M-726

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey

US Army Corps of Engineers®

ORNL/RASA-88/21

HEALTH AND SAFETY RESEARCH DIVISION

Nuclear and Chemical Waste Programs
(Activity No. AH 10 05 00 0; ONLWCO1)

RESULTS OF THE RADIOLOGICAL SURVEY AT GRANT AVENUE MEMORIAL PARK (MJ028), MAYWOOD, NEW JERSEY

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Date of Issue – February 1989

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
for the
U. S. DEPARTMENT OF ENERGY
under Contract No. DE-AC05-84OR21400

CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACKNOWLEDGMENTS

Research for this project was sponsored by the Division of Facility and Site Decommissioning Projects, U.S. Department of Energy, under Contract No. DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc. The authors wish to acknowledge the support of J. E. Baublitz, Deputy Director, Office of Remedial Action and Waste Technology; J. J. Fiore, Director, Division of Facility and Site Decommissioning Projects; and members of their staff. The authors also appreciate the contributions of B. C. Littleton and L. J. Jeffers of IR&A Publications Office, B. S. Ellis, D. A. Roberts, and T. R. Stewart of the Measurement Applications and Development Group, and M. E. Ward of Don Stone Associates for participation in the collection, analyses, and reporting of data for this survey.

RESULTS OF THE RADIOLOGICAL SURVEY AT GRANT AVENUE MEMORIAL PARK (MJ028), MAYWOOD, NEW JERSEY*

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 survey discussed in this report is part of that effort and was conducted, at the request of DOE, by members of the Measurement Applications and Development Group of Oak Ridge National Laboratory.

A radiological survey of the property at Grant Avenue Memorial Park, Maywood, New Jersey, was conducted during 1987. The survey and sampling of the ground surface and subsurface were carried out on April 27, 1987.

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*The survey was performed by members of the Measurement Applications and Development 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 a gamma scan of the entire property outdoors and collection of surface and subsurface soil samples. No indoor survey measurements were performed.

Using a portable gamma scintillation meter, ranges of measurements were recorded for areas of the property surface. Biased soil samples were then collected in areas of elevated gamma levels.

These survey methods followed the plan outlined in Reference 1. A comprehensive description of the survey methods and instrumentation is presented in *Procedures Manual for the ORNL Radiological Activities (RASA) Program,* Oak Ridge National Laboratory, ORNL/TM-8600 (April 1987).[2]

SURVEY RESULTS

Applicable federal guidelines are summarized in Table 1.[3] The normal background radiation levels for the northern New Jersey area are presented in Table 2. 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 environmental samples.

Surface Gamma Radiation Levels

Gamma radiation levels measured during a gamma scan of the surface of the property are given in Fig. 1. Gamma exposure rates over the major portion of the property ranged from 6 to 11 μR/h. Elevated gamma levels (20 to 49 μR/h) were found in one small isolated area north of the flagpole.

Biased Soil Samples

Eleven biased soil samples (B1A–B6) were taken for radionuclide analyses. The samples were taken at 15-cm increments from depths of 0 to 75 cm. Locations of the samples are shown in Fig. 2, and results of laboratory analyses are provided in Table 3. Concentrations ranged from 0.43 to 25 pCi/g for ^{226}Ra and from 0.54 to 130 pCi/g for ^{232}Th. The DOE guideline for ^{232}Th concentration in surface soil is exceeded in sample B1A, and the criterion for subsurface ^{232}Th is exceeded in samples B1B and B1C. For ^{226}Ra, the DOE guideline for concentration in subsurface soil is exceeded in samples B1B and B1C.

SIGNIFICANCE OF FINDINGS

Measurements taken at Grant Avenue Memorial Park indicate that the property contained radioactive contamination primarily from the ^{232}Th decay chain, with some contamination from ^{226}Ra. These radionuclide distributions are typical of the type of material originating from the processing operations at MCW. The concentration and extent of ^{232}Th on this property are in excess of the applicable DOE criteria (Table 1). This material was found in the location shown in Fig. 2 at sample location B1. After the initial findings were reported to DOE and to the City of Maywood, the City remediated the small area involved. The contaminated material was placed in 55-gallon drums and ultimately moved to the Maywood Interim Storage Site (MISS). An ORNL survey team did a walk over scan of the remediated area in 1988 and found no gamma activity above normal background. No soil samples were taken.

REFERENCES

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

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

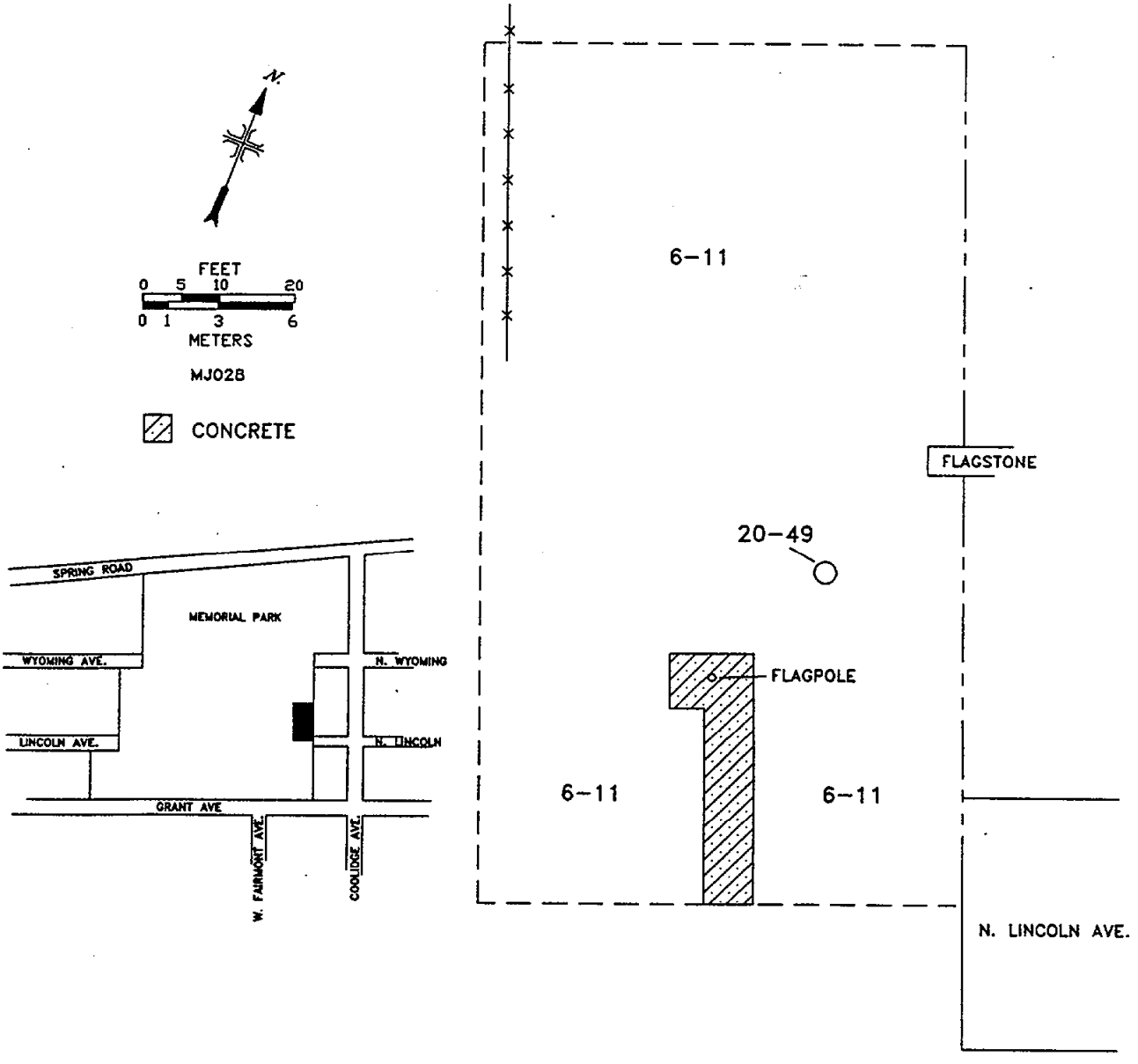

Fig. 1. Gamma radiation levels (μR/h) measured on the surface at Grant Avenue Memorial Park, Maywood, New Jersey (MJ028).

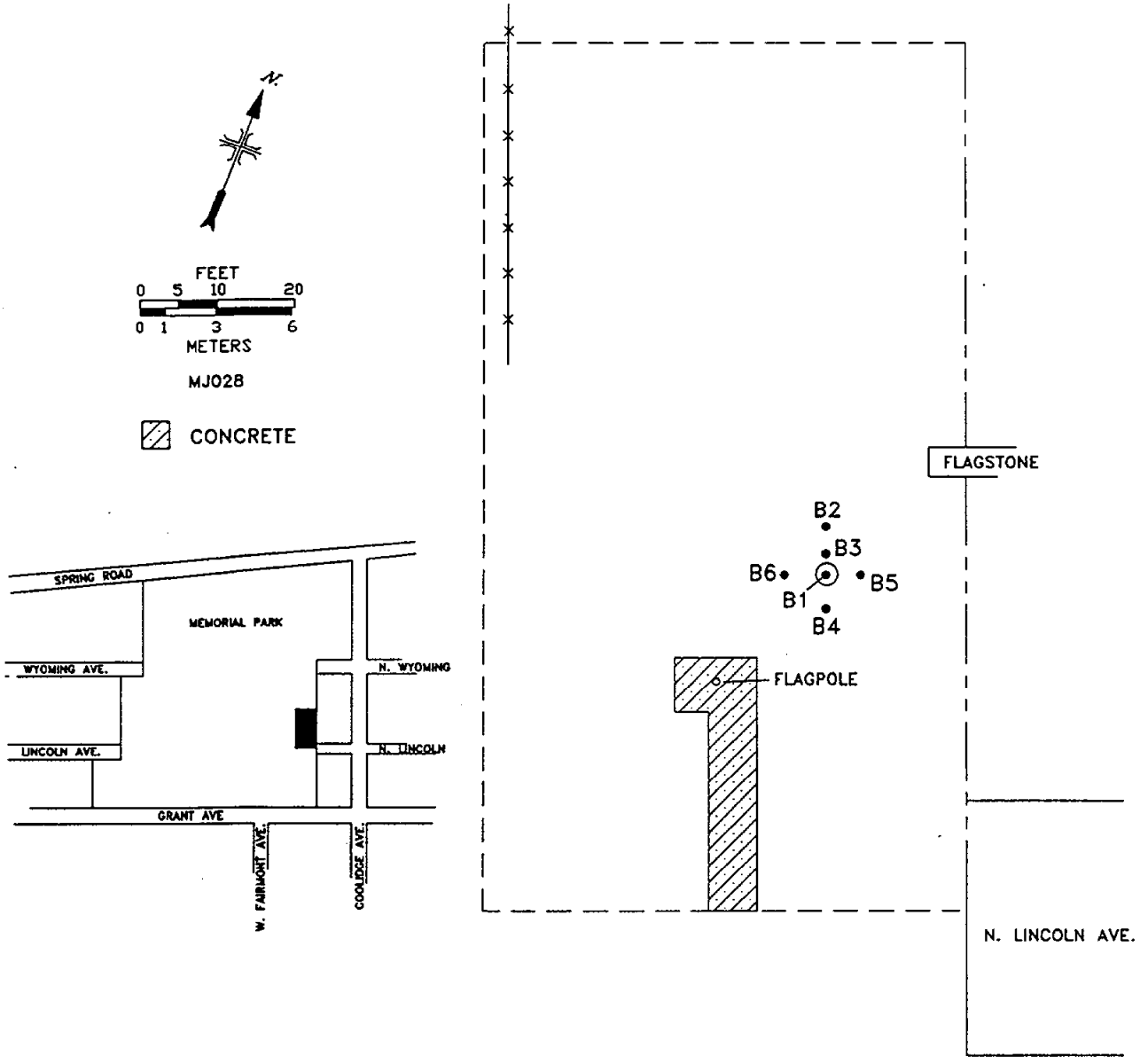

Fig. 2. Diagram showing locations of soil samples taken at Grant Avenue Memorial Park, Maywood, New Jersey (MJ028).

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 levels averaged over 100 m^2 area ^{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 thick soil layers more than 15 cm below the surface

[a]Reference 3.

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

Type of radiation measurement or sample	Radionuclide level or radionuclide concentration
Concentration of radionuclides in soil (pCi/g)	
^{232}Th	0.9[a]
^{238}U	0.9[a]
^{226}Ra	0.9[a]

[a]Reference 4.

Table 3. Concentrations of radionuclides in soil at Grant Avenue Memorial Park, Maywood, New Jersey (MJ028)

Sample[a]	Depth (cm)	Radionuclide concentration (pCi/g)	
		^{226}Ra[b]	^{232}Th[b]
		Biased samples[c]	
B1A	0–15	2.5 ±0.2	11 ±0.7
B1B	15–30	25 ±1	130 ±5
B1C	30–45	25 ±0.9	130 ±4
B1D	45–60	1.8 ±0.1	7.9 ±0.5
B1E	60–75	1.2 ±0.09	4.4 ±0.03
B3A	5–15	1.0 ±0.04	2.3 ±0.04
B3B	15–30	0.76±0.08	1.0 ±0.3
B3C	30–45	0.57±0.07	0.84±0.1
B3D	45–60	0.43±0.07	0.54±0.2
B5A	0–15	0.60±0.08	0.72±0.2
B6	0–15	2.6 ±0.2	5.4 ±0.2

[a]Locations of soil samples are shown on Fig. 2.
[b]Indicated counting error is at the 95% confidence level ($\pm 2\sigma$).
[c]Biased samples are taken from areas shown to have elevated gamma exposure rates.

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