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RESULTS OF THE RADIOLOGICAL SURVEY AT
475 DAVISON AVENUE, MAYWOOD, NEW JERSEY

OPERATED BY
MARTIN MARIETTA ENERGY SYSTEMS, INC.
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HEALTH AND SAFETY RESEARCH DIVISION

Nuclear and Chemical Waste Programs
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RESULTS OF THE RADIOLOGICAL SURVEY AT 475 DAVISON AVENUE, MAYWOOD, NEW JERSEY

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Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

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RESULTS OF THE RADIOLOGICAL SURVEY AT 475 DAVISON AVENUE, MAYWOOD, NEW JERSEY*

INTRODUCTION

At the request of the Department of Energy (DOE), a radiological survey of 475 Davison Avenue, Maywood, New Jersey, was conducted by Oak Ridge National Laboratory (ORNL) on June 13, 1984. Contaminated material was discovered in the area during an EG&G aerial radiological survey,[1] and confirmed by a ground-level radiological survey by the Nuclear Regulatory Commission.[2] This contaminated material is believed to have originated from the former Maywood Chemical Company (now the Stepan Chemical Company).

The Maywood Chemical Company was founded in 1895. From about 1916 until 1957, the Maywood Chemical Company processed thorium for use in the manufacture of gas mantles for various lighting devices.[1] In 1932, Route 17 was built to the west of the main plant through an area that was used for disposal of process wastes. Although access to the site was probably restricted, the waste disposal area had no access restrictions. In 1959, Maywood Chemical Company was purchased by the Stepan Chemical Company.

During an aerial survey of the Stepan Chemical Company and the surrounding area in Maywood, New Jersey, by EG&G[1] on January 26, 1981, anomalously high gamma-ray exposure rates (principally ^{232}Th daughter radionuclides) were observed in a residential area close to the Stepan Chemical site. Seven private homes in Maywood, New Jersey, were later identified in a follow-up ground survey by the Nuclear Regulatory Commission[2] (NRC) as having external gamma radiation levels significantly above background. Gamma exposure rates up to 3 mR/h were observed on these properties during NRC surveys.

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* The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-840R21400.

SURVEY METHODS

The radiological survey of the property included: (1) a gamma scan and direct alpha measurements of the property indoors; (2) a gamma scan of the entire property outdoors; and (3) sampling of surface (0-15 cm) soil. A comprehensive description of the survey methods and instrumentation, as well as the radiation guidelines used in evaluating the data have been presented in another report.[3]

SURVEY RESULTS

Applicable federal guidelines have been summarized in Table 1. The normal background levels for the northern New Jersey area are presented in Table 2. These data are provided for comparison with the survey results presented in this section. All direct measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background concentrations have not been subtracted from radionuclide concentrations measured in environmental samples.

Outdoor Gamma Radiation Levels

Results of grid block measurements are summarized in Table 3. The location of grid blocks are shown in Fig. 1. Gamma radiation levels over the entire property were indicative of the background range. The maximum gamma exposure rate at 1 m on this property outside was 9.5 μR/h at grid location 0+18, 12R (Table 4).

Indoor Gamma Radiation Levels

Results of room measurements are summarized in Table 5. The locations of the rooms are shown in Figs. 3 and 4. The maximum gamma exposure rate at 1 m was 12 μR/h) inside the garage (room 1), which was constructed of brick. No elevated gamma levels were detected above normal variations of background. Direct alpha measurements on all room surfaces were at the background level at all locations in the house. The average external gamma exposure rate at 1 m above the floor (9 μR/h) was well within applicable DOE guidelines for personnel exposure (DOE Order 5480.1A).

Systematic Soil Samples

Four systematic samples of surface soil (top 15 cm) were taken from various locations on the property for radionuclide analyses. Locations of the systematic (MJ samples) are shown in Fig. 1, with results of laboratory analyses provided in Table 6. Concentrations of ^{226}Ra and ^{232}Th were in the background range of approximately 1.0 pCi/g. Based on the results of soil sample analyses and gamma scan, no contaminated material above background was found on the property at 475 Davision Avenue.

SUMMARY

Measurements taken at 475 Davison Avenue indicate that the property contains no radioactive contamination from the ^{232}Th or ^{238}U decay chain above background levels.

REFERENCES

1. An Aerial Radiological Survey of the Stepan Chemical Company and Surrounding Area, Maywood, New Jersey, EG&G Survey Report, NRC-8109, April 1981.

2. Nuclear Regulatory Commmission, memorandum from M. Campbell to J. D. Kinnerman, re: Records of Surveys of Private Homes in Maywood, New Jersey, Docket No. 40-8610, May 15, 1981.

3. Oak Ridge National Laboratory, Procedures Manual for the ORNL Remedial Action Survey and Certification Activities (RASCA) Program, ORNL/TM-8600 (October 1982).

4. U.S. Department of Energy, Radiological Survey of the Middlesex Municipal Landfill, Middlesex, New Jersey, DOE/EV-0005/20, April 1980.

5. T. E. Myrick and B. A. Berven, State Background Radiation Levels: Results of Measurements Taken During 1975-1979, ORNL/TM-7343, Oak Ridge National Laboratory.

6. U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites (February 1985).

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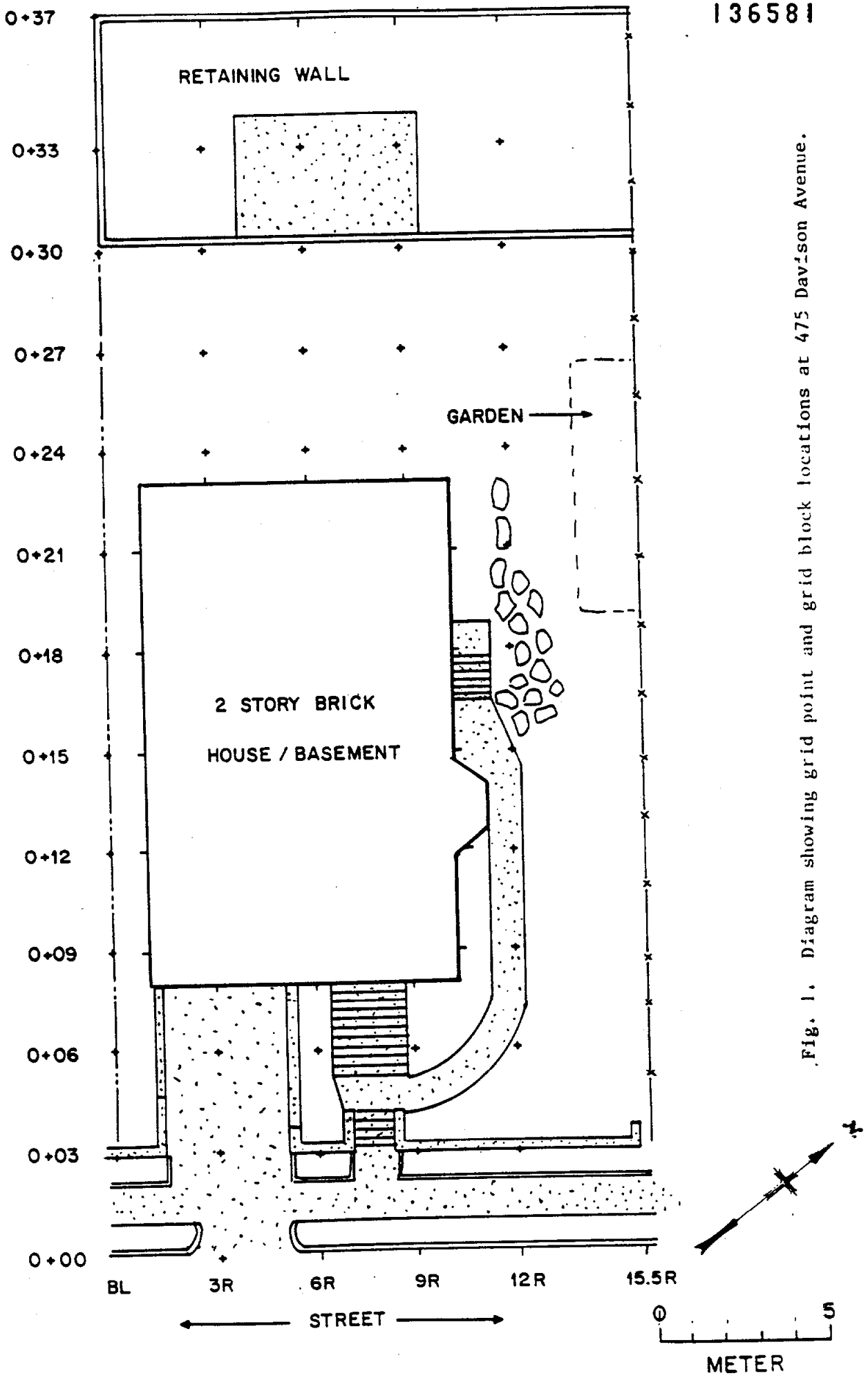

Fig. 1. Diagram showing grid point and grid block locations at 475 Davison Avenue.

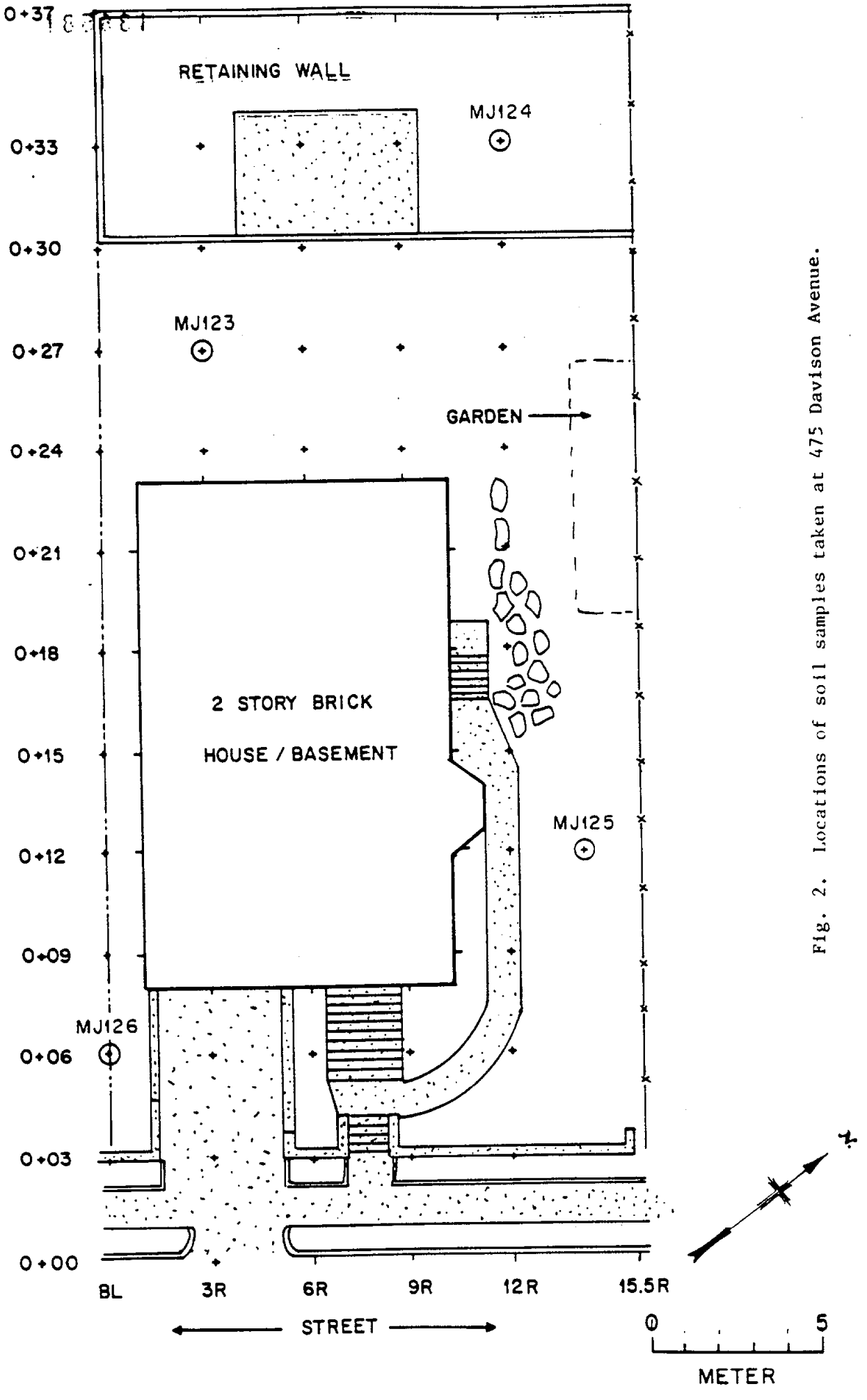

Fig. 2. Locations of soil samples taken at 475 Davison Avenue.

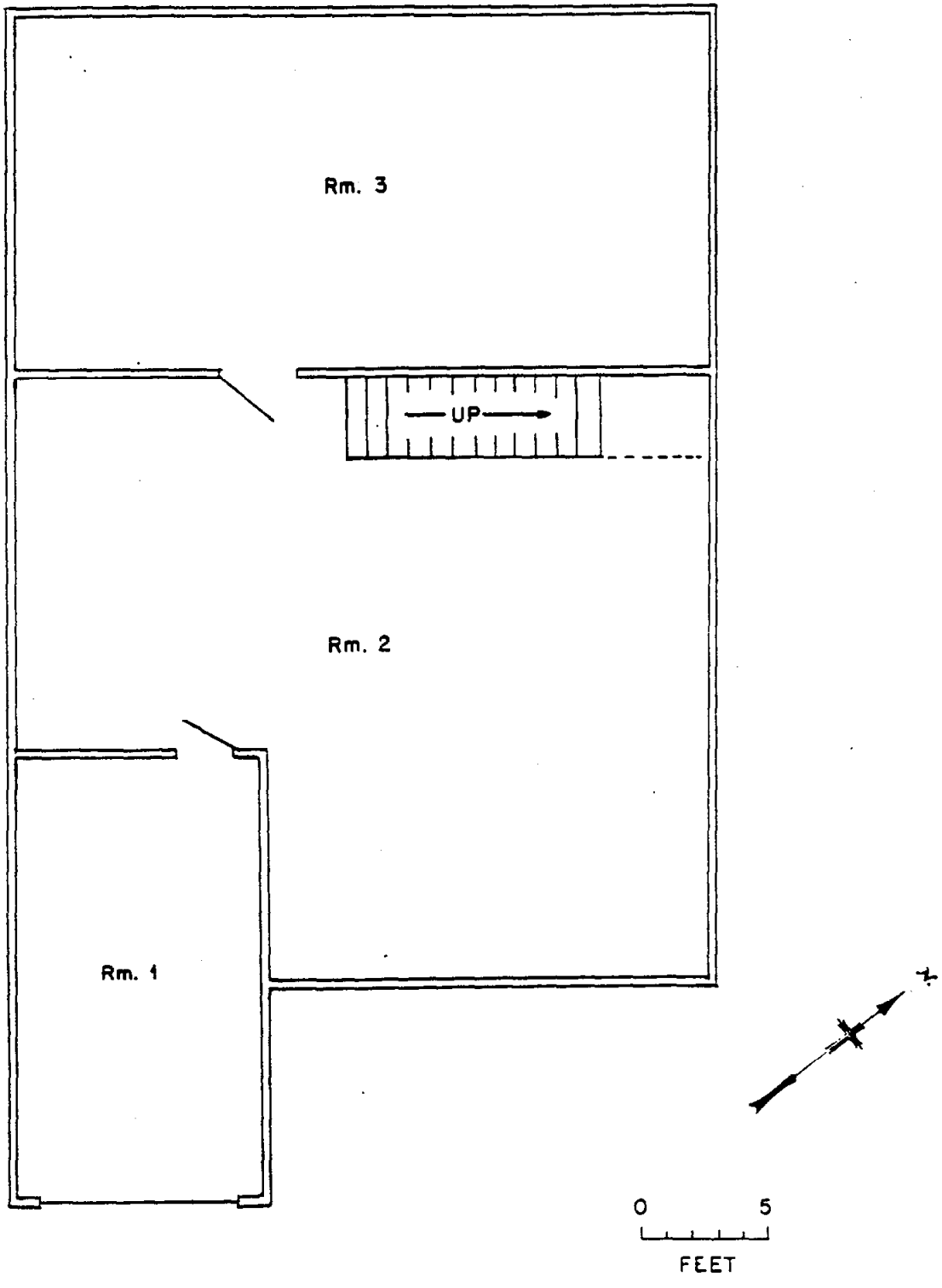

Fig. 3. Location of rooms in basement at 475 Davison Avenue.

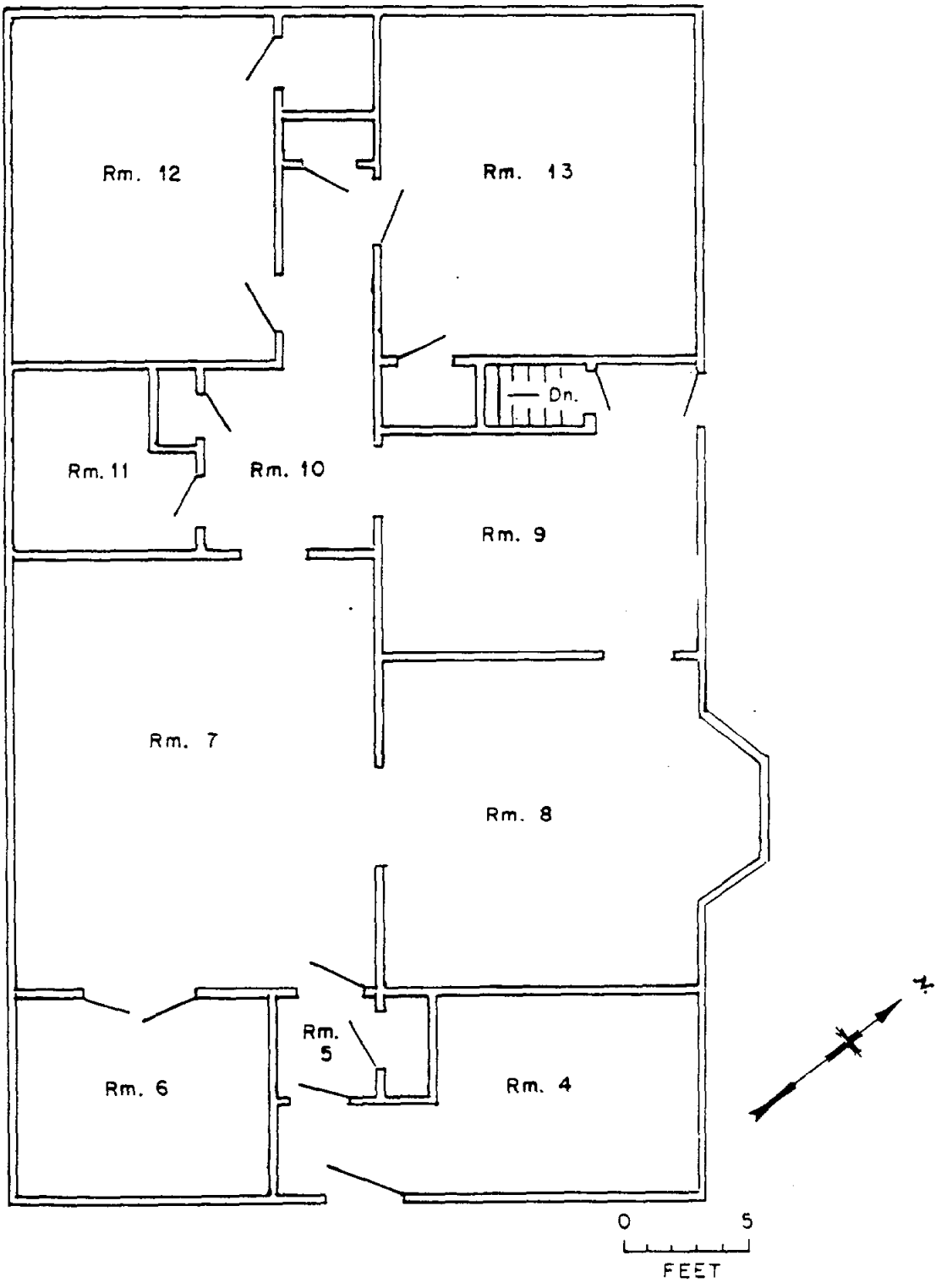

Fig. 4. Location of rooms on top floor at 475 Davison Avenue.

Table 1. A summary of applicable radiation guidelines for the FUSRAP program (July 1985).

	Mode of exposure	Exposure conditions	Guideline value	Guideline source
1.	Gamma radiation	Continuous exposure to individual in general population (whole body)	57 μR/h	DOE Order 5480.1A Chapter 11 Requirements for Radiation Protection
2.	Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels averaged over 100 m^2 area		U.S. Department of Energy Guidelines for Residual Radioactivity at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites (Revision 1, July 1985)
		^{226}Ra ^{232}Th	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm thick soil layers more than 15 cm below the surface and less than 1.5 m below the surface	

Table 2. Background radiation levels for the northern New Jersey area.

Type or radiation measurement or sample	Radiation level or radionuclide concentration
Gamma exposure rate at 1 m above floor or ground surface (μR/h)	8[a]
Concentration of radionuclides in soil (pCi/g)	
^{232}Th	0.9[b]
^{238}U	0.9[b]
^{226}Ra	0.9[b]

[a]Reference 4.
[b]Reference 5.

Table 3. Outdoor gamma radiation levels measured at 475 Davison Avenue.

Grid blocks	Range of exposure rate levels at the ground surface (μR/h)
0+00, BL - 0+37, BL	8 - 14
0+00, 3R - 0+37, 3R	8 - 12
0+00, 6R - 0+37, 6R	8 - 12
0+00, 9R - 0+37, 9R	8 - 13
0+00, 12R - 0+37, 12R	8 - 13

Table 4. Outdoor gamma exposure rates at 475 Davison Avenue.

Grid location	Exposure rate at 1 m above ground surface (μR/h)
0+27, 6R	7.0
0+18, 12R	9.5
0+05, 9R	9.0

Table 5. Indoor gamma radiation levels at 475 Davison Avenue.

Location[a]	External gamma exposure rate μR/h		Direct alpha activity (dpm/100 cm^2)
	Center of room at 1 m	Scan range at surface	
Room 1	12	11-13	<13
Room 2	10	8-11	<13
Room 3	10	10-12	<13
Room 4	10	10-13	<13
Room 5	8	8-10	<13
Room 6	10	10-13	<13
Room 7	9	8-12	<13
Room 8	9	8-11	<13
Room 9	8	8-9	<13
Room 10	8	8	<13
Room 11	9	9	<13
Room 12	9	8-9	<13
Room 13	9	8-11	<13

[a]Location is shown in Figs. 3 and 4.

Table 6. Results of radionuclide concentrations in soil at 475 Davison Avenue

Sample no.	Location	Depth (cm)	Radionuclide concentration (pCi/g)[a]	
			^{226}Ra	^{232}Th
MJ123	0+27, 3R	0-15	0.7 ± 0.1	0.8 ± 0.3
MJ124	0+33, 12R	0-15	0.7 ± 0.1	0.7 ± 0.3
MJ125	0+12, 14R	0-15	0.8 ± 0.2	0.8 ± 0.2
MJ126	0+06, BL	0-15	0.7 ± 0.08	0.8 ± 0.2

[a]Counting error associated with radionuclide results is at the 95% confidence level (1.96σ).

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