

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](http://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 <sup>3</sup>	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 <sup>3</sup>	0.75
	Water	pCi/L	0.1
† Uranium-234,235,238	Air	aCi/m <sup>3</sup>	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 m<sup>3</sup>. Measurement by alpha spectrometry includes combined activities of <sup>239</sup>Pu and <sup>240</sup>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<sup>3</sup>.

‡ 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/m<sup>3</sup>. 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**  
**April 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m <sup>3</sup> )	Avg	Max	Min (pCi/m <sup>3</sup> )	Avg
AL: Montgomery	9	0.1	0.0	0.1	0.013	0.006	0.010
AL: Montgomery/411	9	0.1	0.0	0.1	0.017	0.007	0.011
AR: Little Rock	7	0.2	0.0	0.1	0.014	0.010	0.012
AZ: Phoenix	4	0.4	0.1	0.3	0.020	0.009	0.013
CA: Los Angeles	9	0.3	0.1	0.2	0.016	0.004	0.010
CO: Denver	5	0.9	0.2	0.5	0.013	0.008	0.011
CT: Hartford	8	0.1	0.0	0.0	0.009	0.003	0.006
DC: Washington	9	0.1	0.0	0.0	0.013	0.002	0.008
DE: Wilmington	9	0.1	0.0	0.1	0.010	0.003	0.007
FL: Jacksonville	9	0.1	0.0	0.1	0.011	0.005	0.008
GA: Atlanta	8	0.2	0.0	0.1	0.016	0.006	0.012
HI: Honolulu	5	0.1	0.0	0.0	0.006	0.003	0.004
IA: Iowa City	9	0.6	0.1	0.3	0.022	0.007	0.012
ID: Idaho Falls	9				0.015	0.006	0.009
IN: Indianapolis	9	0.4	0.1	0.3	0.010	0.006	0.008
KS: Kansas City	9	4.3	1.1	2.3	0.017	0.008	0.013
KS: Topeka	8	2.5	0.6	1.2	0.019	0.008	0.013
ME: Augusta	5	0.1	0.0	0.0	0.010	0.005	0.008
MI: Lansing	9	0.4	0.1	0.2	0.015	0.006	0.010
MN: Minneapolis	4	0.2	0.1	0.1	0.014	0.008	0.011
MS: Jackson	5	0.4	0.0	0.2	0.018	0.009	0.014
NC: Charlotte	9	0.1	0.0	0.0	0.019	0.005	0.012
NC: Wilmington	2				0.011	0.006	0.008
ND: Bismarck	4	2.2	0.3	0.9	0.017	0.012	0.014
NH: Concord	9	0.3	0.0	0.1	0.010	0.002	0.006
NJ: Trenton	9	0.4	0.0	0.1	0.011	0.003	0.007
NV: Las Vegas	4	0.1	0.0	0.1	0.014	0.009	0.010
NV: Las Vegas/913	4	0.2	0.0	0.1	0.011	0.008	0.009
NY: Albany	4	0.2	0.0	0.1	0.007	0.004	0.006
NY: New York City	7	0.0	0.0	0.0	0.010	0.005	0.008
NY: Yaphank	9	0.1	0.0	0.1	0.012	0.003	0.008
OH: Painesville	8	0.2	0.1	0.1	0.015	0.004	0.008
OH: Ross	9				0.017	0.007	0.011
OR: Portland	8	0.1	0.0	0.0	0.009	0.002	0.004
PA: Harrisburg	9	0.4	0.1	0.2	0.017	0.004	0.010
PA: Pittsburgh	9	0.2	0.0	0.1	0.014	0.004	0.009
SC: Barnwell	1	0.0	0.0	0.0	0.009	0.009	0.009
SC: Columbia	3	0.1	0.0	0.1	0.015	0.011	0.013

**Table 2 (continued)**  
**Gross Beta in Airborne Particulates**  
**April 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
SD: Pierre	7	0.5	0.0	0.3	0.014	0.003	0.009
TN: Knoxville	7	0.1	0.0	0.1	0.021	0.010	0.015
TN: Nashville	9	0.2	0.1	0.1	0.013	0.007	0.010
TN: Oak Ridge/Bethel	8	0.4	0.1	0.2	0.015	0.005	0.010
TN: Oak Ridge/K25	8	0.5	0.1	0.3	0.013	0.005	0.010
TN: Oak Ridge/Melton	8	0.4	0.1	0.2	0.014	0.004	0.010
TN: Oak Ridge/Y12 E	8	0.4	0.1	0.2	0.015	0.004	0.010
TN: Oak Ridge/Y12 W	8	0.3	0.1	0.1	0.016	0.006	0.011
TX: Austin	8	0.3	0.1	0.1	0.016	0.007	0.011
TX: Dallas	7	0.3	0.0	0.1	0.021	0.007	0.014
TX: El Paso	9	1.1	0.3	0.6	0.019	0.006	0.013
UT: Salt Lake City	7	0.7	0.0	0.2	0.016	0.007	0.011
VA: Lynchburg	8	0.9	0.0	0.4	0.013	0.003	0.009
WA: Olympia	9	0.1	0.0	0.1	0.006	0.001	0.003
WA: Spokane	9	0.9	0.2	0.5	0.019	0.003	0.009

**Table 3**  
**Gross Beta in Airborne Particulates**  
**May 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
AK: Anchorage	1	0.0	0.0	0.0	0.003	0.003	0.003
AL: Montgomery	7	0.1	0.0	0.1	0.013	0.007	0.010
AL: Montgomery/411	8	0.2	0.1	0.1	0.018	0.008	0.012
AR: Little Rock	4	0.0	0.0	0.0	0.012	0.008	0.010
AZ: Phoenix	4	0.4	0.2	0.3	0.021	0.010	0.016
CA: Los Angeles	8	0.3	0.0	0.2	0.013	0.006	0.010
CT: Hartford	8	0.1	0.0	0.1	0.010	0.003	0.007
DC: Washington	8	0.1	0.0	0.0	0.019	0.007	0.011
DE: Wilmington	8	0.2	0.0	0.1	0.016	0.007	0.011
FL: Jacksonville	8	0.1	0.0	0.0	0.013	0.006	0.009
GA: Atlanta	6	0.1	0.0	0.1	0.024	0.008	0.014
HI: Honolulu	7	0.1	0.0	0.1	0.005	0.002	0.004
IA: Iowa City	8	0.5	0.0	0.2	0.018	0.005	0.011
ID: Idaho Falls	8				0.009	0.003	0.007
IN: Indianapolis	8	0.3	0.1	0.2	0.013	0.005	0.008
KS: Kansas City	7	2.2	0.5	1.2	0.013	0.005	0.010
KS: Topeka	5	1.1	0.3	0.6	0.013	0.008	0.010
ME: Augusta	4	0.1	0.0	0.0	0.009	0.004	0.007
MI: Lansing	8	0.3	0.1	0.1	0.016	0.003	0.009
MN: Minneapolis	4	0.2	0.1	0.2	0.013	0.008	0.010
MS: Jackson	6	0.1	0.1	0.1	0.015	0.009	0.012
NC: Charlotte	8	0.1	0.0	0.0	0.015	0.007	0.013
NC: Wilmington	2				0.014	0.008	0.011
ND: Bismarck	6	1.9	0.1	0.8	0.014	0.008	0.010
NH: Concord	8	0.3	0.0	0.2	0.011	0.002	0.008
NJ: Trenton	8	0.5	0.1	0.2	0.019	0.004	0.011
NV: Las Vegas	5	0.1	0.0	0.0	0.016	0.009	0.012
NV: Las Vegas/913	5	0.1	0.0	0.0	0.011	0.008	0.010
NY: Albany	4	0.0	0.0	0.0	0.011	0.006	0.009
NY: New York City	5	0.0	0.0	0.0	0.017	0.009	0.014
NY: Yaphank	8	0.1	0.0	0.1	0.017	0.004	0.010
OH: Painesville	8	0.3	0.1	0.2	0.017	0.007	0.009
OH: Ross	8				0.017	0.007	0.011
OR: Portland	8	0.1	0.0	0.0	0.006	0.002	0.004
PA: Harrisburg	8	0.4	0.1	0.2	0.019	0.008	0.012
PA: Pittsburgh	8	0.3	0.0	0.1	0.020	0.007	0.011
SC: Columbia	5	0.5	0.0	0.2	0.020	0.009	0.016
SD: Pierre	7	0.4	0.0	0.2	0.014	0.004	0.009

**Table 3 (continued)**  
**Gross Beta in Airborne Particulates**  
**May 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
TN: Knoxville	4	0.1	0.0	0.1	0.021	0.009	0.017
TN: Nashville	8	0.2	0.0	0.1	0.021	0.008	0.012
TN: Oak Ridge/Bethel	8	0.7	0.2	0.5	0.018	0.009	0.012
TN: Oak Ridge/K25	8	0.9	0.3	0.6	0.017	0.009	0.012
TN: Oak Ridge/Melton	8	1.0	0.3	0.6	0.018	0.009	0.013
TN: Oak Ridge/Y12 E	8	0.9	0.2	0.5	0.018	0.008	0.013
TN: Oak Ridge/Y12 W	8	0.4	0.1	0.2	0.016	0.008	0.012
TX: Austin	8	0.2	0.0	0.1	0.014	0.007	0.009
TX: Dallas	7	0.2	0.1	0.2	0.020	0.009	0.012
TX: El Paso	8	0.8	0.5	0.6	0.020	0.010	0.013
UT: Salt Lake City	7	0.3	0.1	0.2	0.017	0.007	0.010
VA: Lynchburg	8	0.7	0.1	0.4	0.019	0.008	0.011
WA: Olympia	8	0.1	0.0	0.0	0.005	0.002	0.004
WA: Spokane	8	0.7	0.1	0.3	0.012	0.005	0.008

**Table 4**  
**Gross Beta in Airborne Particulates**  
**June 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
AK: Anchorage	1	0.0	0.0	0.0	0.004	0.004	0.004
AL: Montgomery	10	0.1	0.0	0.0	0.012	0.006	0.008
AL: Montgomery/411	8	0.0	0.0	0.0	0.013	0.006	0.010
AR: Little Rock	6	0.1	0.0	0.1	0.011	0.006	0.009
AZ: Phoenix	5	0.3	0.2	0.2	0.017	0.007	0.011
CA: Los Angeles	8	0.3	0.0	0.1	0.012	0.007	0.009
CA: Richmond	1	0.0	0.0	0.0	0.003	0.003	0.003
CT: Hartford	9	0.1	0.0	0.1	0.010	0.004	0.007
DC: Washington	7	0.0	0.0	0.0	0.012	0.004	0.008
DE: Wilmington	9	0.2	0.0	0.1	0.011	0.005	0.008
FL: Jacksonville	9	0.1	0.0	0.1	0.013	0.004	0.007
GA: Atlanta	7	0.1	0.0	0.0	0.014	0.007	0.011
HI: Honolulu	6	0.1	0.0	0.0	0.004	0.002	0.003
IA: Iowa City	9	0.5	0.2	0.4	0.015	0.004	0.009
ID: Idaho Falls	9				0.010	0.004	0.007
IN: Indianapolis	9	0.3	0.0	0.2	0.009	0.004	0.006
KS: Kansas City	7	1.6	0.1	1.0	0.012	0.005	0.008
KS: Topeka	6	1.0	0.2	0.6	0.013	0.008	0.009
ME: Augusta	4	0.1	0.0	0.1	0.008	0.003	0.006
MI: Lansing	9	0.2	0.0	0.1	0.017	0.004	0.008
MN: Minneapolis	5	0.3	0.0	0.1	0.009	0.004	0.006
MS: Jackson	6	0.2	0.0	0.1	0.014	0.006	0.009
NC: Charlotte	9	0.1	0.0	0.0	0.016	0.007	0.010
NC: Wilmington	5				0.011	0.007	0.009
ND: Bismarck	5	1.1	0.2	0.6	0.010	0.005	0.007
NH: Concord	9	0.3	0.1	0.2	0.008	0.003	0.006
NJ: Trenton	9	0.9	0.1	0.3	0.015	0.006	0.009
NV: Las Vegas	6	0.1	0.0	0.1	0.015	0.010	0.012
NV: Las Vegas/913	4	0.1	0.0	0.1	0.010	0.007	0.008
NY: Albany	5	0.1	0.0	0.0	0.008	0.006	0.007
NY: New York City	6	0.0	0.0	0.0	0.019	0.004	0.010
NY: Yaphank	9	0.1	0.0	0.1	0.012	0.004	0.008
OH: Painesville	8	0.2	0.1	0.2	0.012	0.005	0.008
OH: Ross	9				0.016	0.006	0.010
OR: Portland	9	0.0	0.0	0.0	0.010	0.001	0.004
PA: Harrisburg	9	0.4	0.1	0.2	0.015	0.006	0.010
PA: Pittsburgh	9	0.1	0.0	0.1	0.013	0.004	0.007
SC: Columbia	3	0.1	0.0	0.1	0.015	0.008	0.011

**Table 4 (continued)**  
**Gross Beta in Airborne Particulates**  
**June 2004**

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m <sup>3</sup> )			(pCi/m <sup>3</sup> )		
SD: Pierre	10	0.5	0.1	0.3	0.013	0.004	0.008
TN: Knoxville	6	0.1	0.0	0.1	0.018	0.009	0.012
TN: Nashville	9	0.2	0.0	0.1	0.015	0.007	0.010
TN: Oak Ridge/Bethel	8	0.8	0.1	0.3	0.016	0.005	0.010
TN: Oak Ridge/K25	8	0.6	0.2	0.4	0.014	0.007	0.010
TN: Oak Ridge/Melton	8	0.9	0.2	0.4	0.016	0.005	0.010
TN: Oak Ridge/Y12 E	8	0.7	0.1	0.3	0.018	0.006	0.010
TN: Oak Ridge/Y12 W	8	0.5	0.1	0.2	0.018	0.007	0.011
TX: Austin	7	0.1	0.0	0.1	0.016	0.004	0.009
TX: Dallas	8	0.3	0.0	0.1	0.015	0.005	0.009
TX: El Paso	8	0.9	0.3	0.6	0.016	0.007	0.010
UT: Salt Lake City	8	0.2	0.0	0.2	0.013	0.006	0.009
VA: Lynchburg	8	0.9	0.1	0.5	0.011	0.005	0.008
WA: Olympia	9	0.1	0.0	0.1	0.008	0.001	0.003
WA: Spokane	9	0.7	0.1	0.3	0.017	0.003	0.008

**Table 5**  
**Gross Beta and Specific Gamma in Precipitation**  
**April 2004**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	1.11	0.33	Be7	43 19
AR: Little Rock	1.17	0.32	Be7	29 19
AZ: Phoenix	1.30	0.35		ND
CA: Richmond	0.66	0.30		ND
CO: Denver	1.28	0.34	Be7	18 17
CT: Hartford	2.42	0.41	Be7	74 11
			Pb212	1.3 1.2
DE: Wilmington	1.37	0.34	Be7	37 16
FL: Jacksonville	0.87	0.33		ND
HI: Honolulu	0.98	0.34	K40	7 11
			Pb212	1.8 1.2
IA: Iowa City	0.51	0.29	Be7	13.4 8.2
KS: Kansas City	0.94	0.32	Be7	24 16
MI: Lansing	2.02	0.41		ND
MN: Minneapolis	0.99	0.31		ND
NC: Charlotte	1.49	0.35	Be7	38 14
			Tl208	1.1 1.4
NC: Wilmington	1.24	0.34	Be7	27 22
ND: Bismarck	1.23	0.34	Tl208	1.8 2.9
NH: Concord	3.00	0.43	Be7	73 29
NV: Las Vegas	1.28	0.34	Be7	54 24
			Pb212	2.4 4.2
NY: Albany	0.88	0.31	Be7	30.2 8.7
			Pb212	1.3 1.3
NY: Yaphank	1.24	0.34	Be7	41 14
			K40	16 12
			Tl208	1.0 1.2
OH: Painesville	0.74	0.30	Be7	50 10
OR: Portland	0.32	0.26	K40	28 40
PA: Harrisburg	0.51	0.29		ND
TN: Knoxville	54.5	1.9	Be7	37 17
			K40	55 14
TN: Nashville	1.12	0.33	Be7	57 18
TX: Austin	0.69	0.30		ND
TX: Dallas	1.14	0.34	Tl208	3.5 4.7
TX: El Paso	0.69	0.31	Pb212	4.7 5.3
UT: Salt Lake City	1.34	0.36	Be7	14 13

Note: ND = Not Detected

**Table 5 (continued)**  
**Gross Beta and Specific Gamma in Precipitation**  
**April 2004**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
UT: Salt Lake City	1.34	0.36	Pb212	1.2 1.3
			Tl208	0.82 0.76
VA: Lynchburg	1.90	0.38	ND	
WA: Olympia	1.96	0.38	K40	11 14

Note: ND = Not Detected

**Table 6**  
**Gross Beta and Specific Gamma in Precipitation**  
**May 2004**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.73	0.30	Be7	24 17
AR: Little Rock	0.86	0.31	Be7	15 11
			Pb210	16 19
CA: Richmond	6.4	5.4	Tl208	9 15
CO: Denver	0.94	0.32	Pb212	3.7 4.5
CT: Hartford	1.49	0.35	Be7	57 17
			K40	12 13
DE: Wilmington	1.37	0.34	Be7	50 16
FL: Jacksonville	0.26	0.27		ND
HI: Honolulu	1.40	0.37		ND
IA: Iowa City	0.67	0.30	Be7	22 20
ID: Idaho Falls	1.68	0.38		ND
KS: Kansas City	0.39	0.28	Be7	35 16
MI: Lansing	0.98	0.32	Be7	40 10
			Pb212	1.4 1.2
MN: Minneapolis	1.28	0.34	Be7	14 16
NC: Charlotte	1.21	0.33	Be7	35 19
NC: Wilmington	0.27	0.26		ND
ND: Bismarck	1.88	0.39		ND
NH: Concord	2.19	0.39	Be7	67 18
NY: Albany	1.29	0.35	Be7	47 17
NY: Yaphank	2.12	0.39	Be7	23.3 9.4
OH: Painesville	1.08	0.32	Be7	50 19
OR: Portland	0.97	0.32	Be7	194 41
			Pb212	5.2 7.1
PA: Harrisburg	0.88	0.31	Be7	37 36
			Pb212	4.5 6.1
TN: Knoxville	3.96	0.49		ND
TN: Nashville	0.98	0.32	Be7	68 20
TX: Austin	0.52	0.29	K40	52 54
TX: Dallas	0.86	0.32		ND
TX: El Paso	4.02	0.53	Be7	95 32
UT: Salt Lake City	3.65	0.55		ND
VA: Lynchburg	3.57	0.47		ND
WA: Olympia	0.70	0.31		ND

Note: ND = Not Detected

**Table 7**  
**Gross Beta and Specific Gamma in Precipitation**  
**June 2004**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	0.73	0.31	Be7	39 39
			K40	69 25
			Pb212	11.2 3.4
			Ra224	40 42
			Ra228	14.3 6.6
			Tl208	5.2 2.0
AR: Little Rock	0.72	0.30	Be7	42 20
			Pb212	1.9 2.5
CT: Hartford	1.97	0.38	Be7	41 18
DE: Wilmington	0.81	0.32	Be7	28 18
FL: Jacksonville	0.84	0.31	Be7	47 19
GA: Atlanta	1.73	0.37	Be7	49 33
HI: Honolulu	0.92	0.32	K40	51 26
			Pb212	10.0 3.0
			Tl208	4.1 2.0
IA: Iowa City	0.67	0.30	Be7	22 15
ID: Idaho Falls	0.85	0.31		ND
KS: Kansas City	0.74	0.31	Be7	30 16
MI: Lansing	0.69	0.30	Be7	24 27
			K40	22 37
MN: Minneapolis	0.97	0.32	Be7	43 19
NC: Charlotte	2.04	0.40	Be7	51 19
NC: Wilmington	1.39	0.35	Be7	47 12
ND: Bismarck	0.75	0.30	K40	10 12
NH: Concord	2.53	0.41	Be7	55 17
NY: Albany	1.07	0.33	Be7	43 18
NY: Yaphank	5.31	0.55	Tl208	3.9 3.6
OH: Painesville	1.36	0.35	Be7	47 21
OR: Portland	2.39	0.40	Be7	85 37
PA: Harrisburg	1.47	0.37		ND
TN: Knoxville	1.46	0.35		ND
TN: Nashville	0.34	0.29	Be7	29 29
TX: Austin	0.43	0.28		ND
TX: Dallas	0.86	0.30		ND
UT: Salt Lake City	1.28	0.36		ND
VA: Lynchburg	5.87	0.58		ND
WA: Olympia	0.24	0.27		ND

Note: ND = Not Detected

**Table 8**  
**Tritium in Precipitation**  
**April - June 2004**

Location	April 2004		May 2004		June 2004	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AL: Montgomery	54	81	-35	79	82	84
AR: Little Rock	85	82	56	87	115	85
AZ: Phoenix	-8	78	NS		NS	
CA: Richmond	-12	79	-12	84	NS	
CO: Denver	20	79	-84	80	NS	
CT: Hartford	25	82	31	84	119	87
DE: Wilmington	37	82	-5	81	44	83
FL: Jacksonville	49	81	2	81	-76	76
GA: Atlanta	NS		NS		-58	79
HI: Honolulu	-10	78	-74	80	-4	82
IA: Iowa City	23	80	36	82	30	82
ID: Idaho Falls	NS		208	93	6	83
KS: Kansas City	105	83	38	86	4	82
KS: Topeka	NS		NS		NS	
MI: Lansing	90	82	-26	80	-87	75
MN: Minneapolis	64	81	26	81	133	86
NC: Charlotte	73	82	-38	79	-18	79
NC: Wilmington	77	83	3	81	56	83
ND: Bismarck	62	81	48	82	50	83
NH: Concord	56	83	22	82	150	88
NV: Las Vegas	108	84	NS		NS	
NY: Albany	-5	80	10	81	134	87
NY: Yaphank	28	81	38	82	68	84
OH: Painesville	13	79	5	81	56	83
OR: Portland	122	84	16	84	-24	81
PA: Harrisburg	-2	80	-12	80	18	82
TN: Knoxville	-62	76	-2	81	20	81
TN: Nashville	-21	78	-40	79	50	83
TX: Austin	-36	77	-22	80	88	85
TX: Dallas	85	82	103	89	56	84
TX: El Paso	-2	79	20	81	NS	
UT: Salt Lake City	62	81	62	87	-10	82
VA: Lynchburg	31	80	-46	79	8	81
WA: Olympia	35	81	66	87	4	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 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 the 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 nuclides.

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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**  
**April - June 2004**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	04/13/04	112	77
AL: Dothan	04/07/04	92	77
AL: Montgomery	04/09/04	83	77
AL: Muscle Shoals	04/01/04	17	74
AL: Scottsboro	04/02/04	73	77
AR: Little Rock	04/14/04	7	73
CA: Los Angeles	04/13/04	56	74
CA: Richmond	05/10/04	-5	80
CO: Denver	04/14/04	115	78
CT: Hartford	04/15/04	9	72
DE: Dover	04/14/04	37	73
FL: Tampa	06/03/04	-34	77
GA: Baxley	05/20/04	-57	76
GA: Savannah	06/23/04	12	85
HI: Honolulu	04/13/04	60	76
IA: Cedar Rapids	04/20/04	41	73
ID: Boise	05/03/04	-8	80
ID: Idaho Falls	04/19/04	13	72
IL: Morris	04/13/04	4	72
IL: W. Chicago	04/20/04	7	71
KS: Topeka	04/09/04	114	78
MD: Baltimore	04/09/04	-26	71
MD: Conowingo	05/11/04	31	80
ME: Augusta	04/09/04	58	76
MI: Detroit	04/15/04	58	75
MI: Grand Rapids	04/21/04	91	76
MN: Minneapolis	04/13/04	95	78
MN: Red Wing	04/12/04	-24	71
MO: Jefferson City	04/13/04	-4	73
MS: Jackson	04/13/04	49	75
MS: Port Gibson	04/13/04	-6	72
MT: Helena	04/12/04	35	73
NC: Charlotte	05/05/04	287	91
NC: Raleigh	04/14/04	-11	71
ND: Bismarck	04/14/04	92	76
NE: Lincoln	04/16/04	101	76
NH: Concord	04/13/04	45	75
NJ: Trenton	04/22/04	119	77
NJ: Waretown	04/28/04	-50	78
NM: Santa Fe	04/15/04	49	74

**Table 9 (continued)**  
**Tritium in Drinking Water**  
**April - June 2004**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
NV: Las Vegas	06/25/04	41	80
NY: Albany	04/12/04	77	76
NY: New York City	04/30/04	58	83
NY: Niagara Falls	04/29/04	97	84
NY: Syracuse	06/08/04	11	79
OH: Cincinnati	05/07/04	33	81
OH: E. Liverpool	06/21/04	111	83
OH: Painesville	05/05/04	105	84
OH: Toledo	04/12/04	148	80
OK: Oklahoma City	04/26/04	2	80
OR: Portland	05/18/04	23	80
PA: Columbia	05/13/04	91	82
PA: Harrisburg	05/14/04	-34	77
PA: Philadelphia - Queen Lane	06/18/04	0	78
PA: Philadelphia - Baxter	06/18/04	29	80
PA: Philadelphia - Belmont	06/18/04	3	79
PA: Pittsburgh	06/22/04	62	80
RI: Providence	04/12/04	-11	72
SC: Barnwell	04/23/04	-86	78
SC: Columbia	04/29/04	7	81
SC: Jenkinsville	04/28/04	-31	79
SC: Seneca	04/28/04	32	82
TN: Chattanooga	04/13/04	135	79
TN: Knoxville	04/12/04	37	73
TX: Austin	04/27/04	50	83
VA: Ashland	04/13/04	2090	140
VA: Lynchburg	04/11/04	9	72
WA: Richland	04/22/04	112	77
WA: Seattle	06/28/04	24	79

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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**  
**April - June 2004**

Location	Date Collected	K g/L $\pm 2u$		$^{137}\text{Cs}$ pCi/L $\pm 2u$	$^{140}\text{Ba}$ pCi/L $\pm 2u$	$^{131}\text{I}$ pCi/L $\pm 2u$
AL: Montgomery	04/08/04	1.54	0.12	ND	ND	ND
AR: Little Rock	05/03/04	1.55	0.13	ND	ND	ND
AZ: Phoenix	04/28/04	1.56	0.11	ND	ND	ND
CA: Los Angeles	04/16/04	1.60	0.14	ND	ND	ND
CA: Sacramento	04/15/04	1.62	0.13	ND	ND	ND
CA: San Francisco	04/19/04	1.57	0.12	ND	ND	ND
DE: Dover	04/19/04	1.62	0.12	ND	ND	ND
FL: Tampa	04/13/04	1.45	0.16	ND	ND	ND
HI: Honolulu	05/19/04	1.50	0.12	ND	ND	ND
IA: Des Moines	04/12/04	1.55	0.13	ND	ND	ND
IN: Indianapolis	04/19/04	1.60	0.12	ND	ND	ND
KS: Wichita	04/14/04	1.53	0.12	ND	ND	ND
KY: Louisville	04/13/04	1.58	0.12	ND	ND	ND
MA: Boston	06/30/04	1.66	0.12	ND	ND	ND
MD: Baltimore	04/09/04	1.55	0.17	ND	ND	ND
ME: Portland	04/13/04	1.56	0.12	ND	ND	ND
MI: Detroit	06/28/04	1.73	0.12	ND	ND	ND
MI: Grand Rapids	04/21/04	1.66	0.13	ND	ND	ND
MO: Jefferson City	04/14/04	1.58	0.12	ND	ND	ND
NJ: Trenton	04/07/04	1.48	0.11	ND	ND	ND
NM: Albuquerque	06/15/04	1.57	0.12	ND	ND	ND
NV: Las Vegas	04/14/04	1.50	0.12	ND	ND	ND
NY: Buffalo	04/15/04	1.60	0.12	ND	ND	ND
NY: Syracuse	04/15/04	1.55	0.11	ND	ND	ND
OH: Cincinnati	06/15/04	1.60	0.12	ND	ND	ND
OH: Cleveland	04/19/04	1.50	0.12	ND	ND	ND
OR: Portland	04/26/04	1.56	0.11	ND	ND	ND
PA: Philadelphia	04/13/04	1.51	0.11	ND	ND	ND
PA: Pittsburgh	05/04/04	1.62	0.12	ND	ND	ND
TN: Chattanooga	04/12/04	1.57	0.12	ND	ND	ND
TN: Knoxville	04/19/04	1.63	0.11	ND	ND	ND
TN: Memphis	04/12/04	1.55	0.12	ND	ND	ND
TX: San Antonio	05/11/04	1.42	0.11	ND	ND	ND
VA: Norfolk	06/18/04	1.58	0.12	ND	ND	ND
VT: Montpelier	06/30/04	1.61	0.13	ND	ND	ND
WA: Spokane	04/23/04	1.55	0.12	ND	ND	ND
WA: Tacoma	06/29/04	1.79	0.12	ND	ND	ND
WV: Charleston	04/12/04	1.49	0.13	ND	ND	ND

Note: ND = Not Detected

## For More Information

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Rhonda Sears  
National Air and Radiation Environmental  
Laboratory  
540 South Morris Avenue  
Montgomery, Alabama 36115-2601  
e-mail: sears.rhonda@epa.gov

*For Analytical Information and Data—*

John Griggs  
National Air and Radiation Environmental  
Laboratory  
540 South Morris Avenue  
Montgomery, Alabama 36115-2601  
e-mail: griggs.john@epa.gov

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National Air and Radiation Environmental Laboratory  
540 South Morris Avenue  
Montgomery, Alabama 36115-2601  
e-mail: petko.charles@epa.gov

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Radiation Protection Division (MC66085)  
501 Third Street, N.W.  
Washington, DC 20001  
e-mail: marcinowski.frank@epa.gov

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