402-R-09-019

ENVIRONMENTAL RADIATION DATA

REPORT 140

October - December 2009

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/m³	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/m³	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m³	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 ^{239}Pu and ^{240}Pu, 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 m^3.

‡ 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 dual-phosphor scintillation counter 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 proportional counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m^3. 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.

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.

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
October 2009

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AK: Fairbanks	8	0.1	0.0	0.0	0.019	0.003	0.008
AL: Birmingham	8	0.1	0.0	0.0	0.013	0.003	0.009
AL: Montgomery/408	9	0.1	0.0	0.0	0.013	0.007	0.010
AR: Little Rock	7	0.0	0.0	0.0	0.007	0.004	0.006
AZ: Phoenix	9	1.9	0.5	0.9	0.021	0.010	0.015
AZ: Phoenix/956	8	1.7	0.1	0.7	0.023	0.014	0.019
AZ: Tucson	6	0.1	0.0	0.0	0.011	0.006	0.008
CA: Anaheim	8	0.0	0.0	0.0	0.034	0.007	0.015
CA: Bakersfield	9	0.8	0.0	0.3	0.021	0.006	0.015
CA: Eureka	5	0.0	0.0	0.0	0.004	0.002	0.003
CA: Los Angeles	3	0.4	0.1	0.2	0.037	0.011	0.020
CA: Richmond	4	0.2	0.1	0.1	0.009	0.003	0.005
CA: Riverside	9	0.0	0.0	0.0	0.016	0.005	0.008
CA: Sacramento	9	0.4	0.1	0.2	0.012	0.004	0.007
CA: San Bernardino Cty.	5	0.0	0.0	0.0	0.059	0.010	0.021
CA: San Francisco	5	0.0	0.0	0.0	0.008	0.002	0.004
CA: San Jose	5	0.5	0.0	0.1	0.010	0.002	0.006
CO: Colorado Springs	4				0.011	0.007	0.008
CO: Denver	9	0.7	0.0	0.3	0.014	0.003	0.008
CT: Hartford	7	0.1	0.0	0.0	0.013	0.004	0.006
DC: Washington	7	0.1	0.0	0.0	0.008	0.003	0.005
DE: Dover	6	0.0	-0.0	0.0	0.008	0.002	0.005
FL: Jacksonville	8	0.1	0.0	0.0	0.007	0.004	0.005
FL: Miami	7	0.0	0.0	0.0	0.009	0.003	0.005
FL: Orlando	8	0.1	0.0	0.1	0.014	0.005	0.009
FL: Tampa	1	0.0	0.0	0.0	0.010	0.010	0.010
GA: Atlanta	4	0.0	0.0	0.0	0.007	0.005	0.006
GA: Augusta	4	0.2	0.1	0.1	0.010	0.008	0.009
HI: Hilo	9	0.0	0.0	0.0	0.007	0.001	0.003
IA: Des Moines	8	0.1	0.0	0.0	0.009	0.003	0.005
IA: Mason City	5	0.3	0.0	0.1	0.015	0.003	0.007
ID: Idaho Falls	9	0.3	0.0	0.1	0.011	0.003	0.006
IL: Aurora	2	0.0	0.0	0.0	0.012	0.006	0.009
IL: Chicago	8	0.1	0.0	0.0	0.011	0.004	0.007
IN: Indianapolis	9	0.2	0.0	0.0	0.012	0.004	0.008
KS: Kansas City	8	0.3	0.0	0.1	0.010	0.005	0.007
KS: Topeka	8	0.2	0.1	0.2	0.014	0.005	0.008
KS: Wichita	8	0.3	0.0	0.1	0.011	0.005	0.008

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
KY: Lexington	8	0.1	0.0	0.0	0.009	0.004	0.006
KY: Louisville	9	0.2	0.0	0.1	0.019	0.005	0.009
LA: Baton Rouge	9	0.3	0.0	0.1	0.007	0.004	0.006
LA: Shreveport	3	0.1	0.0	0.0	0.007	0.004	0.006
MA: Worcester	6	0.1	0.0	0.0	0.007	0.002	0.005
MD: Baltimore	9	0.0	0.0	0.0	0.013	0.004	0.007
ME: Portland	8	0.0	-0.0	0.0	0.011	0.003	0.005
MI: Detroit	7	0.2	0.0	0.1	0.012	0.003	0.007
MN: Duluth	7	0.1	0.0	0.0	0.009	0.002	0.005
MN: St. Paul	4	0.0	0.0	0.0	0.008	0.003	0.005
MN: Welch/510	8	0.0	-0.0	0.0	0.016	0.003	0.008
MO: Jefferson City	7	0.2	0.0	0.1	0.009	0.002	0.006
MO: Springfield	9	0.2	-0.0	0.1	0.008	0.004	0.006
MS: Jackson	3	0.1	0.0	0.1	0.011	0.004	0.008
MS: Jackson/Deq	8	0.1	0.0	0.1	0.009	0.003	0.006
MT: Billings	4	0.0	0.0	0.0	0.012	0.006	0.007
NC: Charlotte	6	0.1	0.0	0.0	0.012	0.004	0.007
NC: Raleigh	3	0.0	0.0	0.0	0.040	0.004	0.017
NC: Wilmington	3				0.008	0.007	0.007
ND: Bismarck	8	0.4	-0.0	0.1	0.007	0.003	0.005
NE: Kearney	9	0.5	0.1	0.3	0.056	0.005	0.013
NE: Lincoln	7	0.2	0.0	0.1	0.007	0.003	0.006
NE: Omaha	4	0.0	0.0	0.0	0.009	0.004	0.007
NH: Concord	2				0.007	0.004	0.006
NJ: Edison	9	0.5	-0.0	0.1	0.014	0.003	0.005
NJ: Trenton	9	0.4	0.1	0.2	0.014	0.004	0.008
NM: Carlsbad	6				0.011	0.006	0.008
NM: Santa Fe	6	1.2	0.0	0.4	0.017	0.009	0.012
NV: Las Vegas/913	5	0.0	0.0	0.0	0.010	0.005	0.008
NV: Reno	8	0.9	0.1	0.4	0.020	0.006	0.012
NY: Albany	8	1.0	0.1	0.2	0.021	0.005	0.009
NY: Hauppauge	2	0.0	0.0	0.0	0.005	0.003	0.004
NY: Lockport	9	0.0	-0.0	0.0	0.008	0.001	0.005
NY: Rochester	8	0.1	0.0	0.0	0.006	0.002	0.004
NY: Yaphank	6	0.1	0.0	0.0	0.008	0.003	0.005
OH: Cincinnati	8	0.2	0.0	0.1	0.010	0.002	0.006
OH: Cleveland	7	0.1	0.0	0.1	0.013	0.003	0.006
OH: Painesville	8	0.1	0.0	0.0	0.011	0.005	0.007

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
OK: Oklahoma City	5	0.0	0.0	0.0	0.008	0.003	0.005
OK: Tulsa	9	0.0	0.0	0.0	0.010	0.004	0.008
OR: Portland	8	0.2	0.0	0.1	0.024	0.009	0.013
PA: Harrisburg	8	0.3	0.0	0.1	0.019	0.003	0.009
PA: Philadelphia	1				0.015	0.015	0.015
PA: Pittsburgh	6	0.2	0.0	0.0	0.009	0.005	0.007
RI: Providence	1	0.0	0.0	0.0	0.004	0.004	0.004
SC: Barnwell	4	0.9	0.0	0.3	0.008	0.007	0.008
SC: Columbia	2	0.1	0.0	0.1	0.015	0.011	0.013
SD: Pierre	6	0.6	0.2	0.4	0.011	0.005	0.008
SD: Rapid City	7	1.2	0.1	0.4	0.019	0.004	0.009
TN: Knoxville	8	0.3	0.0	0.1	0.007	0.003	0.005
TN: Memphis	7	0.0	0.0	0.0	0.012	0.005	0.008
TN: Nashville	7	0.0	0.0	0.0	0.008	0.003	0.006
TN: Oak Ridge/Bethel	9	0.6	0.0	0.2	0.019	0.007	0.010
TN: Oak Ridge/K25	8	0.8	0.1	0.3	0.022	0.008	0.012
TN: Oak Ridge/Melton	9	0.7	0.1	0.3	0.018	0.007	0.011
TN: Oak Ridge/Y12 E	8	0.7	0.1	0.2	0.019	0.009	0.013
TN: Oak Ridge/Y12 W	9	0.3	0.1	0.2	0.017	0.007	0.010
TX: Amarillo	6	0.8	0.2	0.6	0.008	0.004	0.006
TX: Corpus Christi	3				0.012	0.006	0.009
TX: Dallas	8	0.1	0.0	0.1	0.007	0.003	0.005
TX: Ft. Worth	5	0.1	0.0	0.1	0.011	0.007	0.008
TX: Houston	8				0.011	0.005	0.007
TX: Laredo	9	0.3	0.1	0.1	0.009	0.004	0.006
TX: San Angelo	9	0.0	0.0	0.0	0.014	0.003	0.008
TX: San Antonio	9	0.3	0.0	0.1	0.007	0.005	0.006
UT: Salt Lake City	7	0.2	0.0	0.1	0.013	0.005	0.009
VA: Harrisonburg	9	1.0	0.2	0.5	0.011	0.004	0.007
VA: Lynchburg	9	1.1	0.5	0.7	0.015	0.006	0.010
VA: Richmond	7	0.1	0.0	0.0	0.008	0.003	0.006
VA: Virginia Beach	6	0.1	0.0	0.0	0.009	0.002	0.006
WA: Olympia	9	0.1	0.0	0.0	0.007	0.003	0.005
WA: Richland	9	0.2	0.0	0.1	0.010	0.003	0.005
WA: Seattle	9	0.0	-0.0	0.0	0.009	0.002	0.005
WA: Spokane	8	0.5	0.0	0.1	0.009	0.004	0.006

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg
WI: Madison	8	0.1	0.0	0.1	0.008	0.002	0.005
WI: Milwaukee	7	0.0	0.0	0.0	0.009	0.004	0.006
WV: Charleston	6	0.0	0.0	0.0	0.011	0.005	0.008

Table 3
Gross Beta in Airborne Particulates
November 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AK: Fairbanks	6	0.1	0.0	0.0	0.015	0.003	0.009
AL: Birmingham	8	0.1	0.0	0.1	0.020	0.010	0.015
AL: Montgomery/408	9	0.3	0.0	0.1	0.019	0.007	0.013
AR: Little Rock	7	0.1	0.0	0.0	0.018	0.007	0.012
AZ: Phoenix	9	2.3	0.9	1.5	0.032	0.004	0.021
AZ: Phoenix/956	8	2.5	0.5	0.9	0.036	0.013	0.028
AZ: Tucson	7	0.1	0.0	0.0	0.018	0.006	0.012
CA: Anaheim	2	0.0	0.0	0.0	0.026	0.014	0.020
CA: Bakersfield	6	0.6	0.0	0.3	0.040	0.011	0.022
CA: Eureka	3	0.0	0.0	0.0	0.003	0.002	0.003
CA: Los Angeles	3	0.3	0.1	0.2	0.020	0.015	0.018
CA: Richmond	4	0.3	0.2	0.2	0.008	0.004	0.005
CA: Riverside	7	0.0	0.0	0.0	0.015	0.008	0.012
CA: Sacramento	9	0.6	0.1	0.4	0.027	0.004	0.013
CA: San Bernardino Cty.	5	0.0	0.0	0.0	0.026	0.008	0.018
CA: San Francisco	4	0.0	0.0	0.0	0.006	0.004	0.005
CA: San Jose	4	0.1	0.0	0.1	0.013	0.004	0.007
CO: Colorado Springs	5				0.016	0.005	0.011
CO: Denver	9	0.9	0.1	0.4	0.023	0.004	0.012
CT: Hartford	7	0.2	0.0	0.0	0.013	0.004	0.007
DC: Washington	8	0.1	0.0	0.0	0.013	0.002	0.007
DE: Dover	5	0.0	0.0	0.0	0.017	0.005	0.009
FL: Jacksonville	7	0.0	0.0	0.0	0.010	0.001	0.007
FL: Miami	5	0.0	0.0	0.0	0.007	0.002	0.004
FL: Orlando	9	0.1	0.0	0.0	0.023	0.003	0.011
GA: Atlanta	1	0.0	0.0	0.0	0.007	0.007	0.007
GA: Augusta	4	0.2	0.0	0.1	0.019	0.004	0.011
HI: Hilo	9	0.0	0.0	0.0	0.005	0.001	0.003
HI: Honolulu	6	0.1	0.0	0.0	0.003	0.001	0.002
IA: Des Moines	6	0.2	0.0	0.1	0.017	0.005	0.010
IA: Mason City	7	0.8	0.2	0.4	0.025	0.005	0.014
ID: Idaho Falls	8	0.9	0.0	0.3	0.013	0.002	0.008
IL: Aurora	9	0.2	0.0	0.1	0.029	0.005	0.014
IL: Chicago	7	0.1	0.0	0.0	0.017	0.007	0.011
IN: Indianapolis	9	0.1	0.0	0.1	0.019	0.009	0.013
KS: Kansas City	5	0.2	0.0	0.1	0.027	0.012	0.018
KS: Topeka	7	0.4	0.1	0.2	0.027	0.006	0.016
KS: Wichita	2	0.2	0.0	0.1	0.009	0.005	0.007

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
KY: Lexington	8	0.0	0.0	0.0	0.015	0.005	0.010
KY: Louisville	9	0.2	0.0	0.1	0.019	0.009	0.013
LA: Baton Rouge	7	0.2	0.0	0.1	0.017	0.004	0.010
LA: Shreveport	7	0.1	0.0	0.1	0.014	0.004	0.009
MA: Worcester	8	0.1	0.0	0.0	0.009	0.003	0.006
MD: Baltimore	7	0.0	0.0	0.0	0.019	0.006	0.011
ME: Orono	4	0.0	0.0	0.0	0.008	0.005	0.007
ME: Portland	7	0.0	0.0	0.0	0.012	0.001	0.007
MI: Bay City 48708	4	0.2	0.0	0.1	0.023	0.009	0.016
MI: Detroit	8	0.2	0.1	0.1	0.021	0.006	0.010
MN: Duluth	4	0.1	0.0	0.1	0.008	0.005	0.006
MN: St. Paul	4	0.2	0.0	0.1	0.020	0.006	0.012
MN: Welch/510	8	0.3	0.0	0.1	0.049	0.009	0.023
MO: Jefferson City	8	0.3	0.0	0.1	0.014	-0.000	0.009
MO: Springfield	8	0.3	0.0	0.1	0.019	0.010	0.014
MO: St. Louis	1	-0.0	-0.0	-0.0	0.009	0.009	0.009
MS: Jackson	1	0.0	0.0	0.0	0.018	0.018	0.018
MS: Jackson/Deq	7	0.3	0.1	0.1	0.016	0.006	0.011
MT: Billings	5	0.0	0.0	0.0	0.014	0.009	0.012
NC: Charlotte	6	0.3	-0.0	0.1	0.036	0.004	0.020
NC: Raleigh	1	0.0	0.0	0.0	0.008	0.008	0.008
ND: Bismarck	8	0.3	0.0	0.1	0.011	0.005	0.007
NE: Kearney	8	0.5	0.1	0.3	0.036	0.004	0.015
NE: Lincoln	8	0.5	0.1	0.3	0.018	0.004	0.011
NE: Omaha	4	0.1	0.0	0.0	0.023	0.007	0.015
NJ: Edison	4	0.0	0.0	0.0	0.012	0.005	0.008
NJ: Trenton	8	0.2	0.1	0.1	0.018	0.005	0.010
NM: Carlsbad	5				0.018	0.009	0.013
NM: Santa Fe	5	2.1	0.0	0.8	0.022	0.009	0.016
NV: Las Vegas/913	8	0.0	0.0	0.0	0.012	0.006	0.010
NV: Reno	5	0.7	0.0	0.3	0.016	0.009	0.013
NY: Albany	7	0.4	0.0	0.1	0.015	0.004	0.009
NY: Hauppauge	2	0.0	0.0	0.0	0.015	0.009	0.012
NY: Lockport	9	0.0	-0.0	0.0	0.018	0.004	0.009
NY: Rochester	7	0.1	0.0	0.0	0.011	0.004	0.006
NY: Yaphank	5	0.1	-0.0	0.0	0.006	0.003	0.005
OH: Cincinnati	8	0.1	0.0	0.1	0.015	0.007	0.010
OH: Cleveland	9	0.1	0.0	0.0	0.017	0.007	0.011

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2009

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
OH: Painesville	7	0.1	0.0	0.0	0.022	0.006	0.012
OK: Oklahoma City	6	0.1	0.0	0.0	0.014	0.004	0.009
OK: Tulsa	8	0.0	0.0	0.0	0.019	0.005	0.012
OR: Portland	5	0.0	0.0	0.0	0.012	0.004	0.008
PA: Harrisburg	8	0.2	0.0	0.1	0.017	0.008	0.011
PA: Philadelphia	1				0.031	0.031	0.031
PA: Pittsburgh	6	0.1	0.0	0.1	0.016	0.005	0.012
SC: Barnwell	3	0.1	0.0	0.0	0.015	0.008	0.011
SC: Columbia	3	0.0	0.0	0.0	0.012	0.010	0.011
SD: Pierre	6	1.0	0.4	0.6	0.013	0.007	0.010
SD: Rapid City	6	0.6	0.1	0.3	0.020	0.005	0.012
TN: Knoxville	6	0.3	0.0	0.1	0.010	0.004	0.007
TN: Memphis	6	0.0	0.0	0.0	0.024	0.009	0.015
TN: Nashville	4	0.0	0.0	0.0	0.014	0.006	0.010
TN: Oak Ridge/Bethel	8	0.5	0.1	0.2	0.021	0.008	0.016
TN: Oak Ridge/K25	8	0.5	0.1	0.3	0.023	0.008	0.017
TN: Oak Ridge/Melton	8	0.5	0.1	0.2	0.024	0.007	0.016
TN: Oak Ridge/Y12 E	8	0.6	0.1	0.3	0.026	0.010	0.019
TN: Oak Ridge/Y12 W	8	0.2	0.0	0.1	0.024	0.006	0.015
TX: Amarillo	6	1.1	0.3	0.8	0.021	0.004	0.012
TX: Corpus Christi	2				0.011	0.009	0.010
TX: Dallas	6	0.2	0.0	0.1	0.018	0.006	0.012
TX: Ft. Worth	6	0.1	0.0	0.1	0.025	0.014	0.019
TX: Harlingen	8	1.9	0.2	0.8	0.020	0.007	0.012
TX: Houston	7	0.0	0.0	0.0	0.021	0.010	0.017
TX: Laredo	8	0.8	0.1	0.4	0.026	0.007	0.013
TX: San Angelo	6	0.1	0.0	0.0	0.019	0.006	0.012
TX: San Antonio	9	1.1	0.1	0.5	0.030	0.007	0.013
UT: Salt Lake City	8	0.4	0.1	0.2	0.019	0.007	0.011
VA: Harrisonburg	8	0.7	0.0	0.3	0.016	0.007	0.010
VA: Lynchburg	7	0.7	0.1	0.3	0.024	0.008	0.014
VA: Richmond	9	0.0	0.0	0.0	0.014	0.002	0.008
VA: Virginia Beach	7	0.3	0.0	0.1	0.014	0.004	0.008
WA: Olympia	8	0.0	0.0	0.0	0.006	0.002	0.003
WA: Richland	8	0.3	0.0	0.1	0.010	0.003	0.005
WA: Seattle	7	0.0	-0.0	0.0	0.005	0.001	0.003
WA: Spokane	8	0.1	0.0	0.1	0.012	0.003	0.007

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg
WI: Madison	8	0.3	0.0	0.1	0.018	0.005	0.009
WI: Milwaukee	8	0.1	0.0	0.0	0.023	0.005	0.010
WV: Charleston	5	0.0	0.0	0.0	0.017	0.009	0.013

Table 4
Gross Beta in Airborne Particulates
December 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
AK: Fairbanks	7	0.0	0.0	0.0	0.019	0.003	0.011
AL: Birmingham	9	0.0	0.0	0.0	0.018	0.009	0.013
AL: Montgomery/408	9	0.1	0.0	0.0	0.022	0.012	0.017
AR: Little Rock	7	0.0	0.0	0.0	0.018	0.009	0.013
AZ: Phoenix	6	1.8	0.4	1.4	0.034	0.015	0.023
AZ: Phoenix/956	9	2.1	0.4	1.0	0.042	0.019	0.028
AZ: Tucson	7	0.1	0.0	0.0	0.012	0.006	0.010
CA: Anaheim	8	0.0	0.0	0.0	0.035	0.004	0.013
CA: Bakersfield	8	1.8	0.0	0.5	0.053	0.009	0.023
CA: Eureka	3	0.0	0.0	0.0	0.001	0.000	0.000
CA: Fresno	2	0.2	0.1	0.1	0.041	0.014	0.028
CA: Los Angeles	4	0.2	0.1	0.2	0.011	0.004	0.008
CA: Richmond	5	0.4	0.1	0.2	0.014	0.008	0.010
CA: Riverside	6	0.0	0.0	0.0	0.016	0.005	0.010
CA: Sacramento	9	0.5	0.1	0.2	0.021	0.007	0.014
CA: San Bernardino Cty.	7	0.0	0.0	0.0	0.075	0.007	0.022
CA: San Francisco	5	0.0	0.0	0.0	0.012	0.004	0.008
CA: San Jose	5	0.1	0.0	0.0	0.017	0.008	0.011
CO: Colorado Springs	4				0.019	0.011	0.013
CO: Denver	8	0.2	0.0	0.1	0.014	0.004	0.009
CT: Hartford	7	0.0	0.0	0.0	0.013	0.006	0.008
DC: Washington	7	0.0	0.0	0.0	0.008	0.004	0.005
DE: Dover	5	0.0	0.0	0.0	0.008	0.005	0.007
FL: Jacksonville	8	0.0	0.0	0.0	0.008	0.004	0.006
FL: Miami	1	0.0	0.0	0.0	0.007	0.007	0.007
FL: Orlando	9	0.1	0.0	0.0	0.024	0.004	0.011
GA: Augusta	5	0.1	0.0	0.1	0.013	0.008	0.011
HI: Hilo	8	0.0	0.0	0.0	0.007	0.003	0.004
HI: Honolulu	9	0.2	0.0	0.1	0.007	0.002	0.004
IA: Des Moines	8	0.2	0.0	0.1	0.029	0.006	0.017
IA: Mason City	5	0.3	0.0	0.1	0.058	0.008	0.032
ID: Idaho Falls	9	0.2	0.0	0.1	0.016	0.005	0.011
IL: Aurora	7	0.2	0.0	0.1	0.026	0.012	0.020
IL: Chicago	7	0.1	0.0	0.0	0.017	0.008	0.011
IN: Indianapolis	8	0.0	0.0	0.0	0.021	0.009	0.012
KS: Kansas City	7	0.3	0.0	0.1	0.027	0.007	0.015
KS: Topeka	6	0.4	0.1	0.3	0.046	0.009	0.024
KY: Lexington	7	0.1	0.0	0.0	0.021	0.008	0.012

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2009

Location	Number of Samples	5-hour Field Estimate (pCi/m³) Max	Min	Avg	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
KY: Louisville	2	0.1	0.0	0.1	0.012	0.008	0.010
LA: Baton Rouge	7	0.0	0.0	0.0	0.013	0.007	0.009
LA: Shreveport	8	0.1	0.0	0.0	0.015	0.007	0.009
MA: Worcester	9	0.0	0.0	0.0	0.011	0.004	0.007
MD: Baltimore	7	0.0	0.0	0.0	0.017	0.005	0.011
ME: Orono	5	0.0	0.0	0.0	0.009	0.004	0.006
ME: Portland	9	0.0	-0.0	0.0	0.012	0.005	0.008
MI: Bay City 48708	7	0.1	0.0	0.0	0.020	0.010	0.012
MI: Detroit	7	0.1	0.0	0.0	0.013	0.008	0.010
MN: Duluth	7	0.1	0.0	0.0	0.016	0.006	0.011
MN: St. Paul	5	0.1	0.0	0.0	0.017	0.007	0.012
MN: Welch/510	7	0.1	0.0	0.0	0.042	0.012	0.028
MO: Jefferson City	7	0.3	0.0	0.1	0.026	0.010	0.014
MO: Springfield	6	0.2	0.0	0.1	0.032	0.012	0.018
MS: Jackson	6	0.2	0.0	0.1	0.025	0.012	0.018
MS: Jackson/Deq	8	0.2	0.0	0.1	0.023	0.010	0.013
MT: Billings	1	0.0	0.0	0.0	0.029	0.029	0.029
NC: Charlotte	7	0.1	0.0	0.0	0.022	0.005	0.011
NC: Wilmington	3				0.008	0.008	0.008
ND: Bismarck	5	0.1	0.0	0.1	0.031	0.006	0.014
NE: Kearney	7	0.3	0.1	0.2	0.035	0.006	0.016
NE: Lincoln	8	0.3	0.0	0.2	0.030	0.006	0.016
NE: Omaha	5	0.1	0.0	0.0	0.033	0.010	0.018
NJ: Edison	8	0.0	-0.0	0.0	0.009	0.004	0.007
NJ: Trenton	8	0.1	0.1	0.1	0.017	0.005	0.011
NM: Carlsbad	4				0.019	0.009	0.014
NM: Santa Fe	5	3.6	0.0	0.7	0.020	0.010	0.016
NV: Las Vegas/913	6	0.1	0.0	0.0	0.017	0.006	0.010
NY: Albany	10	0.1	0.0	0.0	0.066	0.009	0.017
NY: Hauppauge	5	0.0	-0.0	0.0	0.017	0.007	0.012
NY: Lockport	9	0.0	0.0	0.0	0.011	0.006	0.008
NY: Rochester	7	0.1	0.0	0.0	0.009	0.003	0.006
NY: Yaphank	5	0.0	0.0	0.0	0.006	0.003	0.005
OH: Cincinnati	8	0.1	0.0	0.0	0.021	0.007	0.011
OH: Cleveland	9	0.1	0.0	0.0	0.019	0.006	0.011
OH: Painesville	5	0.0	0.0	0.0	0.014	0.010	0.012
OK: Oklahoma City	6	0.2	0.0	0.1	0.015	0.005	0.009
OK: Tulsa	5	0.0	0.0	0.0	0.019	0.007	0.014

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2009

Location	Number of Samples	5-hour Field Estimate Max (pCi/m³)	5-hour Field Estimate Min (pCi/m³)	5-hour Field Estimate Avg (pCi/m³)	NAREL Lab Measurement Max (pCi/m³)	NAREL Lab Measurement Min (pCi/m³)	NAREL Lab Measurement Avg (pCi/m³)
OR: Portland	6	0.2	0.0	0.1	0.051	0.006	0.024
PA: Harrisburg	7	0.1	0.0	0.0	0.019	0.006	0.012
PA: Philadelphia	1				0.028	0.028	0.028
PA: Pittsburgh	6	0.2	0.0	0.1	0.016	0.008	0.011
SC: Barnwell	2	0.0	0.0	0.0	0.011	0.008	0.010
SC: Columbia	2	0.1	0.0	0.0	0.011	0.010	0.010
SD: Pierre	8	0.5	0.0	0.2	0.030	0.006	0.017
SD: Rapid City	5	0.2	0.0	0.2	0.029	0.008	0.016
TN: Knoxville	8	0.1	0.0	0.1	0.013	0.004	0.008
TN: Memphis	7	0.0	0.0	0.0	0.039	0.007	0.018
TN: Nashville	2	0.0	0.0	0.0	0.020	0.008	0.014
TN: Oak Ridge/Bethel	7	0.2	0.0	0.1	0.021	0.009	0.016
TN: Oak Ridge/K25	7	0.3	0.0	0.2	0.023	0.011	0.017
TN: Oak Ridge/Melton	7	0.2	0.0	0.1	0.028	0.009	0.016
TN: Oak Ridge/Y12 E	7	0.2	0.0	0.1	0.023	0.011	0.017
TN: Oak Ridge/Y12 W	7	0.1	0.0	0.1	0.022	0.010	0.017
TX: Amarillo	2	0.9	0.4	0.6	0.012	0.010	0.011
TX: Dallas	4	0.2	0.1	0.1	0.011	0.007	0.009
TX: El Paso	5	2.4	0.1	1.2	0.026	0.009	0.018
TX: Ft. Worth	4	0.1	0.0	0.0	0.020	0.010	0.015
TX: Harlingen	7	0.4	0.1	0.2	0.022	0.005	0.012
TX: Houston	2				0.013	0.010	0.011
TX: Laredo	6	0.4	0.0	0.1	0.014	0.007	0.010
TX: San Angelo	4	0.0	0.0	0.0	0.016	0.008	0.012
TX: San Antonio	9	0.4	0.0	0.2	0.018	0.007	0.010
UT: Salt Lake City	7	0.1	0.0	0.1	0.018	0.007	0.012
VA: Harrisonburg	5	0.2	0.0	0.1	0.010	0.005	0.007
VA: Lynchburg	7	0.4	0.1	0.2	0.019	0.009	0.014
VA: Richmond	8	0.0	0.0	0.0	0.009	0.003	0.007
VA: Virginia Beach	6	0.0	0.0	0.0	0.009	0.005	0.007
WA: Olympia	8	0.1	0.0	0.0	0.012	0.002	0.006
WA: Richland	8	0.3	0.0	0.1	0.032	0.001	0.015
WA: Seattle	7	0.0	-0.0	0.0	0.010	0.002	0.006
WA: Spokane	8	0.1	0.0	0.1	0.038	0.004	0.018
WI: Madison	1	0.1	0.1	0.1	0.005	0.005	0.005
WI: Milwaukee	9	0.0	-0.1	-0.1	0.024	0.008	0.015
WV: Charleston	6	0.0	0.0	0.0	0.018	0.008	0.013

Table 5
Gross Beta and Specific Gamma in Precipitation
October 2009

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.80	0.35	Be7	18	19
AR: Little Rock	0.50	0.32	Be7	27	17
CA: Richmond	0.27	0.31	Be7	19	15
CO: Denver	3.72	0.66	Be7	60	24
CT: Hartford	1.33	0.40	Be7	31	23
FL: Jacksonville	0.97	0.36		ND	
GA: Atlanta	0.31	0.30		ND	
KS: Kansas City	0.77	0.35		ND	
MI: Lansing	1.82	0.47	Be7	20	17
MN: St. Paul	1.45	0.43	Tl208	1.1	1.5
MN: Welch/510	2.39	0.51	Be7	32	27
			Pb212	1.7	2.8
NC: Charlotte	1.17	0.38	Be7	29	26
NC: Wilmington	0.84	0.35	Be7	42	29
NM: Santa Fe	2.32	0.49		ND	
NY: Albany	1.43	0.41	Be7	17	11
NY: Yaphank	0.74	0.34		ND	
OR: Portland	0.69	0.34	Be7	87	52
PA: Harrisburg	1.21	0.39	Tl208	2.4	3.5
TN: Knoxville	0.64	0.32		ND	
TN: Nashville	0.76	0.34	Be7	55	26
			Pb212	2.0	3.0
TN: Oak Ridge/K25	1.16	0.38	Be7	55	20
TN: Oak Ridge/Melton	1.30	0.39		ND	
TN: Oak Ridge/Y12 E	0.71	0.34	Be7	28	24
UT: Salt Lake City	2.77	0.56		ND	
VA: Lynchburg	6.4	1.2		ND	
WA: Olympia	1.12	0.39	Be7	41	19

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
November 2009

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.51	0.33	Be7	42	14
AR: Little Rock	0.97	0.37	Be7	22	22
			Pb212	2.1	2.5
CA: Richmond	1.14	0.67		ND	
CO: Denver	0.67	0.34		ND	
CT: Hartford	1.02	0.38	Be7	37	16
FL: Jacksonville	1.71	0.44	Be7	45	22
GA: Atlanta	0.28	0.29		ND	
ID: Idaho Falls	1.25	0.42	Ra223	17	15
KS: Kansas City	0.85	0.36		ND	
MI: Lansing	0.88	0.36	Be7	26	14
			K40	6	10
MN: St. Paul	0.56	0.32		ND	
NC: Charlotte	0.53	0.33		ND	
NC: Wilmington	1.10	0.38	Be7	52	15
			Pb212	1.2	1.0
			Tl208	1.06	0.75
NY: Albany	0.21	0.30	Pb212	1.3	2.6
NY: Yaphank	1.06	0.37	Bi212	18	19
OH: Painesville	1.14	0.39	K40	18	40
			Pb212	3.5	6.5
			Tl208	2.6	3.9
OR: Portland	0.78	0.33	K40	49	27
PA: Harrisburg	1.53	0.42		ND	
TN: Oak Ridge/K25	0.17	0.29	Pb212	1.2	1.7
TN: Oak Ridge/Melton	1.42	0.41		ND	
TN: Oak Ridge/Y12 E	0.28	0.30		ND	
VA: Lynchburg	2.33	0.50		ND	
WA: Olympia	0.19	0.30		ND	

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
December 2009

Location	Gross Beta Activity pCi/L	± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L	± 2*u*
AL: Montgomery/408	0.40	0.34	Be7	20	13
AR: Little Rock	0.85	0.37		ND	
AZ: Phoenix	0.96	0.39	Be7	39	36
			Bi212	45	38
CA: Richmond	0.55	0.35	Be7	40	21
CO: Denver	0.79	0.38	Be7	30	25
			Tl208	2.1	2.8
CT: Hartford	1.05	0.38	Be7	22	18
FL: Jacksonville	0.96	0.39	Be7	34	12
KS: Kansas City	0.44	0.34		ND	
MN: St. Paul	1.51	0.45	Be7	27	18
			Tl208	0.9	1.5
MN: Welch/510	0.75	0.37	K40	23	34
NC: Charlotte	1.09	0.40	Be7	35	18
NC: Wilmington	0.52	0.35	Be7	38	17
NY: Albany	2.74	0.57		ND	
NY: Yaphank	0.44	0.33	Bi212	10.2	9.8
OH: Painesville	1.48	0.44	K40	25	30
			Tl208	2.8	2.5
OR: Portland	0.61	0.38		ND	
PA: Harrisburg	2.03	0.48	Be7	34	34
TN: Knoxville	1.1	1.3		ND	
TN: Nashville	0.66	0.36		ND	
TN: Oak Ridge/K25	0.47	0.34	Be7	46	21
TN: Oak Ridge/Melton	0.26	0.32	Be7	24	17
TN: Oak Ridge/Y12 E	1.05	0.38	Be7	28	22
UT: Salt Lake City	1.36	0.44		ND	
VA: Lynchburg	3.12	0.59		ND	
WA: Olympia	2.13	0.50	Be7	39	16

Note: ND = Not Detected

Table 8
Tritium in Precipitation
October - December 2009

Location	October 2009 pCi/L	± 2*u*	November 2009 pCi/L	± 2*u*	December 2009 pCi/L	± 2*u*
AL: Montgomery/408	20	110	29	81	-50	96
AR: Little Rock	-10	110	17	80	-60	98
AZ: Phoenix	NS		NS		-28	98
CA: Richmond	26	91	4	80	17	99
CO: Denver	0	100	19	80	-69	94
CT: Hartford	-20	100	34	81	130	110
FL: Jacksonville	-50	100	21	81	-93	94
GA: Atlanta	-50	110	75	83	NS	
ID: Idaho Falls	NS		59	82	NS	
KS: Kansas City	-80	100	36	81	-45	96
MI: Lansing	70	110	15	80	NS	
MN: St. Paul	-30	110	21	81	80	100
MN: Welch/510	-40	110	NS		-47	96
NC: Charlotte	10	100	103	84	-90	100
NC: Wilmington	-40	100	50	100	30	110
NM: Santa Fe	-30	100	NS		NS	
NY: Albany	-80	100	-27	79	140	110
NY: Yaphank	20	110	101	85	10	110
OH: Painesville	NS		84	83	-2	98
OR: Portland	-32	88	6	80	-83	95
PA: Harrisburg	-20	110	-2	79	-40	100
TN: Knoxville	120	110	NS		-28	98
TN: Nashville	-92	99	NS		-91	94
TN: Oak Ridge/K25	128	96	430	110	70	100
TN: Oak Ridge/Melton	10	110	301	94	90	100
TN: Oak Ridge/Y12 E	2	91	730	120	260	110
UT: Salt Lake City	-10	90	NS		4	99
VA: Lynchburg	-60	100	31	82	17	99
WA: Olympia	89	95	40	81	70	100

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.

Table 9
Plutonium and Uranium in Airborne Particulates
January - December 2009 Composites

Location	^{238}Pu aCi/m³	± 2*u*	$^{239–240}$Pu aCi/m³	± 2*u*	^{234}U aCi/m³	± 2*u*	^{235}U aCi/m³	± 2*u*	^{238}U aCi/m³	± 2*u*
AK: Anchorage	-0.48	0.90	0.00	0.76	9.6	4.1	0.3	1.3	11.4	4.5
AK: Fairbanks	0.00	0.67	-0.11	0.70	9.4	3.2	1.0	1.3	5.8	2.5
AL: Birmingham	-0.05	0.31	0.09	0.42	19.3	5.9	0.6	1.5	14.1	5.0
AL: Montgomery/408	0.09	0.38	0.04	0.39	6.9	2.0	0.05	0.43	6.4	1.9
AR: Fort Smith	-0.73	0.98	0.00	0.77	18.4	5.2	0.6	1.4	13.9	4.5
AR: Little Rock	-0.28	0.66	0.00	0.58	15.2	5.1	3.9	2.8	10.2	4.1
AZ: Phoenix	0.3	1.4	0.3	1.1	30.6	8.5	1.1	1.9	34.4	9.1
AZ: Phoenix/956	0.4	3.5	1.2	3.4	54	17	6.8	6.8	49	17
AZ: Tucson	-0.6	1.5	-0.2	1.4	37	11	7.3	5.2	31	10
CA: Anaheim	-0.2	1.5	0.0	1.4	42	12	0.5	2.2	31.1	9.8
CA: Bakersfield	-0.3	3.9	-0.3	1.9	71	19	2.9	4.5	72	19
CA: Eureka	-0.07	0.49	0.22	0.65	3.3	1.8	0.26	0.76	4.1	2.0
CA: Fresno	0.0	1.3	0.00	0.86	14.1	5.0	2.6	2.4	13.1	4.8
CA: Los Angeles	-0.49	0.92	-0.25	0.85	26.2	7.3	2.0	2.3	16.6	5.7
CA: Richmond	0.14	0.79	0.28	0.77	5.9	2.2	0.27	0.73	4.8	2.0
CA: Riverside	1.0	1.4	-0.18	0.63	25.9	6.9	3.7	2.6	28.1	7.3
CA: Sacramento	-0.15	0.99	0.9	1.6	14.3	5.6	0.9	1.9	12.2	5.1
CA: San Bernardino Cty.	-1.0	2.5	1.0	3.0	47	15	3.0	4.7	42	14
CA: San Diego	-0.35	0.65	0.8	1.1	27.9	6.8	1.7	1.7	23.3	6.0
CA: San Francisco	-0.14	0.33	-0.18	0.34	3.8	1.6	0.24	0.67	3.6	1.6
CA: San Jose	-0.23	0.43	1.8	1.2	9.5	2.9	0.83	0.95	5.7	2.2
CO: Colorado Springs	0.5	1.0	0.5	1.0	21.7	5.5	2.6	2.0	20.4	5.3
CO: Denver	0.14	0.62	0.21	0.61	15.1	3.9	0.52	0.93	16.0	4.1
CT: Hartford	0.8	1.3	-0.31	0.75	8.8	3.1	0.8	1.1	7.0	2.7
DC: Washington	-1.0	1.1	0.5	1.4	9.2	3.6	1.4	1.6	8.3	3.4
DE: Dover	0.21	0.45	0.11	0.31	5.5	1.7	0.08	0.35	5.2	1.6
DE: Wilmington	1.4	2.2	-0.4	1.2	12.1	4.8	0.2	1.4	10.7	4.4
FL: Jacksonville	-0.14	0.33	0.50	0.63	9.2	2.5	0.45	0.61	8.3	2.3
FL: Miami	-0.14	0.49	0.57	0.88	17.3	4.4	0.8	1.0	11.9	3.6
FL: Orlando	0.50	0.58	2.0	1.0	8.2	2.3	1.01	0.88	9.1	2.5
FL: Tallahassee	13.9	3.7	14.4	3.8	7.5	2.3	0.53	0.74	6.8	2.1
FL: Tallahassee	-0.10	0.36	0.78	0.78	7.5	2.3	0.53	0.74	6.8	2.1
FL: Tampa	0.3	1.0	1.0	1.3	59	11	4.5	2.6	69	12
GA: Atlanta	0.00	0.33	0.14	0.30	10.9	2.4	1.06	0.73	10.2	2.3
GA: Augusta	0.00	0.58	0.18	0.54	7.7	2.5	1.3	1.1	9.5	2.8
HI: Honolulu	0.00	0.54	0.00	0.36	3.1	1.5	-0.06	0.40	1.8	1.1
IA: Des Moines	0.2	1.0	0.00	0.71	19.9	6.1	0.7	1.6	14.0	5.1
IA: Iowa City	0.1	1.2	0.4	1.1	8.7	3.7	1.1	1.7	11.1	4.2
IA: Mason City	0.0	1.2	0.5	1.4	10.6	4.4	1.8	2.1	10.0	4.2
ID: Idaho Falls	-0.2	1.4	1.2	2.2	32.3	9.8	3.8	4.0	28.0	8.9

Note: NA = No Analysis

Table 9 (continued)
Plutonium and Uranium in Airborne Particulates
January - December 2009 Composites

Location	^{238}Pu		$^{239-240}$Pu		^{234}U		^{235}U		^{238}U	
	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*
IL: Aurora	-0.37	0.90	0.00	0.79	11.0	4.8	1.2	2.2	13.3	5.3
IL: Chicago	1.4	2.0	-0.33	0.80	14.8	4.7	1.7	1.8	9.3	3.8
IN: Indianapolis	-0.44	0.69	0.18	0.79	10.3	3.6	0.3	1.1	10.9	3.7
KS: Kansas City	-0.13	0.84	0.00	0.80	19.0	7.0	2.2	2.8	12.6	5.5
KS: Topeka	-0.2	1.0	-0.2	1.5	17.0	6.2	2.1	2.6	9.9	4.7
KS: Wichita	-0.4	1.0	0.4	1.3	19.5	6.6	1.4	2.2	21.4	6.9
KY: Lexington	-0.18	0.60	0.12	0.54	7.1	2.5	0.41	0.73	8.4	2.7
KY: Louisville	-0.19	0.66	0.29	0.83	9.2	3.2	0.36	0.98	8.1	3.0
LA: Baton Rouge	-0.3	1.1	-0.2	1.1	15.7	5.9	1.6	2.2	16.6	5.9
LA: Shreveport	0.00	0.93	0.00	0.44	5.5	1.9	0.82	0.85	5.2	1.8
MA: Boston	0.3	1.4	-0.2	1.0	8.6	3.1	1.0	1.2	6.7	2.7
MA: Worcester	-0.4	2.0	0.6	2.3	21.0	6.3	0.3	1.4	17.2	5.7
MD: Baltimore	0.6	1.2	0.1	1.0	7.5	3.2	0.1	1.1	6.4	2.9
ME: Orono	-0.33	0.80	-0.11	0.74	7.9	2.8	0.7	1.2	6.5	2.5
ME: Portland	3.2	3.1	1.1	1.9	28.0	8.7	1.3	2.3	25.3	8.2
MI: Bay City 48708	0.00	0.70	-0.07	0.71	5.4	2.1	0.77	0.96	5.3	2.1
MI: Detroit	0.5	1.2	-0.11	0.73	15.7	4.8	0.9	1.5	10.1	3.8
MI: Lansing	-0.62	0.66	0.16	0.70	22.0	5.4	1.1	1.3	17.6	4.7
MN: Duluth	-0.08	0.53	0.24	0.70	2.9	1.4	0.23	0.62	4.2	1.7
MN: St. Paul	1.1	1.6	-0.20	0.71	7.7	3.2	1.3	1.6	10.1	3.7
MN: Welch/510	-0.12	0.82	0.2	1.1	14.6	5.0	0.3	1.3	9.7	4.0
MO: Jefferson City	0.35	0.68	0.13	0.38	6.6	2.2	0.44	0.69	7.6	2.3
MO: Springfield	-0.30	0.57	0.00	0.71	6.2	2.7	1.9	1.6	5.1	2.3
MO: St. Louis	-0.83	0.75	0.00	0.52	10.3	3.9	0.7	1.3	12.1	4.2
MS: Jackson	0.36	0.65	-0.05	0.34	9.6	2.7	0.96	0.92	7.6	2.3
MS: Jackson/Deq	0.00	0.83	-0.09	0.59	6.3	2.5	0.8	1.0	5.9	2.5
MT: Billings	-0.8	1.3	0.8	1.7	34.5	9.4	1.8	2.4	25.1	7.8
NC: Charlotte	0.37	0.79	-0.06	0.41	11.3	3.0	0.71	0.81	8.2	2.5
NC: Raleigh	-0.13	0.44	0.32	0.68	13.6	3.8	1.3	1.3	14.0	3.8
NC: Wilmington	0.9	1.1	-0.08	0.54	5.9	2.4	0.39	0.85	6.0	2.4
ND: Bismarck	-0.13	0.90	-0.1	1.3	13.2	5.0	0.6	1.7	10.1	4.3
NE: Kearney	-0.8	1.3	0.00	0.73	20.1	6.1	0.9	1.8	18.0	5.7
NE: Lincoln	-0.1	1.3	0.00	0.86	15.8	5.8	-0.4	1.2	11.9	5.0
NE: Omaha	-0.6	1.4	0.1	1.0	20.2	5.7	1.2	1.9	16.8	5.1
NH: Concord	-0.14	0.92	0.1	1.3	4.4	3.1	0.5	1.5	2.7	2.5
NJ: Edison	0.8	1.2	0.24	0.88	7.3	2.8	0.7	1.1	7.3	2.8
NJ: Trenton	-0.13	0.84	-0.38	0.91	10.2	3.9	1.1	1.5	7.8	3.3
NM: Carlsbad	0.3	1.6	0.8	1.5	14.7	6.0	0.8	2.2	17.5	6.5
NM: Santa Fe	-0.4	1.9	0.6	1.3	15.5	5.0	0.8	1.4	15.5	5.0
NV: Las Vegas/913	0.19	0.86	0.29	0.84	36.4	8.5	2.5	2.3	21.5	6.1

Note: NA = No Analysis

Table 9 (continued)
Plutonium and Uranium in Airborne Particulates
January - December 2009 Composites

Location	^{238}Pu		$^{239-240}$Pu		^{234}U		^{235}U		^{238}U	
	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*
NV: Reno	-0.1	1.0	-0.10	0.69	23.8	6.1	1.4	1.6	21.3	5.7
NY: Albany	-0.6	1.5	-0.8	1.6	14.8	5.9	0.6	1.8	15.7	6.1
NY: Hauppauge	-0.18	0.64	0.5	1.0	4.6	2.2	0.7	1.1	5.3	2.3
NY: Lockport	-0.12	0.80	-0.36	0.88	4.6	1.9	0.60	0.82	3.0	1.5
NY: Rochester	0.29	0.83	0.00	0.60	8.0	2.9	0.00	0.58	4.5	2.2
NY: Syracuse	-0.3	1.6	0.1	1.2	7.5	3.9	1.6	2.1	4.5	3.1
NY: Yaphank	0.6	1.4	0.3	1.2	5.3	2.6	0.9	1.3	6.1	2.7
OH: Cincinnati	0.3	1.1	-0.22	0.54	13.3	3.8	0.49	0.86	15.0	4.1
OH: Cleveland	0.7	1.7	0.8	1.4	18.1	5.8	1.4	1.9	14.8	5.2
OH: Columbus	0.00	0.75	-0.12	0.79	24.7	7.1	2.3	2.3	13.3	5.0
OH: Painesville	0.42	0.75	0.36	0.64	6.8	2.4	1.1	1.1	6.7	2.4
OK: Oklahoma City	0.1	1.0	0.6	1.2	13.9	4.9	0.6	1.5	9.2	4.0
OK: Tulsa	-0.7	1.7	-1.2	1.8	39	12	0.9	2.6	33	11
OR: Corvallis	0.19	0.84	-0.09	0.62	2.7	1.5	0.48	0.86	3.7	1.7
OR: Portland	0.7	1.0	0.00	0.52	10.4	3.7	0.4	1.2	11.0	3.8
PA: Harrisburg	1.4	2.0	1.1	1.8	5.8	2.4	0.42	0.91	5.2	2.3
PA: Philadelphia	-0.06	0.58	0.12	0.54	13.2	3.7	0.54	0.97	10.2	3.2
PA: Pittsburgh	0.09	0.42	0.00	0.30	9.8	2.5	0.38	0.67	10.4	2.6
RI: Providence	0.08	0.78	0.42	0.91	8.1	3.1	1.0	1.4	8.4	3.1
SC: Barnwell	-0.05	0.13	0.09	0.19	8.3	2.2	1.20	0.82	5.7	1.7
SC: Columbia	0.52	0.56	0.19	0.40	15.0	3.3	0.23	0.60	12.3	2.9
SD: Pierre	1.1	2.0	0.6	1.6	14.3	6.0	1.1	2.3	23.1	7.7
SD: Rapid City	-0.2	1.5	-0.2	1.1	23.1	6.2	1.2	1.8	22.7	6.2
TN: Knoxville	-0.08	0.48	-0.08	0.28	6.3	1.9	1.11	0.85	7.0	2.0
TN: Memphis	0.06	0.72	0.19	0.70	12.0	3.4	1.2	1.2	11.1	3.2
TN: Nashville	0.06	0.28	-0.09	0.22	7.8	2.1	0.60	0.60	6.2	1.8
TN: Oak Ridge/Bethel	-0.08	0.52	-0.08	0.52	11.7	3.2	0.57	0.77	7.2	2.4
TN: Oak Ridge/K25	12.9	3.1	8.9	2.5	30.3	5.2	1.53	0.91	16.4	3.3
TN: Oak Ridge/K25	11.7	3.0	9.9	2.7	30.3	5.2	1.53	0.91	16.4	3.3
TN: Oak Ridge/Melton	0.10	0.44	0.10	0.44	8.4	2.2	1.02	0.82	6.2	1.9
TN: Oak Ridge/Y12 E	-0.20	0.71	0.5	1.1	28.4	6.2	1.0	1.3	14.9	4.1
TN: Oak Ridge/Y12 W	0.53	0.94	0.33	0.72	55.6	9.6	2.0	1.4	16.4	4.0
TX: Amarillo	-0.21	0.73	0.32	0.92	9.8	4.2	1.4	1.9	17.2	5.8
TX: Austin	-0.66	0.89	0.6	1.2	15.2	5.5	1.5	2.0	12.2	4.9
TX: Corpus Christi	-1.1	1.7	0.2	2.1	13.1	5.6	3.1	3.1	16.5	6.3
TX: Dallas	-0.51	0.79	-0.20	0.70	11.7	4.5	2.0	2.1	12.6	4.7
TX: El Paso	-0.8	2.8	-0.4	2.6	51	19	5.5	7.5	54	20
TX: Ft. Worth	-0.8	1.6	0.0	1.3	20.8	9.3	1.7	3.6	18.6	8.8
TX: Harlingen	-0.49	0.76	0.19	0.87	11.5	4.3	0.9	1.7	7.6	3.5
TX: Houston	-0.1	1.2	-0.37	0.89	11.2	4.9	1.1	2.3	22.2	7.1

Note: NA = No Analysis

Table 9 (continued)
Plutonium and Uranium in Airborne Particulates
January - December 2009 Composites

Location	^{238}Pu		$^{239-240}$Pu		^{234}U		^{235}U		^{238}U	
	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*	aCi/m³	± 2*u*
TX: Laredo	-0.38	0.91	-0.3	1.2	9.2	3.9	0.7	1.5	11.4	4.3
TX: San Angelo	-0.5	1.0	0.00	0.87	6.6	3.2	0.6	1.4	5.8	2.9
TX: San Antonio	0.5	1.8	0.2	1.5	17.5	6.8	5.5	4.3	14.2	6.1
UT: Salt Lake City	-0.1	1.1	1.3	1.5	28.8	7.5	0.7	1.5	26.0	7.0
VA: Harrisonburg	-0.23	0.35	0.00	0.29	6.0	1.9	0.49	0.68	4.9	1.7
VA: Lynchburg	0.11	0.41	0.22	0.46	27.1	4.7	1.17	0.78	4.7	1.5
VA: Richmond	0.27	0.58	0.16	0.47	7.1	2.0	1.08	0.84	7.9	2.1
VA: Virginia Beach	0.00	0.44	-0.05	0.31	7.6	2.0	1.01	0.80	7.6	2.0
WA: Olympia	-0.17	0.60	-0.09	0.57	3.1	1.4	0.49	0.67	2.7	1.3
WA: Richland	0.0	1.7	0.0	1.1	17.5	6.8	1.1	2.4	17.9	7.0
WA: Seattle	0.00	0.32	-0.14	0.26	8.2	2.2	0.43	0.60	7.7	2.1
WA: Spokane	-0.29	0.69	0.00	0.61	11.5	3.9	0.22	0.97	9.9	3.6
WI: Madison	-0.66	0.75	0.20	0.58	9.6	3.1	0.17	0.76	11.2	3.5
WI: Milwaukee	-0.42	0.80	0.21	0.95	7.2	3.0	-0.21	0.74	5.8	2.8
WV: Charleston	0.09	0.75	0.00	0.43	9.4	2.5	0.78	0.75	10.1	2.5

Note: NA = No Analysis

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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, 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 on annual composites; (d) iodine-131 on one quarterly sample per year for each station; and (e) 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 on annual composites; and (f) strontium-90 on one-fourth of the annual composites on a four year rotating schedule.

Table 10
Tritium in Drinking Water
October - December 2009

Location	Date Collected	^{3}H pCi/L	± 2*u*
AK: Fairbanks	10/26/09	-14	92
AL: Dothan	10/02/09	65	94
AL: Montgomery	10/13/09	-34	75
AL: Muscle Shoals	10/15/09	174	85
AL: Scottsboro	10/14/09	90	81
AR: Little Rock	10/06/09	10	91
CA: Los Angeles	10/06/09	-13	76
CA: Richmond	10/12/09	-8	76
CO: Denver	10/13/09	-8	76
CT: Hartford	10/08/09	19	77
DE: Dover	10/05/09	59	93
FL: Miami	12/03/09	24	98
FL: Tampa	10/05/09	34	93
GA: Baxley	10/20/09	29	98
GA: Savannah	12/16/09	-9	97
HI: Honolulu	10/27/09	-44	91
IA: Cedar Rapids	10/14/09	-29	74
ID: Boise	12/07/09	-45	95
ID: Idaho Falls	10/13/09	-15	98
IL: Morris	10/05/09	23	92
IL: W. Chicago	12/01/09	50	100
LA: New Orleans	12/16/09	-9	98
MD: Baltimore	10/05/09	86	95
MD: Conowingo	11/02/09	53	95
MI: Detroit	12/01/09	80	100
MI: Grand Rapids	09/30/09	16	84
MI: Grand Rapids	12/18/09	39	99
MN: St. Paul	10/15/09	-23	75
MN: Welch	10/06/09	-56	73
MO: Jefferson City	10/05/09	36	92
MS: Jackson	10/06/09	29	98
MS: Port Gibson	10/06/09	21	92
MT: Helena	10/19/09	46	99
NC: Raleigh	10/07/09	8	91
ND: Bismarck	10/02/09	2	77
NE: Lincoln	10/05/09	40	93
NJ: Trenton	10/05/09	21	92
NJ: Waretown	10/06/09	8	91
NM: Santa Fe	12/21/09	-39	97
NY: Albany	10/27/09	170	110

Table 10 (continued)
Tritium in Drinking Water
October - December 2009

Location	Date Collected	^{3}H pCi/L	± 2*u*
NY: New York City	10/13/09	-15	76
NY: Niagara Falls	10/22/09	50	110
NY: Syracuse	12/09/09	-30	97
OH: Cincinnati	11/19/09	120	89
OH: Cincinnati	11/19/09	63	94
OH: E. Liverpool	10/21/09	-17	97
OH: Painesville	10/15/09	25	78
OH: Toledo	10/05/09	160	100
OK: Oklahoma City	10/05/09	-8	91
OR: Portland	12/29/09	28	99
PA: Columbia	11/05/09	0	100
PA: Harrisburg	11/06/09	37	85
PA: Harrisburg	11/06/09	-5	90
PA: Philadelphia/Baxter	10/07/09	46	79
PA: Philadelphia/Belmont	10/07/09	-19	76
PA: Philadelphia/Queen	10/07/09	-23	75
PA: Pittsburgh	10/21/09	-20	100
RI: Providence	11/05/09	50	100
SC: Barnwell	10/20/09	29	99
SC: Columbia	10/21/09	110	100
SC: Jenkinsville	10/13/09	70	100
SC: Seneca	10/12/09	30	100
TN: Chattanooga	10/05/09	230	100
TN: Knoxville	12/09/09	-97	93
TN: Oak Ridge/#360	10/06/09	-23	75
TN: Oak Ridge/#371	10/06/09	-4	90
TN: Oak Ridge/#4442	10/06/09	40	79
TN: Oak Ridge/#768	10/06/09	69	94
TN: Oak Ridge/#772	10/06/09	21	77
TX: Austin	10/02/09	-13	76
VA: Ashland	10/20/09	3120	200
VA: Lynchburg	10/02/09	-22	82
WA: Richland	10/26/09	10	100
WA: Seattle	12/15/09	-6	97

Table 11
Plutonium and Uranium Analyses
Selected Drinking Water Composite Samples
January - December 2009

Location	^{238}Pu pCi/L ± 2*u*	$^{239-240}$Pu pCi/L ± 2*u*	^{234}U pCi/L ± 2*u*	^{235}U pCi/L ± 2*u*	^{238}U pCi/L ± 2*u*
GA: Baxley	-0.004 0.015	0.000 0.014	0.025 0.038	0.011 0.030	0.039 0.043
LA: New Orleans	0.007 0.019	0.004 0.020	0.47 0.11	0.005 0.031	0.335 0.095
MN: Welch	0.004 0.024	0.019 0.026	0.081 0.043	0.004 0.019	0.029 0.028
NE: Lincoln	0.013 0.023	0.000 0.014	3.55 0.41	0.141 0.069	2.59 0.33
NM: Santa Fe	0.006 0.023	0.000 0.013	2.79 0.33	0.050 0.040	0.88 0.15
SC: Barnwell	-0.011 0.017	0.007 0.019	0.023 0.030	-0.002 0.014	0.034 0.031

Note: NA = No Analysis

Table 12
Iodine-131 in Drinking Water
January - December 2009

Location	Date Collected	^{131}I pCi/L	± 2*u*
AK: Fairbanks	07/22/09	0.20	0.31
AL: Dothan	01/22/09	0.01	0.12
AL: Montgomery	04/06/09	-0.023	0.099
AL: Muscle Shoals	01/15/09	-0.08	0.35
AL: Muscle Shoals	04/15/09	0.01	0.12
AL: Scottsboro	01/14/09	0.40	0.43
AL: Scottsboro	04/14/09	0.02	0.19
AR: Little Rock	04/17/09	0.04	0.13
CA: Los Angeles	07/06/09	-0.05	0.20
CA: Richmond	04/08/09	-0.06	0.14
CO: Denver	01/13/09	0.01	0.15
CT: Hartford	07/09/09	-0.23	0.30
DE: Dover	04/03/09	0.09	0.19
FL: Miami	04/20/09	0.02	0.11
FL: Tampa	01/14/09	-0.11	0.39
GA: Baxley	10/20/09	0.23	0.30
GA: Savannah	03/25/09	0.08	0.15
HI: Honolulu	03/10/09	0.04	0.16
IA: Cedar Rapids	01/15/09	-0.04	0.36
ID: Boise	03/13/09	0.06	0.12
ID: Idaho Falls	07/21/09	0.14	0.16
IL: Morris	10/05/09	0.11	0.15
IL: W. Chicago	04/06/09	-0.02	0.14
LA: New Orleans	03/26/09	0.13	0.25
MD: Baltimore	04/06/09	0.05	0.15
MD: Conowingo	02/03/09	0.08	0.20
MI: Detroit	05/11/09	-0.04	0.25
MI: Grand Rapids	12/18/09	0.46	0.77
MN: St. Paul	04/07/09	-0.01	0.18
MO: Jefferson City	04/07/09	0.05	0.14
MS: Jackson	07/07/09	-0.15	0.37
MS: Port Gibson	01/13/09	-0.01	0.15
MT: Helena	01/22/09	-0.09	0.18
NC: Raleigh	04/15/09	0.00	0.15
ND: Bismarck	04/03/09	-0.03	0.14
NE: Lincoln	01/13/09	0.07	0.16
NE: Lincoln	04/15/09	0.00	0.14
NJ: Trenton	04/08/09	0.02	0.16
NJ: Waretown	04/15/09	0.13	0.15
NM: Santa Fe	12/21/09	-0.17	0.62
NV: Las Vegas	04/13/09	0.32	0.36

Table 12 (continued)
Iodine-131 in Drinking Water
January - December 2009

Location	Date Collected	^{131}I pCi/L	± 2*u*
NY: Albany	04/14/09	0.06	0.13
NY: New York City	01/29/09	0.02	0.29
NY: Niagara Falls	03/03/09	0.04	0.16
NY: Syracuse	02/19/09	-0.01	0.16
OH: Cincinnati	02/26/09	-0.05	0.19
OH: Columbus	09/29/09	0.23	0.40
OH: E. Liverpool	02/19/09	0.30	0.18
OH: Painesville	02/17/09	0.06	0.21
OH: Toledo	04/03/09	0.01	0.14
OK: Oklahoma City	01/12/09	0.03	0.12
OR: Portland	03/27/09	-0.05	0.14
PA: Columbia	04/29/09	0.26	0.17
PA: Harrisburg	04/30/09	0.17	0.21
PA: Philadelphia/Baxter	01/26/09	0.63	0.17
PA: Philadelphia/Baxter	04/27/09	0.43	0.16
PA: Philadelphia/Baxter	08/17/09	0.25	0.17
PA: Philadelphia/Baxter	10/07/09	0.43	0.20
PA: Philadelphia/Belmont	01/26/09	3.58	0.32
PA: Philadelphia/Belmont	04/27/09	0.95	0.19
PA: Philadelphia/Belmont	08/17/09	0.98	0.35
PA: Philadelphia/Belmont	10/07/09	2.11	0.28
PA: Philadelphia/Queen	01/26/09	3.80	0.32
PA: Philadelphia/Queen	08/17/09	0.62	0.17
PA: Philadelphia/Queen	10/07/09	1.87	0.28
RI: Providence	11/05/09	0.8	1.3
SC: Barnwell	07/21/09	0.35	0.33
SC: Columbia	01/29/09	0.01	0.29
TN: Chattanooga	04/04/09	0.09	0.12
TN: Knoxville	05/12/09	0.09	0.20
TN: Oak Ridge/#360	04/08/09	0.04	0.14
TN: Oak Ridge/#371	04/08/09	0.04	0.24
TN: Oak Ridge/#4442	04/08/09	0.16	0.17
TN: Oak Ridge/#768	04/08/09	0.01	0.16
TN: Oak Ridge/#772	04/08/09	0.03	0.17
TX: Austin	01/12/09	0.05	0.11
VA: Ashland	02/20/09	0.33	0.21
VA: Lynchburg	04/02/09	0.04	0.17
WA: Richland	01/19/09	0.05	0.17
WA: Seattle	06/08/09	-0.02	0.14

Table 13
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
Composites
January - December 2009

Location	Total Solids (mg/L)	Gross Beta pCi/L ± 2*u*	Gross Alpha pCi/L ± 2*u*	^{90}Sr pCi/L ± 2*u*
AK: Fairbanks	59.5	2.5 2.1	1.0 2.7	
AL: Dothan	55.6	3.5 2.2	-0.6 2.4	0.05 0.23
AL: Montgomery	28.0	2.1 1.3	0.3 1.3	0.10 0.23
AL: Muscle Shoals	51.8	2.3 1.3	0.0 1.5	0.24 0.22
AL: Scottsboro	40.7	1.5 1.5	-0.2 1.7	
AR: Little Rock	13.3	0.24 0.58	-0.10 0.55	
CA: Los Angeles	99.5	4.6 2.4	1.3 2.9	
CA: Richmond	56.7	0.03 0.77	0.26 0.93	
CO: Denver	99.2	2.03 0.97	0.2 1.0	
CT: Hartford	44.9	0.92 0.62	0.09 0.73	
DE: Dover	91.4	6.8 2.6	0.0 2.8	-0.10 0.19
FL: Miami	26.2	5.1 3.2	0.8 3.3	
FL: Tampa	59.1	3.8 1.7	0.2 1.9	
GA: Baxley	38.5	4.0 3.2	2.9 3.9	
GA: Savannah	66.6	2.2 1.6	0.4 1.9	
HI: Honolulu	76.7	3.2 2.2	1.4 2.9	
IA: Cedar Rapids	63.3	2.7 1.4	0.6 1.6	
ID: Boise	43.0	0.4 1.5	-0.1 1.7	
ID: Idaho Falls	72.7	4.4 3.3	0.0 3.9	
IL: Morris	48.2	3.5 6.2	5.9 8.0	
IL: W. Chicago	38.4	10.1 3.7	1.3 3.7	
KS: Topeka	106.3	11.3 3.1	0.4 2.7	
LA: New Orleans	79.1	2.7 1.7	4.4 2.8	
MD: Baltimore	107.7	2.1 1.2	-0.3 1.3	0.19 0.19
MD: Conowingo	33.1	4.7 3.0	-1.1 3.2	0.10 0.19
MI: Detroit	38.3	2.9 1.7	0.2 1.7	
MI: Grand Rapids	56.6	2.9 1.6	0.1 1.9	
MN: St. Paul	48.5	3.1 1.7	-0.1 1.7	
MN: Welch	38.7	3.4 5.9	3.2 7.6	
MO: Jefferson City	63.4	8.1 2.2	0.9 2.1	
MS: Jackson	26.1	3.4 1.4	0.4 1.3	
MS: Port Gibson	54.6	6.9 3.4	1.3 4.0	
MT: Helena	45.5	2.2 1.3	0.5 1.5	
NC: Raleigh	34.4	4.8 1.6	-0.4 1.3	
ND: Bismarck	62.4	3.8 2.4	0.6 2.6	
NE: Lincoln	86.0	12.7 3.1	7.3 4.0	
NJ: Trenton	70.1	2.1 1.1	-0.2 1.2	0.04 0.24

Table 13 (continued)
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
Composites
January - December 2009

Location	Total Solids (mg/L)	Gross Beta pCi/L ± 2*u*	Gross Alpha pCi/L ± 2*u*	^{90}Sr pCi/L ± 2*u*
NJ: Waretown	69.1	2.66 0.83	0.55 0.84	0.03 0.16
NM: Santa Fe	80.8	2.5 1.3	7.5 2.7	
NV: Las Vegas	75.3	3.5 3.4	0.9 4.0	
NY: Albany	32.4	0.83 0.97	-0.3 1.1	0.13 0.17
NY: New York City	29.4	0.08 0.57	-0.18 0.62	0.05 0.17
NY: Niagara Falls	87.3	1.2 1.2	-0.4 1.5	0.42 0.19
NY: Syracuse	82.6	1.0 1.3	-0.2 1.5	0.26 0.21
OH: Cincinnati	45.6	0.1 2.0	-0.6 2.2	
OH: Columbus	73.4	4.3 1.8	-0.4 1.9	
OH: E. Liverpool	71.0	2.3 1.7	-0.1 1.9	
OH: Painesville	93.0	2.1 1.2	0.0 1.4	
OH: Toledo	51.4	3.2 1.6	0.9 2.0	
OK: Oklahoma City	82.2	4.3 1.6	-0.1 1.6	
OR: Portland	25.9	-0.19 0.57	0.13 0.64	
PA: Columbia	79.2	1.5 1.3	0.0 1.5	0.07 0.18
PA: Harrisburg	69.8	0.8 1.3	-0.3 1.5	0.15 0.21
PA: Philadelphia/Baxter	72.8	0.51 0.97	0.2 1.3	0.09 0.21
PA: Philadelphia/Belmont	93.7	1.7 1.7	-0.3 1.9	0.02 0.18
PA: Philadelphia/Queen	100.8	2.7 1.7	0.2 2.1	-0.03 0.19
PA: Pittsburgh	121.1	1.6 1.2	-0.6 1.3	0.23 0.27
RI: Providence	34.6	1.2 1.5	0.6 1.9	
SC: Barnwell	27.3	1.22 0.69	2.0 1.0	
SC: Columbia	46.3	2.24 0.76	0.33 0.79	
SC: Jenkinsville	41.4	1.54 0.71	0.40 0.76	
SC: Seneca	21.5	0.33 0.57	0.42 0.70	
TN: Chattanooga	48.0	1.5 1.6	-0.2 1.7	
TN: Knoxville	61.0	2.7 1.7	0.5 2.0	
TN: Oak Ridge/#360	51.1	1.7 1.3	-0.1 1.4	0.37 0.29
TN: Oak Ridge/#371	57.5	1.8 1.3	-0.1 1.4	0.32 0.28
TN: Oak Ridge/#4442	65.6	2.7 1.4	0.5 1.6	0.47 0.41
TN: Oak Ridge/#768	72.2	1.8 1.3	-0.4 1.5	0.24 0.36
TN: Oak Ridge/#772	68.7	2.2 1.3	0.5 1.6	0.04 0.37
TX: Austin	47.7	2.6 1.7	-0.3 1.7	
VA: Ashland	40.7	3.0 1.3	-0.3 1.3	0.07 0.31
VA: Lynchburg	38.3	0.2 1.1	-0.2 1.3	0.12 0.23
WA: Richland	67.5	0.89 0.80	-0.26 0.91	
WA: Seattle	13.5	-0.01 0.57	-0.07 0.55	

Table 14
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2009

Location	^{226}Ra pCi/L ± 2*u*	^{228}Ra pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
AK: Fairbanks	NA	NA		ND
AL: Dothan	NA	NA		ND
AL: Montgomery	NA	NA		ND
AL: Muscle Shoals	NA	NA		ND
AL: Scottsboro	NA	NA	Tl208	3.3 2.4
AR: Little Rock	NA	NA		ND
CA: Los Angeles	NA	NA		ND
CA: Richmond	NA	NA	K40	8 12
CO: Denver	NA	NA		ND
CT: Hartford	NA	NA		ND
DE: Dover	NA	NA	K40	17 12
			Pb212	2.2 2.5
FL: Miami	NA	NA		ND
FL: Tampa	NA	NA		ND
GA: Baxley	1.31 0.30	NA		ND
GA: Savannah	NA	NA		ND
HI: Honolulu	NA	NA		ND
IA: Cedar Rapids	NA	NA	Pb212	2.6 3.1
ID: Boise	NA	NA		ND
ID: Idaho Falls	NA	NA	K40	10 13
IL: Morris	1.60 0.33	NA		ND
IL: W. Chicago	NA	NA	K40	8 12
KS: Topeka	NA	NA	K40	11 12
LA: New Orleans	0.095 0.084	NA		ND
MD: Baltimore	NA	NA		ND
MD: Conowingo	NA	NA		ND
MI: Detroit	NA	NA		ND
MI: Grand Rapids	NA	NA	Tl208	1.4 1.8
MN: St. Paul	NA	NA		ND
MN: Welch	1.14 0.28	NA		ND
MO: Jefferson City	NA	NA		ND
MS: Jackson	NA	NA	Bi212	13 12
MS: Port Gibson	NA	NA	K40	13 13
MT: Helena	NA	NA	Bi212	12 16
NC: Raleigh	NA	NA	Pb212	2.7 1.6

Note: ND = Not Detected
NA = No Analysis

Table 14 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2009

Location	^{226}Ra pCi/L ± 2*u*	^{228}Ra pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
NC: Raleigh	NA	NA	Tl208	1.10 0.86
ND: Bismarck	NA	NA	K40	10 13
NE: Lincoln	0.20 0.11	NA	K40	26.6 9.3
NJ: Trenton	NA	NA		ND
NJ: Waretown	NA	NA	Pb212	1.1 1.6
NM: Santa Fe	0.059 0.073	NA		ND
NV: Las Vegas	NA	NA		ND
NY: Albany	NA	NA		ND
NY: New York City	NA	NA		ND
NY: Niagara Falls	NA	NA		ND
NY: Syracuse	NA	NA		ND
OH: Cincinnati	NA	NA		ND
OH: Columbus	NA	NA		ND
OH: E. Liverpool	NA	NA		ND
OH: Painesville	NA	NA		ND
OH: Toledo	NA	NA		ND
OK: Oklahoma City	NA	NA	Tl208	0.83 0.89
OR: Portland	NA	NA	K40	8 12
			Tl208	1.5 1.6
PA: Columbia	NA	NA		ND
PA: Harrisburg	NA	NA		ND
PA: Philadelphia/Baxter	NA	NA	K40	10 12
PA: Philadelphia/Belmont	NA	NA	Tl208	1.7 2.8
PA: Philadelphia/Queen	NA	NA	K40	11 13
PA: Pittsburgh	NA	NA		ND
RI: Providence	NA	NA		ND
SC: Barnwell	0.25 0.13	NA	Pb212	2.0 2.0
SC: Columbia	NA	NA		ND
SC: Jenkinsville	NA	NA		ND
SC: Seneca	NA	NA		ND
TN: Chattanooga	NA	NA		ND
TN: Knoxville	NA	NA	Tl208	1.2 1.6
TN: Oak Ridge/#360	NA	NA		ND
TN: Oak Ridge/#371	NA	NA	Pb212	1.2 1.3
TN: Oak Ridge/#4442	NA	NA		ND

Note: ND = Not Detected
NA = No Analysis

Table 14 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
Composites
January - December 2009

Location	^{226}Ra pCi/L ± 2*u*	^{228}Ra pCi/L ± 2*u*	Gamma-Emitting Radionuclides Nuclide	pCi/L ± 2*u*
TN: Oak Ridge/#768	NA	NA		ND
TN: Oak Ridge/#772	NA	NA		ND
TX: Austin	NA	NA		ND
VA: Ashland	NA	NA	Pb212	1.0 1.5
VA: Lynchburg	NA	NA	Tl208	2.2 2.7
WA: Richland	NA	NA		ND
WA: Seattle	NA	NA	K40	8 12
			Pb212	2.8 3.0

Note: ND = Not Detected
NA = No Analysis

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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 15

Radionuclides in Pasteurized Milk

October - December 2009

Location	Date Collected	K g/L ± 2*u*	^{137}Cs pCi/L ± 2*u*	^{140}Ba pCi/L ± 2*u*	^{131}I pCi/L ± 2*u*
AR: Little Rock	11/16/09	1.61 0.20	ND	ND	ND
AZ: Phoenix	10/23/09	1.63 0.20	ND	ND	ND
CA: Los Angeles	10/08/09	1.75 0.21	ND	ND	ND
CA: Oakland	10/06/09	1.57 0.20	ND	ND	ND
CT: Hartford	10/14/09	1.69 0.21	ND	ND	ND
DE: Wilmington	11/10/09	1.74 0.21	ND	ND	ND
FL: Tampa	10/21/09	1.67 0.20	ND	ND	ND
HI: Hilo	10/05/09	1.61 0.20	ND	ND	ND
IA: Des Moines	11/16/09	1.72 0.21	ND	ND	ND
KS: Wichita	10/14/09	1.67 0.20	ND	ND	ND
KY: Louisville	10/07/09	1.79 0.22	ND	ND	ND
MD: Baltimore	10/05/09	1.73 0.21	ND	ND	ND
MI: Detroit	11/17/09	1.61 0.21	ND	ND	ND
MO: Jefferson City	11/09/09	1.74 0.21	ND	ND	ND
NJ: Trenton	10/08/09	1.62 0.20	ND	ND	ND
NM: Albuquerque	12/07/09	1.51 0.19	ND	ND	ND
NV: Las Vegas	10/19/09	1.69 0.21	ND	ND	ND
NY: Buffalo	12/02/09	1.58 0.20	ND	ND	ND
NY: Syracuse	10/07/09	1.66 0.20	ND	ND	ND
OH: Cincinnati	11/09/09	1.51 0.19	ND	ND	ND
OH: Cleveland	11/02/09	1.64 0.20	ND	ND	ND
OR: Portland	11/02/09	1.64 0.20	ND	ND	ND
PA: Pittsburgh	11/02/09	1.56 0.19	ND	ND	ND
TN: Chattanooga	11/09/09	1.48 0.19	ND	ND	ND
TN: Knoxville	11/24/09	1.55 0.20	ND	ND	ND
TN: Memphis	10/12/09	1.60 0.20	ND	ND	ND
TX: Dallas	11/01/09	1.68 0.20	ND	ND	ND
TX: San Antonio	10/05/09	1.42 0.18	ND	ND	ND
VA: Norfolk	12/28/09	1.49 0.19	ND	ND	ND
VT: Montpelier	12/22/09	1.51 0.20	ND	ND	ND
WA: Spokane	10/06/09	1.61 0.21	ND	ND	ND
WA: Tacoma	12/30/09	1.61 0.19	ND	ND	ND
WV: Charleston	10/05/09	1.66 0.21	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, the data that are generated or publication and distribution of ERD should be directed to:

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