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ENVIRONMENTAL RADIATION DATA

REPORT 153

January–March 2013

United States Environmental Protection Agency

Office of Radiation and Indoor Air

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Preface

Environmental Radiation Data (ERD) contains data from the RadNet monitoring system (formerly ERAMS), which is operated by the Office of Radiation and Indoor Air's National Analytical Radiation Environmental Laboratory (NAREL) in Montgomery, Alabama. ERD is published in both hard-copy and electronic formats. Electronic reports are available online at http://www.epa.gov/radnet/radnet-data/erd.html. RadNet data are also available online in a searchable database at:

http://www.epa.gov/enviro/facts/radnet

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 RadNet samples may include gross alpha and gross beta analysis, gamma analyses, and radionuclide-specific analyses for isotopes of uranium, plutonium, strontium, iodine, radium, and tritium. This monitoring effort also provides information on natural background levels and possible accidental releases into the environment.

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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 Analytical 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
* 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. Continuous air samplers collect airborne particulates at field stations representing wide geographic coverage throughout the United States.

Filters (10 cm diameter synthetic fiber) from air samplers are changed routinely, and generally field measurements are made with a dual-phosphor scintillation counter at least 5 hours after collection to allow ^{222}Rn progeny to decay. Field estimates are reported to appropriate EPA officials by telephone or mail depending on the activity levels found; however, as of the first quarter of 2012, NAREL no longer reports field estimates in *Environmental Radiation Data*.

The filters are sent to NAREL for more sensitive analysis in a gas proportional counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m^3.

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 gamma-emitting radionuclides. NAREL discontinued gross beta analysis of precipitation in January 2010 and discontinued tritium analysis of precipitation in January 2012.

Table 2
Gross Beta in Airborne Particulates
January 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
AK: Anchorage	8	0.007	0.001	0.004
AK: Fairbanks	9	0.024	0.002	0.009
AK: Juneau	3	0.001	0.001	0.001
AL: Birmingham	9	0.022	0.002	0.013
AL: Montgomery/408	9	0.023	0.005	0.015
AR: Little Rock	6	0.018	0.006	0.013
AZ: Phoenix	8	0.036	0.005	0.022
AZ: Phoenix/956	8	0.029	0.008	0.017
AZ: Tucson	7	0.020	0.005	0.013
AZ: Yuma	1	0.012	0.012	0.012
CA: Anaheim	5	0.008	0.003	0.006
CA: Bakersfield	6	0.047	0.010	0.027
CA: Eureka	4	0.006	0.003	0.004
CA: Fresno	3	0.036	0.014	0.023
CA: Richmond	5	0.019	0.004	0.013
CA: Riverside	5	0.012	0.005	0.008
CA: Sacramento	9	0.029	0.004	0.014
CA: San Bernardino Cty.	6	0.010	0.006	0.007
CA: San Francisco	8	0.007	0.002	0.005
CA: San Jose	8	0.025	0.003	0.011
CO: Colorado Springs	3	0.016	0.007	0.011
CO: Denver	9	0.015	0.005	0.009
CO: Grand Junction	3	0.062	0.041	0.054
CT: Hartford	7	0.011	0.003	0.006
DC: Washington	7	0.018	0.007	0.013
DE: Dover	3	0.014	0.009	0.011
FL: Jacksonville	9	0.010	0.003	0.007
FL: Miami	1	0.003	0.003	0.003
FL: Orlando	8	0.015	0.003	0.008
FL: Tallahassee	5	0.018	0.006	0.012
FL: Tampa	9	0.018	0.004	0.009
GA: Atlanta	3	0.011	0.004	0.008
GA: Augusta	8	0.016	0.006	0.011
HI: Hilo	9	0.005	0.001	0.003
HI: Honolulu	8	0.004	0.001	0.002
IA: Des Moines	7	0.023	0.011	0.016
IA: Mason City	7	0.025	0.009	0.014
ID: Boise	4	0.105	0.015	0.059

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
ID: Idaho Falls	9	0.055	0.004	0.030
IL: Aurora	7	0.028	0.011	0.019
IL: Champaign	4	0.030	0.011	0.019
IL: Chicago	9	0.030	0.010	0.016
IN: Fort Wayne	2	0.019	0.009	0.014
IN: Indianapolis	9	0.030	0.008	0.018
KS: Kansas City	7	0.023	0.011	0.017
KS: Topeka	9	0.031	0.011	0.018
KY: Lexington	7	0.033	0.005	0.017
KY: Louisville	6	0.034	0.010	0.019
LA: Baton Rouge	9	0.015	0.004	0.010
LA: Shreveport	8	0.019	0.007	0.012
MA: Boston	8	0.029	0.007	0.015
MA: Worcester	5	0.017	0.007	0.011
MD: Baltimore	7	0.027	0.011	0.015
ME: Portland	8	0.020	0.008	0.013
MI: Bay City 48708	7	0.025	0.009	0.017
MI: Detroit	9	0.023	0.008	0.013
MI: Grand Rapids	4	0.017	0.010	0.012
MI: Lansing	10	0.078	0.017	0.040
MN: Duluth	5	0.025	0.009	0.014
MN: St. Paul	5	0.023	0.008	0.014
MO: Jefferson City	8	0.036	0.010	0.019
MO: Springfield	8	0.021	0.010	0.015
MO: St. Louis	3	0.015	0.009	0.011
MT: Billings	4	0.017	0.010	0.012
NC: Charlotte	8	0.018	0.003	0.011
NC: Wilmington	5	0.019	0.005	0.011
ND: Bismarck	6	0.025	0.010	0.015
NE: Kearney	3	0.021	0.011	0.017
NE: Lincoln	7	0.015	0.010	0.012
NE: Omaha	4	0.015	0.009	0.012
NH: Concord	4	0.032	0.009	0.022
NJ: Edison	4	0.016	0.007	0.009
NM: Albuquerque	4	0.036	0.011	0.022
NM: Carlsbad	5	0.023	0.008	0.015
NM: Navajo Lake St Park	5	0.029	0.012	0.022
NV: Las Vegas/913	9	0.026	0.003	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
NV: Reno	8	0.096	0.009	0.045
NY: Albany	8	0.031	0.006	0.012
NY: Lockport	8	0.021	0.005	0.011
NY: New York City	4	0.016	0.007	0.010
NY: Rochester	5	0.016	0.005	0.011
NY: Syracuse	2	0.021	0.009	0.015
NY: Yaphank	7	0.014	0.003	0.008
OH: Cincinnati	8	0.025	0.008	0.014
OH: Cleveland	8	0.031	0.010	0.017
OH: Painesville	6	0.026	0.010	0.015
OH: Toledo	9	0.020	0.006	0.012
OK: Oklahoma City	8	0.030	0.013	0.020
OK: Tulsa	7	0.025	0.012	0.018
OR: Corvallis	9	0.014	0.001	0.007
OR: Portland	9	0.022	0.001	0.009
PA: Bloomsburg	5	0.039	0.007	0.017
PA: Philadelphia	5	0.021	0.009	0.014
PA: Pittsburgh	3	0.012	0.010	0.011
PR: San Juan	9	0.005	0.001	0.002
RI: Providence	3	0.010	0.004	0.007
SC: Columbia	5	0.020	0.008	0.013
SD: Pierre	8	0.028	0.010	0.016
SD: Rapid City	4	0.017	0.011	0.013
TN: Knoxville	2	0.022	0.021	0.022
TN: Memphis	5	0.021	0.006	0.014
TN: Nashville	6	0.032	0.009	0.016
TN: Oak Ridge/Bethel	8	0.035	0.004	0.017
TN: Oak Ridge/K25	8	0.027	0.004	0.016
TN: Oak Ridge/Melton	8	0.040	0.005	0.021
TN: Oak Ridge/Y12 E	8	0.031	0.004	0.017
TN: Oak Ridge/Y12 W	8	0.030	0.004	0.017
TX: Austin	4	0.027	0.013	0.017
TX: Dallas	7	0.029	0.013	0.018
TX: El Paso	2	0.023	0.010	0.016
TX: Ft. Worth	5	0.022	0.007	0.015
TX: Harlingen	4	0.029	0.008	0.014
TX: Houston	7	0.027	0.006	0.015
TX: Laredo	4	0.013	0.005	0.008

Table 2 (continued)
Gross Beta in Airborne Particulates
January 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
TX: Lubbock	7	0.003	0.001	0.002
TX: San Antonio	7	0.025	0.007	0.013
UT: Salt Lake City	8	0.052	0.003	0.023
VA: Harrisonburg	9	0.016	0.006	0.011
VA: Lynchburg	8	0.023	0.004	0.013
VA: Richmond	8	0.025	0.003	0.012
VA: Virginia Beach	7	0.012	0.004	0.008
VT: Burlington	8	0.030	0.005	0.013
WA: Olympia	9	0.017	0.000	0.006
WA: Richland	9	0.036	0.001	0.020
WA: Seattle	4	0.006	0.003	0.004
WA: Spokane	8	0.037	0.002	0.016
WI: Madison	9	0.041	0.008	0.017
WI: Milwaukee	8	0.020	0.006	0.012
WI: Shawano	9	0.022	0.007	0.013
WV: Charleston	6	0.029	0.009	0.015

Table 3
Gross Beta in Airborne Particulates
February 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
AK: Anchorage	7	0.006	0.001	0.003
AK: Fairbanks	8	0.027	0.003	0.012
AK: Juneau	6	0.001	0.000	0.001
AL: Birmingham	8	0.010	0.005	0.007
AL: Montgomery/408	7	0.011	0.004	0.007
AR: Little Rock	5	0.012	0.007	0.008
AZ: Phoenix/956	7	0.013	0.004	0.008
AZ: Tucson	8	0.013	0.004	0.008
AZ: Yuma	2	0.006	0.005	0.006
CA: Anaheim	6	0.010	0.002	0.006
CA: Bakersfield	3	0.031	0.009	0.017
CA: Eureka	4	0.004	0.002	0.002
CA: Fresno	4	0.020	0.008	0.012
CA: Richmond	4	0.010	0.003	0.006
CA: Riverside	7	0.024	0.004	0.009
CA: Sacramento	8	0.015	0.002	0.008
CA: San Bernardino Cty.	7	0.027	0.004	0.009
CA: San Diego	2	0.012	0.004	0.008
CA: San Francisco	8	0.006	0.001	0.003
CA: San Jose	6	0.012	0.003	0.005
CO: Colorado Springs	4	0.011	0.008	0.010
CO: Denver	7	0.011	0.004	0.007
CO: Grand Junction	1	0.020	0.020	0.020
CT: Hartford	2	0.008	0.007	0.008
DC: Washington	8	0.014	0.004	0.009
DE: Dover	3	0.010	0.004	0.008
FL: Jacksonville	8	0.006	0.004	0.004
FL: Orlando	7	0.006	0.004	0.005
FL: Tallahassee	2	0.007	0.006	0.006
FL: Tampa	8	0.011	0.005	0.007
GA: Atlanta	3	0.007	0.006	0.006
GA: Augusta	6	0.009	0.005	0.007
HI: Hilo	8	0.003	0.001	0.002
HI: Honolulu	8	0.003	0.001	0.002
IA: Des Moines	7	0.020	0.010	0.015
IA: Mason City	6	0.019	0.008	0.013
ID: Idaho Falls	8	0.024	0.004	0.010
IL: Aurora	8	0.025	0.008	0.015

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
IL: Champaign	1	0.019	0.019	0.019
IL: Chicago	8	0.020	0.003	0.011
IN: Fort Wayne	3	0.025	0.010	0.016
IN: Indianapolis	8	0.018	0.005	0.012
KS: Kansas City	7	0.029	0.010	0.016
KS: Topeka	6	0.024	0.008	0.014
KS: Wichita	2	0.014	0.008	0.011
KY: Lexington	6	0.017	0.008	0.012
KY: Louisville	5	0.015	0.006	0.010
LA: Baton Rouge	8	0.008	0.004	0.006
LA: Shreveport	6	0.009	0.004	0.006
MA: Boston	3	0.020	0.011	0.015
MA: Worcester	9	0.018	0.004	0.010
MD: Baltimore	8	0.020	0.005	0.012
ME: Portland	6	0.015	0.005	0.010
MI: Bay City 48708	8	0.015	0.004	0.010
MI: Detroit	8	0.015	0.003	0.009
MI: Grand Rapids	4	0.020	0.004	0.011
MI: Lansing	8	0.044	0.008	0.026
MN: Duluth	3	0.015	0.010	0.012
MN: St. Paul	4	0.016	0.006	0.011
MO: Jefferson City	8	0.016	0.010	0.013
MO: Springfield	7	0.012	0.006	0.010
MO: St. Louis	3	0.011	0.008	0.009
MT: Billings	3	0.013	0.007	0.010
NC: Charlotte	8	0.010	0.006	0.008
NC: Greensboro	1	0.029	0.029	0.029
NC: Wilmington	4	0.009	0.006	0.007
ND: Bismarck	6	0.023	0.008	0.014
NE: Kearney	4	0.014	0.007	0.010
NE: Lincoln	8	0.019	0.006	0.011
NE: Omaha	3	0.018	0.014	0.016
NJ: Edison	6	0.013	0.003	0.007
NM: Albuquerque	4	0.015	0.005	0.010
NM: Carlsbad	4	0.010	0.005	0.007
NM: Navajo Lake St Park	4	0.015	0.010	0.012
NV: Las Vegas/913	9	0.009	0.002	0.006
NV: Reno	8	0.018	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
NY: Albany	8	0.014	0.003	0.008
NY: Lockport	8	0.013	0.005	0.008
NY: New York City	2	0.012	0.007	0.009
NY: Rochester	8	0.009	0.004	0.007
NY: Syracuse	2	0.038	0.012	0.025
NY: Yaphank	4	0.009	0.003	0.006
OH: Cincinnati	8	0.021	0.007	0.012
OH: Painesville	7	0.020	0.007	0.012
OH: Toledo	8	0.015	0.004	0.008
OK: Oklahoma City	8	0.017	0.007	0.012
OK: Tulsa	8	0.019	0.008	0.013
OR: Corvallis	8	0.004	0.001	0.002
OR: Portland	7	0.005	0.002	0.003
PA: Bloomsburg	8	0.015	0.004	0.009
PA: Philadelphia	3	0.016	0.008	0.011
PA: Pittsburgh	4	0.017	0.007	0.011
PR: San Juan	7	0.004	0.002	0.003
RI: Providence	1	0.010	0.010	0.010
SC: Barnwell	1	0.010	0.010	0.010
SC: Columbia	6	0.014	0.007	0.010
SD: Pierre	9	0.026	0.009	0.014
SD: Rapid City	5	0.010	0.005	0.008
TN: Knoxville	3	0.015	0.009	0.013
TN: Memphis	3	0.009	0.008	0.008
TN: Nashville	7	0.011	0.007	0.009
TN: Oak Ridge/Bethel	7	0.015	0.008	0.011
TN: Oak Ridge/K25	4	0.015	0.009	0.011
TN: Oak Ridge/Melton	7	0.017	0.010	0.011
TN: Oak Ridge/Y12 E	7	0.016	0.008	0.011
TN: Oak Ridge/Y12 W	7	0.019	0.008	0.011
TX: Austin	4	0.025	0.009	0.014
TX: Dallas	7	0.014	0.007	0.009
TX: El Paso	4	0.025	0.012	0.017
TX: Ft. Worth	5	0.010	0.007	0.008
TX: Harlingen	5	0.010	0.006	0.008
TX: Houston	5	0.010	0.006	0.008
TX: Laredo	2	0.007	0.005	0.006
TX: Lubbock	6	0.002	0.001	0.002

Table 3 (continued)
Gross Beta in Airborne Particulates
February 2013

Location	Number of Samples	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
TX: San Angelo	1	0.006	0.006	0.006
TX: San Antonio	7	0.010	0.006	0.008
UT: Salt Lake City	8	0.023	0.005	0.011
VA: Harrisonburg	8	0.011	0.003	0.008
VA: Lynchburg	8	0.012	0.006	0.009
VA: Richmond	9	0.011	0.004	0.007
VA: Virginia Beach	8	0.013	0.003	0.007
VT: Burlington	7	0.016	0.006	0.010
WA: Olympia	8	0.004	0.001	0.002
WA: Richland	7	0.008	0.002	0.005
WA: Seattle	4	0.003	0.001	0.002
WA: Spokane	6	0.006	0.002	0.004
WI: Madison	8	0.018	0.008	0.012
WI: Milwaukee	6	0.014	0.008	0.011
WI: Shawano	8	0.016	0.005	0.010
WV: Charleston	6	0.015	0.006	0.010

Table 4
Gross Beta in Airborne Particulates
March 2013

Location	Number of Samples	NAREL Lab Measurement (pCi/m³) Max	Min	Avg
AK: Anchorage	4	0.005	0.002	0.003
AK: Fairbanks	8	0.010	0.005	0.007
AK: Juneau	6	0.007	0.002	0.004
AL: Birmingham	8	0.011	0.006	0.008
AL: Montgomery/408	6	0.028	0.008	0.014
AR: Little Rock	8	0.012	0.005	0.008
AZ: Phoenix/956	9	0.012	0.005	0.009
AZ: Tucson	9	0.015	0.005	0.011
AZ: Yuma	1	0.009	0.009	0.009
CA: Anaheim	9	0.017	0.003	0.008
CA: Bakersfield	4	0.015	0.009	0.013
CA: Eureka	3	0.003	0.002	0.002
CA: Fresno	4	0.010	0.008	0.009
CA: Richmond	4	0.007	0.003	0.005
CA: Riverside	9	0.021	0.006	0.012
CA: Sacramento	8	0.009	0.003	0.005
CA: San Bernardino Cty.	8	0.022	0.005	0.012
CA: San Diego	4	0.013	0.005	0.009
CA: San Francisco	8	0.004	0.001	0.003
CA: San Jose	7	0.006	0.003	0.005
CO: Colorado Springs	3	0.012	0.010	0.011
CO: Denver	8	0.014	0.005	0.009
CO: Grand Junction	3	0.011	0.008	0.010
CT: Hartford	6	0.007	0.002	0.005
DC: Washington	9	0.009	0.002	0.006
DE: Dover	4	0.005	0.003	0.004
FL: Jacksonville	8	0.007	0.004	0.005
FL: Miami	3	0.007	0.005	0.006
FL: Orlando	2	0.007	0.005	0.006
FL: Tallahassee	3	0.009	0.006	0.008
FL: Tampa	7	0.012	0.007	0.008
GA: Atlanta	4	0.009	0.007	0.007
GA: Augusta	6	0.010	0.006	0.009
HI: Hilo	8	0.006	0.004	0.005
HI: Honolulu	9	0.006	0.004	0.005
IA: Des Moines	8	0.024	0.006	0.014
IA: Mason City	1	0.010	0.010	0.010
ID: Boise	3	0.008	0.004	0.006

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
ID: Idaho Falls	8	0.014	0.006	0.008
IL: Aurora	9	0.016	0.004	0.009
IL: Champaign	7	0.012	0.005	0.008
IL: Chicago	7	0.013	0.003	0.009
IN: Fort Wayne	3	0.011	0.007	0.009
IN: Indianapolis	8	0.013	0.003	0.009
KS: Kansas City	8	0.016	0.009	0.013
KS: Topeka	8	0.018	0.008	0.013
KS: Wichita	8	0.022	0.010	0.013
KY: Lexington	7	0.010	0.007	0.008
LA: Baton Rouge	8	0.012	0.007	0.010
LA: Shreveport	7	0.008	0.005	0.006
MA: Boston	3	0.007	0.002	0.005
MA: Worcester	6	0.014	0.004	0.008
MD: Baltimore	6	0.012	0.004	0.007
ME: Portland	9	0.012	0.004	0.007
MI: Bay City 48708	8	0.013	0.003	0.008
MI: Detroit	8	0.011	0.003	0.007
MI: Grand Rapids	4	0.012	0.004	0.007
MI: Lansing	6	0.032	0.020	0.025
MN: Duluth	5	0.010	0.003	0.008
MN: St. Paul	4	0.010	0.005	0.008
MO: Jefferson City	9	0.014	0.006	0.011
MO: Springfield	6	0.012	0.009	0.010
MO: St. Louis	3	0.011	0.008	0.009
MT: Billings	3	0.013	0.006	0.010
NC: Charlotte	8	0.009	0.004	0.006
NC: Greensboro	2	0.006	0.006	0.006
NC: Wilmington	4	0.006	0.004	0.005
ND: Bismarck	5	0.019	0.009	0.014
NE: Lincoln	9	0.016	0.007	0.010
NE: Omaha	4	0.021	0.012	0.015
NJ: Edison	8	0.006	0.002	0.004
NM: Albuquerque	3	0.009	0.006	0.007
NM: Carlsbad	9	0.015	0.006	0.010
NM: Navajo Lake St Park	4	0.010	0.004	0.008
NV: Las Vegas/913	8	0.011	0.005	0.007
NV: Reno	9	0.014	0.004	0.008

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2013

Location	Number of Samples	NAREL Lab Measurement Max (pCi/m³)	Min (pCi/m³)	Avg (pCi/m³)
NY: Albany	6	0.006	0.004	0.006
NY: Lockport	9	0.008	0.002	0.005
NY: New York City	4	0.008	0.002	0.004
NY: Rochester	7	0.007	0.002	0.004
NY: Syracuse	4	0.010	0.003	0.006
NY: Yaphank	8	0.007	0.002	0.004
OH: Cincinnati	9	0.011	0.003	0.008
OH: Cleveland	6	0.017	0.004	0.009
OH: Painesville	7	0.013	0.004	0.008
OH: Toledo	8	0.009	0.002	0.006
OK: Oklahoma City	8	0.018	0.010	0.014
OK: Tulsa	8	0.022	0.009	0.013
OR: Corvallis	7	0.007	0.002	0.004
OR: Portland	8	0.008	0.002	0.004
PA: Bloomsburg	8	0.008	0.002	0.005
PA: Philadelphia	5	0.010	0.004	0.005
PA: Pittsburgh	4	0.010	0.005	0.007
PR: San Juan	7	0.006	0.002	0.004
RI: Providence	1	0.002	0.002	0.002
SC: Columbia	6	0.012	0.006	0.009
SD: Pierre	8	0.021	0.011	0.015
SD: Rapid City	6	0.013	0.005	0.010
TN: Knoxville	7	0.013	0.007	0.011
TN: Memphis	3	0.010	0.010	0.010
TN: Nashville	4	0.011	0.007	0.009
TN: Oak Ridge/Bethel	7	0.015	0.008	0.011
TN: Oak Ridge/K25	7	0.014	0.008	0.011
TN: Oak Ridge/Melton	7	0.014	0.008	0.011
TN: Oak Ridge/Y12 E	7	0.015	0.007	0.011
TN: Oak Ridge/Y12 W	7	0.015	0.008	0.011
TX: Austin	1	0.010	0.010	0.010
TX: Dallas	8	0.013	0.007	0.010
TX: El Paso	1	0.018	0.018	0.018
TX: Ft. Worth	4	0.014	0.009	0.011
TX: Harlingen	5	0.012	0.009	0.010
TX: Houston	8	0.013	0.008	0.010
TX: Lubbock	9	0.004	0.001	0.002
TX: San Angelo	5	0.014	0.006	0.010

Table 4 (continued)
Gross Beta in Airborne Particulates
March 2013

Location	Number of Samples	NAREL Lab Measurement Max	Min	Avg
		(pCi/m³)		
TX: San Antonio	9	0.013	0.007	0.010
UT: Salt Lake City	7	0.009	0.006	0.007
UT: St. George	1	0.010	0.010	0.010
VA: Harrisonburg	8	0.008	0.002	0.006
VA: Lynchburg	7	0.010	0.004	0.006
VA: Richmond	8	0.006	0.002	0.004
VA: Virginia Beach	8	0.008	0.001	0.005
VT: Burlington	8	0.012	0.003	0.008
WA: Olympia	8	0.006	0.002	0.004
WA: Richland	7	0.009	0.002	0.004
WA: Seattle	5	0.006	0.002	0.003
WA: Spokane	9	0.007	0.003	0.004
WI: Madison	8	0.014	0.004	0.008
WI: Shawano	8	0.011	0.002	0.007
WV: Charleston	5	0.012	0.006	0.009

Table 5
Specific Gamma in Precipitation
January 2013

Location	Nuclide	pCi/L ± 2*u*	
AL: Montgomery/408	Be-7	39	15
AR: Little Rock	Ra-228	5.3	4.4
AZ: Phoenix		ND	
CA: Richmond	Be-7	33.3	9.9
CO: Denver	Be-7	77	39
CT: Hartford	Be-7	31	14
FL: Jacksonville	Be-7	27	14
GA: Atlanta	Be-7	20	15
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	121	24
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington	Be-7	19	14
NY: Albany		ND	
NY: Yaphank		ND	
OH: Painesville	Be-7	46	18
OR: Portland	Be-7	29.5	9.6
PA: Harrisburg		ND	
TN: Nashville	Be-7	39	16
TN: Oak Ridge/K25	Be-7	74	21
TN: Oak Ridge/Melton	Be-7	68	11
TN: Oak Ridge/Y12 E	Be-7	54	15
TX: Austin		ND	
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 6
Specific Gamma in Precipitation
February 2013

Location	Nuclide	pCi/L ± 2*u*	
AL: Montgomery/408	Be-7	30	18
AR: Little Rock	Be-7	49	20
	K-40	14	10
AZ: Phoenix	Be-7	36	18
CA: Richmond	Be-7	51	20
CO: Denver	Be-7	41	18
CT: Hartford		ND	
FL: Jacksonville	Be-7	21.1	8.0
GA: Atlanta		ND	
HI: Honolulu	K-40	18	13
ID: Idaho Falls	Be-7	19	16
	K-40	12	11
KS: Kansas City	K-40	15	12
MA: Boston	Be-7	61	20
	K-40	16	12
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte	Be-7	27	16
NC: Wilmington	Be-7	38	15
NH: Concord		ND	
NY: Albany	K-40	14	10
NY: Yaphank		ND	
OR: Portland	Be-7	19	17
PA: Harrisburg		ND	
TN: Knoxville		ND	
TN: Nashville	Be-7	39	17
TN: Oak Ridge/K25	Be-7	53	18
TN: Oak Ridge/Melton	Be-7	60	14
TN: Oak Ridge/Y12 E	Be-7	71	20
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia		ND	

Table 7
Specific Gamma in Precipitation
March 2013

Location	Nuclide	pCi/L ± 2*u*	
AL: Montgomery/408	Be-7	35	17
AR: Little Rock		ND	
CA: Richmond	Be-7	25	11
CO: Denver		ND	
CT: Hartford	Be-7	23	12
FL: Jacksonville	Be-7	50	21
GA: Atlanta	Be-7	23	15
HI: Honolulu	Be-7	27	12
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	56	16
MN: St. Paul		ND	
MN: Welch/510	Be-7	21	11
NC: Charlotte	Be-7	26	15
	K-40	15	12
NC: Wilmington	Be-7	31	15
NY: Albany	Be-7	24	14
NY: Yaphank		ND	
OR: Portland		ND	
PA: Harrisburg	Be-7	22	14
	K-40	16	13
TN: Knoxville	Be-7	14	14
TN: Nashville	Be-7	29	15
	K-40	14	11
TN: Oak Ridge/K25	Be-7	56	16
TN: Oak Ridge/Melton	Be-7	61	17
	K-40	14	12
TN: Oak Ridge/Y12 E	Be-7	58	17
UT: Salt Lake City		ND	
VA: Lynchburg		ND	
WA: Olympia	Be-7	46	20

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 airborne particulate samplers. Plutonium and uranium results are published in the ERD for the third quarter of the following year.

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.

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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. Sampling sites are either major population centers or selected nuclear facility environs.

Drinking water data are used to assess trends and anomalies in concentrations. The analysis scheme for RadNet samples is similar to that of EPA's "National Interim Primary Drinking Water Regulations." 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; (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. Composite results are published in the ERD for the third quarter of the following year.

RadNet drinking water data should not be used to monitor compliance with drinking water regulations or for comparisons to those data since different procedures for collection and analysis may be used.

Table 8
Tritium in Drinking Water
January–March 2013

Location	Date Collected	^{3}H pCi/L	± 2*u*
AK: Fairbanks	02/20/13	39	77
AL: Dothan	01/04/13	−70	76
AL: Muscle Shoals	01/09/13	−16	78
AL: Scottsboro	01/08/13	21	80
AR: Little Rock	01/09/13	129	88
CO: Denver	01/18/13	46	86
CT: Hartford	01/08/13	−36	79
DE: Dover	01/10/13	−8	82
GA: Baxley	01/29/13	17	84
GA: Savannah	03/29/13	93	90
HI: Honolulu	03/15/13	4	86
IA: Cedar Rapids	01/08/13	98	86
ID: Boise	01/09/13	84	86
ID: Idaho Falls	01/17/13	−15	82
IL: W. Chicago	02/11/13	62	81
KS: Topeka	01/23/13	−2	83
LA: New Orleans	01/11/13	25	84
MD: Baltimore	01/07/13	19	80
MD: Conowingo	01/02/13	19	79
MI: Detroit	01/14/13	65	86
MN: St. Paul	01/08/13	112	87
MN: Welch	01/08/13	46	84
MO: Jefferson City	01/07/13	−32	79
MS: Jackson	01/29/13	34	85
MS: Port Gibson	01/29/13	8	84
MT: Helena	01/27/13	59	86
ND: Bismarck	01/10/13	25	84
NE: Lincoln	01/09/13	−23	82
NH: Concord	03/12/13	2	75
NJ: Trenton	01/15/13	82	87
NJ: Waretown	01/15/13	−36	81
NM: Santa Fe	02/27/13	−14	75
NY: New York City	01/23/13	61	87
NY: Niagara Falls	01/08/13	76	86
NY: Syracuse	01/24/13	−2	84
OH: Cincinnati	01/18/13	74	87
OH: Columbus	01/22/13	40	85
OH: E. Liverpool	03/13/13	71	78
OH: Painesville	03/11/13	84	79
OH: Toledo	01/03/13	7	79

Table 8 (continued)
Tritium in Drinking Water
January–March 2013

Location	Date Collected	^{3}H pCi/L	± 2*u*
OK: Oklahoma City	01/10/13	40	84
PA: Columbia	01/11/13	−11	82
PA: Harrisburg	01/02/13	28	80
PA: Pittsburgh	03/13/13	21	76
RI: Providence	01/14/13	2	84
SC: Barnwell	01/30/13	48	86
SC: Columbia	01/24/13	42	85
SC: Jenkinsville	01/09/13	82	87
SC: Seneca	01/14/13	−21	83
TN: Knoxville	01/08/13	4	79
TN: Oak Ridge/#360	01/04/13	162	90
TN: Oak Ridge/#371	01/04/13	55	85
TN: Oak Ridge/#4442	01/04/13	157	90
TN: Oak Ridge/#768	01/04/13	103	88
TN: Oak Ridge/#772	01/04/13	137	89
TX: Austin	01/29/13	−23	82
VA: Lynchburg	03/21/13	25	76
WA: Richland	02/07/13	17	84
WI: Madison	01/15/13	57	86

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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.

Milk samples are collected quarterly at each of the sampling sites. 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 9

Radionuclides in Pasteurized Milk

January–March 2013

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: Fayetteville	01/08/13	1.54 0.19	ND	ND	ND
AZ: Phoenix	01/08/13	1.64 0.20	ND	ND	ND
CA: Los Angeles	03/19/13	1.65 0.20	ND	ND	ND
CA: Oakland	01/15/13	1.96 0.22	ND	ND	ND
CT: Hartford	03/06/13	1.71 0.20	ND	ND	ND
DE: Wilmington	01/15/13	1.64 0.19	ND	ND	ND
HI: Hilo	01/15/13	1.72 0.20	ND	ND	ND
IA: Des Moines	03/20/13	1.59 0.19	ND	ND	ND
KS: Wichita	01/31/13	1.66 0.19	ND	ND	ND
MA: Boston	03/14/13	1.62 0.19	ND	ND	ND
MD: Baltimore	01/08/13	1.62 0.19	ND	ND	ND
MO: Kansas City	01/10/13	1.65 0.19	ND	ND	ND
NJ: Trenton	01/09/13	1.61 0.19	ND	ND	ND
NM: Albuquerque	01/07/13	1.53 0.18	ND	ND	ND
NV: Las Vegas	02/25/13	1.59 0.19	ND	ND	ND
NV: Reno	03/28/13	1.66 0.19	ND	ND	ND
NY: Buffalo	02/27/13	1.69 0.21	ND	ND	ND
NY: Syracuse	01/14/13	1.68 0.20	ND	ND	ND
OH: Cincinnati	01/14/13	1.59 0.20	ND	ND	ND
OR: Portland	03/12/13	1.62 0.19	ND	ND	ND
PA: Pittsburgh	01/22/13	1.59 0.18	ND	ND	ND
TN: Chattanooga	03/06/13	1.57 0.19	ND	ND	ND
TN: Knoxville	01/16/13	1.65 0.19	ND	ND	ND
TN: Memphis	01/07/13	1.64 0.19	ND	ND	ND
TX: Dallas	02/11/13	1.50 0.19	ND	ND	ND
TX: San Antonio	01/14/13	1.54 0.18	ND	ND	ND
VT: Montpelier	01/23/13	1.60 0.19	ND	ND	ND
WA: Spokane	01/31/13	1.62 0.19	ND	ND	ND
WA: Tacoma	03/30/13	1.90 0.22	ND	ND	ND
WV: Charleston	01/09/13	1.66 0.20	ND	ND	ND

Note: ND = Not detected
NR = No result (not analyzed within 5 half-lives of collection)

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:

Requests for information concerning the operation of RadNet, the data that are generated, or publication and distribution of ERD should be directed to:

Charles M. Petko
Office of the Director
National Analytical Radiation Environmental Laboratory
540 South Morris Avenue
Montgomery, Alabama 36115-2601
email: petko.charles@epa.gov

Requests for information concerning policies of the Office of Radiation and Indoor Air should be directed to:

Jonathan Edwards
USEPA - ORIA
Radiation Protection Division (MC6608J)
1200 Pennsylvania Ave. N.W.
Washington, DC 20460
email: edwards.jonathan@epa.gov

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