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Environmental Protection
Agency

Office of Radiation Programs
National Air and Radiation
Environmental Laboratory
Montgomery, AL 36115-2601

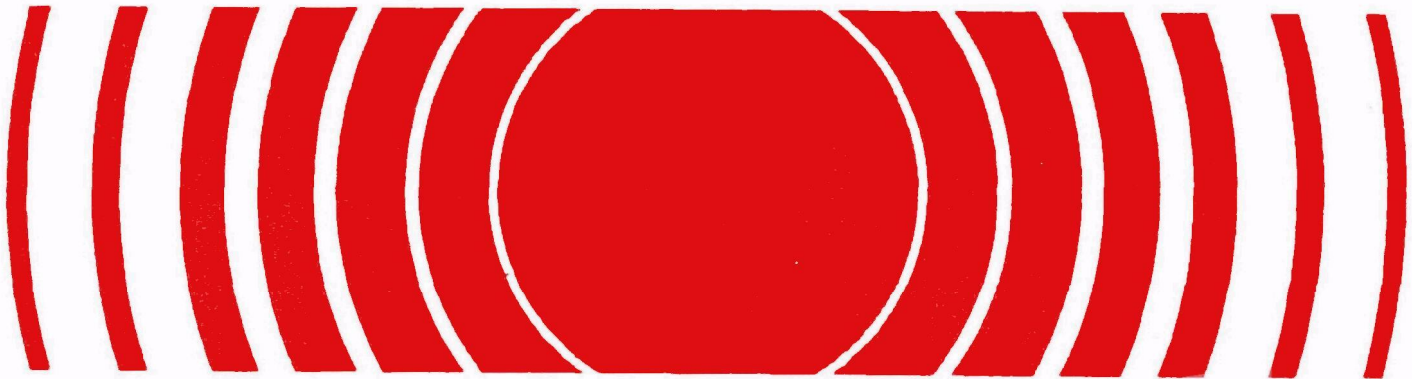
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July-September 1991



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July–September 1991

United States Environmental Protection Agency

Office of Radiation and Indoor Air

Preface

Environmental Radiation Data (ERD) is compiled and distributed 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). Data from similar networks operated by contributing States, Canada, Mexico, and the Pan American Health Organization are reported in the ERD when available.

ERAMS was established in 1973 by the United States Environmental Protection Agency. It is comprised of a nationwide network of sampling stations that provide air, surface and drinking water, and milk samples from which environmental radiation levels are derived. The major emphasis for ERAMS is upon identifying trends in the accumulation of long-lived radionuclides in the environment.

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 levels, gamma analyses for fission products, and specific analyses for uranium, plutonium, strontium, iodine, radium, krypton, 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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Data Reporting Rationale

Frequently, there is little or no radioactivity in environmental media. Thus, the results of laboratory analyses should show a distribution of negative and positive numbers about zero. A negative value occurs when a previously determined background value is subtracted from a sample value that is less than that of the background. From July 1975 to March 1991, ERAMS data were reported as calculated, whether the results were negative, zero, or positive. In this and future reports, negative results will be denoted as "not detectable," or "ND." For gamma analyses only, results less than the 2σ counting error will also be denoted as "not detectable."

All data will continue to be stored in the NAREL sample database as generated, and these values will be available for statistical evaluation. However, caution should be exercised in the use of the data in this report for statistical analysis, since the removal of negative numbers produces a positive bias in the distribution of results.

Reported Error Terms

Each reported value for specific analyses will be accompanied by a counting error term at the 2σ (95%) confidence level. Error terms are therefore reported as counting errors. At the very low levels characteristic of most ERAMS measurements, counting error is the greatest contributor to overall error.

Significant Figures

No more than three significant figures will be reported. A datum that contains more than three figures will be rounded off to three figures.

Reporting Levels

The reporting units, smallest increments for reporting, and typical minimum detectable levels (MDL's) for each isotope are shown in Table 1. MDL is defined as the 3σ error of the background. Reporting increments are sometimes considerably smaller than MDL's to avoid truncation errors in averaging.

Averages

Averages will be calculated along with appropriate error terms in an annual summary and analysis of ERAMS data. In calculating these averages, all values of individual data, including negative numbers, will be utilized. Averages will not be included in ERD quarterly reports.

Table 1

ERAMS Reporting Increments and Minimum Detectable Levels for Radionuclide Analyses

Radionuclide	Media	Reporting Units	Reporting Increments	Minimum Detectable Levels
Gross Alpha	Water	pCi/L	1 pCi/L	2 pCi/L
† Gross Beta	Air	pCi/m ³	0.01 pCi/m ³	0.01 pCi/m ³
	Water	pCi/L	1 pCi/L	1 pCi/L
	Precipitation	nCi/m ²	0.01 nCi/m ²	0.01 nCi/m ²
	(specific radiochemical analyses)			
Tritium	Water	nCi/L	0.1 nCi/L	0.2 nCi/L
	Milk	nCi/L	0.1 nCi/L	0.2 nCi/L
Carbon-14	Milk	pCi/L	1 pCi/L	15 pCi/L
Krypton-85	Ambient Air	pCi/m ³	0.1 pCi/m ³	2 pCi/m ³
†† Plutonium-238,239,240	Air	aCi/m ³	0.1 aCi/m ³	0.015 pCi
	Milk	pCi/L	0.001 pCi/L	0.015 pCi
	Water	pCi/L	0.001 pCi/L	0.015 pCi
‡ Uranium-234,235,238	Air	aCi/m ³	0.1 aCi/m ³	0.015 pCi
	Milk	pCi/L	0.001 pCi/L	0.015 pCi
	Water	pCi/L	0.001 pCi/L	0.015 pCi
Radium-226	Water	pCi/L	0.1 pCi/L	0.1 pCi/L
Strontium-90	Milk	pCi/L	0.1 pCi/L	1 pCi/L
	Water	pCi/L	0.1 pCi/L	1 pCi/L
‡‡ Strontium-89	Milk	pCi/L	1 pCi/L	5 pCi/L
‡‡ Iodine-131	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	0.1 pCi/L	0.4 pCi/L
Iodine-129	Milk	fCi/L	0.1 fCi/L	0.4 fCi/L
Cesium-137	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
‡‡ Barium-140	Milk	pCi/L	1 pCi/L	10 pCi/L
	Water	pCi/L	1 pCi/L	10 pCi/L
Potassium	Milk	g/L	0.1 g/L	0.12 g/L
	Water	g/L	0.1 g/L	0.12 g/L
Potassium-40	Water	pCi/L	1 pCi/L	100 pCi/L

† The value of MDL for precipitation in terms of nCi/m² would be dependent on precipitation (mm).

†† This value of MDL for air in terms of pCi/m³ would be dependent on the air volume. Measurement by alpha spectroscopy that includes contributions of plutonium-239 and plutonium-240. MDL for all media given per sample.

‡ This value of MDL for air in terms of pCi/m³ would be dependent on the air volume. MDL for all media given per sample.

‡‡ Activity as of the day of counting.

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 and 29 hours after collection to allow for radon and thoron daughter product 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 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 those 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 composite of the March, April, and May precipitation samples is analyzed for plutonium-238, -239, -240, and uranium-234, -235, and -238.

A compilation of individual measurements is available from the National Air and Radiation Environmental Laboratory, 1504 Avenue A, Montgomery, AL 36115-2601.

Tables 2-4 contain the data from airborne particulate samples for July-September 1991. Tables 5-7 contain the data from precipitation samples for July-September 1991. Table 8 contains the data from tritium in precipitation samples for July-September 1991 at the selected sites.

† The counts at five hours for the Montgomery, Alabama, station are performed on a low background beta counter.

Table 2
Gross Beta in Airborne Particulates
July 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL:Montgomery	8	0.0	0.0	0.0	0.01	0.01	0.01
AR:Little Rock	9	0.5	0.3	0.4	0.01	0.01	0.01
AZ:Phoenix	8	1.2	0.3	0.7	0.02	0.01	0.01
CA:Berkeley	9	0.1	0.0	0.0	0.00	0.00	0.00
CA:Los Angeles	9	0.3	0.0	0.1	0.02	0.00	0.01
CO:Denver	8	0.8	0.3	0.4	0.01	0.01	0.01
CT:Hartford	9	0.2	0.0	0.1	0.02	0.01	0.01
DE:Wilmington	9	0.5	0.0	0.3	0.02	0.01	0.01
FL:Jacksonville	9	0.1	0.0	0.1	0.01	0.00	0.01
FL:Miami	9	0.1	0.0	0.1	0.03	0.01	0.01
HI:Honolulu	8	0.2	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	9	0.6	0.2	0.3	0.02	0.01	0.01
ID:Boise	8	0.5	0.0	0.3	0.01	0.01	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.01	0.00	0.01
IL:Chicago	8	0.8	0.0	0.3	0.04	0.01	0.02
IN:Indianapolis	8	0.4	0.0	0.2	0.02	0.01	0.01
KS:Topeka	8	3.1	0.6	1.3	0.02	0.01	0.01
KY:Frankfort	4	0.6	0.1	0.4	0.02	0.01	0.01
LA:New Orleans	8	0.2	0.0	0.1	0.01	0.01	0.01
MA:Lawrence	9	0.3	0.0	0.1	0.02	0.00	0.01
ME:Augusta	8	0.6	0.0	0.2	0.02	0.00	0.01
MI:Lansing	9	0.7	0.2	0.3	0.02	0.01	0.01
MN:Minneapolis	7	0.4	0.0	0.2	0.02	0.01	0.01
MO:Jefferson City	9	0.8	0.2	0.5	0.02	0.01	0.01
MS:Jackson	8	0.5	0.1	0.3	0.04	0.01	0.02
NC:Charlotte	4	0.2	0.1	0.1	0.03	0.01	0.02
NC:Wilmington	8	0.0	0.0	0.0	0.01	0.00	0.01
ND:Bismarck	8	0.9	0.2	0.6	0.02	0.00	0.01
NE:Lincoln	7	2.2	0.1	0.9	0.03	0.01	0.02
NH:Concord	9	0.5	0.1	0.2	0.02	0.00	0.01
NJ:Trenton	9	1.1	0.3	0.6	0.02	0.01	0.01
NM:Santa Fe	7	0.6	0.1	0.3	0.01	0.00	0.01
NV:Las Vegas	9	0.3	0.1	0.2	0.01	0.01	0.01
NY:Albany	5	0.1	0.0	0.1	0.01	0.01	0.01
NY:Niagara Falls	9	0.7	0.1	0.2	0.02	0.00	0.01
NY:Syracuse	3	0.2	0.0	0.1	0.03	0.01	0.02
NY:Yaphank	9	0.2	0.1	0.2	0.02	0.01	0.01

Table 2 (continued)
Gross Beta in Airborne Particulates
July 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
OH:Columbus	8	0.3	0.1	0.2	0.02	0.01	0.01
OH:Painesville	9	0.8	0.1	0.3	0.02	0.01	0.01
OH:Ross	8	0.0	0.0	0.0	0.03	0.01	0.02
OH:Toledo	8	1.5	0.5	1.1	0.03	0.00	0.01
OK:Oklahoma City	8	0.8	0.2	0.4	0.02	0.01	0.01
OR:Portland	9	0.0	0.0	0.0	0.01	0.00	0.00
PA:Harrisburg	9	0.8	0.1	0.4	0.02	0.01	0.01
PA:Pittsburgh	8	0.3	0.3	0.3	0.02	0.01	0.01
RI:Providence	8	0.0	0.0	0.0	0.02	0.00	0.01
SC:Barnwell	2	0.1	0.1	0.1	0.01	0.01	0.01
SC:Columbia	8	0.4	0.0	0.2	0.03	0.00	0.01
SD:Pierre	2	0.4	0.3	0.4	0.01	0.01	0.01
TN:Knoxville	9	1.1	0.3	0.6	0.04	0.01	0.02
TN:Nashville	8	1.0	0.1	0.6	0.04	0.02	0.03
TX:Austin	9	0.2	0.1	0.1	0.02	0.00	0.01
TX:El Paso	9	0.9	0.2	0.4	0.02	0.00	0.01
UT:Salt Lake City	9	0.3	0.0	0.2	0.01	0.01	0.01
VA:Lynchburg	8	0.9	0.2	0.7	0.01	0.01	0.01
VA:Virginia Beach	4	0.1	0.1	0.1	0.02	0.01	0.01
WA:Olympia	9	0.1	0.1	0.1	0.00	0.00	0.00
WA:Spokane	9	0.3	0.1	0.2	0.01	0.00	0.01
WI:Madison	9	0.6	0.2	0.4	0.02	0.00	0.01
WV:Charleston	9	0.8	0.1	0.3	0.02	0.01	0.01

Minimum Detectable Limit for field estimates - 0.1 pCi/m³.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m³.

Table 3
Gross Beta in Airborne Particulates
August 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL:Montgomery	6	0.1	0.0	0.1	0.02	0.00	0.01
AR:Little Rock	9	0.7	0.2	0.5	0.02	0.01	0.01
AZ:Phoenix	7	1.0	0.1	0.4	0.02	0.01	0.01
CA:Berkeley	9	0.2	0.0	0.1	0.01	0.00	0.00
CA:Los Angeles	9	2.5	0.1	0.6	0.02	0.01	0.01
CO:Denver	9	1.0	0.0	0.5	0.01	0.01	0.01
CT:Hartford	9	0.1	0.1	0.1	0.02	0.00	0.01
DE:Wilmington	9	0.5	0.1	0.3	0.01	0.01	0.01
FL:Jacksonville	8	0.1	0.0	0.1	0.01	0.00	0.01
FL:Miami	9	0.1	0.0	0.0	0.02	0.01	0.01
HI:Honolulu	7	0.1	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	9	0.4	0.0	0.2	0.03	0.01	0.01
ID:Boise	9	0.4	0.1	0.3	0.02	0.01	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.01	0.00	0.01
IL:Chicago	9	0.7	0.0	0.3	0.02	0.01	0.01
IN:Indianapolis	9	1.1	0.0	0.4	0.02	0.00	0.01
KS:Topeka	9	4.0	0.8	2.0	0.03	0.01	0.01
KY:Frankfort	2	0.7	0.3	0.5	0.02	0.01	0.01
LA:New Orleans	9	0.2	0.0	0.1	0.02	0.00	0.01
MA:Lawrence	9	0.3	0.0	0.1	0.02	0.00	0.01
ME:Augusta	9	0.4	0.1	0.2	0.02	0.00	0.01
MI:Lansing	9	0.7	0.1	0.3	0.01	0.01	0.01
MN:Minneapolis	7	0.7	0.1	0.3	0.03	0.01	0.02
MO:Jefferson City	9	1.4	0.4	0.8	0.03	0.01	0.02
MS:Jackson	9	0.9	0.2	0.5	0.04	0.01	0.02
NC:Charlotte	9	0.2	0.0	0.1	0.03	0.00	0.02
NC:Wilmington	8	0.0	0.0	0.0	0.02	0.00	0.01
ND:Bismarck	8	1.5	0.2	0.9	0.02	0.01	0.01
NE:Lincoln	8	2.4	0.0	1.2	0.03	0.01	0.02
NH:Concord	9	0.3	0.1	0.2	0.02	0.00	0.01
NJ:Trenton	9	1.1	0.2	0.7	0.02	0.01	0.01
NM:Santa Fe	6	0.6	0.2	0.4	0.01	0.00	0.01
NV:Las Vegas	9	0.3	0.1	0.2	0.02	0.01	0.01
NY:Albany	4	0.2	0.0	0.1	0.01	0.01	0.01
NY:Niagara Falls	9	0.6	0.1	0.3	0.03	0.01	0.01
NY:Syracuse	1	0.1	0.1	0.1	0.01	0.01	0.01
NY:Yaphank	9	0.6	0.0	0.2	0.02	0.00	0.01

Table 3 (continued)
Gross Beta in Airborne Particulates
August 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
OH:Columbus	6	0.2	0.0	0.1	0.01	0.01	0.01
OH:Painesville	9	0.6	0.2	0.4	0.02	0.01	0.01
OH:Ross	7	0.0	0.0	0.0	0.02	0.01	0.01
OH:Toledo	9	2.7	0.0	1.1	0.02	0.00	0.01
OK:Oklahoma City	9	0.8	0.2	0.4	0.03	0.00	0.01
OR:Portland	9	0.0	0.0	0.0	0.01	0.00	0.00
PA:Harrisburg	9	0.8	0.2	0.5	0.02	0.01	0.01
PA:Pittsburgh	9	1.0	0.3	0.7	0.02	0.01	0.01
RI:Providence	9	0.1	0.0	0.0	0.02	0.00	0.01
SC:Barnwell	2	0.1	0.0	0.1	0.01	0.00	0.00
SC:Columbia	9	0.4	0.1	0.3	0.03	0.00	0.02
SD:Pierre	7	0.7	0.3	0.5	0.03	0.01	0.01
TN:Knoxville	9	1.0	0.3	0.6	0.07	0.01	0.03
TN:Nashville	9	2.4	0.3	1.1	0.06	0.02	0.03
TX:Austin	9	0.4	0.1	0.2	0.04	0.00	0.01
TX:El Paso	9	1.0	0.2	0.6	0.01	0.01	0.01
UT:Salt Lake City	9	0.4	0.1	0.2	0.01	0.01	0.01
VA:Lynchburg	9	1.3	0.4	0.8	0.02	0.01	0.01
VA:Virginia Beach	3	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	9	0.2	0.0	0.1	0.01	0.00	0.00
WA:Spokane	8	0.5	0.2	0.3	0.02	0.00	0.01
WI:Madison	9	1.4	0.2	0.4	0.02	0.01	0.01
WV:Charleston	6	0.6	0.1	0.4	0.02	0.01	0.01

Minimum Detectable Limit for field estimates - 0.1 pCi/m³.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m³.

Table 4
Gross Beta in Airborne Particulates
September 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
		(pCi/m ³)			(pCi/m ³)		
AL:Montgomery	5	0.1	0.1	0.1	0.02	0.01	0.01
AR:Little Rock	9	0.6	0.1	0.3	0.02	0.00	0.01
AZ:Phoenix	5	0.9	0.3	0.6	0.01	0.01	0.01
CA:Berkeley	7	0.1	0.0	0.1	0.01	0.00	0.01
CA:Los Angeles	8	1.2	0.1	0.5	0.03	0.01	0.02
CO:Denver	8	1.2	0.4	0.7	0.01	0.01	0.01
CT:Hartford	9	0.2	0.1	0.1	0.01	0.00	0.01
DE:Wilmington	9	0.5	0.1	0.2	0.02	0.01	0.01
FL:Jacksonville	8	0.1	0.0	0.1	0.02	0.00	0.01
FL:Miami	9	0.1	0.0	0.0	0.01	0.00	0.01
HI:Honolulu	8	0.2	0.1	0.1	0.00	0.00	0.00
IA:Iowa City	9	0.3	0.1	0.2	0.01	0.01	0.01
ID:Boise	8	0.8	0.1	0.4	0.02	0.01	0.01
ID:Idaho Falls	9	0.0	0.0	0.0	0.01	0.00	0.01
IL:Chicago	8	0.6	0.1	0.3	0.04	0.01	0.01
IN:Indianapolis	6	0.7	0.0	0.3	0.01	0.01	0.01
KS:Topeka	10	2.1	0.4	1.2	0.01	0.00	0.01
KY:Frankfort	3	0.4	0.1	0.3	0.01	0.01	0.01
LA:New Orleans	9	0.2	0.0	0.1	0.01	0.00	0.01
MA:Lawrence	7	0.1	0.0	0.1	0.01	0.00	0.01
ME:Augusta	8	0.3	0.1	0.2	0.01	0.00	0.01
MI:Lansing	9	0.6	0.1	0.3	0.01	0.00	0.01
MN:Minneapolis	7	0.4	0.1	0.2	0.02	0.00	0.01
MO:Jefferson City	8	1.2	0.2	0.4	0.01	0.00	0.01
MS:Jackson	8	0.8	0.2	0.3	0.02	0.01	0.01
NC:Charlotte	5	0.3	0.0	0.1	0.03	0.01	0.02
NC:Wilmington	2	0.0	0.0	0.0	0.01	0.01	0.01
ND:Bismarck	8	1.4	0.2	0.7	0.01	0.00	0.01
NE:Lincoln	9	4.8	0.0	1.8	0.03	0.01	0.02
NH:Concord	8	0.2	0.1	0.1	0.01	0.00	0.01
NJ:Trenton	9	1.4	0.2	0.6	0.01	0.00	0.01
NM:Santa Fe	7	0.6	0.2	0.3	0.01	0.00	0.01
NV:Las Vegas	9	0.3	0.1	0.2	0.02	0.01	0.01
NY:Albany	4	0.1	0.1	0.1	0.01	0.00	0.01
NY:Niagara Falls	8	0.5	0.1	0.3	0.01	0.00	0.01
NY:Syracuse	5	0.2	0.0	0.1	0.02	0.00	0.01
NY:Yaphank	8	0.4	0.1	0.2	0.02	0.00	0.01

Table 4 (continued)
Gross Beta in Airborne Particulates
September 1991

Location	Number of Samples	5-Hour Field Estimate			NAREL Lab Measurement		
		Max	Min	Avg	Max	Min	Avg
OH:Columbus	4	0.2	0.1	0.1	0.01	0.01	0.01
OH:Painesville	8	0.3	0.1	0.2	0.02	0.00	0.01
OH:Ross	8	0.0	0.0	0.0	0.05	0.01	0.02
OH:Toledo	6	2.3	0.5	1.2	0.01	0.01	0.01
OK:Oklahoma City	8	0.7	0.0	0.2	0.01	0.01	0.01
OR:Portland	8	0.0	0.0	0.0	0.01	0.00	0.01
PA:Harrisburg	9	1.0	0.3	0.4	0.02	0.01	0.01
PA:Pittsburgh	8	0.2	0.0	0.1	0.02	0.00	0.01
RI:Providence	8	0.0	0.0	0.0	0.01	0.00	0.01
SC:Barnwell	2	0.0	0.0	0.0	0.01	0.00	0.00
SC:Columbia	8	0.7	0.0	0.3	0.03	0.01	0.02
SD:Pierre	5	0.4	0.0	0.3	0.01	0.00	0.00
TN:Knoxville	6	1.2	0.3	0.7	0.04	0.01	0.02
TN:Nashville	8	1.1	0.3	0.6	0.04	0.01	0.02
TX:Austin	8	0.2	0.1	0.1	0.01	0.00	0.01
TX:El Paso	8	0.2	0.2	0.2	0.02	0.01	0.01
UT:Salt Lake City	9	0.6	0.1	0.3	0.02	0.01	0.01
VA:Lynchburg	8	1.9	0.5	1.0	0.02	0.01	0.01
VA:Virginia Beach	3	0.1	0.1	0.1	0.01	0.01	0.01
WA:Olympia	9	0.4	0.1	0.2	0.01	0.00	0.00
WA:Spokane	9	0.6	0.3	0.4	0.02	0.01	0.01
WI:Madison	9	0.8	0.1	0.3	0.03	0.00	0.01
WV:Charleston	3	0.3	0.2	0.3	0.01	0.01	0.01

Minimum Detectable Limit for field estimates - 0.1 pCi/m³.

Minimum Detectable Limit for laboratory measurement - 0.01 pCi/m³.

Table 5
Gross Beta and Specific Gamma in Precipitation
July 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
AL:Montgomery	100.0	0.12 0.04	⁷ Be: 46.6±23.1 ²¹⁴ Pb: 18.0±6.0
AR:Little Rock	45.0	0.07 0.02	²¹⁴ Pb: 5.3±4.2
CO:Denver	20.2	0.05 0.01	²¹⁴ Bi: 47.9±8.7 ²¹² Pb: 6.1±5.9 ²¹⁴ Pb: 37.3±7.4
CT:Hartford	90.0	0.22 0.04	²¹⁴ Bi: 113±10 ²¹⁴ Pb: 72.4±8.4
DE:Wilmington	127.4	0.76 0.07	²¹⁴ Bi: 46.6±10.9 ²¹⁴ Pb: 34.3±9.0
FL:Jacksonville	244.4	0.48 0.10	ND
FL:Miami	132.2	0.06 0.05	²¹⁴ Bi: 92.5±6.5 ²¹² Pb: 10.3±4.8 ²¹⁴ Pb: 60.8±5.6
ID:Boise	0.8	0.00 0.00	²¹⁴ Bi: 26.3±11.0
ID:Idaho Falls	4.2	0.06 0.00	⁷ Be: 144±42
IL:Chicago	11.0	0.02 0.00	²¹⁴ Pb: 28.3±9.7
LA:New Orleans	166.0	0.22 0.06	ND
ME:Augusta	44.0	0.18 0.02	ND
MI:Lansing	43.8	0.05 0.02	²¹⁴ Bi: 23.1±7.6 ²¹⁴ Pb: 12.6±6.2
MN:Minneapolis	107.0	0.14 0.04	²¹⁴ Pb: 45.8±8.3 ²¹⁴ Bi: 77.8±10.9 ²¹⁴ Pb: 31.9±8.0
MO:Jefferson City	68.0	0.06 0.02	ND
MS:Jackson	84.0	0.07 0.03	ND
NC:Charlotte	71.0	0.14 0.03	²¹² Pb: 5.7±4.9
NC:Wilmington	127.4	0.25 0.05	⁷ Be: 32.5±22.8
ND:Bismarck	30.2	0.03 0.01	ND
NH:Concord	56.6	0.19 0.03	²¹⁴ Pb: 37.5±8.8 ²¹⁴ Bi: 75.8±10.9
NJ:Trenton	92.0	0.43 0.05	²¹⁴ Pb: 48.0±8.6 ²¹⁴ Bi: 73.4±9.8
NM:Santa Fe	112.0	0.06 0.04	²¹⁴ Pb: 34.8±8.5 ²¹⁴ Bi: 76.8±9.7
NY:Albany	34.4	0.09 0.02	⁷ Be: 44.7±29.7
NY:Niagara Falls	47.0	0.22 0.02	²¹⁴ Pb: 75.1±8.9 ²¹⁴ Bi: 105±11 ⁷ Be: 71.1±42.6
NY:Syracuse	11.0	0.02 0.00	²¹⁴ Pb: 71.9±9.6 ²¹² Pb: 8.1±7.5

Table 5 (continued)

Gross Beta and Specific Gamma in Precipitation

July 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
NY:Yaphank	63.0	0.28 0.03	²¹⁴ Bi: 103±11
OH:Painesville	18.0	0.04 0.01	²¹⁴ Pb: 30.5±9.0
			²¹⁴ Bi: 20.5±7.6
			⁷ Be: 44.5±26.5
			²¹⁴ Pb: 17.9±6.3
PA:Harrisburg	50.0	0.24 0.03	²¹² Pb: 8.0±5.7
			²¹⁴ Pb: 48.6±11.1
SC:Barnwell	41.8	0.10 0.02	²¹⁴ Bi: 77.7±14.1
			²¹⁴ Bi: 228±13
			²¹² Pb: 6.5±6.0
			²¹⁴ Pb: 167±11
SC:Columbia	184.2	0.24 0.07	ND
TN:Knoxville	42.0	0.13 0.02	⁷ Be: 25.0±23.2
TN:Nashville	16.8	0.06 0.01	⁷ Be: 54.1±33.8
TX:Austin	50.0	0.03 0.02	²¹⁴ Bi: 187±14
			²¹⁴ Pb: 104±10
TX:El Paso	54.0	0.15 0.02	²¹⁴ Pb: 6.8±5.2
VA:Lynchburg	43.0	0.19 0.02	ND
WA:Olympia	7.0	0.02 0.00	ND
WI:Madison	76.0	0.05 0.03	²¹² Pb: 6.2±5.5
			²¹⁴ Bi: 31.4±6.6
			²¹⁴ Pb: 17.0±5.7
WV:Charleston	38.0	0.13 0.02	ND

Note: σ = Counting Error. ND = Not Detectable.

Table 6
Gross Beta and Specific Gamma in Precipitation
August 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
AL:Montgomery	97.0	0.27 0.05	ND
AR:Little Rock	79.0	0.15 0.03	²¹² Pb: 7.9±6.3
CO:Denver	71.4	0.18 0.03	ND
CT:Hartford	111.0	0.25 0.05	ND
DE:Wilmington	134.0	0.21 0.06	⁷ Be: 54.8±33.4
FL:Jacksonville	124.2	0.06 0.04	ND
FL:Miami	75.6	0.09 0.03	ND
ID:Idaho Falls	8.0	0.02 0.00	ND
IL:Chicago	43.2	0.05 0.02	ND
LA:New Orleans	106.6	0.39 0.05	⁷ Be: 42.3±28.1
ME:Augusta	168.0	0.29 0.07	²¹⁴ Pb: 14.4±5.9
MI:Lansing	124.6	0.28 0.05	ND
MN:Minneapolis	80.0	0.06 0.03	ND
MO:Jefferson City	8.0	0.01 0.00	ND
MS:Jackson	42.0	0.11 0.02	ND
NC:Charlotte	154.0	0.11 0.05	ND
NC:Wilmington	169.0	0.62 0.08	ND
ND:Bismarck	11.2	0.03 0.01	ND
NH:Concord	170.6	0.15 0.07	ND
NJ:Trenton	103.8	0.19 0.04	ND
NM:Santa Fe	68.0	0.05 0.02	²¹² Pb: 8.0±5.1 ²¹⁴ Bi: 34.3±7.0 ²¹⁴ Pb: 17.5±5.9
NV:Las Vegas	12.0	0.03 0.01	ND
NY:Albany	106.4	0.19 0.04	ND
NY:Niagara Falls	48.0	0.15 0.02	⁷ Be: 63.2±34.7
NY:Syracuse	23.0	0.02 0.01	ND
NY:Yaphank	70.0	0.12 0.03	²¹⁴ Bi: 13.9±5.6
OH:Painesville	75.4	0.13 0.03	ND
OH:Toledo	51.0	0.07 0.02	ND
OR:Portland	15.6	0.01 0.00	²¹⁴ Bi: 7.8±6.9
PA:Harrisburg	117.4	0.25 0.05	ND
SC:Barnwell	639.4	0.57 0.25	ND
SC:Columbia	316.6	0.40 0.11	²¹² Pb: 7.6±6.9
TN:Knoxville	94.0	0.13 0.03	²¹² Pb: 6.6±4.3
TN:Nashville	21.6	0.04 0.01	ND
TX:Austin	40.0	0.02 0.01	ND
TX:El Paso	44.0	0.06 0.02	ND
UT:Salt Lake City	15.6	0.01 0.01	²¹⁴ Bi: 19.0±5.8 ²¹² Pb: 6.8±4.4

Table 6 (continued)
Gross Beta and Specific Gamma in Precipitation
August 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
VA:Lynchburg	116.8	0.41 0.06	ND
WA:Olympia	47.2	0.06 0.02	⁷ Be: 50.7 \pm 35.0
WI:Madison	54.0	0.06 0.02	²¹² Pb: 9.2 \pm 4.4
			²¹⁴ Bi: 18.8 \pm 5.7
			²¹⁴ Pb: 12.1 \pm 5.2
WV:Charleston	63.2	0.19 0.03	²¹⁴ Bi: 13.6 \pm 5.8
			⁷ Be: 34.9 \pm 33.4
			²¹² Pb: 5.9 \pm 4.5

Note: σ = Counting Error. ND = Not Detectable.

Table 7
Gross Beta and Specific Gamma in Precipitation
September 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
AL:Montgomery	72.0	0.30 0.04	²¹² Pb: 7.3±6.0
AR:Little Rock	76.0	0.06 0.03	ND
AZ:Phoenix	8.0	0.01 0.00	²¹⁴ Bi: 19.5±5.2 ²¹⁴ Pb: 8.9±5.0 ²¹² Pb: 7.3±4.2
CT:Hartford	75.0	0.19 0.04	⁷ Be: 51.8±22.5
DE:Wilmington	120.0	0.20 0.05	ND
FL:Jacksonville	214.0	0.21 0.08	ND
FL:Miami	206.0	0.10 0.07	²¹⁴ Pb: 10.0±5.6
HI:Honolulu	34.0	0.02 0.01	ND
IL:Chicago	65.4	0.07 0.02	ND
LA:New Orleans	157.6	0.49 0.08	⁷ Be: 39.7±25.7
ME:Augusta	106.0	0.19 0.05	⁷ Be: 40.0±24.7
MI:Lansing	23.4	0.04 0.01	ND
MN:Minneapolis	101.0	0.10 0.04	ND
MO:Jefferson City	93.0	0.08 0.03	ND
NC:Charlotte	49.6	0.14 0.02	²¹² Pb: 9.1±7.1
NC:Wilmington	23.0	0.05 0.01	ND
ND:Bismarck	52.2	0.06 0.02	ND
NH:Concord	152.2	0.33 0.07	ND
NJ:Trenton	82.0	0.21 0.04	ND
NM:Santa Fe	64.0	0.06 0.02	²¹⁴ Bi: 22.5±5.3 ²¹⁴ Pb: 11.3±5.2 ²¹² Pb: 4.9±4.5
NY:Albany	60.6	0.15 0.03	⁷ Be: 34.6±31.0
NY:Niagara Falls	34.0	0.08 0.02	ND
NY:Syracuse	28.0	0.04 0.01	ND
NY:Yaphank	96.0	0.14 0.04	ND
OH:Painesville	93.0	0.12 0.03	ND
OH:Toledo	10.0	0.01 0.00	ND
OR:Portland	5.6	0.01 0.00	ND
PA:Harrisburg	34.0	0.13 0.02	⁷ Be: 69.9±31.5
RI:Providence	42.0	0.05 0.02	ND
SC:Columbia	104.8	0.15 0.04	ND
TN:Knoxville	80.0	0.18 0.03	ND
TN:Nashville	68.8	0.07 0.03	ND
TX:Austin	10.0	0.01 0.00	ND
TX:El Paso	69.0	0.03 0.03	ND
UT:Salt Lake City	47.0	0.44 0.03	ND
VA:Lynchburg	26.2	0.19 0.02	ND

Table 7 (continued)
Gross Beta and Specific Gamma in Precipitation
September 1991

Location	Depth (mm)	Act. $\pm 2\sigma$ (nCi/m ²)	Specific Gamma Activity (pCi/L)
WA:Olympia	80.0	0.27 0.04	ND
WA:Olympia	14.0	0.01 0.00	ND
WI:Madison	83.4	0.06 0.03	ND
WV:Charleston	103.0	0.20 0.04	⁷ Be: 38.1 \pm 28.2

Note: σ = Counting Error. ND = Not Detectable.

Table 8
Tritium in Precipitation
July–September 1991

Location	July 1991		August 1991		September 1991	
	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$
AL:Montgomery	0.1	0.2	0.2	0.2	0.2	0.2
AR:Little Rock	0.1	0.2	0.2	0.2	0.1	0.2
AZ:Phoenix	NS		NS		0.2	0.2
CO:Denver	0.1	0.2	0.2	0.2	NS	
CT:Hartford	0.1	0.2	0.2	0.2	0.1	0.2
DE:Wilmington	0.2	0.2	0.1	0.2	0.3	0.2
FL:Jacksonville	0.1	0.2	0.1	0.2	0.1	0.2
FL:Miami	0.2	0.2	0.2	0.2	0.1	0.2
HI:Honolulu	NS		NS		0.2	0.2
ID:Boise	0.2	0.2	NS		NS	
ID:Idaho Falls	0.2	0.2	0.2	0.2	NS	
IL:Chicago	0.2	0.2	0.2	0.2	0.3	0.2
LA:New Orleans	0.1	0.2	0.1	0.2	0.1	0.2
ME:Augusta	0.1	0.2	0.1	0.2	0.2	0.2
MI:Lansing	0.2	0.2	0.3	0.2	0.3	0.2
MN:Minneapolis	0.2	0.2	0.2	0.2	0.1	0.2
MO:Jefferson City	0.1	0.2	0.2	0.2	0.1	0.2
MS:Jackson	0.2	0.2	0.2	0.2	NS	
NC:Charlotte	0.2	0.2	0.1	0.2	0.2	0.2
NC:Wilmington	0.1	0.2	0.1	0.2	0.1	0.2
ND:Bismarck	0.2	0.2	0.2	0.2	0.2	0.2
NH:Concord	0.2	0.2	0.1	0.2	0.2	0.2
NJ:Trenton	0.1	0.2	0.2	0.2	0.1	0.2
NM:Santa Fe	0.2	0.2	0.2	0.2	0.1	0.2
NV:Las Vegas	NS		0.2	0.2	NS	
NY:Albany	0.1	0.2	0.2	0.2	0.1	0.2
NY:Niagara Falls	0.1	0.2	0.3	0.2	0.3	0.2
NY:Syracuse	0.2	0.2	0.1	0.2	0.1	0.2
NY:Yaphank	0.2	0.2	0.1	0.2	0.3	0.2
OH:Painesville	0.2	0.2	0.2	0.2	0.1	0.2
OH:Toledo	NS		0.2	0.2	0.3	0.2
OR:Portland	NS		0.1	0.2	0.1	0.2
PA:Harrisburg	0.1	0.2	0.1	0.2	0.2	0.2
RI:Providence	NS		NS		0.2	0.2
SC:Barnwell	0.2	0.2	0.9	0.2	NS	
SC:Columbia	0.3	0.2	0.2	0.2	0.1	0.2
TN:Knoxville	0.1	0.2	0.2	0.2	0.3	0.2
TN:Nashville	0.2	0.2	0.2	0.2	0.2	0.2
TX:Austin	0.1	0.2	0.1	0.2	0.1	0.2
TX:El Paso	0.2	0.2	0.2	0.2	0.1	0.2

Table 8 (continued)
Tritium in Precipitation
July–September 1991

Location	July 1991		August 1991		September 1991	
	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$	nCi/L	$\pm 2\sigma$
UT:Salt Lake City	NS		0.1	0.2	0.1	0.2
VA:Lynchburg	0.2	0.2	0.1	0.2	0.2	0.2
WA:Olympia	0.2	0.2	0.2	0.2	0.2	0.2
WI:Madison	0.2	0.2	0.2	0.2	0.2	0.2
WV:Charleston	0.2	0.2	0.1	0.2	0.4	0.2

Note: σ = Counting Error. NS = No Sample.

Plutonium and Uranium in Airborne Particulates and Precipitation

Environmental radiation levels of plutonium and uranium are determined by the analysis of semiannually composited samples (air filters) collected from the continuously operating airborne particulate samplers.

Concentration of the specific isotopes of plutonium-238, -239, and -240 and uranium-234, -235, and -238 are determined by alpha spectroscopy following chemical separation. The volume of air represented by the semiannual composite ranges from 60,000 to 250,000 cubic meters.

Plutonium and uranium results are published when they become available.

Tables 9–14 contain the plutonium and uranium results for air samples for the period January 1988–December 1990. Tables 15–16 contain the plutonium and uranium in precipitation data for 1989 and 1991. Values are based upon composites of the March, April, and May samples. Samples from these three months only are analyzed annually because, due to the spring rains, they usually contain the year's highest concentrations of plutonium and uranium.

Table 9
Plutonium and Uranium In Airborne Particulates
January-June 1988 Composites

Location	²³⁸ Pu		²³⁹⁻²⁴⁰ Pu		²³⁴ U		²³⁵ U		²³⁸ U	
	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ
AL:Montgomery	ND		0.7	0.6	21.8	3.8	0.9	0.6	21.6	3.7
AR:Little Rock	ND		ND		30.1	3.2	1.0	0.6	29.9	3.1
AZ:Phoenix	ND		0.9	1.2	68.6	9.6	3.9	2.3	55.8	8.6
CA:Berkeley	ND		0.1	0.2	10.9	1.9	0.2	0.3	8.8	1.7
CA:Los Angeles	ND		0.4	0.4	33.3	3.7	1.9	0.9	25.9	3.3
CO:Denver	0.1	0.3	0.1	0.3	37.9	4.3	1.2	0.8	33.3	4.0
CT:Hartford	1.1	0.9	0.2	0.3	24.4	5.5	1.1	1.2	23.3	5.2
DE:Wilmington	1.1	0.5	0.1	0.1	13.9	2.2	1.1	0.5	14.2	2.2
FL:Jacksonville	1.1	0.7	0.2	0.3	25.0	3.8	1.2	0.7	21.1	3.4
FL:Miami	1.6	1.1	0.1	0.4	19.1	3.2	1.4	0.7	19.2	3.2
GA:Atlanta	0.7	0.9	0.4	0.4	53.8	7.0	2.0	1.1	44.7	6.2
HI:Honolulu	ND		0.1	0.1	9.9	1.6	0.5	0.4	5.0	1.1
IA:Iowa City	ND		0.1	0.2	23.4	3.9	1.0	0.7	21.4	3.7
ID:Boise	ND		0.2	0.5	31.1	4.2	1.4	1.0	26.6	3.9
ID:Idaho Falls	ND		0.1	0.3	33.9	3.6	1.2	0.7	32.4	3.5
IL:Chicago	ND		0.6	0.6	23.7	3.7	0.7	0.5	20.3	3.3
IN:Indianapolis	0.6	0.8	0.1	0.3	49.0	6.9	1.7	0.9	44.7	6.4
KS:Topeka	ND		0.4	0.6	36.9	5.4	4.5	1.7	30.2	4.7
KY:Frankfort	0.4	0.4	0.2	0.2	19.3	2.5	0.7	0.4	19.6	2.5
LA:New Orleans	0.1	0.3	ND		18.1	2.8	1.2	0.7	13.0	2.3
MA:Lawrence	0.8	0.9	ND		29.6	6.8	0.6	0.8	26.4	6.3
ME:Augusta	2.2	1.6	0.3	0.7	47.3	11.3	1.1	1.6	35.2	9.4
MI:Lansing	0.6	0.6	0.4	0.4	21.1	3.0	0.9	0.5	23.4	3.2
MN:Minneapolis	0.2	0.9	0.5	0.6	28.8	4.6	1.5	0.9	24.3	4.2
MO:Jefferson City	0.1	0.2	0.2	0.3	15.4	2.6	0.7	0.5	14.9	2.6
MS:Jackson	2.6	1.5	0.4	0.5	23.5	3.7	1.2	0.7	23.9	3.8
NC:Charlotte	2.5	1.4	0.3	0.4	27.5	4.6	1.4	0.8	24.8	4.2
NC:Wilmington	0.3	0.7	0.2	0.5	17.3	3.5	0.6	0.7	17.3	3.4
ND:Bismarck	0.6	1.0	0.2	0.5	35.4	4.8	1.6	0.8	32.8	4.6
NE:Lincoln	0.3	0.6	0.2	0.3	31.9	3.5	0.9	0.7	29.7	3.4
NH:Concord	0.9	0.4	0.2	0.2	18.8	3.4	0.3	0.5	12.4	2.5
NJ:Trenton	1.0	0.9	0.7	0.9	16.8	3.0	0.8	0.6	15.8	2.9
NM:Santa Fe	0.2	0.3	0.1	0.2	26.9	4.4	0.9	0.6	24.3	4.0
NV:Las Vegas	ND		0.7	0.7	96.1	9.5	3.9	1.9	63.2	7.7
NY:Albany	2.0	1.4	0.4	0.4	33.9	5.6	1.5	1.2	31.4	5.3
NY:New York City	3.0	1.8	0.7	1.2	39.0	6.8	1.4	1.1	34.8	6.3
NY:Niagara Falls	1.7	1.5	0.1	0.3	43.3	5.4	3.4	1.3	43.5	5.4

Table 9 (continued)

Plutonium and Uranium In Airborne Particulates
January-June 1988 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
NY:Syracuse	1.8	1.0	0.3	0.6	35.2	5.4	3.0	1.4	29.4	4.8
NY:Yaphank	ND		1.0	0.6	12.8	2.2	0.6	0.4	14.1	2.3
OH:Columbus	1.0	0.9	0.9	0.7	36.4	5.8	1.3	0.8	33.0	5.4
OH:Painesville	ND		ND		26.8	4.6	1.7	0.9	19.1	3.5
OH:Toledo	ND		0.1	0.5	25.5	3.6	1.5	0.7	27.1	3.7
OK:Oklahoma City	0.2	0.2	0.1	0.2	20.1	3.4	0.8	0.6	20.3	3.5
OR:Portland	0.2	0.3	0.2	0.4	15.7	2.4	0.6	0.5	16.3	2.4
PA:Goldsboro	0.9	0.5	0.3	0.3	20.0	3.0	0.8	0.5	18.3	2.8
PA:Harrisburg	0.2	0.6	0.2	0.3	20.8	2.5	1.1	0.6	21.0	2.6
PA:Philadelphia	3.0	1.3	ND		26.7	4.1	0.7	0.7	27.0	4.2
PA:Pittsburgh	0.4	0.6	0.3	0.4	25.3	2.7	0.5	0.4	25.9	2.8
PA:Three Mile Island	1.0	0.9	0.5	0.4	21.5	3.2	0.8	0.6	17.7	2.8
RI:Providence	1.4	1.0	ND		30.8	6.1	ND		28.2	5.7
SC:Barnwell	3.0	2.0	1.1	0.9	26.6	4.3	0.8	0.7	22.0	3.8
SC:Columbia	1.1	1.1	2.4	1.1	55.0	7.0	1.2	0.7	51.0	6.6
SD:Pierre	1.4	1.1	0.9	0.6	26.4	4.0	2.0	1.0	22.5	3.6
TN:Knoxville	ND		0.1	0.4	18.0	3.1	1.8	0.8	19.5	3.3
TN:Nashville	2.7	1.4	ND		28.9	4.8	2.1	1.1	19.8	3.8
TX:Austin	0.1	0.4	0.3	0.5	14.9	2.9	1.1	0.7	14.8	2.9
TX:El Paso	ND		0.2	0.9	54.6	8.3	2.7	1.5	43.6	7.2
VA:Lynchburg	1.4	0.8	0.1	0.5	121	13	2.4	0.8	16.2	2.6
WA:Olympia	ND		0.1	0.3	7.2	1.5	0.2	0.3	3.7	1.1
WA:Spokane	0.1	0.3	0.1	0.5	20.1	2.6	0.2	0.3	18.9	2.4
WI:Madison	ND		ND		22.1	3.1	1.3	0.7	54.2	6.0
WV:Charleston	0.2	0.8	0.2	0.5	31.5	4.6	0.9	0.6	32.1	4.5

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 10
Plutonium and Uranium In Airborne Particulates
July-December 1988 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
AL:Montgomery	ND		0.4	0.6	19.4	3.0	0.8	0.6	13.7	2.4
AR:Little Rock	ND		0.1	0.2	22.8	2.9	0.4	0.4	21.7	2.8
AZ:Phoenix	ND		ND		47.0	7.3	1.3	1.0	41.1	6.7
CA:Berkeley	ND		ND		7.2	1.7	0.5	0.5	8.5	1.8
CA:Los Angeles	ND		0.1	0.3	35.0	5.3	1.4	0.9	23.3	4.1
CO:Denver	0.2	0.3	0.1	0.2	37.7	5.7	1.4	0.8	34.5	5.3
CT:Hartford	0.3	0.5	0.1	0.1	14.0	2.3	0.6	0.5	13.6	2.3
DE:Wilmington	ND		ND		10.5	1.4	0.2	0.1	9.9	1.3
FL:Jacksonville	ND		ND		20.7	3.4	1.2	0.8	17.0	3.0
FL:Miami	0.1	0.2	0.4	0.4	19.8	3.9	0.8	0.7	14.7	3.1
HI:Honolulu	ND		0.1	0.2	7.5	1.9	ND		4.2	1.3
IA:Iowa City	ND		0.2	0.3	26.9	3.6	0.5	0.6	22.9	3.3
ID:Boise	ND		0.3	0.4	41.0	4.9	1.7	0.8	34.7	4.4
ID:Idaho Falls	0.3	1.1	ND		65.3	11.1	3.4	2.4	61.8	10.8
IL:Chicago	ND		ND		26.0	4.2	0.3	0.7	26.5	4.2
IN:Indianapolis	ND		ND		36.7	4.6	1.8	1.0	35.3	4.5
KS:Topeka	0.4	0.7	0.1	0.3	36.0	4.1	1.4	0.8	27.8	3.5
KY:Frankfort	0.1	0.2	0.2	0.3	16.9	2.9	0.8	0.6	14.5	2.6
LA:New Orleans	0.1	0.8	0.1	0.4	14.3	2.7	0.4	0.4	12.1	2.2
MA:Lawrence	0.8	0.6	0.2	0.3	20.4	2.9	0.3	0.3	19.5	3.0
ME:Augusta	0.7	0.5	0.2	0.4	17.7	2.9	1.0	0.6	14.4	2.5
MI:Lansing	0.4	0.4	0.2	0.2	15.1	2.4	0.6	0.4	14.3	2.2
MN:Minneapolis	ND		0.8	0.6	21.1	2.6	0.8	0.5	17.8	2.4
MO:Jefferson City	ND		0.1	0.2	18.8	2.5	0.3	0.4	17.7	2.4
MS:Jackson	0.1	0.3	ND		19.6	2.9	0.4	0.5	13.8	2.3
NC:Charlotte	ND		ND		20.5	2.8	0.5	0.4	16.5	2.4
NC:Wilmington	0.2	0.4	0.2	0.2	15.0	2.3	1.0	0.6	13.7	2.2
ND:Bismarck	0.2	0.3	0.4	0.4	36.1	3.8	0.6	0.5	30.4	3.4
NE:Lincoln	0.3	0.8	0.2	0.3	28.3	3.4	1.7	0.8	23.2	3.1
NH:Concord	0.1	0.4	ND		16.0	2.4	0.5	0.3	12.0	2.0
NJ:Trenton	0.3	0.5	0.4	0.3	13.7	2.2	0.3	0.2	12.5	2.1
NM:Santa Fe	0.1	0.2	0.2	0.3	24.4	4.0	0.8	0.6	23.9	4.0
NV:Las Vegas	ND		1.3	1.8	210	31	2.1	2.4	93.9	19.0
NY:Albany	ND		0.8	0.8	24.0	4.5	2.0	1.2	24.3	4.4
NY:New York City	0.2	0.6	0.3	0.3	23.9	3.0	0.5	0.3	19.9	2.6
NY:Niagara Falls	0.1	0.3	0.1	0.3	NA		NA		NA	
NY:Syracuse	0.2	0.6	0.1	0.4	13.1	1.9	0.7	0.4	13.4	1.9

Table 10 (continued)
Plutonium and Uranium In Airborne Particulates
July–December 1988 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
NY:Yaphank	ND		0.2	0.2	10.8	1.9	0.3	0.4	7.8	1.6
OH:Columbus	0.6	0.5	0.4	0.3	33.0	4.4	1.5	0.7	27.3	3.8
OH:Painesville	0.1	0.4	0.2	0.3	17.3	2.3	0.5	0.3	17.3	2.3
OH:Toledo	0.7	0.8	0.1	0.5	27.0	4.3	1.7	0.9	22.4	3.8
OK:Oklahoma City	0.4	0.4	ND		23.5	3.4	1.5	0.9	23.0	3.4
OR:Portland	0.6	0.7	0.2	0.7	20.9	3.6	0.9	0.7	18.3	3.3
PA:Goldsboro	0.4	0.3	1.1	0.4	15.0	2.2	0.2	0.3	10.0	1.8
PA:Harrisburg	0.2	0.5	0.1	0.2	14.9	2.4	0.8	0.6	15.4	2.3
PA:Pittsburgh	ND		0.2	0.2	27.0	3.0	1.6	0.8	22.0	2.7
PA:Three Mile Island	0.3	0.7	0.2	0.3	19.5	3.6	1.6	1.0	16.6	3.3
RI:Providence	1.5	1.6	ND		27.2	4.4	0.6	0.6	19.0	3.6
SC:Barnwell	0.6	0.8	0.6	0.8	39.9	10.7	3.8	2.9	30.7	8.4
SC:Columbia	ND		ND		30.0	3.6	1.0	0.6	27.6	3.4
SD:Pierre	ND		0.9	0.7	28.0	3.0	0.6	0.5	19.3	2.5
TN:Knoxville	ND		ND		34.8	5.2	1.0	0.8	25.0	4.2
TN:Nashville	ND		0.1	0.2	23.9	3.7	1.3	0.9	23.4	3.7
TX:Austin	0.1	0.2	0.2	0.3	18.4	2.9	0.8	0.6	15.2	2.6
TX:El Paso	ND		0.3	1.0	61.3	10.8	2.1	1.7	45.3	8.8
UT:Salt Lake City	0.1	0.4	0.9	0.6	21.7	3.6	1.3	0.8	18.1	3.2
VA:Lynchburg	0.2	0.3	ND		56.7	4.7	1.8	0.8	12.8	2.2
WA:Olympia	ND		0.2	0.3	10.1	2.1	0.1	0.4	6.3	1.6
WA:Spokane	ND		0.4	0.8	25.1	5.1	1.5	1.1	30.3	5.7
WI:Madison	ND		0.2	0.3	21.8	3.5	0.5	0.5	18.3	3.0
WV:Charleston	ND		0.3	0.3	50.6	5.2	1.7	1.0	40.3	4.6
WY:Cheyenne	ND		0.4	0.5	34.5	4.6	1.2	0.8	32.7	4.4

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 11
Plutonium and Uranium In Airborne Particulates
January-June 1989 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
AL:Montgomery	ND		0.4	0.3	15.4	3.0	0.5	0.5	11.8	2.6
AR:Little Rock	ND		0.2	0.3	25.7	3.7	0.5	0.4	23.9	3.5
AZ:Phoenix	0.3	0.5	0.2	0.3	55.9	8.2	2.2	1.4	58.8	8.5
CA:Berkeley	0.2	0.3	ND		5.5	1.4	0.3	0.4	5.6	1.4
CA:Los Angeles	ND		0.2	0.2	25.8	3.8	1.0	0.7	21.5	3.4
CO:Denver	ND		ND		39.1	5.2	1.3	0.7	36.0	4.9
CT:Hartford	ND		ND		10.7	2.0	0.2	0.3	11.3	2.1
DE:Wilmington	ND		0.2	0.4	12.9	2.4	0.3	0.4	9.4	2.0
FL:Jacksonville	ND		ND		25.4	3.7	1.2	0.7	18.0	2.9
FL:Miami	ND		0.1	0.2	13.3	2.9	1.1	0.8	12.2	2.8
HI:Honolulu	ND		0.3	0.3	8.7	2.0	ND		6.0	1.6
IA:Iowa City	0.1	0.2	0.2	0.2	25.7	3.7	0.9	0.7	19.3	3.3
ID:Boise	ND		0.2	0.3	25.2	4.0	1.3	0.8	24.5	3.9
ID:Idaho Falls	ND		ND		23.5	3.5	0.9	0.7	16.9	3.0
IL:Chicago	ND		ND		33.1	4.3	1.0	0.6	27.1	3.8
IN:Indianapolis	ND		0.1	0.2	38.3	4.6	1.5	0.8	34.4	4.3
KS:Topeka	ND		0.1	0.2	27.7	3.7	1.3	0.6	29.6	3.8
KY:Frankfort	ND		0.1	0.2	19.1	3.2	1.4	0.8	16.8	2.9
LA:New Orleans	ND		ND		14.9	2.8	0.3	0.4	11.7	2.4
MA:Lawrence	ND		0.3	0.3	24.3	3.6	1.0	0.6	18.3	2.9
ME:Augusta	ND		ND		34.6	5.3	1.5	1.3	25.1	4.8
MI:Lansing	ND		ND		16.4	3.2	0.8	0.6	14.2	2.9
MN:Minneapolis	0.1	0.2	0.2	0.2	18.0	2.9	0.7	0.5	15.8	2.7
MO:Jefferson City	ND		0.1	0.2	20.3	3.1	0.5	0.4	18.8	2.9
MS:Jackson	ND		0.2	0.4	18.7	3.1	0.4	0.4	15.9	2.8
NC:Charlotte	ND		0.1	0.2	15.4	2.8	0.8	0.5	14.1	2.6
NC:Wilmington	ND		0.2	0.4	13.2	2.4	0.3	0.3	11.1	2.2
ND:Bismarck	0.1	0.2	0.4	0.4	29.4	3.9	1.1	0.7	24.5	3.5
NE:Lincoln	0.1	0.2	0.2	0.2	24.8	3.7	1.2	0.7	24.9	3.7
NH:Concord	ND		ND		15.5	2.5	0.6	0.5	12.3	2.3
NJ:Trenton	ND		0.2	0.2	NA		NA		NA	
NM:Santa Fe	ND		ND		31.1	5.6	0.2	0.9	27.9	5.2
NV:Las Vegas	0.5	1.1	0.5	0.8	106	14	3.4	2.2	59.6	9.6
NY:Albany	ND		ND		27.2	4.3	1.3	0.8	25.4	4.1
NY:New York City	ND		0.2	0.3	22.5	3.3	0.9	0.6	20.7	3.2
NY:Niagara Falls	ND		0.2	0.3	35.4	4.5	1.8	0.8	34.4	4.4
NY:Syracuse	0.1	0.2	0.3	0.5	20.1	3.4	1.1	0.7	18.0	3.2

Table 11 (continued)
Plutonium and Uranium In Airborne Particulates
January-June 1989 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
NY:Yaphank	ND		ND		14.8	2.6	0.5	0.5	10.1	2.0
OH:Columbus	0.4	0.4	0.3	0.3	NA		NA		NA	
OH:Painesville	0.3	0.6	ND		25.4	3.4	1.0	0.5	29.1	3.7
OH:Toledo	0.3	0.6	0.1	0.3	27.7	4.0	1.2	0.7	28.0	4.0
OK:Oklahoma City	ND		ND		31.7	5.5	0.5	0.6	21.4	4.3
OR:Portland	0.1	0.2	ND		17.7	3.2	1.6	0.8	16.9	3.1
PA:Goldsboro	0.2	0.5	0.2	0.3	5.0	1.3	0.1	0.1	5.1	1.3
PA:Harrisburg	ND		ND		16.6	3.1	0.1	0.2	5.9	1.6
PA:Pittsburgh	ND		ND		14.7	2.4	0.5	0.4	9.5	1.8
PA:Three Mile Island	0.1	0.2	ND		6.2	1.5	0.2	0.2	4.6	1.3
RI:Providence	ND		ND		19.5	3.7	0.8	0.7	18.2	3.6
SC:Barnwell	ND		0.2	0.7	14.4	3.0	0.1	0.4	10.3	2.8
SC:Columbia	ND		0.2	0.2	32.9	4.0	1.0	0.5	26.8	3.5
SD:Pierre	ND		ND		27.6	5.2	1.6	1.2	17.9	4.0
TN:Knoxville	ND		0.1	0.2	24.7	3.5	0.2	0.3	23.1	3.4
TN:Nashville	ND		0.4	0.3	24.1	3.8	0.4	0.4	25.8	4.0
TX:Austin	0.1	0.2	0.2	0.3	14.0	2.7	0.7	0.5	10.0	2.2
TX:El Paso	ND		0.4	0.6	83.5	12.7	1.3	1.9	74.0	11.7
UT:Salt Lake City	0.5	0.9	0.5	0.9	26.8	3.5	1.1	0.6	22.8	3.1
VA:Lynchburg	0.1	0.1	ND		107	11	2.7	1.1	13.0	2.5
WA:Olympia	0.1	0.3	0.1	0.4	9.9	2.3	1.3	0.8	6.8	1.9
WA:Spokane	ND		0.2	0.3	18.7	2.9	0.8	0.5	16.4	2.7
WI:Madison	ND		ND		15.9	2.6	0.8	0.5	14.6	2.4
WV:Charleston	0.2	0.7	0.4	0.4	21.1	3.2	0.4	0.4	21.0	3.1

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 12
Plutonium and Uranium In Airborne Particulates
July-December 1989 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
AL:Montgomery	ND		0.2	0.4	16.6	2.9	0.3	0.4	15.5	2.8
AR:Little Rock	0.1	0.2	0.2	0.3	27.4	4.6	1.6	1.0	23.6	4.1
AZ:Phoenix	ND		0.3	0.5	78.8	11.4	1.5	1.3	61.8	9.6
CA:Berkeley	0.1	0.1	0.1	0.1	12.5	2.4	0.3	0.3	12.5	2.3
CA:Los Angeles	ND		ND		32.4	4.4	1.1	0.6	28.1	4.0
CO:Denver	ND		0.7	0.6	47.4	6.3	1.1	0.7	36.5	5.3
CT:Hartford	ND		0.1	0.3	11.7	2.3	0.7	0.5	9.0	1.9
DE:Wilmington	ND		0.2	0.3	10.8	2.2	0.6	0.5	9.3	2.0
FL:Jacksonville	ND		0.1	0.4	18.0	3.6	0.6	0.6	13.6	3.1
FL:Miami	0.1	0.2	0.1	0.4	16.5	2.8	0.5	0.5	13.4	2.5
HI:Honolulu	0.1	0.2	ND		16.4	3.1	1.4	0.8	7.3	2.0
IA:Iowa City	0.1	0.1	0.4	0.3	29.1	4.7	1.0	0.9	22.0	3.9
ID:Boise	0.1	0.2	0.3	0.6	38.3	5.2	0.7	0.5	25.4	4.0
ID:Idaho Falls	ND		0.7	0.5	29.0	4.8	2.6	1.2	26.7	4.5
IL:Chicago	0.1	0.2	ND		30.5	4.3	0.6	0.5	29.5	4.2
IN:Indianapolis	ND		0.2	0.2	38.4	5.1	1.5	0.8	33.3	4.6
KS:Topeka	ND		0.1	0.2	35.6	5.5	0.9	0.8	36.9	5.6
KY:Frankfort	ND		0.3	0.4	18.8	3.8	0.9	0.7	12.9	3.1
LA:New Orleans	ND		0.1	0.2	15.4	2.8	0.4	0.5	14.7	2.7
ME:Augusta	ND		ND		4.2	1.0	0.2	0.2	1.0	0.5
MI:Lansing	ND		0.1	0.1	12.3	2.3	0.5	0.4	13.5	2.4
MN:Minneapolis	ND		0.2	0.3	26.9	4.3	1.3	0.8	23.1	3.8
MO:Jefferson City	ND		ND		19.6	3.7	0.4	0.6	18.7	3.6
MS:Jackson	ND		0.2	0.2	16.7	2.7	0.4	0.4	16.5	2.7
NC:Charlotte	ND		0.1	0.3	19.4	3.0	0.8	0.6	16.7	2.7
NC:Wilmington	ND		ND		12.9	2.4	0.7	0.5	10.8	2.1
ND:Bismarck	0.1	0.4	0.3	0.4	28.8	5.0	0.3	0.7	29.1	4.9
NE:Lincoln	0.3	0.5	0.2	0.2	19.7	3.6	0.8	0.8	21.3	3.8
NH:Concord	ND		0.1	0.1	5.0	1.0	ND		2.0	0.6
NJ:Trenton	ND		0.1	0.3	11.3	2.2	0.4	0.6	6.3	2.0
NM:Santa Fe	ND		ND		29.7	5.9	1.1	1.0	20.2	4.7
NV:Las Vegas	1.3	1.0	0.4	0.6	116	17	4.2	2.4	77.7	12.6
NY:Albany	0.3	1.6	0.6	0.9	27.0	6.4	1.0	1.1	28.0	6.5
NY:New York City	0.3	0.4	ND		24.4	4.0	1.0	0.7	21.4	3.7
NY:Niagara Falls	0.1	0.3	0.1	0.3	45.9	6.3	2.4	1.2	31.8	5.0
NY:Syracuse	0.1	0.5	ND		20.9	4.3	0.5	0.8	18.3	3.9
NY:Yaphank	ND		ND		10.9	2.4	1.1	0.7	8.8	2.1

Table 12 (continued)
Plutonium and Uranium In Airborne Particulates
July-December 1989 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
OH:Columbus	0.2	0.3	ND		54.9	9.2	5.5	2.4	29.7	6.2
OH:Painesville	0.2	0.4	0.2	0.2	18.7	3.9	0.4	0.8	13.1	3.1
OH:Toledo	ND		0.3	0.3	30.6	4.7	0.6	0.7	26.1	4.2
OK:Oklahoma City	ND		ND		25.9	4.3	0.2	0.3	21.9	3.8
OR:Portland	ND		0.2	0.4	94.3	12.4	2.0	1.2	18.8	4.0
PA:Goldsboro	ND		ND		29.3	7.4	1.6	1.6	26.4	7.0
PA:Harrisburg	2.0	2.6	ND		32.5	7.5	ND		22.6	7.7
PA:Philadelphia	0.2	0.5	ND		16.2	3.2	0.4	0.4	11.8	2.7
PA:Pittsburgh	ND		0.4	0.7	49.4	8.4	1.4	1.3	45.1	8.0
PA:Three Mile Island	ND		ND		27.1	6.2	2.1	1.8	17.9	5.0
RI:Providence	NA		4.3	1.0	0.1	0.1	2.3	0.8	ND	
SC:Barnwell	ND		1.2	1.7	76.0	14.2	4.3	3.0	51.5	11.3
SC:Columbia	ND		0.2	0.2	32.7	5.1	0.7	0.6	26.6	4.5
SD:Pierre	NA		NA		64.5	19.5	2.6	6.3	20.6	10.5
TN:Knoxville	ND		ND		27.2	4.1	0.4	0.6	24.8	4.1
TN:Nashville	0.5	0.5	0.3	0.3	27.3	3.9	0.6	0.5	23.6	3.6
TX:Austin	ND		ND		16.1	2.9	0.4	0.4	10.3	2.2
TX:El Paso	0.5	0.8	0.3	0.5	78.9	12.9	4.1	2.4	69.1	11.8
UT:Salt Lake City	ND		0.2	0.3	40.2	6.1	1.0	0.8	37.8	5.6
VA:Lynchburg	ND		0.1	0.1	156	14	3.6	1.0	9.9	1.8
WA:Olympia	ND		0.1	0.6	9.0	2.5	ND		6.6	2.1
WA:Spokane	0.2	0.4	0.2	0.3	21.0	3.9	0.5	0.7	18.9	3.6
WI:Madison	0.1	0.1	0.1	0.2	13.0	2.1	0.2	0.2	9.6	1.8
WV:Charleston	ND		ND		28.0	4.0	0.7	0.5	22.2	3.5
WY:Cheyenne	ND		ND		12.3	2.6	0.4	0.4	11.3	2.4

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 13
Plutonium and Uranium In Airborne Particulates
January-June 1990 Composites

Location	²³⁸ Pu		²³⁹⁻²⁴⁰ Pu		²³⁴ U		²³⁵ U		²³⁸ U	
	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ	aCi/m ³	±2σ
AL:Montgomery	0.3	0.3	0.5	0.5	14.4	3.0	0.7	0.6	15.0	3.1
AR:Little Rock	ND		0.1	0.2	25.3	4.0	1.1	0.8	25.7	3.9
AZ:Phoenix	0.2	0.4	ND		57.5	9.6	1.7	1.4	41.8	7.9
CA:Berkeley	0.1	0.4	0.1	0.1	10.7	2.3	0.3	0.3	6.5	1.7
CA:Los Angeles	0.1	0.2	0.2	0.3	24.9	4.3	0.7	0.6	20.0	3.8
CO:Denver	ND		0.1	0.2	21.3	3.8	0.2	0.4	18.5	3.5
CT:Hartford	ND		0.1	0.3	15.9	3.1	0.4	0.5	13.1	2.7
DE:Wilmington	0.1	0.2	2.3	0.9	11.5	2.3	0.5	0.6	9.4	2.0
FL:Jacksonville	0.1	0.2	0.1	0.2	19.1	3.8	0.3	0.7	14.3	3.2
FL:Miami	ND		0.2	0.2	14.9	3.0	0.2	0.3	13.2	2.7
HI:Honolulu	0.1	0.2	0.1	0.2	5.6	1.5	0.2	0.2	5.1	1.4
IA:Iowa City	ND		1.0	0.8	20.0	4.6	2.6	1.4	16.5	4.0
ID:Boise	ND		0.1	0.2	35.1	5.9	3.3	1.5	20.9	4.2
ID:Idaho Falls	0.2	0.3	0.6	0.5	22.7	3.9	1.3	0.8	20.3	3.5
IL:Chicago	0.2	0.3	ND		30.9	6.0	0.4	0.6	28.5	5.7
IN:Indianapolis	ND		ND		33.4	5.9	1.5	1.1	39.4	6.3
KS:Topeka	0.2	0.3	ND		23.7	5.1	0.2	0.4	21.7	4.8
KY:Frankfort	0.4	0.7	0.3	0.5	18.6	3.8	0.3	0.4	15.6	3.4
LA:New Orleans	ND		0.4	0.4	11.4	2.6	0.5	0.5	11.4	2.4
MA:Lawrence	ND		0.1	0.1	22.2	3.8	0.1	0.5	16.6	3.2
ME:Augusta	0.4	0.7	0.2	0.4	35.1	6.4	1.2	1.3	28.4	5.6
MI:Lansing	ND		ND		17.0	3.5	0.9	0.7	14.4	3.1
MN:Minneapolis	ND		0.5	0.6	29.4	6.3	1.8	1.4	20.5	5.0
MO:Jefferson	ND		0.3	0.3	12.1	2.5	0.7	0.5	14.4	2.7
MS:Jackson	ND		ND		18.2	4.0	1.0	0.9	12.6	3.2
NC:Charlotte	ND		0.4	0.6	32.1	6.3	1.4	1.2	22.2	5.0
NC:Wilmington	0.2	0.8	0.2	0.4	21.5	5.3	1.3	1.6	19.6	4.9
ND:Bismarck	0.1	0.4	ND		30.3	5.0	0.5	0.5	28.5	4.7
NE:Lincoln	0.8	0.6	0.8	0.5	20.0	3.2	2.6	1.0	13.6	2.5
NH:Concord	0.1	0.2	0.1	0.4	20.0	3.4	1.2	0.7	14.2	2.7
NJ:Trenton	ND		0.3	0.3	13.1	2.7	0.5	0.6	8.7	2.1
NV:Las Vegas	ND		ND		148	21	1.8	1.8	92.4	15.6
NY:Albany	ND		ND		25.5	6.3	1.4	1.7	31.8	6.9
NY:New York City	0.3	0.5	0.2	0.3	49.5	10.3	2.5	1.6	27.0	5.7
NY:Niagara Falls	ND		0.5	0.6	44.2	7.8	2.7	1.7	35.5	6.7
NY:Syracuse	ND		ND		24.8	6.0	1.2	1.2	19.2	5.1
NY:Yaphank	0.7	0.9	0.8	0.9	17.3	4.2	ND		10.8	3.1

Table 13 (continued)
Plutonium and Uranium In Airborne Particulates
January–June 1990 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
OH:Columbus	0.5	0.7	ND		41.0	7.1	3.2	1.7	32.6	6.2
OH:Painesville	0.4	0.6	ND		24.6	5.2	1.3	1.1	16.7	4.1
OH:Toledo	0.3	0.5	0.1	0.3	29.4	4.8	1.3	0.8	28.7	4.7
OK:Oklahoma City	0.1	0.2	0.2	0.4	20.6	3.6	1.0	0.8	14.5	2.8
OR:Portland	ND		0.1	0.2	18.1	3.2	0.5	0.5	13.6	2.6
PA:Goldsboro	ND		0.8	0.7	24.1	4.7	1.9	1.3	22.5	4.3
PA:Harrisburg	ND		0.1	0.1	11.9	3.4	0.8	0.5	7.3	1.8
PA:Pittsburgh	0.1	0.4	0.5	0.5	34.2	6.2	0.4	1.1	27.3	5.3
PA:Three Mile Island	0.5	0.7	ND		19.4	4.3	0.4	0.8	13.2	3.4
RI:Providence	ND		0.2	0.3	15.2	2.8	0.8	0.5	14.9	2.7
SC:Barnwell	ND		0.4	0.5	24.7	5.6	ND		29.1	6.0
SC:Columbia	ND		0.2	0.3	37.1	5.4	0.3	0.4	30.6	4.7
SD:Pierre	ND		0.5	0.6	28.4	5.4	0.4	0.5	19.5	4.5
TN:Knoxville	ND		0.4	0.5	26.0	5.5	1.4	1.1	24.0	5.1
TN:Nashville	ND		0.3	0.3	25.8	4.4	1.5	1.0	21.7	4.0
TX:Austin	ND		ND		9.3	2.2	0.3	0.4	6.1	1.8
TX:El Paso	0.7	1.3	0.3	0.7	108	16	0.4	0.8	93.5	14.5
UT:Salt Lake City	0.5	0.7	0.5	0.5	28.3	4.9	0.8	0.7	20.6	4.0
VA:Lynchburg	ND		0.1	0.1	253	24	6.8	1.6	11.4	2.2
WA:Olympia	ND		0.5	0.5	8.8	2.2	0.5	0.5	5.1	1.6
WA:Spokane	ND		0.3	0.5	22.3	5.3	1.6	1.2	18.1	4.5
WI:Madison	ND		ND		16.7	3.2	ND		10.1	2.8
WV:Charleston	0.2	0.3	0.2	0.3	32.2	6.4	1.4	1.2	25.0	5.4
WY:Cheyenne	ND		0.3	0.6	24.7	6.5	3.0	2.0	23.7	6.0

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 14
Plutonium and Uranium In Airborne Particulates
July–December 1990 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
AL:Montgomery	ND		0.1	0.3	21.6	3.4	0.4	0.4	17.0	2.9
AR:Little Rock	ND		2.2	1.7	40.8	6.2	2.1	1.3	33.4	5.4
AZ:Phoenix	0.6	0.6	1.0	0.8	73.2	9.7	4.1	2.1	62.5	8.6
CA:Berkeley	ND		0.3	0.4	9.5	2.3	0.6	0.5	10.7	2.4
CA:Los Angeles	0.1	0.3	0.5	0.5	33.8	5.7	1.3	1.0	29.2	5.3
CO:Denver	0.3	0.5	0.3	0.6	45.7	7.7	2.0	1.4	36.8	6.7
CT:Hartford	0.2	0.3	0.5	0.7	21.9	4.6	2.0	1.2	16.2	3.7
DE:Wilmington	ND		0.2	0.4	11.2	2.3	1.3	0.7	8.4	1.9
FL:Jacksonville	0.1	0.2	0.1	0.2	14.1	2.8	0.3	0.4	12.6	2.6
FL:Miami	0.1	0.2	0.3	0.3	26.5	4.7	1.7	1.0	23.1	4.3
HI:Honolulu	0.1	0.1	0.1	0.1	6.3	1.6	0.3	0.3	3.8	1.2
IA:Iowa City	ND		0.2	0.4	37.0	8.3	1.8	1.6	30.9	7.1
ID:Boise	ND		0.7	0.7	54.6	8.5	3.9	2.1	44.3	7.4
ID:Idaho Falls	ND		ND		39.2	6.7	2.1	1.4	28.8	5.7
IL:Chicago	ND		0.3	0.4	34.5	5.4	1.7	1.1	34.8	5.5
IN:Indianapolis	ND		0.1	0.3	46.8	7.0	1.6	1.1	42.8	6.4
KS:Topeka	ND		0.3	0.7	37.1	7.9	2.7	1.9	34.7	7.6
KY:Frankfort	ND		0.8	0.6	12.3	2.9	0.8	0.7	12.3	2.8
LA:New Orleans	ND		ND		23.4	4.5	2.0	1.2	21.9	4.2
ME:Augusta	0.1	0.3	ND		12.0	2.3	0.8	0.5	9.4	2.0
MI:Lansing	ND		0.1	0.2	22.7	4.1	0.8	0.7	19.5	3.6
MN:Minneapolis	ND		ND		36.4	7.9	1.4	1.4	26.1	6.5
MO:Jefferson City	0.4	0.5	ND		24.3	4.8	1.3	1.0	22.1	4.4
MS:Jackson	ND		ND		28.4	5.0	1.8	1.2	28.6	5.1
NC:Charlotte	ND		ND		22.8	3.3	2.0	0.8	21.5	3.2
NC:Wilmington	0.2	0.5	0.3	0.3	20.8	3.8	1.4	0.8	17.7	3.4
ND:Bismarck	0.2	0.3	ND		48.3	7.8	1.4	1.2	34.2	6.3
NE:Lincoln	0.1	0.1	ND		20.6	3.2	1.1	0.6	20.6	3.2
NH:Concord	0.2	0.3	0.3	0.4	13.1	2.6	0.4	0.5	10.0	2.2
NJ:Trenton	ND		ND		13.9	3.1	1.5	0.9	7.8	2.2
NM:Santa Fe	ND		0.1	0.2	12.6	2.8	1.3	0.8	9.2	2.3
NV:Las Vegas	0.5	0.9	ND		227	31	8.2	4.8	116	20
NY:Albany	0.2	0.4	1.3	1.1	21.9	5.2	1.5	1.4	23.4	5.3
NY:New York City	ND		0.1	0.2	21.8	3.7	0.8	0.6	20.6	3.5
NY:Niagara Falls	ND		0.1	0.2	41.4	5.2	2.0	0.8	43.9	5.4
NY:Syracuse	ND		0.1	0.2	16.3	3.4	0.4	0.5	14.4	3.2
NY:Yaphank	ND		0.1	0.1	16.0	2.8	0.5	0.4	13.7	2.6

Table 14 (continued)

Plutonium and Uranium In Airborne Particulates

July-December 1990 Composites

Location	^{238}Pu		$^{239-240}\text{Pu}$		^{234}U		^{235}U		^{238}U	
	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$	aCi/m ³	$\pm 2\sigma$
OH:Columbus	ND		ND		28.4	4.5	1.8	1.0	23.4	3.9
OH:Painesville	ND		0.2	0.3	20.7	3.4	0.6	0.5	17.6	3.0
OH:Ross	ND		0.9	0.9	57.0	10.4	2.4	2.0	46.2	9.0
OH:Toledo	ND		0.1	0.5	30.0	5.7	2.7	1.5	29.3	5.5
OK:Oklahoma City	0.1	0.2	0.1	0.2	30.4	4.8	1.6	0.9	27.0	4.5
OR:Portland	ND		ND		18.5	4.1	ND		15.8	3.7
PA:Harrisburg	0.1	0.4	ND		11.7	2.2	0.3	0.3	9.2	1.9
PA:Pittsburgh	ND		0.1	0.2	22.8	3.7	1.1	0.7	23.4	3.7
RI:Providence	0.2	0.3	0.1	0.2	16.3	3.4	1.0	0.7	11.3	2.6
SC:Barnwell	0.5	1.0	0.8	0.9	36.6	8.3	2.0	2.1	30.3	7.3
SC:Columbia	0.2	0.4	0.5	0.5	38.5	5.2	1.4	0.8	35.7	4.9
SD:Pierre	ND		0.2	0.4	30.8	5.8	2.8	1.7	25.8	5.2
TN:Knoxville	0.2	0.4	0.2	0.4	31.4	5.9	1.9	1.3	21.4	4.7
TN:Nashville	0.2	0.2	ND		29.8	5.1	3.3	1.4	22.0	4.2
TX:Austin	0.2	0.3	1.0	1.0	34.4	6.9	1.5	1.3	38.5	7.0
TX:El Paso	0.3	1.0	0.6	0.8	47.9	10.1	0.4	0.8	29.7	7.8
UT:Salt Lake City	ND		0.8	0.9	50.9	9.4	6.6	2.9	41.1	8.0
VA:Lynchburg	ND		0.2	0.2	125	12	4.2	0.9	12.8	1.9
VA:Virginia Beach	ND		ND		36.0	5.9	0.8	0.8	31.3	5.4
WA:Olympia	ND		0.1	0.2	7.6	1.8	0.5	0.4	4.8	1.5
WA:Spokane	0.2	0.4	0.7	0.7	41.3	7.7	3.1	1.9	43.5	7.8
WI:Madison	ND		0.1	0.2	25.6	4.1	0.7	0.6	22.2	3.7
WV:Charleston	0.1	0.3	0.2	0.4	28.7	4.7	2.4	1.1	24.9	4.3

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 15
Plutonium and Uranium Analyses
Selected Precipitation Composite Samples
January–June 1989

Location	²³⁸ Pu		^{239–240} Pu		²³⁴ U		²³⁵ U		²³⁸ U	
	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
CT:Hartford	0.014	0.014	0.015	0.011	0.030	0.014	0.004	0.006	0.013	0.009
MA:Lawrence	0.009	0.028	0.006	0.019	0.050	0.024	0.004	0.006	0.015	0.013
ME:Augusta	0.002	0.008	ND		0.057	0.022	0.009	0.013	0.014	0.013
NH:Concord	0.010	0.009	0.000	0.008	0.060	0.019	0.001	0.006	0.028	0.013
NJ:Trenton	0.004	0.011	0.002	0.013	0.046	0.022	0.002	0.004	0.022	0.015
NY:Albany	ND		0.008	0.014	0.042	0.024	0.007	0.008	0.005	0.009
NY:New York City	0.023	0.013	0.096	0.026	0.024	0.016	0.003	0.005	0.003	0.007
NY:Yaphank	0.036	0.017	ND		0.011	0.008	0.007	0.006	0.012	0.009
PA:Harrisburg	0.004	0.011	0.002	0.004	0.024	0.013	0.000	0.005	0.007	0.007
PA:Middletown	0.013	0.015	0.015	0.016	0.012	0.009	0.003	0.004	0.018	0.010
RI:Providence	0.005	0.017	ND		0.029	0.017	0.031	0.018	0.031	0.018

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Table 16
Plutonium and Uranium Analyses
Selected Precipitation Composite Samples

January-June 1991

Location	²³⁸ Pu		²³⁹⁻²⁴⁰ Pu		²³⁴ U		²³⁵ U		²³⁸ U	
	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AL:Montgomery	ND		ND		0.062	0.021	0.006	0.006	0.029	0.014
AR:Little Rock	ND		ND		0.085	0.029	0.009	0.008	0.026	0.014
AZ:Phoenix	ND		ND		0.130	0.050	0.030	0.022	0.080	0.038
CA:Berkeley	ND		0.006	0.007	0.169	0.044	0.005	0.007	0.043	0.021
CO:Denver	ND		ND		0.065	0.022	0.008	0.007	0.023	0.011
CT:Hartford	ND		0.003	0.006	0.030	0.026	0.002	0.006	0.018	0.011
DE:Wilmington	0.001	0.002	0.001	0.002	0.076	0.023	0.003	0.004	0.023	0.011
FL:Jacksonville	0.002	0.003	ND		0.066	0.021	ND		0.003	0.004
FL:Miami	ND		0.001	0.002	0.071	0.026	0.003	0.004	0.025	0.012
HI:Honolulu	ND		ND		0.080	0.041	ND		0.053	0.030
ID:Boise	ND		ND		0.071	0.029	0.002	0.004	0.041	0.019
ID:Idaho Falls	0.001	0.006	ND		0.071	0.023	0.007	0.007	0.029	0.016
IL:Chicago	ND		ND		0.072	0.021	0.013	0.008	0.023	0.012
LA:New Orleans	ND		0.001	0.002	0.032	0.015	0.003	0.004	0.021	0.013
ME:Augusta	ND		0.002	0.004	0.106	0.038	0.006	0.009	0.057	0.029
MI:Lansing	ND		0.002	0.005	0.021	0.014	0.011	0.010	0.009	0.011
MN:Minneapolis	0.001	0.004	ND		0.081	0.023	0.001	0.003	0.021	0.012
MO:Jefferson City	0.001	0.003	ND		0.085	0.031	ND		0.008	0.017
MS:Jackson	ND		0.001	0.002	0.088	0.024	0.006	0.006	0.025	0.012
NC:Charlotte	ND		0.002	0.003	0.036	0.016	0.007	0.008	0.015	0.009
NC:Wilmington	ND		ND		0.071	0.023	0.004	0.005	0.023	0.014
ND:Bismarck	0.001	0.002	0.001	0.002	0.042	0.020	0.007	0.007	0.020	0.011
NH:Concord	0.002	0.003	0.003	0.004	0.086	0.025	ND		0.030	0.014
NJ:Trenton	0.003	0.003	ND		0.079	0.025	0.003	0.005	0.012	0.009
NM:Santa Fe	0.002	0.005	0.002	0.005	0.156	0.049	0.006	0.009	0.028	0.022
NV:Las Vegas	ND		ND		0.113	0.028	0.005	0.011	0.044	0.023
NY:Albany	ND		ND		0.068	0.021	0.002	0.003	0.027	0.013
NY:New York City	ND		ND		0.086	0.026	0.002	0.004	0.047	0.019
NY:Niagara Falls	ND		0.002	0.003	0.055	0.020	0.015	0.011	0.017	0.011
NY:Syracuse	ND		ND		0.096	0.036	ND		0.038	0.021
NY:Yaphank	0.003	0.004	ND		0.077	0.026	0.002	0.004	0.018	0.012
OH:Painesville	0.002	0.005	0.001	0.002	0.044	0.023	0.003	0.009	0.003	0.009
OH:Toledo	ND		ND		0.090	0.029	0.004	0.008	0.016	0.011
OR:Portland	ND		ND		0.055	0.021	0.008	0.008	0.030	0.017
PA:Harrisburg	0.001	0.002	ND		0.063	0.020	0.001	0.003	0.024	0.012
RI:Providence	ND		ND		0.112	0.029	ND		0.029	0.013
SC:Barnwell	ND		ND		0.074	0.025	0.022	0.013	0.018	0.011

Table 16 (continued)
Plutonium and Uranium Analyses
Selected Precipitation Composite Samples
January–June 1991

Location	²³⁸ Pu		^{239–240} Pu		²³⁴ U		²³⁵ U		²³⁸ U	
	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
SC:Columbia	ND		0.001	0.003	0.065	0.021	0.001	0.005	0.028	0.013
TN:Knoxville	0.001	0.007	ND		0.068	0.026	0.004	0.005	0.020	0.013
TN:Nashville	0.002	0.003	0.001	0.002	0.074	0.021	0.010	0.008	0.015	0.009
TX:Austin	0.001	0.002	ND		0.083	0.027	ND		0.031	0.016
TX:El Paso	ND		ND		0.183	0.053	0.007	0.009	0.105	0.039
UT:Salt Lake City	0.001	0.002	0.003	0.004	0.048	0.022	0.007	0.006	0.043	0.016
VA:Lynchburg	0.001	0.004	ND		0.095	0.025	0.011	0.008	0.026	0.012
WA:Olympia	ND		0.003	0.004	0.099	0.030	0.002	0.003	0.029	0.014
WI:Madison	0.002	0.003	ND		0.069	0.024	0.002	0.004	0.028	0.015
WV:Charleston	ND		ND		0.053	0.019	0.004	0.005	0.018	0.010

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

Krypton-85

Krypton-85 is a long-lived noble gas with a half-life of 10.8 years. It is released into the atmosphere by nuclear reactor operations, fuel reprocessing, weapons tests, and research and defense related activities. Krypton-85 also occurs naturally in minor quantities primarily from the neutron capture of stable krypton-84 as well as spontaneous fission and neutron-induced fission of uranium. Krypton-85 in the atmosphere has been monitored to identify and establish baseline levels and long-term trends.

Krypton-85 analysis began in January 1973 with sample collections and analyses being performed for 12 sampling locations. These locations were selected to provide atmospheric coverage of the United States with considerations being given to the proximity to fuel reprocessing plants, nuclear reactors, and wide geographic coverage.

Dry compressed air samples, collected at each location, are purchased from commercial air suppliers and shipped to the NAREL, where the krypton-85 is cryogenically separated and counted in a liquid scintillation system.

The last Kr-85 results were for 1976, 1977, and 1979. They were published in *Environmental Radiation Data: Report 30*.

2. Water Program

The ERAMS water program provides data on ambient radiation levels in the nation's rivers, streams, and drinking water supplies.

Surface Water

Quarterly grab samples are taken downstream from operating or future nuclear facilities at 58 stations. Surface water samples are analyzed for tritium quarterly and specific gamma activity annually. Tritium is a primary radioactive pollutant from nuclear power plants and weapons production activities. Tritium concentrations are determined by liquid scintillation counting of distilled samples. Gamma scans are performed annually to determine levels of gamma emitting radionuclides.

Table 17 contains the tritium concentration data for July–September 1991.

Table 17
Tritium in Surface Water
July–September 1991

Location	Source	Date Collected	nCi/L	$\pm 2\sigma$
AL:Decatur	Tennessee River	07/03/91	0.2	0.2
AL:Gordon	Chattahoochee River	07/11/91	0.1	0.2
AL:Scottsboro	Tennessee River	07/03/91	0.2	0.2
AR:Little Rock	Arkansas River	07/03/91	0.1	0.2
CA:Clay Station	Folsom S. Canal	07/17/91	0.2	0.2
CA:Eureka	Humboldt Bay	07/11/91	0.1	0.2
CA:San Onofre	Pacific Ocean	09/27/91	0.2	0.2
CO:Platteville	South Platte River	07/11/91	0.2	0.2
CT:East Haddam	Connecticut River	07/16/91	1.8	0.2
CT:Waterford	Long Island Sound	07/03/91	0.1	0.2
FL:Crystal River	Gulf of Mexico	07/08/91	0.2	0.2
FL:Fort Pierce	Atlantic Ocean	07/02/91	0.2	0.2
FL:Homestead	Biscayne Bay	07/17/91	0.5	0.2
GA:Baxley	Altamaha River	07/17/91	0.2	0.2
IA:Cedar Rapids	Cedar River	07/09/91	0.2	0.2
ID:Buhl	Snake River	08/20/91	0.2	0.2
IL:E. Moline	Mississippi River	07/03/91	0.2	0.2
IL:Zion	Lake Michigan	07/01/91	0.2	0.2
KS:Leroy	Neosho River	07/08/91	0.2	0.2
LA:New Orleans	Mississippi River	07/31/91	0.2	0.2
MA:Plymouth	Cape Cod Bay	07/02/91	0.2	0.2
MD:Conowingo	Susquehanna River	07/02/91	0.2	0.2
MD:Lusby	Chesapeake Bay	07/02/91	0.1	0.2
ME:Wiscasset	Montseway Bay	07/04/91	0.5	0.2
MI:Bridgman	Lake Michigan	07/08/91	0.2	0.2
MI:Monroe	Lake Erie	07/03/91	0.3	0.2
MI:South Haven	Lake Michigan	07/08/91	0.2	0.2
MN:Monticello	Mississippi River	07/01/91	0.2	0.2
MN:Red Wing	Mississippi River	07/09/91	0.1	0.2
MS:Port Gibson	Mississippi River	07/03/91	0.2	0.2
NC:Charlotte	Catawba River	07/02/91	0.5	0.2
NC:Southport	Atlantic Ocean	07/18/91	0.2	0.2
NE:Rulo	Missouri River	07/18/91	0.2	0.2
NJ:Bayside	Delaware River	07/16/91	0.3	0.2
NJ:Oyster Creek	Oyster Creek	07/31/91	0.1	0.2
NV:Boulder City	Colorado River	07/31/91	0.1	0.2
NY:Chelsea	Hudson River	07/02/91	0.2	0.2

Table 17 (continued)
Tritium in Surface Water
July–September 1991

Location	Source	Date Collected	nCi/L $\pm 2\sigma$	
			nCi/L	$\pm 2\sigma$
NY:Ossining	Hudson River	07/17/91	0.1	0.2
OH:Toledo	Lake Erie	07/02/91	0.1	0.2
OR:Bradwood	Columbia River	07/22/91	0.3	0.2
PA:Danville	Susquehanna River	07/10/91	0.2	0.2
PA:Philadelphia	Schuylkill-Belmont	07/09/91	0.2	0.2
PA:Philadelphia	Schuylkill-Queen	07/09/91	0.3	0.2
PA:Philadelphia	Delaware-Baxter	07/09/91	0.2	0.2
SC:Allendale	Savannah River	07/31/91	2.1	0.2
SC:Broad River	Broad River	07/18/91	0.4	0.2
SC:Hartsville	Lake Robinson	07/22/91	1.0	0.2
TN:Daisy	Tennessee River	07/23/91	0.2	0.2
TN:Kingston	Clinch River	07/08/91	0.2	0.2
TX:El Paso	Rio Grande	07/02/91	0.1	0.2
TX:Matagorda	Colorado River	07/16/91	0.2	0.2
VA:Doswell	North Anna River	07/03/91	3.3	0.2
VA:Newport News	James River	07/15/91	0.2	0.2
VT:Vernon	Connecticut River	07/09/91	0.2	0.2
WA:Northport	Columbia River	07/17/91	0.3	0.2
WA:Richland	Columbia River	07/10/91	0.3	0.2
WI:Two Creeks	Lake Michigan	07/03/91	0.2	0.2
WI:Victory	Mississippi River	07/01/91	0.1	0.2
WV:Wheeling	Ohio River	07/29/91	0.2	0.2

Note: σ = Counting Error.

Drinking Water

This program monitors ambient radiation levels in drinking water at 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) specific iodine-131 on one quarterly sample per year for each station; and (e) an annual composite for plutonium-238, -239, and -240 and uranium-234, -235, and -238 for stations that demonstrate gross alpha levels greater than 2 pCi/L.

Tritium analyses are performed by scintillation counting of the distilled samples. Gross beta and alpha are determined by evaporating an aliquot on a stainless steel planchet for counting. Radium-226 is determined by the standard emanation technique. Strontium-90 is determined by beta counting a strontium carbonate precipitate isolated by ion exchange.

Table 18 contains the data from drinking water samples for July–September 1991. Tables 19–20 contain the data on gross alpha, gross beta, strontium-90, and radium-226 in drinking water for 1989 and 1990.

Table 18
Tritium in Drinking Water
July-September 1991

Location	Date Collected	nCi/L	$\pm 2\sigma$
AK:Fairbanks	07/12/91	0.2	0.2
AL:Dothan	07/11/91	0.3	0.2
AL:Montgomery	07/02/91	0.2	0.2
AL:Muscle Shoals	07/02/91	0.2	0.2
AL:Scottsboro	07/03/91	0.2	0.2
AR:Little Rock	07/03/91	0.2	0.2
CA:Berkeley	07/09/91	0.3	0.2
CA:Los Angeles	07/02/91	0.2	0.2
CO:Denver	07/10/91	0.2	0.2
CO:Platteville	07/11/91	0.2	0.2
CT:Hartford	07/01/91	0.1	0.2
FL:Miami	07/03/91	0.2	0.2
FL:Tampa	07/05/91	0.1	0.2
GA:Baxley	07/17/91	0.2	0.2
HI:Honolulu	07/12/91	0.1	0.2
IA:Cedar Rapids	07/09/91	0.1	0.2
ID:Boise	07/02/91	0.1	0.2
ID:Idaho Falls	07/05/91	0.3	0.2
IL:Chicago	07/01/91	0.1	0.2
IL:Morris	07/29/91	0.2	0.2
KS:Topeka	07/01/91	0.1	0.2
LA:New Orleans	07/08/91	0.1	0.2
MA:Lawrence	07/05/91	0.1	0.2
MD:Baltimore	07/01/91	0.2	0.2
ME:Augusta	07/03/91	0.1	0.2
MI:Detroit	07/01/91	0.2	0.2
MI:Grand Rapids	07/03/91	0.2	0.2
MN:Minneapolis	07/03/91	0.2	0.2
MN:Red Wing	07/09/91	0.1	0.2
MS:Jackson	07/03/91	0.1	0.2
MS:Port Gibson	07/02/91	0.1	0.2
MT:Helena	07/09/91	0.2	0.2
NC:Charlotte	07/02/91	0.3	0.2
NC:Wilmington	07/18/91	0.2	0.2
ND:Bismarck	07/01/91	0.2	0.2
NH:Concord	07/02/91	0.1	0.2
NJ:Trenton	07/15/91	0.1	0.2
NJ:Waretown	07/31/91	0.2	0.2
NM:Santa Fe	07/22/91	0.1	0.2
NV:Las Vegas	07/03/91	0.1	0.2
NY:Albany	07/23/91	0.1	0.2

Table 18 (continued)
Tritium in Drinking Water
July-September 1991

Location	Date Collected	nCi/L	$\pm 2\sigma$
NY:New York City	07/03/91	0.2	0.2
NY:Niagara Falls	07/02/91	0.3	0.2
NY:Syracuse	09/26/91	0.2	0.2
OH:Cincinnati	08/19/91	0.1	0.2
OH:Columbus	07/15/91	0.1	0.2
OH:East Liverpool	07/25/91	0.2	0.2
OH:Painesville	07/01/91	0.2	0.2
OH:Toledo	07/02/91	0.2	0.2
OK:Oklahoma City	07/09/91	0.1	0.2
OR:Portland	07/02/91	0.1	0.2
PA:Columbia	07/08/91	0.2	0.2
PA:Harrisburg	07/08/91	0.2	0.2
PA:Phila.-Baxter	07/09/91	0.2	0.2
PA:Phila.-Belmont	07/09/91	0.2	0.2
PA:Phila.-Queen	07/09/91	0.2	0.2
PA:Pittsburgh	07/25/91	0.1	0.2
PC:Corozal	07/01/91	0.1	0.2
RI:Providence	07/09/91	0.1	0.2
SC:Barnwell	07/11/91	0.2	0.2
SC:Columbia	07/09/91	0.3	0.2
SC:Hartsville	07/02/91	0.1	0.2
SC:Jenkinsville	07/12/91	0.3	0.2
SC:Seneca	07/09/91	0.2	0.2
TN:Chattanooga	07/22/91	0.2	0.2
TN:Knoxville	07/01/91	0.2	0.2
TX:Austin	07/03/91	0.2	0.2
VA:Doswell	07/08/91	0.2	0.2
VA:Virginia Beach	07/01/91	0.1	0.2
WA:Richland	07/10/91	0.2	0.2
WA:Seattle	07/08/91	0.2	0.2
WI:Genoa City	07/02/91	0.2	0.2
WI:Madison	07/08/91	0.1	0.2

Note: σ = Counting Error.

Table 19
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January-December 1989 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		⁹⁰ Sr		²²⁶ Ra		Specific Gamma Activity
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
AK:Fairbanks	100.0	3.5	0.9	0.4	0.8	0.0	0.4	NA		ND
AL:Dothan	200.0	2.0	1.2	0.1	1.4	ND		NA		ND
AL:Montgomery	70.0	1.9	0.9	0.3	1.4	0.0	0.4	NA		¹⁴⁴ Ce: 65.3±58.8
AL:Muscle Shoals	100.0	2.1	0.7	0.2	0.6	0.20	0.04	NA		ND
AL:Scottsboro	100.0	1.4	0.9	0.6	0.8	0.0	0.2	NA		ND
AR:Little Rock	30.0	0.9	0.7	0.3	0.7	ND		NA		ND
CA:Berkeley	40.0	0.3	0.7	0.2	0.8	0.057	0.002	NA		²¹⁴ Bi: 51.5±41.9
CA:Los Angeles	400.0	5.2	2.3	0.6	2.2	ND		NA		²¹⁴ Bi: 42.0±41.6
CO:Denver	100.0	1.8	0.9	2.6	1.8	0.0	0.3	0.10	0.01	ND
CO:Platteville	900.0	13.3	3.8	13.4	6.7	ND		0.27	0.02	ND
CT:Hartford	40.0	0.8	0.7	0.2	0.7	0.2	0.4	NA		ND
DC:Washington	100.0	2.5	1.0	ND		0.3	0.3	NA		ND
DE:Dover	200.0	3.3	1.0	ND		ND		NA		ND
FL:Miami	200.0	2.0	0.9	0.6	0.9	0.15	0.02	NA		ND
FL:Tampa	200.0	2.8	1.1	0.7	1.3	0.1	0.1	NA		²¹⁴ Bi: 44.0±41.6
GA:Baxley	200.0	3.3	1.3	3.2	1.3	0.0	0.3	1.8	0.1	ND
GA:Savannah	100.0	1.8	0.8	0.6	0.9	0.1	0.3	NA		ND
HI:Honolulu	200.0	2.0	0.9	ND		0.1	1.2	NA		ND
IA:Cedar Rapids	100.0	3.4	0.9	0.7	0.7	0.1	0.4	NA		ND
ID:Boise	90.0	1.1	0.8	1.0	0.6	0.05	0.05	NA		ND
ID:Idaho Falls	300.0	3.5	1.4	1.9	1.8	0.0	0.2	NA		ND
†IL:Chicago	300.0	20.1	2.3	18.4	3.7	ND		3.8	0.1	ND
IL:Morris	500.0	21.1	2.4	20.6	4.0	ND		7.1	0.1	ND
KS:Topeka	400.0	8.6	1.7	0.7	1.6	0.0	0.2	NA		ND
LA:New Orleans	100.0	2.5	0.9	0.6	0.7	ND		NA		ND
MA:Lawrence	90.0	3.3	0.9	0.4	0.6	0.0	0.3	NA		ND
MD:Baltimore	90.0	1.1	0.8	0.1	0.5	0.2	0.3	NA		ND
MD:Conowingo	200.0	1.7	0.8	0.4	0.8	0.0	0.1	NA		ND
ME:Augusta	30.0	1.4	0.8	ND		0.0	0.5	NA		ND
MI:Detroit	80.0	2.3	0.9	0.6	0.6	0.7	0.6	NA		ND
MI:Grand Rapids	100.0	2.8	0.9	0.4	0.8	0.4	0.3	NA		ND
MN:Minneapolis	80.0	1.7	0.9	0.2	1.0	0.36	0.04	NA		²¹⁴ Bi: 48.2±42.0
†MN:Red Wing	400.0	9.2	1.5	11.8	2.9	0.02	0.04	2.5	0.1	ND
MO:Jefferson City	300.0	5.3	1.1	0.5	1.0	0.0	0.2	NA		ND
MS:Jackson	70.0	2.4	0.9	0.8	1.4	0.5	0.2	NA		ND

Table 19 (continued)
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January–December 1989 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		⁹⁰ Sr		²²⁶ Ra		Specific Gamma Activity
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
MS:Port Gibson	400.0	4.9	1.7	2.0	2.6	ND		NA		ND
MT:Helena	200.0	3.6	1.2	1.7	1.6	0.0	0.2	0.8	0.1	ND
NC:Charlotte	60.0	2.2	0.8	0.1	0.7	0.1	0.1	NA		ND
NC:Wilmington	90.0	3.1	1.0	0.6	0.7	0.14	0.04	NA		ND
ND:Bismarck	300.0	4.1	1.2	ND		0.1	0.1	NA		ND
NE:Lincoln	300.0	11.1	1.9	5.4	2.5	0.0	0.4	0.17	0.01	ND
NH:Concord	80.0	1.5	0.8	ND		0.1	0.8	NA		⁶⁰ Co: 11.9±8.3
NJ:Trenton	90.0	1.5	0.9	ND		ND		NA		ND
NJ:Waretown	50.0	2.0	0.9	1.2	0.8	0.1	0.1	NA		ND
NM:Santa Fe	90.0	6.8	1.1	8.1	1.5	ND		0.15	0.01	ND
NV:Las Vegas	500.0	6.2	2.3	4.6	3.2	0.0	0.4	0.14	0.01	ND
NY:Albany	80.0	1.8	0.9	0.4	0.7	0.0	0.1	NA		ND
NY:New York City	40.0	1.2	0.8	0.4	0.6	ND		NA		ND
NY:Niagara Falls	100.0	1.7	0.9	1.2	1.6	0.5	0.8	NA		ND
NY:Syracuse	100.0	1.8	0.9	0.4	0.9	0.3	0.1	NA		ND
OH:Cincinnati	200.0	0.1	0.3	0.1	0.8	0.0	0.1	NA		ND
OH:Columbus	200.0	4.4	1.2	0.4	1.1	0.5	0.2	NA		ND
OH:East Liverpool	200.0	4.4	1.3	2.3	1.2	0.2	0.9	0.07	0.01	ND
OH:Painesville	100.0	2.6	0.9	0.6	0.8	0.4	0.3	NA		ND
OH:Toledo	100.0	1.7	0.8	0.8	0.8	0.2	0.3	NA		ND
OK:Oklahoma City	60.0	3.0	0.8	ND		0.1	0.1	NA		ND
OR:Portland	20.0	0.9	0.6	ND		0.17	0.03	NA		ND
PA:Columbia	100.0	2.8	0.7	ND		0.0	0.3	NA		ND
PA:Harrisburg	40.0	1.1	0.9	0.7	0.6	0.3	0.1	NA		ND
PA:Philadelphia	200.0	3.6	1.0	0.2	0.5	0.1	0.2	NA		ND
PA:Pittsburgh	200.0	2.1	0.7	0.9	0.9	0.1	0.2	NA		ND
PC:Ancon	70.0	0.9	0.6	0.1	0.5	0.0	0.2	NA		ND
RI:Providence	60.0	1.5	0.7	0.0	0.5	0.4	0.6	NA		ND
SC:Barnwell	30.0	0.9	0.9	0.5	0.4	0.1	0.1	NA		ND
SC:Columbia	80.0	2.3	0.9	0.2	0.5	0.1	0.2	NA		ND
SC:Hartsville	30.0	1.3	0.7	0.7	0.5	0.2	0.3	NA		ND
SC:Jenkinsville	200.0	6.3	1.1	2.7	1.2	ND		0.85	0.03	ND
SC:Seneca	30.0	1.3	0.8	0.1	0.5	ND		NA		ND
TN:Chattanooga	90.0	2.0	0.8	0.1	0.5	ND		NA		ND
TN:Knoxville	200.0	2.3	0.9	0.4	0.8	ND		NA		ND

Table 19 (continued)
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January–December 1989 Composites

Location	Total Solids (mg/L)	Gross Beta pCi/L $\pm 2\sigma$		Gross Alpha pCi/L $\pm 2\sigma$		⁹⁰ Sr pCi/L $\pm 2\sigma$		²²⁶ Ra pCi/L $\pm 2\sigma$		Specific Gamma Activity
TX:Austin	300.0	3.6	1.0	ND		ND		NA		ND
VA:Doswell	200.0	5.2	0.9	1.2	1.0	ND		NA		ND
VA:Lynchburg	50.0	0.8	0.7	0.3	0.5	0.0	0.2	NA		ND
VA:Virginia Beach	90.0	2.6	0.8	0.1	0.6	0.4	0.2	NA		ND
VI:St. Thomas	50.0	1.0	0.7	ND		0.0	0.2	NA		ND
WA:Richland	60.0	1.6	0.7	0.1	0.4	ND		NA		ND
WA:Seattle	30.0	0.3	0.6	ND		ND		NA		ND
WI:Genoa City	100.0	2.4	0.7	1.8	0.9	ND		0.49	0.02	ND
WI:Madison	200.0	3.1	0.9	4.1	1.3	ND		0.51	0.02	ND

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

† 2.5 ± 0.6 pCi/L ²²⁸Ra.

‡ 2.7 ± 0.6 pCi/L ²²⁸Ra.

Table 20
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January-December 1990 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		⁹⁰ Sr		²²⁶ Ra		Specific Gamma Activity
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
AK:Fairbanks	100.0	3.1	0.8	0.4	0.6	0.1	0.1	NA		ND
AL:Dothan	200.0	1.4	0.9	0.8	1.0	0.0	0.3	NA		ND
AL:Montgomery	60.0	1.5	0.7	0.8	0.7	0.4	0.1	NA		ND
AL:Muscle Shoals	80.0	2.1	0.7	ND		0.2	0.3	NA		ND
AL:Scottsboro	100.0	0.6	0.7	ND		0.2	0.2	NA		ND
AR:Little Rock	30.0	1.3	0.6	ND		0.2	0.3	NA		ND
CA:Berkeley	30.0	0.6	0.6	0.0	0.3	0.2	0.1	NA		ND
CA:Los Angeles	400.0	9.2	2.1	9.0	2.9	ND		NA		ND
CO:Denver	100.0	2.9	0.8	0.7	0.6	0.2	0.3	NA		ND
CO:Platteville	800.0	9.5	2.8	7.1	4.5	ND		NA		ND
CT:Hartford	40.0	1.8	0.7	ND		ND		NA		ND
DC:Washington	100.0	3.4	0.9	ND		0.0	1.1	NA		ND
DE:Dover	200.0	2.8	0.9	0.4	0.8	0.0	0.6	NA		ND
FL:Miami	200.0	0.5	0.8	1.6	1.6	ND		0.32	0.02	²¹⁴ Bi: 20.8±6.3 ²¹² Pb: 8.8±5.5
FL:Tampa	200.0	2.3	0.9	0.4	1.3	0.2	0.6	NA		ND
GA:Baxley	200.0	2.5	0.7	1.8	1.1	ND		1.8	0.1	ND
GA:Savannah	100.0	2.0	0.9	0.1	0.7	ND		NA		ND
HI:Honolulu	200.0	1.9	0.8	0.5	0.7	ND		NA		ND
IA:Cedar Rapids	100.0	2.7	0.8	ND		ND		NA		ND
ID:Boise	100.0	0.6	0.8	0.2	0.5	ND		NA		ND
ID:Idaho Falls	200.0	3.6	1.3	1.6	1.0	ND		0.05	0.01	ND
IL:Morris	300.0	19.8	2.2	14.2	2.8	ND		6.0	0.1	²¹² Pb: 6.3±5.5
IL:W. Chicago	200.0	19.5	2.1	16.7	2.9	ND		7.7	0.1	²¹⁴ Pb: 9.4±5.6
KS:Topeka	300.0	7.6	1.6	0.2	1.1	0.1	0.8	NA		ND
LA:New Orleans	100.0	2.7	0.9	0.3	0.5	0.0	0.7	NA		ND
MA:Lawrence	90.0	1.0	0.8	ND		0.2	0.6	NA		ND
MD:Baltimore	80.0	1.9	0.9	ND		0.3	0.5	NA		ND
MD:Conowingo	200.0	2.2	0.8	0.3	0.4	ND		NA		ND
ME:Augusta	50.0	3.0	0.9	0.6	0.6	ND		NA		ND
MI:Detroit	80.0	2.1	0.9	0.7	0.7	0.3	0.3	NA		ND
MI:Grand Rapids	100.0	2.2	0.9	0.6	0.9	0.0	3.7	NA		ND
MN:Minneapolis	90.0	3.4	1.0	0.4	0.9	0.1	0.3	NA		ND
†MN:Red Wing	200.0	10.0	1.5	7.0	2.1	ND		3.4	0.1	ND
MO:Jefferson City	300.0	5.9	1.2	1.0	1.2	0.3	0.2	NA		ND

Table 20 (continued)
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January-December 1990 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		⁹⁰ Sr		²²⁶ Ra		Specific Gamma Activity
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
MS:Jackson	60.0	2.9	0.9	0.2	0.5	0.3	0.3	NA		²⁰⁸ Tl: 3.2±2.7
MS:Port Gibson	300.0	5.4	1.6	0.8	0.9	0.0	0.1	NA		²⁰⁸ Tl: 5.6±4.6
MT:Helena	100.0	3.3	1.2	1.0	1.0	0.1	0.8	NA		²¹⁴ Pb: 14.1±6.3 ²¹⁴ Bi: 22.1±6.4
NC:Charlotte	40.0	2.0	0.9	ND		0.0	0.2	NA		ND
NC:Wilmington	90.0	2.6	0.9	ND		ND		NA		²⁰⁸ Tl: 4.7±4.5
ND:Bismarck	300.0	3.7	1.2	0.2	1.5	ND		NA		ND
NE:Lincoln	300.0	11.3	1.8	7.2	2.5	0.0	0.6	0.23	0.01	ND
NH:Concord	80.0	1.1	0.8	0.1	0.5	0.09	0.04	NA		ND
NJ:Trenton	90.0	1.6	0.9	ND		0.3	1.0	NA		ND
NJ:Waretown	50.0	2.0	0.8	1.5	0.7	ND		NA		²¹⁴ Pb: 11.1±6.6
NM:Santa Fe	200.0	14.2	1.4	10.6	1.9	0.0	0.3	0.14	0.01	²¹⁴ Bi: 91.0±7.4 ²¹² Pb: 18.0±5.8 ²¹⁴ Pb: 84.6±6.6
NV:Las Vegas	500.0	7.1	2.3	4.1	2.6	0.2	0.2	0.16	0.01	ND
NY:Albany	80.0	1.0	0.8	0.1	0.5	ND		NA		ND
NY:New York City	40.0	0.7	0.8	ND		0.2	0.1	NA		²¹² Pb: 6.4±5.8
NY:Niagara Falls	100.0	1.9	0.8	ND		0.5	0.3	NA		ND
NY:Syracuse	90.0	2.4	0.9	0.1	0.6	0.1	0.2	NA		ND
OH:Cincinnati	200.0	2.9	0.9	0.2	0.5	0.13	0.04	NA		ND
OH:Columbus	300.0	3.8	1.1	ND		ND		NA		ND
OH:East Liverpool	100.0	2.5	1.2	ND		0.1	0.1	NA		²⁰⁸ Tl: 6.4±3.5
OH:Painesville	100.0	2.9	0.9	ND		0.6	0.5	NA		ND
OH:Toledo	90.0	1.8	0.7	0.3	0.5	0.2	0.1	NA		ND
OK:Oklahoma City	70.0	2.1	0.7	0.1	0.4	ND		NA		ND
OR:Portland	20.0	0.4	0.6	ND		ND		NA		ND
PA:Columbia	200.0	2.3	0.7	ND		0.2	0.2	NA		ND
PA:Harrisburg	40.0	1.0	0.8	0.3	0.5	0.0	0.7	NA		ND
PA:Phila.-Baxter	100.0	2.1	0.9	0.1	0.6	ND		NA		ND
PA:Phila.-Belmont	200.0	2.7	0.9	ND		ND		NA		²¹⁴ Bi: 15.2±7.6
PA:Phila.-Queen	200.0	3.6	0.9	0.4	0.8	0.2	0.1	NA		²¹⁴ Bi: 20.5±6.9 ²¹⁴ Pb: 12.8±6.5
PA:Pittsburgh	100.0	1.9	0.7	0.2	0.5	0.2	0.3	NA		²¹⁴ Bi: 18.4±7.1 ²¹⁴ Pb: 10.1±6.5
PC:Ancon	70.0	0.9	0.6	ND		ND		NA		ND

Table 20 (continued)
Drinking Water
Alpha, Beta, Gamma, Sr-90, and Ra-226 Concentrations
January-December 1990 Composites

Location	Total Solids (mg/L)	Gross Beta		Gross Alpha		⁹⁰ Sr		²²⁶ Ra		Specific Gamma Activity
		pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	
RI:Providence	60.0	1.5	0.7	ND		ND		NA		ND
SC:Barnwell	30.0	1.5	0.8	0.7	0.5	ND		NA		ND
SC:Columbia	70.0	2.0	0.7	0.5	0.5	ND		NA		ND
SC:Hartsville	30.0	0.4	0.6	0.2	0.4	ND		NA		ND
SC:Jenkinsville	100.0	3.4	0.9	2.5	1.0	ND		0.60	0.02	²⁰⁸ Tl: 4.2±3.5 ²¹² Pb: 8.8±6.6 ²¹⁴ Bi: 19.0±6.7 ²¹⁴ Pb: 9.8±6.3
SC:Seneca	30.0	0.6	0.7	0.1	0.5	ND		NA		ND
TN:Chattanooga	100.0	1.6	0.8	0.6	0.5	0.2	0.5	NA		ND
TN:Knoxville	100.0	1.5	0.7	0.1	0.4	ND		NA		ND
TX:Austin	400.0	4.5	1.4	0.7	1.2	0.1	0.1	NA		ND
VA:Doswell	200.0	5.7	1.1	ND		0.1	0.1	NA		ND
VA:Lynchburg	60.0	1.3	0.7	ND		ND		NA		ND
VA:Virginia Beach	100.0	2.8	0.8	ND		0.3	1.0	NA		ND
VI:St. Thomas	50.0	0.5	0.7	0.1	0.6	ND		NA		ND
WA:Richland	60.0	1.2	0.8	0.3	0.4	ND		NA		ND
WA:Seattle	30.0	0.9	0.6	0.2	0.3	0.0	0.3	NA		ND
WI:Genoa City	100.0	2.2	0.7	1.1	0.8	ND		NA		ND
WI:Madison	200.0	2.6	1.0	2.2	1.2	ND		NA		ND

Note: σ = Counting Error. NA = No Analysis. ND = Not Detectable.

† 0.3 ± 0.4 pCi/L ²²⁸Ra.

3. External Gamma Ambient Monitoring Program

The External Gamma Monitoring Program (EGAMP), which began in October 1978, provides a continuous measurement of ambient gamma exposure rates, including cosmic, at selected sites throughout the continental United States. Data from this program are used to evaluate fluctuations in natural background due to variations in environmental conditions and to provide a means of monitoring any significant increases in ambient gamma levels. The program consists of approximately 22 sites representing wide geographic coverage throughout the country.† Although exposure measurements at these few sites are not totally representative of nationwide exposures, they do indicate national trends.

The EGAMP program utilizes $\text{CaF}_2:\text{Mn}$ thermoluminescent dosimeters (TLD's). These dosimeters are commercially available glass-bulb type dosimeters with energy compensating shields. A group of three TLD's is located at each station or site. Dosimeters are annealed by the station operator prior to positioning in the field. The dosimeters are returned to NAREL for readout approximately every three months. Several dosimeters are annealed by the station operator as controls and returned with the exposed field dosimeters to correct for any exposures accumulated during shipment.

Publication of EGAMP data has been suspended until problems with the data are resolved.

† Since some of these sites may not return dosimeters each period, the number of sites listed may vary slightly.

4. Milk Program

Pasteurized Milk

This is a cooperative program with the Dairy and Lipid Products Branch, Milk Sanitation Section, Food and Drug Administration. 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 important 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.

Monthly samples are collected at 65 sampling sites with one or more located in each state, Puerto Rico, and the Panama Canal Zone. 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. All samples collected in July are analyzed for strontium-90. Also, for the first month of the three quarters beginning January, April, and October, 10 regional composite samples of milk made up from the states within each of EPA's 10 regions are analyzed for strontium-90.

Iodine-131, barium-140, cesium-137, and potassium 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.

Tables 21-23 contain the concentrations of radionuclides in pasteurized milk for July-September 1991. Table 24 contains the concentrations of strontium-90 in pasteurized milk for July 1991.

Table 21
Radionuclides in Pasteurized Milk
July 1991

Location	Date Collected	K		¹³⁷ Cs		¹⁴⁰ Ba		¹³¹ I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AL:Montgomery	07/05/91	1.50	0.08	ND		ND		ND	
AR:Little Rock	07/10/91	1.56	0.22	ND		ND		ND	
AZ:Phoenix	07/11/91	1.57	0.11	ND		ND		ND	
CA:Los Angeles	07/16/91	1.57	0.13	ND		ND		ND	
CA:Sacramento	07/31/91	1.68	0.11	ND		ND		ND	
CA:San Francisco	07/08/91	1.63	0.09	ND		ND		ND	
DE:Dover	07/25/91	1.65	0.08	ND		ND		ND	
FL:Tampa	07/01/91	1.61	0.08	3	2	ND		ND	
GA:Atlanta	07/15/91	1.58	0.12	ND		ND		ND	
HI:Honolulu	07/18/91	1.66	0.12	ND		ND		ND	
IA:Des Moines	07/08/91	1.64	0.13	ND		ND		ND	
ID:Idaho Falls	07/14/91	1.67	0.14	ND		ND		ND	
IL:Chicago	07/10/91	1.49	0.08	ND		ND		ND	
IN:Indianapolis	07/09/91	1.64	0.12	ND		ND		ND	
KS:Wichita	07/22/91	1.70	0.11	ND		ND		ND	
KY:Louisville	07/01/91	1.80	0.08	ND		ND		ND	
LA:New Orleans	07/31/91	1.69	0.10	ND		ND		ND	
MA:Boston	07/09/91	1.49	0.18	ND		ND		ND	
MD:Baltimore	07/12/91	1.66	0.12	ND		ND		ND	
ME:Portland	07/02/91	1.79	0.08	ND		ND		ND	
MI:Detroit	07/11/91	1.63	0.13	ND		ND		ND	
MI:Grand Rapids	07/10/91	1.85	0.14	ND		ND		ND	
MN:St. Paul	07/03/91	1.58	0.14	ND		ND		ND	
MO:St. Louis	07/03/91	1.53	0.10	ND		ND		ND	
MS:Jackson	07/08/91	1.60	0.08	ND		ND		ND	
MT:Helena	07/26/91	1.44	0.10	ND		ND		ND	
NC:Charlotte	07/25/91	1.68	0.05	ND		ND		ND	
ND:Minot	07/31/91	1.91	0.08	ND		ND		ND	
NE:Omaha	07/29/91	1.54	0.08	ND		ND		ND	
NJ:Trenton	07/03/91	1.63	0.09	ND		ND		ND	
NM:Albuquerque	07/10/91	1.43	0.10	ND		ND		ND	
NV:Las Vegas	07/17/91	1.76	0.14	ND		ND		ND	
NY:Buffalo	07/22/91	1.64	0.13	ND		ND		ND	
NY:New York City	07/01/91	1.63	0.14	ND		ND		ND	
NY:Syracuse	07/08/91	1.67	0.19	ND		ND		ND	
OH:Cleveland	07/16/91	1.67	0.08	ND		ND		ND	
OR:Portland	07/02/91	1.58	0.12	ND		ND		ND	

Table 21 (continued)
Radionuclides in Pasteurized Milk
July 1991

Location	Date Collected	K g/L ±2σ	¹³⁷ Cs pCi/L ±2σ	¹⁴⁰ Ba pCi/L ±2σ	¹³¹ I pCi/L ±2σ
PA:Philadelphia	07/08/91	1.66 0.13	ND	ND	ND
PA:Pittsburgh	07/08/91	1.63 0.09	ND	ND	ND
PC:Cristobal	07/09/91	1.69 0.13	8 3	ND	ND
PR:San Juan	07/18/91	1.78 0.17	ND	ND	ND
SC:Charleston	07/16/91	1.56 0.12	ND	ND	ND
SD:Rapid City	07/08/91	1.69 0.08	ND	ND	ND
TN:Chattanooga	07/30/91	1.62 0.06	ND	ND	ND
TN:Knoxville	07/22/91	1.61 0.14	ND	ND	ND
TN:Memphis	07/17/91	1.76 0.12	ND	ND	ND
TX:Austin	07/03/91	1.56 0.09	ND	ND	ND
TX:Dallas	07/10/91	1.69 0.08	ND	ND	ND
VT:Burlington	07/22/91	1.62 0.08	ND	ND	ND
WA:Seattle	07/05/91	1.78 0.12	ND	ND	ND
WA:Spokane	07/08/91	1.63 0.16	ND	ND	ND
WV:Charleston	07/09/91	1.58 0.08	ND	ND	ND
WY:Riverton	07/29/91	1.61 0.07	ND	ND	ND

Note: σ = Counting Error. ND = Not Detectable.

Table 22
Radionuclides in Pasteurized Milk
August 1991

Location	Date Collected	K		¹³⁷ Cs		¹⁴⁰ Ba		¹³¹ I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AL:Montgomery	08/09/91	1.57	0.06	ND		ND		ND	
AR:Little Rock	08/05/91	1.61	0.08	ND		ND		ND	
AZ:Phoenix	08/08/91	1.51	0.16	ND		ND		ND	
CA:Los Angeles	08/06/91	1.61	0.06	ND		ND		ND	
CA:San Francisco	08/08/91	1.66	0.14	ND		ND		ND	
CO:Denver	08/06/91	1.59	0.06	ND		ND		ND	
CT:Hartford	08/12/91	1.63	0.06	ND		ND		ND	
DE:Dover	08/21/91	1.64	0.12	ND		ND		ND	
FL:Tampa	08/12/91	1.61	0.08	ND		ND		ND	
IA:Des Moines	08/06/91	1.54	0.08	ND		ND		ND	
ID:Idaho Falls	08/26/91	1.53	0.10	ND		ND		ND	
IL:Chicago	08/01/91	1.68	0.08	ND		ND		ND	
IN:Indianapolis	08/08/91	1.58	0.09	ND		ND		ND	
KS:Wichita	08/13/91	1.61	0.12	ND		ND		ND	
KY:Louisville	08/06/91	1.54	0.10	ND		ND		ND	
LA:New Orleans	08/12/91	1.64	0.06	ND		ND		ND	
MA:Boston	08/06/91	1.67	0.09	ND		ND		ND	
MD:Baltimore	08/09/91	1.85	0.06	ND		ND		ND	
ME:Portland	08/05/91	1.69	0.08	ND		ND		ND	
MI:Detroit	08/08/91	1.62	0.08	ND		ND		ND	
MI:Grand Rapids	08/05/91	1.62	0.09	ND		ND		ND	
MN:St. Paul	08/07/91	1.62	0.07	ND		ND		ND	
MO:Kansas City	08/17/91	1.60	0.08	ND		ND		ND	
MO:St. Louis	08/07/91	1.81	0.08	ND		ND		ND	
MS:Jackson	08/06/91	1.67	0.08	ND		ND		ND	
MT:Helena	08/22/91	1.68	0.05	ND		ND		ND	
NC:Charlotte	08/20/91	1.58	0.08	ND		ND		ND	
ND:Minot	08/27/91	1.61	0.12	ND		ND		ND	
NE:Omaha	08/26/91	1.66	0.08	ND		ND		ND	
NJ:Trenton	08/08/91	1.56	0.09	ND		ND		ND	
NM:Albuquerque	08/14/91	1.70	0.14	ND		ND		ND	
NV:Las Vegas	08/29/91	2.13	0.10	ND		ND		ND	
NY:Buffalo	08/05/91	1.76	0.09	ND		ND		ND	
NY:New York City	08/05/91	1.60	0.05	ND		ND		ND	
NY:Syracuse	08/15/91	1.44	0.18	ND		ND		ND	
OH:Cincinnati	08/29/91	1.74	0.08	ND		ND		ND	
OH:Cleveland	08/27/91	1.42	0.10	ND		ND		ND	

Table 22 (continued)
Radionuclides in Pasteurized Milk
August 1991

Location	Date Collected	K g/L $\pm 2\sigma$	¹³⁷ Cs pCi/L $\pm 2\sigma$	¹⁴⁰ Ba pCi/L $\pm 2\sigma$	¹³¹ I pCi/L $\pm 2\sigma$
OR:Portland	08/14/91	1.62 0.08	ND	ND	ND
PA:Philadelphia	08/05/91	1.67 0.08	ND	ND	ND
PA:Pittsburgh	08/05/91	1.70 0.09	ND	ND	ND
PC:Cristobal	08/28/91	1.47 0.08	6 2	ND	ND
PR:San Juan	08/27/91	1.57 0.09	ND	ND	ND
SC:Charleston	08/06/91	1.58 0.14	ND	ND	ND
SD:Rapid City	08/05/91	1.64 0.10	ND	ND	ND
TN:Chattanooga	08/19/91	1.69 0.09	ND	ND	ND
TN:Knoxville	08/05/91	1.67 0.12	ND	ND	ND
TN:Memphis	08/26/91	1.56 0.08	ND	ND	ND
TX:Austin	08/13/91	1.54 0.12	ND	ND	ND
TX:Ft. Worth	08/30/91	1.54 0.08	ND	ND	ND
VA:Norfolk	08/01/91	1.68 0.06	ND	ND	ND
VT:Montpelier	08/12/91	1.78 0.08	ND	ND	ND
WA:Seattle	08/07/91	1.64 0.08	ND	ND	ND
WA:Spokane	08/05/91	1.61 0.08	ND	ND	ND
WV:Charleston	08/12/91	1.81 0.09	ND	ND	ND
WY:Riverton	08/15/91	1.55 0.14	ND	ND	ND

Note: σ = Counting Error. ND = Not Detectable.

Table 23
Radionuclides in Pasteurized Milk
September 1991

Location	Date Collected	K		¹³⁷ Cs		¹⁴⁰ Ba		¹³¹ I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
AK:Anchorage	09/30/91	1.53	0.09	ND		ND		ND	
AL:Montgomery	09/10/91	1.74	0.06	ND		ND		ND	
AR:Little Rock	09/29/91	1.53	0.09	ND		ND		ND	
AZ:Phoenix	09/05/91	1.58	0.12	ND		ND		ND	
CA:Los Angeles	09/06/91	1.57	0.10	ND		ND		ND	
CA:Sacramento	09/03/91	1.59	0.06	ND		ND		ND	
CA:San Francisco	09/04/91	1.81	0.09	ND		ND		ND	
CT:Hartford	09/09/91	1.61	0.09	ND		ND		ND	
DE:Dover	09/25/91	1.86	0.08	ND		ND		ND	
FL:Tampa	09/05/91	1.63	0.12	ND		ND		ND	
GA:Atlanta	09/09/91	1.76	0.09	ND		ND		ND	
HI:Honolulu	09/24/91	1.91	0.08	ND		ND		ND	
IA:Des Moines	09/04/91	1.57	0.08	ND		ND		ND	
IL:Chicago	09/05/91	1.57	0.08	ND		ND		ND	
KS:Wichita	09/24/91	1.72	0.09	ND		ND		ND	
KY:Louisville	09/03/91	1.67	0.09	ND		ND		ND	
LA:New Orleans	09/20/91	1.61	0.08	ND		ND		ND	
MA:Boston	09/04/91	1.89	0.09	ND		ND		ND	
MD:Baltimore	09/13/91	1.56	0.11	ND		ND		ND	
MI:Detroit	09/18/91	1.62	0.08	ND		ND		ND	
MI:Grand Rapids	09/03/91	1.71	0.06	ND		ND		ND	
MN:St. Paul	09/06/91	1.54	0.08	ND		ND		ND	
MO:Kansas City	09/17/91	1.66	0.08	ND		ND		ND	
MO:St. Louis	09/09/91	1.51	0.10	ND		ND		ND	
MS:Jackson	09/06/91	1.84	0.08	ND		ND		ND	
MT:Helena	09/23/91	1.35	0.07	ND		ND		ND	
NC:Charlotte	09/26/91	1.58	0.10	ND		ND		ND	
ND:Minot	09/24/91	1.69	0.09	ND		ND		ND	
NE:Omaha	09/26/91	1.59	0.07	ND		ND		ND	
NJ:Trenton	09/05/91	1.57	0.14	ND		ND		ND	
NM:Albuquerque	09/19/91	1.48	0.10	ND		ND		ND	
NV:Las Vegas	09/25/91	1.62	0.14	ND		ND		ND	
NY:Buffalo	09/17/91	1.94	0.13	ND		ND		ND	
NY:New York City	09/09/91	1.63	0.08	ND		ND		ND	
NY:Syracuse	09/05/91	1.63	0.08	ND		ND		ND	
OH:Cincinnati	09/26/91	1.58	0.08	ND		ND		ND	
OH:Cleveland	09/18/91	1.58	0.08	ND		ND		ND	

Table 23 (continued)
Radionuclides in Pasteurized Milk
September 1991

Location	Date Collected	K		¹³⁷ Cs		¹⁴⁰ Ba		¹³¹ I	
		g/L	±2σ	pCi/L	±2σ	pCi/L	±2σ	pCi/L	±2σ
OR:Portland	09/09/91	1.94	0.08	ND		ND		ND	
PA:Philadelphia	09/03/91	1.62	0.08	ND		ND		ND	
PA:Pittsburgh	09/11/91	1.54	0.08	ND		ND		ND	
PC:Cristobal	09/11/91	1.62	0.08	6	2	ND		ND	
PR:San Juan	09/13/91	1.88	0.09	ND		ND		ND	
SC:Charleston	09/17/91	1.60	0.08	ND		ND		ND	
SD:Rapid City	09/04/91	1.59	0.09	ND		ND		ND	
TN:Chattanooga	09/16/91	1.60	0.06	ND		ND		ND	
TN:Knoxville	09/09/91	1.55	0.08	ND		ND		ND	
TN:Memphis	09/18/91	1.72	0.09	ND		ND		ND	
TX:Austin	09/18/91	1.57	0.09	ND		ND		ND	
TX:Dallas	09/05/91	1.55	0.05	ND		ND		ND	
VA:Norfolk	09/26/91	1.78	0.09	ND		ND		ND	
VT:Burlington	09/06/91	1.58	0.08	ND		ND		ND	
WA:Seattle	09/03/91	1.57	0.06	ND		ND		ND	
WA:Spokane	09/04/91	1.49	0.16	ND		ND		ND	
WV:Charleston	09/16/91	1.72	0.09	ND		ND		ND	
WY:Riverton	09/16/91	1.50	0.10	ND		ND		ND	

Note: σ = Counting Error. ND = Not Detectable.

Table 24
Strontium-90 in Pasteurized Milk
July 1991

EPA Location	Collection Date	⁹⁰ Sr	
		pCi/L	±2σ
AL:Montgomery	07/05/91	1.4	0.1
AR:Little Rock	07/10/91	2.2	2.6
AZ:Phoenix	07/11/91	0.1	0.7
CA:Los Angeles	07/16/91	0.8	0.2
CA:Sacramento	07/01/91	1.6	0.5
CA:San Francisco	07/08/91	0.7	0.3
DE:Dover	07/25/91	2.0	0.2
FL:Tampa	07/01/91	1.4	0.2
GA:Atlanta	07/15/91	0.6	0.4
HI:Honolulu	07/18/91	0.7	1.1
IA:Des Moines	07/08/91	1.9	0.2
ID:Idaho Falls	07/14/91	1.2	0.4
IL:Chicago	07/10/91	1.3	0.1
IN:Indianapolis	07/09/91	1.8	0.0
KS:Wichita	07/22/91	1.9	0.4
KY:Louisville	07/01/91	1.5	0.7
LA:New Orleans	07/31/91	2.7	0.1
MA:Boston	07/09/91	0.9	0.1
MD:Baltimore	07/12/91	1.2	0.6
ME:Portland	07/02/91	1.5	0.6
MI:Detroit	07/11/91	2.0	1.0
MI:Grand Rapids	07/10/91	2.3	1.2
MN:St. Paul	07/03/91	2.1	0.3
MO:St. Louis	07/03/91	2.0	0.8
MS:Jackson	07/08/91	1.5	1.1
MT:Helena	07/26/91	2.2	1.0
NC:Charlotte	07/25/91	1.6	0.5
ND:Minot	07/31/91	2.6	0.2
NE:Omaha	07/29/91	1.9	0.2
NJ:Trenton	07/03/91	2.2	0.9
NM:Albuquerque	07/10/91	0.2	0.5
NV:Las Vegas	07/17/91	0.0	0.7
NY:Buffalo	07/22/91	3.0	0.3
NY:New York City	07/01/91	1.9	0.1
NY:Syracuse	07/08/91	1.5	0.4
OH:Cleveland	07/16/91	2.4	0.5
OR:Portland	07/02/91	1.0	1.5

Table 24 (continued)
Strontium-90 in Pasteurized Milk
July 1991

EPA Location	Collection Date	⁹⁰ Sr pCi/L ±2σ	
PA:Philadelphia	07/08/91	2.1	0.5
PA:Pittsburgh	07/08/91	1.1	0.6
PC:Cristobal	07/09/91	0.6	0.9
PR:San Juan	07/18/91	0.4	0.4
SC:Charleston	07/16/91	0.9	0.3
SD:Rapid City	07/08/91	1.3	1.2
TN:Chattanooga	07/30/91	2.1	0.5
TN:Knoxville	07/22/91	2.4	0.1
TN:Memphis	07/17/91	2.0	0.0
TX:Austin	07/03/91	0.2	0.0
TX:Dallas	07/10/91	0.5	0.1
VT:Burlington	07/22/91	2.2	0.3
WA:Seattle	07/05/91	0.8	0.2
WA:Spokane	07/08/91	2.5	0.1
WV:Charleston	07/09/91	2.5	0.3
WY:Riverton	07/29/91	0.6	0.3

Note: σ = Counting Error. NA = Not Analyzed.

Carbon-14 in Milk

Nine stations, chosen for wide geographical distribution, contribute milk samples for annual analysis of carbon-14. These samples are monitored for carbon-14 levels in the food chain resulting from nuclear testing. The pasteurized milk is freeze-dried and the resulting powder is pelletized for ease of combustion. Analysis consists of combusting the samples and converting the released carbon dioxide through a series of chemical conversions to benzene, which is then assayed for carbon-14 by liquid scintillation.

The samples undergo three main steps in the chemical conversions to benzene prior to liquid scintillation counting. They include (1) combustion of the sample to carbon dioxide, (2) conversion of the carbon dioxide to acetylene, and (3) trimerizations of the acetylene to benzene. The last carbon-14 results were for samples collected during April–May 1982, 1983–1986, and March–May 1987. They were published in *Environmental Radiation Data: Report 54* and *Environmental Radiation Data: Report 59*.

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