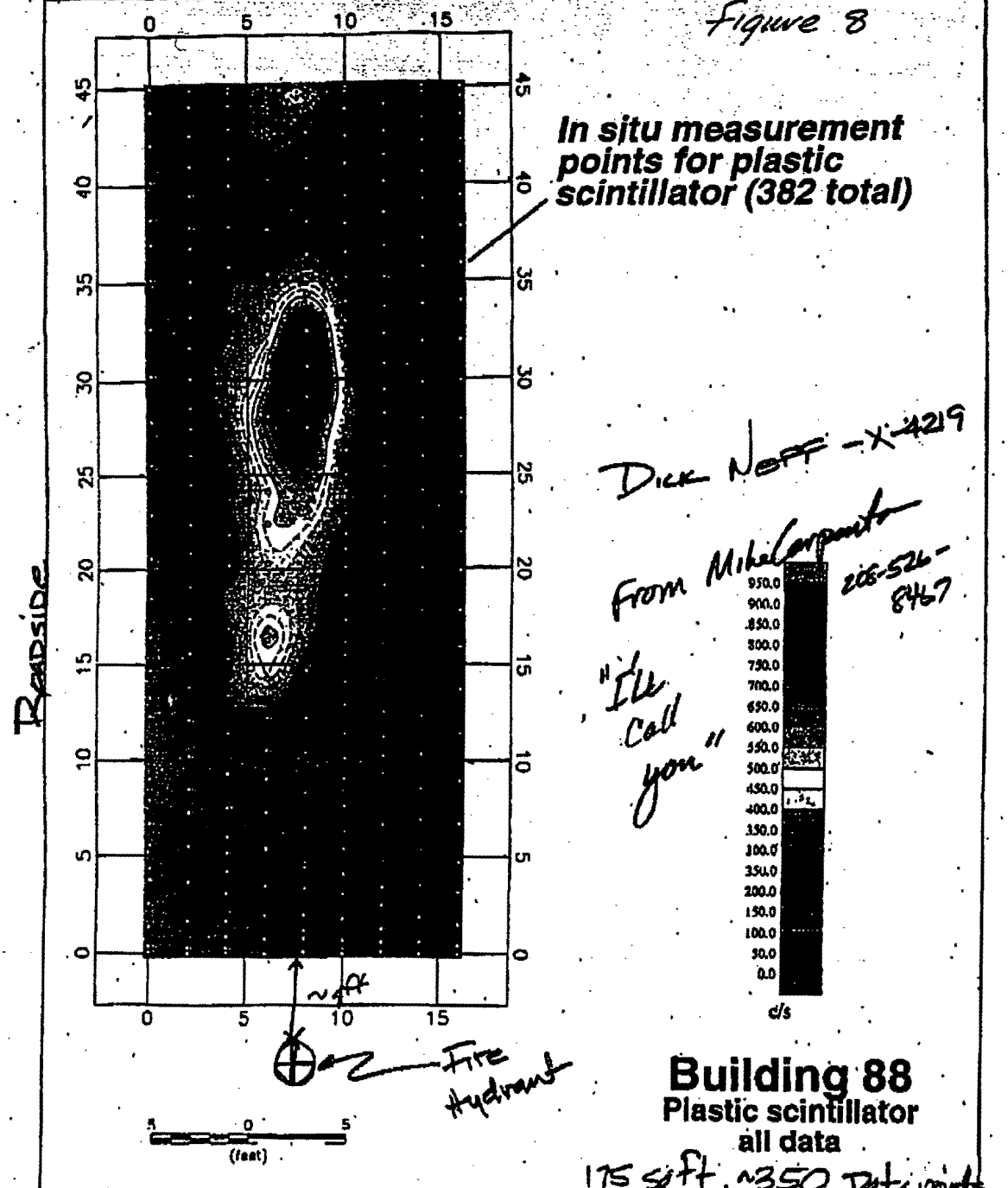

BDS 88(?)
Hydrant

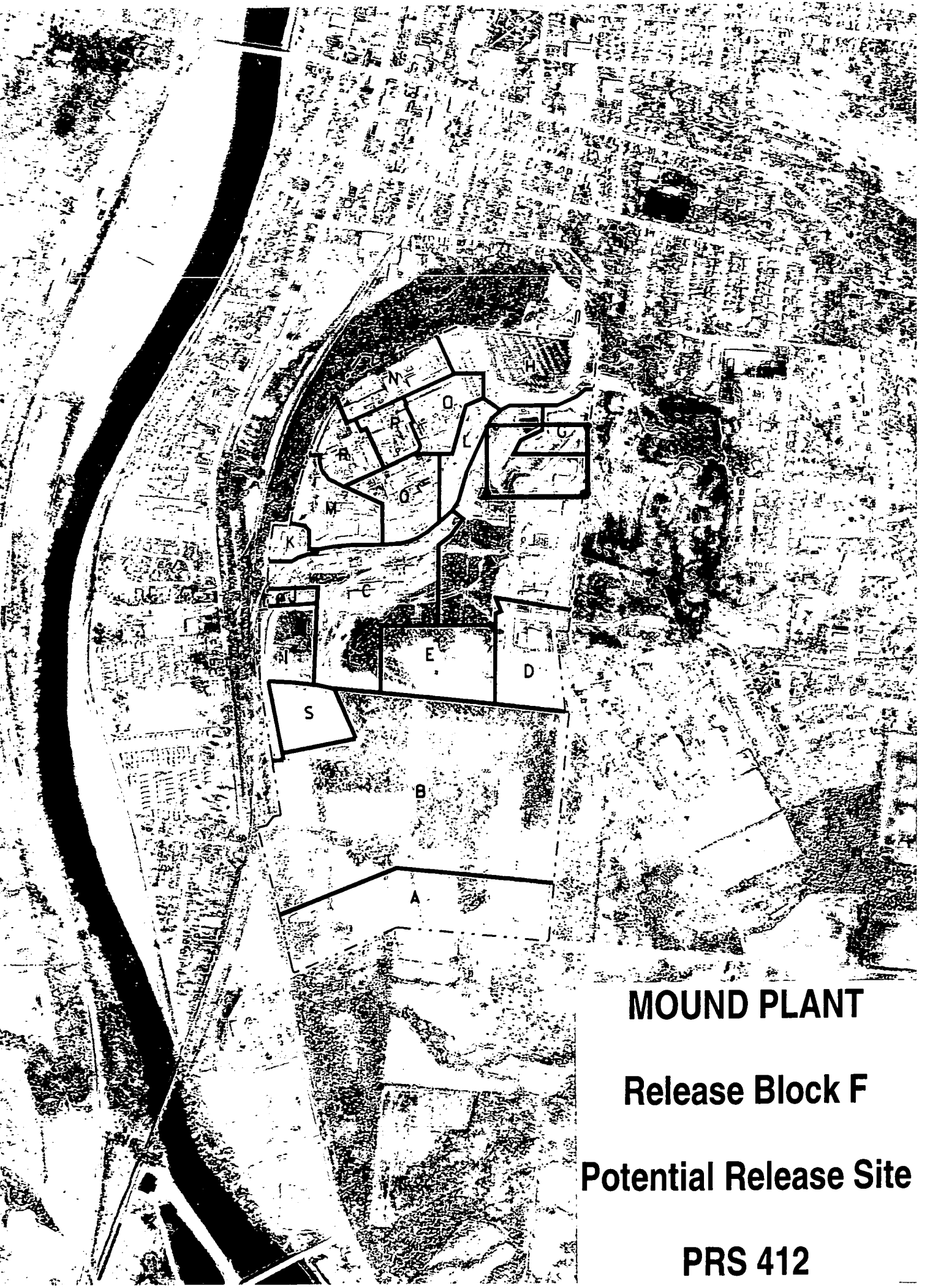
Figure 8



Dick Neff -X-4219

From Mike Carpenter 206-526-8467

"I'll Call you"



MOUND PLANT

Release Block F

Potential Release Site

PRS 412

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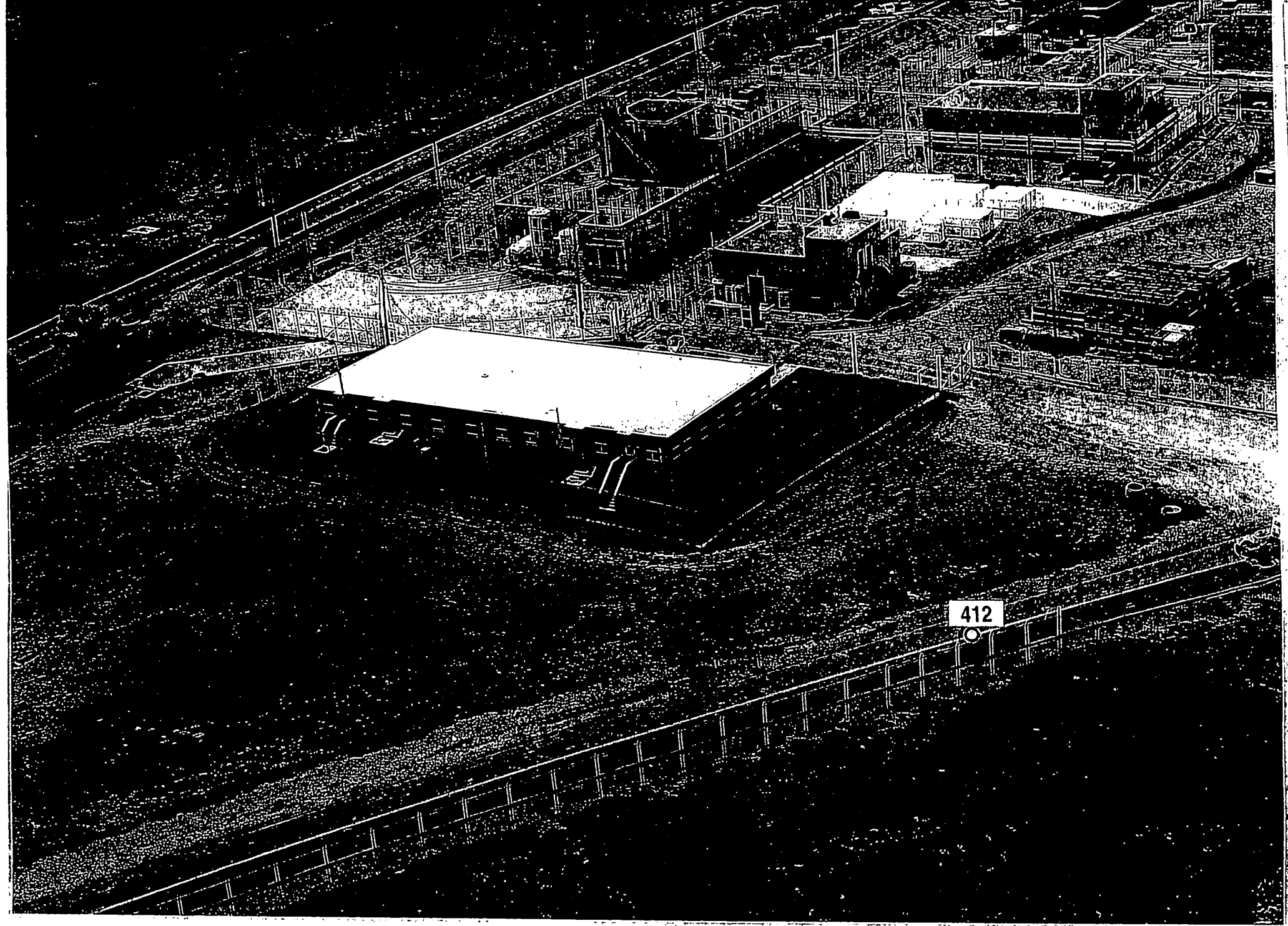

412

PRS 412

PRS HISTORY:

PRS 412 (previously known as PRS 393) is identified as a radiological hot spot located near the eastern boundary of the Mound plant on the SM hill. PRS 412 (hot spot C0033) was identified as a result of the Radiological Site Survey Project.[1]

CONTAMINATION:

1. In 1983, the ***Radiological Site Survey***[1] investigated radionuclides in the soils at the Mound site via Mound Soil Screening, radiochemistry, and gamma spectroscopy. The *Radiological Site Survey* map on page 7 shows the locations of PRS 412 to pertinent *Radiological Site Survey* samples. Results showed:

PRS	No. of Samples	Sample Type and Location	Results (Maximum)	Guideline Criteria
412	4	2 surface soil samples (one at S0253 and one at S0314) and 2 core samples (both at C0033) taken within 50 ft. of PRS 412	Plutonium-238 at 0.97 pCi/g	25 pCi/g (Mound ALARA)
			Thorium at 42.4 pCi/g at 3 ft (C0033)	15 pCi/g
			Tritium 2.07 pCi/ml	20 pCi/ml

2. In 1994, the ***OU5, Operational Area Phase I Investigation***[2] analyzed the Mound site for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs) via a qualitative PETREX soil gas survey. The OU5 investigation also analyzed surface soil for radiological contamination via Mound FIDLER (field instrument for detecting low energy radiation) and Mound soil screening. Results showed:

PRS	PETREX Qualitative Results	Mound Soil Screened Sample
412	Relatively elevated halogenated hydrocarbons	9 pCi/g plutonium-238 (ALARA guideline = 25 pCi/g) 0.5 pCi/g thorium-232 (guideline = 5 pCi/g)

3. In 1996, the quantitative ***Soil Gas Confirmation Sampling***[5] investigation sampled the *PETREX* soil gas locations with the highest *PETREX* ion counts in the northern sector of the Mound plant. These locations were identified as *Soil Gas Confirmation Sampling* locations 2 and 4 (the corresponding *PETREX* sample locations are 974 and 890) respectively).

   PRS 412 (*PETREX* sample location 868), also located in Mound's northern sector had lower ion counts than *Soil Gas Confirmation Sampling* locations 974 and 890. Hence, the quantitative *Soil Gas Confirmation* results taken at the locations with the highest ion counts provide evidence about the risk of contamination at other locations with similar or lower ion counts such as PRS 412. The map on page 22 shows the locations of PRS 412 relative to the *Soil Gas Confirmation Sampling* locations 2 and 4).

The following table lists the qualitative (*PETREX*) and quantitative (*Soil Gas Confirmation Sampling*) results for the locations with the highest ion counts. The table also compares these results to the relative ion counts for PRS 412.

PETREX Soil Gas Contaminant Family	Maximum Ion Count[4]	Confirm Sample #	Confirmation Sample Results that Exceed Guideline Criteria (GC)	Ion Counts at PRS 412
Total Aromatic Hydrocarbons	7,780,673	2	None	22,326
Total Semivolatile Hydrocarbons	7,015,960	2	1300 ug/kg Benzo(a)pyrene (GC = 410 ug/kg [ref 3])	Non-detect
Total C5-C11 Petroleum Hydrocarbons	24,166,931	2	None	43,566
Total Halogenated Hydrocarbons	1,370,283	4	None	51,737

The above table and discussion make no conclusions about individual contaminant concentrations at PRS 412 only that the overall health risk from PRS 412 is expected to be similar to or less than that of the PETREX locations with the highest measured ion counts (*Confirmation Sample* locations 2 and 4).

READING ROOM REFERENCES:

1) OU9, Site Scoping Report: Volume 3 - Radiological Site Survey, June 1993. (pages 6-10)
2) OU5, Operational Area Phase I Investigation, Non-AOC Field Report, Volumes I and II, Final (Revision 0), June 1995. (pages 11-17)
3) Risk Based Guideline Values, Final, (Revision 0), December 1995.

OTHER REFERENCES:

4) Code of Federal Regulations, 40 CFR 192.41 and 40 CFR 192.12.
5) Soil Gas Confirmation Sampling, (Revision 0), May 1996. (pages 18-26)

PREPARED BY:

Dennis J. Gault, Member of EG&G Technical Staff

MOUND PLANT
PRS 412
Contaminated Soil

RECOMMENDATION:

PRS 412 (hot spot C0033) was identified as a result of the Radiological Site Survey Project. Thorium was found at 42 pCi/g at this location.

The Core Team originally recommended Further Assessment for PRS 412. Subsequently, the cost of further investigation versus the cost of removing the potentially contaminated soils was evaluated. Cost estimates indicate that the cost of removal is not significantly greater than the cost of further assessment at PRS 412. Additionally Further Assessment findings may indicate the need for a Response (removal) Action, resulting in costs associated with both Further Assessment and Response Action. Therefore, the Core Team recommends a RESPONSE ACTION as a more cost-effective course of action for PRS 412.

CONCURRENCE:

DOE/MEMP: Arthur W. Kleinrath, Remedial Project Manager — 3/19/98 (date)

USEPA: Timothy J. Fischer, Remedial Project Manager — 3/19/98 (date)

OEPA: Brian K. Nickel, Project Manager — 3/19/98 (date)

SUMMARY OF COMMENTS AND RESPONSES:

Comment period from 4/15/98 to 5/15/98

☐ No comments were received during the comment period.

☒ Comment responses can be found on page C1 - C8 of this package.

REFERENCE MATERIAL
PRS 412

Document Control No. DGC

Environmental Restoration Program

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

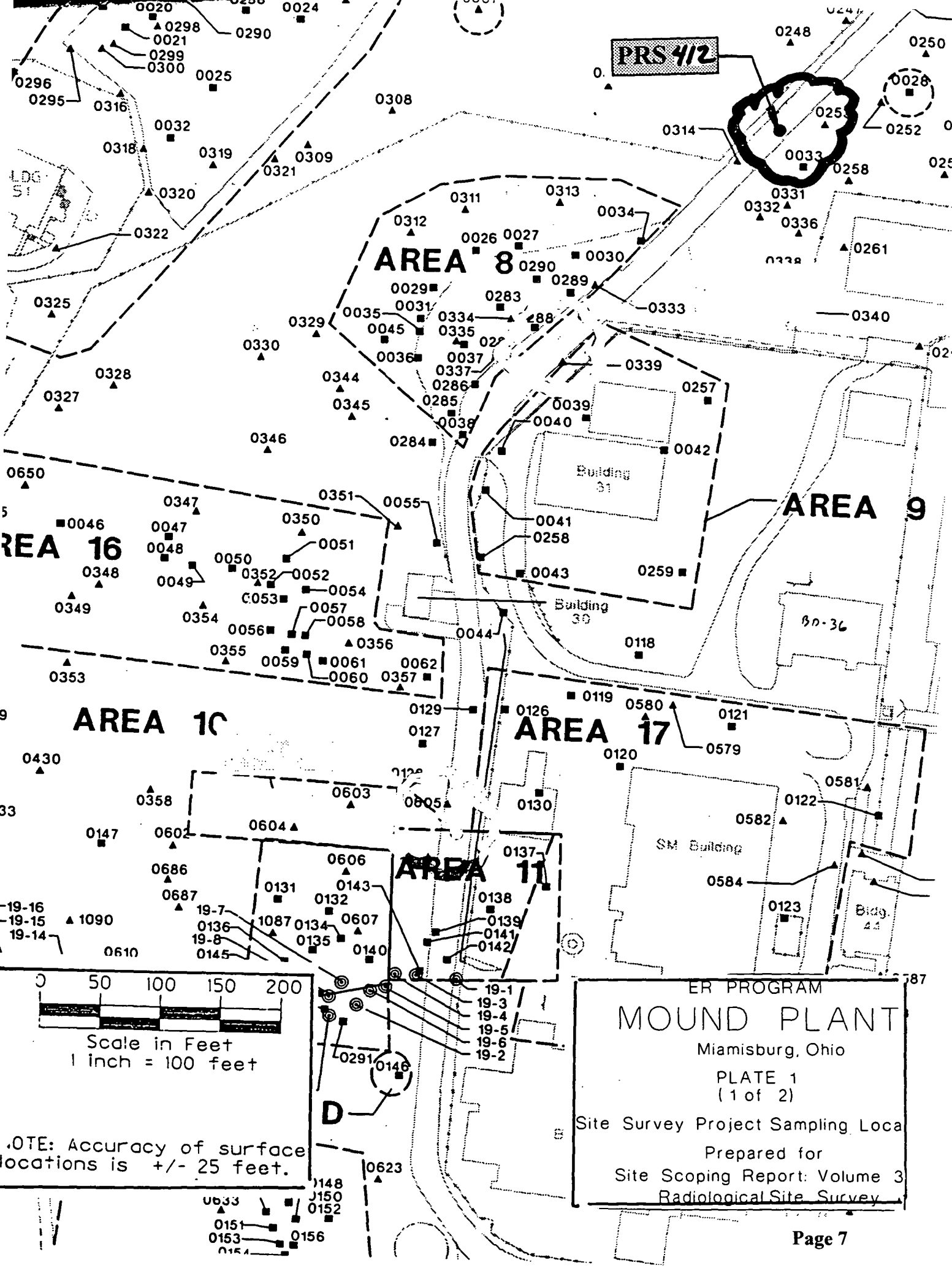
MOUND PLANT
MIAMISBURG, OHIO

June 1993

FINAL

Department of Energy
Albuquerque Field Office

Environmental Restoration Program
EG&G Mound Applied Technologies


PRS 4/2
AREA 8
AREA 9
AREA 16
AREA 10
AREA 17
AREA 11
Building 31
Building 30
SM Building
Bldg. 44
Scale in Feet
1 inch = 100 feet
0 50 100 150 200
NOTE: Accuracy of surface locations is +/- 25 feet.
ER PROGRAM
MOUND PLANT
Miamisburg, Ohio
PLATE 1
(1 of 2)
Site Survey Project Sampling Loca
Prepared for
Site Scoping Report: Volume 3
Radiological Site Survey

Map Location[a]	Coordinates South	Coordinates West	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)
S0323	2225	2540	5988	08-84	0	0.45[c]	3.64[c]					
S0324	2275	2540	6848	08-84	0	1.86	b					
S0325	2275	2490	6849	08-84	0	1.73	b					
S0326	2325	2590	4096	10-83	0	3.91	b					
S0327	2350	2515	6847	08-84	0	1.50	b					
S0328	2350	2465	4097	10-83	0	0.73	b		LDL	1.2	1.1	LDL
S0329	2375	2290	4098	10-83	0	15.88	b	1.39				
S0330	2375	2340	6846	08-84	0	2.02	b					
C0033	2400	1860	6349	11-84	36	0.11[c]	42.38[c]					
			6414	11-84	48	0.97[c]	20.17[c]					
C0034	2405	2010	1260	12-82	18	4.83[c]	32.20[c]					
			1261	12-82	72	0.48	9.12					
			1262	12-82	90	0.07	b					
			1263	12-82	108	0.03	b					
C0035	[illegible]	[illegible]	[illegible][d]	[illegible]	[illegible]	[illegible]	[illegible]					

[a]C denotes core location and S denotes surface sample location on Plate 1.
[b]Thorium results of ≤ 2 pCi/g are listed as "b".
[c]Verification sample analyzed for QA/QC.
[d]No MRC ID assigned because *in situ* gamma spectrometry was performed for thorium-232.
[e]Gamma results could not be confirmed using the gamma spectroscopy printout given in this appendix.
[f]The depth for this sample was given as "SS". For mapping purposes (Plates 1 and 5), this is assumed to be a surface sample.
[g]Sample results were given isotopically for this sample and included 0.99 pCi/g thorium-228; 321 pCi/g thorium-230; and 1.5 pCi/g thorium-232, for a total of 323.5 pCi/g.

LDL - The sample result was below the Lower Detection Limit, which was estimated to be 0.5 pCi/g for cesium-137, cobalt-60, and americium-241. The LDL for radium-226 or actinium-227 was estimated to be 1 pCi/g.
NR - No result provided. (Note: no samples were taken for plutonium-238 when *in situ* gamma spectrometry was performed.)

Map Location[a]	Coordinates South	Coordinates West	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)
S0252	2375	1780	6500	08-84	0	0.49	b					
S0253	2375	1830	2810	10-83	0	0.66	b	2.07				
S0254	2425	1500	2824	10-83	0	1.56	b					
S0255	2425	1605	6355	08-84	0	1.42	b					
S0256	2425	1705	2823	10-83	0	0.35	b					
S0257	2425	1730	6362	08-84	0	0.01	b					
S0258	2425	1830	2822	10-83	0	0.72	b					
S0259	2450	1755	6361	08-84	0	0.01	b					
S0260	2475	1630	6356	08-84	0	0.02	b					
S0261	2475	1855	6360	08-84	0	0.01	b					
S0262	2500	1650	6357	08-84	0	0.79	b					
S0263	2500	1655	6353	08-84	0	0.03	b					
S0264	2500	1730	6354	08-84	0	0.04	b					
S0265	2525	1655	6358	08-84	0	0.02	b					
S0266	2525	1680	6352	08-84	0	0.01	b					
S0267	2525	1730	2862	10-83	0	0.05[c]	b					
S0268	2575	1655	6359	08-84	0	3.60[c]	b					
S0269	2575	1830	6350	08-84	0	0.34	b					
S0270	2625	1730	6351	08-84	0	0.13	b					

Map Location[a]	Coordinates South	Coordinates West	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)
			None[d]	07-84	72	NR	18					
			None[d]	07-84	84	NR	12					
			None[d]	07-84	96	NR	12					
			None[d]	07-84	108	NR	10					
			None[d]	07-84	120	NR	5.3					
C0028	2375	1755	1245	12-82	18	11.40	5.61					
			1246	12-82	48	NR	109.00					
			1247	12-82	66	NR	109.00					
			1248	12-82	102	NR	58.00					
			1250	12-82	156	NR	97.00					
			1251	12-82	216	0.29[c]	29.45[c]					
			1252	12-82	234	0.06	b					
			1253	12-82	252	0.03	b					
S0314	2375	1910	2820	10-83	0	0.78	b					
C0029	2374.1	2184.3	None[d]	07-84	0	NR	12					
			None[d]	07-84	12	NR	17					
			None[d]	07-84	24	NR	17					
			None[d]	07-84	36	NR	38					
			None[d]	07-84	48	NR	53					
			None[d]	07-84	60	NR	42					
			None[d]	07-84	72	NR	36					
			None[d]	07-84	84	NR	38					
			None[d]	07-84	96	NR	55					
			None[d]	07-84	108	NR	48					
			None[d]	07-84	120	NR	36					
			None[d]	07-84	132	NR	21					
			None[d]	07-84	144	NR	17					

Document Control No.

Environmental Restoration Program

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

MOUND PLANT
MIAMISBURG, OHIO

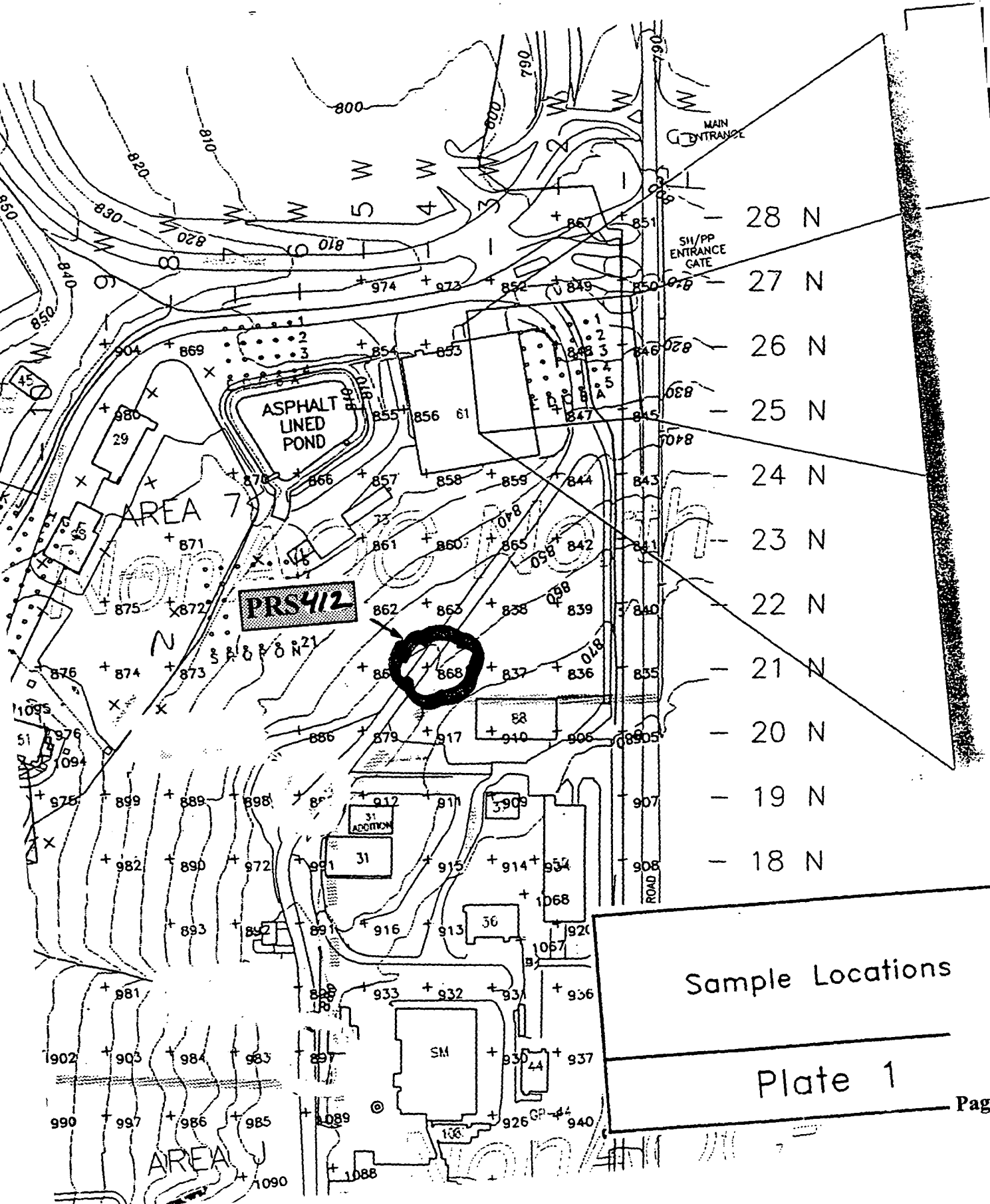
VOLUME II - APPENDICES A-G

June 1995

Final (Revision 0)

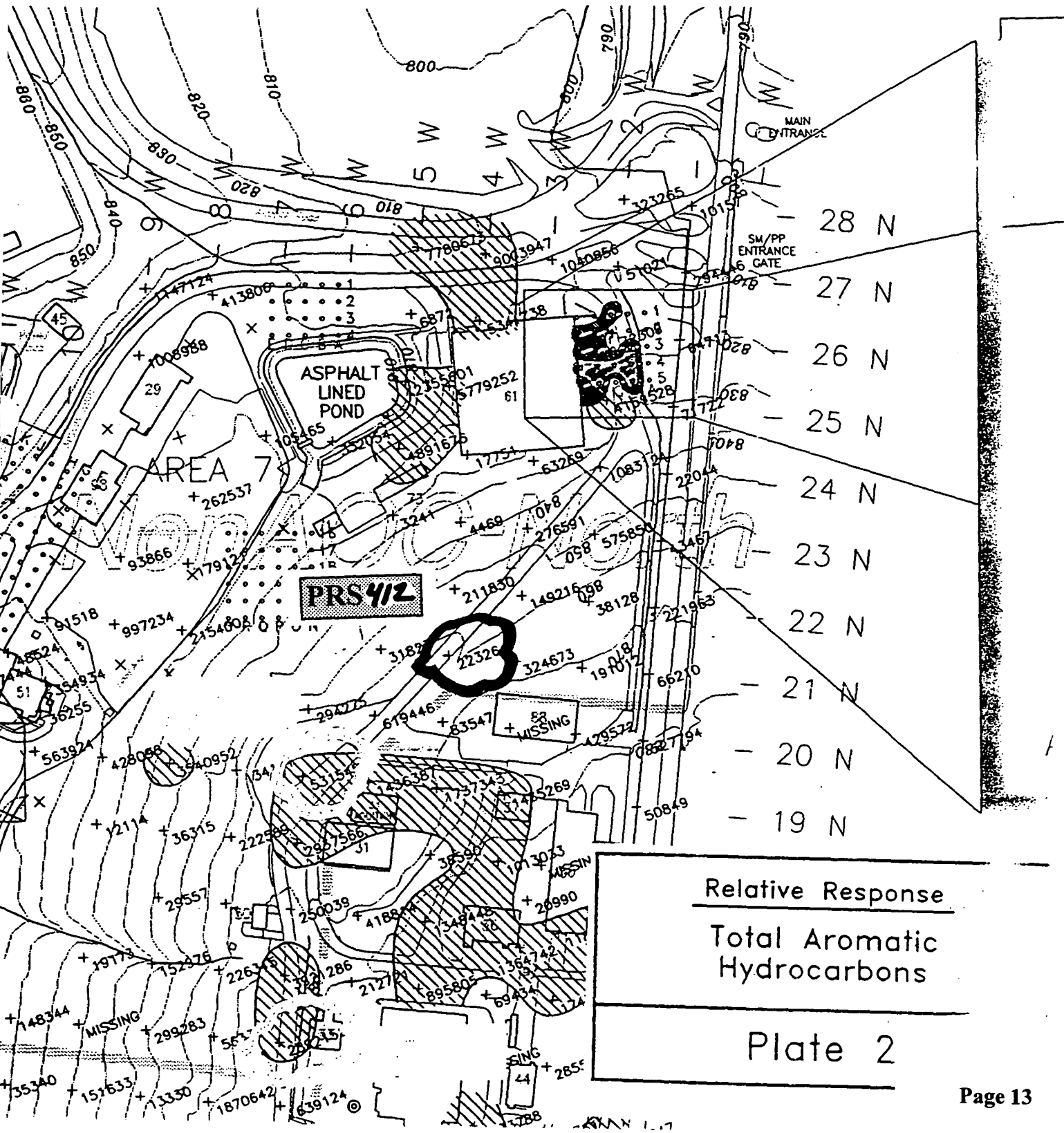
U.S. Department of Energy
Ohio Field Office

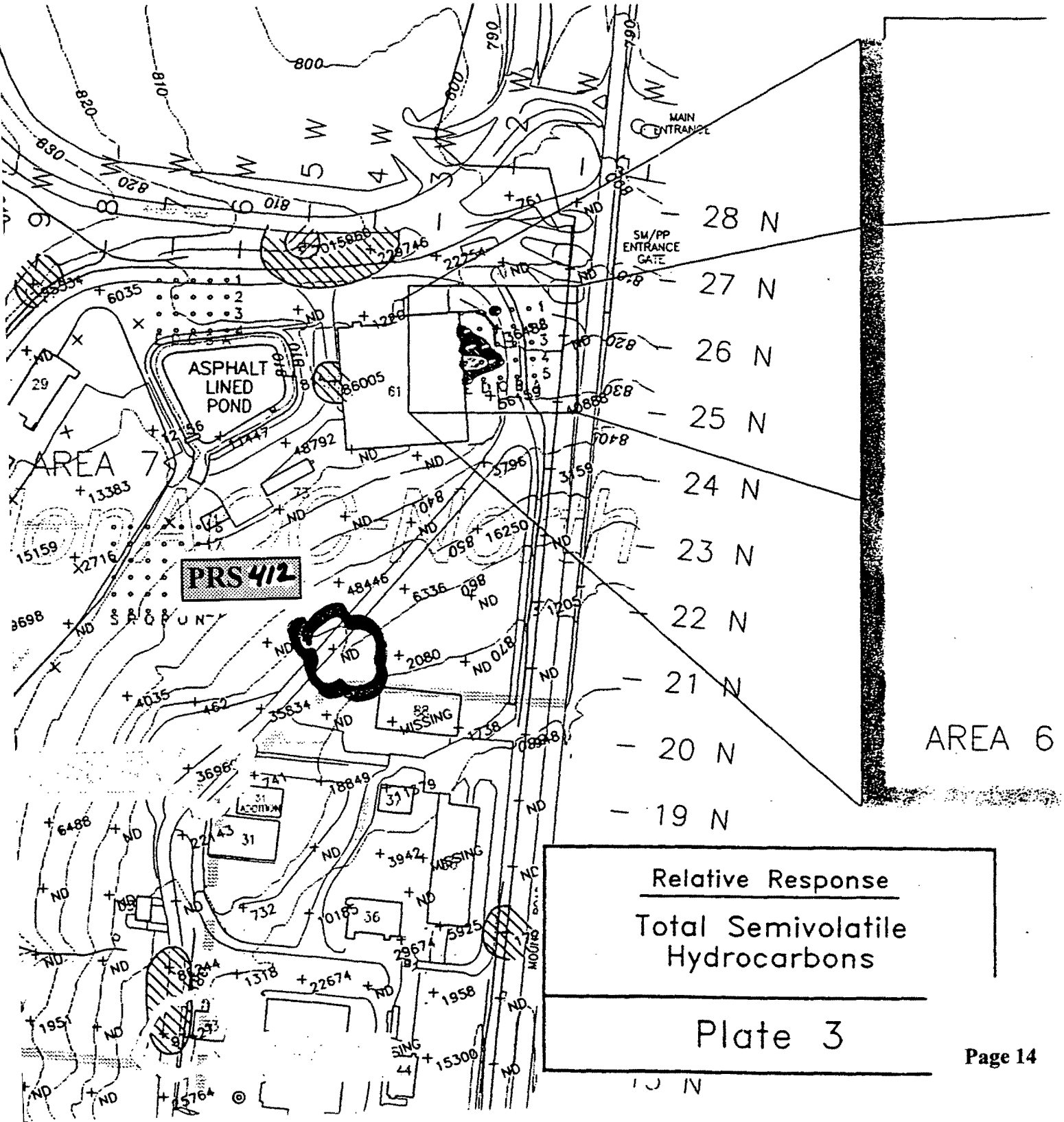
EG&G Mound Applied Technologies



Sample Locations

Plate 1

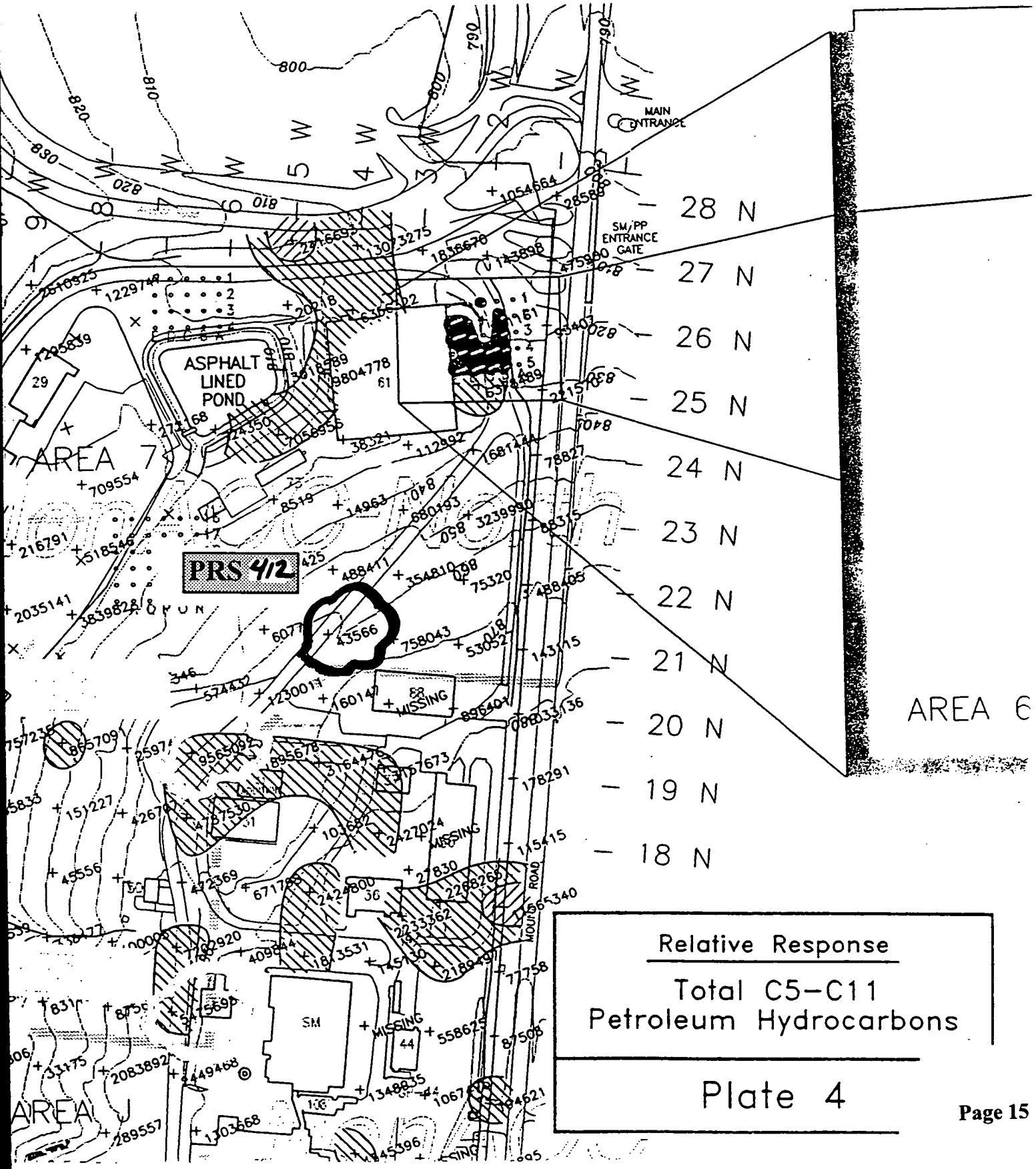

ASPHALT LINED POND
AREA 7
PRS412
MAIN ENTRANCE
SM/PP ENTRANCE GATE
28 N
27 N
26 N
25 N
24 N
23 N
22 N
21 N
20 N
19 N
Relative Response
Total Aromatic Hydrocarbons
Plate 2



Relative Response

Total Semivolatile Hydrocarbons

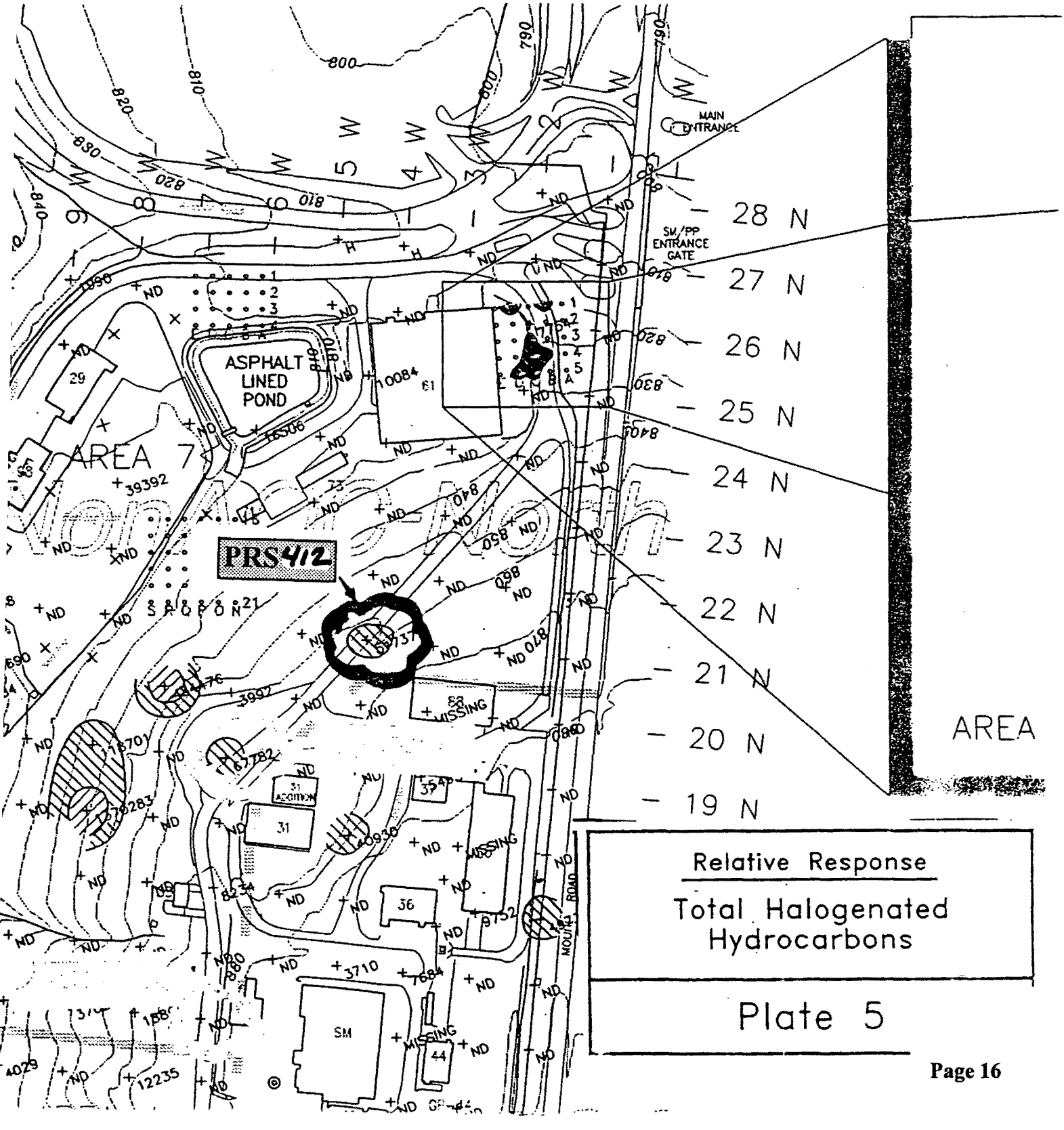
Plate 3



Relative Response

Total C5-C11 Petroleum Hydrocarbons

Plate 4



Relative Response

Total Halogenated Hydrocarbons

Plate 5

APPENDIX D

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

	FIDLER SURVEY DATA					MOUND SOIL SCREENING FACILITY DATA			
SMPID	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:
20N03	130	100	6.5	6.5	NC	0	a	0.3	a
20N04	176.8	110	8.97	7.5	NC	0	a	1.1	a
20N05	176.8	85	8.97	4.5	NC	WIPE	c	WIPE	c
20N06	176.8	375	8.97	22.0	30	27	b	2.6	b
20N07	176.8	325	8.97	22.5	45	37	b	14.7	b
20N10	157.3	95	8.45	4.5	NC	0	a	0.6	a
20N11	157.3	80	8.45	4.0	NC	WIPE	c	WIPE	c
21N01	253.5	140	12.48	9.5	NC	15	a	1	a
						3	a	0.8	a
21N02	176.8	140	8.97	6.5	NC	7	a	1	a
						19	a	0.7	a
21N03	176.8	160	8.97	8.0	NC	20	a	1.2	a
21N04	176.8	100	8.97	5.0	NC	9	a	0.5	a
21N05	152.1	110	8.45	10.0	NC	11	a	1.8	a
21N08	176.8	85	8.97	4.5	NC	WIPE	c	WIPE	c
21N09	176.8	75						IPE	c
21N10	157.3	90							a
22N01	253.5	145							a
22N02	176.8	135							a
22N03	176.8	115							a
22N04	152.1	100							b
22N05	152.1	105							a
22N08	176.8	115						PE	c
22N09	176.8	95						PE	c
23N01	253.5	170							a
23N02	176.8	160							a
									a

NC - No sample collected because location not an original grid point
NA - Reading not taken; contamination criteria not exceeded.
NS - Sample collected but not analyzed.
a - Mound Soil Screening Facility detection level not exceeded.
c - Results of the wipe sample were less than 20 disintegrations per minute.
CPM - Counts per minute
KCPM - Counts per minute x 1000
pCi/g - Picocuires per gram

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

Table I.1 Soil Analyte List

Volatile Organic Compounds

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

Semivolatile Organic Compounds

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

Table I.1 Soil Analyte List (Continued)		
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

Table I.2. Variance From 3-Foot Sampling Depth Specification

Location	Description of Variance
SGC-NAC-000001	Core sampler hit refusal at 2 feet.
SGC-NAC-000002	Relocated due to utilities.
SGC-NAC-000003	Core sampler hit refusal at 2 feet.
SGC-NAC-000004	Core sampler hit refusal at 18 inches.
SGC-NAC-000005	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-NAC-000006	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-NAC-000007	Core sampler hit refusal at 18 inches.
SGC-NAC-000008	Drilled to 2 feet due to utilities.
SGC-NAC-000010	Drilled to 1 foot; hand-augered rest due to utilities; flag against building, so sample taken 6 feet from flag.
SGC-NAC-000012	Drilled to 2 feet due to utilities.
SGC-SAN-000018	Core sampler hit refusal at 2 feet; relocated from inside clarifier.
SGC-NAC-000029	Core sampler hit refusal at 18 inches.
SGC-A61-000043	Sampled 1 foot from flag.
SGC-A61-000047	Drilled to 2 feet due to utilities.
SGC-A61-000048	Drilled to 2 feet due to utilities.
SGC-A61-000049	Relocated due to utilities.
SGC-A61-000051	Core sampler hit refusal at 18 inches.
SGC-A61-000052	Relocated due to utilities; core sampler hit refusal at 18 inches.
SGC-A61-000053	Core sampler hit refusal at 2 feet.
SGC-A13-000056	Core sampler hit refusal at 18 inches
SGC-A13-000058	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-A13-000060	Core sampler hit refusal at 1 foot.
SGC-AOJ-000064	Core sampler hit refusal at 2 - 3 inches.
SGC-AOJ-000066	Core sampler hit refusal at 4 inches.
SGC-AOJ-000067	Core sampler hit refusal at 6 inches.
SGC-AOJ-000069	Core sampler hit refusal at 2 feet.
SGC-A03-000080	Core sampler hit refusal at 20 inches
SGC-A03-000081	Drilled to 2 feet due to utilities.
SGC-A03-000082	Drilled to 1 foot, hand-augered rest due to utilities.
SGC-A03-000083	Sampled 25 feet from original location due to storm sewer; core sampler hit refusal at 18 inches.
SGC-A03-000087	Core sampler hit refusal at 2 feet.
SGC-A21-000088	Core sampler hit refusal at 18 inches.
SGC-A21-000090	Core sampler hit refusal at 20 inches.
SGC-SDB-000097	Relocated due to utilities.
SGC-SDB-000098	Relocated from inside a building.
SGC-SDB-000101	Relocation of SGC-SDB-000099; first location surveyed incorrectly.
SGC-SDB-000102	Relocation of SGC-SDB-000100; first location surveyed incorrectly.

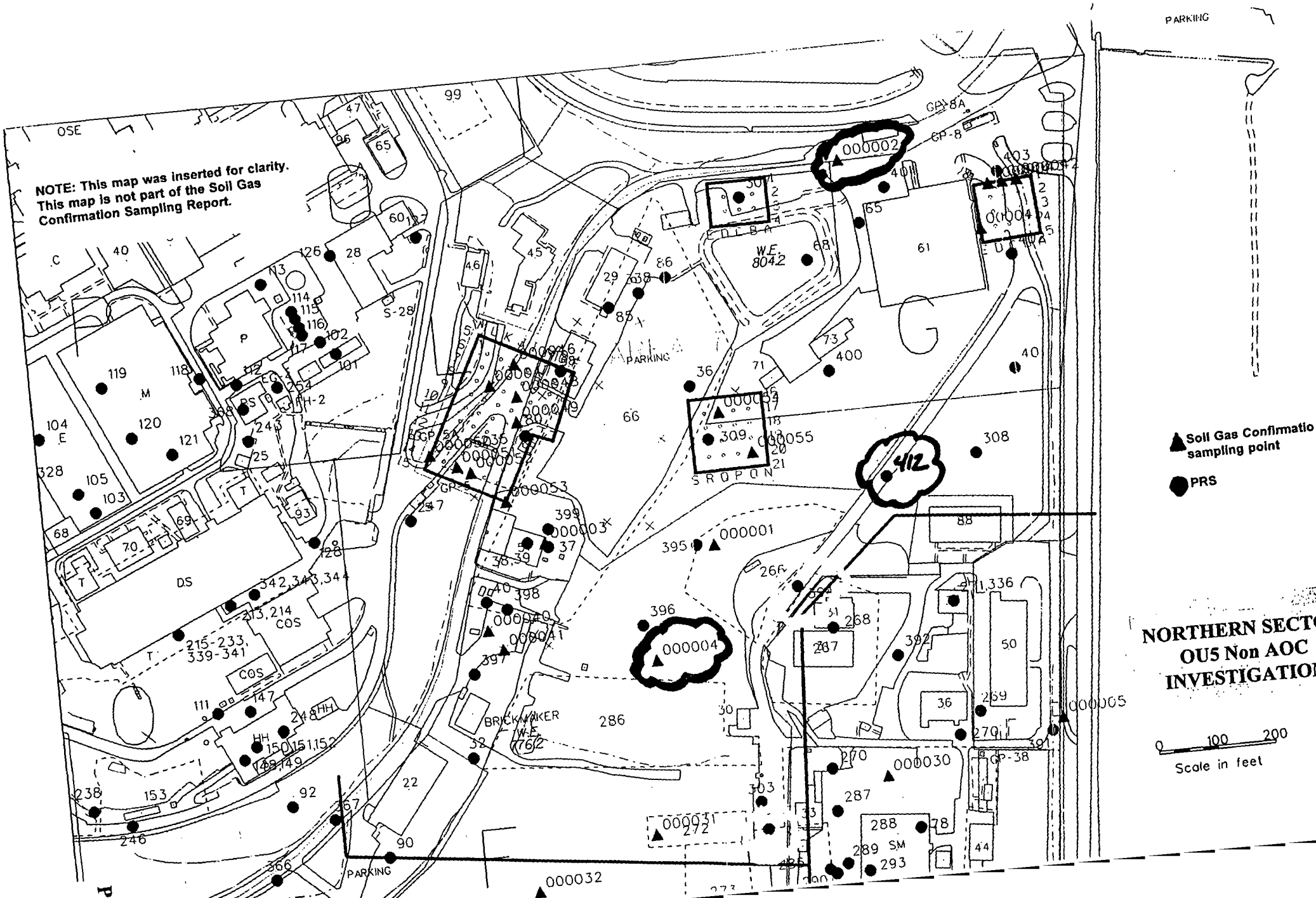

NOTE: This map was inserted for clarity.
This map is not part of the Soil Gas
Confirmation Sampling Report.
Soil Gas Confirmatio
sampling point
PRS
NORTHERN SECT
OU5 Non AOC
INVESTIGATIO
0 100 200
Scale in feet
PARKING
OSE
W.E. 804.2
BRICKMAKER W.E. 776.2
412
000002
000004
000001
000030
000031
000032
000005
000055
000053
000003
000040
000041
000046
000049
000048
000035
000054
000056
000057
GP-8A
GP-8
GP-38
GP-5A
GP-5
S-28
FH-2
DS
COS
HH
SM
P
M
T
E
C
S R O P O N
E D L B A
W L K
215-233, 339-341
342,343,344
213,214
1,336

Table A.1

Detected Volatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006
PETREX SAMPLE AREA			NORTH	NORTH	NORTH	EAST	EAST
Acetone	NA	21000000	36				
1,2-Dichloroethene (total)	NA	43000000					
2-Butanone	NA	93000000	12				
Benzene	NA	8.90E+03	1 J				
Carbon Disulfide	NA	280000					
Chloroform	NA	3100			67		
Chloromethane	NA	NA					
Ethylbenzene	NA	480					
Methylene Chloride	NA	3.95E+05	6			7	8
Tetrachloroethene	NA	21000000					
Toluene	NA	250000	1 J	1 J			
Trichloroethene	NA	41000					
Xylene (total)	NA	430000000					

No entry - not detected

J - Numerical value is an estimated quantity

C - Identification confirmed by GC/MS

mg/kg - micrograms per kilogram

Red = above Guideline Criteria (GC)

Green = above GC and below Background

Magenta = above Background and Below GC

Blue = above Background (no GC)

Table A.2.

Detected Semivolatile Organic Compounds (µg/kg)

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST
Acenaphthene	NA	NA		190 J	63 J				
Acenaphthylene	NA	NA		730				42 J	
Anthracene	NA	64,000,000		1300	66 J		25	55 J	
Benzo(a)anthracene	NA	4,100		1500	180 J		16 J	3[illegible] J	57 J
Benzo(a)pyrene	NA	410		1300	80 J		00 J	450	65 J
Benzo(b)fluoranthene	NA	4,100		1000	1[illegible] J		190 J	460	67 J
Benzo(g,h,i)perylene	NA	NA		550	0 J		100 J	260	26 J
Benzo(k)fluoranthene	NA	41,000		1000	160 J		190 J	4[illegible]	58 J
Bis(2-ethylhexyl)phthalate	NA	215,000							
Butylbenzylphthalate	NA	43,000,000							
Carbazole	NA	NA		600	2			34 J	
Chrysene	NA	410,000		1500	22[illegible]		240 J	490	6[illegible] J
Di-n-butyl phthalate	NA	21,000,000	120			280 J			
Di-n-octyl phthalate	NA	4,300,000							
Dibenz(a,h)anthracene	NA	410		180 J	40 J		37	J	
Dibenzofuran	NA	NA		1100	23				
Diethyl phthalate	NA	NA							
Fluoranthene	NA	8,500,000		3400 D	[illegible]		400 J	800	110 J
Fluorene	NA	NA		1500	42 J				
Indeno(1,2,3-cd)pyrene	NA	4,100		690	120 J		[illegible] J	[illegible]0 J	[illegible]
2-Methylnaphthalene	NA	NA		970					
Naphthalene	NA	NA		4000 D	24				
Phenanthrene	NA	NA		4700 D	3[illegible]		150 J	280 J	53 J
Phenol	NA	130,000,000							
Pyrene	NA	6,400,000	24 J	2700 D	4[illegible]0		340 J	7[illegible]	120 J

No entry - not detected
J - Value is an est. quantity
D - Sample was diluted
NA - Value not available
H - Analyzed outside holding time
µg/kg - micrograms per kilogram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.4.
Detected Inorganics

ANALYTE	Background Value	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005	SGC-NAC-000006	SGC-NAC-000007	SGC-NAC-000008	SGC-NAC-000009
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST	EAST	WEST	WEST	EAST
TAL INORGANICS (mg/kg)											
Aluminum	19000	NA	11000	4190	1910	11400	7970	7780	10200	2820	18700
Antimony	NA	85		0.23 B		0.24 B	0.41			0.27 B	0.91 B
Arsenic	8.6	64	B	2.1 B	2.9	1.4 B		2	1.9		11.1
Barium	180	15,000	.6	20.7 B	B	47.1 B	3.6	86.	B	23.2	
Beryllium	1.3	1	0.56		0. B	0.65	0.38	0.28	.28		.9 B
Bismuth	NA	NA									0.85 B
Cadmium	2.1	210		0.25 B	.19 B		0.36 B	0.5 B	0.33 B	0.22 B	6
Calcium	310000	NA	162000	159000	6500	152000	15	86200	8	113000	5940
Chromium	20	110,000	13.2	6.7	3.8	15.2	1	11	14	5.7	20.3
Cobalt	19	NA	9 B	4.5 B	2.3 B	10.1 B	7.6 B	.6 B	11 B	B	13
Copper	26	NA	1	11.9	9.9	17.1	14.5	15.2	16.2	.9	19.2
Cyanide	ND	4,300									
Iron	35000	NA	300	10600	5	21800	17200	700	23000	60	29400
Lead	48	NA	7	5.2	1	8.6	30.9	2	7.2	5	22.2
Lithium	26	NA	2 B	12.5 B	.2	23 B	7 B	10.3	B	8.2	14.7 B
Magnesium	40000	NA	6160	57800	900	5670	52	35600	00	47900	45
Manganese	1400	27,000	69	384	270	612	383	589	493	256	28
Mercury	ND	64			0.13						
Molybdenum	27	NA	.43 B	1.2 B	0.77 B		B	1.5 B	B	1.4 B	1.8 B
Nickel	32	4,300	18.4	9.9	6.4	20.6	11.1	16	22.	8.1	24.5
Potassium	1900	NA	780	742 B	346	2080	574 B	44 B	1590	46	1420
Selenium	NA	NA									
Silver	1.7	1,100			0 B						
Sodium	240	NA	228	888 B	50	137 B	411 B	8 B	246 B	B	1010 B
Thallium	0.46	NA									
Tin	20	NA	1.1			1.4 B	B			4.5 B	1 B
Vanadium	25	1,500	14	8.3	4.7	16.3	23.1	18.9	4.2	7.4	
Zinc	140	64,000	5	29.5		67	59	69.2	53.8	36.8	1.8
OTHER INORGANICS											
% Solids (%)	NA	NA	83	93.8	5	83.3	78.4	75	8	95	8.9
Nitrate/Nitrite (mg-N/kg)	NA	NA	2	1.8	2	2.1	7.2	4.8	1.6	26.5	2.2

No entry - not detected
mg/kg - milligrams/kilogram
NA - Value not available
NC - Background not comp
ND - No detections in background samples
mg-N/kg - milligrams per kilogram, reported as nitrogen
J - Numerical value is an estimated quantity
B - Analyte detected in blanks associated with this sample
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)

Table A.5.

Detected Radionuclides (pCi/g)

ANALYTE	Background	Industrial Scenario Guideline Criteria	SGC-NAC-000001	SGC-NAC-000002	SGC-NAC-000003	SGC-NAC-000004	SGC-NAC-000005
PETREX Sample Area			NORTH	NORTH	NORTH	NORTH	EAST
Americium-241	ND	4.95					
Bismuth-207	ND	0.18					
Bismuth-210	ND	NA					
Cesium-137	0.42	0.46					
Cobalt-60	NC	0.10					
Plutonium-238	0.13	5.5	1.42	0.069	0.[illegible]	0.087	0.543
Plutonium-239/240	0.18	5.5			0.0[illegible]2		
Potassium-40	37	NA	21.[illegible]	2.95	[illegible].53	27.4	15.1
Radium-226+D	2	0.14	[illegible]	0.478	[illegible]0.508	1.16	[illegible]
Thorium-228+D	1.5	0.85	1.[illegible]	0.277	[illegible].37	1.24	1.[illegible]
Thorium-230	1.9	44	0.814	0.374	0.6[illegible]	0.98	1.19
Thorium-232	1.4	50	1.3	0.184	0.3[illegible]	1.17	0.95
Uranium-234	1.1	38	2.1[illegible]	0.401	0.[illegible]19	0.934	0.874
Uranium-235+D	0.11	3.4	0.[illegible]4		[illegible]0.04	0.0349	0.[illegible]8
Uranium-238+D	1.2	11.0	[illegible]5	0.392	0.512	0.918	0.91[illegible]

No entry - not detected
ND -No detections in background samples
NA - Data not available
NC - Background value not computed
pCi/g - picocuries per gram
Red = above Guideline Criteria (GC)
Green = above GC and below Background
Magenta = above Background and Below GC
Blue = above Background (no GC)