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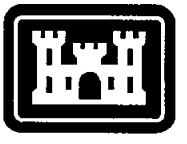
Formerly Utilized Sites Remedial Action Program (FUSRAP)

ADMINISTRATIVE RECORD

for the Maywood Site, New Jersey



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RESULTS OF THE INDEPENDENT RADIOLOGICAL VERIFICATION SURVEY AT 22 GROVE AVENUE, ROCHELLE PARK, NEW JERSEY (MJ04L)

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C. A. Johnson

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MARTIN MARIETTA ENERGY SYSTEMS, INC.
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ORNL/RASA-86/43
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HEALTH AND SAFETY RESEARCH DIVISION

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RESULTS OF THE INDEPENDENT RADIOLOGICAL VERIFICATION SURVEY AT 22 GROVE AVENUE, ROCHELLE PARK, NEW JERSEY (MJ04L)*

INTRODUCTION

Processing of thorium ores was performed in Maywood, New Jersey, between 1916 and 1956 by the Maywood Chemical Works.[1] During the course of thorium processing the wastes from the operations were pumped to diked areas west of the plant. Additional material was placed in two piles surrounded by earthen dikes. In 1932, Route 17 was built through this disposal area. The Maywood Chemical Works ceased thorium processing in 1956 and subsequently was sold to Stepan Chemical Company in 1959. After 1963, on several occasions wastes were removed from the west side of New Jersey Route 17. In 1984, the U.S. Department of Energy (DOE) was assigned the responsibility by Congress for the decontamination project involving the site and vicinity properties in Maywood and Rochelle Park under the Formerly Utilized Sites Remedial Action Program (FUSRAP).

This site, referred to as the Maywood site, had surface and subsurface radionuclide concentrations in excess of the DOE criteria listed in Table 1. This site is now owned by Ballod and Associates. It has been identified through radiological assessment procedures by Oak Ridge Associated Universities and Nuclear Safety Associates, Inc.,[1,2] for the purpose of decontamination based on DOE's remedial action objectives. The Maywood site and vicinity properties, which include the residential properties on Grove Avenue and Park Way in Rochelle Park, were assigned by DOE to FUSRAP although the contamination at the Maywood site did not result from the Atomic Energy Program.

From June to December, 1984, Bechtel National, Inc. (BNI), the project management contractor designated by DOE, performed remedial action on this residential property. This remedial action is on one of ten designated properties in the Rochelle Park area (Fig. 1). Based on drawings showing the extent of contamination, the property was excavated and the contaminated material transported to the Maywood Interim Storage Site (MISS), adjacent to the Stepan Company plant.[3] After removal of all contaminated soil, the property was restored to its original condition. By using a combination of procedures, the contamination was controlled and prevented from spreading to other areas. A post-remedial radiological survey was conducted by BNI to ensure compliance with DOE remedial action guidelines.[4]

The DOE adopted a policy to assign an independent verification contractor to ensure the effectiveness of remedial actions performed within FUSRAP. The Radiological Survey Activities Group of Oak Ridge National Laboratory (ORNL) has been assigned the responsibility for this task at the Maywood site. This report describes the methods and results of that verification.

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*The survey was performed by members of the Radiological Survey Activities Group of the Health and Safety Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400 with Martin Marietta Energy Systems, Inc.

CONCLUSION

Measurements of the gamma exposure levels taken from the excavated area (before backfilling) of the adjacent property at 26 Grove Ave. determined that the exposure rate at 1 m above the ground surface was 12 μR/h. For comparison, the background for the state of New Jersey[7,8,9] averages ~8 μR/h and ranges from 6 to 11 μR/h based on 1968 measurements. The results of soil radionuclide analyses for ^{238}U, ^{226}Ra, and ^{232}Th show that all soil concentration measurements are within the limits prescribed by DOE radiological guidelines.[10]

Based upon the results of the post–remedial action data, which were confirmed by the verification survey data, soil concentration measurements fall well below the limits prescribed by DOE radiological guidelines established for this site. It is concluded that the site successfully meets the DOE remedial action objectives.

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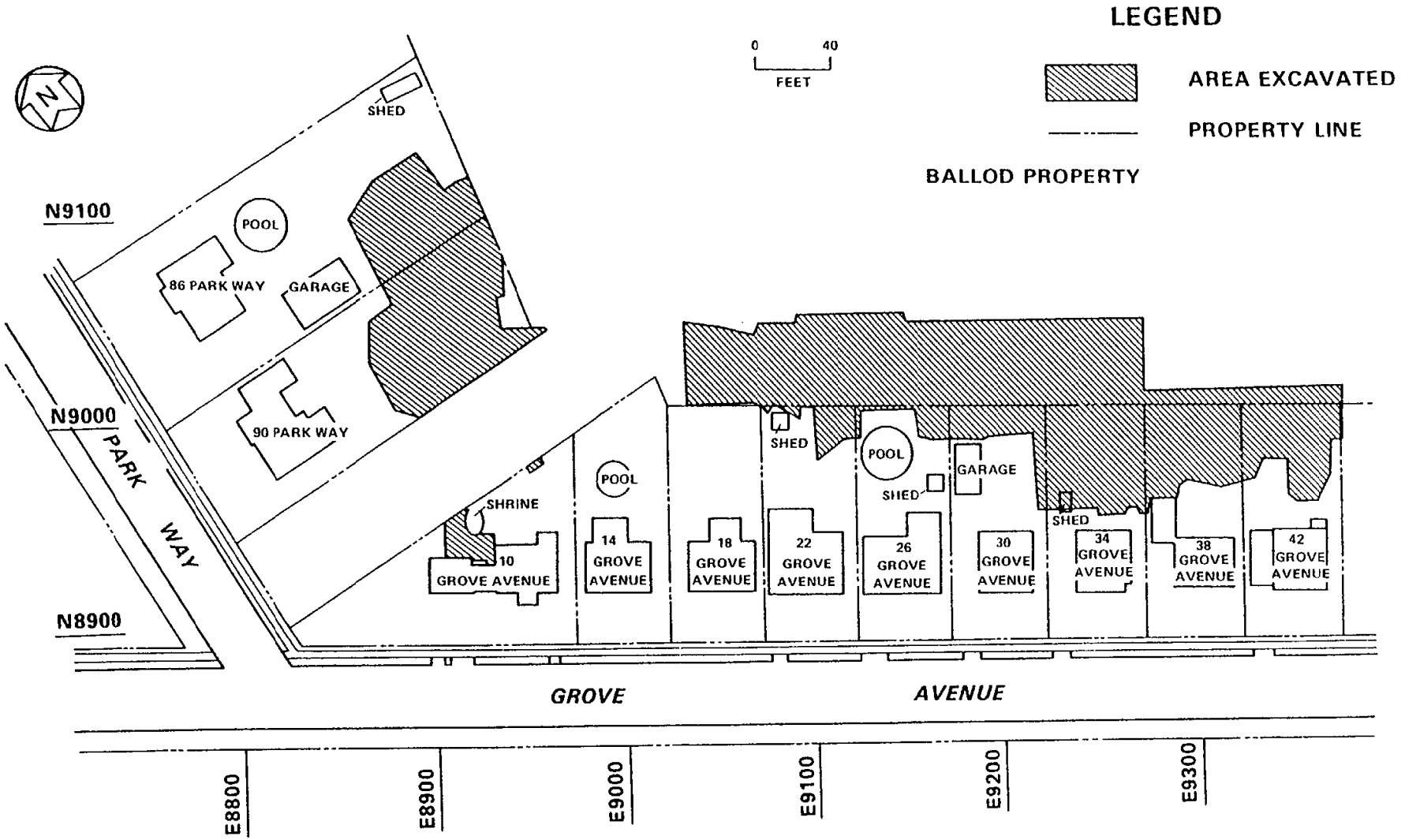

Fig. 1. Vicinity properties in the Rochelle Park, New Jersey, area.

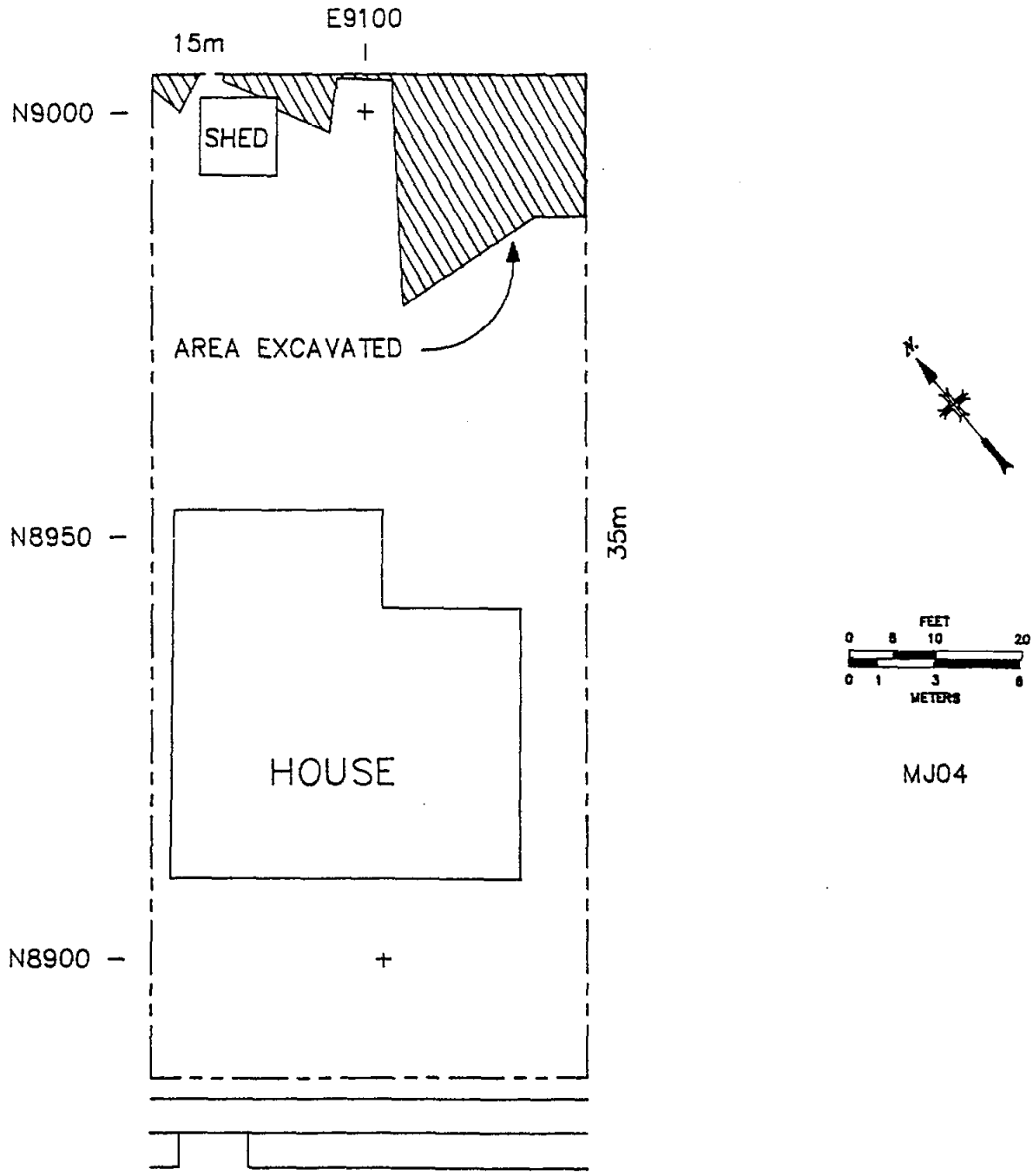

Fig. 2. Diagram showing grid point and grid block locations outdoors on the property at 22 Grove Ave., Rochelle Park, New Jersey (MJ04L).

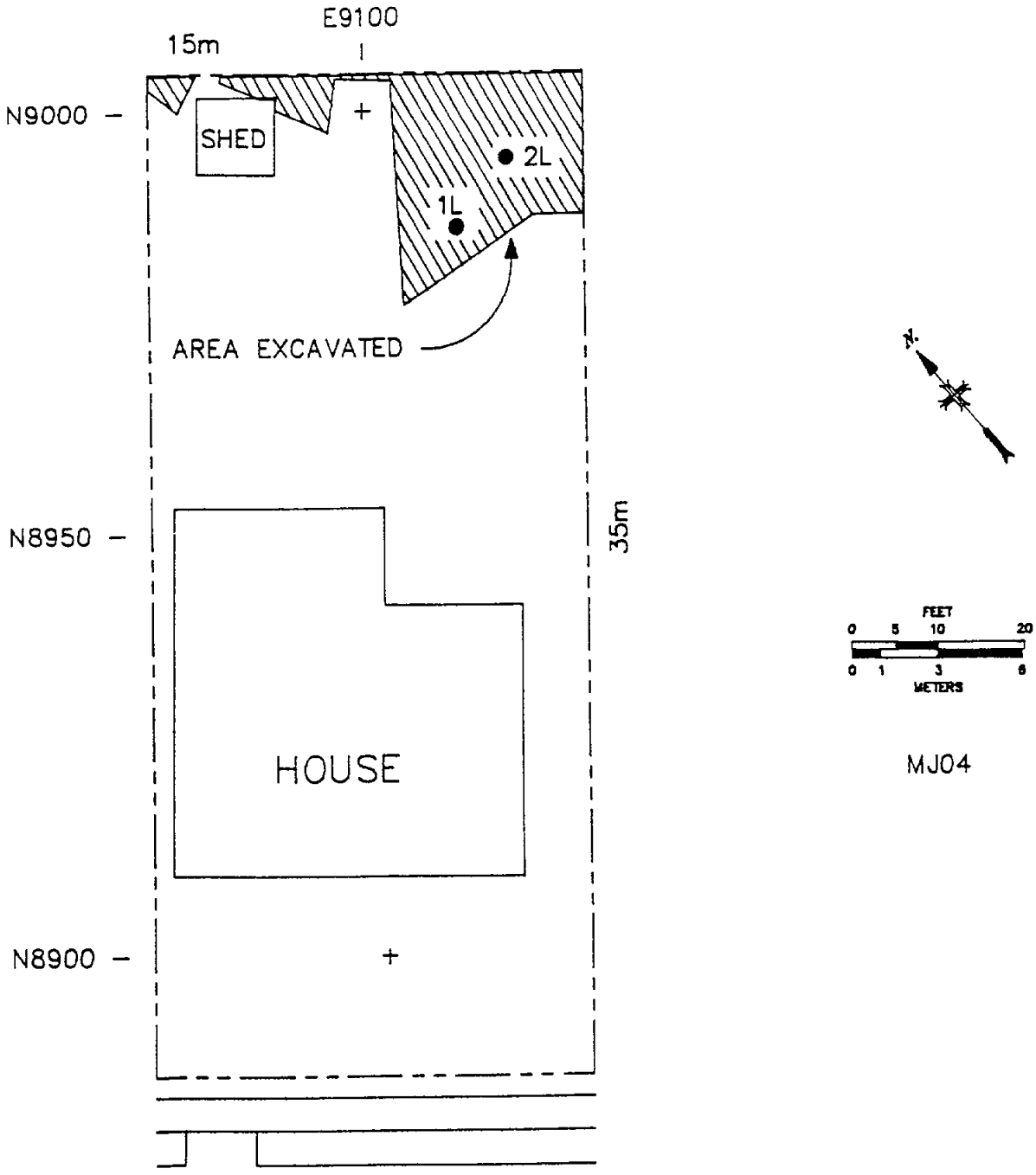

Fig. 3. Locations of soil samples on the property at 22 Grove Ave., Rochelle Park, New Jersey (MJ04L).

Table 1. Summary of residual contamination guidelines for the Rochelle Park, New Jersey, site

Soil (Land) Guidelines (Maximum Limits for Unrestricted Use)

Radionuclide	Soil concentration (pCi/g) above background[a,b,c]
^{226}Ra ^{228}Ra ^{230}Th ^{232}Th	5 pCi/g, averaged over the first 15 cm of soil below the surface; 15 pCi/g when averaged over any 15-cm-thick soil layer below the surface layer
Other radionuclides	Soil guidelines will be calculated on a site-specific basis using the DOE manual developed for this use

Structure Guidelines (Maximum Limits for Unrestricted Use)

Indoor Radon Decay Products

For ^{222}Ra and ^{220}Rn concentrations in buildings, the average annual radon decay product concentration (including background) due to uranium or thorium by-products should not exceed 0.02 WL after remedial action. When remedial action has been performed and it would be unreasonably difficult and costly to reduce the level below 0.03 WL, the remedial action may be terminated, and the reasons for termination should be documented. Remedial action shall be undertaken for any building that exceeds an annual average radon decay product concentration (including background) of 0.03 WL.

Indoor Gamma Radiation

The indoor gamma radiation after decontamination shall not exceed 20 microroentgen per hour (20 μR/h) above background in any occupied or habitable building.

Indoor/Outdoor Structure Surface Contamination

Radionuclide[e]	Allowable Surface Residual Contamination[d] (dpm/100 cm^2)		
	Average[f,g]	Maximum[f]	Removable[f]
Transuranics, ^{226}Ra, ^{228}Ru, ^{230}Th, ^{228}Th, ^{231}Pa, ^{227}Ac, ^{125}I, ^{129}I	100	300	20
Natural Th, ^{232}Th, ^{90}Sr, ^{223}Ra, ^{224}Ra, ^{232}U, ^{126}I, ^{131}I, ^{133}I	1,000	3,000	200
Natural U, ^{235}U, ^{238}U, and associated decay products	5,000	15,000	1,000

Table 1 (continued)

Indoor/Outdoor Structure Surface Contamination

Radionuclide[e]	Allowable Surface Residual Contamination[d] (dpm/100 cm^2)		
	Average[f,g]	Maximum[f]	Removable[f]
Beta-gamma emitters (radionuclides with decay modes other than alpha emission or spontaneous fission) except ^{90}Sr and others noted above	5,000	15,000	1,000

[a]In the event of occurrence of mixtures of radionuclides, the fraction contributed by each radionuclide to its limit shall be determined, and the sum of these fractions shall not exceed 1.

[b]These guidelines represent unrestricted-use residual concentrations above background averaged across any 15-cm thick layer to any depth and over any contiguous 100-m^2 surface area.

[c]Localized concentrations in excess of these limits are allowable provided that the average over 100 m^2 is not exceeded.

[d]As used in this table, dpm (disintegrations per minute) means the rate of emission by radioactive material as determined by correcting the counts per minute observed by an appropriate detector for background, efficiency, and geometric factors associated with the instrumentation.

[e]Where surface contamination by both alpha- and beta-gamma–emitting radionuclides exists, the limits established for alpha- and beta-gamma–emitting radionuclides shall apply independently.

[f]Measurements of average contaminant should not be averaged over more than 1 m^2. For objects of less surface area, the average shall be derived for each such object.

[g]The average and maximum radiation levels associated with surface contamination resulting from beta-gamma emitters should not exceed 0.2 mrad/h at 1 cm and 1.0 mrad/h at 1 cm, respectively, measured through not more than 7 mg/cm^2 of total absorber.

Table 2. Background radiation levels in the Rochelle Park, New Jersey, area

Type of radiation measurement or sample	Radiation level or radionuclide concentration	
	Range	Average
Gamma exposure rate at 1 m above floor or ground surface (μR/h)[a]	8–11	9
Concentration of radionuclides in soil (pCi/g)[b]		
^{238}U	0.13–1.4	0.86
^{226}Ra	0.24–1.4	0.87
^{232}Th	0.31–1.5	0.9

[a]Values obtained from 35 locations in the Rochelle Park area.[8]

[b]Soil samples obtained from locations around the Maywood area.[6]

Table 3. Result and location of the pressurized ionization chamber (PIC) measurement at 22 Grove Ave., Rochelle Park, New Jersey (MJ04L)[a]

Coordinates		Gamma exposure rate (μR/h)
East	North	
9170	8995	12

[a]Gamma measurement taken on the adjacent property (26 Grove Ave.) (Ref. 4).

Table 4. Results of soil sample analysis at 22 Grove Ave., Rochelle Park, New Jersey (MJ04L)

Sample	Location[a]		Depth (cm)	Radionuclide concentration (pCi/g)		
	East	North		^{226}Ra[b]	^{232}Th[c]	^{238}U[d]
Systematic Samples[e]						
1L	9110	8985	15–30	1.4 ± 0.1 (1.3)[f]	5.6 ± 1.0 (4.2)[f]	1.8 ± 1.4 (1.4)[f]
2L	9115	8995	15–30	1.6 ± 0.3 (1.4)[f]	7.0 ± 1.0 (5.3)[f]	0.2 (1.4)[f]

[a]Locations of soil samples are shown on Fig. 3.
[b]Indicated counting error is at the 95% confidence level ($\pm 2\sigma$).
[c]Indicated counting error is at the 95% confidence level ($\pm 2\sigma$).
[d]Analytical error of measurement results is less than ±5% (95% confidence level).
[e]Systematic samples are taken at grid locations irrespective of gamma exposure.
[f]BNI results are shown in parentheses.

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