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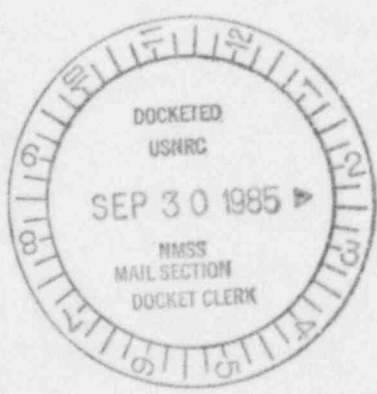
REPORT ON THE DECONTAMINATION
ACTIVITIES AND FINAL CONFIRMATORY
SURVEY OF THE MCGEAN-ROHCO PROPERTIES,
NEWBURG HEIGHTS, OHIO



PREPARED FOR:
CHEMETRON/ALLEGHENY INTERNATIONAL

PREPARED BY:
RADIATION MANAGEMENT CORPORATION
SEPTEMBER, 1985

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DESCRIPTION:

Report on the Recon-
struction Activities
and Final Confirmatory
Survey of the McLean-
Rohco Properties
10/03/85 INITIAL CEC

I. INTRODUCTION

This report summarizes the decontamination and radiological survey activities performed by Radiation Management Corporation (RMC) at two properties at the McGean-Rohco, Inc. site in Newburg Heights, Ohio. The first property was an industrial dump site located to the northwest of Bert Avenue and East 29th Street. The second property was the McGean-Rohco facility at 2910 Harvard Avenue, with decontamination activities limited to the southwest corner of this property.

Decontamination activities were performed for the licensee, Chemetron Corp., a division of Allegheny International, Inc., in accordance with a formal work plan prepared by RMC entitled "Decontamination Plan for McGean-Rohco, Inc. Facilities", dated October 5, 1983. As a supplement to this plan, RMC prepared a radiological survey procedure, dated June 28, 1984, outlining survey measurement methods appropriate for confirming that the necessary decontamination and site release criteria had been achieved. Final confirmatory surveys of both McGean-Rohco properties were performed according to this procedure.

A brief site history and summary of decontamination activities performed at the industrial dump site are presented in Section III of this report. Final survey measurements at this site were completed in August, 1985, and measurement results are summarized in Section III.

Final survey measurements at the 2910 Harvard Avenue facility were completed in September 1985. Measurement results and a summary of decontamination activities performed at this site are presented in

Section IV of this report.

II. DECONTAMINATION AND SITE RELEASE CRITERIA

The purpose of the decontamination activities performed at the McGean-Rohco properties was to reduce activity levels of licensed radioactive materials to the limits specified in Option 1 of the Uranium Fuel Licensing Branch Technical Position entitled, "Disposal or On-Site Storage of Thorium or Uranium Wastes From Past Operations". The contaminant of concern for both properties was depleted uranium, and the applicable limit specified in Option 1 is 35 pCi/g for the average U-238 activity concentration in soil remaining on site.

Excavation and building demolition activities resulted in a variety of non-soil materials requiring removal from the Harvard Avenue site. These materials were surveyed in accordance with RMC procedures to identify those materials acceptable for release to unrestricted areas. Surface contamination limits specified in the U.S.N.R.C. "Guidelines for Decontamination of Facilities and Equipment Prior to Release for Unrestricted Use or Termination of Licenses for By-Product, Source or Special Nuclear Material" (July 1982) were used as the basis for releasing these materials. The applicable limits are: 1) average total surface U-238 activity less than 5000 dpm/100 cm², 2) maximum total surface U-238 activity less than 15,000 dpm/100 cm² (over small areas less than 100 cm²), and 3) removable surface U-238 activity less than 1000 dpm/100 cm². Materials with surface contamination levels in excess of these limits were either decontaminated or disposed

of as radioactive waste at a licensed disposal site.

III. DUMP SITE ACTIVITIES AND SURVEY RESULTS

A description of the McGean-Rohco dump site, including an assessment of the different types and quantities of radioactive materials present at the site prior to decontamination, was presented in a previous (October, 1984) RMC report. This report summarized the decontamination activities and survey measurements performed by RMC between July and September, 1984. A survey grid coordinate system was established, and soil sample collection and analyses were performed according to the confirmatory survey procedure (dated June 28, 1984) approved by RMC, Allegheny International and NRC representatives. Based on the results of these confirmatory measurements, the dump site was assumed to be acceptable for unrestricted release.

In December, 1984, Oak Ridge Associated Universities (ORAU) was contracted by the NRC to perform an independent follow-up survey of the dump site. ORAU survey procedures and protocols for choosing soil sample locations were different from those followed in RMC's September, 1984 survey. ORAU survey results indicated that numerous small-area "hot spots", with U-238 activity concentrations in soil exceeding 35 pCi/g, were still present at the dump site.

In March, 1985, RMC performed an investigatory survey to evaluate the number and sizes of the hot spot areas identified by ORAU. Sensitive NaI probe/ratemeter systems were used to thoroughly scan the surface

soil in areas identified by ORAU as exceeding site-release criteria. These surface soil scanning measurements did identify many small areas of elevated U-238 activity at grid locations which had not been designated for soil sampling in RMC's September, 1984 survey.

The isolated "hot spots" were typically one to two square meters in area. Hand excavation to a depth of 5-15 cm was usually sufficient to remove the contaminated soil from these areas, although several spots required excavation to depths of up to one meter. Soil was removed from approximately 100 isolated hot spots between May and July, 1985. This soil was relocated to the Harvard Avenue site prior to final disposal. A dump site map showing the general areas where hot spot removal was performed is presented in Figure 1.

When surface soil scanning measurements indicated that excavation activities had reduced U-238 activity levels to acceptable levels, a final exposure rate and soil sampling survey was performed. Exposure rate measurements were performed at the locations shown in Figure 2. Exposure rates at ground surface and at one meter above ground surface were measured at a total of 94 locations. Measurement results are presented in Table 1.

Soil sampling was limited to the general areas where hot spot excavation had been performed. A total of 32 samples were collected at the locations shown in Figure 3. Analysis results for these samples are presented in Table 2. The average U-238 activity concentration for these samples is 25 pCi/g. Based on these survey measurement results, the McGean-Rohco dump site has been adequately decontaminated and is

acceptable for unrestricted release.

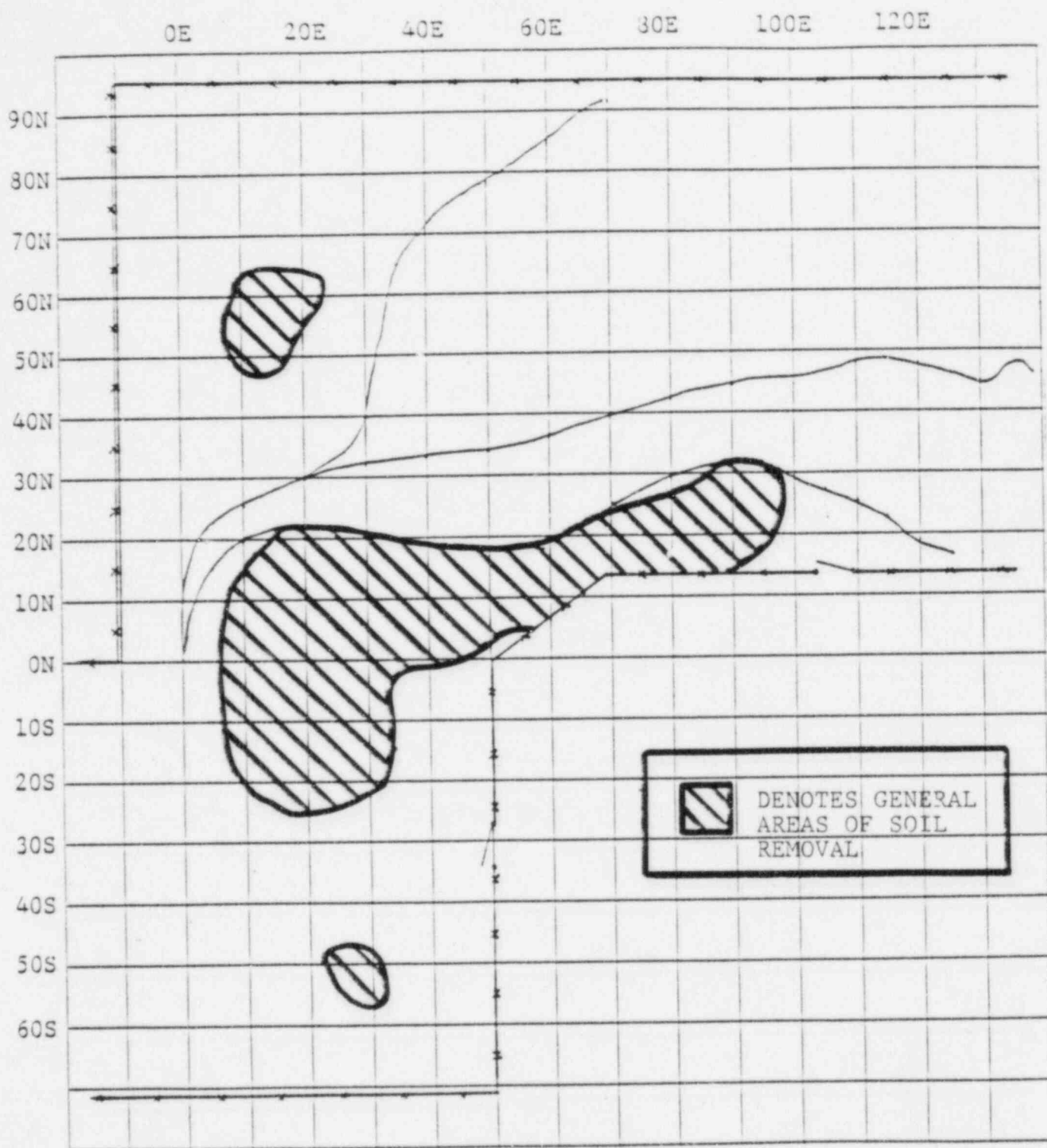


FIGURE 1. Dump site map showing general areas where excavation was performed at isolated hot spots between May and July, 1985.

Note: grid lines shown are placed at 10-meter intervals.

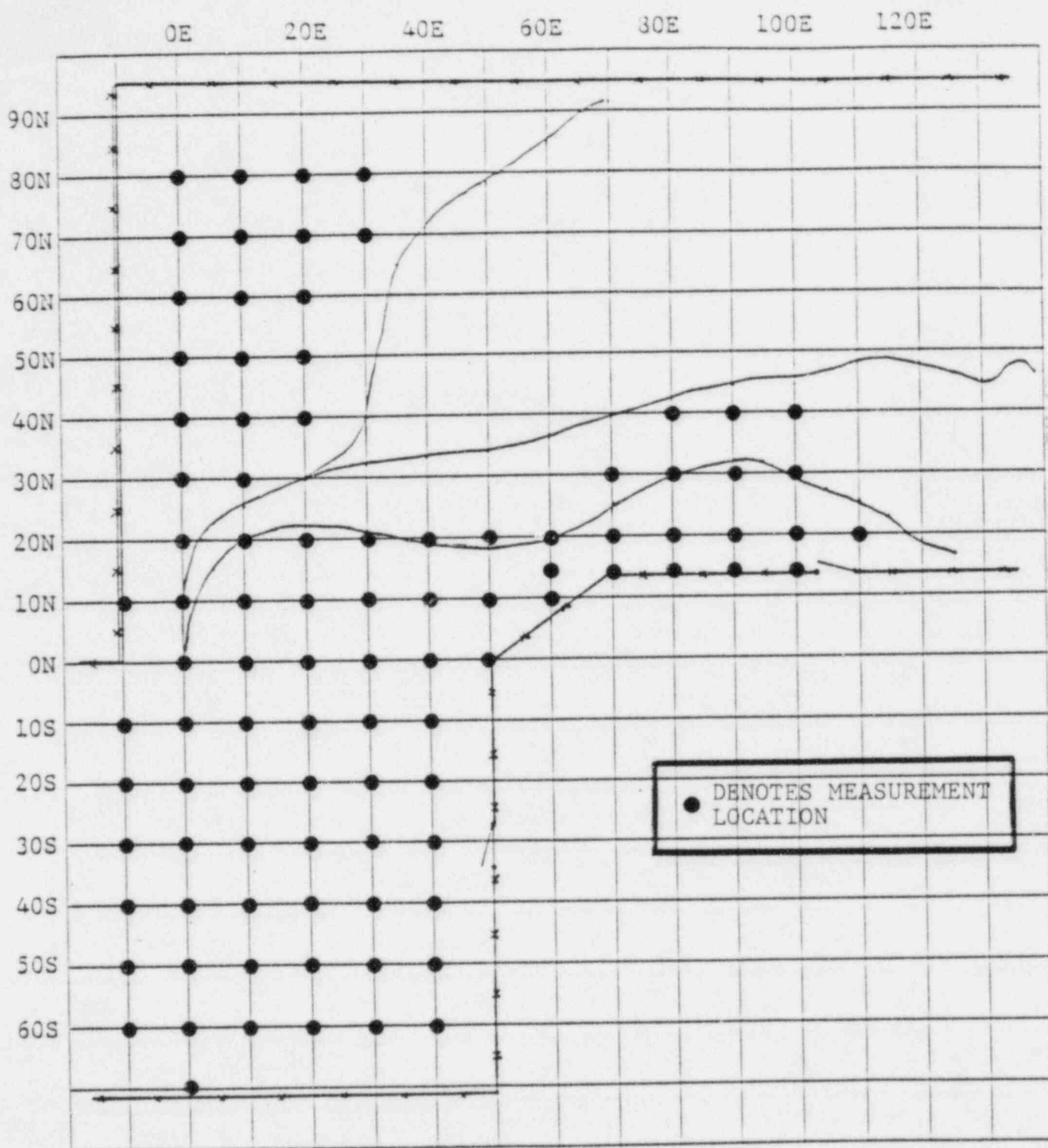


FIGURE 2. Dump site map showing locations of exposure rate measurements performed in August, 1985. Measurements were made at ground surface and one meter above ground surface at each location.

Note: grid lines shown are placed at 10-meter intervals.

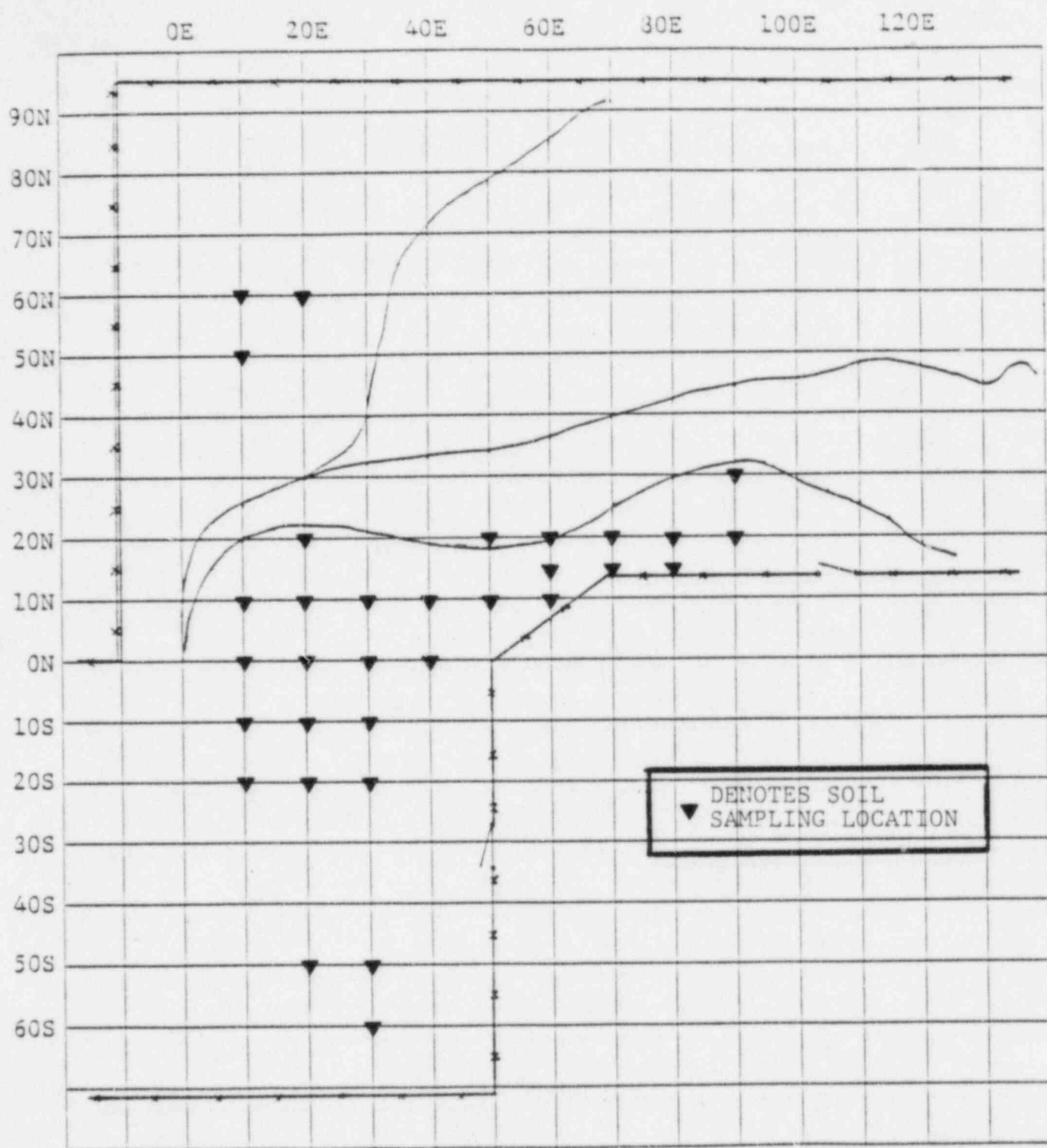


FIGURE 3. Dump site map showing locations of confirmatory soil sample collection, August, 1985.

Note: grid lines shown are placed at 10-meter intervals.

TABLE 1

Dump Site Confirmatory Survey

Exposure Rate Measurements Performed August, 1985

Measurement Location	Exposure Rate (μ R/hr)	
	At Ground Surface	1 Meter Above Ground Surface
80N 0E	16	15
80N 10E	13	13
80N 20E	12	13
80N 30E	10	11
70N 0E	10	10
70N 10E	11	11
70N 20E	10	11
70N 30E	13	12
60N 0E	9	10
60N 10E	11	11
60N 20E	10	11
50N 0E	10	10
50N 10E	11	11
50N 20E	12	11
40N 0E	10	10
40N 10E	12	11
40N 20E	12	12
40N 80E	11	11
40N 90E	12	12
40N 100E	12	12
30N 0E	10	10
30N 10E	10	10
30N 70E	12	12
30N 80E	12	12
30N 90E	13	12
30N 100E	13	12
20N 0E	12	11
20N 10E	12	11
20N 20E	11	11
20N 30E	11	11
20N 40E	13	11
20N 50E	12	12
20N 60E	13	12
20N 70E	13	12
20N 80E	12	12
20N 90E	12	12
20N 100E	13	13
20N 110E	13	12

TABLE 1 - cont.

Dump Site Confirmatory Survey

Exposure Rate Measurements Performed August, 1985

Measurement Location	Exposure Rate (μ R/hr)	
	At Ground Surface	1 Meter Above Ground Surface
15N 60E	11	11
15N 70E	12	11
15N 80E	13	12
15N 90E	12	12
15N 100E	12	12
10N 10W	11	11
10N 0E	11	11
10N 10E	11	11
10N 20E	11	11
10N 30E	11	11
10N 40E	11	11
10N 50E	12	11
10N 60E	12	11
0N 0E	10	10
0N 10E	11	11
0N 20E	11	11
0N 30E	12	12
0N 40E	11	11
0N 50E	11	11
10S 10W	12	11
10S 0E	10	10
10S 10E	11	12
10S 20E	12	12
10S 30E	13	12
10S 40E	12	12
20S 10W	12	10
20S 0E	12	11
20S 10E	12	12
20S 20E	12	12
20S 30E	12	12
20S 40E	12	12
30S 10W	9	10
30S 0E	13	12
30S 10E	12	12
30S 20E	12	12
30S 30E	13	12
30S 40E	11	11
40S 10W	11	11
40S 0E	10	10
40S 10E	12	12

TABLE 1 - cont.

Dump Site Confirmatory Survey

Exposure Rate Measurements Performed August, 1985

Measurement Location	Exposure Rate (μ R/hr)	
	At Ground Surface	1 Meter Above Ground Surface
40S 20E	12	12
40S 30E	12	12
40S 40E	12	12
50S 10W	12	12
50S 0E	12	11
50S 10E	12	12
50S 20E	13	12
50S 30E	12	12
50S 40E	12	12
60S 10W	13	12
60S 0E	12	12
60S 10E	12	12
60S 20E	12	12
60S 30E	12	12
60S 40E	12	12
70S 0E	12	12

TABLE 2

Dump Site Confirmatory Survey

Surface Soil Sample Analysis Results - August, 1985

<u>Sample Location</u>	<u>U-238</u>	<u>pCi/g</u>
60N 10E	47	
60N 20E	17	
50N 10E	22	
30N 90E	26	
20N 20E	9	
20N 50E	46	
20N 60E	33	
20N 70E	19	
20N 80E	20	
20N 90E	25	
15N 60E	21	
15N 70E	19	
15N 80E	21	
10N 10E	31	
10N 20E	44	
10N 30E	34	
10N 40E	21	
10N 50E	41	
10N 60E	34	
0N 10E	15	
0N 20E	22	
0N 30E	46	
0N 40E	27	
10S 10E	42	
10S 20E	25	
10S 30E	45	
20S 10E	9	
20S 20E	27	
20S 30E	<8	
50S 20E	<8	
50S 30E	8	
60S 30E	19	

IV. HARVARD AVENUE SITE ACTIVITIES AND SURVEY RESULTS

Remedial action activities at the 2910 Harvard Avenue site began with the demolition of a large warehouse located along the western property fence, shown as Building 21 in Figure 4. Between 1965 and 1972, catalyst materials containing depleted uranium were manufactured in sections 21-A and 21-B of this building. Decontamination of this site had been attempted with varying levels of effort between 1972 and 1980, and all portions of Building 21 except 21-A and 21-B were approved for unrestricted release.

In 1983, RMC performed a survey to locate and quantify the amount of contaminated material remaining in 21-A and 21-B. Much of the concrete floor in these sections had been broken up during previous decontamination efforts, exposing large areas of the underlying soil. Soil samples were collected and analyzed to estimate the volume of material requiring excavation. Survey measurements were performed to determine how much of the remaining concrete in 21-A and 21-B was contaminated. In addition, an inventory was taken of materials which had been previously packaged for disposal as radioactive waste, but never shipped off site.

Based on the results of these surveys, RMC developed a work plan outlining the remedial action activities to be performed at this site. The work plan included the following general tasks:

- 1) demolition of the entire Building 21 structure,

- 2) consolidation and disposal of previously packaged contaminated materials,
- 3) volume-reduction and disposal of contaminated concrete rubble,
- 4) excavation and disposal of contaminated soil,
- 5) final grading of surface soil on the cleared site area. and
- 6) final surveying of the site to confirm that site-release criteria had been achieved.

Demolition of Building 21 was begun in June, 1984 by a local subcontractor. The walls and roof of the northern portion of this building (north of grid line 10N in Figure 4) were removed first, leaving sections 21-A and 21-B intact. A section of concrete floor between grid lines 10N and 100N was left in place to serve as a stable working area for later drum handling activities.

Most of the waste generated during previous decontamination activities had been packaged in plywood boxes or 55-gallon drums and stored inside 21-A and 21-B. These containers were relocated to the open concrete pad north of grid line 10N. Most of the contaminated concrete floor from inside 21-A and 21-B was also relocated to this area. Demolition of the remaining 21-A and 21-B structure was then begun.

All building materials from 21-A and 21-B were carefully surveyed prior

to unrestricted release from the site. Surface activity measurements were performed on these scrap materials as specified in RMC's June 28, 1984 confirmatory measurement procedure. No activity levels above release limits were detected on roof and wall materials from 21-A and 21-B. This was as expected, because these structures had been cleaned and surveyed during extensive decontamination efforts in 1979-1980.

Contamination levels above release limits were detected on some portions of the concrete floor not previously removed from 21-A and 21-B. These portions were relocated to the concrete pad area, while the remaining building scrap materials were approved for unrestricted release from the site. Demolition activities were completed in October, 1984.

The materials which had been relocated to the concrete pad included four large plywood boxes and approximately 500 55-gallon drums. The boxes were set aside for shipment to a licensed waste disposal site. Each 55-gallon drum was checked to determine the type and U-238 activity of the material it contained.

Approximately 60% of the drums contained sandy material (presumably due to sandblasting activities) or soil. Samples were taken from each drum containing these types of material. Drums with sample analysis results indicating high activities were emptied and the contents repackaged in new 55-gallon drums for shipment to a licensed disposal site. Material from drums with sample analysis results less than the disposal criteria was left on site to be dispersed with low-activity topsoil in the final site grading process.

Most of the remaining drums contained concrete rubble. These drums were emptied, and the contents consolidated in one pile on the concrete pad. A small fraction of the original drums contained used protective clothing, tools and other non-soil debris. These materials were assumed to be contaminated and were repackaged for shipment to a licensed disposal site. All material consolidation and repackaging activities were completed by November, 1984. The original empty drums were all surveyed, decontaminated if necessary, and approved for unrestricted release from the site.

Excavation of contaminated soil was begun in November, 1984. Surface soil scanning surveys to measure relative gamma flux levels were performed over the area previously covered by the concrete floor of 21-A and 21-B. These measurements were used to guide excavation of all soil with U-238 activity exceeding 35 pCi/g. The excavated soil was sampled to separate high activity material which was packaged in 55-gallon drums for shipment to a disposal site. The lower activity material was left on site to be dispersed with other topsoil during final site grading activities. Excavation of soil was completed in late December, 1984, at which time the entire work site was secured for the winter months.

Remedial action activities resumed in April, 1985. All remaining soil with U-238 high activity concentrations (which had been excavated in December, 1984 and stored on site over the winter) was loaded into 55-gallon drums for disposal. A crusher was brought on site to process the remaining pile of contaminated concrete. The concrete rubble was first sorted according to surface activity levels. The lowest activity material was crushed to very small size fragments and segregated for

dispersal with topsoil on the site. The remaining concrete with higher levels of surface contamination was crushed and loaded into 55-gallon drums for disposal as radioactive waste. Concrete crushing and drumming activities were completed in June, 1985.

A total of 21 shipments of radioactive waste were made during the course of this project. The total volume of waste was approximately 8900 cubic feet. This volume included approximately 2000 cubic feet of material from the industrial dump site. Four of the waste shipments were sent to the Chem-Nuclear site in Barnwell, SC. The remaining 17 shipments were sent to the U.S. Ecology site in Richland, WA.

By the middle of July, the final load of waste had been shipped off site, and the concrete pad area had been cleared of all soil and concrete materials. The concrete pad was surveyed, found to be acceptable for unrestricted release, and removed from the site. This left the entire area bounded by the 20E grid line and the north, west and south property fences clear for final topsoil grading.

Still present on site were numerous small piles of material with low U-238 activity concentration. These materials had not been shipped to a radioactive waste disposal site due to their relatively low activity levels and due to the unreasonably high additional cost of such disposal. These materials were to be blended with existing topsoil over the site area to achieve an essentially uniform matrix with average U-238 activity concentration below the 35 pCi/g limit.

Topsoil grading activities were performed in July and August, 1985.

Elevated activity materials were systematically worked with existing topsoil over the site area using bulldozers and other earth moving equipment. Surface grading operations continued until count rate measurements indicated that all areas with activity concentrations above 35 pCi/g had been eliminated or reduced to acceptable levels.

When final topsoil grading was complete, the original survey grid system was re-established over the work site. Grid line markers were placed at 10-meter intervals to designate exposure rate measurement and soil sampling locations. Exposure rates were measured at ground surface and at one meter above ground surface. Figure 5 shows a total of 137 locations where these measurements were performed. Measurement results are presented in Table 3.

Confirmatory surface soil samples were collected at the 103 locations shown in Figure 6. Samples were collected at 10-meter intervals in areas where extensive soil mixing had been required. Samples were collected at 20-meter intervals in areas where minimal soil mixing was performed.

Soil samples were analyzed using a high resolution gamma spectroscopy system. Th-234 and Pa-234 activity concentrations were determined for each sample, and U-238 activity concentrations were calculated as the average of these two daughter nuclide concentrations. Analysis results are presented in Table 4. The average U-238 activity concentration for these samples is 27 pCi/g, with one standard deviation or the mean equal to 8.5 pCi/g. Based on these sample results, the 2910 Harvard Avenue site is acceptable for unrestricted release.

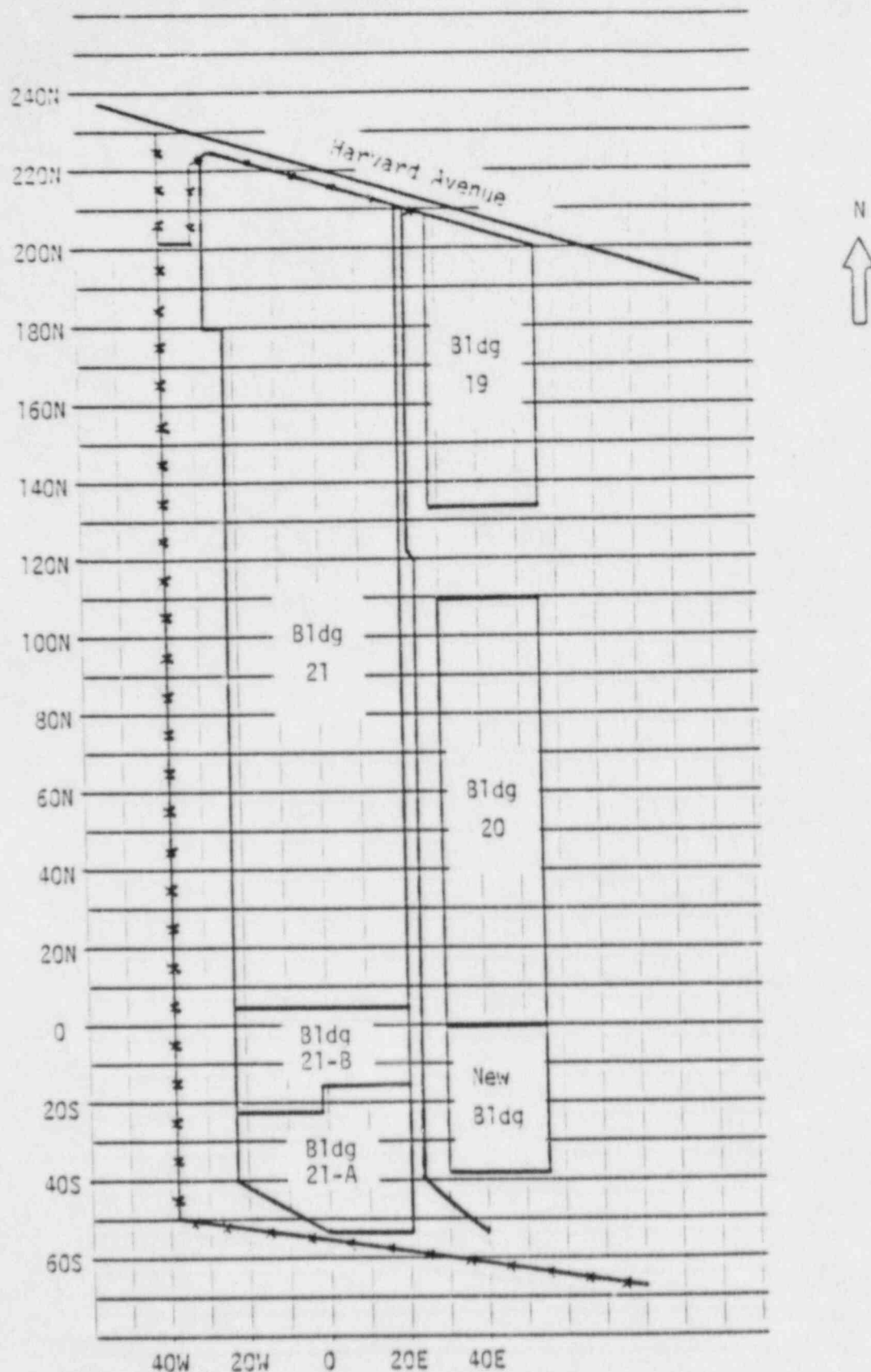


FIGURE 4. McGean-Rohco 2910 Harvard Avenue site map showing original Building 21 structure before demolition.

Note: grid lines shown are at 10-meter intervals.

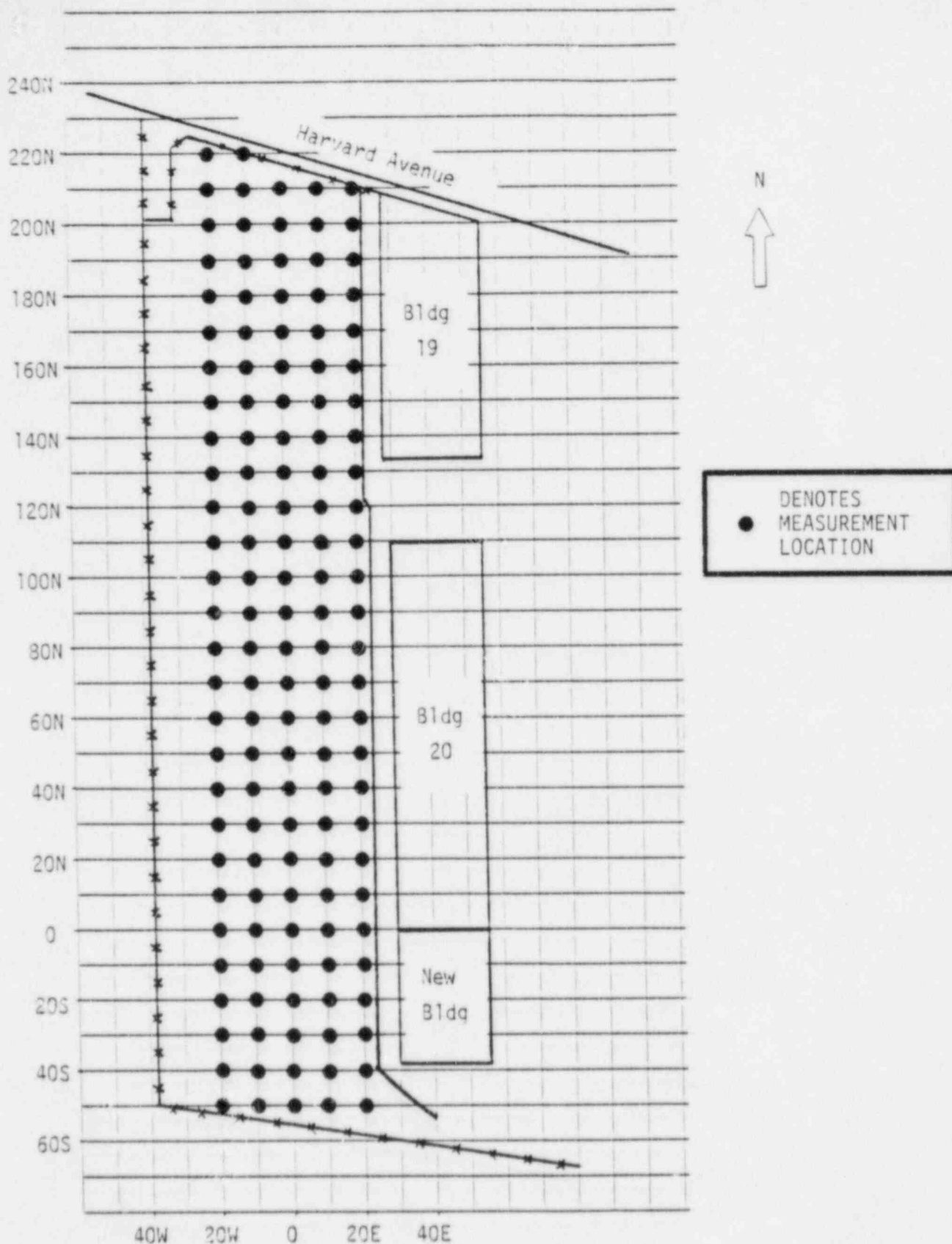


FIGURE 5. 2910 Harvard Avenue site map showing locations of exposure rate measurements performed in August and September, 1985. Measurements were made at ground surface and one meter above ground at each location.

Note: grid lines shown are at 10-meter intervals.

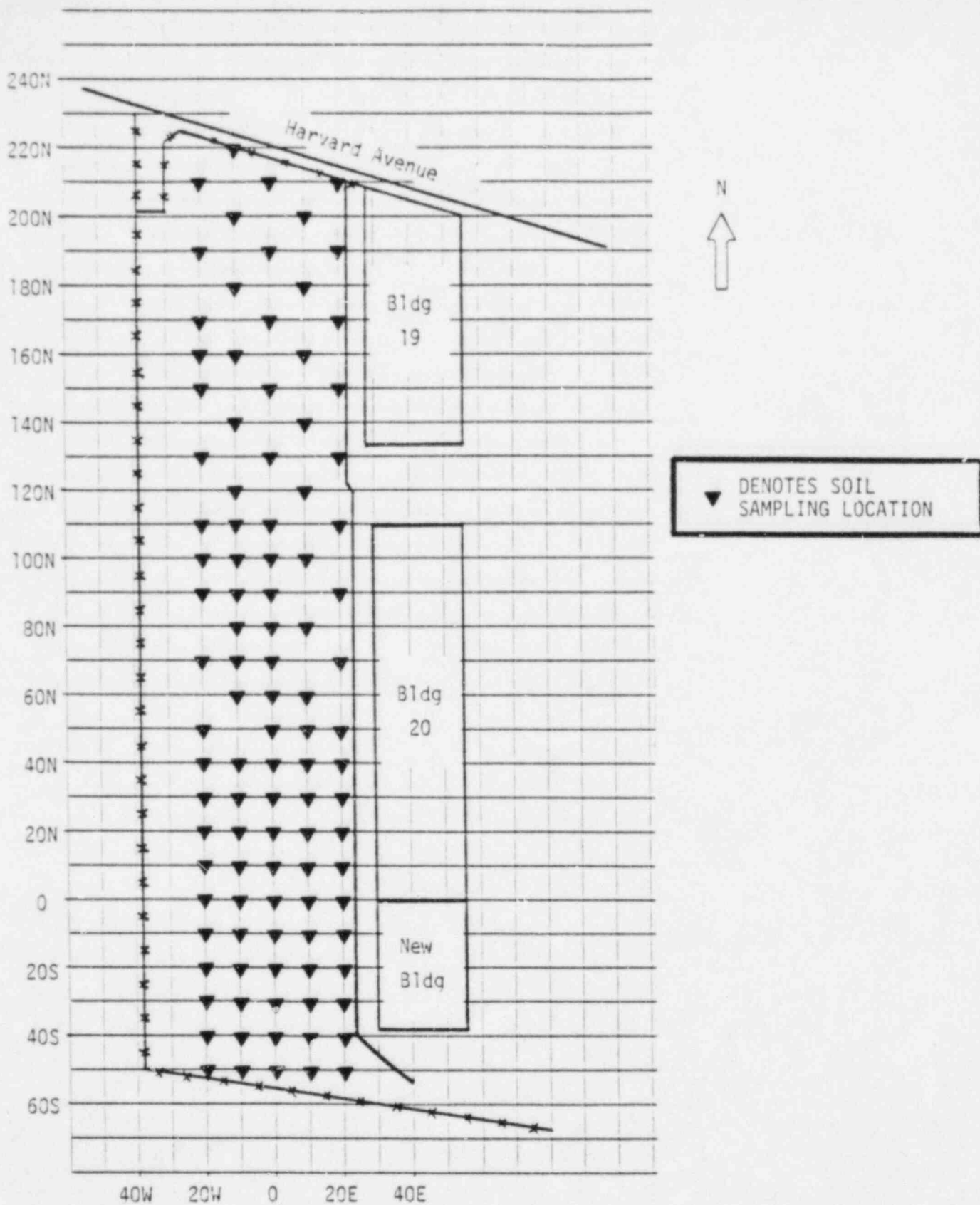


FIGURE 6. 2910 Harvard Avenue site map showing locations of confirmatory soil sample collection (August-September, 1985).

Note: grid lines shown are at 10-meter intervals.

TABLE 3

2910 Harvard Avenue Site Confirmatory Survey

Exposure Rate Measurements Results

Exposure Rate Values at East-West Coordinates
($\mu\text{R/hr}$ at Ground Surface)/($\mu\text{R/hr}$ at 1- meter above ground)

North-South Coordinate	20W	10W	0	10E	20E
220 N	12/11	12/11			
210 N	12/11	12/12	12/11	12/11	12/11
200 N	12/11	12/12	12/12	12/12	12/12
190 N	12/12	12/12	12/12	12/12	12/12
180 N	13/12	12/12	12/12	12/12	12/11
170 N	13/12	12/12	12/12	12/12	12/12
160 N	13/12	12/12	12/12	12/12	12/11
150 N	12/11	12/12	12/12	12/12	12/12
140 N	12/11	12/12	12/11	12/12	12/12
130 N	12/12	12/12	12/11	12/12	12/12
120 N	12/11	12/12	12/11	12/11	12/12
110 N	11/11	11/11	12/11	12/11	12/11
100 N	11/11	12/11	12/12	12/12	12/11
90 N	12/11	12/11	12/11	12/12	12/12
80 N	12/11	12/11	12/12	12/11	12/11
70 N	12/11	12/11	12/11	11/11	11/11
60 N	14/11	11/11	12/11	11/11	12/11
50 N	12/11	12/11	12/11	12/11	12/11
40 N	13/12	12/11	12/11	11/11	12/11
30 N	12/11	12/11	11/11	12/11	11/11
20 N	12/12	11/11	11/11	12/11	12/11
10 N	12/12	11/11	10/11	12/11	12/11
0 N	13/12	12/11	12/11	12/11	12/11
10 S	12/11	11/11	12/11	12/12	12/11
20 S	11/11	11/11	12/11	12/11	12/11
30 S	12/11	12/11	11/11	12/11	12/11
40 S	11/10	11/11	11/11	11/11	12/11
50 S	11/11	12/11	12/11	12/11	12/11

TABLE 4

2910 Harvard Avenue Site Confirmatory Survey

Surface Soil Sample Analysis Results

North-South Coordinate	U-238 pCi/g at East-West Coordinates				
	20W	10W	0	10E	20E
220 N		15			
210 N	7.3		24		10
200 N		26		18	
190 N	11		32		16
180 N		35		31	
170 N	26		25		34
160 N	7.6	32		18	
150 N	11		25		20
140 N		34		25	
130 N	27		28		24
120 N		7.4		29	
110 N	21	26	24		33
100 N	35	27	27	29	
90 N	18	33	36		23
80 N		39	37	29	
70 N	15	32	31		26
60 N		24	27	20	
50 N	16		33	33	28
40 N	11	28	38	28	33
30 N	34	37	31	37	38
20 N	25	32	26	29	35
10 N	37	33	20	25	37
0 N	33	31	23	24	30
10 S	43	41	25	47	37
20 S	23	28	26	41	39
30 S	30	31	14	34	28
40 S	11	24	36	39	37
50 S	13	20	24	27	27

APPENDIX A - EXPOSURE RATE MEASUREMENT TECHNIQUES

Above ground exposure rates at the McGean-Rohco sites were assessed with NaI(Tl) detectors which had been cross calibrated with a sensitive ionization chamber system. The purpose of the cross calibration was to obtain reliable factors for converting NaI(Tl) count rates to exposure rates when depleted uranium is the source of gamma radiation.

The chamber employed was a 16-liter tissue-equivalent ionization chamber (Shonka chamber). Measurements with both the ion chamber and NaI(Tl) detector were made at several locations on the McGean site. Results of these measurements are shown in Figure A-1. It was observed that small increases in exposure rates produced large increases in NaI(Tl) count rates. This was not unexpected, since the photons from U-238 (Th-234) are less than 100 keV, a region where sodium iodide detectors are known to over-respond.

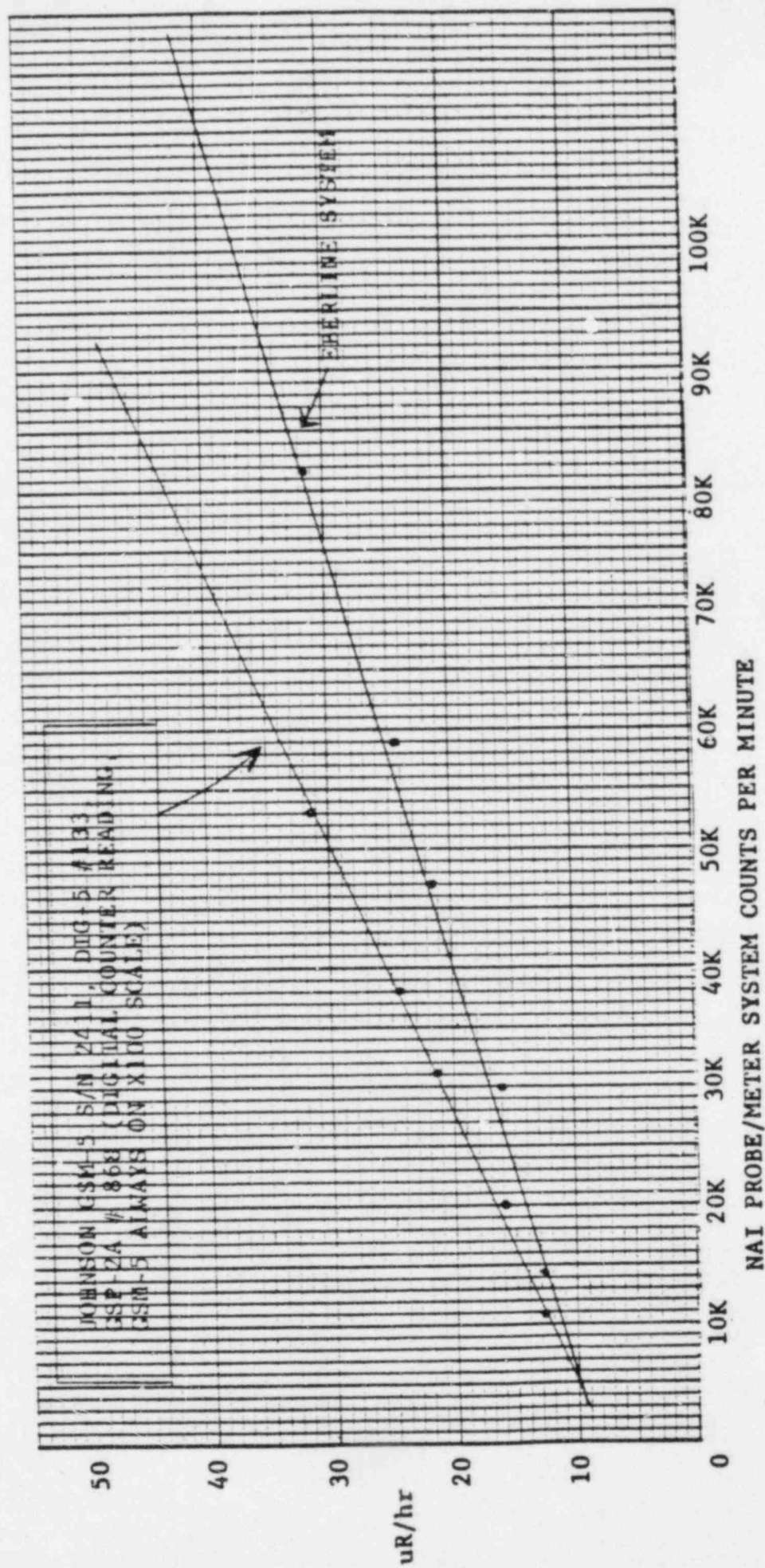
A similar calibration of this NaI system for exposure rates from radium and thorium daughters yields a much greater exposure rate-to-count rate ratio than for exposures due to depleted U. For example, a 20 uR/hr field from radium daughters produces a count rate of only 4000 cpm. (The same exposure rate from dep U produces a count rate of 40,000 cpm). Therefore, care must be taken when converting observed count rates from NaI(Tl) detector systems to exposure rates, especially when depleted uranium is involved.

FIGURE A-1

NAI PROBE/METER SYSTEM COUNTS PER MINUTE VS. $\mu R/hr$
($\mu R/hr$ VALUES MEASURED WITH A TISSUE-EQUIVALENT IONIZATION CHAMBER, RMC SHONKA CHAMBER #2)

CROSS CALIBRATION MEASUREMENTS PERFORMED ON 9/27/84 AT THE MCGEAN-ROHCO CLEVELAND SITE
CALIBRATION VALID FOR PHOTON FLUX DUE PRIMARILY TO DEPLETED URANIUM IN SURFACE SOIL.

NAI PROBE/METER SYSTEM: EBERLINE RASCAL S/N 431, GROSS COUNT MODE, THRESHOLD 1.00,
WINDOW 10.00, HIGH VOLTAGE 1220 V, SPA-3 PROBE (RMC #2)



APPENDIX B - SOIL SAMPLE ANALYSIS TECHNIQUES

All soil samples were analyzed using a gamma spectroscopy system housed in the RMC mobile laboratory at the 2910 Harvard Avenue site. This system consists of an intrinsic germanium detector, multichannel analyzer, and associated detector electronics. Samples were sealed in 210 ml aluminum cans and the net sample mass determined. Routine counting time was 20 minutes, although some samples were counted longer to reduce counting statistics uncertainties.

Spectral data were analyzed by calculating the net count rates in photopeak regions of interest and converting these values to corresponding activity values. System efficiency values for the 210 ml sample can counting geometry (in units of net counts per photon emitted) were determined during a system recalibration on May 24, 1985.

Photopeak regions of interest were examined for the 93 keV Th-234, 186 keV U-235 (and Ra-226), and 1001 keV Pa-234 photon emissions. In addition, Ra-226 daughter nuclide and Th-232 daughter nuclide photopeaks were examined. For samples collected from the industrial dump site, the Pa-234 activity value was assumed to represent the best estimated of U-238 activity. (Because of increased attenuation of low energy photons in this material, the Th-234 activity values calculated for these samples were believed to be biased low.) For samples collected from the 2910 Harvard Avenue site, the Th-234 and Pa-234 activity values were averaged to estimate the U-238 activity.