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Formerly Utilized Sites Remedial Action Program (FUSRAP)

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# ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey

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**US Army Corps  
of Engineers®**

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SEP 07 1988

Mr. John Curran  
Administrator, Lodi Borough  
1 Memorial Drive  
Lodi, New Jersey 07644

NE-23

Wallo  
AWW  
09/7/88

NE-23

Dear Mr. Curran:

Flore  
09/7/88

As you know, the Department of Energy has completed a radiological survey of your property at Main Street and New Jersey Highway 46, Lodi, 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 LJ074. If you have any questions on this survey or the letter or on the report when you receive it, please call Mr. Andrew Wallo of my staff at 301-353-5439.

Sincerely,

JSI

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

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**HEALTH AND SAFETY RESEARCH DIVISION**

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

**RESULTS OF THE RADIOLOGICAL  
SURVEY AT MAIN STREET AND HIGHWAY 46,  
LODI, NEW JERSEY (LJ074)**

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Date Published - September 1989

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## CONTENTS

LIST OF FIGURES .....	v
LIST OF TABLES .....	vii
ACKNOWLEDGEMENTS .....	ix
ABSTRACT .....	xi
INTRODUCTION .....	1
SURVEY METHODS .....	2
SURVEY RESULTS .....	2
Surface Gamma Radiation Levels .....	3
Auger Hole Soil Samples and Gamma Logging .....	3
SIGNIFICANCE OF FINDINGS .....	3
REFERENCES .....	4

## LIST OF FIGURES

1	Gamma radiation levels ( $\mu\text{R/h}$ ) measured on the surface at Main Street and Highway 46, Lodi, New Jersey (LJ74) . . . . .	5
2	Diagram showing locations of soil samples taken at Main Street and Highway 46, Lodi, New Jersey (LJ74) . . . . .	6
3	Gamma profile of auger hole 2 (A2) at Main Street and Highway 46, Lodi, New Jersey . . . . .	7
4	Gamma profile of auger hole 4 (A4) at Main Street and Highway 46, Lodi, New Jersey . . . . .	8
5	Gamma profile of auger hole 6 (A6) at Main Street and Highway 46, Lodi, New Jersey . . . . .	9

## LIST OF TABLES

1	Applicable guidelines for protection against radiation . . . . .	10
2	Background radiation levels for the northern New Jersey area . . . . .	10
3	Concentrations of selected radionuclides in soil at Main Street and Highway 46, Lodi, New Jersey (LJ074) . . . . .	11

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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  $^{232}\text{Th}$ , 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 located at the intersection of Main Street and Highway 46, Lodi, New Jersey (LJ074), was conducted during 1987.

While some radiological measurements taken at the vacant lot at the intersection of Main Street and Highway 46 were greater than background levels typically encountered in the northern New Jersey area, no radiation levels nor radionuclide concentrations exceeded the applicable DOE criteria. The survey results demonstrate that the radiological condition of this property conforms to DOE guidelines for remedial action.



**RESULTS OF THE RADIOLOGICAL SURVEY  
AT THE PROPERTY AT MAIN STREET  
AND HIGHWAY 46, LODI, NEW JERSEY  
(LJ074)\***

**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.

Lodi Brook is a small stream flowing south from Maywood with its headwaters near the Stepan waste storage site. Approximately 150 ft after passing under State Route 17, the stream has been diverted underground through concrete or steel culverts until it merges with the Saddle River in Lodi, New Jersey. Only a small section near Interstate 80 remains uncovered. From the 1940s to the 1970s when the stream was being diverted underground, its course was altered several times. Some of these changes resulted in the movement of contaminated soil to the surface of a few properties, where it is still in evidence. In other instances, the contaminated soil was covered over or mixed with clean fill, leaving no immediate evidence on the surface. Therefore, properties in question may be drilled in search of former stream bed material, even in the absence of surface contamination.

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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.

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 the Oak Ridge National Laboratory.

A radiological survey of the vacant lot at the intersection of Main Street and Highway 46, Lodi, New Jersey, was conducted in 1987. The survey and sampling of the ground surface, as well as the subsurface investigation, were carried out June 11 and 12.

## SURVEY METHODS

The radiological survey included: (1) a gamma scan of the entire property, (2) collection of subsurface soil samples, and (3) gamma profiles of auger holes. There were no structures on the property at the time of the survey.

Using a portable gamma scintillation meter, ranges of measurements were recorded for areas of the property surface. To define the extent of possible subsurface soil contamination, auger holes were drilled to depths of approximately 3 m. A plastic pipe was placed in each hole, and a NaI scintillation probe was lowered inside the pipe. The probe was encased in a lead shield with a horizontal row of collimating slits on the side. This collimation allows measurement of gamma radiation intensities resulting from contamination within small fractions of the hole depth. If the gamma readings in the hole were elevated, a soil sample was scraped from the wall of the auger hole at the point showing the highest gamma radiation level. The auger hole loggings were used to select locations where further soil sampling would be useful. A split-spoon sampler was used to collect subsurface samples at known depths. In some auger holes, a combination of split-spoon sampling and side-wall scraping was used to collect samples. These survey methods followed the plan outlined in Reference 1. A comprehensive description of the survey methods and instrumentation has been presented in another report.<sup>2</sup>

## SURVEY RESULTS

Applicable federal guidelines are summarized in Table 1.<sup>3</sup> 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 scan of the surface of the property are given in Fig. 1. Exposure rates ranged from 5 to 9  $\mu\text{R}/\text{h}$  with no areas of elevated gamma levels observed.

### Auger Hole Soil Samples and Gamma Logging

Varying thicknesses of subsurface soil were sampled from depths of 15 to 120 cm in three of six auger holes (A) drilled at separate locations as indicated in Fig. 2. Three holes (A1, A3, and A5) were not sampled because of the absence of elevated gamma activity. The results of analyses of these samples are given in Table 3. Concentrations of  $^{226}\text{Ra}$  and  $^{232}\text{Th}$  in soil samples from auger holes A2, A4, and A6 ranged from 0.65 to 1.8 pCi/g and 0.64 to 1.9 pCi/g, respectively. Although some values slightly exceed background concentrations (Table 2), all results are well below the DOE criterion for subsurface soil (Table 1).

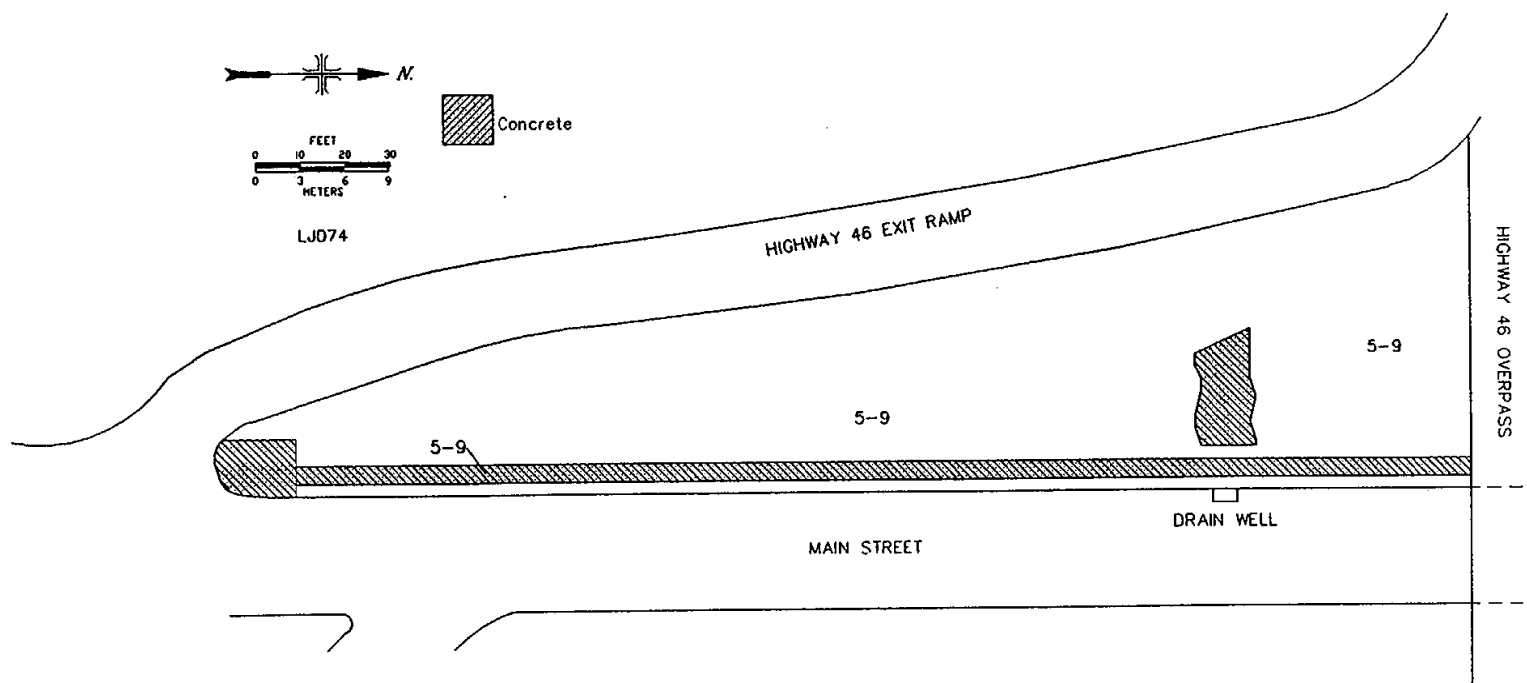
Gamma logging was performed in three of the six auger holes to characterize and further define the extent of possible contamination. The logging technique used here is not radionuclide specific. However, logging data, in conjunction with soil analyses data, may be used to estimate regions of elevated radionuclide concentrations in auger holes when compared with background levels for the area. Following a comparison of these data, it appears that any shielded scintillator readings of 1,000 counts per minute (cpm) or greater generally indicate the presence of elevated concentrations of  $^{226}\text{Ra}$  and/or  $^{232}\text{Th}$ . Data from the gamma profiles of the auger holes logged with the shielded scintillator (A2, A4, and A6) are graphically represented in Figs. 3 through 5. No measurements above 900 cpm were found.

### SIGNIFICANCE OF FINDINGS

While some radiological measurements taken on the property at the intersection of Main Street and Highway 46 were greater than background levels typically encountered in the northern New Jersey area, no radiation levels nor radionuclide concentrations exceeded the applicable DOE criteria. Based on the results of this radiological assessment, it is recommended that this site be eliminated from consideration for inclusion in the DOE remedial action program.

## 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 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).



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Fig. 1. Gamma radiation levels ( $\mu\text{R/h}$ ) measured on the surface at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074).

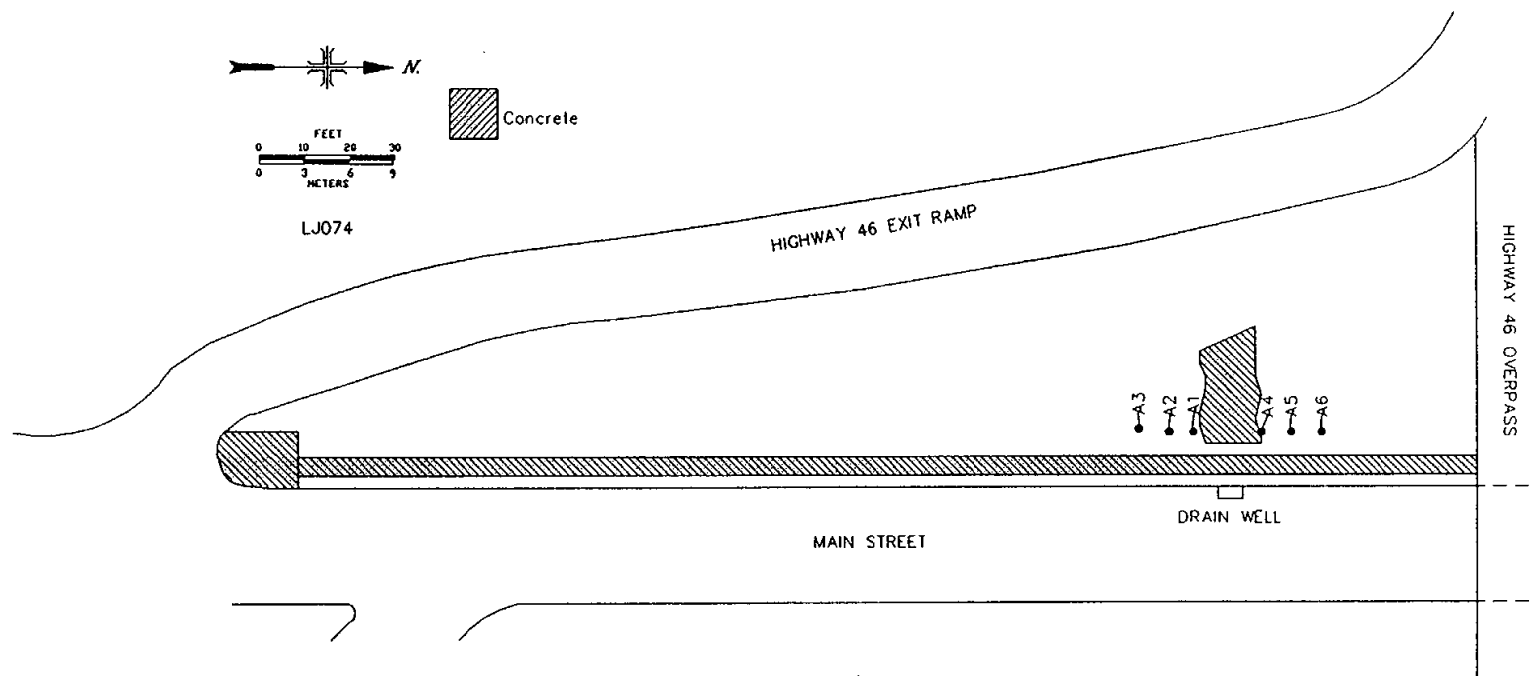
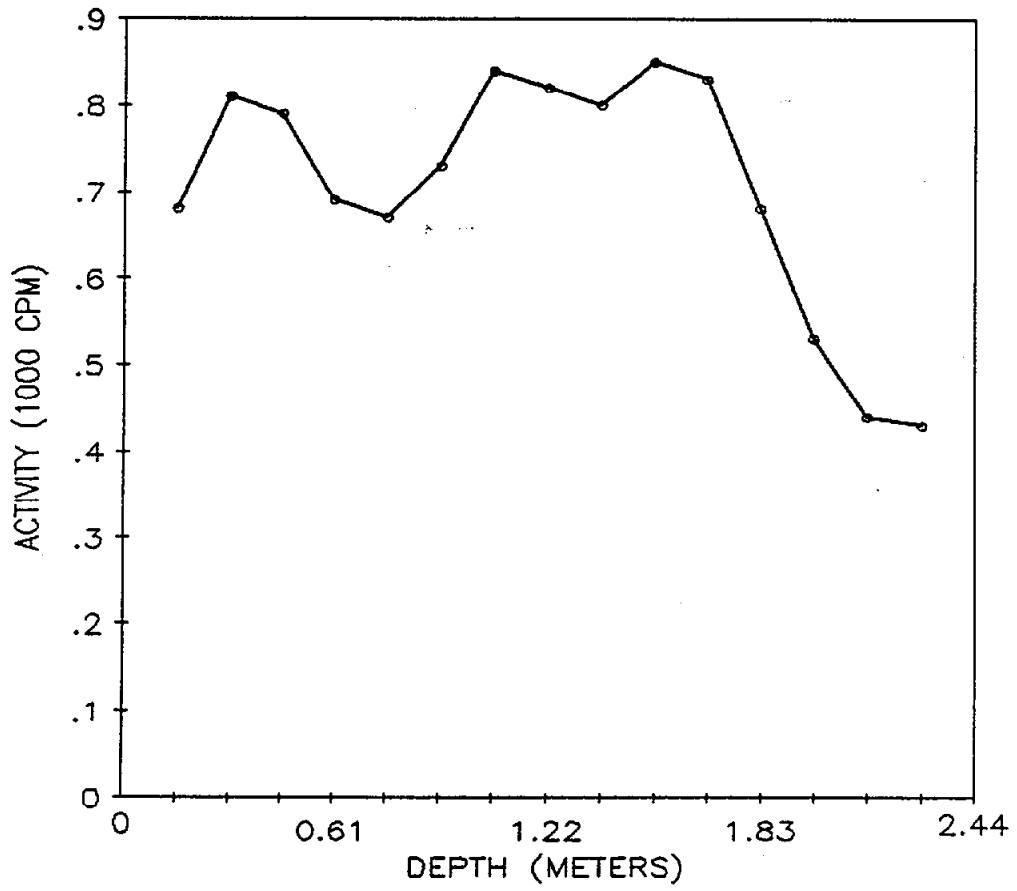


Fig. 2. Diagram showing locations of soil samples taken at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074).

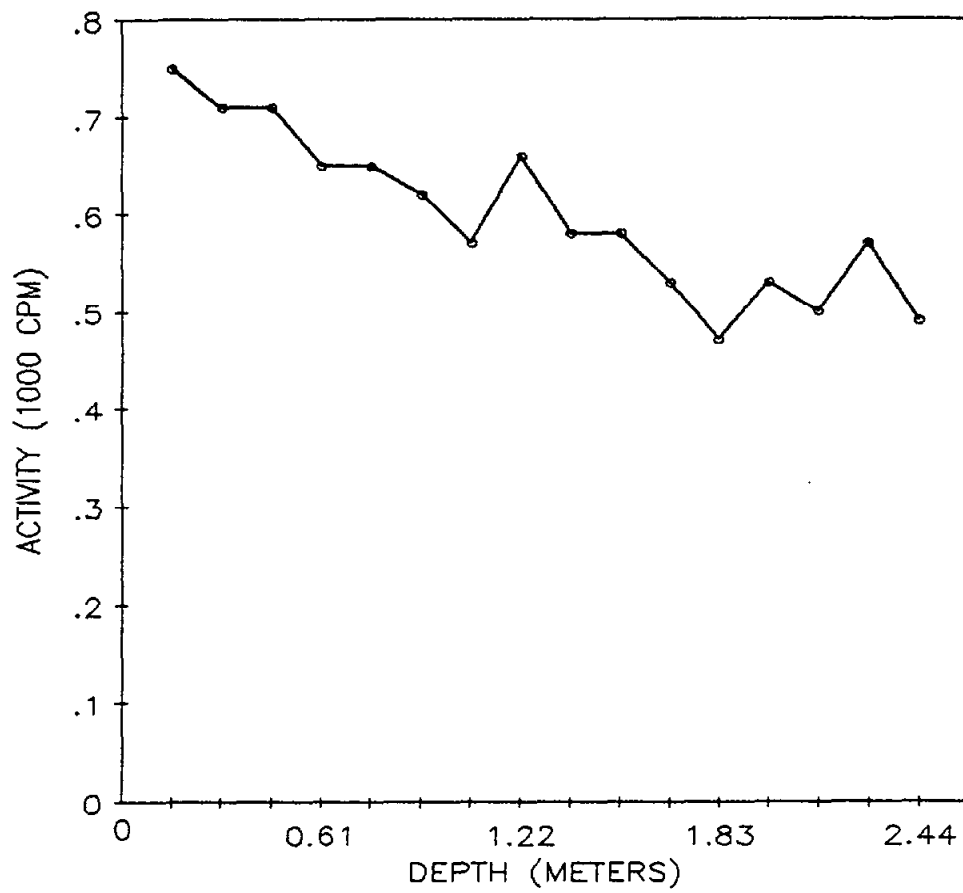
ORNL-DWG 89-14852



LJ074A2

Fig. 3. Gamma profile of auger hole 2 (A2) at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074).

ORNL-DWG 89-14853

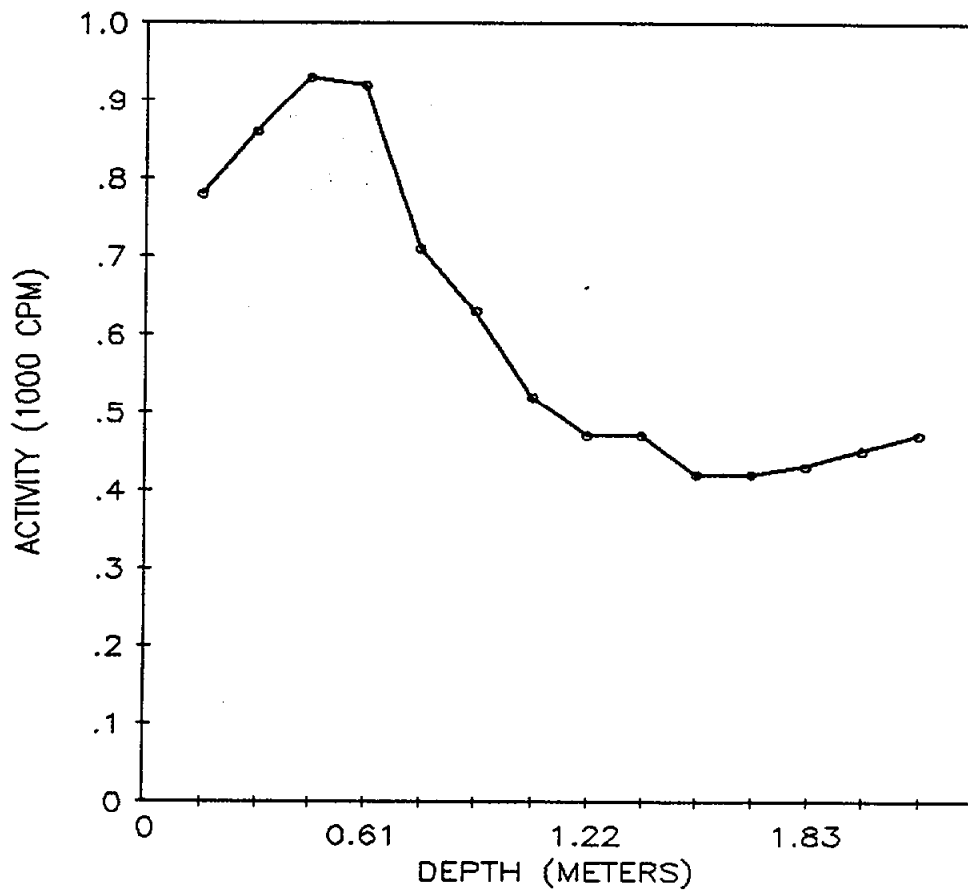


LJ074A4

Fig. 4. Gamma profile of auger hole 4 (A4) at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074).



ORNL-DWG 89-14854



LJ074A6

Fig. 5. Gamma profile of auger hole 6 (A6) at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074).

Table 1. Applicable guidelines for protection against radiation<sup>a</sup>

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 a 100 m <sup>2</sup> area <sup>232</sup> Th <sup>230</sup> Th <sup>228</sup> Ra <sup>226</sup> 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

<sup>a</sup>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).

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

Type of sample	Radionuclide concentration
Concentration of radionuclides in soil (pCi/g) <sup>a</sup>	
<sup>137</sup> Cs	0.9
<sup>226</sup> Ra	0.9
<sup>238</sup> U	0.9

<sup>a</sup>Reference 4.

Table 3. Concentrations of radionuclides in soil at the property at Main Street and Highway 46, Lodi, New Jersey (LJ074)

Sample <sup>a</sup>	Depth (cm)	Radionuclide concentration (pCi/g)	
		<sup>226</sup> Ra <sup>b</sup>	<sup>232</sup> Th <sup>b</sup>
<i>Auger samples<sup>c</sup></i>			
A2A	75-90	0.94 ± 0.08	0.97 ± 0.1
A2B	90-105	1.3 ± 0.1	1.4 ± 0.09
A2C	105-120	1.8 ± 0.1	1.9 ± 0.3
A4A	15-30	0.93 ± 0.1	1.1 ± 0.2
A4B	105-120	0.95 ± 0.1	1.1 ± 0.1
A6A	15-30	1.3 ± 0.03	1.5 ± 0.2
A6B	30-45	1.0 ± 0.2	1.2 ± 0.08
A6C	45-60	0.91 ± 0.09	1.0 ± 0.1
A6D	60-75	0.77 ± 0.02	0.88 ± 0.03
A6E	75-90	0.65 ± 0.07	0.64 ± 0.5

<sup>a</sup>Locations of soil samples are shown on Fig. 2.

<sup>b</sup>Indicated counting error is at the 95% confidence level ( $\pm 2\sigma$ ).

<sup>c</sup>Auger samples are those taken from holes drilled to further define the depth and extent of radioactive material. Holes are drilled where the surface may or may not be contaminated.

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