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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for Maywood, New Jersey



U.S. Department of Energy

Health and Safety Research Division

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

April 1985

Work performed as part of the
RADIOLOGICAL SURVEY ACTIVITIES PROGRAM

OAK RIDGE NATIONAL LABORATORY
Oak Ridge, Tennessee 37831
operated by
MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

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454 DAVISON AVENUE, MAYWOOD, NEW JERSEY**

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**Prepared by the
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RESULTS OF THE RADIOLOGICAL SURVEY AT
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INTRODUCTION

A radiological survey of 454 Davison Avenue, Maywood, New Jersey, was conducted by Oak Ridge National Laboratory (ORNL) on June 13, 1984 at the request of the Department of Energy (DOE). 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&G¹ on January 26, 1981, anomalously high gamma-ray exposure rates (principally ²³²Th 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 Commission² (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.

* 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-AC05-84OR21400.

SURVEY METHODS

The radiological survey of the property included: (1) a gamma scan of the entire property outdoors; and (2) sampling of surface (0-15 cm) and subsurface soil. Since it was not indicated that contamination was near the house on the property, no indoor survey was conducted. 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.

Gamma Radiation Levels

Results of grid block measurements are summarized in Table 3. The location of grid blocks are shown in Fig. 1. The elevated gamma levels confirm the presence of contaminated material at the property line of 460 Davison Avenue. Also, one other spot, grid location 0+06.1, 9.5R, showed an elevated gamma level above background (MJB48). Aside from these two areas, gamma levels over the rest of the property were indicative of the background range. The maximum gamma exposure rate at 1 m on this property was 14 μ R/h at grid location 0+30, BL (Table 5).

Systematic and Biased Soil Samples

Systematic samples of surface soil (top 15 cm) and biased surface and subsurface soil samples were taken from various locations on the property for radionuclide analyses. Locations of the systematic (MJ samples) and biased (MJB samples) samples are shown in Fig. 1, with

results of laboratory analyses provided in Table 4. Concentrations of ^{232}Th exceeded the concentrations of ^{226}Ra in all but two of the samples collected at 454 Davison Avenue (MJB49A and MJB49B). Based on the results of soil sample analyses, the contaminated material is located: (1) at the fence/property line of 460 Davison Avenue, and (2) an isolated spot at 0+06.1, 9.5R.

SUMMARY

Measurements taken at 454 Davison Avenue indicate that the property contains radioactive contamination primarily from the ^{232}Th decay chain, and to a lesser extent from the ^{238}U decay chain. This material is found in the locations shown in Fig. 2. Although concentrations of radionuclides were elevated significantly above background, the levels were not in excess of remedial action guidelines with the exception of sample MJB49 (^{226}Ra guideline). The contaminated strip down the property line adjacent to 460 Davison Avenue extends approximately 0.5 m onto 454 Davison, and an isolated spot of contaminated material is located at 0+6.1, 9.5R.

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 Commission, 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.

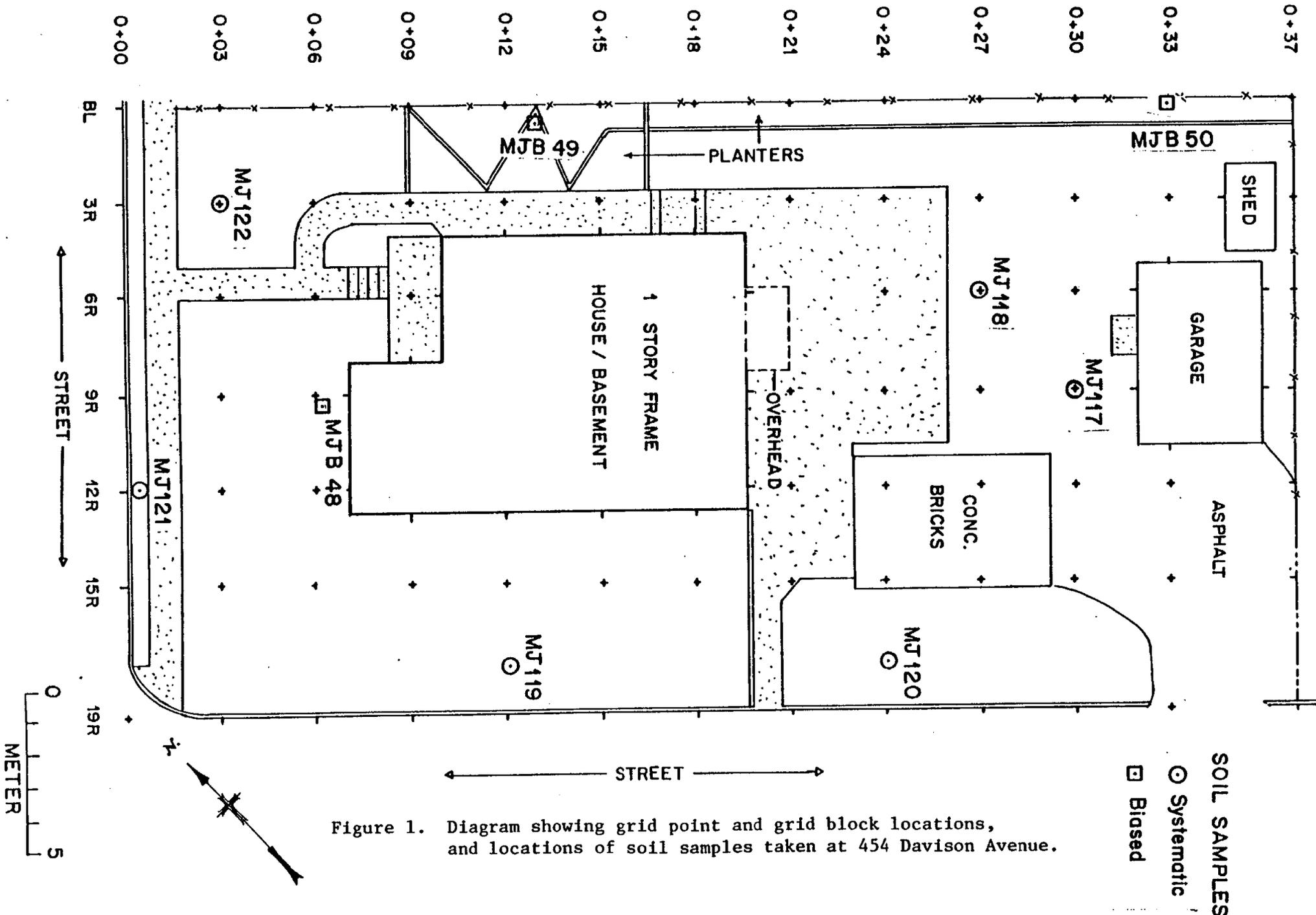


Figure 1. Diagram showing grid point and grid block locations, and locations of soil samples taken at 454 Davison Avenue.

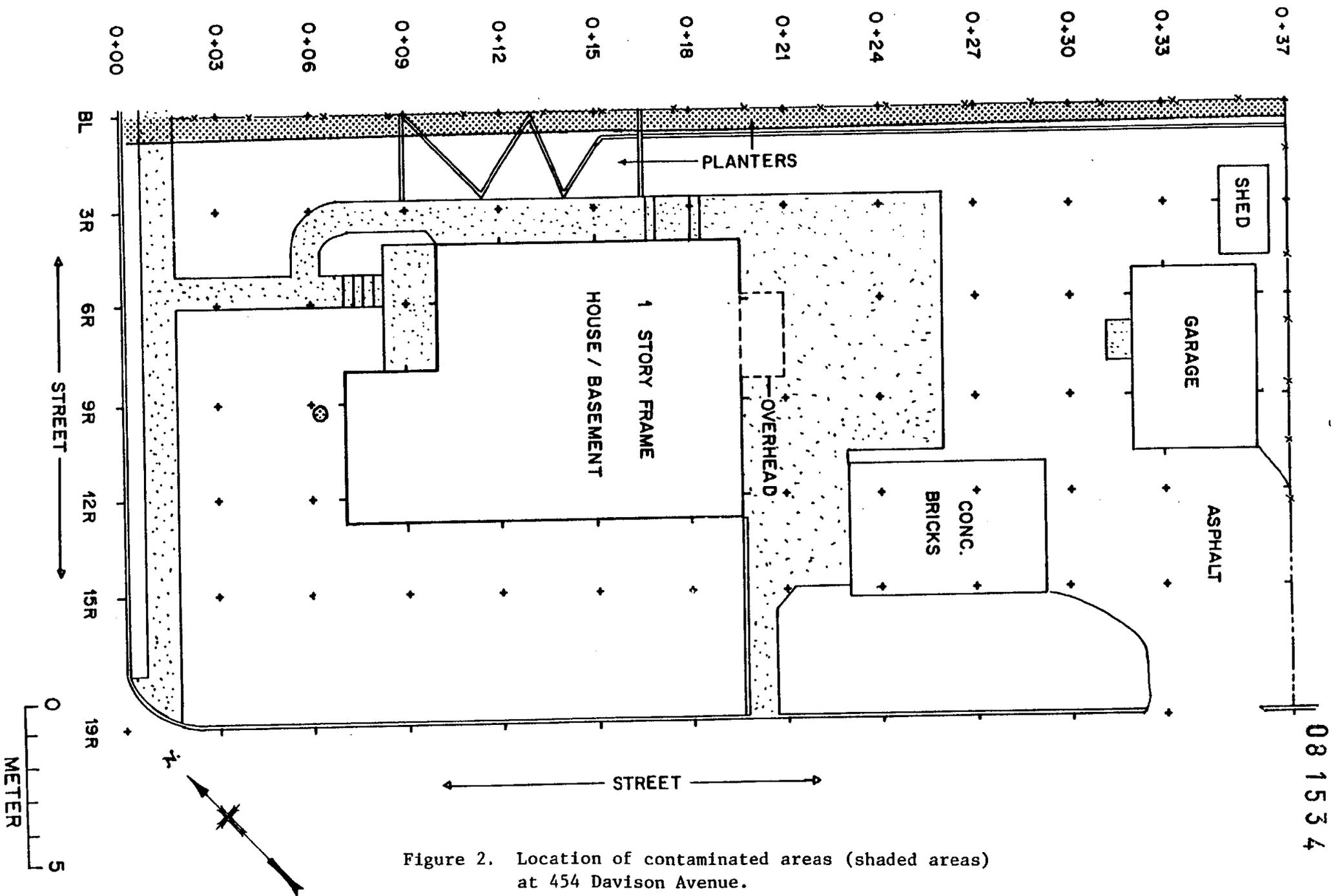


Figure 2. Location of contaminated areas (shaded areas) at 454 Davison Avenue.

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Table 1. A summary of proposed applicable radiation guidelines for the FUSRAP program (April 1984).

Mode of exposure	Exposure conditions	Guideline value	Guideline source
1. External gamma radiation	Continuous exposure to individual in general population (whole body)	60 μ R/h	Nuclear Regulatory Commission (NRC) - Standards for Protection Against Radiation (10 CFR 20.105)
2. Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background levels averaged over 100 m ² area		DOE Interim Residual Contamination and Waste Control Guidelines for FUSRAP and SFMP Sites (April 1984)
	²²⁶ Ra	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	
	²³² Th	15 pCi/g	

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 ($\mu\text{R/h}$)	g ^a
Concentration of radionuclides in soil (pCi/g)	
²³² Th	0.9 ^b
²³⁸ U	0.9 ^b
²²⁶ Ra	0.9 ^b

^aReference 4.

^bReference 5.

Table 3. Gamma radiation levels at 454 Davison Avenue

Grid blocks	Range of exposure rate levels at the ground surface ($\mu\text{R/h}$)
0+00, BL - 0+37, BL	8 - 34 (maximum at 0+37, BL)
0+00, 3R - 0+37, 3R	8 - 14
0+00, 6R - 0+37, 6R	8 - 14
0+00, 9R - 0+37, 6R	8 - 17 (maximum at 0+6.1, 9.5R)
0+00, 12R - 0+37, 12R	7 - 10
0+00, 15R - 0+37, 15R	7 - 12

Table 4. Radionuclide concentrations in soil at 454 Davison Avenue

Sample no.	Location	Depth (cm)	Radionuclide concentration (pCi/g) ^a	
			²²⁶ Ra	²³² Th
MJ117	0+30, 9R	0-15	0.8 ± 0.06	1.0 ± 0.3
MJ118	0+27, 6R	0-15	0.8 ± 0.02	1.0 ± 0.3
MJ119	0+12, 17.5R	0-15	1.5 ± 0.07	1.5 ± 0.3
MJ120	0+24, 17.5R	0-15	1.1 ± 0.1	1.2 ± 0.3
MJ121	0+0.5, 12R	0-15	0.6 ± 0.05	0.8 ± 0.2
MJ122	0+03, 3R	0-15	0.6 ± 0.1	0.8 ± 0.3
MJB48A	0+6.1, 9.5R	0-15	2.6 ± 0.3	8.5 ± 2
MJB48B	0+6.1, 9.5R	15-30	0.9 ± 0.1	1.9 ± 0.5
MJB48C	0+6.1, 9.5R	30-46	0.8 ± 0.2	1.5 ± 0.5
MJB49A	0+13, 0.25R	0-15	6.0 ± 0.9	5.5 ± 2
MJB49B	0+13, 0.25R	15-30	10 ± 0.3	6.5 ± 1
MJB49C	0+13, 0.25R	30-46	1.5 ± 0.07	1.9 ± 0.4
MJB50A	0+33, BL	0-15	1.9 ± 0.1	4.1 ± 1
MJB50B	0+33, BL	15-30	2.3 ± 0.4	5.7 ± 1
MJB50C	0+33, BL	30-36	2.2 ± 0.2	6.1 ± 2

^aCounting error associated with radionuclide results is at the 95% (1.96 σ) confidence level.