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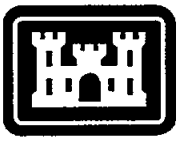
Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey



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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 112 COLUMBIA LANE, LODI, NEW JERSEY (LJ068)

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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, 112 Columbia Lane, Lodi, New Jersey (LJ068), was conducted during 1987.

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

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 5 to 11 μR/h. The highest gamma levels were found at the foundation around the entire perimeter of the house, ranging from 10 to 14 μR/h. The yard on the western side of the house measured from 11 to 13 μR/h. This slight elevation in gamma levels is typical of the naturally occurring radioactive substances present in bricks, concrete, granite, and other such materials used in paving and building construction. Otherwise, none of the measurements were elevated.

Systematic Soil Samples

Systematic soil samples were taken from various locations on the property for radionuclide analyses. Locations of these samples (S) are shown in Fig. 2, with results of laboratory analyses provided in Table 3. Concentrations of radium and thorium in these samples ranged from 0.58 to 0.61 pCi/g and 0.67 to 0.86 pCi/g, respectively. Both samples were below normal background levels for the northern New Jersey area (Table 2) and well below DOE guidelines (Table 1).

Auger Hole Soil Samples and Gamma Logging

Varying thicknesses of subsurface soil were sampled from depths of 30 to 135 cm in auger holes (A) drilled at four separate locations indicated in Fig. 2. The results of analyses of these samples are given in Table 3. Concentrations of ^{226}Ra and ^{232}Th in these auger soil samples ranged from 0.37 to 0.62 pCi/g and 0.50 to 1.0 pCi/g, respectively; all values were below DOE criteria (Table 1) for radium and thorium as well as near or below background (Table 2).

Gamma logging was performed in each of the 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 1000 counts per minute (cpm) or greater generally indicate the presence of elevated concentrations of ^{226}Ra and/or ^{232}Th. Data from the gamma profiles of the logged auger holes are graphically represented in Figs. 3 through 6. All readings were below 1000 cpm.

SIGNIFICANCE OF FINDINGS

Measurements and results of soil sample analyses taken at 112 Columbia Lane indicate that the property contained no radionuclide concentrations above DOE guideline values. The radionuclide distributions on this property were similar to normal background levels for the northern New Jersey area.

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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).

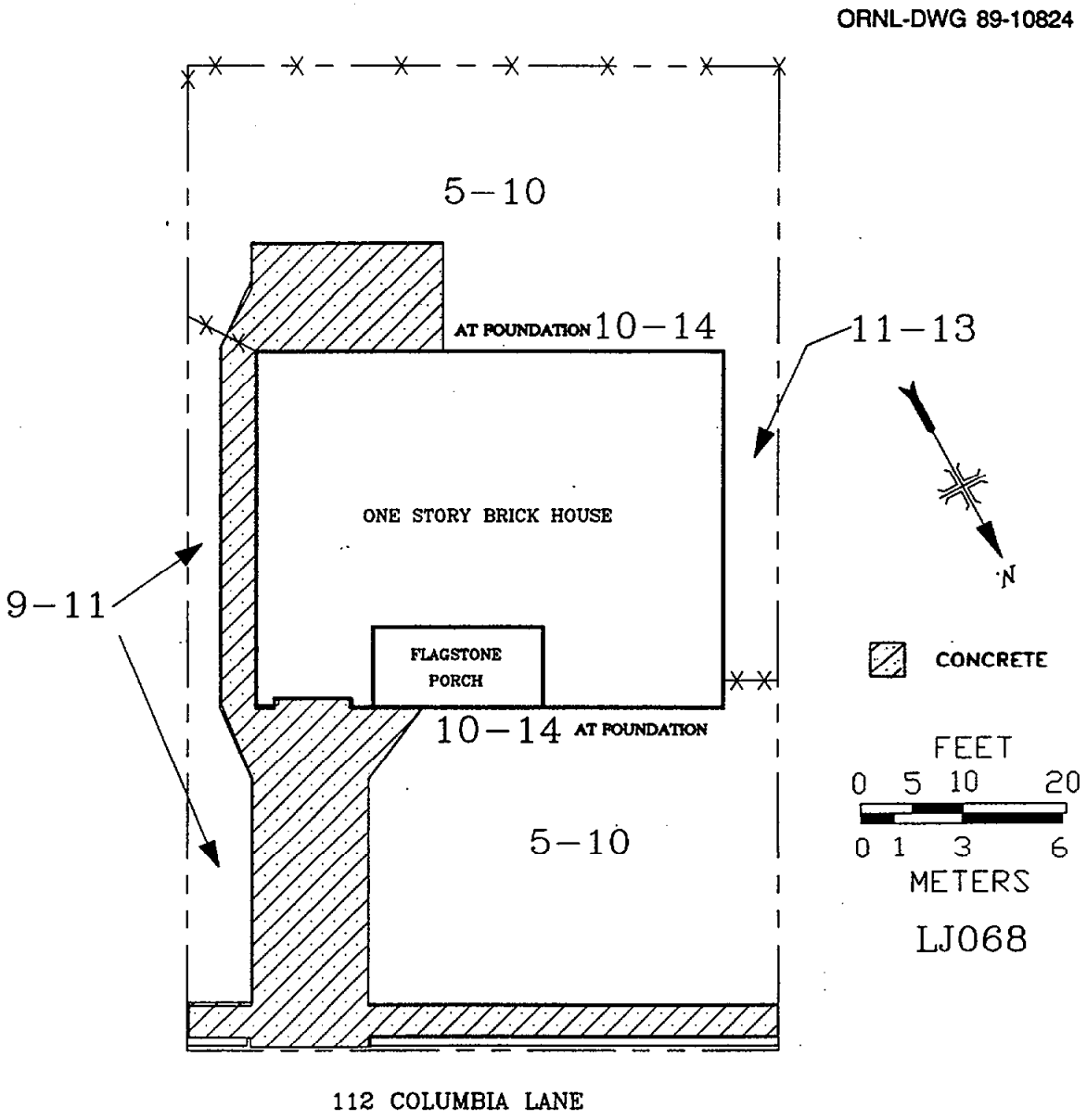

Fig. 1. Gamma radiation levels (μR/h) measured on the surface at 112 Columbia Lane, Lodi, New Jersey (LJ068).

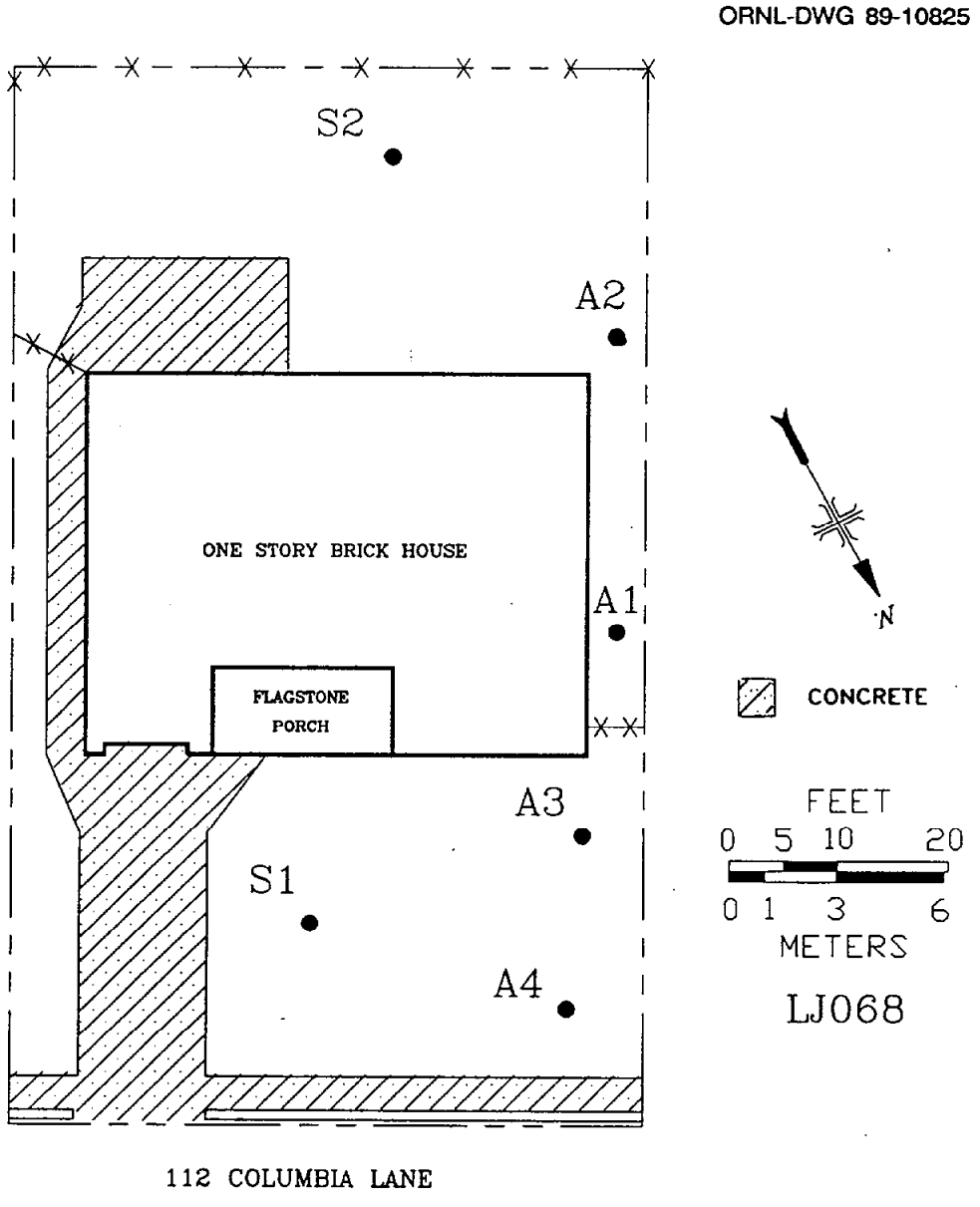

Fig. 2. Diagram showing locations of soil samples taken at 112 Columbia Lane, Lodi, New Jersey (LJ068).

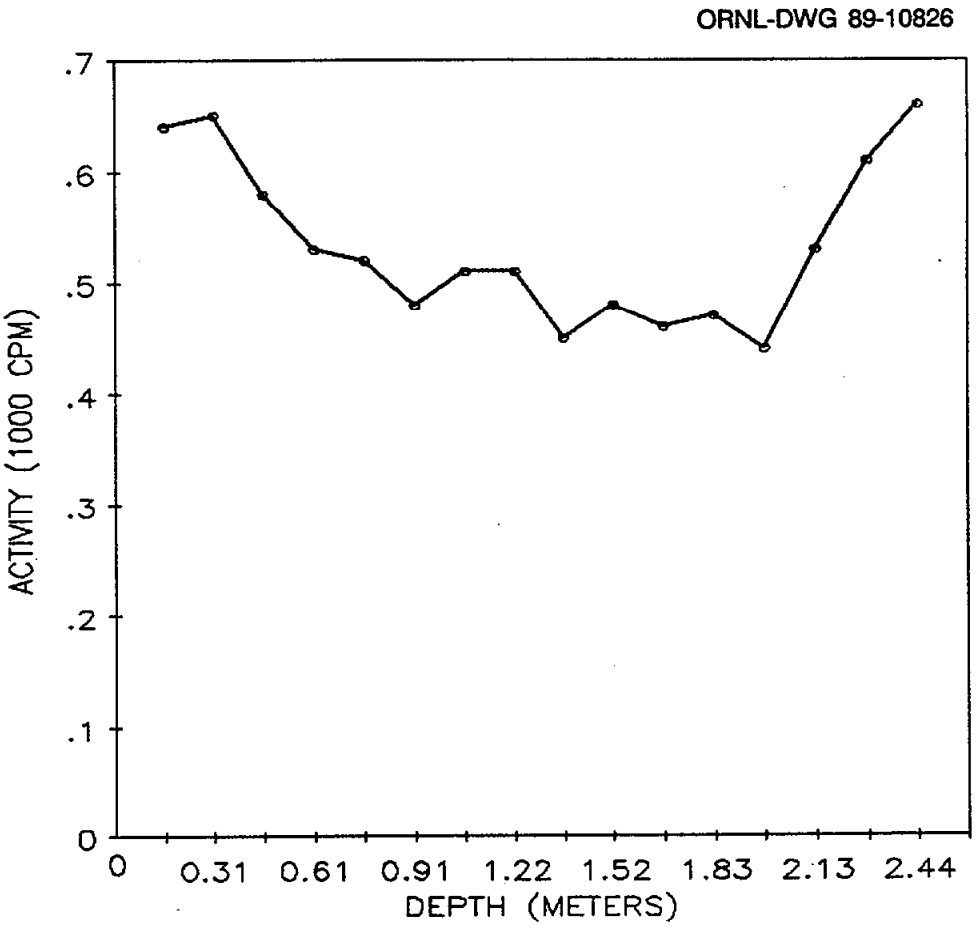

Fig. 3. Gamma profile for auger hole 1 (LJ068A1) at 112 Columbia Lane, Lodi, New Jersey.

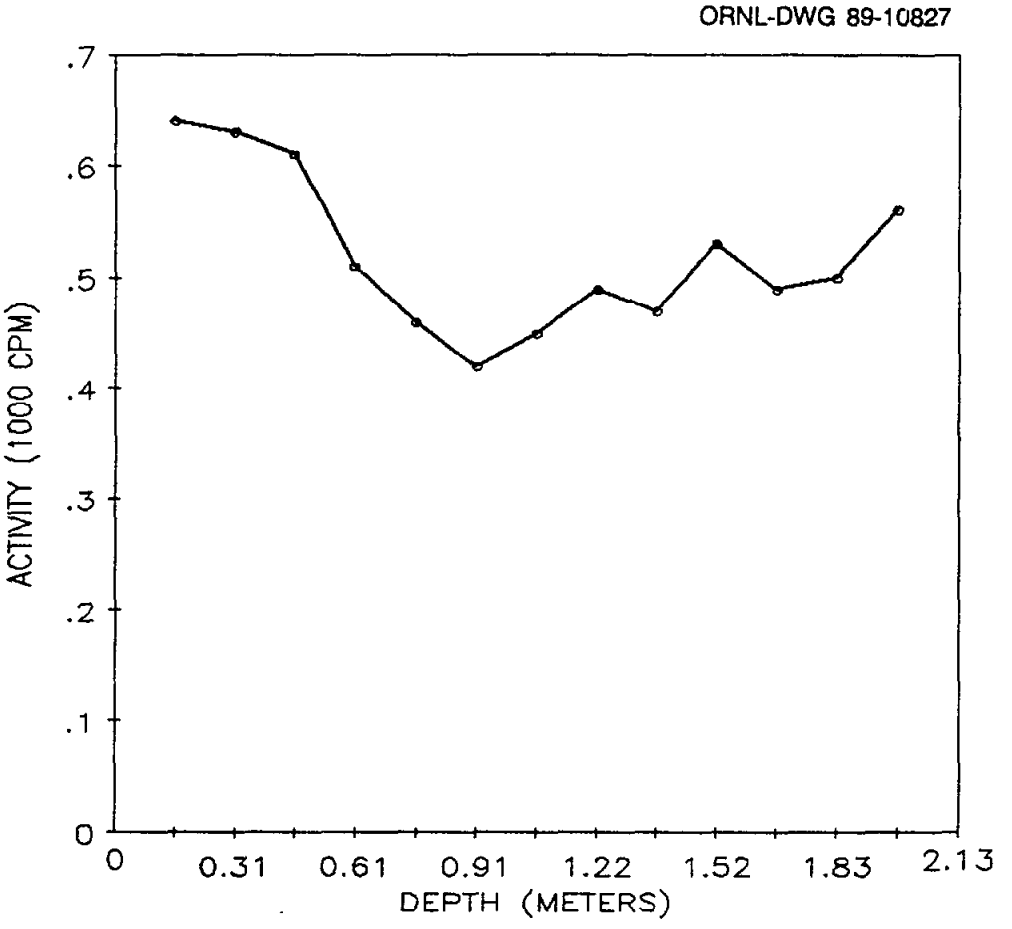

Fig. 4. Gamma profile for auger hole 2 (LJ068A2) at 112 Columbia Lane, Lodi, New Jersey.

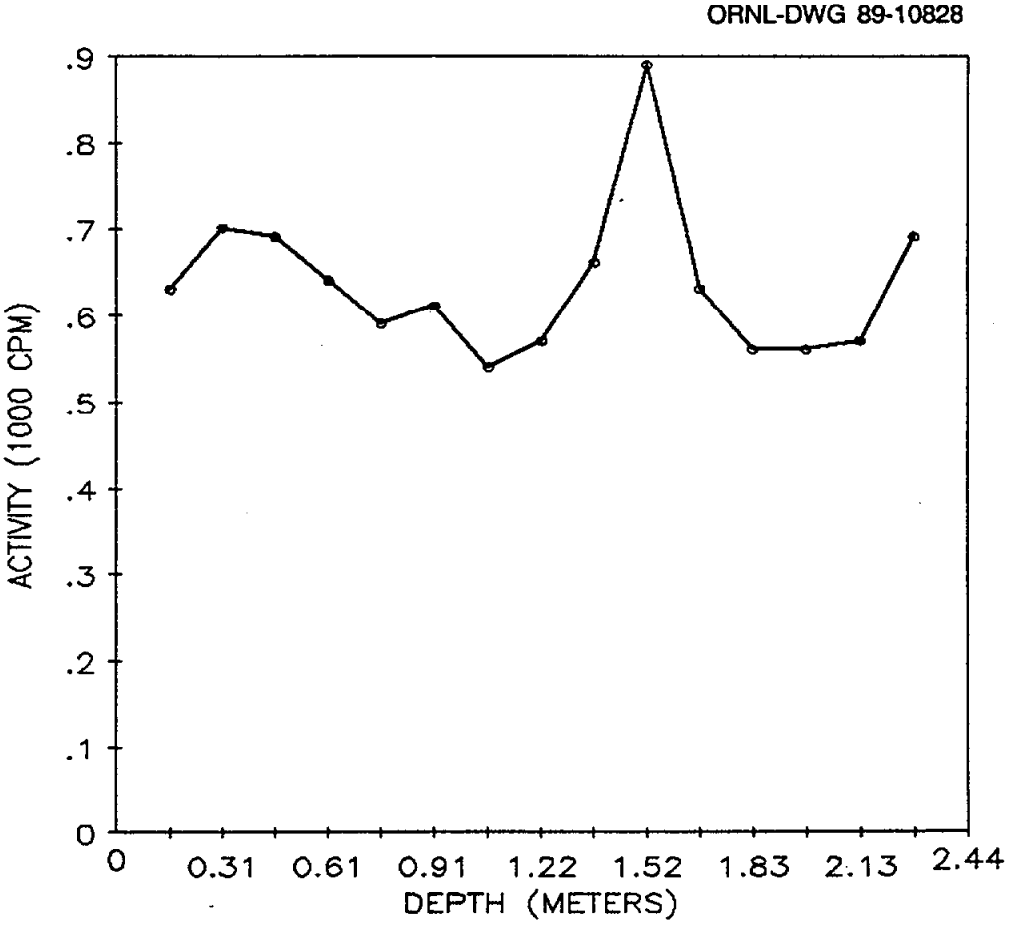

Fig. 5. Gamma profile for auger hole 3 (LJ068A3) at 112 Columbia Lane, Lodi, New Jersey.

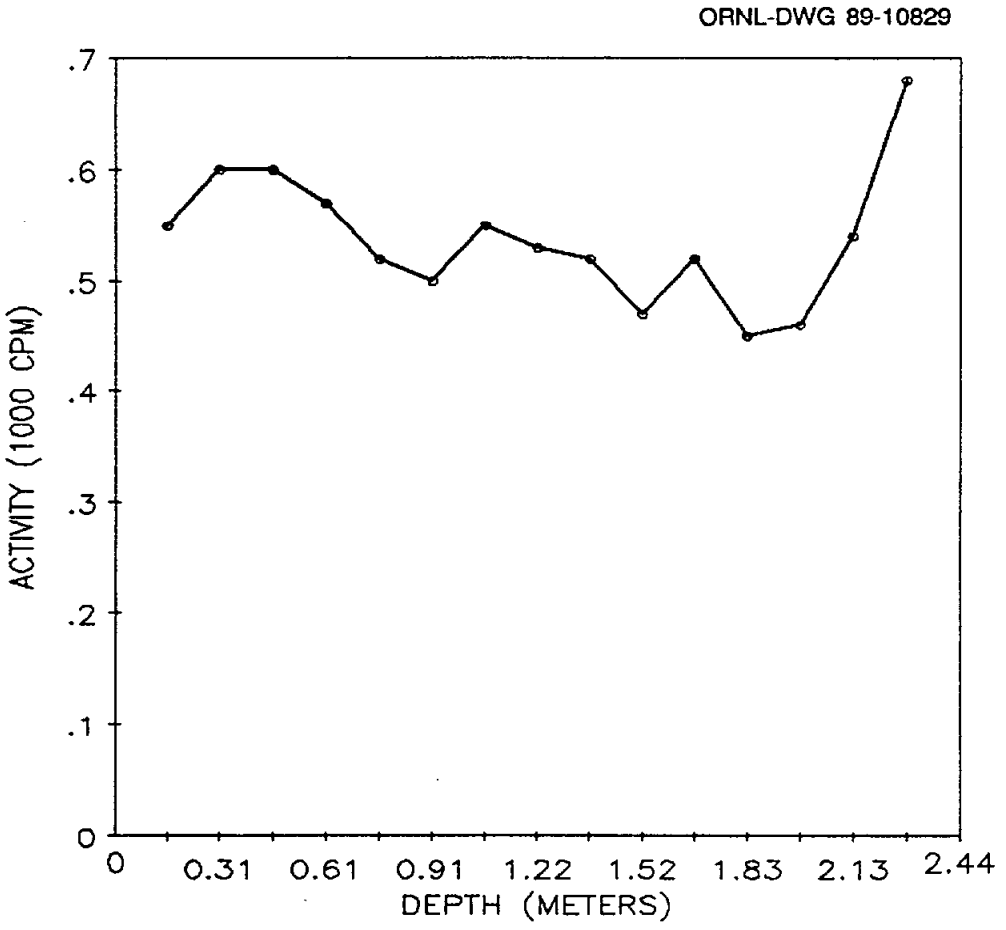

Fig. 6. Gamma profile for auger hole 4 (LJ068A4) at 112 Columbia Lane, Lodi, New Jersey.

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	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
	^{232}Th	
	^{230}Th	
	^{228}Ra	
	^{226}Ra	
	^{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 112 Columbia Lane, Lodi, New Jersey (LJ068)

Sample[a]	Depth (cm)	Radionuclide concentration (pCi/g)	
		^{226}Ra[b]	^{232}Th[b]
		Systematic samples[c]	
S1	0–15	0.61 ± 0.02	0.67 ± 0.04
S2	0–15	0.58 ± 0.07	0.86 ± 0.1
		Auger samples[d]	
A1A	30–45	0.56 ± 0.07	0.70 ± 0.1
A1B	120–135	0.59 ± 0.09	0.79 ± 0.1
A2A	30–45	0.49 ± 0.08	0.69 ± 0.09
A2B	120–135	0.37 ± 0.04	0.50 ± 0.1
A3A	30–45	0.57 ± 0.07	0.72 ± 0.1
A3B	120–135	0.62 ± 0.08	0.76 ± 0.2
A4A	30–45	0.55 ± 0.03	0.77 ± 0.2
A4B	120–135	0.57 ± 0.08	1.0 ± 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]Systematic samples are taken at locations irrespective of gamma exposure rates.

[d]Auger samples are 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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