

ENVIRONMENTAL

RADIATION

DATA

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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 Environmental Radiation Ambient Monitoring System (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 ERAMS in 1973 with an emphasis on identifying trends in the accumulation of long-lived radionuclides in the environment. ERAMS 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 ERAMS 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 Environmental Radiation Ambient Monitoring System (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 ERAMS. 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 blank sample.

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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 for decay of natural radon isotopes and their progeny. 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 2001

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/411	9	0.2	0.0	0.1	0.015	0.003	0.009
AR: Little Rock	8	0.1	0.0	0.0	0.025	0.006	0.015
AZ: Phoenix	5	0.5	0.2	0.4	0.015	0.009	0.012
CA: Berkeley	9	0.1	0.0	0.0	0.006	0.001	0.004
CA: Los Angeles	9	0.3	0.0	0.1	0.010	0.005	0.008
CO: Denver	8	0.7	0.3	0.5	0.010	0.006	0.008
CT: Hartford	9	0.1	0.0	0.1	0.008	0.002	0.005
DE: Wilmington	9	0.3	0.1	0.2	0.015	0.004	0.008
FL: Jacksonville	9	0.1	0.0	0.1	0.010	0.004	0.007
FL: Miami	4	0.0	0.0	0.0	0.007	0.004	0.006
HI: Honolulu	8	0.1	0.1	0.1	0.005	0.001	0.003
IA: Iowa City	9				0.014	0.007	0.010
ID: Boise	5	0.5	0.1	0.3	0.008	0.005	0.006
ID: Idaho Falls	8				0.009	0.006	0.007
IN: Indianapolis	9	0.4	0.0	0.2	0.013	0.006	0.010
KS: Topeka	9	1.2	0.4	0.8	0.013	0.009	0.011
ME: Augusta	8	0.2	0.0	0.1	0.010	0.002	0.005
MI: Lansing	9	0.7	0.1	0.3	0.017	0.006	0.009
MN: Minneapolis	4	0.2	0.0	0.1	0.012	0.008	0.010
MN: Welch/510	2				0.010	0.009	0.009
MS: Jackson	8	0.5	0.1	0.2	0.015	0.005	0.010
NC: Wilmington	5				0.010	0.005	0.007
ND: Bismarck	5	0.7	0.2	0.5	0.010	0.004	0.007
NH: Concord	9	0.2	0.1	0.1	0.010	0.002	0.006
NJ: Trenton	3				0.009	0.006	0.008
NV: Las Vegas	9	0.2	0.1	0.1	0.012	0.006	0.008
NY: Albany	4	0.1	0.0	0.1	0.010	0.003	0.007
NY: New York City	9	0.1	0.0	0.1	0.011	0.003	0.007
NY: Syracuse	3	0.0	0.0	0.0	0.013	0.003	0.009
NY: Yaphank	8	0.1	0.0	0.1	0.010	0.004	0.007
OH: Painesville	8	0.5	0.1	0.3	0.020	0.005	0.011
OH: Ross	9				0.023	0.007	0.010
OR: Portland	8	0.1	0.0	0.1	0.004	0.001	0.003
PA: Harrisburg	9	0.5	0.1	0.3	0.014	0.004	0.009
PA: Pittsburgh	9				0.014	0.005	0.009
SC: Barnwell	2	0.0	0.0	0.0	0.008	0.007	0.008
SC: Columbia	8	0.2	0.1	0.1	0.013	0.004	0.008
TN: Knoxville	9	2.2	0.0	0.4	0.023	0.006	0.014

Table 2 (continued)
Gross Beta in Airborne Particulates
July 2001

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Nashville	9	0.4	0.1	0.2	0.021	0.008	0.013
TN: Oak Ridge/Bethel	9	1.0	0.2	0.5	0.019	0.006	0.011
TN: Oak Ridge/K25	9	1.0	0.2	0.5	0.017	0.005	0.011
TN: Oak Ridge/Melton	9	1.0	0.1	0.4	0.019	0.005	0.011
TN: Oak Ridge/Y12 E	9	0.9	0.2	0.4	0.018	0.006	0.011
TN: Oak Ridge/Y12 W	9	0.8	0.1	0.4	0.021	0.005	0.012
TX: Austin	8	0.3	0.1	0.2	0.013	0.005	0.009
TX: El Paso	9	0.7	0.2	0.5	0.011	0.006	0.009
UT: Salt Lake City	9	0.4	0.0	0.2	0.019	0.007	0.009
VA: Lynchburg	8	0.8	0.1	0.5	0.012	0.006	0.008
WA: Olympia	7	0.2	0.0	0.1	0.004	0.002	0.003
WA: Spokane	9	0.2	0.1	0.1	0.010	0.003	0.006

Table 3
Gross Beta in Airborne Particulates
August 2001

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/411	9	0.1	0.0	0.1	0.018	0.006	0.010
AR: Little Rock	7	0.1	0.0	0.0	0.022	0.010	0.015
AZ: Phoenix	4	1.3	0.2	0.6	0.013	0.012	0.013
CA: Berkeley	9	0.1	0.0	0.1	0.005	0.001	0.003
CA: Los Angeles	9	0.2	0.0	0.1	0.009	0.005	0.008
CO: Denver	9	0.8	0.1	0.5	0.013	0.007	0.010
CT: Hartford	9	0.3	0.1	0.1	0.017	0.006	0.009
DE: Wilmington	9	0.5	0.1	0.2	0.023	0.006	0.013
FL: Jacksonville	9	0.1	0.0	0.1	0.016	0.005	0.009
FL: Miami	4	0.0	0.0	0.0	0.009	0.005	0.007
HI: Honolulu	9	0.2	0.1	0.1	0.003	0.001	0.002
IA: Iowa City	9				0.022	0.009	0.013
ID: Boise	6	0.9	0.3	0.6	0.017	0.005	0.010
ID: Idaho Falls	10				0.014	0.004	0.008
IN: Indianapolis	9	0.7	0.2	0.4	0.017	0.007	0.012
KS: Topeka	9	1.5	0.3	0.9	0.027	0.008	0.013
ME: Augusta	9	0.4	0.1	0.2	0.013	0.005	0.008
MI: Lansing	8	0.4	0.1	0.3	0.017	0.007	0.011
MN: Minneapolis	5	0.4	0.2	0.3	0.017	0.009	0.012
MN: Welch/510	4	0.8	0.3	0.5	0.016	0.006	0.010
MS: Jackson	9	0.5	0.1	0.2	0.020	0.007	0.013
NC: Wilmington	2				0.007	0.005	0.006
ND: Bismarck	8	1.3	0.1	0.7	0.021	0.006	0.009
NH: Concord	9	0.4	0.1	0.2	0.015	0.005	0.010
NJ: Trenton	4				0.015	0.005	0.011
NV: Las Vegas	9	0.2	0.1	0.1	0.014	0.007	0.010
NY: Albany	5	0.2	0.0	0.1	0.016	0.006	0.011
NY: New York City	9	0.2	0.1	0.1	0.018	0.006	0.010
NY: Syracuse	4	0.0	0.0	0.0	0.016	0.009	0.012
NY: Yaphank	9	0.5	0.0	0.2	0.023	0.007	0.011
OH: Painesville	8	0.6	0.1	0.3	0.017	0.007	0.011
OH: Ross	9				0.103	0.008	0.024
OR: Portland	5	0.1	0.0	0.1	0.004	0.002	0.003
PA: Harrisburg	9	0.8	0.1	0.5	0.021	0.008	0.014
PA: Pittsburgh	9				0.019	0.010	0.014
SC: Barnwell	1	0.0	0.0	0.0	0.011	0.011	0.011
SC: Columbia	8	0.4	0.1	0.2	0.021	0.007	0.013
TN: Knoxville	8	1.3	0.0	0.5	0.024	0.010	0.017

Table 3 (continued)
Gross Beta in Airborne Particulates
August 2001

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
TN: Nashville	8	3.3	0.0	0.6	0.020	0.010	0.015
TN: Oak Ridge/Bethel	9	1.2	0.2	0.8	0.022	0.008	0.014
TN: Oak Ridge/K25	9	1.0	0.2	0.7	0.018	0.008	0.013
TN: Oak Ridge/Melton	9	1.8	0.3	1.0	0.020	0.008	0.014
TN: Oak Ridge/Y12 E	9	1.5	0.2	0.8	0.019	0.008	0.015
TN: Oak Ridge/Y12 W	9	0.7	0.3	0.5	0.021	0.009	0.015
TX: Austin	9	0.4	0.0	0.2	0.013	0.004	0.008
TX: El Paso	9	0.8	0.0	0.5	0.014	0.006	0.010
UT: Salt Lake City	9	0.5	0.2	0.3	0.016	0.007	0.011
VA: Lynchburg	6	1.3	0.2	0.8	0.017	0.007	0.012
WA: Olympia	6	0.1	0.0	0.0	0.004	0.002	0.003
WA: Spokane	9	0.6	0.1	0.2	0.012	0.005	0.008

Table 4
Gross Beta in Airborne Particulates
September 2001

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	3	0.1	0.0	0.0	0.016	0.006	0.011
AL: Montgomery/411	8	0.1	0.0	0.1	0.020	0.006	0.011
AR: Little Rock	6	0.1	0.0	0.0	0.024	0.003	0.013
AZ: Phoenix	4	0.5	0.1	0.3	0.012	0.008	0.009
CA: Berkeley	8	0.1	0.0	0.1	0.008	0.002	0.006
CA: Los Angeles	8	0.3	0.0	0.2	0.019	0.008	0.012
CO: Denver	8	1.2	0.3	0.7	0.017	0.006	0.012
CT: Hartford	8	0.2	0.1	0.1	0.013	0.005	0.008
DE: Wilmington	8	0.2	0.1	0.1	0.016	0.008	0.010
FL: Jacksonville	8	0.1	0.0	0.1	0.012	0.003	0.006
FL: Miami	4	0.0	0.0	0.0	0.006	0.003	0.005
HI: Honolulu	7	0.1	0.1	0.1	0.004	0.002	0.003
IA: Iowa City	8	0.5	0.0	0.2	0.020	0.005	0.010
ID: Boise	3	0.6	0.0	0.3	0.014	0.001	0.009
ID: Idaho Falls	6				0.014	0.004	0.009
IN: Indianapolis	8	0.5	0.0	0.2	0.018	0.006	0.010
KS: Topeka	8	1.7	0.2	0.7	0.019	0.006	0.011
ME: Augusta	7	0.3	0.0	0.1	0.010	0.004	0.006
MI: Lansing	8	0.5	0.0	0.2	0.013	0.004	0.008
MN: Minneapolis	4	0.7	0.1	0.3	0.014	0.007	0.009
MN: Welch/510	6	0.6	0.1	0.4	0.013	0.006	0.008
MS: Jackson	7	0.3	0.0	0.1	0.022	0.007	0.014
NC: Charlotte	3	0.2	0.0	0.1	0.019	0.009	0.015
NC: Wilmington	3				0.013	0.006	0.009
ND: Bismarck	5	0.9	0.2	0.5	0.015	0.006	0.010
NH: Concord	8				0.018	0.006	0.009
NJ: Trenton	2				0.009	0.007	0.008
NV: Las Vegas	8	0.2	0.1	0.1	0.017	0.006	0.010
NY: Albany	4	0.1	0.0	0.0	0.013	0.007	0.010
NY: New York City	5	0.1	0.0	0.0	0.010	0.005	0.008
NY: Syracuse	1	0.0	0.0	0.0	0.011	0.011	0.011
NY: Yaphank	8	0.4	0.1	0.2	0.013	0.005	0.008
OH: Painesville	9	0.4	0.1	0.2	0.019	0.004	0.010
OH: Ross	7				0.019	0.007	0.011
OR: Portland	6	0.2	0.0	0.1	0.005	0.003	0.004
PA: Harrisburg	8	0.6	0.2	0.4	0.019	0.008	0.012
PA: Pittsburgh	8				0.020	0.006	0.012
SC: Barnwell	1	0.1	0.1	0.1	0.011	0.011	0.011

Table 4 (continued)
Gross Beta in Airborne Particulates
September 2001

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
SC: Columbia	5	0.3	0.1	0.2	0.015	0.008	0.010
TN: Knoxville	7	0.4	0.0	0.1	0.024	0.009	0.016
TN: Nashville	7	0.2	0.1	0.1	0.021	0.007	0.012
TN: Oak Ridge/Bethel	7	0.9	0.4	0.6	0.019	0.006	0.012
TN: Oak Ridge/K25	7	1.0	0.3	0.6	0.021	0.007	0.013
TN: Oak Ridge/Melton	7	1.0	0.5	0.7	0.018	0.007	0.012
TN: Oak Ridge/Y12 E	7	1.0	0.3	0.6	0.020	0.006	0.013
TN: Oak Ridge/Y12 W	7	0.6	0.1	0.4	0.023	0.007	0.015
TX: Austin	8	0.4	0.0	0.2	0.015	0.004	0.008
TX: El Paso	6	1.0	0.3	0.5	0.018	0.006	0.010
UT: Salt Lake City	8	0.4	0.1	0.3	0.019	0.004	0.012
VA: Lynchburg	8	1.2	0.2	0.8	0.020	0.005	0.011
WA: Olympia	7	0.1	0.0	0.0	0.004	0.002	0.003
WA: Spokane	8	0.3	0.1	0.2	0.015	0.005	0.008

Table 5
Gross Beta and Specific Gamma in Precipitation
July 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	2.45	0.46	Be7	34 38
AR: Little Rock	3.22	0.51	Be7	91 39
			Pb214	11.2 7.2
AZ: Phoenix	1.74	0.45	Pb212	8.6 5.9
CO: Denver	0.38	0.36	Bi214	16.7 7.2
			Pb212	4.5 5.8
CT: Hartford	2.73	0.50	Be7	63 44
DE: Wilmington	7.21	0.68		ND
FL: Jacksonville	0.51	0.38		ND
FL: Miami	0.48	0.38	K40	22 37
HI: Honolulu	1.87	0.46	Tl208	3.1 4.5
IA: Iowa City	0.83	0.39		ND
KS: Topeka	1.11	0.42	Bi214	10.9 6.6
			Pb212	7.9 6.1
			Pb214	8.1 7.0
			Tl208	3.5 3.6
ME: Augusta	2.32	0.48	Be7	38 29
MI: Lansing	0.78	0.40	Pb214	6.9 7.9
MN: Minneapolis	1.20	0.41	Pb212	6.1 6.5
			Tl208	3.9 3.6
MN: Welch	2.05	0.47		ND
NC: Wilmington	1.32	0.43	Pb212	4.7 5.9
ND: Bismarck	1.00	0.40	Bi214	13.5 7.2
			Pb212	4.2 6.2
NH: Concord	2.27	0.48	Be7	65 32
			Pb212	8.8 7.0
NY: Albany	1.89	0.44	Be7	49 38
			Bi212	40 38
NY: Syracuse	0.53	0.38	K40	22 36
NY: Yaphank	12.55	0.84		ND
OH: Painesville	2.22	0.45	Pb212	4.6 6.7
OR: Portland	0.81	0.38	Pb212	5.4 6.4
			Pb214	7.9 6.3
PA: Harrisburg	2.53	0.49		ND
SC: Barnwell	0.78	0.39	Bi212	23 25
			Bi214	6.4 7.8
SC: Columbia	1.42	0.43		ND

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
July 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
TN: Knoxville	1.44	0.44		ND
TN: Nashville	0.41	0.37	Pb212	6.2 6.9
			Tl208	2.3 3.5
TX: El Paso	1.43	0.43	K40	20 37
			Pb212	6.6 6.0
UT: Salt Lake City	0.79	0.41		ND
VA: Lynchburg	4.18	0.55	Pb212	6.2 6.7
WA: Olympia	0.46	0.36	Bi212	32 31
			Pb212	5.5 6.3

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
August 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.49	0.29		ND
AR: Little Rock	1.78	0.47	Tl208	2.3 3.7
AZ: Phoenix	3.1	1.5		ND
CO: Denver	1.77	0.44	Be7	85 52
CT: Hartford	4.13	0.52	Be7	71 52
DE: Wilmington	4.01	0.51	Be7	54 43
			K40	28 37
FL: Jacksonville	1.26	0.35	Be7	47 34
			Pb212	6.6 7.0
			Tl208	2.1 4.0
FL: Miami	0.32	0.29	Pb212	4.1 5.9
HI: Honolulu	1.46	0.44	K40	26 36
IA: Iowa City	0.52	0.30	K40	34 38
			Pb212	5.5 6.7
ID: Idaho Falls	4.06	0.56		ND
KS: Topeka	0.53	0.38		ND
MI: Lansing	0.57	0.31		ND
MN: Minneapolis	0.57	0.41	Bi214	8.1 6.8
			Cs137	2.2 2.3
MN: Welch	1.23	0.36	Bi214	6.8 6.8
MS: Jackson	0.50	0.30	Bi214	16.5 6.9
			K40	34 37
			Pb212	4.3 6.5
			Ra224	68 74
NC: Wilmington	1.23	0.35		ND
ND: Bismarck	0.43	0.36	K40	25 36
			Pb212	6.1 6.6
NH: Concord	5.87	0.59	Be7	128 59
NY: Albany	1.48	0.37	Be7	57 32
			K40	28 42
NY: Syracuse	0.89	0.33	Pb212	7.6 6.5
NY: Yaphank	6.29	0.61	Pb212	8.6 5.9
OH: Painesville	3.54	0.48	Be7	57 37
OR: Portland	0.53	0.36	Pb212	4.0 6.1
PA: Harrisburg	5.46	0.57	K40	26 47
SC: Barnwell	1.37	0.36	K40	27 45
SC: Columbia	2.43	0.42		ND

Note: ND = Not Detected

Table 6 (continued)
Gross Beta and Specific Gamma in Precipitation
August 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
TN: Knoxville	2.50	0.44	Pb212	5.8 7.0
TN: Nashville	1.22	0.36	Pb212	3.9 6.0
TX: Austin	0.15	0.32	Bi212	53 40
			K40	24 37
			Tl208	3.6 3.6
UT: Salt Lake City	4.85	0.61	K40	25 37
VA: Lynchburg	3.82	0.50	Tl208	3.3 3.6
WA: Olympia	0.36	0.40	Pb212	3.4 5.4

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
September 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.20	0.38		ND
AR: Little Rock	1.26	0.42		ND
CA: Berkeley	3.71	0.54	Bi214	17.6 8.0
			K40	20 37
			Ra224	74 85
CO: Denver	1.28	0.39	Be7	49 33
			Bi214	7.6 7.4
CT: Hartford	2.17	0.50	Bi214	21.1 7.4
			Pb214	21.6 7.5
DE: Wilmington	1.41	0.47	Bi214	12.0 7.7
			Pb212	4.6 6.5
FL: Jacksonville	0.59	0.42	Be7	38 36
FL: Miami	0.25	0.37	Pb212	4.6 6.1
HI: Honolulu	3.08	0.53	Pb212	5.1 6.6
IA: Iowa City	-0.05	0.38	Bi214	10.2 7.1
			Pb214	8.4 6.9
KS: Topeka	0.23	0.36		ND
ME: Augusta	3.09	0.52	Bi214	30.2 8.1
			Pb212	4.2 6.3
			Pb214	20.5 7.7
MI: Lansing	0.02	0.36	Pb212	4.6 6.7
MN: Minneapolis	1.25	0.44		ND
MN: Welch	0.40	0.38	Bi214	16.5 7.6
			Pb214	12.2 7.1
NC: Charlotte	0.63	0.39		ND
NC: Wilmington	0.72	0.41		ND
ND: Bismarck	2.26	0.46	Tl208	3.9 3.3
NH: Concord	2.02	0.48	Be7	36 34
			Pb212	4.5 6.3
NY: Albany	0.91	0.41	Bi214	10.3 7.8
			Pb212	6.9 6.7
			Pb214	15.1 7.2
NY: Yaphank	4.41	0.58		ND
OH: Painesville	2.02	0.48	Be7	76 36
OR: Portland	1.10	0.38	Be7	37 36
			Bi214	8.0 7.3
SC: Barnwell	0.91	0.44	Pb212	6.1 6.0

Note: ND = Not Detected

Table 7 (continued)
Gross Beta and Specific Gamma in Precipitation
September 2001

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
SC: Columbia	1.56	0.44	Bi212	35 47
			Pb212	6.2 6.2
TN: Knoxville	1.45	0.44		ND
TN: Nashville	0.63	0.42	Pb212	4.5 6.1
TX: Austin	0.13	0.37	Pb212	4.7 6.6
			Pb214	14.6 7.1
TX: El Paso	0.68	0.36	K40	25 39
UT: Salt Lake City	5.49	0.66	Be7	85 42
			Pb212	4.4 6.6
VA: Lynchburg	3.84	0.57		ND
WA: Olympia	0.26	0.38		ND

Note: ND = Not Detected

Table 8
Tritium in Precipitation
July - September 2001

Location	July 2001		August 2001		September 2001	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AL: Montgomery	-2	77	76	79	47	80
AR: Little Rock	-11	74	33	78	-12	82
AZ: Phoenix	4	75	30	77	NS	
CA: Berkeley	NS		NS		-10	82
CO: Denver	13	76	7	77	45	84
CT: Hartford	26	78	43	78	-51	76
DE: Wilmington	25	78	33	77	15	80
FL: Jacksonville	18	78	0	77	67	81
FL: Miami	31	79	51	78	8	79
HI: Honolulu	22	77	-11	75	54	80
IA: Iowa City	22	76	63	79	-27	81
ID: Idaho Falls	NS		74	79	NS	
KS: Topeka	-22	74	39	77	7	83
ME: Augusta	70	80	NS		26	80
MI: Lansing	-25	76	37	77	48	81
MN: Minneapolis	17	76	39	78	57	81
MN: Welch	68	79	57	83	20	79
MS: Jackson	NS		36	77	NS	
NC: Charlotte	NS		NS		62	82
NC: Wilmington	34	78	-22	76	18	79
ND: Bismarck	42	77	-15	75	10	83
NH: Concord	34	78	102	81	2	78
NY: Albany	13	78	47	83	16	79
NY: Syracuse	15	77	69	79	NS	
NY: Yaphank	13	77	-17	80	242	92
OH: Painesville	29	78	82	80	154	84
OR: Portland	-9	76	30	77	57	80
PA: Harrisburg	73	79	47	82	NS	
SC: Barnwell	80	80	353	90	80	81
SC: Columbia	48	79	287	88	-8	78
TN: Knoxville	-43	76	42	83	10	79
TN: Nashville	18	78	25	82	5	78
TX: Austin	NS		-76	72	-56	80
TX: El Paso	46	77	NS		-57	80
UT: Salt Lake City	-9	75	-2	76	22	83
VA: Lynchburg	-8	76	69	79	1580	130
WA: Olympia	50	79	-7	75	19	79

Note: NS = No Sample

Plutonium and Uranium in Airborne Particulates and Precipitation

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 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.

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2. Drinking Water Program

The ERAMS 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 2001

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	07/09/01	36	79
AL: Dothan	07/02/01	-42	79
AL: Montgomery	07/02/01	25	82
AL: Muscle Shoals	07/11/01	107	83
AL: Scottsboro	07/12/01	97	82
AR: Little Rock	07/26/01	0	80
CA: Berkeley	07/10/01	-8	78
CA: Los Angeles	07/06/01	24	79
CT: Hartford	07/05/01	-20	77
DE: Dover	07/10/01	16	77
FL: Miami	08/08/01	0	82
FL: Tampa	08/31/01	-19	81
GA: Baxley	07/23/01	41	80
GA: Savannah	08/02/01	-32	80
HI: Honolulu	07/10/01	35	81
ID: Boise	07/10/01	13	78
ID: Idaho Falls	07/27/01	17	81
IL: W. Chicago	07/24/01	54	78
KS: Topeka	07/05/01	6	78
LA: New Orleans	09/25/01	-4	80
MA: Lawrence	07/12/01	-11	77
MD: Baltimore	07/06/01	7	79
MD: Conowingo	07/31/01	68	83
ME: Augusta	07/05/01	11	78
MI: Detroit	07/10/01	176	85
MI: Grand Rapids	07/23/01	20	81
MN: Minneapolis	07/31/01	30	81
MN: Red Wing	07/11/01	-10	77
MO: Jefferson City	07/09/01	64	81
MS: Jackson	07/10/01	-49	75
MS: Port Gibson	07/10/01	-81	74
MT: Helena	08/07/01	30	83
NC: Charlotte	09/04/01	1110	120
NC: Wilmington	07/16/01	124	82
ND: Bismarck	07/06/01	2	78
NE: Lincoln	07/09/01	26	79
NH: Manchester	07/11/01	26	79
NM: Santa Fe	09/21/01	-7	80
NV: Las Vegas	07/09/01	-24	77
NY: Albany	07/06/01	28	80

Table 9 (continued)
Tritium in Drinking Water
July - September 2001

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
NY: Niagara Falls	09/29/01	70	84
NY: Syracuse	07/19/01	62	80
OH: Cincinnati	08/24/01	-9	80
OH: E. Liverpool	08/29/01	0	82
OH: Painesville	07/05/01	66	81
OH: Toledo	07/06/01	121	83
OK: Oklahoma City	07/12/01	-7	78
OR: Portland	07/06/01	17	78
PA: Columbia	08/06/01	450	100
PA: Harrisburg	08/01/01	-20	79
PA: Philadelphia/Baxter	07/31/01	19	83
PA: Philadelphia/Queen	07/31/01	-6	82
PA: Pittsburgh	08/29/01	-7	81
RI: Providence	07/09/01	-29	76
SC: Barnwell	07/09/01	15	78
SC: Columbia	07/10/01	28	79
SC: Jenkinsville	07/27/01	21	81
SC: Seneca	07/25/01	39	79
TN: Chattanooga	07/11/01	251	88
TN: Knoxville	07/09/01	6	78
TN: Oak Ridge - Knox Co. #371	08/09/01	15	82
TN: Oak Ridge - Roane Co. #360	08/09/01	-11	81
TN: Oak Ridge - Anderson Co. #768	08/09/01	-7	81
TN: Oak Ridge - Anderson Co. #772	08/09/01	-88	78
TN: Oak Ridge - Roane Co. #4442	08/17/01	-15	81
VA: Ashland	07/12/01	1860	140
VA: Lynchburg	07/09/01	42	79
WA: Richland	07/16/01	71	80
WA: Seattle	07/24/01	21	78

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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 2001

Location	Date Collected	K g/L $\pm 2u$		¹³⁷ Cs pCi/L $\pm 2u$	¹⁴⁰ Ba pCi/L $\pm 2u$	¹³¹ I pCi/L $\pm 2u$
AL: Montgomery	07/09/01	1.62	0.16	ND	ND	ND
AR: Little Rock	08/28/01	1.55	0.13	ND	ND	ND
AZ: Phoenix	07/16/01	1.62	0.13	ND	ND	ND
AZ: Phoenix	09/29/01	1.51	0.13	ND	ND	ND
CA: Los Angeles	07/19/01	1.69	0.13	ND	ND	ND
CA: Sacramento	08/13/01	1.53	0.12	ND	ND	ND
CA: San Francisco	07/12/01	1.57	0.13	ND	ND	ND
DE: Wilmington	07/24/01	1.67	0.12	ND	ND	ND
FL: Tampa	07/09/01	1.44	0.11	ND	ND	ND
GA: Atlanta	07/03/01	1.54	0.12	ND	ND	ND
HI: Honolulu	07/10/01	1.72	0.14	ND	ND	ND
IA: Des Moines	07/23/01	1.69	0.13	ND	ND	ND
IL: Chicago	08/09/01	1.62	0.12	ND	ND	ND
IN: Indianapolis	07/11/01	1.64	0.12	ND	ND	ND
KS: Wichita	07/17/01	1.68	0.13	ND	ND	ND
KY: Louisville	07/10/01	1.63	0.12	ND	ND	ND
MA: Boston	08/04/01	1.68	0.13	ND	ND	ND
MD: Baltimore	07/13/01	1.54	0.12	ND	ND	ND
ME: Portland	07/10/01	1.54	0.12	ND	ND	ND
MI: Detroit	07/17/01	1.44	0.12	ND	ND	ND
MI: Grand Rapids	07/20/01	1.68	0.12	ND	ND	ND
MO: Jefferson City	07/06/01	1.56	0.12	ND	ND	ND
MS: Jackson	07/16/01	1.56	0.12	ND	ND	ND
NJ: Trenton	07/16/01	1.62	0.12	ND	ND	ND
NM: Albuquerque	07/12/01	1.50	0.12	ND	ND	ND
NV: Las Vegas	07/10/01	1.58	0.12	ND	ND	ND
NY: Buffalo	07/13/01	1.49	0.13	ND	ND	ND
NY: Syracuse	07/10/01	1.49	0.12	ND	ND	ND
OH: Cincinnati	07/23/01	1.64	0.12	ND	ND	ND
OH: Cleveland	07/12/01	1.62	0.13	ND	ND	ND
OR: Portland	07/10/01	1.48	0.12	ND	ND	ND
PA: Philadelphia	07/10/01	1.63	0.12	ND	ND	ND
PA: Pittsburgh	08/07/01	1.58	0.13	ND	ND	ND
SD: Rapid City	07/23/01	1.58	0.13	ND	ND	ND
TN: Chattanooga	07/03/01	1.55	0.13	ND	ND	ND
TN: Knoxville	08/06/01	1.66	0.13	ND	ND	ND
TN: Memphis	07/24/01	1.51	0.12	ND	ND	ND
TX: San Antonio	07/31/01	1.45	0.12	ND	ND	ND
VA: Norfolk	09/21/01	1.72	0.13	ND	ND	ND

Note: ND = Not Detected

Table 10 (continued)
Radionuclides in Pasteurized Milk
July - September 2001

Location	Date Collected	K g/L $\pm 2u$		¹³⁷ Cs pCi/L $\pm 2u$	¹⁴⁰ Ba pCi/L $\pm 2u$	¹³¹ I pCi/L $\pm 2u$
VA: Norfolk	09/21/01	1.45	0.16	ND	ND	ND
WA: Spokane	07/09/01	1.63	0.17	ND	ND	ND
WA: Tacoma	07/16/01	1.60	0.17	ND	ND	ND
WV: Charleston	07/06/01	1.47	0.12	ND	ND	ND

Note: ND = Not Detected

Table 11
Strontium-90 in Pasteurized Milk
July - September 2001

Location	Date Collected	⁹⁰ Sr pCi/L ± 2 <i>u</i>	
AR: Little Rock	08/28/01	0.73	0.47
IA: Des Moines	07/23/01	0.44	0.51
ME: Portland	07/10/01	1.23	0.60
NJ: Trenton	07/16/01	1.29	0.54
NV: Las Vegas	07/10/01	0.14	0.43
OH: Cleveland	07/12/01	0.98	0.53
OR: Portland	07/10/01	0.46	0.46
PA: Philadelphia	07/10/01	0.78	0.52
SD: Rapid City	07/23/01	1.71	0.51
TN: Memphis	07/24/01	1.83	0.53

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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