

ENVIRONMENTAL

RADIATION

DATA

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Preface

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

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

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

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

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Acknowledgments

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

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Data Reporting Conventions

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

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

Measurement Uncertainty

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

Significant Figures

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

Detection Capability

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

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

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

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

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

‡ Activity as of the day of counting.

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1. Air Program

Airborne Particulates and Precipitation

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

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

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

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

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

Table 2
Gross Beta in Airborne Particulates
July 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Montgomery/408	9	0.2	0.0	0.1	0.022	0.008	0.014
AR: Little Rock	4	0.0	0.0	0.0	0.017	0.012	0.014
AZ: Phoenix	4	0.4	0.1	0.3	0.013	0.009	0.010
CA: Los Angeles	7	0.2	0.1	0.2	0.016	0.006	0.009
CA: Richmond	4	0.0	0.0	0.0	0.004	0.002	0.003
CA: San Diego	4	0.1	0.1	0.1	0.011	0.003	0.006
CA: San Francisco	4	0.0	0.0	0.0	0.003	0.001	0.002
CO: Denver	9	1.0	0.4	0.7	0.016	0.008	0.012
CT: Hartford	9	0.1	0.0	0.1	0.012	0.006	0.008
DC: Washington	7	0.6	0.1	0.3	0.020	0.005	0.013
DE: Wilmington	8	0.2	0.1	0.1	0.016	0.010	0.013
FL: Jacksonville	9	0.1	0.0	0.1	0.010	0.003	0.006
FL: Miami	8	0.1	0.0	0.0	0.011	0.004	0.006
GA: Atlanta	3	0.1	0.0	0.1	0.016	0.008	0.011
IA: Iowa City	9	0.9	0.2	0.5	0.026	0.010	0.015
ID: Idaho Falls	9				0.009	0.007	0.008
IL: Chicago	6	0.5	0.0	0.2	0.012	0.007	0.010
IN: Indianapolis	8	0.2	0.1	0.1	0.012	0.006	0.010
KS: Topeka	9	1.8	0.6	1.2	0.020	0.008	0.014
MA: Boston	9	0.4	0.0	0.1	0.013	0.005	0.008
MI: Detroit	9	0.2	0.1	0.1	0.012	0.005	0.008
MI: Lansing	9	0.3	0.1	0.2	0.015	0.007	0.010
MN: St. Paul	5	0.2	0.0	0.1	0.016	0.010	0.012
MS: Jackson	6	0.3	0.0	0.1	0.016	0.010	0.014
NC: Charlotte	8	0.1	0.0	0.0	0.019	0.009	0.012
NC: Wilmington	2				0.009	0.008	0.008
ND: Bismarck	4	0.8	0.2	0.5	0.012	0.008	0.010
NH: Concord	8	0.6	0.1	0.3	0.011	0.005	0.009
NJ: Trenton	7	0.4	0.1	0.2	0.018	0.009	0.012
NV: Las Vegas/913	1				0.010	0.010	0.010
NY: Albany	4	0.1	0.0	0.0	0.010	0.006	0.009
NY: New York City	9	7.5	0.0	1.6	0.021	0.009	0.014
NY: Yaphank	8	0.1	0.0	0.1	0.009	0.004	0.007
OH: Painesville	6	0.2	0.1	0.2	0.011	0.006	0.008
OH: Ross	8				0.045	0.009	0.018
OR: Portland	8	0.1	0.0	0.0	0.005	0.001	0.003
PA: Harrisburg	9	0.6	0.1	0.3	0.020	0.009	0.015
PA: Pittsburgh	8	0.4	0.0	0.2	0.020	0.008	0.015

Table 2 (continued)
Gross Beta in Airborne Particulates
July 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
SC: Barnwell	1	0.0	0.0	0.0	0.014	0.014	0.014
SC: Columbia	3	0.4	0.0	0.1	0.018	0.008	0.013
SD: Pierre	8	0.4	0.1	0.2	0.012	0.009	0.010
TN: Knoxville	7	0.3	0.0	0.1	0.023	0.015	0.019
TN: Nashville	9	0.6	0.1	0.3	0.021	0.011	0.015
TN: Oak Ridge/Bethel	9	1.0	0.4	0.7	0.019	0.009	0.015
TN: Oak Ridge/K25	9	1.8	0.7	1.1	0.022	0.010	0.016
TN: Oak Ridge/Melton	9	1.4	0.7	0.9	0.021	0.008	0.015
TN: Oak Ridge/Y12 E	9	1.2	0.3	0.7	0.021	0.010	0.016
TN: Oak Ridge/Y12 W	9	0.6	0.3	0.4	0.019	0.010	0.015
TX: Austin	9	0.2	0.1	0.2	0.018	0.005	0.010
TX: Dallas	6	0.3	0.3	0.3	0.016	0.001	0.008
TX: El Paso	9	0.9	0.3	0.6	0.015	0.010	0.013
UT: Salt Lake City	8	0.5	0.0	0.3	0.015	0.009	0.012
VA: Lynchburg	6	0.8	0.2	0.6	0.018	0.010	0.013
WA: Olympia	6	0.1	0.0	0.0	0.004	0.001	0.003
WA: Spokane	9	0.6	0.2	0.4	0.017	0.007	0.011

Table 3
Gross Beta in Airborne Particulates
August 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Montgomery/408	8	0.1	0.0	0.1	0.020	0.008	0.012
AR: Little Rock	5	0.1	0.0	0.0	0.021	0.008	0.015
AZ: Phoenix	5	0.6	0.1	0.3	0.009	0.006	0.008
CA: Los Angeles	9	0.4	0.1	0.2	0.014	0.006	0.010
CA: Richmond	5	0.0	0.0	0.0	0.004	0.002	0.004
CA: San Diego	7	0.3	0.0	0.1	0.009	0.006	0.008
CA: San Francisco	5	0.0	0.0	0.0	0.004	0.002	0.003
CO: Denver	9	1.0	0.3	0.7	0.013	0.009	0.011
CT: Hartford	8	0.1	0.0	0.1	0.009	0.005	0.006
DC: Washington	9	0.9	0.1	0.4	0.023	0.008	0.013
DE: Wilmington	8	0.7	0.1	0.2	0.026	0.010	0.015
FL: Jacksonville	8	0.1	0.0	0.1	0.011	0.004	0.008
FL: Miami	9	0.1	0.0	0.0	0.014	0.005	0.010
GA: Atlanta	4	0.1	0.0	0.0	0.018	0.009	0.013
IA: Iowa City	9	0.6	0.2	0.4	0.023	0.009	0.014
ID: Idaho Falls	9				0.016	0.007	0.012
IL: Chicago	7	0.4	0.0	0.1	0.016	0.007	0.010
IN: Indianapolis	9	0.3	0.1	0.1	0.014	0.007	0.010
KS: Kansas City	1	1.0	1.0	1.0	0.016	0.016	0.016
KS: Topeka	9	1.5	0.4	0.8	0.026	0.008	0.015
MA: Boston	3	0.0	-0.0	0.0	0.005	0.004	0.004
MI: Detroit	9	0.1	0.0	0.1	0.013	0.004	0.007
MI: Lansing	8	0.3	0.0	0.2	0.019	0.008	0.011
MN: St. Paul	4	0.1	0.1	0.1	0.013	0.011	0.012
MS: Jackson	7	0.2	0.0	0.1	0.020	0.003	0.014
NC: Charlotte	9	0.1	0.0	0.1	0.019	0.011	0.014
NC: Wilmington	5				0.013	0.008	0.010
ND: Bismarck	2	1.6	0.3	0.9	0.012	0.012	0.012
NH: Concord	8	0.4	0.2	0.3	0.009	0.005	0.007
NJ: Trenton	9	0.5	0.1	0.3	0.017	0.007	0.010
NM: Santa Fe	2	1.3	0.1	0.7	0.005	0.005	0.005
NV: Las Vegas/913	4				0.010	0.006	0.008
NY: Albany	5	0.1	0.0	0.0	0.010	0.005	0.008
NY: New York City	7	9.4	0.0	2.4	0.022	0.010	0.015
NY: Yaphank	8	0.1	0.0	0.1	0.012	0.005	0.007
OH: Painesville	7	0.6	0.1	0.2	0.013	0.007	0.010
OH: Ross	9				0.096	0.011	0.026
OR: Portland	9	0.1	0.0	0.0	0.004	0.001	0.003

Table 3 (continued)
Gross Beta in Airborne Particulates
August 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
PA: Harrisburg	8	0.6	0.2	0.4	0.024	0.009	0.013
PA: Philadelphia	3	0.4	0.4	0.4	0.016	0.009	0.013
PA: Pittsburgh	8	0.5	0.1	0.2	0.030	0.011	0.016
SC: Barnwell	2	0.0	0.0	0.0	0.013	0.010	0.011
SC: Columbia	4	0.1	0.1	0.1	0.016	0.011	0.013
SD: Pierre	8	0.4	0.2	0.3	0.018	0.007	0.011
TN: Knoxville	10	0.5	0.0	0.2	0.035	0.007	0.017
TN: Nashville	9	0.4	0.1	0.2	0.020	0.009	0.014
TN: Oak Ridge/Bethel	9	1.4	0.4	0.8	0.020	0.008	0.014
TN: Oak Ridge/K25	9	1.6	0.5	1.0	0.020	0.008	0.014
TN: Oak Ridge/Melton	9	1.9	0.6	1.1	0.022	0.008	0.015
TN: Oak Ridge/Y12 E	9	1.0	0.4	0.6	0.023	0.009	0.016
TN: Oak Ridge/Y12 W	9	0.8	0.2	0.4	0.019	0.009	0.014
TX: Austin	8	0.4	0.1	0.2	0.013	0.009	0.010
TX: Dallas	7	0.6	0.0	0.3	0.014	0.002	0.008
TX: El Paso	8	0.8	0.2	0.6	0.016	0.006	0.011
UT: Salt Lake City	7	0.4	0.0	0.2	0.015	0.008	0.011
VA: Lynchburg	8	1.9	0.3	1.0	0.021	0.009	0.015
WA: Olympia	8	0.1	0.0	0.1	0.005	0.002	0.003
WA: Spokane	6	0.9	0.1	0.4	0.017	0.005	0.011

Table 4
Gross Beta in Airborne Particulates
September 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AL: Montgomery/408	8	0.2	0.0	0.1	0.027	0.005	0.015
AR: Little Rock	2	0.0	0.0	0.0	0.026	0.018	0.022
AZ: Phoenix	4	0.5	0.3	0.4	0.011	0.007	0.009
CA: Los Angeles	9	0.4	0.0	0.2	0.018	0.009	0.013
CA: Richmond	4	0.0	0.0	0.0	0.007	0.003	0.005
CA: San Diego	5	0.2	0.0	0.1	0.010	0.006	0.008
CA: San Francisco	2	0.0	0.0	0.0	0.005	0.004	0.005
CO: Denver	7	1.9	0.3	1.0	0.019	0.008	0.013
CT: Hartford	9	0.2	0.0	0.1	0.009	0.002	0.006
DC: Washington	8	0.6	0.1	0.3	0.018	0.003	0.010
DE: Wilmington	9	0.4	0.0	0.1	0.015	0.003	0.010
FL: Jacksonville	9	0.1	0.0	0.1	0.015	0.003	0.009
FL: Miami	2	0.1	0.0	0.0	0.008	0.008	0.008
GA: Atlanta	4	0.1	0.0	0.1	0.020	0.009	0.014
IA: Iowa City	8	1.2	0.4	0.7	0.016	0.004	0.010
ID: Idaho Falls	7				0.021	0.006	0.013
IL: Chicago	3	0.1	0.0	0.0	0.013	0.007	0.011
IN: Indianapolis	10	0.3	0.0	0.1	0.016	0.004	0.008
KS: Kansas City	8	6.7	0.9	2.2	0.034	0.009	0.017
KS: Topeka	8	4.1	0.3	1.1	0.016	0.008	0.012
MA: Boston	8	0.1	0.0	0.0	0.010	0.003	0.006
MI: Detroit	8	0.2	0.0	0.1	0.013	0.005	0.009
MI: Lansing	9	0.4	0.1	0.1	0.015	0.005	0.010
MN: St. Paul	5	0.1	0.0	0.0	0.012	0.008	0.010
MS: Jackson	9	0.1	0.0	0.0	0.024	0.009	0.014
NC: Charlotte	9	0.1	0.0	0.0	0.021	0.005	0.011
NC: Wilmington	4				0.011	0.004	0.009
ND: Bismarck	4	1.4	0.1	0.5	0.022	0.007	0.012
NH: Concord	9	0.6	0.2	0.3	0.009	0.003	0.007
NJ: Trenton	8	0.5	0.1	0.2	0.013	0.004	0.009
NM: Santa Fe	1	0.2	0.2	0.2	0.018	0.018	0.018
NV: Las Vegas/913	1				0.012	0.012	0.012
NY: Albany	4	0.1	0.0	0.0	0.009	0.004	0.007
NY: New York City	7	7.6	0.0	2.0	0.018	0.006	0.013
NY: Yaphank	3	5.7	0.0	2.0	0.005	0.003	0.004
OH: Painesville	8	0.3	0.1	0.2	0.013	0.005	0.009
OH: Ross	9				0.029	0.005	0.014
OR: Portland	9	0.1	0.0	0.1	0.007	0.002	0.004

Table 4 (continued)
Gross Beta in Airborne Particulates
September 2006

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
PA: Harrisburg	8	0.7	0.2	0.3	0.018	0.007	0.012
PA: Philadelphia	3				0.041	0.008	0.021
PA: Pittsburgh	8	0.5	0.1	0.2	0.018	0.007	0.012
SC: Barnwell	1	0.0	0.0	0.0	0.010	0.010	0.010
SC: Columbia	4	0.2	0.0	0.1	0.019	0.011	0.014
SD: Pierre	9	1.3	0.1	0.4	0.024	0.006	0.014
TN: Knoxville	5	0.2	0.0	0.1	0.028	0.011	0.019
TN: Nashville	8	0.4	0.0	0.2	0.022	0.006	0.014
TN: Oak Ridge/Bethel	7	1.3	0.3	0.8	0.021	0.008	0.015
TN: Oak Ridge/K25	6	1.3	0.4	0.9	0.021	0.009	0.013
TN: Oak Ridge/Melton	7	1.7	0.4	0.9	0.023	0.009	0.014
TN: Oak Ridge/Y12 E	7	1.4	0.2	0.7	0.023	0.009	0.015
TN: Oak Ridge/Y12 W	7	0.7	0.1	0.4	0.022	0.008	0.014
TX: Austin	8	0.5	0.1	0.2	0.021	0.008	0.013
TX: Dallas	9	0.5	0.0	0.3	0.020	0.006	0.012
TX: El Paso	9	1.6	0.2	0.7	0.018	0.008	0.014
UT: Salt Lake City	9	0.4	0.0	0.2	0.017	0.006	0.011
VA: Lynchburg	6	1.2	0.1	0.5	0.015	0.004	0.010
WA: Olympia	9	0.1	0.1	0.1	0.006	0.002	0.004
WA: Spokane	9	1.3	0.1	0.6	0.038	0.005	0.014

Table 5
Gross Beta and Specific Gamma in Precipitation
July 2006

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	1.53	0.38	Be7	45	32
CO: Denver	1.13	0.34		ND	
CT: Hartford	2.91	0.44	Be7	95	19
DE: Wilmington	1.77	0.39	Be7	48	22
			Tl208	1.7	3.0
FL: Jacksonville	0.66	0.32	Be7	50	23
FL: Miami	0.33	0.29		ND	
GA: Atlanta	2.69	0.43	Be7	54	25
IA: Iowa City	0.69	0.32		ND	
MA: Boston	2.83	0.44	Be7	58	39
MI: Lansing	0.64	0.31		ND	
MN: St. Paul	3.79	0.51	Be7	52	31
			Pb212	4.1	6.8
NC: Charlotte	1.96	0.40	Be7	69	31
NC: Wilmington	0.76	0.32		ND	
ND: Bismarck	4.80	0.60	Pb212	3.2	5.3
NH: Concord	1.46	0.37	Be7	45	30
			Bi212	25	38
NM: Santa Fe	2.66	0.43	Be7	46	26
NY: Albany	1.57	0.38	Be7	89	40
			K40	30	61
			Tl208	3.7	3.6
NY: Yaphank	7.65	0.67	Be7	19	16
			K40	9	13
OH: Painesville	1.61	0.37		ND	
OR: Portland	2.23	0.42		ND	
PA: Harrisburg	0.92	0.33	Be7	40	28
TN: Knoxville	3.34	0.50		ND	
TN: Nashville	2.77	0.46		ND	
TN: Oak Ridge/Melton	1.85	0.38	Be7	47	10
			Pb212	1.3	1.1
			Tl208	0.53	0.59
TX: El Paso	1.32	0.37	Be7	63	43
VA: Lynchburg	3.17	0.47		ND	

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
August 2006

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	1.81	0.38	Be7	57	26
AR: Little Rock	1.19	0.37		ND	
AZ: Phoenix	1.23	0.38		ND	
CO: Denver	1.14	0.36	Be7	28	30
CT: Hartford	1.45	0.36	Be7	46	28
			K40	20	33
			Be7	61	32
DE: Wilmington	2.60	0.45	Be7	31	18
FL: Jacksonville	1.39	0.37		ND	
FL: Miami	0.51	0.30		ND	
GA: Atlanta	2.85	0.45	Be7	47	24
IA: Iowa City	0.26	0.31	Tl208	2.5	3.7
ID: Idaho Falls	0.59	0.31		ND	
MA: Boston	1.42	0.36	Be7	37	29
MI: Lansing	1.76	0.41	Pb212	3.8	6.3
MN: St. Paul	0.54	0.30		ND	
NC: Charlotte	2.43	0.42	Be7	29	34
NC: Wilmington	1.33	0.36	Be7	39	23
ND: Bismarck	1.29	0.37	Be7	32	29
NH: Concord	1.69	0.37	Be7	68	30
			K40	15	32
NM: Santa Fe	3.40	0.48	Be7	37	31
NY: Albany	1.63	0.38	Be7	36	24
NY: Yaphank	2.57	0.44		ND	
OH: Painesville	1.48	0.37		ND	
PA: Harrisburg	6.36	0.62	Be7	133	31
TN: Knoxville	5.44	0.59		ND	
TN: Nashville	0.63	0.30		ND	
TN: Oak Ridge/Melton	2.33	0.42	Be7	62	43
TX: Dallas	1.05	0.35	Be7	26	19
TX: El Paso	0.44	0.31		ND	
UT: Salt Lake City	8.39	0.83	Be7	28	25
			Pb212	6.6	6.4
VA: Lynchburg	5.09	0.57	Pb212	5.9	6.4

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
September 2006

Location	Gross Beta Activity		Gamma-Emitting Radionuclides		
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$	
AL: Montgomery/408	0.33	0.28		ND	
AR: Little Rock	0.71	0.31		ND	
AZ: Phoenix	0.46	0.30	Tl208	1.8	2.7
CO: Denver	2.22	0.43	Be7	50	28
			Pb212	9.1	6.0
			Tl208	4.9	3.5
CT: Hartford	0.66	0.31		ND	
DE: Wilmington	0.45	0.29		ND	
FL: Jacksonville	1.20	0.35	Be7	32	23
FL: Miami	0.27	0.29		ND	
GA: Atlanta	0.50	0.30		ND	
IA: Iowa City	0.66	0.31		ND	
KS: Kansas City	0.85	0.32	Be7	39	33
MA: Boston	1.05	0.33	Pb212	4.5	5.8
MI: Lansing	0.94	0.33	Be7	31	15
MN: St. Paul	2.25	0.43	Be7	29	30
NC: Charlotte	1.07	0.32		ND	
NC: Wilmington	0.42	0.31	K40	33	50
			Pb212	5.8	7.8
			Be7	103	32
ND: Bismarck	12.57	0.94	Bi212	28	50
NM: Santa Fe	1.45	0.36	Be7	70	19
NY: Albany	1.45	0.38		ND	
NY: Yaphank	5.22	0.57	K40	39	42
OH: Painesville	1.18	0.34		ND	
OR: Portland	0.67	0.30		ND	
PA: Harrisburg	0.74	0.30	Be7	15.5	7.6
TN: Knoxville	4.47	0.54	Tl208	3.7	4.5
TN: Nashville	1.24	0.35		ND	
TN: Oak Ridge/Melton	2.17	0.40		ND	
TX: Austin	0.69	0.31		ND	
TX: Dallas	0.67	0.31	Be7	53	31
TX: El Paso	0.57	0.30	Tl208	3.1	3.1
UT: Salt Lake City	3.70	0.52		ND	
VA: Lynchburg	2.78	0.44		ND	
WA: Olympia	2.11	0.42	K40	19	31
			Tl208	2.6	3.6

Note: ND = Not Detected

Table 8
Tritium in Precipitation
July - September 2006

Location	July 2006 pCi/L $\pm 2u$	August 2006 pCi/L $\pm 2u$	September 2006 pCi/L $\pm 2u$
AL: Montgomery/408	14 82	-4 80	-10 78
AR: Little Rock	NS	8 80	40 80
AZ: Phoenix	NS	-16 79	56 84
CO: Denver	51 83	18 81	78 85
CT: Hartford	-47 82	41 84	-20 80
DE: Wilmington	16 84	-5 82	43 81
FL: Jacksonville	-32 80	-2 82	54 81
FL: Miami	9 82	-41 80	37 80
GA: Atlanta	-16 81	-49 80	28 80
IA: Iowa City	-5 81	4 80	50 80
ID: Idaho Falls	NS	78 83	NS
KS: Kansas City	NS	NS	65 85
MA: Boston	-29 82	-14 82	14 81
MI: Lansing	14 82	63 83	98 83
MN: St. Paul	2 82	83 84	5 79
NC: Charlotte	4 84	21 83	56 81
NC: Wilmington	-14 83	-28 81	23 79
ND: Bismarck	55 84	18 81	21 79
NH: Concord	4 83	69 85	NS
NM: Santa Fe	-20 81	22 81	47 81
NY: Albany	25 84	5 83	62 82
NY: Yaphank	-45 81	-18 82	86 82
OH: Painesville	28 82	10 80	24 79
OR: Portland	-5 81	NS	51 83
PA: Harrisburg	-4 83	-5 82	-22 79
TN: Knoxville	25 83	55 83	33 80
TN: Nashville	5 82	-11 82	32 80
TN: Oak Ridge/Melton	99 86	77 84	14 79
TX: Austin	NS	NS	-47 76
TX: Dallas	NS	-12 79	74 85
TX: El Paso	9 82	24 81	7 79
UT: Salt Lake City	NS	92 84	4 81
VA: Lynchburg	40 85	49 84	56 81
WA: Olympia	NS	NS	21 82

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.

2. Drinking Water Program

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

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

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

Table 9
Tritium in Drinking Water
July - September 2006

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>
AK: Fairbanks	07/26/06	-19 82
AL: Dothan	07/12/06	-45 79
AL: Montgomery	07/06/06	-40 82
AL: Muscle Shoals	07/03/06	165 89
AL: Scottsboro	07/03/06	173 89
AR: Little Rock	07/11/06	-83 77
CA: Los Angeles	07/03/06	-62 80
CA: Richmond	07/05/06	-9 83
CO: Denver	07/20/06	-59 80
CT: Hartford	07/05/06	2 85
DE: Dover	07/11/06	-45 78
FL: Miami	08/17/06	-9 81
FL: Tampa	09/26/06	26 79
GA: Baxley	08/23/06	14 83
GA: Savannah	09/13/06	25 81
HI: Honolulu	07/14/06	-88 78
IA: Cedar Rapids	07/12/06	8 81
ID: Boise	08/21/06	-2 80
ID: Idaho Falls	07/28/06	-29 82
IL: Morris	07/25/06	-14 83
IL: W. Chicago	08/02/06	12 84
KS: Topeka	07/10/06	-12 80
LA: New Orleans	09/05/06	126 86
MD: Baltimore	07/06/06	-31 82
MD: Conowingo	08/29/06	44 84
ME: Augusta	07/03/06	38 86
MI: Detroit	07/06/06	42 85
MI: Grand Rapids	07/21/06	-6 80
MN: Red Wing	07/18/06	-53 80
MN: St. Paul	07/31/06	-20 82
MO: Jefferson City	07/11/06	-39 79
MS: Jackson	07/11/06	-53 78
MS: Port Gibson	07/11/06	-29 80
MT: Helena	07/05/06	-37 83
NC: Charlotte	07/31/06	900 120
NC: Raleigh	07/13/06	83 85
ND: Bismarck	07/03/06	11 85
NE: Lincoln	07/07/06	-16 82
NH: Concord	07/21/06	15 81
NJ: Trenton	07/12/06	6 81

Table 9 (continued)
Tritium in Drinking Water
July - September 2006

Location	Date Collected	³ H pCi/L ± 2u
NJ: Waretown	07/19/06	-12 81
NM: Santa Fe	07/06/06	-16 83
NV: Las Vegas	09/28/06	26 79
NY: Albany	07/03/06	-22 83
NY: New York City	07/07/06	-14 82
NY: Niagara Falls	07/11/06	100 85
NY: Syracuse	08/22/06	14 81
OH: Cincinnati	09/14/06	41 82
OH: Columbus	07/03/06	5 84
OH: E. Liverpool	07/20/06	53 83
OH: Painesville	07/21/06	18 81
OH: Toledo	07/05/06	13 86
OR: Portland	09/05/06	-14 82
PA: Columbia	08/30/06	2 82
PA: Harrisburg	08/31/06	14 82
PA: Philadelphia - Queen Lane Lab.	07/17/06	-14 82
PA: Philadelphia - Baxter Control Lab.	07/17/06	18 83
PA: Philadelphia – Belmont Lab.	07/17/06	-2 82
PA: Pittsburgh	07/20/06	-56 80
RI: Providence	07/05/06	-35 82
SC: Barnwell	07/20/06	-45 81
SC: Jenkinsville	07/27/06	-23 82
SC: Seneca	07/03/06	25 84
TN: Chattanooga	07/06/06	450 100
TN: Knoxville	07/03/06	-28 83
TN: Oak Ridge/#360	07/14/06	-62 79
TN: Oak Ridge/#371	07/14/06	8 83
TN: Oak Ridge/#4442	07/14/06	22 84
TN: Oak Ridge/#768	07/14/06	23 83
TN: Oak Ridge/#772	07/14/06	-72 79
TX: Austin	07/10/06	-47 79
VA: Ashland	07/27/06	-4 83
VA: Lynchburg	07/07/06	45 85
WA: Richland	07/10/06	38 85
WA: Seattle	09/13/06	11 82

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3. Milk Program

Pasteurized Milk

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

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

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

Table 10
Radionuclides in Pasteurized Milk
July - September 2006

Location	Date Collected	K g/L ± 2u	¹³⁷ Cs pCi/L ± 2u	¹⁴⁰ Ba pCi/L ± 2u	¹³¹ I pCi/L ± 2u
AR: Little Rock	09/18/06	1.62 0.21	ND	ND	ND
AZ: Phoenix	08/29/06	1.61 0.21	ND	ND	ND
CA: Los Angeles	07/07/06	1.63 0.13	ND	ND	ND
CA: Sacramento	07/19/06	1.60 0.12	ND	ND	ND
CA: San Francisco	07/06/06	1.63 0.14	ND	ND	ND
CT: Hartford	07/07/06	1.60 0.12	ND	ND	ND
DE: Wilmington	08/16/06	1.61 0.11	ND	ND	ND
FL: Tampa	07/10/06	1.64 0.13	ND	ND	ND
HI: Honolulu	08/28/06	1.66 0.20	ND	ND	ND
IA: Des Moines	07/10/06	1.67 0.13	ND	ND	ND
IN: Indianapolis	08/11/06	1.61 0.12	ND	ND	ND
KS: Wichita	07/24/06	1.39 0.11	ND	ND	ND
MA: Boston	09/19/06	1.57 0.20	ND	ND	ND
MD: Baltimore	07/07/06	1.68 0.11	ND	ND	ND
MO: Jefferson City	07/17/06	1.57 0.13	ND	ND	ND
NJ: Trenton	07/31/06	1.49 0.12	ND	ND	ND
NV: Las Vegas	07/17/06	1.66 0.12	ND	ND	ND
NY: Buffalo	07/17/06	1.62 0.13	ND	ND	ND
NY: Syracuse	07/13/06	1.62 0.13	ND	ND	ND
OH: Cincinnati	07/24/06	1.62 0.12	ND	ND	ND
OH: Cleveland	08/30/06	1.49 0.22	ND	ND	ND
OR: Portland	08/14/06	1.66 0.13	ND	ND	ND
PA: Pittsburgh	07/11/06	1.57 0.12	ND	ND	ND
TN: Chattanooga	08/17/06	1.73 0.14	ND	ND	ND
TN: Memphis	07/10/06	1.56 0.12	ND	ND	ND
TX: Austin	07/25/06	1.54 0.12	ND	ND	ND
TX: Ft. Worth	08/15/06	1.56 0.12	ND	ND	ND
VA: Norfolk	09/20/06	1.51 0.19	ND	ND	ND
VT: Montpelier	09/26/06	1.50 0.22	ND	ND	ND
WA: Spokane	07/06/06	1.54 0.12	ND	ND	ND
WA: Tacoma	09/13/06	1.62 0.20	ND	ND	ND
WV: Charleston	07/12/06	1.60 0.13	ND	ND	ND

Note: ND = Not Detected

Table 11
Strontium-90 in Pasteurized Milk
July - September 2006

Location	Date Collected	⁹⁰ Sr pCi/L ± 2 <i>u</i>
CA: Los Angeles	07/07/06	0.07 0.51
CT: Hartford	07/07/06	0.75 0.51
MO: Jefferson City	07/17/06	0.65 0.62
NY: Syracuse	07/13/06	0.48 0.64
OH: Cincinnati	07/24/06	-0.16 0.64
TN: Memphis	07/10/06	0.93 0.57
TX: Austin	07/25/06	0.19 0.52
WA: Spokane	07/06/06	0.96 0.54
WV: Charleston	07/12/06	0.71 0.63

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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.

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