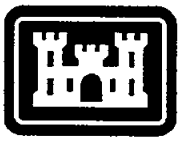
M-720

Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey



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RESULTS OF THE RADIOLOGICAL SURVEY AT WEST HUNTER AVENUE FIREHALL, MAYWOOD, NEW JERSEY (MJ027)

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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, West Hunter Avenue Firehall, Maywood, New Jersey (MJ027), was conducted during 1987.

Results of the survey demonstrated no radionuclide concentrations in excess of the DOE Formerly Utilized Sites Remedial Action Program guideline values. The radionuclide distributions were not significantly different from normal background levels in the northern New Jersey area.

RESULTS OF THE RADIOLOGICAL SURVEY AT WEST HUNTER AVENUE FIREHALL, MAYWOOD, NEW JERSEY (MJ027)*

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 U.S. 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.

A radiological survey of the private, residential property at West Hunter Avenue Firehall, Maywood, New Jersey, was conducted during 1987. The survey and sampling of the ground surface were carried out on April 29, 1987.

*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: (1) a gamma scan of the entire property surface outdoors and (2) collection of soil samples. These survey methods followed the plan outlined in Reference 1. No indoor survey measurements were performed.

Using a portable gamma scintillation meter, ranges of measurements were recorded for areas of the property surface. If the gamma readings were elevated, a biased soil sample was taken at the point showing the highest gamma radiation level. These samples were taken from the surface at 15 cm intervals to a depth of 30 cm. A comprehensive description of the survey methods and instrumentation has been presented in another report.[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.[4] These data are provided for comparison with survey results presented in this report. 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 were measured during a gamma scan of the entire property surface. Gamma exposure rates over the major portion of the property ranged from 9 to 12 μR/h. The highest gamma level, measuring 18 μR/h, was found in the parking area on the southeastern side of the building, about five feet from the foundation midway along the building. Otherwise, none of the readings were elevated.

Biased Soil Samples

Biased soil samples were taken under the paving asphalt at the one area of slightly elevated gamma readings. Results of laboratory analyses are provided in Table 3. Concentrations of radium and thorium in these soil samples ranged from 0.60 to 0.88 pCi/g and 1.3 to 2.8 pCi/g, respectively. Both samples were below DOE criteria (Table 1) and were not significantly different from normal background levels for the northern New Jersey area (Table 2).

SIGNIFICANCE OF FINDINGS

Measurements taken at West Hunter Avenue Firehall indicate that the property contained no significant radioactive contamination above normal background levels in this area. Since all soil samples from this site demonstrated low radionuclide concentrations, the slightly elevated gamma levels found in the parking area apparently emanated from the aggregate used in the asphalt. These findings are consistant with the asphalt used elsewhere in the Maywood area and are typical of the naturally occurring radioactive substances present in bricks, concrete, granite, and other such materials used in paving and building construction. None of the measurements were in excess of applicable Federal guideline values.

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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).
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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
	^{238}U	Derived (site specific)

[a]Reference 3.

Table 2. Background radiation levels in soil from the northern New Jersey area

Radionuclide	Concentration (pCi/g)[a]
^{226}Ra	0.9[b]
^{232}Th	0.9[b]
^{238}U	0.9[b]

[a]These values represent an average of normal radionuclide concentrations in this part of the state. Actual values may fluctuate.

[b]Reference 4.

Table 3. Concentrations of radionuclides in soil at West Hunter Avenue Firehall, Maywood, New Jersey (MJ027)

Sample	Depth (cm)	Radionuclide concentration (pCi/g)	
		^{226}Ra[a]	^{232}Th[a]
		Biased samples[b]	
B1A	0–15	0.60±0.08	2.8±0.2
B1B	15–30	0.88±0.01	1.3±0.03

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

[b]Biased samples were taken from areas shown to have elevated gamma exposure rates.

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