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Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey

US Army Corps of Engineers®

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[redacted]
137 Maywood Avenue
Maywood, New Jersey 07607

Dear [redacted]

As you know, the Department of Energy has completed a radiological survey of your property at 137 Maywood Avenue, Maywood, New Jersey. The purpose of the survey was to determine if your property warrants consideration for remedial action. We are pleased to inform you that the preliminary results from that survey indicate that radiological conditions on your property comply with Guidelines applicable to the Department's Maywood, New Jersey, remedial action project. As a result, no remedial action is required at your property.

A copy of the final survey report will be sent to you in the next few months by our radiological contractor, Oak Ridge National Laboratory. The file number for this survey is MJ026. If you have any questions on this survey or the letter or on the report when your receive it, please call Mr. Andrew Wallo of my staff at 301-353-5439.

Sincerely,

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James J. Fiore, Director
Division of Facility and Site
Decommissioning Projects
Office of Nuclear Energy

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HEALTH AND SAFETY RESEARCH DIVISION

Waste Management Research and Development Programs
(Activity No. AH 10 05 00 0; NEAH001)

RESULTS OF THE RADIOLOGICAL SURVEY AT 137 MAYWOOD AVENUE, MAYWOOD, NEW JERSEY (MJ026)

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ABSTRACT

Maywood Chemical Works (MCW) of Maywood, New Jersey, generated process wastes and residues associated with the production and refining of thorium and thorium compounds from monazite ores from 1916 to 1956. MCW supplied rare earth metals and thorium compounds to the Atomic Energy Commission and various other government agencies from the late 1940s to the mid–1950s. Area residents used the sandlike waste from this thorium extraction process mixed with tea and cocoa leaves as mulch in their yards. Some of these contaminated wastes were also eroded from the site into Lodi Brook. At the request of the U.S. Department of Energy (DOE), a group from Oak Ridge National Laboratory conducts investigative radiological surveys of properties in the vicinity of MCW to determine whether a property is contaminated with radioactive residues, principally ^{232}Th, derived from the MCW site. The survey typically includes direct measurement of gamma radiation levels and soil sampling for radionuclide analyses. The survey of this site, 137 Maywood Avenue, Maywood, New Jersey (MJ026), was conducted during 1987.

Slightly elevated concentrations of radionuclides in one localized spot on the property were well within the criterion used by DOE to determine the eligibility of a site for remedial action. Results of the survey demonstrated that all areas of the property are in general compliance with DOE Formerly Utilized Sites Remedial Action Program guidelines.

RESULTS OF THE RADIOLOGICAL SURVEY AT 137 MAYWOOD AVENUE, MAYWOOD,NEW JERSEY (MJ026)*

INTRODUCTION

From 1916 to 1956, process wastes and residues associated with the production and refining of thorium and thorium compounds from monazite ores were generated by the Maywood Chemical Works (MCW), Maywood, New Jersey. During the latter part of this period, MCW supplied rare earth metals and thorium compounds to various government agencies. In the 1940s and 1950s, MCW produced thorium and lithium, under contract, for the Atomic Energy Commission (AEC). These activities ceased in 1956, and, approximately three years later, the 30–acre real estate was purchased by the Stepan Company. The property is located at 100 Hunter Avenue in a highly developed area in Maywood and Rochelle Park, Bergen County, New Jersey.

During the early years of operation, MCW stored wastes and residues in low-lying areas west of the processing facilities. In the early 1930s, these areas were separated from the rest of the property by the construction of New Jersey State Highway 17. The Stepan property, the interim storage facility, and several vicinity properties have been designated for remedial action by the Department of Energy (DOE).

The waste produced by the thorium extraction process was a sandlike material containing residual amounts of thorium and its decay products, with smaller quantities of uranium and its decay products. During the years 1928 and 1944 to 1946, area residents used these process wastes mixed with tea and cocoa leaves as mulch in their lawns and gardens. In addition, some of the contaminated wastes were apparently eroded from the site into Lodi Brook and carried downstream.

As a result of the Energy and Water Appropriations Act of Fiscal Year 1984, the property discussed in this report and properties in its vicinity contaminated with residues from the former MCW were included as a decontamination research and development project under the DOE Formerly Utilized Sites Remedial Action Program. As part of this project, DOE is conducting radiological surveys in the vicinity of the site to identify properties contaminated with residues derived from the MCW. The principal radionuclide of concern is thorium-232. The radiological surveys discussed in this report are part of that effort and were conducted, at the request of DOE, by members of the Measurement Applications and Development Group of the Oak Ridge National Laboratory.

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*Members of the Measurement Applications and Development Group of the Health and Safety Research Division at Oak Ridge National Laboratory performed the survey under DOE contract DE-AC05-84OR21-400.

A radiological survey of the private, residential property at 137 Maywood Avenue, Maywood, New Jersey, was conducted on April 25, 1987.

SURVEY METHODS

The radiological survey of the property included a gamma scan of the entire property surface outdoors and collection of soil samples. No indoor survey measurements were performed. The survey methods followed the basic plan outlined in a correspondence from W. D. Cottrell to A. J. Whitman.[1] A comprehensive description of the survey methods and instrumentation has been presented in another report.[2]

Using a portable gamma scintillation meter, ranges of gamma exposure rates were recorded for areas of the property surface. Systematic soil samples were then obtained at randomly selected locations irrespective of the gamma exposure rates. In addition, a biased soil sample was collected in an area of elevated gamma levels; however, not all elevated areas were sampled. Measurements were usually made and soil samples collected at 15–cm intervals. The samples were analyzed for ^{226}Ra and ^{232}Th content.

SURVEY RESULTS

Applicable federal guidelines are summarized in Table 1.[3] Typical background radiation levels for the Maywood, New Jersey area are presented in Table 2.[4-5] These data are provided for comparison with 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 soil samples.

Surface Gamma Radiation Levels

Gamma radiation levels measured during a scan of the property surface are given in Fig. 1. Gamma exposure rates over the major portion of the property ranged from 5 to 11 μR/h. Elevated gamma levels ranging from 15 to 25 μR/h were measured in an area of approximately 4.7 m^2 in the northeast corner of the lot.

Systematic and Biased Soil Samples

Six systematic (S) and two biased (B) soil samples were taken from four different locations on the property for radionuclide analyses. Locations of these samples are shown on Fig. 2 with results of laboratory analyses provided in Table 3. Concentrations of radium and thorium in the systematic samples ranged from 0.38 to 0.69 pCi/g and 0.39 to 0.77 pCi/g, respectively. All results for systematic samples were below background for the northern New Jersey area (Table 2).

Values for biased samples taken from depths of 0 to 15 cm and 15 to 30 cm, respectively, were 1.9 and 1.1 pCi/g for ^{226}Ra, and 7.9 and 3.2 pCi/g for ^{232}Th. The area in the northeast corner of the lot where surface soil sample B1A was found to contain 7.9 pCi/g of ^{232}Th is ~4.7 m^2. The concentrations of radionuclides in that sample are well within the hot spot criteria shown in Table 1. All areas of the site are in general compliance with DOE criteria (5 and 15 pCi/g averaged over 100 m^2).

SIGNIFICANCE OF FINDINGS

Measurements taken at 137 Maywood Avenue indicate that the property contains radioactive residuals in one small, isolated spot in the northeast corner of the lot. Nevertheless, the survey results demonstrate that no radiation levels nor radionuclide concentrations exceed the DOE guidelines. Based on these survey data, it is recommended that this property be excluded from consideration for remedial action under the FUSRAP criteria for such activities.

REFERENCES

1. W. D. Cottrell, ORNL, to A. J. Whitman, DOE/HQ, correspondence, "Radiological Survey of Private Properties in Lodi, New Jersey" (August 15, 1984).

2. T. E. Myrick, B. A. Berven, W. D. Cottrell, W. A. Goldsmith, and F. F. Haywood, *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program,* Oak Ridge National Laboratory, ORNL/TM-8600 (April 1987).

3. U.S. Department of Energy, *Guidelines for Residual Radioactive Material at Formerly Utilized Sites Remedial Action Program and Remote Surplus Facilities Management Program Sites* (Rev. 2, March 1987).

4. T. E. Myrick, B. A. Berven, and F. F. Haywood, *State Background Radiation Levels: Results of Measurements Taken During 1975-1979,* Oak Ridge National Laboratory, ORNL/TM-7343 (November 1981).

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

6. E. G. Delaney, DOE/HQ, to S. Ahrends, ORO, correspondence, "Revised Hot Spot Guidelines for FUSRAP and Remote SFMP Sites" (December 22, 1986).

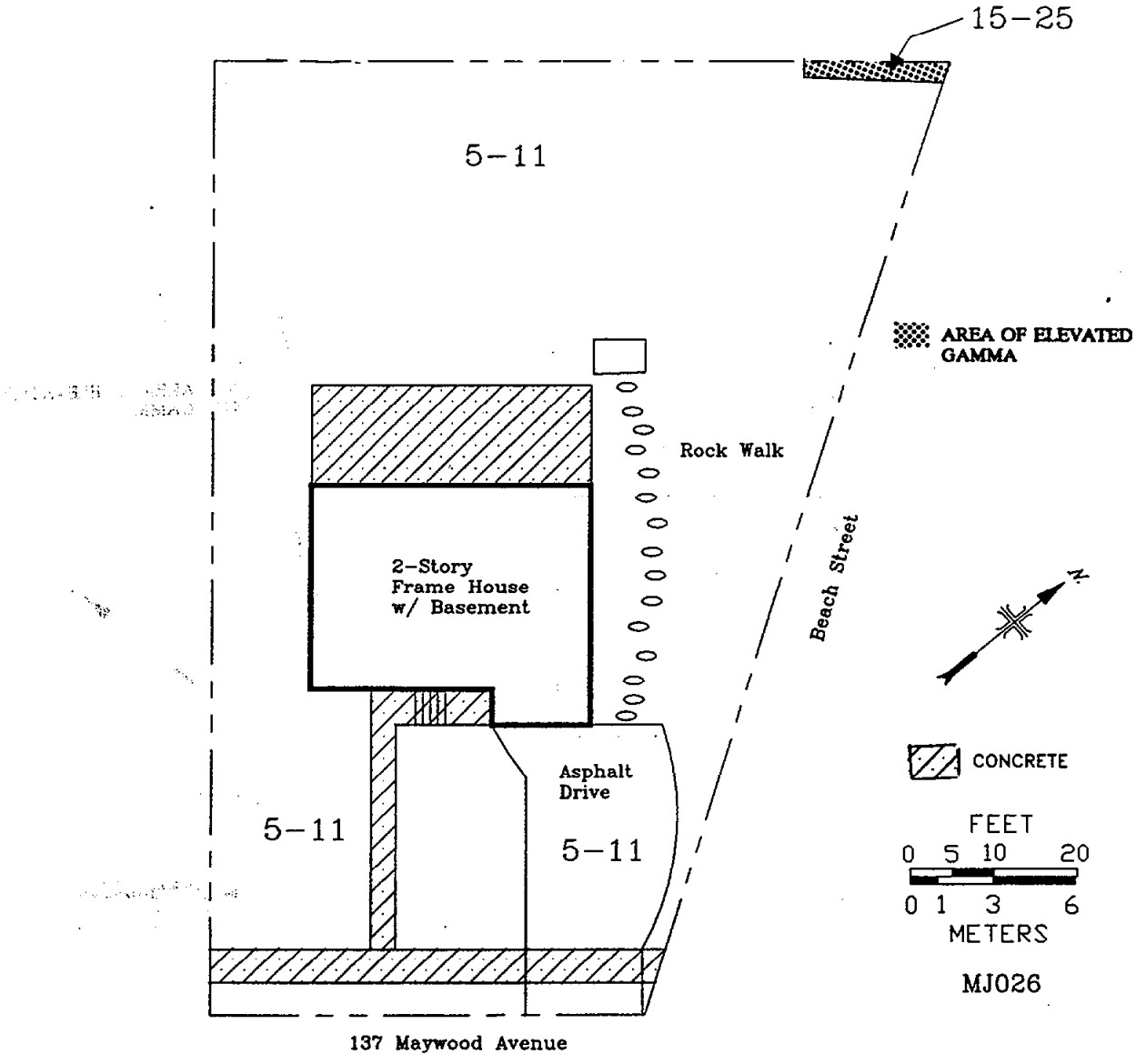

Fig. 1. Gamma radiation levels (μR/h) measured on the surface at 137 Maywood Avenue, Maywood New Jersey (MJ026).

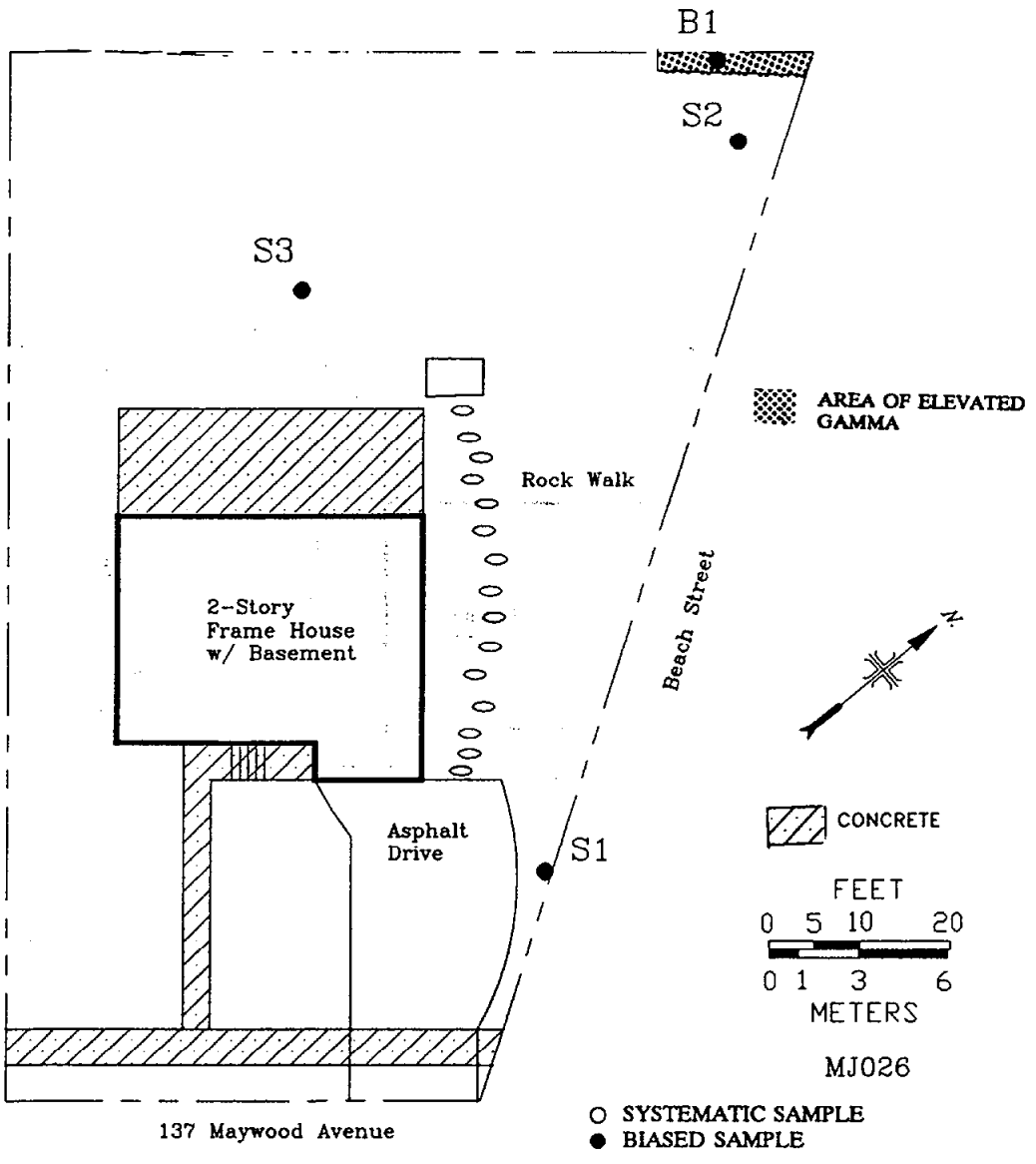

Fig. 2. Diagram showing locations of soil samples taken at 137 Maywood Avenue, Maywood New Jersey (MJ026).

Table 1. Applicable guidelines for protection against radiation[a]

Mode of exposure	Exposure conditions	Guideline value
Radionuclide concentrations in soil	Maximum permissible concentration of the following radionuclides in soil above background over a 100 m^2 area[b] ^{232}Th ^{230}Th ^{228}Ra ^{226}Ra	5 pCi/g averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over 15-cm soil layers more than 15 cm below the surface
Guidelines for nonhomogeneous contamination (used in addition to the 100 m^2 guideline)[c]	Applicable to locations meeting the above criterion but ≤25 m^2 with significantly elevated concentrations of radionuclides	Concentration limits for application to "hot spots" varying in size as follows: (m^2) (pCi/g) <1 50 1-<3 30 3-<10 15 10-25 10

[a]Reference 3.

[b]These guideline values are applicable to surface concentrations of ^{232}Th, ^{230}Th, ^{228}Ra, and ^{226}Ra only; for other radionuclides and subsurface values, see Reference 3.

[c]"Every reasonable effort shall be made to identify and remove any source which has a concentration exceeding 30 times the guideline value, irrespective of area." See Reference 6.

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

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

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

Table 3. Concentrations of radionuclides in soil at 137 Maywood Avenue, Maywood New Jersey (MJ026)

Sample[a]	Depth (cm)	Radionuclide concentration (pCi/g)	
		^{226}Ra[b]	^{232}Th[b]
		Systematic samples[c]	
S1A	0–15	0.63±0.06	0.77±0.1
S1B	15–30	0.45±0.04	0.53±0.07
S2A	0–15	0.66±0.2	0.54±0.03
S2B	15–30	0.38±0.04	0.39±0.2
S3A	0–15	0.69±0.5	0.69±0.15
S3B	15–30	0.55±0.08	0.58±0.07
		Biased samples[d]	
B1A	0–15	1.9 ±0.08	7.9 ±0.4
B1B	15–30	1.1 ±0.1	3.2 ±0.6

[a]Locations of soil samples are shown on Fig. 2.

[b]Indicated counting error is at the 95% confidence level ($\pm 2\sigma$).

[c]Systematic samples are taken at locations irrespective of gamma exposure rates.

[d]Biased samples are taken where gamma exposure rates have been shown to be elevated.

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