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**Radiological Survey Results at
914 Black Oak Ridge Road,
Wayne, New Jersey
(WJ005)**

**R. E. Rodriguez
C. A. Johnson**

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HEALTH SCIENCES RESEARCH DIVISION
Environmental Restoration and Waste Management Non-Defense Programs
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Radiological Survey Results at 914 Black Oak Ridge Road, Wayne, New Jersey (WJ005)

R. E. Rodriguez and C. A. Johnson

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ABSTRACT

The U. S. Department of Energy (DOE) conducted remedial action during 1993 at several vicinity properties in the Wayne and Pequannock Townships in New Jersey as part of the Formerly Utilized Sites Remedial Action Program (FUSRAP). These properties are in the vicinity of the DOE-owned Wayne Interim Storage Site (WISS), formerly the W. R. Grace facility. The property at 914 Black Oak Ridge Road, Wayne, New Jersey was not one of these vicinity properties; however the owner requested that his property be radiologically surveyed.

At the request of DOE, a team from Oak Ridge National Laboratory conducted a radiological scoping survey of this property. The purpose of the survey, conducted in early November 1993, was to determine whether any radiological contamination might be present on the property. The radiological survey included surface gamma scans and gamma readings at one meter, and the collection of soil and/or debris samples for radionuclide analysis.

Results of the survey demonstrated no radionuclide concentrations or radiation measurements in excess of applicable DOE guidelines.

RADIOLOGICAL SURVEY RESULTS AT 914 BLACK OAK RIDGE ROAD, WAYNE, NEW JERSEY (WJ005)*

INTRODUCTION

As part of the Formerly Utilized Sites Remedial Action Program (FUSRAP), the Department of Energy (DOE) conducted a remedial action project in 1993 at several residential vicinity properties in the Townships of Pequannock and Wayne, New Jersey. Figure 1 shows the general location of these vicinity properties.

Although the property at 914 Black Oak Ridge Rd. was not one of the properties being surveyed, the owner had requested a survey of his property because radiological contamination had been found and was being remediated on the adjoining neighbor's property.

During early November, 1993, a team from the Oak Ridge National Laboratory (ORNL) conducted investigative radiological surveys of several properties in the Wayne and Pequannock, New Jersey area, and at the request of DOE, the team conducted a radiological scoping survey of this property. The survey consisted primarily of a complete gamma scan of the grounds and the collection of soil and gravel samples for radionuclide analysis.

This report describes the results of the radiological survey of the private residential property at 914 Black Oak Ridge Rd., Wayne, New Jersey, conducted by ORNL at the request of the Department of Energy's Office of Environmental Restoration.

The property at 914 Black Oak Ridge Rd., is a single family dwelling with separate three-car garage and a gravel drive that surrounds the house (Fig. 2).

A walkover survey of the property (a technician walks slowly over the property swinging a detection probe at ~1-2 inches from the ground surface) was conducted on November 2, 1993 by ORNL's Measurement Applications and Development Group. The purpose of the survey, which extended further to the east than the property boundary, was to determine the nature and extent of any radiological contamination that might be present on the property.

A field survey drawing showing 10-m grids and indicating soil sampling locations and gamma radiation measurements is included in this report as Fig. 2.

SCOPE OF THE SURVEY

A comprehensive description of the survey methods and instrumentation used in this survey is given in *Procedures Manual for the ORNL Radiological Survey Activities (RASA) Program*, ORNL/TM-8600 (April 1987), and *Measurement Applications and Development Group Guidelines*, ORNL-6782 (January 1995).

* The survey was performed by members of the Measurement Applications and Development Group of the Health Sciences Research Division at Oak Ridge National Laboratory under DOE contract DE-AC05-84OR21400.

The radiological survey of this property included: (1) a surface gamma scan of the grounds, sidewalks, and driveway, and (2) the collection of surface and subsurface soil samples for analysis.

Gamma radiation levels were determined using a portable sodium iodide (NaI) gamma scintillation detector connected to a Victoreen ratemeter. Measurements were recorded and converted to $\mu\text{R/h}$. Because NaI gamma scintillators are energy dependent, measurements of gamma radiation levels in counts per minute (CPM) are normalized to pressurized ionization chamber (PIC) measurements to estimate gamma exposure rates in $\mu\text{R/h}$.

Surface (0-15 cm, or 0 to 6 in) and subsurface (15-45 cm, or 6 to 18 in) soil samples, were collected randomly over the property. Confirmatory samples were taken from one location on the driveway on the south side of the house where elevated gamma levels had been identified. These are referred to as biased samples and are labeled as B1A and B1B. Systematic samples (S1-S9) were taken at locations irrespective of gamma exposure rates. Locations of the samples are shown in Fig. 2, and results of the analysis are shown in Table 1.

Direct measurement results presented in this report are gross readings; background radiation levels have not been subtracted. Similarly, background radiation levels have not been subtracted from radionuclide concentrations measured in environmental samples.

SURVEY RESULTS

Gamma measurements at one meter from the surface ranged from 9 to 15 $\mu\text{R/h}$. Surface gamma measurements generally ranged from 10 to 12 $\mu\text{R/h}$ in the grassy areas of the front and back yards, and up to 21 $\mu\text{R/h}$ at the surface of the gravel drive. All of these measurements are comparable to background levels in the northern New Jersey area.

Surface and subsurface soil samples were collected from the front and back yards of the property, including two biased samples taken from the gravel driveway. All samples were analyzed for radium (^{226}Ra), thorium (^{232}Th), and uranium (^{238}U).

Results of the soil analyses are in picocuries per gram (pCi/g) and are shown in Table 1. A curie (Ci) is a unit used to express activity of radionuclides. Radionuclide concentrations of ^{226}Ra and ^{232}Th ranged from 0.62 to 1.2 pCi/g in the systematic samples, which are comparable to typical average background levels for the northern New Jersey area of 0.9 pCi/g for these radionuclides (T. E. Myrick, et al., ORNL/TM-7343, 1981), and well below the DOE guideline for these radionuclides in soil, which is 5 and 15 pCi/g above background averaged over 100 m^2 for surface and subsurface soil, respectively.* Ranges for the biased samples, taken from the graveled area were from 0.71 to 1.7 pCi/g for ^{226}Ra , and 0.96 to 2.4 pCi/g for ^{232}Th , which are also well below DOE guidelines.

* For residential properties in this area the guideline for ^{232}Th is 5 pCi/g for both surface and subsurface soil.

Concentrations of ^{238}U in soil ranged from 0.78 to 1.3 pCi/g in biased samples (gravel), and from ~3.2 to 6.6 pCi/g in systematic samples (see Table 1). All these values are also below the site specific guidelines for uranium in soil.**

SIGNIFICANCE OF FINDINGS

Generally, gamma measurements on the property at 914 Black Oak Ridge Road, Wayne, New Jersey were comparable to the average values for the area and were well below DOE guidelines. The slightly elevated gamma measurements found on the driveway are attributable to the naturally occurring radiological elements in the gravel (predominantly ^{40}K , which ranged from 12 to 20 pCi/g), as indicated by the radionuclide analysis of samples from the drive. Furthermore, the results of the soil analysis showed that the lawn soil contained normal levels of radionuclides for the New Jersey area. Based on the results of this survey, it is believed that no radiological contamination is present on the property.

** DOE guidelines for uranium are derived on a site-specific basis. Guidelines of 100 pCi/g have been applied to this FUSRAP site. Source: Memo, J. W. Wagoner II, Director, Division of Off-Site Programs, Office of Environmental Restoration, U. S. Department of Energy, to L. K. Price, Director, Former Sites Restoration Division, Oak Ridge Field Office, U. S. DOE, April 25, 1995.

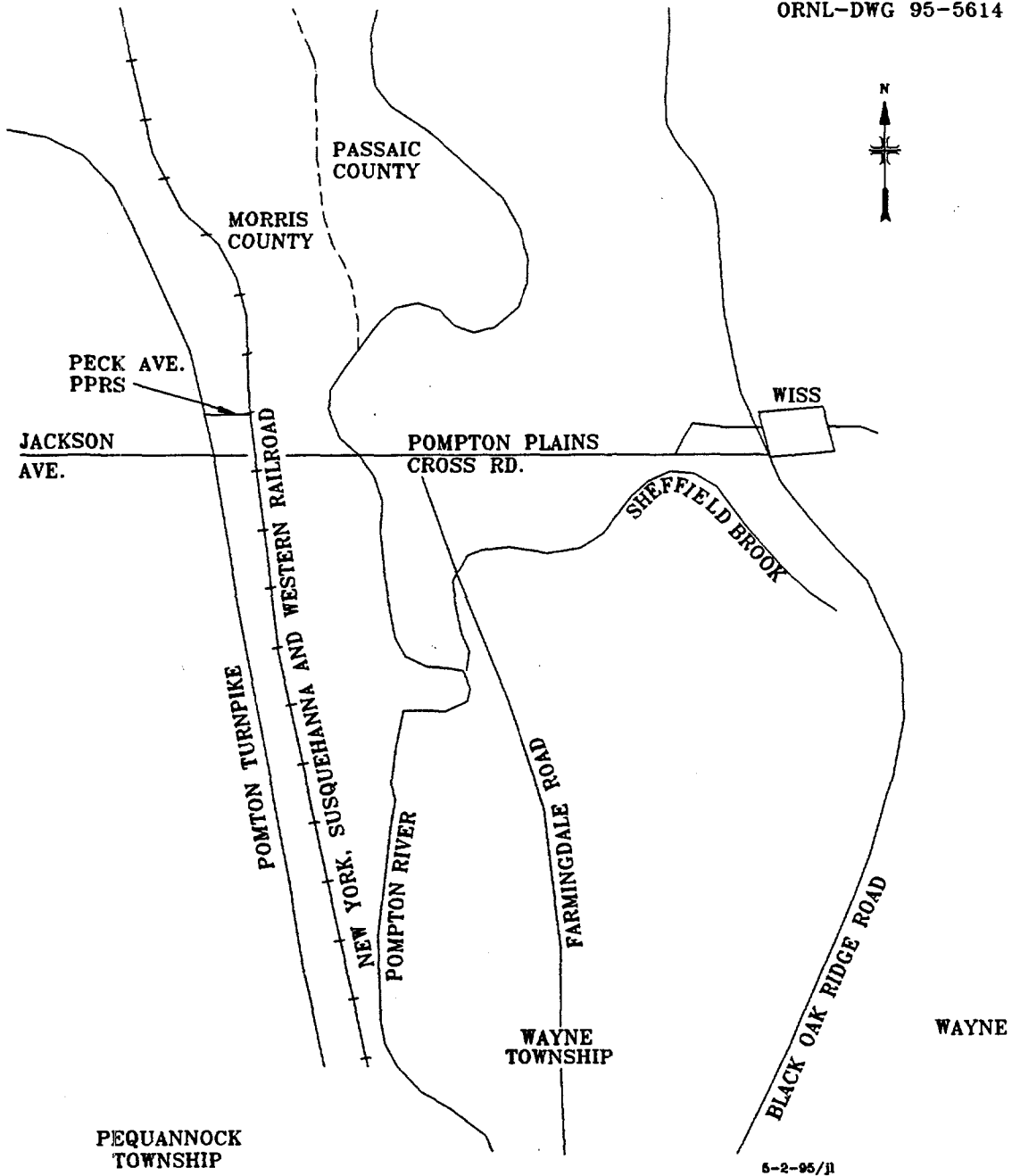


Fig. 1. Diagram showing general location of the Wayne Interim Storage Site (WISS) relative to the Wayne and Pequannock, New Jersey vicinity properties.

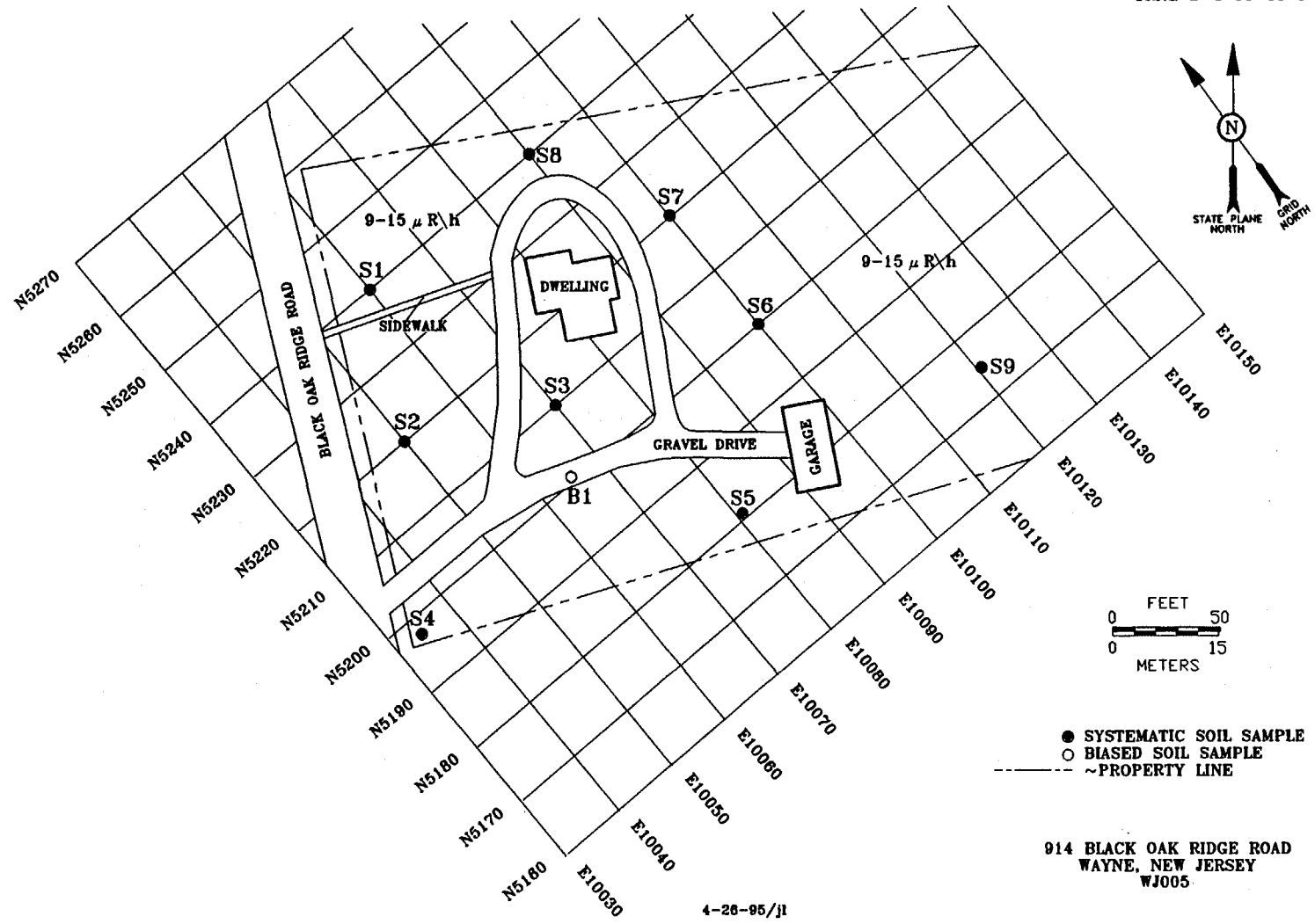


Fig. 2. Diagram of the property at 914 Black Oak Ridge Rd., Wayne, New Jersey showing soil sampling locations and gamma measurements.

Table 1. Concentrations of radionuclides in soil and other materials at 914 Black Oak Ridge Rd., Wayne, New Jersey (WJ005)

Sample number ^a	Grid location	Depth (cm)	Radionuclide concentration (pCi/g) ^b		
			²²⁶ Ra	²³² Th	²³⁸ U
<i>Systematic soil samples^c</i>					
S1	5240N,10060E	0-15	0.68 ±0.06	1.00 ±0.1	<4.3
S2	5220N,10050E	0-15	0.66 ±0.08	0.90 ±0.2	<6.0
S3	5210N,10070E	0-15	0.77 ±0.07	1.2 ±0.2	<4.4
S4	5198N,10033E	0-15	0.62 ±0.09	0.98 ±0.2	<6.6
S5	5180N,10080E	0-15	0.88 ±0.05	1.1 ±0.1	<3.2
S6	5200N,10100E	0-15	0.73 ±0.09	1.05 ±0.2	<5.3
S7	5220N,10100E	0-15	0.75 ±0.07	1.01 ±0.1	<4.7
S8	5240N,10090E	0-15	0.81 ±0.07	1.2 ±0.1	<4.9
S9A	5175N,10120E	0-15	0.78 ±0.07	0.89 ±0.1	<4.4
S9B		15-30	0.74 ±0.08	0.99 ±0.2	<5.9
<i>Biased samples^d</i>					
B1A	5200N,10063E	0-15	1.7 ±0.1	2.4 ±0.2	1.3 ±0.50
B1B		15-30	0.71±0.1	0.96±0.1	0.78±0.4

^aLocations of soil samples are shown on Fig. 2.

^bIndicated counting error is at the 95% confidence level ($\pm 2\sigma$).

^cSystematic samples are taken at locations irrespective of gamma exposure rates.

^dBiased samples are taken from areas with elevated gamma exposure rates.

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