

ENVIRONMENTAL

RADIATION

DATA

REPORT 160

October–December 2014

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 electronic format, which is available online at <http://www.epa.gov/narel>. 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, and drinking water 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, and radium, and for tritium. This monitoring effort also provides information on natural background levels and possible 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/m ³	0.0006
	Water	pCi/L	2
Tritium	Water	pCi/L	150
* Plutonium-238,239/240	Air	aCi/m ³	6
	Water	pCi/L	0.3
† Uranium-234,238	Air	aCi/m ³	7.5
	Water	pCi/L	0.35
† Uranium-235	Air	aCi/m ³	9
	Water	pCi/L	0.4
Radium-226	Water	pCi/L	0.02
Strontium-90	Water	pCi/L	1
‡ Iodine-131	Water (gamma)	pCi/L	4
	Water	pCi/L	0.3
Cesium-137	Water	pCi/L	5
‡ Barium-140	Water	pCi/L	15
Potassium-40	Water	pCi/L	50

* The MDC for air is based on an assumed total sample volume of 10,000 m³. Measurement by alpha spectrometry includes combined activities of ²³⁹Pu and ²⁴⁰Pu, since the relative contributions of these two isotopes cannot be determined.

† The MDCs for air are based on an assumed total sample volume of 10,000 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. 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 the exposed filters are sent to NAREL for analysis in a gas proportional counter. Gamma scans are performed on all filters showing gross beta activity greater than 1 pCi/m³.

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.

Table 2
Gross Beta in Airborne Particulates
October 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.006	0.004	0.005
AK: Fairbanks	9	0.021	0.002	0.009
AK: Juneau	4	0.004	0.001	0.002
AL: Birmingham	9	0.019	0.005	0.011
AL: Montgomery/408	8	0.012	0.003	0.008
AR: Fort Smith	4	0.014	0.005	0.008
AR: Little Rock	7	0.023	0.002	0.010
AZ: Phoenix/956	7	0.017	0.010	0.013
AZ: Tucson	9	0.015	0.008	0.011
CA: Anaheim	9	0.015	0.005	0.009
CA: Eureka	5	0.009	0.003	0.004
CA: Fresno	1	0.008	0.008	0.008
CA: Los Angeles	5	0.021	0.010	0.013
CA: Richmond	4	0.007	0.004	0.006
CA: Riverside	7	0.027	0.010	0.017
CA: Sacramento	8	0.012	0.003	0.007
CA: San Bernardino Cty.	10	0.030	0.007	0.017
CA: San Diego	4	0.025	0.007	0.015
CA: San Francisco	7	0.008	0.003	0.005
CA: San Jose	9	0.019	0.005	0.008
CO: Colorado Springs	3	0.018	0.009	0.013
CO: Denver	9	0.025	0.009	0.013
CO: Grand Junction	2	0.013	0.008	0.010
CT: Hartford	9	0.008	0.003	0.006
DC: Washington	9	0.010	0.004	0.007
DE: Dover	3	0.007	0.004	0.005
FL: Jacksonville	7	0.018	0.004	0.011
FL: Orlando	8	0.010	0.003	0.006
FL: Tallahassee	3	0.014	0.005	0.009
FL: Tampa	8	0.013	0.002	0.008
GA: Atlanta	5	0.016	0.006	0.009
GA: Augusta	5	0.012	0.006	0.008
HI: Honolulu	1	0.002	0.002	0.002
IA: Des Moines	8	0.012	0.005	0.007
IA: Mason City	4	0.013	0.006	0.009
ID: Boise	4	0.007	0.004	0.006
ID: Idaho Falls	9	0.014	0.005	0.008
IL: Aurora	3	0.014	0.007	0.009

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IL: Champaign	9	0.010	0.003	0.006
IL: Chicago	5	0.011	0.007	0.008
IN: Fort Wayne	4	0.010	0.007	0.008
IN: Indianapolis	9	0.009	0.005	0.007
KS: Kansas City	4	0.025	0.007	0.014
KS: Wichita	8	0.020	0.006	0.011
KY: Lexington	6	0.017	0.005	0.010
KY: Louisville	6	0.013	0.005	0.009
KY: Paducah	7	0.025	0.006	0.012
LA: Baton Rouge	8	0.013	0.004	0.009
LA: Shreveport	6	0.013	0.004	0.007
MA: Boston	9	0.007	0.002	0.005
MA: Worcester	8	0.009	0.004	0.006
MD: Baltimore	1	0.005	0.005	0.005
ME: Portland	9	0.006	0.002	0.005
MI: Bay City 48708	8	0.008	0.005	0.006
MI: Detroit	6	0.012	0.005	0.009
MI: Grand Rapids	5	0.012	0.006	0.009
MN: Duluth	8	0.007	0.002	0.005
MN: St. Paul	1	0.012	0.012	0.012
MO: Jefferson City	9	0.018	0.005	0.008
MO: Springfield	4	0.022	0.009	0.013
MO: St. Louis	4	0.013	0.007	0.009
MS: Jackson/Deq	4	0.016	0.009	0.012
MT: Billings	3	0.009	0.006	0.008
NC: Charlotte	9	0.022	0.006	0.012
NC: Greensboro	2	0.011	0.005	0.008
NC: Raleigh	5	0.008	0.005	0.007
NC: Wilmington	4	0.007	0.004	0.005
ND: Bismarck	7	0.010	0.006	0.008
NE: Kearney	9	0.016	0.005	0.009
NE: Lincoln	9	0.018	0.004	0.009
NE: Omaha	2	0.023	0.010	0.016
NH: Concord	9	0.007	0.002	0.005
NJ: Edison	4	0.007	0.004	0.006
NM: Carlsbad	6	0.012	0.004	0.008
NM: Navajo Lake St Park	2	0.005	0.005	0.005
NV: Las Vegas/913	8	0.015	0.008	0.011

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NV: Reno	8	0.011	0.003	0.006
NY: Albany	6	0.014	0.003	0.007
NY: Lockport	8	0.018	0.006	0.009
NY: New York City	5	0.009	0.005	0.008
NY: Rochester	10	0.020	0.006	0.010
NY: Syracuse	3	0.009	0.006	0.007
NY: Yaphank	6	0.009	0.002	0.005
OH: Cincinnati	8	0.014	0.002	0.008
OH: Cleveland	9	0.013	0.006	0.009
OH: Columbus	1	0.013	0.013	0.013
OH: Toledo	7	0.007	0.005	0.006
OK: Oklahoma City	9	0.017	0.006	0.011
OK: Tulsa	10	0.018	0.003	0.009
OR: Corvallis	9	0.008	0.002	0.004
OR: Portland	9	0.008	0.002	0.004
PA: Bloomsburg	9	0.007	0.002	0.004
PA: Philadelphia	4	0.012	0.006	0.008
PA: Pittsburgh	5	0.015	0.005	0.010
PR: San Juan	6	0.016	0.001	0.005
RI: Providence	4	0.007	0.004	0.006
SC: Columbia	4	0.015	0.006	0.008
SD: Pierre	8	0.008	0.004	0.006
SD: Rapid City	4	0.009	0.005	0.007
TN: Knoxville	4	0.018	0.007	0.013
TN: Memphis	9	0.021	0.006	0.010
TN: Nashville	7	0.020	0.006	0.010
TN: Oak Ridge/Bethel	9	0.020	0.007	0.011
TN: Oak Ridge/K25	9	0.023	0.006	0.012
TN: Oak Ridge/Melton	8	0.014	0.006	0.009
TN: Oak Ridge/Y12 E	9	0.023	0.007	0.013
TN: Oak Ridge/Y12 W	8	0.020	0.006	0.013
TX: Amarillo	8	0.017	0.007	0.012
TX: Austin	4	0.017	0.005	0.009
TX: Dallas	7	0.021	0.006	0.011
TX: El Paso	3	0.019	0.009	0.013
TX: Ft. Worth	2	0.010	0.007	0.009
TX: Harlingen	5	0.008	0.004	0.006
TX: Houston	9	0.015	0.004	0.008

Table 2 (continued)
Gross Beta in Airborne Particulates
October 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Laredo	8	0.015	0.005	0.008
TX: Lubbock	9	0.012	0.004	0.008
TX: San Angelo	2	0.019	0.014	0.016
TX: San Antonio	9	0.011	0.003	0.006
UT: Salt Lake City	9	0.012	0.004	0.006
UT: St. George	3	0.009	0.005	0.007
VA: Harrisonburg	9	0.018	0.005	0.008
VA: Richmond	6	0.009	0.005	0.007
VA: Virginia Beach	8	0.012	0.006	0.009
VT: Burlington	5	0.007	0.005	0.005
WA: Olympia	9	0.010	0.002	0.004
WA: Richland	9	0.011	0.002	0.005
WA: Seattle	5	0.007	0.001	0.004
WA: Spokane	4	0.012	0.005	0.008
WI: Lacrosse	4	0.008	0.005	0.006
WI: Madison	9	0.013	0.005	0.009
WI: Milwaukee	4	0.012	0.005	0.008
WI: Shawano	9	0.008	0.003	0.005
WV: Charleston	7	0.013	0.006	0.009
WY: Casper	5	0.012	0.005	0.008

Table 3
Gross Beta in Airborne Particulates
November 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	2	0.010	0.001	0.005
AK: Fairbanks	7	0.013	0.003	0.008
AK: Juneau	5	0.007	0.001	0.003
AL: Birmingham	7	0.012	0.006	0.010
AL: Montgomery/408	5	0.013	0.006	0.010
AR: Fort Smith	4	0.013	0.007	0.009
AR: Little Rock	5	0.012	0.006	0.009
AZ: Phoenix/956	6	0.015	0.008	0.012
AZ: Tucson	7	0.014	0.007	0.011
CA: Anaheim	6	0.013	0.003	0.008
CA: Bakersfield	2	0.023	0.013	0.018
CA: Eureka	3	0.006	0.003	0.004
CA: Fresno	1	0.016	0.016	0.016
CA: Los Angeles	5	0.016	0.006	0.010
CA: Richmond	4	0.011	0.006	0.008
CA: Riverside	7	0.022	0.006	0.012
CA: Sacramento	4	0.015	0.004	0.010
CA: San Bernardino Cty.	7	0.025	0.006	0.014
CA: San Diego	1	0.020	0.020	0.020
CA: San Francisco	8	0.016	0.004	0.008
CA: San Jose	4	0.010	0.004	0.008
CO: Colorado Springs	1	0.016	0.016	0.016
CO: Denver	6	0.019	0.004	0.009
CO: Grand Junction	3	0.026	0.022	0.024
CT: Hartford	7	0.007	0.003	0.006
DC: Washington	7	0.011	0.005	0.007
DE: Dover	5	0.007	0.003	0.006
FL: Jacksonville	1	0.007	0.007	0.007
FL: Orlando	6	0.010	0.006	0.008
FL: Tallahassee	4	0.012	0.009	0.010
FL: Tampa	5	0.012	0.006	0.009
GA: Atlanta	3	0.009	0.007	0.008
GA: Augusta	4	0.010	0.007	0.008
HI: Honolulu	7	0.005	0.002	0.003
IA: Des Moines	6	0.011	0.005	0.008
IA: Mason City	7	0.014	0.004	0.010
ID: Boise	2	0.007	0.006	0.006
ID: Idaho Falls	8	0.026	0.004	0.013

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2014

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

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NV: Las Vegas/913	4	0.015	0.005	0.009
NV: Reno	4	0.009	0.003	0.006
NY: Albany	2	0.016	0.006	0.011
NY: Lockport	8	0.016	0.005	0.009
NY: New York City	3	0.009	0.006	0.008
NY: Rochester	1	0.007	0.007	0.007
NY: Syracuse	1	0.007	0.007	0.007
NY: Yaphank	6	0.006	0.003	0.005
OH: Cincinnati	8	0.017	0.007	0.010
OH: Cleveland	8	0.015	0.008	0.011
OH: Toledo	5	0.009	0.003	0.006
OK: Oklahoma City	7	0.016	0.006	0.010
OK: Tulsa	6	0.012	0.006	0.009
OR: Corvallis	6	0.020	0.003	0.006
OR: Portland	8	0.024	0.002	0.007
PA: Bloomsburg	7	0.009	0.003	0.006
PA: Philadelphia	4	0.010	0.006	0.008
PA: Pittsburgh	4	0.010	0.008	0.009
PR: San Juan	8	0.006	0.001	0.003
RI: Providence	3	0.010	0.005	0.008
SC: Columbia	7	0.015	0.006	0.010
SD: Pierre	7	0.014	0.007	0.010
SD: Rapid City	3	0.014	0.005	0.008
TN: Knoxville	3	0.014	0.010	0.011
TN: Memphis	7	0.011	0.006	0.009
TN: Nashville	6	0.011	0.006	0.008
TN: Oak Ridge/Bethel	7	0.015	0.007	0.012
TN: Oak Ridge/K25	7	0.016	0.007	0.013
TN: Oak Ridge/Melton	7	0.015	0.006	0.012
TN: Oak Ridge/Y12 E	7	0.016	0.007	0.012
TN: Oak Ridge/Y12 W	7	0.016	0.009	0.013
TX: Austin	1	0.010	0.010	0.010
TX: Dallas	7	0.023	0.008	0.013
TX: El Paso	8	0.019	0.005	0.011
TX: Ft. Worth	3	0.009	0.006	0.008
TX: Harlingen	2	0.013	0.006	0.009
TX: Houston	8	0.010	0.003	0.008
TX: Laredo	7	0.012	0.005	0.009

Table 3 (continued)
Gross Beta in Airborne Particulates
November 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Lubbock	5	0.013	0.006	0.010
TX: San Angelo	4	0.016	0.010	0.011
TX: San Antonio	8	0.008	0.003	0.006
UT: Salt Lake City	7	0.020	0.005	0.010
UT: St. George	1	0.012	0.012	0.012
VA: Harrisonburg	7	0.010	0.006	0.008
VA: Richmond	5	0.010	0.006	0.007
VA: Virginia Beach	6	0.016	0.006	0.010
VT: Burlington	5	0.010	0.005	0.008
WA: Olympia	7	0.012	0.002	0.005
WA: Richland	6	0.063	0.003	0.020
WA: Seattle	2	0.004	0.003	0.003
WA: Spokane	2	0.020	0.014	0.017
WI: Lacrosse	4	0.010	0.005	0.008
WI: Madison	8	0.019	0.007	0.013
WI: Milwaukee	4	0.010	0.008	0.009
WI: Shawano	7	0.011	0.003	0.007
WV: Charleston	4	0.011	0.010	0.010
WY: Casper	3	0.012	0.008	0.011

Table 4
Gross Beta in Airborne Particulates
December 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
AK: Anchorage	4	0.005	0.001	0.004
AK: Fairbanks	6	0.023	0.009	0.013
AK: Juneau	6	0.008	0.001	0.003
AL: Birmingham	9	0.019	0.005	0.011
AL: Montgomery/408	8	0.015	0.007	0.010
AR: Fort Smith	5	0.020	0.011	0.015
AR: Little Rock	2	0.018	0.017	0.018
AZ: Phoenix/956	7	0.024	0.005	0.012
AZ: Tucson	5	0.023	0.005	0.011
CA: Anaheim	7	0.014	0.004	0.008
CA: Bakersfield	3	0.028	0.006	0.014
CA: Eureka	4	0.004	0.001	0.002
CA: Fresno	3	0.017	0.005	0.012
CA: Los Angeles	5	0.013	0.004	0.008
CA: Richmond	5	0.016	0.003	0.006
CA: Riverside	3	0.014	0.004	0.009
CA: Sacramento	8	0.020	0.003	0.008
CA: San Bernardino Cty.	8	0.017	0.004	0.009
CA: San Francisco	8	0.008	0.001	0.004
CA: San Jose	2	0.004	0.003	0.003
CO: Colorado Springs	2	0.015	0.010	0.012
CO: Denver	5	0.017	0.007	0.013
CO: Grand Junction	2	0.026	0.014	0.020
CT: Hartford	9	0.007	0.001	0.005
DC: Washington	8	0.013	0.006	0.009
DE: Dover	5	0.009	0.004	0.007
FL: Jacksonville	5	0.014	0.006	0.010
FL: Orlando	8	0.011	0.003	0.007
FL: Tallahassee	3	0.014	0.006	0.011
FL: Tampa	7	0.013	0.004	0.009
GA: Atlanta	1	0.017	0.017	0.017
GA: Augusta	6	0.009	0.003	0.007
HI: Honolulu	9	0.006	0.002	0.003
IA: Des Moines	9	0.029	0.006	0.014
IA: Mason City	3	0.025	0.015	0.020
ID: Boise	7	0.015	0.002	0.007
ID: Idaho Falls	9	0.018	0.003	0.009
IL: Aurora	5	0.021	0.011	0.016

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
IL: Champaign	7	0.019	0.009	0.013
IL: Chicago	7	0.022	0.008	0.015
IN: Fort Wayne	4	0.020	0.010	0.015
IN: Indianapolis	10	0.018	0.008	0.013
KS: Kansas City	6	0.028	0.010	0.017
KS: Wichita	7	0.028	0.011	0.017
KY: Lexington	7	0.023	0.011	0.015
KY: Louisville	7	0.024	0.013	0.016
KY: Paducah	8	0.027	0.011	0.019
LA: Baton Rouge	9	0.024	0.008	0.013
LA: Shreveport	4	0.022	0.011	0.017
MA: Boston	9	0.009	0.002	0.006
MA: Worcester	8	0.010	0.002	0.006
MD: Baltimore	1	0.008	0.008	0.008
ME: Portland	8	0.008	0.003	0.005
MI: Bay City 48708	7	0.024	0.010	0.014
MI: Detroit	8	0.022	0.009	0.013
MI: Grand Rapids	5	0.018	0.008	0.013
MN: Duluth	7	0.017	0.007	0.012
MN: St. Paul	5	0.037	0.020	0.026
MO: Jefferson City	9	0.024	0.007	0.014
MO: Springfield	8	0.024	0.009	0.016
MO: St. Louis	5	0.025	0.010	0.016
MS: Jackson/Deq	5	0.021	0.009	0.013
MT: Billings	3	0.018	0.015	0.017
NC: Charlotte	8	0.015	0.007	0.011
NC: Greensboro	1	0.011	0.011	0.011
NC: Raleigh	3	0.007	0.005	0.006
NC: Wilmington	5	0.007	0.004	0.005
ND: Bismarck	6	0.030	0.011	0.017
NE: Kearney	3	0.024	0.009	0.016
NE: Lincoln	8	0.031	0.009	0.017
NE: Omaha	5	0.039	0.013	0.023
NH: Concord	7	0.009	0.002	0.006
NJ: Edison	4	0.009	0.005	0.007
NM: Albuquerque	1	0.017	0.017	0.017
NM: Carlsbad	7	0.023	0.004	0.012
NM: Navajo Lake St Park	3	0.011	0.006	0.009

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
NV: Reno	2	0.005	0.004	0.005
NY: Albany	6	0.011	0.002	0.008
NY: Lockport	6	0.020	0.007	0.010
NY: New York City	4	0.009	0.006	0.007
NY: Rochester	1	0.007	0.007	0.007
NY: Syracuse	1	0.007	0.007	0.007
NY: Yaphank	2	0.006	0.005	0.006
OH: Cincinnati	8	0.022	0.009	0.013
OH: Cleveland	8	0.030	0.007	0.014
OH: Toledo	6	0.017	0.005	0.009
OK: Oklahoma City	8	0.026	0.009	0.016
OK: Tulsa	9	0.028	0.008	0.016
OR: Corvallis	9	0.013	0.001	0.004
OR: Portland	8	0.014	0.002	0.005
PA: Bloomsburg	6	0.009	0.004	0.006
PA: Philadelphia	3	0.011	0.005	0.009
PA: Pittsburgh	5	0.017	0.006	0.011
PR: San Juan	7	0.003	0.001	0.002
RI: Providence	4	0.007	0.005	0.006
SC: Columbia	8	0.015	0.007	0.011
SD: Pierre	9	0.036	0.010	0.019
SD: Rapid City	7	0.013	0.005	0.009
TN: Knoxville	3	0.020	0.012	0.017
TN: Memphis	9	0.019	0.008	0.015
TN: Nashville	8	0.018	0.007	0.012
TN: Oak Ridge/Bethel	8	0.021	0.008	0.015
TN: Oak Ridge/K25	8	0.024	0.010	0.016
TN: Oak Ridge/Melton	8	0.020	0.008	0.014
TN: Oak Ridge/Y12 E	8	0.021	0.009	0.015
TN: Oak Ridge/Y12 W	8	0.024	0.009	0.016
TX: Amarillo	3	0.025	0.009	0.015
TX: Austin	4	0.017	0.009	0.014
TX: Dallas	4	0.018	0.006	0.011
TX: El Paso	4	0.030	0.013	0.018
TX: Ft. Worth	3	0.016	0.008	0.011
TX: Harlingen	2	0.012	0.011	0.012
TX: Houston	9	0.021	0.006	0.012
TX: Laredo	8	0.030	0.006	0.016

Table 4 (continued)
Gross Beta in Airborne Particulates
December 2014

Location	Number of Samples	NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg
TX: Lubbock	5	0.020	0.008	0.013
TX: San Angelo	4	0.017	0.010	0.013
TX: San Antonio	9	0.018	0.004	0.009
UT: Salt Lake City	7	0.013	0.003	0.008
UT: St. George	1	0.014	0.014	0.014
VA: Harrisonburg	9	0.013	0.005	0.009
VA: Richmond	5	0.012	0.006	0.008
VA: Virginia Beach	8	0.017	0.005	0.011
VT: Burlington	6	0.012	0.007	0.009
WA: Olympia	9	0.007	0.001	0.003
WA: Richland	8	0.024	0.003	0.014
WA: Seattle	1	0.004	0.004	0.004
WA: Spokane	5	0.022	0.002	0.011
WI: Lacrosse	4	0.021	0.011	0.014
WI: Madison	7	0.027	0.015	0.019
WI: Milwaukee	5	0.020	0.014	0.016
WI: Shawano	8	0.018	0.006	0.012
WV: Charleston	5	0.021	0.009	0.016
WY: Casper	4	0.010	0.006	0.009

Table 5
Gamma-Emitters in Precipitation
October 2014

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408		ND	
AR: Little Rock		ND	
AZ: Phoenix		ND	
CA: Richmond		ND	
CT: Hartford		ND	
FL: Jacksonville		ND	
GA: Atlanta		ND	
HI: Honolulu		ND	
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston		ND	
MI: Lansing		ND	
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NY: Albany		ND	
NY: Yaphank		ND	
OR: Portland	K-40	13	12
PA: Harrisburg		ND	
TN: Nashville		ND	
TN: Oak Ridge/K25		ND	
TN: Oak Ridge/Melton		ND	
TN: Oak Ridge/Y12 E	Be-7	27	17
TX: Austin		ND	
UT: Salt Lake City	Be-7	105	44
VA: Lynchburg	Be-7	46	29
	K-40	22	14
WA: Olympia		ND	

Table 6
Gamma-Emitters in Precipitation
November 2014

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408		ND	
AR: Little Rock	Be-7	28	17
CA: Richmond		ND	
CT: Hartford	Be-7	55	16
FL: Jacksonville	K-40	21	14
HI: Honolulu		ND	
ID: Idaho Falls		ND	
KS: Kansas City		ND	
MA: Boston	Be-7	45	18
MN: St. Paul	Be-7	57	22
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NH: Concord		ND	
NY: Albany	Be-7	56	21
NY: Yaphank		ND	
OR: Portland		ND	
PA: Harrisburg		ND	
TN: Nashville		ND	
TN: Oak Ridge/K25	Be-7	85	34
TN: Oak Ridge/Melton	Be-7	67	28
TN: Oak Ridge/Y12 E	Be-7	65	29
UT: Salt Lake City	Be-7	65	25
VA: Lynchburg	K-40	8.6	7.7
WA: Olympia		ND	

Table 7
Gamma-Emitters in Precipitation
December 2014

Location	Nuclide	pCi/L \pm 2 <i>u</i>	
AL: Montgomery/408	Be-7	30	19
AR: Little Rock	Be-7	73	25
AZ: Phoenix		ND	
CA: Richmond		ND	
CT: Hartford	Be-7	51	22
FL: Jacksonville		ND	
GA: Atlanta	Be-7	19	15
HI: Honolulu	Be-7	37	19
ID: Idaho Falls	Be-7	48	23
	K-40	10.9	8.9
KS: Kansas City		ND	
MA: Boston	Be-7	19	13
MN: St. Paul		ND	
MN: Welch/510		ND	
NC: Charlotte		ND	
NC: Wilmington		ND	
NH: Concord		ND	
NY: Albany		ND	
OR: Portland		ND	
PA: Harrisburg	Be-7	32	17
TN: Nashville	Be-7	24	10
TN: Oak Ridge/K25	Be-7	50	17
TN: Oak Ridge/Melton	Be-7	46	14
TN: Oak Ridge/Y12 E	Be-7	57	20
TX: Austin		ND	
UT: Salt Lake City	Be-7	38	20
VA: Lynchburg		ND	
WA: Olympia		ND	

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 total volume of air represented by all the samples received from one sampling location during a year typically ranges from 120,000 m³ to 500,000 m³. The aliquot analyzed is a fraction of the total volume and is typically between 5,000 m³ and 30,000 m³.

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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
October–December 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	11/14/14	90 100
AL: Dothan	10/07/14	58 97
AL: Montgomery	12/19/14	-121 91
AL: Muscle Shoals	10/02/14	31 85
AL: Scottsboro	10/01/14	29 85
AR: Little Rock	11/24/14	-71 93
CT: Hartford	10/07/14	63 98
DE: Dover	10/15/14	19 96
FL: Miami	12/29/14	4 67
FL: Tampa	10/06/14	28 96
GA: Baxley	10/20/14	-81 95
GA: Savannah	10/07/14	400 110
HI: Honolulu	11/18/14	330 110
IA: Cedar Rapids	12/03/14	-81 92
ID: Idaho Falls	11/21/14	31 89
IL: W. Chicago	10/22/14	-43 96
LA: New Orleans	12/15/14	-52 94
MD: Baltimore	10/17/14	36 98
MD: Conowingo	10/07/14	33 96
MI: Detroit	10/13/14	50 97
ND: Bismarck	11/04/14	100 100
NE: Lincoln	10/16/14	37 96
NH: Concord	12/24/14	36 69
NJ: Trenton	10/09/14	7 95
NJ: Waretown	10/09/14	6 95
NY: Albany	12/30/14	4 67
NY: New York City	12/22/14	6 66
NY: Niagara Falls	11/20/14	60 100
NY: Syracuse	12/10/14	290 110
OH: Columbus	12/09/14	-44 94
OH: E. Liverpool	11/19/14	-11 97
OH: Toledo	10/08/14	48 97
OK: Oklahoma City	12/09/14	-80 93
OR: Portland	12/23/14	-6 67
PA: Columbia	10/01/14	-10 83
PA: Harrisburg	10/01/14	15 84
PA: Pittsburgh	11/17/14	60 100
SC: Columbia	10/10/14	-2 93
SC: Jenkinsville	10/07/14	17 95
SC: Seneca	10/07/14	-90 100

Table 8 (continued)
Tritium in Drinking Water
October–December 2014

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
SC: Seneca	10/07/14	-22 94
TN: Knoxville	10/17/14	-9 98
TN: Oak Ridge/#360	10/07/14	73 97
TN: Oak Ridge/#371	10/07/14	-17 94
TN: Oak Ridge/#768	10/07/14	58 97
TN: Oak Ridge/#772	10/07/14	-30 93
TX: Austin	10/13/14	2 95
WA: Richland	11/05/14	100 100

Table 9
Iodine-131 in Drinking Water
January–December 2014

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
AK: Fairbanks	01/15/14	0.06	0.17
AL: Dothan	01/02/14	-0.06	0.14
AL: Montgomery	02/19/14	0.08	0.12
AL: Muscle Shoals	01/09/14	0.03	0.15
AL: Scottsboro	01/08/14	-0.04	0.16
AR: Little Rock	01/08/14	0.03	0.15
CA: Richmond	02/20/14	-0.04	0.16
CO: Denver	01/21/14	0.02	0.20
CT: Hartford	01/15/14	-0.09	0.14
DE: Dover	01/09/14	-0.02	0.15
FL: Miami	12/29/14	-0.05	0.28
FL: Tampa	01/30/14	0.10	0.18
GA: Savannah	10/07/14	0.12	0.47
HI: Honolulu	05/15/14	-0.04	0.13
IA: Cedar Rapids	01/17/14	0.07	0.13
ID: Boise	05/30/14	0.09	0.16
ID: Idaho Falls	11/21/14	0.13	0.42
IL: W. Chicago	10/22/14	-0.02	0.37
KS: Topeka	07/29/14	0.11	0.36
LA: New Orleans	01/10/14	0.00	0.13
MD: Baltimore	07/07/14	0.05	0.16
MI: Detroit	01/09/14	0.04	0.14
MN: St. Paul	09/30/14	-0.01	0.16
MN: Welch	09/30/14	0.04	0.18
MO: Jefferson City	01/21/14	0.13	0.18
ND: Bismarck	05/22/14	0.06	0.16
NE: Lincoln	01/07/14	0.08	0.20
NH: Concord	07/16/14	0.18	0.16
NJ: Trenton	10/09/14	0.14	0.29
NJ: Waretown	10/09/14	-0.05	0.25
NY: Albany	12/30/14	0.52	0.43
NY: New York City	09/19/14	-0.02	0.33
NY: Niagara Falls	11/20/14	0.12	0.48
NY: Syracuse	06/05/14	0.02	0.15
OH: E. Liverpool	05/28/14	0.00	0.31
OH: Painesville	05/22/14	0.05	0.43
OH: Toledo	07/03/14	0.22	0.37
OK: Oklahoma City	07/09/14	0.06	0.18
OR: Portland	12/23/14	0.00	0.71
PA: Columbia	10/01/14	0.02	0.16
PA: Harrisburg	10/01/14	0.12	0.17

Table 9 (continued)
Iodine-131 in Drinking Water
January–December 2014

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>
PA: Pittsburgh	11/17/14	0.10 0.59
SC: Columbia	04/10/14	0.03 0.31
SC: Jenkinsville	01/16/14	0.09 0.14
SC: Seneca	10/07/14	-0.05 0.41
TN: Knoxville	01/08/14	0.08 0.17
TN: Oak Ridge/#360	10/07/14	0.08 0.39
TN: Oak Ridge/#371	10/07/14	0.21 0.45
TN: Oak Ridge/#4442	07/01/14	-0.03 0.29
TN: Oak Ridge/#768	10/07/14	-0.14 0.34
TN: Oak Ridge/#772	10/07/14	0.10 0.33
TX: Austin	10/13/14	-0.04 0.18
VA: Ashland	02/20/14	0.06 0.16
VA: Lynchburg	05/16/14	-0.03 0.13

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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:

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

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