

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 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/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**  
**July 2003**

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
AK: Fairbanks	3	0.0	0.0	0.0	0.006	0.004	0.005
AL: Montgomery/408	9	0.1	0.0	0.0	0.010	0.005	0.007
AL: Montgomery/411	9	0.1	0.0	0.0	0.013	0.004	0.009
AR: Little Rock	8	0.1	0.0	0.1	0.020	0.009	0.013
AZ: Phoenix	5	0.4	0.1	0.2	0.023	0.014	0.017
CA: Berkeley	9	0.7	0.0	0.1	0.006	0.002	0.003
CA: Los Angeles	9	0.3	0.1	0.2	0.012	0.008	0.010
CO: Denver	7	1.0	0.5	0.8	0.019	0.012	0.016
CT: Hartford	9	0.1	0.1	0.1	0.011	0.005	0.008
DC: Washington	6	0.1	0.0	0.0	0.014	0.007	0.010
DE: Wilmington	7	0.2	0.0	0.1	0.013	0.007	0.010
FL: Jacksonville	10	0.1	0.0	0.1	0.011	0.005	0.007
FL: Miami	4	0.0	0.0	0.0	0.009	0.006	0.007
GA: Atlanta	9	0.5	0.0	0.3	0.032	0.007	0.013
HI: Honolulu	7	0.1	0.0	0.0	0.008	0.003	0.005
IA: Iowa City	9	0.6	0.1	0.3	0.031	0.005	0.013
ID: Idaho Falls	9				0.018	0.009	0.012
IN: Indianapolis	9	1.5	0.1	0.3	0.015	0.004	0.009
KS: Topeka	8	2.6	0.8	1.3	0.019	0.008	0.013
ME: Augusta	7	0.2	0.0	0.1	0.011	0.005	0.008
MI: Lansing	9	1.0	0.1	0.4	0.014	0.007	0.010
MN: Minneapolis	4	0.2	0.0	0.1	0.014	0.008	0.011
MS: Jackson	8	0.5	0.0	0.2	0.029	0.005	0.013
NC: Charlotte	8	0.1	0.0	0.1	0.013	0.007	0.010
NC: Wilmington	4				0.011	0.006	0.008
ND: Bismarck	4	1.3	0.3	0.7	0.013	0.006	0.009
NH: Concord	8	0.5	0.1	0.3	0.013	0.005	0.009
NJ: Trenton	7	0.4	0.1	0.2	0.012	0.006	0.009
NV: Las Vegas/906	7	0.2	0.1	0.1	0.024	0.010	0.016
NV: Las Vegas/913	5				0.018	0.007	0.012
NY: Albany	5	0.1	0.0	0.0	0.014	0.005	0.010
NY: New York City	8	0.1	0.0	0.0	0.014	0.009	0.011
NY: Yaphank	9	0.6	0.0	0.1	0.012	0.006	0.009
OH: Painesville	6	0.3	0.1	0.2	0.013	0.007	0.009
OH: Ross	9				0.037	0.005	0.014
OR: Portland	8	1.0	0.0	0.2	0.005	0.002	0.003
PA: Harrisburg	9	0.4	0.2	0.3	0.016	0.009	0.012
PA: Pittsburgh	9				0.012	0.008	0.010



**Table 2 (continued)**  
**Gross Beta in Airborne Particulates**  
**July 2003**

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
SC: Barnwell	1	0.0	0.0	0.0	0.006	0.006	0.006
SC: Columbia	4	0.1	0.0	0.1	0.013	0.007	0.010
SD: Pierre	4	0.2	0.1	0.2	0.013	0.006	0.009
TN: Knoxville	6	0.3	0.0	0.1	0.032	0.003	0.013
TN: Nashville	9	0.5	0.1	0.1	0.017	0.009	0.012
TN: Oak Ridge/Bethel	8	0.9	0.1	0.5	0.021	0.007	0.012
TN: Oak Ridge/K25	8	1.0	0.2	0.6	0.023	0.007	0.012
TN: Oak Ridge/Melton	8	1.0	0.1	0.6	0.018	0.006	0.012
TN: Oak Ridge/Y12 E	8	1.0	0.1	0.6	0.025	0.008	0.013
TN: Oak Ridge/Y12 W	8	0.6	0.1	0.4	0.021	0.008	0.012
TX: Austin	8	0.4	0.1	0.2	0.014	0.008	0.010
TX: El Paso	6	0.8	0.3	0.6	0.014	0.008	0.010
UT: Salt Lake City	9	0.9	0.0	0.3	0.030	0.014	0.020
VA: Lynchburg	8	1.6	0.2	0.5	0.016	0.008	0.010
WA: Olympia	9	0.2	0.1	0.1	0.005	0.002	0.003
WA: Spokane	9	0.6	0.1	0.3	0.011	0.006	0.008

**Table 3**  
**Gross Beta in Airborne Particulates**  
**August 2003**

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
AK: Fairbanks	2	0.0	0.0	0.0	0.004	0.004	0.004
AL: Montgomery/408	7	0.1	0.0	0.0	0.017	0.007	0.011
AL: Montgomery/411	8	0.1	0.0	0.0	0.016	0.006	0.010
AR: Little Rock	5	0.7	0.0	0.2	0.025	0.013	0.017
AZ: Phoenix	4	0.3	0.0	0.2	0.022	0.014	0.018
CA: Berkeley	9	0.1	0.0	0.1	0.006	0.002	0.004
CA: Los Angeles	9	0.3	0.0	0.1	0.015	0.007	0.009
CO: Denver	8	1.0	0.2	0.6	0.018	0.010	0.013
CT: Hartford	8	1.0	0.0	0.2	0.011	0.004	0.007
DC: Washington	8	0.5	0.0	0.1	0.015	0.007	0.012
DE: Wilmington	8	0.2	0.0	0.1	0.013	0.005	0.009
FL: Jacksonville	8	0.1	0.0	0.1	0.007	0.003	0.005
FL: Miami	2	0.0	0.0	0.0	0.007	0.006	0.006
GA: Atlanta	8	0.5	0.2	0.4	0.022	0.008	0.015
HI: Honolulu	6	0.1	0.0	0.0	0.004	0.002	0.003
IA: Iowa City	8	0.6	0.2	0.4	0.019	0.009	0.016
ID: Idaho Falls	7				0.019	0.008	0.013
IN: Indianapolis	9	0.6	0.1	0.4	0.019	0.006	0.012
ME: Augusta	5	0.1	0.0	0.1	0.010	0.004	0.007
MI: Lansing	8	0.8	0.2	0.4	0.015	0.010	0.012
MN: Minneapolis	4	0.4	0.1	0.3	0.020	0.012	0.015
MS: Jackson	9	0.5	0.1	0.3	0.019	0.008	0.015
NC: Charlotte	9	0.1	0.0	0.1	0.018	0.006	0.012
NC: Wilmington	3				0.007	0.006	0.006
ND: Bismarck	6	2.0	0.4	1.0	0.020	0.010	0.016
NH: Concord	9	0.7	0.2	0.3	0.013	0.004	0.009
NJ: Trenton	6	0.2	0.1	0.1	0.012	0.007	0.009
NV: Las Vegas/906	4	0.1	0.0	0.1	0.011	0.007	0.009
NY: Albany	4	0.1	0.0	0.0	0.017	0.006	0.011
NY: New York City	3	0.0	0.0	0.0	0.007	0.006	0.007
NY: Yaphank	8	0.1	0.0	0.0	0.013	0.003	0.007
OH: Painesville	8	0.7	0.2	0.4	0.076	0.009	0.025
OH: Ross	9				0.028	0.011	0.019
OR: Portland	9	0.2	0.0	0.1	0.007	0.002	0.004
PA: Harrisburg	8	0.6	0.1	0.3	0.019	0.010	0.013
PA: Pittsburgh	8	0.2	0.0	0.1	0.019	0.010	0.013
SC: Barnwell	1	0.0	0.0	0.0	0.008	0.008	0.008
SC: Columbia	4	0.1	0.1	0.1	0.015	0.013	0.014

**Table 3 (continued)**  
**Gross Beta in Airborne Particulates**  
**August 2003**

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
SD: Pierre	8	1.5	0.2	0.5	0.023	0.007	0.012
TN: Knoxville	6	0.5	0.1	0.3	0.037	0.013	0.021
TN: Nashville	8	0.2	0.1	0.2	0.028	0.010	0.017
TN: Oak Ridge/Bethel	8	1.5	0.1	0.7	0.027	0.010	0.017
TN: Oak Ridge/K25	8	1.5	0.2	0.7	0.022	0.010	0.015
TN: Oak Ridge/Melton	8	1.7	0.2	0.8	0.026	0.010	0.016
TN: Oak Ridge/Y12 E	8	1.3	0.2	0.7	0.032	0.009	0.018
TN: Oak Ridge/Y12 W	8	0.9	0.1	0.5	0.027	0.010	0.016
TX: Austin	9	0.3	0.1	0.2	0.013	0.006	0.009
TX: El Paso	9	0.8	0.4	0.7	0.016	0.006	0.010
UT: Salt Lake City	9	0.6	0.0	0.3	0.020	0.011	0.016
VA: Lynchburg	7	1.2	0.2	0.6	0.018	0.006	0.013
WA: Olympia	8	0.2	0.0	0.1	0.008	0.002	0.004
WA: Spokane	8	0.5	0.2	0.3	0.015	0.008	0.011

**Table 4**  
**Gross Beta in Airborne Particulates**  
**September 2003**

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
AK: Fairbanks	2	0.0	0.0	0.0	0.005	0.004	0.005
AL: Montgomery/408	9	0.1	0.0	0.1	0.028	0.009	0.016
AL: Montgomery/411	8	0.1	0.0	0.1	0.021	0.008	0.012
AR: Little Rock	8	0.2	0.0	0.1	0.022	0.010	0.014
AZ: Phoenix	5	0.5	0.1	0.3	0.022	0.013	0.017
CA: Berkeley	9	0.2	0.0	0.1	0.012	0.004	0.007
CA: Los Angeles	9	0.4	0.1	0.2	0.019	0.008	0.013
CO: Denver	9	1.1	0.2	0.6	0.016	0.006	0.011
CT: Hartford	9	0.1	0.0	0.1	0.010	0.005	0.007
DC: Washington	8	0.1	0.0	0.0	0.012	0.005	0.009
DE: Wilmington	8	0.2	0.0	0.1	0.014	0.005	0.008
FL: Jacksonville	9	0.1	0.0	0.1	0.008	0.002	0.006
FL: Miami	4	0.0	0.0	0.0	0.007	0.003	0.005
GA: Atlanta	7	0.7	0.1	0.4	0.025	0.010	0.016
HI: Honolulu	7	0.1	0.0	0.1	0.015	0.003	0.006
IA: Iowa City	9	0.3	0.2	0.3	0.022	0.008	0.011
ID: Idaho Falls	9				0.013	0.006	0.009
IN: Indianapolis	9	0.7	0.1	0.3	0.020	0.005	0.009
KS: Topeka	5	1.7	0.3	0.9	0.014	0.008	0.011
ME: Augusta	5	0.4	0.0	0.1	0.009	0.005	0.007
MI: Lansing	9	0.9	0.1	0.4	0.017	0.006	0.012
MN: Minneapolis	5	0.3	0.2	0.2	0.015	0.008	0.011
MS: Jackson	9	1.2	0.0	0.3	0.027	0.006	0.018
NC: Charlotte	9	1.1	0.0	0.2	0.015	0.005	0.011
NC: Wilmington	4				0.013	0.007	0.010
ND: Bismarck	6	1.3	0.3	0.8	0.023	0.006	0.013
NH: Concord	9	0.5	0.2	0.3	0.012	0.006	0.008
NJ: Trenton	8	0.5	0.1	0.2	0.013	0.006	0.008
NV: Las Vegas/913	3				0.013	0.010	0.012
NY: Albany	4	0.0	0.0	0.0	0.011	0.006	0.008
NY: New York City	3	0.0	0.0	0.0	0.013	0.008	0.010
NY: Yaphank	9	0.2	0.0	0.1	0.014	0.005	0.008
OH: Painesville	8	0.3	0.1	0.2	0.017	0.006	0.011
OH: Ross	9				0.022	0.005	0.015
OR: Portland	8	0.2	0.0	0.1	0.008	0.003	0.005
PA: Harrisburg	8	0.4	0.1	0.3	0.014	0.007	0.011
PA: Pittsburgh	9	0.3	0.0	0.1	0.013	0.006	0.009
SC: Columbia	2	0.1	0.0	0.1	0.012	0.009	0.010

**Table 4 (continued)**  
**Gross Beta in Airborne Particulates**  
**September 2003**

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
SD: Pierre	5	0.4	0.2	0.3	0.017	0.007	0.010
TN: Knoxville	8	0.5	0.0	0.1	0.027	0.014	0.021
TN: Nashville	8	0.5	0.0	0.2	0.024	0.007	0.013
TN: Oak Ridge/Bethel	8	1.3	0.0	0.7	0.026	0.014	0.018
TN: Oak Ridge/K25	8	1.6	0.2	0.8	0.024	0.011	0.016
TN: Oak Ridge/Melton	8	1.6	0.3	1.0	0.021	0.012	0.017
TN: Oak Ridge/Y12 E	8	1.0	0.1	0.7	0.032	0.015	0.020
TN: Oak Ridge/Y12 W	8	0.8	0.2	0.5	0.025	0.014	0.018
TX: Austin	9	0.4	0.0	0.2	0.023	0.005	0.013
TX: El Paso	8	1.0	0.3	0.7	0.016	0.009	0.011
UT: Salt Lake City	9	0.6	0.0	0.3	0.024	0.007	0.013
VA: Lynchburg	7	1.1	0.2	0.6	0.014	0.007	0.011
WA: Olympia	9	0.2	0.0	0.1	0.008	0.002	0.004
WA: Spokane	9	1.3	0.1	0.5	0.025	0.004	0.010

**Table 5**  
**Gross Beta and Specific Gamma in Precipitation**  
**July 2003**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AK: Fairbanks	0.30	0.31	Be7	69 27
AL: Montgomery	1.54	0.38	Be7	48 16
			Tl208	1.0 1.2
AR: Little Rock	0.98	0.36		ND
CO: Denver	2.03	0.41	Be7	42 11
CT: Hartford	3.90	0.50	Be7	62 40
			Pb210	47 38
DE: Wilmington	2.11	0.41	Be7	29 15
FL: Jacksonville	0.97	0.36	Be7	41 17
FL: Miami	0.53	0.34		ND
HI: Honolulu	1.02	0.36		ND
IA: Iowa City	0.65	0.33	Be7	19 17
ID: Idaho Falls	5.71	0.65	Pb212	7.3 6.7
MI: Lansing	1.22	0.37	Be7	25 16
			K40	11 12
MN: Minneapolis	1.08	0.36	Be7	24 15
NC: Charlotte	2.22	0.42	Be7	61 10
NC: Wilmington	1.24	0.35	Be7	44 10
			Pb212	2.2 1.5
ND: Bismarck	0.78	0.35		ND
NH: Concord	2.88	0.44	Be7	49 17
NY: Albany	0.89	0.33	Be7	51 15
NY: Yaphank	9.71	0.74		ND
OH: Painesville	1.43	0.38	Be7	53 16
			K40	9 11
PA: Harrisburg	2.33	0.42	Be7	39 14
SC: Barnwell	1.32	0.35	Be7	24 22
			Pb212	3.2 4.5
			Tl208	2.3 2.8
TN: Knoxville	1.50	0.39	K40	7 11
TN: Nashville	0.80	0.32	Be7	22 14
			Tl208	1.0 1.3
TX: Austin	0.46	0.33		ND
TX: El Paso	1.40	0.42		ND
VA: Lynchburg	2.07	0.41		ND
WA: Olympia	3.16	0.50	Ra224	25 22

Note: ND = Not Detected

**Table 6**  
**Gross Beta and Specific Gamma in Precipitation**  
**August 2003**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	1.11	0.31	Be7	40 14
AR: Little Rock	2.01	0.42	Be7	48 11
AZ: Phoenix	1.83	0.42		ND
CT: Hartford	0.75	0.29	Be7	16 13
DE: Wilmington	0.41	0.27		ND
FL: Jacksonville	0.90	0.30	Be7	18 14
FL: Miami	0.36	0.27		ND
ME: Augusta	0.29	0.26		ND
MI: Lansing	1.70	0.41	K40	8 12
MN: Minneapolis	1.85	0.40	Be7	67 24
NC: Charlotte	1.80	0.35	Be7	45 15
NC: Wilmington	-0.02	0.23	Be7	24 13
			Tl208	1.2 1.3
NH: Concord	1.25	0.32	Be7	19 13
NY: Albany	0.38	0.27	Be7	22 13
NY: Yaphank	5.87	0.55	Be7	20 14
			K40	11 12
OH: Painesville	1.06	0.37	Be7	33 28
PA: Harrisburg	2.02	0.37	Be7	40 27
			Pb212	6.4 6.4
SC: Columbia	1.44	0.34		ND
TN: Knoxville	2.78	0.48	Be7	18 13
			K40	8 12
TN: Nashville	1.32	0.34	Be7	53 30
			Pb212	7.6 6.5
			Ra224	42 57
TX: Austin	0.50	0.37	Be7	17.6 7.9
TX: El Paso	2.11	0.46	Be7	160 30
UT: Salt Lake City	3.31	0.56	Be7	30 26
VA: Lynchburg	2.20	0.39	Pb212	5.0 6.0
WA: Olympia	2.53	0.50		ND

Note: ND = Not Detected

**Table 7**  
**Gross Beta and Specific Gamma in Precipitation**  
**September 2003**

Location	Gross Beta Activity		Gamma-Emitting Radionuclides	
	pCi/L $\pm 2u$		Nuclide	pCi/L $\pm 2u$
AL: Montgomery	1.05	0.35	Be7	25.5 9.6
AR: Little Rock	0.94	0.30	Be7	18.6 9.6
AZ: Phoenix	2.75	0.42		ND
CO: Denver	0.76	0.29		ND
CT: Hartford	0.83	0.33	K40	43 38
DE: Wilmington	0.95	0.35	Be7	17 13
FL: Jacksonville	0.38	0.36		ND
FL: Miami	0.57	0.33		ND
HI: Honolulu	4.79	0.54	Pb212	2.9 3.9
IA: Iowa City	0.65	0.29	Pb212	7.4 6.7
ID: Idaho Falls	4.54	0.53	Be7	59 24
			K40	37 36
			Pb212	6.8 5.1
MI: Lansing	1.10	0.32		ND
MN: Minneapolis	0.70	0.28	K40	19 36
			Pb212	3.9 6.1
NC: Charlotte	0.79	0.34		ND
NC: Wilmington	1.07	0.35	Be7	28 16
ND: Bismarck	0.98	0.32		ND
NH: Concord	0.78	0.37		ND
NY: Albany	0.58	0.33	Bi212	28 25
NY: Yaphank	8.16	0.70	Be7	15 12
			K40	10 13
OH: Painesville	0.92	0.29	Be7	28 24
OR: Portland	0.76	0.29	Be7	43 26
			Tl208	3.9 3.7
PA: Harrisburg	0.80	0.33	Be7	35 20
			Pb212	4.0 5.0
			Tl208	1.8 3.1
TN: Knoxville	14.39	0.91	K40	49 38
TN: Nashville	0.52	0.32		ND
TX: Austin	0.40	0.26		ND
UT: Salt Lake City	1.58	0.35	Tl208	1.16 0.81
VA: Lynchburg	4.09	0.51		ND
WA: Olympia	0.47	0.27		ND

Note: ND = Not Detected



**Table 8**  
**Tritium in Precipitation**  
**July - September 2003**

Location	July 2003		August 2003		September 2003	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AK: Fairbanks	-24	77	NS		NS	
AL: Montgomery	79	75	7	78	-42	75
AR: Little Rock	24	79	0	77	-58	79
AZ: Phoenix	NS		10	77	28	76
CO: Denver	-11	77	NS		26	75
CT: Hartford	77	74	-18	77	-40	76
DE: Wilmington	24	74	-34	76	42	79
FL: Jacksonville	13	71	37	79	-15	77
FL: Miami	39	73	34	79	-11	77
HI: Honolulu	-10	78	NS		25	75
IA: Iowa City	20	79	NS		28	78
ID: Idaho Falls	41	79	NS		32	75
ME: Augusta	NS		0	77	NS	
MI: Lansing	-47	75	-15	76	-33	75
MN: Minneapolis	-13	78	35	79	55	78
NC: Charlotte	16	71	5	78	-10	77
NC: Wilmington	22	72	-23	76	-7	77
ND: Bismarck	-13	77	NS		-24	76
NH: Concord	7	73	47	80	102	81
NY: Albany	44	74	18	79	16	77
NY: Yaphank	7	72	-11	77	10	76
OH: Painesville	50	80	16	77	39	79
OR: Portland	NS		NS		5	74
PA: Harrisburg	52	74	39	79	11	77
SC: Barnwell	88	75	NS		NS	
SC: Columbia	NS		101	82	NS	
TN: Knoxville	18	72	-13	76	-23	76
TN: Nashville	72	76	47	79	-15	77
TX: Austin	2	78	73	80	-36	72
TX: El Paso	-66	76	21	77	NS	
UT: Salt Lake City	NS		62	80	38	76
VA: Lynchburg	9	72	-65	75	-42	75
WA: Olympia	-44	75	70	80	0	74

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.

## 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 2003**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	07/08/03	-20	83
AL: Dothan	07/08/03	105	89
AL: Montgomery	07/02/03	-10	78
AL: Muscle Shoals	07/02/03	44	86
AL: Scottsboro	07/03/03	54	86
AR: Little Rock	07/10/03	-44	75
CA: Berkeley	07/29/03	37	76
CA: Los Angeles	07/07/03	-5	84
CO: Denver	09/19/03	44	78
CT: Hartford	07/10/03	11	71
DE: Dover	07/03/03	-22	84
FL: Miami	07/25/03	37	77
FL: Tampa	09/24/03	23	77
GA: Baxley	07/08/03	22	71
GA: Savannah	09/10/03	21	77
HI: Honolulu	07/20/03	15	76
IA: Cedar Rapids	07/08/03	-14	84
ID: Boise	08/11/03	-46	76
ID: Idaho Falls	07/31/03	-13	70
IL: Morris	07/03/03	-66	82
IL: W. Chicago	07/29/03	22	76
KS: Topeka	07/03/03	-31	83
LA: New Orleans	09/15/03	31	77
MD: Baltimore	07/07/03	50	86
MD: Conowingo	08/26/03	29	79
ME: Augusta	07/03/03	-35	83
MI: Detroit	07/14/03	87	79
MI: Grand Rapids	07/08/03	-5	70
MN: Minneapolis	07/15/03	-26	75
MN: Red Wing	07/23/03	-29	74
MO: Jefferson City	07/07/03	34	86
MS: Jackson	07/08/03	-24	84
MS: Port Gibson	07/08/03	-53	83
MT: Helena	07/03/03	-3	85
NC: Charlotte	08/13/03	172	84
NC: Raleigh	07/09/03	8	78
ND: Bismarck	07/03/03	40	86
NE: Lincoln	07/10/03	60	74
NH: Concord	07/03/03	3	84
NJ: Trenton	08/04/03	32	71

**Table 9 (continued)**  
**Tritium in Drinking Water**  
**July - September 2003**

Location	Date Collected	<sup>3</sup> H pCi/L ± 2 <i>u</i>	
NJ: Waretown	07/22/03	23	76
NM: Santa Fe	07/08/03	26	78
NV: Las Vegas	09/24/03	39	78
NY: Albany	07/07/03	26	72
NY: New York City	07/31/03	72	79
NY: Syracuse	07/09/03	69	78
OH: Cincinnati	08/19/03	-27	80
OH: E. Liverpool	08/22/03	31	79
OH: Painesville	07/03/03	108	89
OH: Toledo	07/07/03	34	86
OK: Oklahoma City	07/15/03	-29	74
OR: Portland	07/09/03	26	71
PA: Columbia	08/27/03	31	79
PA: Harrisburg	08/28/03	2	78
PA: Philadelphia/Baxter	07/28/03	66	78
PA: Philadelphia/Belmont	07/28/03	50	77
PA: Philadelphia/Queen	07/28/03	45	77
PA: Pittsburgh	08/22/03	5	78
RI: Providence	07/14/03	11	76
SC: Barnwell	07/30/03	5	75
SC: Columbia	07/29/03	24	76
SC: Jenkinsville	07/29/03	89	79
SC: Seneca	07/29/03	60	78
TN: Chattanooga	07/14/03	58	79
TN: Knoxville	07/07/03	54	87
TN: Oak Ridge - Knox Co. #371	07/29/03	35	73
TN: Oak Ridge - Roane Co. #360	08/01/03	-7	71
TN: Oak Ridge - Roane Co. #4442	08/01/03	29	72
TN: Oak Ridge - Anderson Co. #772	08/19/03	24	79
TN: Oak Ridge - Anderson Co. #768	08/19/03	-2	78
TX: Austin	07/18/03	2	75
VA: Ashland	07/09/03	24	72
VA: Lynchburg	07/09/03	51	73
WA: Richland	07/10/03	51	73
WA: Seattle	07/10/03	-23	76

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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 2003**

Location	Date Collected	K g/L $\pm 2u$		<sup>137</sup> Cs pCi/L $\pm 2u$	<sup>140</sup> Ba pCi/L $\pm 2u$	<sup>131</sup> I pCi/L $\pm 2u$
AL: Montgomery	07/08/03	1.54	0.12	ND	ND	ND
AR: Little Rock	09/02/03	1.58	0.12	ND	ND	ND
AZ: Phoenix	08/27/03	1.70	0.12	ND	ND	ND
CA: Los Angeles	07/07/03	1.74	0.12	ND	ND	ND
CA: Sacramento	09/16/03	1.73	0.12	ND	ND	ND
CA: San Francisco	07/08/03	1.61	0.16	ND	ND	ND
DE: Dover	07/22/03	1.72	0.12	ND	ND	ND
FL: Tampa	07/14/03	1.53	0.12	ND	ND	ND
GA: Atlanta	07/30/03	1.54	0.12	ND	ND	ND
HI: Honolulu	07/24/03	1.63	0.12	ND	ND	ND
IA: Des Moines	07/07/03	1.36	0.15	ND	ND	ND
IN: Indianapolis	08/26/03	1.61	0.11	ND	ND	ND
KS: Wichita	07/15/03	1.67	0.12	ND	ND	ND
KY: Louisville	07/16/03	1.50	0.13	ND	ND	ND
MD: Baltimore	07/11/03	1.63	0.13	ND	ND	ND
MI: Detroit	07/16/03	1.64	0.11	ND	ND	ND
MI: Grand Rapids	07/08/03	1.60	0.13	ND	ND	ND
MO: Jefferson City	07/07/03	1.56	0.12	ND	ND	ND
NJ: Trenton	07/14/03	1.53	0.12	ND	ND	ND
NM: Albuquerque	07/07/03	1.62	0.11	ND	ND	ND
NV: Las Vegas	07/14/03	1.61	0.12	ND	ND	ND
NY: Buffalo	07/10/03	1.63	0.12	ND	ND	ND
NY: Syracuse	07/10/03	1.48	0.16	ND	ND	ND
OH: Cincinnati	07/22/03	1.64	0.12	ND	ND	ND
OH: Cleveland	07/14/03	1.63	0.11	ND	ND	ND
PA: Philadelphia	07/07/03	1.66	0.16	ND	ND	ND
PA: Pittsburgh	07/07/03	1.58	0.11	ND	ND	ND
TN: Chattanooga	07/30/03	1.48	0.13	ND	ND	ND
TN: Knoxville	07/09/03	1.53	0.16	ND	ND	ND
TN: Memphis	08/04/03	1.68	0.12	ND	ND	ND
TX: Ft. Worth	07/15/03	1.53	0.12	ND	ND	ND
TX: Ft. Worth	08/26/03	1.72	0.12	ND	ND	ND
TX: San Antonio	07/07/03	1.54	0.11	ND	ND	ND
VA: Norfolk	07/23/03	1.48	0.12	ND	ND	ND
VT: Montpelier	09/26/03	1.56	0.12	ND	ND	ND
WA: Spokane	07/08/03	1.68	0.16	ND	ND	ND
WA: Tacoma	09/23/03	1.63	0.13	ND	ND	ND
WV: Charleston	07/07/03	1.51	0.12	ND	ND	ND

Note: ND = Not Detected



**Table 11**  
**Strontium-90 in Pasteurized Milk**  
**July - September 2003**

Location	Date Collected	<sup>90</sup> Sr pCi/L ± 2 <i>u</i>	
CA: San Francisco	07/08/03	0.73	0.54
DE: Dover	07/22/03	0.19	0.90
GA: Atlanta	07/30/03	0.59	0.88
KS: Wichita	07/15/03	0.42	0.74
MI: Grand Rapids	07/08/03	0.45	0.57
NY: Syracuse	07/10/03	0.53	0.57
TX: San Antonio	07/07/03	-0.02	0.64
WA: Spokane	07/08/03	-0.13	0.84

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