

ENVIRONMENTAL

RADIATION

DATA

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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, precipitation, drinking water, and milk samples.

Sampling locations are selected to provide optimal population coverage while functioning to monitor fallout from nuclear devices and other forms of radioactive contamination of the environment. The radiation analyses performed on these samples include gross alpha and gross beta analyses, 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 *Eastern Environmental Radiation Facility Radiochemistry Procedures Manual* (EPA 520/5-84-006). 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 the 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, including present and potential sources of environmental radioactivity. Sampling sites are located 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 at 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 analyses in a low background beta counter. Gamma scans are performed on all filters showing gross beta counts greater than 1 pCi/m³. The laboratory obtained values are usually lower than the field estimates due to the decay of naturally occurring radionuclides between the times of the two measurements.

Precipitation samples are collected at most field stations collecting 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
October 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Anchorage	7	0.0	0.0	0.0	0.003	0.001	0.002
AK: Fairbanks	8	0.1	0.0	0.0	0.013	0.002	0.006
AK: Juneau	6				0.004	0.001	0.002
AL: Montgomery	22	0.3	0.0	0.1	0.092	0.005	0.021
AR: Little Rock	12	1.3	0.0	0.4	0.031	0.007	0.016
AZ: Phoenix	8	5.7	0.5	2.5	0.028	0.008	0.018
CA: Berkeley	14	0.4	0.0	0.2	0.041	0.003	0.015
CA: Los Angeles	14	1.0	0.1	0.4	0.035	0.008	0.020
CO: Denver	11	2.6	0.3	1.2	0.026	0.006	0.013
CT: Hartford	12	0.2	0.0	0.1	0.010	0.003	0.006
DE: Wilmington	11	0.5	0.0	0.2	0.037	0.007	0.012
FL: Jacksonville	12	0.2	0.0	0.1	0.016	0.005	0.010
FL: Miami	7	0.1	0.0	0.0	0.022	0.004	0.009
HI: Honolulu	14	0.4	0.1	0.3	0.005	0.001	0.003
IA: Iowa City	11	1.0	0.1	0.6	0.023	0.005	0.012
ID: Boise	12	2.0	0.3	1.1	0.033	0.003	0.013
ID: Idaho Falls	14				0.080	0.007	0.019
IL: Chicago	8	0.6	0.1	0.3	0.016	0.007	0.012
IN: Indianapolis	12	1.1	0.2	0.5	0.040	0.005	0.014
KS: Topeka	14	4.4	0.3	1.8	0.027	0.007	0.016
ME: Augusta	12	0.3	0.0	0.1	0.021	0.003	0.008
MI: Lansing	11	0.4	0.1	0.2	0.017	0.004	0.009
MN: Minneapolis	7	0.8	0.2	0.5	0.024	0.009	0.012
MS: Jackson	12	1.0	0.2	0.7	0.124	0.007	0.026
NC: Charlotte	11	0.5	0.0	0.2	0.029	0.006	0.016
ND: Bismarck	14	4.2	0.2	1.2	0.022	0.006	0.012
NH: Concord	13	0.3	0.0	0.2	0.024	0.002	0.008
NJ: Trenton	4				0.011	0.001	0.008
NM: Santa Fe	8	7.6	0.0	1.0	0.027	0.010	0.015
NV: Las Vegas	11	0.6	0.1	0.3	0.024	0.006	0.015
NY: Albany	8	0.2	0.0	0.1	0.020	0.003	0.008
NY: New York City	11	0.1	0.0	0.1	0.010	0.004	0.008
NY: Syracuse	8				0.011	0.005	0.007
NY: Yaphank	11	0.4	0.0	0.1	0.035	0.004	0.009
OH: Columbus	5	0.6	0.3	0.4	0.028	0.008	0.015
OH: Painesville	12	0.4	0.1	0.2	0.013	0.003	0.008
OH: Ross	12				0.022	0.007	0.013
OR: Portland	11	0.7	0.1	0.3	0.017	0.002	0.008

Table 2 (continued)
Gross Beta in Airborne Particulates
October 1999

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	11	0.6	0.1	0.3	0.014	0.006	0.010
PA: Pittsburgh	12	0.5	0.2	0.3	0.052	0.007	0.014
SC: Barnwell	7	1.2	0.0	0.4	0.021	0.006	0.015
SC: Columbia	12	1.1	0.1	0.4	0.056	0.007	0.016
SD: Pierre	10	3.9	0.1	1.0	0.023	0.003	0.011
TN: Knoxville	11	5.6	0.1	1.5	0.230	0.009	0.039
TN: Nashville	9	1.8	0.1	0.5	0.027	0.007	0.016
TN: Oak Ridge/Bethel	10	2.8	0.2	1.3	0.026	0.012	0.017
TN: Oak Ridge/K25	10	4.1	0.3	1.5	0.023	0.008	0.015
TN: Oak Ridge/Melton	10	3.4	0.2	1.6	0.027	0.010	0.016
TN: Oak Ridge/Y12 E	10	4.2	0.3	1.6	0.026	0.010	0.017
TN: Oak Ridge/Y12 W	10	1.8	0.2	0.8	0.023	0.009	0.015
TX: Austin	9	0.8	0.1	0.4	0.023	0.011	0.015
TX: El Paso	15	3.9	0.3	1.7	0.278	0.012	0.039
UT: Salt Lake City	8	1.5	0.2	0.8	0.027	0.009	0.018
VA: Lynchburg	11	0.8	0.2	0.4	0.052	0.008	0.014
WA: Olympia	14	0.5	0.1	0.2	0.016	0.003	0.008
WA: Spokane	14	1.0	0.1	0.5	0.023	0.003	0.011
WI: Madison	8	0.3	0.2	0.2	0.014	0.004	0.009

Table 3
Gross Beta in Airborne Particulates
November 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	1	0.0	0.0	0.0	0.023	0.023	0.023
AL: Montgomery	18	0.2	0.0	0.1	0.045	0.004	0.019
AR: Little Rock	7	0.1	0.0	0.1	0.032	0.007	0.018
AZ: Phoenix	5	1.3	0.1	0.6	0.031	0.017	0.024
CA: Berkeley	9	0.2	0.0	0.1	0.012	0.002	0.008
CA: Los Angeles	3	0.3	0.2	0.2	0.026	0.017	0.022
CO: Denver	8	1.5	0.4	0.8	0.013	0.007	0.010
CT: Hartford	9	0.1	0.0	0.1	0.019	0.003	0.009
DE: Wilmington	9	0.3	0.0	0.2	0.023	0.002	0.013
FL: Jacksonville	7	0.1	0.0	0.1	0.020	0.003	0.011
FL: Miami	3	0.0	0.0	0.0	0.010	0.007	0.008
HI: Honolulu	7	0.1	0.1	0.1	0.006	0.002	0.004
IA: Iowa City	9	1.7	0.6	1.0	0.026	0.007	0.018
ID: Boise	9	1.6	0.2	0.6	0.023	0.004	0.010
ID: Idaho Falls	7				0.018	0.006	0.011
IL: Chicago	8	1.1	0.2	0.6	0.043	0.015	0.024
IN: Indianapolis	8	1.3	0.0	0.5	0.025	0.009	0.017
KS: Topeka	8	1.9	0.3	1.3	0.028	0.008	0.018
ME: Augusta	8	0.2	0.0	0.1	0.017	0.004	0.009
MI: Lansing	9	0.4	0.1	0.2	0.028	0.007	0.015
MN: Minneapolis	5	1.0	0.2	0.5	0.029	0.018	0.022
MN: Welch/511	2				0.019	0.012	0.016
MS: Jackson	8	0.7	0.1	0.4	0.043	0.008	0.021
NC: Charlotte	7	0.7	0.0	0.2	0.025	0.004	0.016
ND: Bismarck	4	1.7	0.4	0.9	0.029	0.005	0.017
NH: Concord	9	0.2	0.1	0.1	0.018	0.004	0.010
NV: Las Vegas	9	0.4	0.0	0.2	0.033	0.005	0.016
NY: Albany	4	0.1	0.0	0.0	0.024	0.009	0.016
NY: New York City	8	0.2	0.0	0.1	0.020	0.004	0.011
NY: Syracuse	4				0.025	0.005	0.014
NY: Yaphank	8	0.1	0.0	0.1	0.019	0.003	0.010
OH: Painesville	9	0.3	0.1	0.2	0.033	0.005	0.015
OH: Ross	9				0.037	0.011	0.021
OR: Portland	7	0.1	0.0	0.1	0.007	0.001	0.005
PA: Harrisburg	9	0.7	0.1	0.3	0.026	0.005	0.015
PA: Pittsburgh	9				0.034	0.006	0.015
SC: Barnwell	2	0.2	0.1	0.1	0.015	0.012	0.013
SC: Columbia	8	0.8	0.1	0.3	0.028	0.006	0.016

Table 3 (continued)
Gross Beta in Airborne Particulates
November 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
SD: Pierre	2	0.3	0.1	0.2	0.009	0.008	0.008
TN: Knoxville	9	1.8	0.1	0.9	0.040	0.011	0.027
TN: Nashville	8	0.7	0.1	0.2	0.032	0.007	0.018
TN: Oak Ridge/Bethel	8	1.0	0.2	0.6	0.036	0.008	0.018
TN: Oak Ridge/K25	9	1.0	0.3	0.7	0.028	0.007	0.017
TN: Oak Ridge/Melton	9	0.8	0.0	0.5	0.029	0.007	0.016
TN: Oak Ridge/Y12 E	9	1.2	0.1	0.8	0.036	0.008	0.019
TN: Oak Ridge/Y12 W	9	0.5	0.1	0.3	0.031	0.007	0.017
TX: Austin	7	0.2	0.0	0.1	0.023	0.008	0.016
TX: El Paso	7	1.9	0.5	1.0	0.033	0.017	0.023
UT: Salt Lake City	7	0.8	0.0	0.3	0.032	0.006	0.021
VA: Lynchburg	8	0.8	0.1	0.5	0.020	0.007	0.013
WA: Olympia	5	0.1	0.0	0.1	0.010	0.003	0.005
WA: Spokane	9	0.2	0.1	0.1	0.015	0.003	0.008
WI: Madison	9	1.4	0.0	0.6	0.031	0.010	0.018

Table 4
Gross Beta in Airborne Particulates
December 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
AK: Fairbanks	2	0.0	0.0	0.0	0.022	0.017	0.020
AL: Montgomery	18	0.2	0.0	0.0	0.022	0.002	0.013
AR: Little Rock	5	0.1	0.0	0.1	0.016	0.010	0.014
AZ: Phoenix	4	0.7	0.3	0.4	0.023	0.015	0.018
CA: Berkeley	8	0.3	0.0	0.1	0.045	0.002	0.015
CA: Los Angeles	7	0.3	0.2	0.2	0.032	0.011	0.016
CO: Denver	7	1.0	0.2	0.4	0.016	0.005	0.009
CT: Hartford	10	0.1	0.0	0.1	0.013	0.004	0.008
DE: Wilmington	9	0.3	0.0	0.1	0.017	0.007	0.012
FL: Jacksonville	7	0.2	0.0	0.1	0.014	0.008	0.012
FL: Miami	5	0.1	0.0	0.0	0.009	0.005	0.006
HI: Honolulu	8	0.2	0.1	0.1	0.002	0.002	0.002
IA: Iowa City	8	0.9	0.1	0.4	0.024	0.011	0.019
ID: Boise	8	0.5	0.1	0.3	0.057	0.003	0.017
ID: Idaho Falls	9				0.041	0.007	0.014
IL: Chicago	8	0.8	0.1	0.3	0.019	0.010	0.016
IN: Indianapolis	9	0.3	0.1	0.2	0.018	0.011	0.014
KS: Topeka	8	0.8	0.2	0.4	0.021	0.010	0.014
ME: Augusta	6	0.2	0.0	0.1	0.016	0.006	0.010
MI: Lansing	9	0.2	0.0	0.1	0.016	0.008	0.012
MN: Minneapolis	4	0.6	0.2	0.3	0.031	0.022	0.025
MN: Welch/510	2	0.1	0.1	0.1	0.025	0.019	0.022
MS: Jackson	6	0.3	0.1	0.2	0.014	0.009	0.011
NC: Charlotte	1				0.013	0.013	0.013
ND: Bismarck	4	0.8	0.1	0.5	0.021	0.008	0.015
NH: Concord	8	0.3	0.1	0.1	0.021	0.007	0.011
NV: Las Vegas	7	0.2	0.1	0.2	0.017	0.007	0.010
NY: Albany	5	0.2	0.0	0.1	0.017	0.008	0.013
NY: New York City	5	0.1	0.0	0.0	0.012	0.006	0.009
NY: Syracuse	3				0.010	0.006	0.009
NY: Yaphank	9	0.1	0.0	0.1	0.016	0.005	0.010
OH: Painesville	7	0.4	0.1	0.2	0.013	0.006	0.011
OH: Ross	9				0.020	0.009	0.014
OR: Portland	6	0.2	0.0	0.1	0.011	0.001	0.004
PA: Harrisburg	9	0.6	0.1	0.2	0.018	0.007	0.013
PA: Pittsburgh	9				0.014	0.006	0.011
SC: Barnwell	2	0.2	0.0	0.1	0.010	0.010	0.010
SC: Columbia	8	0.6	0.1	0.2	0.014	0.009	0.012

Table 4 (continued)
Gross Beta in Airborne Particulates
December 1999

Location	Number of Samples	5-hour Field Estimate			NAREL Lab Measurement		
		Max	Min (pCi/m ³)	Avg	Max	Min (pCi/m ³)	Avg
SD: Pierre	3	0.1	0.0	0.1	0.015	0.009	0.012
TN: Knoxville	8	1.1	0.2	0.5	0.029	0.011	0.019
TN: Nashville	8	0.2	0.0	0.1	0.017	0.011	0.014
TN: Oak Ridge/Bethel	9	0.5	0.1	0.3	0.017	0.007	0.012
TN: Oak Ridge/K25	9	0.9	0.1	0.3	0.017	0.006	0.012
TN: Oak Ridge/Melton	9	0.5	0.1	0.3	0.017	0.006	0.012
TN: Oak Ridge/Y12 E	9	0.7	0.1	0.3	0.019	0.006	0.013
TN: Oak Ridge/Y12 W	9	0.3	0.1	0.2	0.017	0.007	0.013
TX: Austin	7	0.2	0.0	0.1	0.013	0.007	0.010
TX: El Paso	9	1.3	0.5	0.9	0.040	0.013	0.024
UT: Salt Lake City	7	0.3	0.0	0.2	0.024	0.005	0.010
VA: Lynchburg	6	0.5	0.1	0.4	0.012	0.006	0.009
WA: Olympia	9	0.1	0.0	0.1	0.024	0.001	0.005
WA: Spokane	9	0.1	0.0	0.1	0.042	0.002	0.011
WI: Madison	7	0.7	0.1	0.3	0.020	0.012	0.017

Table 5
Gross Beta and Specific Gamma in Precipitation
October 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AK: Anchorage	4.91	0.90		ND
	-1.3	5.2		ND
AK: Juneau	0.08	0.56		ND
	0.66	0.47		ND
	0.37	0.23		ND
AL: Montgomery	2.75	0.44		ND
	2.95	0.42	Be7	44 40
		K40	24 32	
AR: Little Rock	1.58	0.34		ND
CA: Berkeley	1.08	0.30		ND
CO: Denver	0.77	0.27	Pb212	5.7 6.9
CT: Hartford	11.8	5.1		ND
	2.16	0.37		ND
	0.37	0.46		ND
	1.06	0.30	Be7	57 46
		Tl208	4.7 4.2	
DE: Wilmington	2.54	0.43		ND
	0.98	0.29	Be7	37 40
FL: Jacksonville	1.58	0.36		ND
	0.78	0.67		ND
	0.57	0.27		ND
FL: Miami	1.23	0.35		ND
	0.47	0.32		ND
	0.38	0.30		ND
	1.3	1.8		ND
	1.18	0.30		ND
	0.65	0.28		ND
HI: Honolulu	1.60	0.34		ND
IA: Iowa City	2.65	0.45		ND
	1.35	0.32		ND
KS: Topeka	4.82	0.85		ND
ME: Augusta	1.31	0.31		ND
	3.73	0.46		ND
	2.88	0.42	Be7	70 35
	0.99	0.36		ND
	1.01	0.30		ND
NC: Charlotte	0.62	0.33		ND

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
October 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
NC: Charlotte	1.44	0.33	Be7	74 40
NC: Wilmington	1.92	0.90		ND
	3.0	3.0		ND
	3.5	1.7		ND
ND: Bismarck	1.16	0.31		ND
NH: Concord	1.19	0.30		ND
	5.05	0.52		ND
	1.22	0.36		ND
	2.05	0.36	Be7	46 32
NM: Santa Fe	1.31	0.31		ND
NY: Albany	0.82	0.36		ND
	0.26	0.14		ND
	12.0	6.6		ND
	1.35	0.32	Be7	38 30
NY: Syracuse	1.53	0.37		ND
	2.04	0.36	Be7	47 37
			Tl208	2.2 3.2
NY: Yaphank	12.09	0.80		ND
	3.61	0.50		ND
	9.25	0.67		ND
OH: Painesville	1.06	0.37		ND
	4.35	0.53		ND
	2.12	0.37	Be7	45 44
OR: Portland	2.6	1.5		ND
	0.83	0.26	Tl208	2.9 4.1
PA: Harrisburg	4.23	0.52		ND
	1.07	0.30		ND
SC: Barnwell	1.41	0.35		ND
	2.58	0.39	K40	24 27
SC: Columbia	0.65	0.34		ND
	1.79	0.37		ND
	0.34	0.24		ND
TN: Knoxville	3.75	0.50		ND
	3.73	0.45		ND
TN: Nashville	2.07	0.43		ND
	0.61	0.27	Pb212	5.9 7.2
			Tl208	2.9 4.1

Note: ND = Not Detected

Table 5 (continued)
Gross Beta and Specific Gamma in Precipitation
October 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
TX: Austin	0.94	0.28		ND
TX: El Paso	2.09	0.39	Tl208	3.6 3.8
VA: Lynchburg	4.18	0.51		ND
	3.54	0.69		ND
WA: Olympia	1.26	0.37		ND
	0.64	0.26		ND
	0.21	0.22	Tl208	3.8 3.6
WI: Madison	1.53	0.33		ND

Note: ND = Not Detected

Table 6
Gross Beta and Specific Gamma in Precipitation
November 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	2.08	0.36		ND
AR: Little Rock	0.81	0.28	Be7	31 32
CA: Berkeley	0.56	0.24		ND
CT: Hartford	1.16	0.31		ND
DE: Wilmington	0.84	0.29	K40	36 35
FL: Jacksonville	1.06	0.31	Pb212	3.1 6.3
FL: Miami	0.42	0.25	Tl208	3.0 4.7
HI: Honolulu	3.27	0.42		ND
IA: Iowa City	5.20	0.52		ND
ID: Boise	3.21	0.42	Pb212	9.7 7.6
ID: Idaho Falls	26.4	2.4	Pb212	6.2 7.9
KS: Topeka	0.88	0.28		ND
MI: Lansing	2.36	0.40		ND
MN: Minneapolis	5.72	0.56	Be7	43 29
NC: Charlotte	0.87	0.27	K40	21 22
			Tl208	1.5 2.5
NC: Wilmington	0.32	0.24		ND
NH: Concord	2.51	0.38		ND
NY: Albany	0.60	0.27		ND
NY: Syracuse	2.21	0.38		ND
NY: Yaphank	3.36	0.44		ND
OH: Painesville	2.42	0.38	Be7	61 39
			Pb212	6.5 6.4
OR: Portland	3.24	0.43	Be7	48 33
PA: Harrisburg	0.65	0.27	Be7	61 35
			Tl208	2.7 3.4
SC: Barnwell	10.98	0.74	Be7	21 23
			Tl208	1.4 2.6
SC: Columbia	1.82	0.34		ND
TN: Knoxville	7.37	0.60		ND
TN: Nashville	1.74	0.34	Pb212	6.8 6.5
TX: Austin	0.69	0.27	Pb212	4.0 7.0
UT: Salt Lake City	4.79	0.52	Pb212	5.0 4.5
			Tl208	2.6 2.7
VA: Lynchburg	7.99	0.62	K40	71 72
WA: Olympia	0.21	0.21		ND
WI: Madison	2.34	0.37		ND

Note: ND = Not Detected

Table 7
Gross Beta and Specific Gamma in Precipitation
December 1999

Location	Gross Beta Activity		Specific Gamma Activity	
	pCi/L $\pm 2\sigma$		Nuclide	pCi/L $\pm 2\sigma$
AL: Montgomery	1.27	0.31		ND
AR: Little Rock	0.90	0.27		ND
CA: Berkeley	0.71	0.26		ND
CT: Hartford	1.27	0.37	Be7	48 54
DE: Wilmington	1.63	0.40	Pb212	3.7 5.8
FL: Jacksonville	0.81	0.28		ND
FL: Miami	2.37	0.42		ND
HI: Honolulu	1.58	0.33		ND
IA: Iowa City	1.52	0.33	Tl208	2.5 4.5
ID: Boise	3.89	0.47		ND
ID: Idaho Falls	2.33	0.39		ND
MN: Minneapolis	3.17	0.44	Be7	60 43
			Tl208	4.5 3.8
ND: Bismarck	7.78	0.63		ND
NY: Albany	1.65	0.38		ND
NY: Syracuse	1.50	0.38		ND
NY: Yaphank	1.33	0.36		ND
OH: Painesville	3.39	0.43	Pb212	4.3 6.4
OR: Portland	2.44	0.38	Be7	72 51
PA: Harrisburg	1.08	0.36	K40	34 62
SC: Barnwell	1.99	0.36	K40	15 26
TN: Knoxville	7.01	0.60		ND
TN: Nashville	3.07	0.43		ND
UT: Salt Lake City	1.64	0.33	Pb212	4.9 4.2
VA: Lynchburg	7.97	0.63		ND
WA: Olympia	0.30	0.24		ND
WI: Madison	1.21	0.32		ND

Note: ND = Not Detected

Table 8
Tritium in Precipitation
October - December 1999

Location	October 1999		November 1999		December 1999	
	pCi/L $\pm 2u$		pCi/L $\pm 2u$		pCi/L $\pm 2u$	
AK: Anchorage	NS		NS		NS	
AK: Juneau	NS		NS		NS	
AL: Montgomery	-30	78	46	72	-7	78
AR: Little Rock	52	75	25	70	-42	78
CA: Berkeley	7	72	5	69	-87	76
CO: Denver	52	75	NS		NS	
CT: Hartford	33	80	39	73	63	81
DE: Wilmington	10	79	31	74	13	78
FL: Jacksonville	-3	79	0	70	-36	75
FL: Miami	-20	78	2	70	3	77
HI: Honolulu	14	73	12	69	0	80
IA: Iowa City	45	74	30	72	-21	79
ID: Boise	NS		23	71	-48	78
ID: Idaho Falls	NS		14	77	13	76
KS: Topeka	NS		60	72	NS	
ME: Augusta	65	81	NS		NS	
MI: Lansing	-5	78	41	71	NS	
MN: Minneapolis	NS		62	73	-3	79
NC: Charlotte	5	78	2	71	NS	
NC: Wilmington	-24	78	23	72	NS	
ND: Bismarck	27	73	NS		-76	76
NH: Concord	57	81	-25	70	NS	
NM: Santa Fe	93	76	NS		NS	
NY: Albany	30	80	43	73	16	78
NY: Syracuse	82	81	39	74	35	80
NY: Yaphank	7	79	0	71	-49	75
OH: Painesville	85	83	85	74	32	81
OR: Portland	7	72	-28	75	770	110
PA: Harrisburg	79	82	-9	71	10	78
SC: Barnwell	10	79	193	79	144	82
SC: Columbia	10	79	62	72	NS	
TN: Knoxville	-58	77	25	71	25	79
TN: Nashville	27	80	64	73	-3	77
TX: Austin	127	78	33	70	NS	
TX: El Paso	41	73	NS		NS	
UT: Salt Lake City	NS		42	71	3	80
VA: Lynchburg	NS		41	72	31	78
WA: Olympia	5	72	-7	76	23	76

Note: NS = No Sample

Table 8 (continued)
Tritium in Precipitation
October - December 1999

Location	October 1999 pCi/L $\pm 2u$	November 1999 pCi/L $\pm 2u$	December 1999 pCi/L $\pm 2u$
WI: Madison	-2 78	51 72	11 78

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 ranges from 120,000 to 500,000 cubic meters.

Plutonium and uranium results are published when they become available.

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2. Water Program

The ERAMS water program provides data on radionuclide concentrations in the nation's rivers, streams, and drinking water supplies.

Surface Water

In July, 1999, the collection of surface water samples, part of the ERAMS water program, was discontinued. The results of the gamma scans performed on the surface water samples collected in 1999 are reported in this ERD.

Table 9
Surface Water Annual Gamma Analysis
January - December 1999

Location	Source	Date Collected	Specific Gamma Activity	
			Nuclide	pCi/L $\pm 2u$
AL: Decatur	Tennessee River	04/15/99		ND
AL: Gordon	Chattahoochee River	04/01/99		ND
AL: Scottsboro	Tennessee River	04/15/99		ND
AR: Little Rock	Arkansas River	04/08/99		ND
CA: Clay Station	Folsom S. Canal	04/19/99		ND
CA: Eureka	Humboldt Bay	04/07/99	K40	276 47
CO: Platteville	South Platte River	04/14/99	I131	23.7 4.1
CT: E. Haddam	Connecticut River	04/09/99		ND
CT: Waterford	Long Island Sound	04/08/99	K40	277 47
FL: Crystal River	Gulf Of Mexico	04/19/99		ND
FL: Ft. Pierce	Atlantic Ocean	04/20/99	K40	250 38
FL: Homestead	Biscayne Bay	04/14/99	K40	334 50
GA: Baxley	Altamaha River	04/23/99		ND
IA: Cedar Rapids	Cedar River	04/19/99		ND
ID: Buhl	Snake River	04/14/99		ND
IL: Morris	Illinois River	04/12/99		ND
KS: Le Roy	Neosho River	06/24/99	Tl208	2.8 4.9
LA: New Orleans	Mississippi River	04/28/99	Pb212	9.0 8.8
MA: Plymouth	Cape Cod Bay	04/27/99	Tl208	1.8 3.1
MD: Conowingo	Susquehanna River	04/13/99		ND
MD: Lusby	Chesapeake Bay	04/13/99	K40	116 41
			Pb212	6.7 7.1
ME: Wiscasset	Montseway Bay	04/12/99		ND
MI: Bridgman	Lake Michigan	04/12/99		ND
MI: Charlevoix	Lake Michigan	04/10/99	Pb212	5.0 3.5
			Tl208	2.2 1.7
MI: Monroe	Lake Erie	04/12/99	K40	33 36
MI: S. Haven	Lake Michigan	04/12/99		ND
MN: Monticello	Mississippi River	04/26/99	Pb212	17.7 6.6
MN: Red Wing	Mississippi River	04/19/99		ND
MS: Port Gibson	Mississippi River	04/06/99		ND
NC: Charlotte	Catawba River	04/23/99		ND
NC: Southport	Atlantic Ocean	04/08/99	Bi212	49 33
			K40	231 51
NV: Boulder City	Colorado River	05/26/99		ND
NY: Chelsea	Hudson River	04/12/99	Tl208	2.4 4.0
NY: Croton-On-Hudson	Hudson River	04/16/99	Pb212	3.5 4.9

Note: ND = Not Detected

Table 9 (continued)
Surface Water Annual Gamma Analysis
January - December 1999

Location	Source	Date Collected	Specific Gamma Activity	
			Nuclide	pCi/L $\pm 2u$
NY: Oswego	Lake Ontario	06/11/99	Pb212	2.8 5.3
OH: Toledo	Lake Erie	06/29/99		ND
OR: Bradwood	Columbia River	04/20/99		ND
PA: Danville	Susquehanna River	04/14/99		ND
PA: Philadelphia	Schuylkill River - Queen	04/15/99		ND
	Delaware River - Baxter	04/15/99		ND
	Savannah River	04/07/99		ND
SC: Allendale	Broad River	04/06/99		ND
SC: Broad River	Lake Robinson	04/21/99	Pb212	4.0 5.9
SC: Hartsville	Tennessee River	04/12/99	K40	176 62
TN: Daisy	Clinch River	04/13/99		ND
TN: Kingston	Clinch River	05/17/99		ND
TN: Oak Ridge	Colorado River	04/12/99		ND
TX: Matagorda	North Anna River	04/07/99	Pb212	7.7 8.5
VA: Doswell	James River	04/21/99	K40	151 69
VA: Newport News	Connecticut River	04/26/99		ND
VT: Vernon	Columbia River	04/05/99		ND
WA: Northport	Columbia River	05/19/99		ND
WA: Richland	Lake Michigan	04/14/99		ND
WI: Two Creeks	Mississippi River	04/13/99		ND
WI: Victory	Ohio River	04/06/99	K40	27 52
WV: Wheeling			Pb212	9.0 7.4

Note: ND = Not Detected

Drinking Water

This program monitors ambient radiation levels in drinking water in as many as 78 sites. These data serve 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.

Grab samples are taken at the 78 sites which are either major population centers or selected nuclear facility environs.

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 10
Tritium in Drinking Water
October - December 1999

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
AK: Fairbanks	11/09/99	-53	77
AL: Dothan	10/07/99	-75	78
AL: Montgomery	10/01/99	10	78
AL: Muscle Shoals	10/14/99	53	82
AL: Scottsboro	10/13/99	-47	78
AR: Little Rock	10/07/99	-28	79
CA: Berkeley	10/15/99	-48	78
CA: Los Angeles	10/05/99	-3	79
CT: Hartford	10/07/99	-8	79
CZ: Balboa	11/22/99	-46	77
DE: Dover	10/18/99	-56	77
FL: Miami	10/06/99	-34	74
GA: Baxley	10/19/99	0	79
GA: Savannah	12/09/99	-49	76
HI: Honolulu	10/04/99	2	80
IA: Cedar Rapids	10/11/99	8	80
ID: Idaho Falls	10/27/99	76	82
IL: Morris	12/10/99	-21	75
IL: W. Chicago	10/22/99	-9	76
KS: Topeka	10/04/99	-14	77
MA: Lawrence	10/27/99	-7	79
MD: Baltimore	10/04/99	-63	74
MD: Conowingo	10/12/99	-24	78
ME: Augusta	10/12/99	-5	80
MI: Grand Rapids	10/21/99	43	81
MN: Minneapolis	11/08/99	-59	77
MN: Red Wing	11/01/99	-43	78
MO: Jefferson City	10/06/99	150	86
MS: Jackson	10/06/99	-66	74
MS: Port Gibson	10/05/99	-85	75
MT: Helena	11/03/99	-5	79
NC: Charlotte	10/05/99	421	95
NC: Wilmington	10/11/99	63	83
ND: Bismarck	10/04/99	33	79
NE: Lincoln	10/05/99	-5	75
NM: Santa Fe	10/22/99	-8	80
NV: Las Vegas	10/05/99	2	79
NY: Albany	10/04/99	-24	76
NY: Niagara Falls	10/19/99	143	86
NY: Syracuse	12/28/99	95	80

Table 10 (continued)
Tritium in Drinking Water
October - December 1999

Location	Date Collected	³ H pCi/L ± 2 <i>u</i>	
OH: Cincinnati	12/14/99	-21	76
OH: Columbus	12/07/99	3	76
OH: E. Liverpool	12/03/99	-8	78
OH: Painesville	10/06/99	129	85
OK: Oklahoma City	10/04/99	-28	76
OR: Portland	10/05/99	-60	75
PA: Columbia	12/09/99	-9	76
PA: Harrisburg	12/10/99	-13	77
PA: Philadelphia - Baxter	10/13/99	-34	79
PA: Philadelphia - Queen	10/13/99	-8	79
PA: Pittsburgh	12/03/99	-28	79
RI: Providence	10/04/99	-3	75
SC: Barnwell	10/05/99	-42	76
SC: Columbia	10/22/99	181	87
SC: Jenkinsville	10/22/99	-25	79
SC: Seneca	10/25/99	67	80
TN: Chattanooga	10/05/99	-34	75
TN: Knoxville	10/04/99	10	74
TN: Oak Ridge - Anderson Co #768	12/14/99	-60	74
TN: Oak Ridge - Anderson Co #772	12/14/99	-40	75
TN: Oak Ridge - Knox Co #371	12/14/99	16	77
TN: Oak Ridge - Roane Co #360	12/14/99	-4	76
TN: Oak Ridge - Roane Co #4442	12/14/99	468	95
TX: Austin	10/20/99	10	80
VA: Lynchburg	10/08/99	-31	79
WA: Richland	10/06/99	15	81
WA: Seattle	10/11/99	-11	80
WI: Genoa	10/12/99	22	82
WI: Madison	10/15/99	13	81

Table 11
Iodine-131 in Drinking Water
January - December 1999

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
AK: Fairbanks	11/09/99	0.03	0.31
AL: Dothan	01/11/99	0.006	0.074
AL: Montgomery	01/05/99	0.03	0.18
AL: Muscle Shoals	01/20/99	0.052	0.071
AL: Scottsboro	01/19/99	0.060	0.073
AR: Little Rock	01/06/99	-0.03	0.24
CA: Berkeley	01/26/99	0.108	0.097
CA: Los Angeles	07/13/99	-0.019	0.092
CA: Los Angeles	10/05/99	-0.09	0.25
CO: Denver	01/12/99	0.13	0.10
CO: Denver	01/12/99	-0.02	0.47
CO: Platteville	01/12/99	0.02	0.11
CT: Hartford	01/04/99	0.02	0.22
CZ: Balboa	11/22/99	0.15	0.33
DE: Dover	07/07/99	-0.07	0.10
FL: Miami	01/14/99	-0.006	0.077
FL: Tampa	02/25/99	0.229	0.088
GA: Baxley	10/19/99	-0.15	0.16
GA: Savannah	02/25/99	-0.070	0.078
HI: Honolulu	01/15/99	0.100	0.079
HI: Honolulu	01/15/99	0.08	0.34
IA: Cedar Rapids	01/12/99	0.098	0.098
IA: Cedar Rapids	01/12/99	-0.04	0.45
ID: Idaho Falls	04/26/99	-0.066	0.072
IL: Morris	12/10/99	-0.10	0.17
IL: W. Chicago	01/05/99	0.044	0.098
KS: Topeka	10/04/99	0.00	0.26
MA: Lawrence	03/10/99	0.03	0.18
MD: Baltimore	07/06/99	0.03	0.21
MD: Baltimore	10/04/99	-0.038	0.078
MD: Conowingo	09/15/99	0.095	0.085
ME: Augusta	01/12/99	0.05	0.10
MI: Grand Rapids	07/08/99	-0.060	0.084
MI: Grand Rapids	10/21/99	0.00	0.36
MN: Minneapolis	07/19/99	0.18	0.22
MN: Red Wing	01/25/99	0.00	0.11
MO: Jefferson City	01/05/99	0.02	0.12
MS: Jackson	01/05/99	-0.059	0.092
MS: Port Gibson	01/05/99	-0.077	0.096
MT: Helena	02/19/99	-0.15	0.31
NC: Charlotte	01/20/99	0.068	0.085

Table 11 (continued)
Iodine-131 in Drinking Water
January - December 1999

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
NC: Wilmington	01/13/99	-0.006	0.093
ND: Bismarck	10/04/99	-0.059	0.080
NE: Lincoln	01/06/99	-0.05	0.21
NH: Concord	02/17/99	-0.037	0.088
NM: Santa Fe	10/22/99	0.10	0.18
NV: Las Vegas	07/14/99	-0.003	0.083
NV: Las Vegas	10/05/99	-0.15	0.28
NY: Albany	01/04/99	-0.02	0.41
NY: Niagara Falls	10/19/99	0.08	0.22
NY: Syracuse	02/09/99	0.04	0.34
NY: Syracuse	04/22/99	0.010	0.087
OH: Cincinnati	01/28/99	0.12	0.11
OH: Columbus	12/07/99	0.05	0.24
OH: E. Liverpool	03/12/99	0.13	0.16
OH: Painesville	01/04/99	0.21	0.36
OH: Toledo	07/07/99	-0.041	0.095
OK: Oklahoma City	07/14/99	-0.052	0.085
OK: Oklahoma City	10/04/99	0.034	0.080
OR: Portland	10/05/99	-0.13	0.27
PA: Columbia	01/21/99	0.17	0.19
PA: Harrisburg	01/21/99	0.002	0.080
PA: Philadelphia - Baxter	01/28/99	0.039	0.081
PA: Philadelphia - Queen	01/28/99	0.134	0.077
PA: Pittsburgh	03/12/99	0.05	0.16
PC: Corozal	08/03/99	0.00	0.11
RI: Providence	10/04/99	0.03	0.25
SC: Barnwell	10/05/99	0.00	0.24
SC: Columbia	01/06/99	-0.02	0.22
SC: Jenkinsville	01/07/99	0.004	0.093
SC: Seneca	01/20/99	0.037	0.085
TN: Chattanooga	01/08/99	-0.05	0.19
TN: Knoxville	07/05/99	-0.25	0.26
TN: Oak Ridge - Roane Co #4442	06/23/99	0.077	0.092
TN: Oak Ridge - Roane Co#360	06/23/99	0.022	0.098
TN: Oak Ridge - Anderson Co#768	06/23/99	0.070	0.092
TN: Oak Ridge - Anderson Co #772	06/23/99	0.046	0.084
TX: Austin	01/08/99	-0.08	0.20
VA: Lynchburg	07/27/99	-0.046	0.069
WA: Richland	01/25/99	0.123	0.099
WA: Seattle	01/04/99	0.08	0.19
WI: Genoa	07/13/99	-0.050	0.096

Table 11 (continued)
Iodine-131 in Drinking Water
January - December 1999

Location	Date Collected	¹³¹ I pCi/L ± 2 <i>u</i>	
WI: Genoa	10/12/99	0.03	0.48
WI: Madison	10/15/99	0.063	0.095

Table 12
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
January - December 1999 Composites

Location	Total Solids	Gross Beta		Gross Alpha		⁹⁰ Sr*
	(mg/L)	pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u
AK: Fairbanks	66.4	3.47	0.82	-0.07	0.79	
AL: Dothan	66.5	1.1	1.8	-0.9	1.9	
AL: Montgomery	41.0	2.26	0.83	0.18	0.69	
AL: Muscle Shoals	38.2	2.61	0.97	0.00	0.80	
AL: Scottsboro	52.1	1.94	0.81	-0.06	0.73	
AR: Little Rock	15.0	0.79	0.62	-0.09	0.49	
CA: Berkeley	25.1	1.00	0.64	0.26	0.60	
CA: Los Angeles	49.8	6.7	3.3	1.6	3.7	
CO: Denver	69.6	2.35	0.76	0.08	0.87	
CO: Platteville	7.7	1.5	2.8	-0.4	2.3	
CT: Hartford	22.2	1.51	0.66	-0.18	0.52	
CZ: Balboa	45.8	0.11	0.55	0.18	0.69	
DC: Washington	59.5	3.7	1.2	0.3	1.3	
DE: Dover	54.2	3.4	1.2	-0.2	1.2	
FL: Miami	60.6	2.4	1.2	0.2	1.2	
FL: Tampa	104.5	3.1	1.4	0.7	1.9	
GA: Baxley	74.3	2.46	0.87	0.9	1.0	
GA: Savannah	74.1	2.48	0.86	0.00	0.89	
HI: Honolulu	92.9	1.97	0.87	0.0	1.2	
IA: Cedar Rapids	69.7	2.92	0.78	-0.04	0.83	
ID: Boise	62.1	0.90	0.65	0.60	0.88	
ID: Idaho Falls	66.3	2.5	1.1	1.9	1.6	
IL: Morris	75.4	18.6	3.1	5.5	3.8	
IL: W. Chicago	93.7	14.2	2.2	15.4	3.9	
KS: Topeka	106.3	8.0	1.8	-0.6	2.0	
LA: New Orleans	77.0	3.41	0.97	1.1	1.3	
MA: Lawrence	55.3	2.83	0.77	-0.05	0.74	
MD: Baltimore	58.6	2.45	0.75	0.10	0.82	
MD: Conowingo	78.1	2.71	0.90	-0.1	1.1	
ME: Augusta	48.4	1.96	0.70	0.31	0.73	
MI: Detroit	41.2	1.50	0.78	0.40	0.73	
MI: Grand Rapids	61.3	2.49	0.85	-0.07	0.79	
MN: Minneapolis	45.4	2.60	0.77	0.64	0.79	
MN: Red Wing	75.8	15.8	2.0	17.2	3.4	
MO: Jefferson City	97.8	6.6	1.4	0.1	1.7	
MS: Jackson	53.5	1.81	0.94	-0.33	0.84	
MS: Port Gibson	117.2	5.3	1.7	0.6	2.4	

* Results will be reported at a later date.

Table 12 (continued)
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
January - December 1999 Composites

Location	Total Solids	Gross Beta		Gross Alpha		⁹⁰ Sr*
	(mg/L)	pCi/L ± 2u		pCi/L ± 2u		pCi/L ± 2u
MT: Helena						
NC: Charlotte	28.4	1.51	0.68	0.64	0.66	
NC: Wilmington	29.8	1.62	0.78	-0.10	0.58	
ND: Bismarck	72.2	4.37	0.97	0.25	0.93	
NE: Lincoln	92.2	4.1	1.3	0.3	1.6	
NH: Concord	101.5	15.1	2.2	5.9	3.0	
NM: Santa Fe	53.2	1.34	0.65	-0.11	0.69	
NV: Las Vegas	87.0	11.8	1.8	8.5	2.8	
NY: Albany	88.7	7.1	2.5	0.9	3.4	
NY: Niagara Falls	50.3	1.37	0.65	0.02	0.70	
NY: Syracuse	53.8	2.34	0.72	0.13	0.74	
OH: Cincinnati	47.9	1.89	0.71	-0.04	0.71	
OH: Columbus	108.9	4.2	1.1	-0.1	1.3	
OH: E. Liverpool	97.1	2.9	1.4	-0.1	2.0	
OH: Painesville	97.0	4.5	1.0	-0.1	1.2	
OH: Toledo	53.5	2.58	0.92	-0.08	0.91	
OK: Oklahoma City	57.5	1.91	0.71	0.10	0.77	
OR: Portland	47.0	3.17	0.77	0.11	0.69	
PA: Columbia	19.3	0.39	0.58	0.05	0.51	
PA: Harrisburg	84.2	2.40	0.76	-0.15	0.91	
PA: Philadelphia - Queen	45.1	1.74	0.81	-0.05	0.81	
PA: Philadelphia - Baxter	52.1	2.4	1.1	-0.1	1.2	
PA: Pittsburgh	50.1	4.0	1.2	0.1	1.2	
RI: Providence	83.4	2.21	0.90	-0.1	1.2	
SC: Barnwell	34.2	1.23	0.65	-0.03	0.61	
SC: Columbia	27.6	0.31	0.83	0.00	0.69	
SC: Jenkinsville	43.5	2.77	0.82	-0.18	0.65	
SC: Seneca	45.2	4.1	1.1	2.4	1.2	
TN: Chattanooga	18.0	1.42	0.76	0.05	0.53	
TN: Knoxville	37.2	2.37	0.79	0.06	0.65	
TN: Oak Ridge - Anderson Co	62.1	0.84	0.89	-0.43	0.90	
#768	56.0	1.80	0.69	0.08	0.71	
TN: Oak Ridge - Anderson Co	53.9	2.03	0.73	-0.07	0.73	
#772	57.3	2.46	0.75	0.07	0.76	
TN: Oak Ridge - Roane Co #4442	66.9	2.51	0.77	0.70	0.93	
TN: Oak Ridge - Roane Co #360	54.1	1.54	0.67	0.21	0.73	
TN: Oak Ridge - Knox Co #371	69.1	3.8	1.0	0.3	1.1	
TX: Austin	67.2	4.1	1.0	-0.2	1.0	
VA: Ashland						

* Results will be reported at a later date.

Table 12 (continued)
Drinking Water
Alpha, Beta, and Sr-90 Concentrations
January - December 1999 Composites

Location	Total Solids (mg/L)	Gross Beta pCi/L \pm 2 <i>u</i>		Gross Alpha pCi/L \pm 2 <i>u</i>		⁹⁰ Sr* pCi/L \pm 2 <i>u</i>
VA: Lynchburg	37.6	0.97	0.61	-0.20	0.57	
WA: Richland	28.8	0.39	0.60	0.27	0.62	
WA: Seattle	6.6	0.44	0.57	0.04	0.48	
WI: Genoa	75.3	2.08	0.75	1.2	1.1	
WI: Madison	74.5	2.6	1.2	3.0	1.9	

* Results will be reported at a later date.

Table 13
Drinking Water
Radium and Gamma-Emitting Radionuclides
January - December 1999 Composites

Location	²²⁶ Ra	²²⁸ Ra	Specific Gamma Activity	
	pCi/L ± 2 <i>u</i>	pCi/L ± 2 <i>u</i>	Nuclide	pCi/L ± 2 <i>u</i>
AK: Fairbanks	NA	NA	K40	13 15
AL: Dothan	NA	NA		ND
AL: Montgomery	NA	NA	K40	11 14
AL: Muscle Shoals	NA	NA	K40	11 14
AL: Scottsboro	NA	NA		ND
AR: Little Rock	NA	NA	K40	14 14
CA: Berkeley	NA	NA	Tl208	2.0 2.2
CA: Los Angeles	NA	NA		ND
CO: Denver	NA	NA		ND
CO: Platteville	NA	NA		ND
CT: Hartford	NA	NA	K40	15 14
CZ: Balboa	NA	NA	Pb212	3.2 4.0
DC: Washington	NA	NA	Pb212	11 18
DE: Dover	NA	NA		ND
FL: Miami	NA	NA		ND
FL: Tampa	NA	NA		ND
GA: Baxley	NA	NA		ND
GA: Savannah	NA	NA	Tl208	2.0 2.2
HI: Honolulu	NA	NA		ND
IA: Cedar Rapids	NA	NA	K40	11 14
ID: Boise	NA	NA		ND
ID: Idaho Falls	NA	NA	Pb212	3.3 4.1
IL: Morris	NA	NA	K40	15 15
IL: W. Chicago	NA	NA		ND
KS: Topeka	NA	NA		ND
LA: New Orleans	NA	NA		ND
MA: Lawrence	NA	NA		ND
MD: Baltimore	NA	NA		ND
MD: Conowingo	NA	NA	K40	11 15
			Pb212	4.6 4.1
ME: Augusta	NA	NA		ND
MI: Detroit	NA	NA		ND
MI: Grand Rapids	NA	NA	K40	14 15
MN: Minneapolis	NA	NA		ND
MN: Red Wing	NA	NA		ND
MO: Jefferson City	NA	NA	K40	11 15

Note: ND = Not Detected
NA = No Analysis

Table 13 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
January - December 1999 Composites

Location	²²⁶ Ra	²²⁸ Ra	Specific Gamma Activity	
	pCi/L ± 2u	pCi/L ± 2u	Nuclide	pCi/L ± 2u
MS: Jackson				
MS: Port Gibson	NA	NA		ND
MT: Helena	NA	NA		ND
NC: Charlotte	NA	NA		ND
NC: Wilmington	NA	NA		ND
ND: Bismarck	NA	NA	K40	11 15
NE: Lincoln	NA	NA		ND
NH: Concord	NA	NA		ND
NM: Santa Fe	NA	NA		ND
NV: Las Vegas	NA	NA		ND
NY: Albany	NA	NA	Tl208	1.9 2.3
NY: Niagara Falls	NA	NA	Tl208	2.2 2.2
NY: Syracuse	NA	NA		ND
OH: Cincinnati	NA	NA		ND
OH: Columbus	NA	NA		ND
OH: E. Liverpool	NA	NA		ND
OH: Painesville	NA	NA		ND
OH: Toledo	NA	NA	Pb212	2.9 3.7
OK: Oklahoma City	NA	NA	K40	11 14
OR: Portland	NA	NA	K40	13 15
PA: Columbia	NA	NA	K40	14 15
			Pb212	3.0 3.7
PA: Harrisburg			Tl208	2.3 2.2
PA: Philadelphia - Queen	NA	NA		ND
	NA	NA	K40	16 14
PA: Philadelphia - Baxter			Tl208	3.1 2.1
PA: Pittsburgh	NA	NA		ND
RI: Providence	NA	NA		ND
SC: Barnwell	NA	NA	Tl208	2.7 2.3
SC: Columbia	NA	NA		ND
SC: Jenkinsville	NA	NA		ND
SC: Seneca	NA	NA		ND
TN: Chattanooga	NA	NA		ND
TN: Knoxville	NA	NA		ND
TN: Oak Ridge - Anderson Co	NA	NA		ND
#768	NA	NA		ND
TN: Oak Ridge - Anderson Co	NA	NA		ND
#772				

Note: ND = Not Detected
NA = No Analysis

Table 13 (continued)
Drinking Water
Radium and Gamma-Emitting Radionuclides
January - December 1999 Composites

Location	²²⁶ Ra	²²⁸ Ra	Specific Gamma Activity	
	pCi/L ± 2 <i>u</i>	pCi/L ± 2 <i>u</i>	Nuclide	pCi/L ± 2 <i>u</i>
TN: Oak Ridge - Roane Co #4442	NA	NA	Tl208	1.9 2.3
TN: Oak Ridge - Roane Co #360	NA	NA	K40	13 14
TN: Oak Ridge - Knox Co #371	NA	NA	Tl208	2.1 2.2
TX: Austin	NA	NA		ND
VA: Ashland	NA	NA		ND
VA: Lynchburg	NA	NA	Tl208	2.3 2.3
WA: Richland	NA	NA	Pb212	3.7 4.3
WA: Seattle	NA	NA	Tl208	2.6 2.3
WI: Genoa	NA	NA		ND
WI: Madison	NA	NA		ND

Note: ND = Not Detected
NA = No Analysis

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3. Milk Program

Pasteurized Milk

Milk is a reliable indicator of the general population's intake of 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. All samples collected in July are analyzed for strontium-90.

Iodine-131, barium-140, cesium-137, and potassium-40 are determined by gamma spectral analysis. Strontium-90 is determined by beta counting a total strontium precipitate that has been chemically separated by ion exchange.

Table 14
Radionuclides in Pasteurized Milk
October - December 1999

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	10/07/99	1.716	0.051	ND		ND	ND
AR: Little Rock	10/27/99	1.656	0.093	ND		ND	ND
AZ: Phoenix	10/05/99	1.609	0.090	ND		ND	ND
CA: Los Angeles	10/26/99	1.656	0.095	ND		ND	ND
CA: Sacramento	11/22/99	1.621	0.067	ND		ND	ND
CA: San Francisco	10/12/99	1.799	0.051	ND		ND	ND
DE: Wilmington	10/05/99	1.692	0.081	ND		ND	ND
FL: Tampa	10/13/99	1.704	0.050	2.5	1.5	ND	ND
GA: Atlanta	10/05/99	1.728	0.051	ND		ND	ND
HI: Honolulu	10/07/99	1.63	0.10	ND		ND	ND
IA: Des Moines	10/05/99	1.632	0.080	ND		ND	ND
IL: Chicago	11/04/99	1.47	0.12	ND		ND	ND
IN: Indianapolis	10/04/99	1.668	0.050	ND		ND	ND
KS: Wichita	10/05/99	1.728	0.051	ND		ND	ND
KY: Louisville	10/05/99	1.716	0.050	ND		ND	ND
MA: Boston	10/08/99	1.632	0.088	ND		ND	ND
MD: Baltimore	10/08/99	1.585	0.067	ND		ND	ND
ME: Portland	10/25/99	1.716	0.050	ND		ND	ND
MI: Detroit	10/12/99	1.716	0.050	ND		ND	ND
MI: Grand Rapids	10/05/99	1.775	0.051	ND		ND	ND
MS: Jackson	10/04/99	1.537	0.086	ND		ND	ND
NM: Albuquerque	10/20/99	1.680	0.051	ND		ND	ND
NV: Las Vegas	10/20/99	1.680	0.050	ND		ND	ND
NY: Buffalo	10/15/99	1.656	0.078	ND		ND	ND
NY: Syracuse	10/05/99	1.609	0.078	ND		ND	ND
OH: Cincinnati	10/19/99	1.692	0.051	ND		ND	ND
OH: Cleveland	10/18/99	1.728	0.051	ND		ND	ND
OR: Portland	10/07/99	1.728	0.085	ND		ND	ND
PA: Philadelphia	10/05/99	1.573	0.081	ND		ND	ND
PA: Pittsburgh	10/05/99	1.668	0.050	ND		ND	ND
PR: San Juan	11/08/99	1.60	0.14	ND		ND	ND
TN: Chattanooga	10/12/99	1.656	0.088	ND		ND	ND
TN: Knoxville	11/02/99	1.680	0.092	ND		ND	ND
TN: Memphis	10/20/99	1.692	0.050	ND		ND	ND
TX: Ft. Worth	10/25/99	1.621	0.091	ND		ND	ND
TX: San Antonio	11/09/99	1.656	0.091	ND		ND	ND
VT: Montpelier	11/02/99	1.632	0.092	ND		ND	ND
WA: Spokane	10/05/99	1.561	0.089	ND		ND	ND
WV: Charleston	10/05/99	1.49	0.10	ND		ND	ND

Note: ND = Not Detected

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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