

ENVIRONMENTAL

RADIATION

DATA

REPORT 133

January - March 2008

United States Environmental Protection Agency

Office of Radiation and Indoor Air

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Preface

Environmental Radiation Data(ERD) is compiled and published quarterly by the Office of Radiation and Indoor Air's National Air and Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama, and contains data from the RadNet monitoring system (formerly ERAMS). ERD is published in both hard-copy and electronic formats. Electronic reports are available online at www.epa.gov/narel.

The United States Environmental Protection Agency established RadNet in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. RadNet is comprised of a nationwide network of sampling stations that provide air particulate, precipitation, drinking water, and milk samples.

Sampling locations are selected to provide population and geographic coverage for the United States. The radiation analyses performed on these samples include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides ancillary information on natural background levels and on routine and accidental releases into the environment from stationary sources.

The radiochemical procedures used by NAREL to analyze the RadNet samples are contained in the *NAREL Radiochemistry Procedures Manual*. Station operation and sample collection are in accordance with procedures contained in the *ERAMS Manual*(EPA 520/5-84-007, 008, 009).

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Acknowledgments

All sampling for the RadNet monitoring system (formerly ERAMS) is performed by volunteer collectors who are frequently members of health departments or related environmental agencies of their respective states. The National Air and Radiation Environmental Laboratory (NAREL), on behalf of the U.S. Environmental Protection Agency, would like to acknowledge the time and effort of these volunteer collectors, who are so essential to the successful operation of RadNet. The efforts of the sample collectors are especially appreciated during times of emergency operation when sampling frequencies are increased and schedules are sometimes demanding.

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Data Reporting Conventions

Every laboratory measurement involves uncertainty. When there is little or no radioactivity in a sample, one consequence of measurement uncertainty is the possibility of obtaining a measured value that is less than zero. Such a negative result occurs when random effects in the measurement process cause the measured value for the sample to be less than that of the blank or background, which is subtracted from it. From April 1991 to December 1995, negative results were reported as “not detected” or “ND,” and gamma analysis results that were less than their estimated measurement uncertainties were also reported as “ND.” In January 1996, both of these practices were discontinued. Although negative activities are physically impossible, the inclusion of negative results in the report allows better statistical analysis of the data.

Results of gamma analyses are still reported as “ND” when gamma-emitting radionuclides are not detected.

Measurement Uncertainty

Each measured value y is reported with an expanded uncertainty $U = k u_c(y)$, which is determined from the combined standard uncertainty $u_c(y)$ and the coverage factor $k = 2$. The interval from $y - U$ to $y + U$ is estimated to have a level of confidence of approximately 95 %.

Significant Figures

Expanded uncertainties are reported to two significant figures. Measurement results are rounded to the corresponding number of decimal places.

Detection Capability

The minimum detectable concentrations (MDCs) for each radionuclide are shown in Table 1. The MDC is defined as the minimum concentration that gives a 95 % probability of detection when the detection criteria are chosen to give only a 5 % probability of false detection in a sample that is analyte-free.

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Table 1**Reporting Units and Minimum Detectable Concentrations
for Radionuclide Analyses**

Radionuclide	Media	Reporting Unit	Minimum Detectable Concentration
Gross Alpha	Water	pCi/L	2
Gross Beta	Air	pCi/m ³	0.0015
	Water	pCi/L	2
	Precipitation	pCi/L	2
Tritium	Water	pCi/L	150
	Milk	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m ³	0.75
	Water	pCi/L	0.1
Radium-226	Water	pCi/L	0.02
Strontium-90	Milk	pCi/L	2
	Water	pCi/L	1
‡ Iodine-131	Milk (gamma)	pCi/L	4
	Water (gamma)	pCi/L	4
	Water	pCi/L	0.3
Cesium-137	Milk	pCi/L	5
	Water	pCi/L	5
‡ Barium-140	Milk	pCi/L	15
	Water	pCi/L	15
Potassium	Milk	g/L	0.06
	Water	g/L	0.06
Potassium-40	Water	pCi/L	50

* The MDC for air is based on an assumed total sample volume of 120,000 m³. Measurement by alpha spectrometry includes combined activities of ²³⁹Pu and ²⁴⁰Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDC for air is based on an assumed total sample volume of 120,000 m³.

‡ Activity as of the day of counting.

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1. Air Program

Airborne Particulates and Precipitation

Gross beta radioactivity measurements and certain specific analyses are performed on air particulates and precipitation samples as indicator measurements in assessing the general (national) impact of all contributing sources on environmental levels of radiation. Airborne particulates are collected continuously at field stations representing wide geographic coverage throughout the United States.

Filters (10-cm diameter synthetic fiber) from air samplers are changed twice weekly and field measurements are made with a G-M survey meter 5 hours after collection to allow natural radon isotopes and their progeny to decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found.

The filters are sent to NAREL for more sensitive analysis in a low background beta counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m³. The laboratory obtained values are usually lower than the field estimates because of the decay of naturally occurring radionuclides during the time between the two measurements.

Precipitation samples are collected at most field stations that collect air filters. These samples are also sent to NAREL where they are composited monthly for gamma scans, tritium, and gross beta activity measurements.

A compilation of individual measurements is available from the National Air and Radiation Environmental Laboratory, 540 South Morris Avenue, Montgomery, AL 36115-2601.

Table 2
Gross Beta in Airborne Particulates
January 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Birmingham	8	0.0	0.0	0.0	0.015	0.004	0.010
AL: Montgomery/408	9	0.1	0.0	0.0	0.023	0.004	0.015
AR: Little Rock	7	0.0	0.0	0.0	0.034	0.015	0.022
AZ: Phoenix	5	0.6	0.1	0.3	0.015	0.008	0.011
AZ: Phoenix/956	8	0.8	0.0	0.4	0.018	0.008	0.013
CA: Anaheim	8	0.0	0.0	0.0	0.011	0.004	0.007
CA: Fresno	6	0.3	0.0	0.2	0.022	0.002	0.012
CA: Los Angeles	9	0.2	0.0	0.1	0.010	0.003	0.007
CA: Richmond	4	0.1	0.0	0.0	0.007	0.003	0.005
CA: San Bernardino Cty.	7	0.0	0.0	0.0	0.008	0.002	0.006
CA: San Diego	4	0.1	0.0	0.1	0.012	0.005	0.009
CA: San Francisco	4	0.1	0.0	0.0	0.007	0.003	0.005
CA: San Jose	7	0.1	-0.1	0.0	0.008	0.002	0.005
CO: Denver	9	0.3	0.0	0.1	0.012	0.000	0.006
DC: Washington	9	0.1	0.0	0.0	0.016	0.005	0.008
DE: Wilmington	8	0.5	0.1	0.3	0.017	0.006	0.012
FL: Jacksonville	8	0.0	0.0	0.0	0.026	0.000	0.008
FL: Miami	9	0.1	0.0	0.0	0.025	0.002	0.008
FL: Orlando	8	0.1	0.0	0.0	0.013	0.000	0.005
GA: Atlanta	4	0.0	0.0	0.0	0.011	0.005	0.008
IA: Des Moines	9	0.1	0.1	0.1	0.021	0.015	0.018
IA: Iowa City	9	0.9	0.2	0.4	0.031	0.015	0.022
ID: Idaho Falls	8				0.021	0.004	0.012
IL: Chicago	9	0.2	0.0	0.1	0.022	0.007	0.015
IN: Indianapolis	2	0.1	0.1	0.1	0.022	0.018	0.020
KS: Kansas City	10	0.1	0.0	0.1	0.017	0.004	0.011
KS: Topeka	9	0.2	0.0	0.1	0.021	0.008	0.015
MD: Baltimore	5	0.0	0.0	0.0	0.034	0.000	0.016
MI: Detroit	9	0.1	0.0	0.1	0.020	-0.005	0.010
MN: St. Paul	4	0.1	-0.0	0.0	0.019	0.004	0.015
MO: St. Louis	4	0.0	0.0	0.0	0.011	0.001	0.007
MS: Jackson	5	0.2	0.0	0.1	0.015	0.010	0.012
NC: Charlotte	8	0.1	0.0	0.1	0.012	0.005	0.009
NC: Wilmington	4				0.013	0.007	0.010
ND: Bismarck	5	1.2	0.3	0.8	0.047	0.013	0.025
NH: Concord	8	0.0	0.0	0.0	0.014	0.005	0.009
NJ: Edison	8	0.0	0.0	0.0	0.011	0.003	0.006
NJ: Trenton	9	0.2	0.1	0.1	0.021	0.006	0.012

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
NM: Santa Fe	6	15.2	0.0	2.6	0.028	0.011	0.015
NY: Albany	5	0.0	0.0	0.0	0.010	0.007	0.009
NY: Lockport	8	0.0	0.0	0.0	0.013	0.006	0.009
NY: New York City	8	0.2	0.0	0.0	0.032	0.009	0.022
NY: Yaphank	9	0.1	0.0	0.0	0.011	0.000	0.005
OH: Cincinnati	8	0.1	0.0	0.0	0.010	0.003	0.007
OH: Cleveland	9	0.1	0.0	0.0	0.029	0.007	0.017
OH: Columbus	8	0.0	0.0	0.0	0.040	0.000	0.014
OH: Painesville	8	0.1	0.0	0.0	0.019	0.007	0.012
OH: Ross	9				0.026	0.008	0.017
OK: Oklahoma City	9	0.0	0.0	0.0	0.009	0.000	0.006
OR: Portland	6	0.1	0.0	0.0	0.008	0.002	0.005
PA: Harrisburg	8	0.1	0.0	0.1	0.036	0.000	0.010
PA: Pittsburgh	7	0.1	0.0	0.1	0.017	0.005	0.012
PR: San Juan	1	-0.0	-0.0	-0.0	0.001	0.001	0.001
RI: Providence	5	0.4	0.0	0.1	0.007	0.004	0.006
SC: Barnwell	3	0.0	0.0	0.0	0.019	0.009	0.012
SC: Columbia	3	0.0	0.0	0.0	0.018	0.008	0.013
SD: Pierre	1	0.4	0.4	0.4	0.018	0.018	0.018
TN: Knoxville	6	0.5	0.1	0.2	0.030	0.011	0.018
TN: Memphis	7	0.3	0.0	0.1	0.011	0.000	0.008
TN: Nashville	7	0.1	0.0	0.0	0.016	0.005	0.010
TN: Oak Ridge/Bethel	8	0.4	0.1	0.2	0.020	0.005	0.014
TN: Oak Ridge/K25	8	0.4	0.1	0.2	0.016	0.004	0.012
TN: Oak Ridge/Melton	8	0.5	0.1	0.2	0.019	0.006	0.015
TN: Oak Ridge/Y12 E	8	0.3	0.1	0.2	0.016	0.005	0.012
TN: Oak Ridge/Y12 W	8	0.2	0.1	0.1	0.017	0.005	0.013
TX: Austin	8	0.3	0.0	0.2	0.021	0.005	0.010
TX: Austin/Concordia	9	0.3	0.1	0.2	0.013	0.004	0.007
TX: Dallas	7	0.2	0.0	0.1	0.011	0.003	0.006
TX: El Paso	8	1.3	0.2	0.5	0.017	0.008	0.014
TX: Houston	9	0.1	0.0	0.0	0.011	0.005	0.008
UT: Salt Lake City	8	0.1	0.0	0.0	0.025	0.006	0.012
VA: Lynchburg	9	0.6	0.1	0.4	0.017	0.005	0.013
VA: Richmond	9	0.1	0.0	0.0	0.010	0.003	0.007
VA: Virginia Beach	9	0.1	0.0	0.0	0.009	0.002	0.007

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
WA: Olympia	8	0.1	0.0	0.0	0.012	0.001	0.005
WA: Spokane	8	0.2	0.1	0.1	0.022	0.003	0.011
WI: Milwaukee	4	0.1	0.0	0.1	0.039	0.017	0.026

Table 3
Gross Beta in Airborne Particulates
February 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Birmingham	8	0.6	0.0	0.2	0.010	0.000	0.007
AL: Montgomery/408	8	0.0	0.0	0.0	0.015	0.007	0.010
AR: Little Rock	5	0.0	0.0	0.0	0.032	0.015	0.020
AZ: Phoenix	4	0.6	0.1	0.3	0.014	0.008	0.011
AZ: Phoenix/956	8	1.0	0.1	0.5	0.025	0.006	0.014
CA: Anaheim	7	0.0	0.0	0.0	0.014	0.003	0.008
CA: Fresno	5	0.1	0.0	0.1	0.017	0.003	0.009
CA: Los Angeles	7	0.2	0.0	0.1	0.011	0.003	0.006
CA: Richmond	4	0.0	0.0	0.0	0.005	0.003	0.004
CA: Riverside	3	0.0	0.0	0.0	0.004	0.003	0.004
CA: San Bernardino Cty.	7	0.0	0.0	0.0	0.011	0.002	0.006
CA: San Diego	4	0.2	0.0	0.1	0.016	0.004	0.008
CA: San Francisco	4	0.0	0.0	0.0	0.003	0.002	0.003
CA: San Jose	9	0.1	-0.0	0.0	0.005	0.002	0.003
CO: Denver	8	0.9	0.0	0.2	0.011	0.003	0.008
DC: Washington	8	0.0	0.0	0.0	0.016	0.003	0.007
DE: Wilmington	9	0.3	0.1	0.2	0.020	0.000	0.011
FL: Jacksonville	9	0.0	0.0	0.0	0.008	0.000	0.006
FL: Miami	8	0.0	0.0	0.0	0.009	0.004	0.006
FL: Orlando	5	0.0	0.0	0.0	0.011	0.000	0.006
GA: Atlanta	5	0.0	0.0	0.0	0.009	0.000	0.006
IA: Des Moines	8	0.1	0.0	0.0	0.019	0.011	0.014
IA: Iowa City	8	0.2	0.0	0.1	0.024	0.000	0.014
ID: Idaho Falls	8				0.020	0.003	0.011
IL: Chicago	8	0.0	0.0	0.0	0.020	0.007	0.012
IN: Indianapolis	8	0.1	0.0	0.1	0.025	0.011	0.020
KS: Kansas City	6	0.2	0.0	0.1	0.021	0.007	0.014
KS: Topeka	8	0.2	0.0	0.1	0.025	0.013	0.017
MD: Baltimore	4	0.1	0.0	0.0	0.014	0.007	0.012
MI: Detroit	7	0.0	0.0	0.0	0.015	0.000	0.009
MN: St. Paul	3	0.1	0.0	0.0	0.038	0.016	0.029
MN: Welch/510	9	0.1	0.0	0.0	0.033	0.012	0.023
MO: St. Louis	5	0.0	0.0	0.0	0.013	0.007	0.009
MS: Jackson	5	0.3	0.1	0.2	0.015	0.008	0.011
NC: Charlotte	8	0.1	0.0	0.0	0.011	0.004	0.008
NC: Wilmington	5				0.012	0.006	0.008
NH: Concord	9	0.0	0.0	0.0	0.026	0.000	0.011
NJ: Edison	7	0.0	0.0	0.0	0.010	-0.000	0.006

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
NJ: Trenton	7	0.2	0.1	0.1	0.017	0.000	0.010
NM: Santa Fe	9	0.4	0.0	0.2	0.017	0.004	0.009
NY: Albany	4	0.0	0.0	0.0	0.011	0.008	0.010
NY: Lockport	4	0.0	0.0	0.0	0.074	0.008	0.026
NY: New York City	4	0.0	0.0	0.0	0.030	0.021	0.024
NY: Yaphank	6	0.0	0.0	0.0	0.007	0.005	0.006
OH: Cincinnati	8	0.0	0.0	0.0	0.010	-0.000	0.006
OH: Cleveland	8	0.0	0.0	0.0	0.020	0.008	0.014
OH: Columbus	7	0.0	0.0	0.0	0.014	0.006	0.011
OH: Painesville	8	0.0	0.0	0.0	0.018	0.009	0.013
OH: Ross	8				0.018	0.001	0.012
OK: Oklahoma City	8	0.0	0.0	0.0	0.015	0.004	0.009
OR: Portland	8	0.0	0.0	0.0	0.019	0.001	0.008
PA: Harrisburg	8	0.2	0.0	0.1	0.019	0.014	0.016
PA: Pittsburgh	8	0.1	0.0	0.0	0.014	0.002	0.010
RI: Providence	4	0.1	0.0	0.0	0.008	0.001	0.006
SC: Barnwell	2	0.0	0.0	0.0	0.010	0.010	0.010
SC: Columbia	3	0.0	0.0	0.0	0.014	0.012	0.013
SD: Pierre	9	0.7	0.4	0.6	0.030	0.000	0.019
TN: Knoxville	8	0.4	0.1	0.2	0.019	0.001	0.013
TN: Memphis	2	0.1	0.0	0.1	0.034	0.007	0.020
TN: Nashville	8	0.1	0.0	0.0	0.010	0.005	0.007
TN: Oak Ridge/Bethel	7	0.2	0.1	0.1	0.014	0.000	0.009
TN: Oak Ridge/K25	7	0.3	0.1	0.2	0.012	0.000	0.008
TN: Oak Ridge/Melton	7	0.3	0.1	0.2	0.013	0.001	0.009
TN: Oak Ridge/Y12 E	6	0.2	0.0	0.1	0.012	0.000	0.008
TN: Oak Ridge/Y12 W	7	0.2	0.0	0.1	0.012	0.001	0.008
TX: Austin	9	0.9	0.0	0.3	0.013	0.008	0.010
TX: Austin/Concordia	8	0.3	0.1	0.2	0.012	0.001	0.008
TX: Dallas	8	0.2	0.0	0.1	0.008	0.005	0.007
TX: El Paso	9	0.8	0.1	0.3	0.016	0.000	0.010
TX: Ft. Worth	8	0.3	0.0	0.1	0.009	0.005	0.007
TX: Houston	7	0.1	0.0	0.0	0.014	0.006	0.009
TX: San Antonio	1				0.011	0.011	0.011
UT: Salt Lake City	9	0.1	0.0	0.0	0.027	0.003	0.010
VA: Lynchburg	8	0.3	0.1	0.2	0.020	0.001	0.011
VA: Richmond	8	0.0	0.0	0.0	0.010	0.004	0.006
VA: Virginia Beach	8	0.0	0.0	0.0	0.008	0.000	0.005

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
WA: Olympia	8	0.1	0.0	0.1	0.006	0.001	0.002
WA: Spokane	9	0.3	0.1	0.1	0.032	0.001	0.011
WI: Milwaukee	6	0.0	0.0	0.0	0.030	0.001	0.017

Table 4
Gross Beta in Airborne Particulates
March 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Birmingham	9	0.3	0.0	0.1	0.011	0.006	0.009
AL: Montgomery/408	9	0.1	0.0	0.0	0.014	0.007	0.010
AR: Little Rock	6	0.1	0.0	0.0	0.025	0.010	0.019
AZ: Phoenix	4	0.5	0.4	0.4	0.014	0.011	0.012
AZ: Phoenix/956	7	0.6	0.3	0.4	0.022	0.010	0.016
CA: Anaheim	9	0.0	0.0	0.0	0.015	0.006	0.010
CA: Fresno	6	0.2	0.0	0.1	0.011	0.004	0.007
CA: Los Angeles	8	0.2	0.1	0.1	0.012	0.004	0.009
CA: Richmond	4	0.1	0.0	0.1	0.008	0.004	0.006
CA: Riverside	8	0.0	0.0	0.0	0.009	0.003	0.007
CA: San Bernardino Cty.	8	0.1	0.0	0.0	0.014	0.006	0.010
CA: San Diego	3	0.2	0.0	0.1	0.013	0.005	0.009
CA: San Francisco	5	0.0	0.0	0.0	0.010	0.002	0.004
CA: San Jose	8	0.1	0.0	0.0	0.006	0.001	0.004
CO: Denver	9	0.7	0.1	0.4	0.013	0.006	0.009
DC: Washington	8	0.1	0.0	0.0	0.011	0.004	0.006
DE: Wilmington	9	0.7	0.1	0.2	0.015	0.007	0.009
FL: Jacksonville	9	0.1	0.0	0.0	0.010	0.005	0.008
FL: Miami	9	0.0	0.0	0.0	0.011	0.004	0.007
FL: Orlando	8	0.1	0.0	0.0	0.011	0.005	0.008
GA: Atlanta	2	0.0	0.0	0.0	0.009	0.006	0.007
IA: Des Moines	9	0.2	0.1	0.1	0.016	0.006	0.011
IA: Iowa City	9	1.2	0.1	0.4	0.021	0.009	0.014
ID: Idaho Falls	6				0.020	0.006	0.011
IL: Chicago	7	0.1	0.0	0.1	0.020	0.007	0.012
IN: Indianapolis	7	0.2	0.1	0.1	0.026	0.013	0.019
KS: Kansas City	8	0.3	0.0	0.1	0.016	0.006	0.011
KS: Topeka	9	0.4	0.1	0.2	0.017	0.008	0.012
LA: Baton Rouge	8	0.2	0.0	0.0	0.011	0.005	0.009
MD: Baltimore	4	0.1	0.0	0.0	0.014	0.010	0.012
MI: Detroit	9	0.1	0.0	0.0	0.012	0.006	0.009
MI: Lansing	4	0.1	0.0	0.1	0.011	0.008	0.010
MN: St. Paul	3	0.0	0.0	0.0	0.009	0.007	0.008
MN: Welch/510	7	0.2	0.0	0.1	0.024	0.011	0.015
MO: St. Louis	3	0.0	-0.0	0.0	0.009	0.005	0.006
MS: Jackson	7	0.2	0.0	0.1	0.015	0.008	0.012
NC: Charlotte	7	0.2	0.0	0.1	0.046	0.005	0.015
NC: Wilmington	3				0.010	0.007	0.008

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
ND: Bismarck	4	0.5	0.2	0.3	0.013	0.006	0.011
NH: Concord	9	0.0	0.0	0.0	0.010	0.004	0.007
NJ: Edison	6	0.0	0.0	0.0	0.007	0.004	0.005
NJ: Trenton	8	0.4	0.0	0.1	0.014	0.007	0.009
NM: Santa Fe	4	5.5	0.0	1.6	0.019	0.015	0.017
NY: Albany	4	0.0	0.0	0.0	0.008	0.006	0.007
NY: Lockport	1	0.0	0.0	0.0	0.007	0.007	0.007
NY: New York City	6	0.0	0.0	0.0	0.024	0.014	0.019
NY: Yaphank	9	0.1	0.0	0.0	0.008	0.004	0.005
OH: Cincinnati	10	0.1	0.0	0.0	0.008	0.003	0.006
OH: Cleveland	7	0.0	0.0	0.0	0.018	0.004	0.011
OH: Columbus	8	0.0	0.0	0.0	0.012	0.007	0.010
OH: Painesville	7	0.0	0.0	0.0	0.013	0.008	0.010
OH: Ross	8				0.018	0.008	0.011
OK: Oklahoma City	7	0.0	0.0	0.0	0.014	0.005	0.007
OR: Portland	7	0.1	0.0	0.0	0.010	0.004	0.006
PA: Harrisburg	9	0.6	0.0	0.2	0.021	0.009	0.013
PA: Pittsburgh	7	0.1	0.0	0.0	0.011	0.004	0.008
RI: Providence	5	0.1	0.0	0.0	0.008	0.002	0.005
SC: Barnwell	2	0.0	0.0	0.0	0.010	0.010	0.010
SC: Columbia	4	0.1	0.0	0.0	0.019	0.007	0.012
SD: Pierre	5	0.8	0.5	0.6	0.016	0.010	0.012
TN: Knoxville	8	0.3	0.1	0.2	0.024	0.009	0.014
TN: Memphis	1				0.009	0.009	0.009
TN: Nashville	5	0.1	0.0	0.0	0.010	0.006	0.008
TN: Oak Ridge/Bethel	9	0.9	0.1	0.4	0.018	0.008	0.013
TN: Oak Ridge/K25	9	0.6	0.2	0.4	0.015	0.007	0.011
TN: Oak Ridge/Melton	8	0.5	0.1	0.3	0.018	0.009	0.014
TN: Oak Ridge/Y12 E	9	0.7	0.1	0.4	0.018	0.007	0.013
TN: Oak Ridge/Y12 W	8	0.3	0.1	0.2	0.017	0.009	0.012
TX: Austin	8	0.3	0.0	0.2	0.013	0.005	0.009
TX: Austin/Concordia	9	0.2	0.1	0.2	0.012	0.005	0.008
TX: Dallas	7	0.3	0.0	0.1	0.009	0.004	0.006
TX: El Paso	9	0.3	0.0	0.2	0.019	0.007	0.012
TX: Ft. Worth	7	0.2	0.0	0.1	0.007	0.005	0.006
TX: Houston	8	0.1	0.0	0.0	0.019	0.006	0.009
TX: San Antonio	8				0.013	0.006	0.009
UT: Salt Lake City	8	0.2	0.0	0.1	0.013	0.006	0.010

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2008

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
VA: Lynchburg	9	0.5	0.1	0.3	0.011	0.006	0.009
VA: Richmond	9	0.0	0.0	0.0	0.010	0.004	0.006
VA: Virginia Beach	9	0.3	0.0	0.1	0.010	0.005	0.006
WA: Olympia	9	0.1	0.0	0.0	0.005	0.002	0.003
WA: Spokane	8	0.4	0.1	0.2	0.011	0.004	0.007
WI: Milwaukee	7	0.1	0.0	0.0	0.019	0.005	0.015

Table 5
Gross Beta and Specific Gamma in Precipitation
January 2008

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	1.11	0.38	Be7	38	17
AZ: Phoenix	1.31	0.67		ND	
CA: Richmond	0.17	0.55		ND	
CO: Denver	5.4	1.1	Be7	56	25
CT: Hartford	1.87	0.46	Be7	38	14
			Tl208	1.1	1.3
DE: Wilmington	1.47	0.42	Be7	66	17
FL: Jacksonville	1.13	0.38	Be7	32.6	9.2
GA: Atlanta	0.49	0.31	Be7	37	13
IA: Iowa City	7.5	1.3	Be7	11	12
ID: Idaho Falls	0.75	0.40		ND	
KS: Kansas City	1.51	0.69		ND	
MA: Boston	1.54	0.41	Be7	51	16
MN: St. Paul	10.8	2.5	Be7	44	24
			K40	24	33
			Pb212	4.6	4.3
NC: Charlotte	0.55	0.32	Be7	25	13
NC: Wilmington	1.07	0.37	Be7	12.4	8.3
NM: Santa Fe	2.18	0.76	Pb212	9.0	7.0
			Ra224	69	62
NY: Albany	1.84	0.47		ND	
NY: Yaphank	1.58	0.42	Be7	60	13
OH: Painesville	0.87	0.61	Ra224	51	54
OR: Portland	0.82	0.60	Be7	43	26
			Pb212	4.2	5.4
PA: Harrisburg	3.16	0.59	Be7	47	30
TN: Knoxville	2.92	0.55	Be7	34	29
TN: Nashville	2.31	0.49	Be7	55	11
TN: Oak Ridge/K25	2.37	0.74	Be7	53	18
TN: Oak Ridge/Melton	1.40	0.40	Be7	47	17
			K40	9	12
TX: Austin	0.74	0.61		ND	
UT: Salt Lake City	0.7	1.4		ND	
VA: Lynchburg	3.41	0.61	Tl208	2.5	3.4
WA: Olympia	1.7	1.5	Be7	37.8	9.5

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
February 2008

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	1.01	0.41	Be7	47	11
AR: Little Rock	0.91	0.42	Be7	52	30
			Tl208	1.8	3.5
AZ: Phoenix	1.50	0.52		ND	
CA: Richmond	0.81	0.45	Be7	34	20
CO: Denver	2.87	0.99	Be7	38	35
CT: Hartford	2.07	0.50	Be7	41	17
DE: Wilmington	1.97	0.50	Be7	79	22
FL: Jacksonville	0.95	0.42	Be7	17	17
GA: Atlanta	0.88	0.39	Be7	27	18
			K40	12	13
IA: Iowa City	2.13	0.55		ND	
ID: Idaho Falls	0.52	0.39		ND	
KS: Kansas City	3.43	0.68	Be7	33	33
			Pb212	6.0	6.2
MA: Boston	2.05	0.51	Be7	56	17
MN: St. Paul	6.9	1.0		ND	
NC: Charlotte	1.84	0.49	Be7	58	18
NC: Wilmington	0.65	0.38		ND	
NM: Santa Fe	1.50	0.48		ND	
NY: Albany	0.98	0.41	Be7	39	17
NY: Yaphank	2.47	0.56	Be7	36	15
			K40	8	12
OH: Painesville	1.52	0.49	Be7	36	36
OR: Portland	1.38	0.49		ND	
PA: Harrisburg	2.53	0.55	Be7	87	38
TN: Knoxville	1.05	0.74		ND	
TN: Nashville	1.26	0.44	Be7	48	17
TN: Oak Ridge/K25	2.29	0.54	Be7	81	21
TN: Oak Ridge/Melton	1.52	0.45	Be7	52	19
TX: Austin	1.10	0.48		ND	
UT: Salt Lake City	1.93	0.53	Be7	27	20
VA: Lynchburg	2.17	0.52		ND	
WA: Olympia	0.32	0.38		ND	

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
March 2008

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	0.97	0.35	Be7	30.6	9.3
AR: Little Rock	1.01	0.41	Be7	21	14
CA: Richmond	3.9	2.0		ND	
CO: Denver	12.5	1.6	Be7	98	32
			Bi212	42	34
CT: Hartford	3.82	0.64	Be7	123	23
DE: Wilmington	2.16	0.49	Be7	63	17
			Pb212	2.0	2.6
FL: Jacksonville	1.14	0.39		ND	
GA: Atlanta	0.91	0.35	Be7	33	15
IA: Iowa City	3.09	0.61		ND	
ID: Idaho Falls	1.63	0.48	Pb212	6.0	4.3
			Ra224	43	35
KS: Kansas City	0.97	0.42	Be7	22	14
MA: Boston	2.25	0.48	Be7	50	16
MN: St. Paul	4.46	0.79		ND	
NC: Charlotte	0.94	0.35	Be7	13	14
			Pb212	2.2	2.6
NC: Wilmington	1.37	0.40	Pb212	4.6	6.2
NY: Albany	1.40	0.40	Be7	32	16
NY: Yaphank	2.57	0.52	Be7	18.0	9.4
OH: Painesville	2.93	0.58	Be7	43	18
OR: Portland	1.32	0.46	Be7	55	32
			Pb212	3.7	6.1
PA: Harrisburg	2.12	0.46	Be7	74	31
			K40	34	35
TN: Knoxville	0.79	0.34		ND	
TN: Nashville	1.43	0.40	Be7	52	17
TN: Oak Ridge/K25	2.59	0.54	Be7	60	19
TN: Oak Ridge/Melton	1.23	0.39	Be7	55	15
TN: Oak Ridge/Y12 E	1.53	0.46	Be7	51	16
TX: Austin	2.10	0.53	Pb212	3.4	3.3
UT: Salt Lake City	6.03	0.93		ND	
VA: Lynchburg	2.02	0.48		ND	
WA: Olympia	0.93	0.41	Be7	52	17

Note: ND = Not Detected

Table 8
Tritium in Precipitation
January - March 2008

Location	January 2008 pCi/L $\pm 2u$	February 2008 pCi/L $\pm 2u$	March 2008 pCi/L $\pm 2u$
AL: Montgomery/408	-6 82	-6 89	-21 80
AR: Little Rock	NS	63 86	2 81
AZ: Phoenix	2 80	17 83	NS
CA: Richmond	23 81	13 84	-39 80
CO: Denver	30 81	31 84	-4 81
CT: Hartford	-33 81	-17 86	-17 73
DE: Wilmington	-32 80	11 87	10 75
FL: Jacksonville	-8 81	-46 86	19 75
GA: Atlanta	-89 77	24 88	0 74
IA: Iowa City	11 80	-42 86	-29 80
ID: Idaho Falls	-28 86	64 87	-35 79
KS: Kansas City	19 80	65 85	-27 80
MA: Boston	-27 82	26 88	21 75
MN: St. Paul	17 81	-38 86	68 84
NC: Charlotte	-19 81	15 88	10 74
NC: Wilmington	-70 80	21 88	21 75
NM: Santa Fe	35 83	31 85	NS
NY: Albany	-10 81	30 88	53 77
NY: Yaphank	-17 81	-64 84	21 75
OH: Painesville	0 80	-19 85	6 81
OR: Portland	-29 79	39 86	-17 80
PA: Harrisburg	-31 80	-15 86	16 76
TN: Knoxville	-19 82	-43 84	29 82
TN: Nashville	-19 82	-40 86	19 82
TN: Oak Ridge/K25	12 83	65 89	0 82
TN: Oak Ridge/Melton	164 90	275 99	56 83
TN: Oak Ridge/Y12 E	NS	NS	-2 81
TX: Austin	8 80	149 91	10 83
UT: Salt Lake City	13 80	59 85	-8 81
VA: Lynchburg	-6 82	-41 85	17 75
WA: Olympia	46 82	-6 82	-19 80

Note: NS = No Sample

Plutonium and Uranium in Airborne Particulates

Environmental radiation levels of plutonium and uranium are determined by the analysis of annually composited samples (air filters) collected from the continuously operating airborne particulate samplers.

Concentrations of plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 are determined by alpha-particle spectrometry following chemical separation. The volume of air represented by the annual composite typically ranges from 120,000 to 500,000 cubic meters.

Plutonium and uranium results are published when they become available.

Beta Activity in Precipitation

All stations routinely submit precipitation samples as rainfall, snow, or sleet occurs. The precipitation samples are composited at NAREL into single monthly samples for each station. Each month that precipitation occurs, an aliquant of the composited sample is analyzed for gross beta, tritium, and gamma-emitting radionuclides.

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2. Drinking Water Program

The RadNet drinking water program provides data on radionuclide concentrations in the nation's drinking water supplies. Samples are taken at 78 sites which are either major population centers or selected nuclear facility environs.

Drinking water data are used to assess trends and anomalies in concentrations, and to compare with standards set forth in the EPA "National Interim Primary Drinking Water Regulations." These regulations provide for approval of supplies when the combined radium-226 and radium-228 levels do not exceed 5 pCi/L, when the gross alpha (excluding radon and uranium) levels do not exceed 15 pCi/L, when tritium levels do not exceed 20,000 pCi/L, when the strontium-90 levels do not exceed 8 pCi/L, and when the gross beta levels do not exceed 50 pCi/L.

The analyses include (a) tritium on a quarterly basis; (b) gross alpha, gross beta, strontium-90, and gamma on annual composites; (c) radium-226 if the gross alpha exceeds 2 pCi/L and radium-228 if the radium-226 falls between 3 and 5 pCi/L; (d) iodine-131 on one quarterly sample per year for each station; and (e) an annual composite for plutonium-238, combined plutonium-239 and 240, and uranium-234, 235, and 238 for stations that demonstrate gross alpha levels greater than 2 pCi/L.

Table 9
Tritium in Drinking Water
January - March 2008

Location	Date Collected	³ H pCi/L ± 2u
AK: Fairbanks	01/18/08	-48 84
AL: Dothan	01/23/08	4 86
AL: Montgomery	01/09/08	-11 80
AL: Muscle Shoals	01/17/08	160 93
AL: Scottsboro	01/16/08	145 93
AR: Little Rock	01/10/08	44 77
CA: Los Angeles	01/04/08	-25 81
CA: Richmond	01/11/08	-2 75
CT: Hartford	01/07/08	-2 83
DE: Dover	01/07/08	-25 80
FL: Miami	01/10/08	42 77
FL: Tampa	01/10/08	2 75
GA: Baxley	02/18/08	-34 78
GA: Savannah	03/12/08	26 85
HI: Honolulu	03/07/08	-35 83
IA: Cedar Rapids	02/04/08	-27 80
ID: Boise	02/14/08	4 80
ID: Idaho Falls	01/15/08	33 87
IL: W. Chicago	01/22/08	15 87
KS: Topeka	01/28/08	36 88
LA: New Orleans	03/19/08	11 85
MD: Baltimore	01/07/08	60 85
MD: Conowingo	01/30/08	-44 83
MI: Detroit	01/23/08	42 89
MI: Grand Rapids	01/29/08	-19 85
MN: Red Wing	02/26/08	22 87
MO: Jefferson City	01/09/08	25 85
MS: Jackson	01/08/08	-10 91
MS: Port Gibson	01/08/08	-2 83
MT: Helena	01/08/08	-26 82
NC: Charlotte	01/28/08	890 120
NC: Raleigh	01/30/08	-9 84
ND: Bismarck	01/04/08	-40 80
NE: Lincoln	01/09/08	-13 82
NH: Concord	01/08/08	-28 86
NJ: Trenton	01/09/08	50 85
NJ: Waretown	01/15/08	-36 85
NM: Santa Fe	01/22/08	-42 83
NV: Las Vegas	03/31/08	141 89
NY: Albany	01/08/08	-24 81

Table 9 (continued)
Tritium in Drinking Water
January - March 2008

Location	Date Collected	³ H pCi/L ± 2u
NY: New York City	01/09/08	-16 89
NY: Niagara Falls	01/07/08	-10 82
NY: Syracuse	03/05/08	59 87
OH: Cincinnati	02/27/08	65 87
OH: Columbus	03/30/08	58 86
OH: E. Liverpool	01/10/08	17 75
OH: Painesville	02/18/08	8 79
OH: Toledo	01/07/08	4 82
OR: Portland	03/27/08	-5 83
PA: Columbia	01/30/08	-56 84
PA: Harrisburg	01/30/08	7 86
PA: Philadelphia - Baxter Control Lab.	01/29/08	2 82
PA: Philadelphia - Belmont	01/29/08	-50 79
PA: Philadelphia - Queen Lane Lab.	01/29/08	-15 81
PA: Pittsburgh	01/14/08	80 79
RI: Providence	01/10/08	33 77
SC: Barnwell	01/08/08	-28 86
SC: Columbia	01/09/08	10 77
SC: Jenkinsville	01/04/08	4 82
SC: Seneca	01/07/08	-48 80
TN: Chattanooga	01/08/08	530 100
TN: Knoxville	01/18/08	32 88
TN: Oak Ridge - Roan Co. #4442	01/08/08	104 87
TN: Oak Ridge - Roan Co. #360	01/08/08	-65 80
TN: Oak Ridge - Anderson Co. #768	01/08/08	9 83
TN: Oak Ridge - Knox Co. #371	01/08/08	-15 82
TN: Oak Ridge - Anderson Co. #772	01/08/08	9 83
TX: Austin	01/11/08	40 77
VA: Ashland	01/04/08	1560 140
VA: Lynchburg	01/15/08	-19 86
WA: Seattle	01/07/08	7 84

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3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of certain radionuclides since it is consumed fresh by a large segment of the population and can contain several of the biologically significant radionuclides that result from environmental releases from nuclear activities. A primary function of this program is to obtain reliable monitoring data relative to current radionuclide concentrations and determine any long-term trends.

Quarterly samples are collected at approximately 55 sampling sites. The samples are composited, according to production, from the major milk suppliers representing more than 80 percent of the milk consumed in a given population center.

The samples are analyzed for gamma-emitting nuclides, including iodine-131, barium-140, cesium-137, and potassium-40. Total potassium concentrations in g/L are determined from potassium-40 activities assuming natural isotopic abundances. During the third quarter collection, one-fourth of the samples are also analyzed for strontium-90 on a four year rotating schedule.

Table 10
Radionuclides in Pasteurized Milk
January - March 2008

Location	Date Collected	K g/L ± 2u	¹³⁷ Cs pCi/L ± 2u	¹⁴⁰ Ba pCi/L ± 2u	¹³¹ I pCi/L ± 2u
AR: Little Rock	03/10/08	1.55 0.20	ND	ND	ND
AZ: Phoenix	03/19/08	1.73 0.21	ND	ND	ND
CA: Los Angeles	01/09/08	1.61 0.20	ND	ND	ND
CA: Sacramento	01/08/08	1.54 0.19	ND	ND	ND
CA: San Francisco	01/29/08	1.57 0.20	ND	ND	ND
DE: Wilmington	02/08/08	1.50 0.20	ND	ND	ND
FL: Tampa	01/09/08	1.53 0.19	ND	ND	ND
IA: Des Moines	02/04/08	1.57 0.20	ND	ND	ND
KS: Wichita	01/07/08	1.50 0.19	ND	ND	ND
KY: Louisville	01/07/08	1.78 0.21	ND	ND	ND
MA: Boston	03/13/08	1.64 0.24	ND	ND	ND
MD: Baltimore	01/10/08	1.69 0.21	ND	ND	ND
MO: Jefferson City	02/20/08	1.73 0.21	ND	ND	ND
NJ: Trenton	01/22/08	1.72 0.21	ND	ND	ND
NM: Albuquerque	02/11/08	1.49 0.19	ND	ND	ND
NV: Las Vegas	03/11/08	1.56 0.19	ND	ND	ND
NY: Buffalo	01/10/08	1.60 0.20	ND	ND	ND
NY: Syracuse	01/08/08	1.68 0.20	ND	ND	ND
OH: Cincinnati	01/08/08	1.53 0.20	ND	ND	ND
OH: Cleveland	02/13/08	1.62 0.20	ND	ND	ND
OR: Portland	01/14/08	1.55 0.20	ND	ND	ND
PA: Pittsburgh	01/08/08	1.64 0.24	ND	ND	ND
TN: Chattanooga	01/23/08	1.50 0.19	ND	ND	ND
TN: Knoxville	02/05/08	1.55 0.20	ND	ND	ND
TN: Memphis	01/14/08	1.45 0.19	ND	ND	ND
TX: Austin/Concordia	01/08/08	1.50 0.18	ND	ND	ND
VA: Norfolk	03/28/08	1.54 0.20	ND	ND	ND
VT: Montpelier	03/31/08	1.62 0.20	ND	ND	ND
WA: Spokane	01/29/08	1.62 0.23	ND	ND	ND
WA: Tacoma	03/31/08	1.53 0.20	ND	ND	ND
WV: Charleston	01/07/08	1.61 0.20	ND	ND	ND

Note: ND = Not Detected

For More Information

Environmental Radiation Data (ERD) is published quarterly by the U.S. Environmental Protection Agency's Office of Radiation and Indoor Air.

Requests for information concerning the operation of RadNet and the data that are generated should be directed as follows:

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