

Rocky Flats Plant

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# Monthly Environmental Monitoring Report

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**Executive Summary**

The Rocky Flats Plant has been part of a nationwide Department of Energy complex for the research, development, and production of nuclear weapons. The plant was responsible for fabricating nuclear weapons components from plutonium, uranium, beryllium, and stainless steel. The primary production activities included metal fabrication and assembly, chemical recovery and purification of process-produced transuranic radionuclides, and related quality control functions.

This mission has changed with the announcement in early 1992 that certain planned weapons systems had been canceled. Rocky Flats Plant is no longer a weapons component production facility. The plant is now in a transition phase into decontamination and decommission (D&D). Primary objectives of this new mission include meeting and maintaining environmental regulatory requirements as well as effecting proper D&D steps that are under development.

Because radioactive and chemically hazardous materials may be used or handled at the Rocky Flats Plant for transition purposes, the plant maintains an extensive environmental protection program. Included in that program is regular monitoring for radioactive and hazardous constituents at onsite, plant boundary, and offsite locations. This Monthly Environmental Monitoring Report provides a monthly summary of environmental monitoring data collected by the Rocky Flats Plant. Summarized below are highlights from the major data categories presented. Remaining data presented are within the ranges historically measured for their respective parameters and locations.

Radiation standards for protection of the public are discussed in Appendix A. The primary standards are based on calculations of radiation dose. These calculations are performed annually using monitoring data presented in the Monthly Environmental Monitoring Report. Radiation doses to the public from Rocky Flats Plant operations are typically well below any regulatory limit and far less than are received from naturally occurring radiation sources in the Denver metropolitan area (see Appendix A).

April 1992 Monitoring Data - Reporting of air effluent data, ambient air data, and most of the onsite and offsite surface water monitoring data continues to be delayed because of software and

hardware difficulties with a new data management system implemented in March. Although the processing of this information by the new data management system has encountered technical difficulties, most laboratory analyses have been completed. Limited data is presented on americium and uranium concentrations in effluent water, NPDES parameter values, and daily water flow volumes from discharge locations. In addition, some January, February, and March samples have been included as errata. These values were previously reported as incomplete.

Results of total long-lived alpha and beta activity screening are within normally expected ranges. These analyses are performed on air effluent sample filters and surface water discharge samples prior to radiochemical processing.

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**April  
1992**

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# **Rocky Flats Plant Environmental Monitoring Report**

## **Introduction**

This report summarizes the effluent and environmental monitoring programs at the Rocky Flats Plant (RFP) for the month of April 1992. The data presented herein reflect the best information available to the RFP at this time. Should subsequent analyses indicate that any data presented herein are inaccurate or misleading, appropriate revisions will be issued promptly.

Tables 1 through 3 show monitoring results for radioactive and nonradioactive airborne effluents continuously sampled from plant buildings. Tables 4 through 6 summarize environmental monitoring data from the RFP ambient air sampling network. This network is comprised of continuously operating outdoor air samplers located on plantsite, around the plant boundary, and in neighboring communities.

Water sampling results for radioactive constituents are given in Tables 7 through 11. Results are summarized for plant surface water control ponds, for nearby drinking water reservoirs, and for tap water for neighboring communities. Nitrate monitoring for Great Western Reservoir and Standley Lake, the two drinking water reservoirs that can receive surface water discharges from the plant, are summarized in Table 12. Surface water discharges from RFP currently are being diverted around these drinking water reservoirs.

The Environmental Protection Agency (EPA) has issued to the plant a National Pollutant Discharge Elimination System (NPDES) permit for control of surface water discharges. Water sampling results associated with the NPDES permit, as modified by a March 25, 1991, Federal Facilities Compliance Agreement (FFCA) with EPA, are reported in Table 13. Applicable NPDES/FFCA limits are included in Table 13 for comparison. Monitoring results for which no limits have been established under the NPDES/FFCA are reported in Table 14. Appendix B

lists the volatile organic compounds for which monitoring is required under the NPDES/FFCA. Analytical results for nonradioactive parameters in water at the Walnut Creek at Indiana Street location are summarized in Table 15. Daily flow data for surface water from the two plant drainage systems (Walnut Creek and Woman Creek) are given in Tables 16 and 17. Daily flow data for water transferred from Pond B-5 to Pond A-4, for subsequent discharge offsite, are given in Table 18. Meteorological data are given in Tables 19 and 20.

Appendix D contains corrections and updates on previously reported information.

Error terms in the form of "a±b" are included with some of the data. For a single sample, "a" is the analytical-blank corrected value; for multiple samples it represents the arithmetic mean, the volume-weighted mean, or the annual total, as indicated in the table. The error term "b" accounts for the propagated statistical counting uncertainty of the sample(s) and the associated analytical blanks at the 95 percent confidence level. These error terms represent a minimum estimate of error for the data.

Plutonium, uranium, americium, tritium, and beryllium measured concentrations are given in this report. Most of the measured concentrations are at or very near background levels, and often there is little or no amount of these materials in the media being analyzed. When this occurs, the results of the laboratory analyses can be expected to show a statistical distribution of positive and negative numbers near zero and numbers that are less than the calculated minimum detectable concentration for the analyses. The laboratory analytical blanks, used to correct for background contributions to the measurements, show a similar statistical distribution around their average values. Negative sample values result when the measured value for a laboratory analytical blank is subtracted from a sample analytical result smaller than the analytical blank value. Results that are less than calculated minimum detectable levels indicate that the results are below the level of statistical confidence in the actual numerical values. All reported results - including negative values and values that are less than minimum detectable levels - are included in any arithmetic calculations on the data set. Reporting all values allows all of the data to be evaluated using appropriate statistical treatment. This assists in identifying any

bias in the analyses, allows better evaluation of distributions and trends in environmental data, and helps in estimating the true sensitivity of the measurement process.

The reader should use caution in interpreting individual values that are negative or less than minimum detectable levels. A negative value has no physical significance. Values less than minimum detectable levels lack statistical confidence as to what the actual number is, although it is known with high confidence that it is below the specified detection level. Such values should not be interpreted as being the actual amount of material in the sample, but should be seen as reflecting a range (from zero to the minimum detectable level) in which the actual amount would likely lie. These values are significant, however, when taken together with other analytical results that indicate that the distribution is near zero.

The data provided in this report are provided as a matter of courtesy and should not be construed as an application for a permit or license, or in support of such an application. Approval of the Department of Energy should be obtained before publication of any data contained in this report.

Abbreviations used within this report are as defined.

## Abbreviations

C Average	Average concentration
C Maximum	Maximum concentration
C Minimum	Minimum concentration
m <sup>3</sup>	Cubic meter
m/s	Meters per second
mCi	Millicurie
mg/l	Milligrams per liter
mrem	Millirem
pCi/l	Picocuries per liter
pCi/m <sup>3</sup>	Picocuries per cubic meter
pH	Hydrogen ion concentration
SU	Standard Unit
µg/m <sup>3</sup>	Micrograms per cubic meter
#/100 ml	Number per 100 milliliter
µCi	Microcurie

**Table 1**

**Plutonium and Americium Airborne Effluent Data**

<b>Month</b>	<b>Plutonium-239, -240 (03/16/92 - 04/17/92)</b>		<b>Americium-241 (03/16/92 - 04/17/92)</b>	
	<b>Release (<math>\mu\text{Ci}</math>)</b>	<b>C Maximum (<math>\text{pCi}/\text{m}^3</math>)</b>	<b>Release (<math>\mu\text{Ci}</math>)</b>	<b>C Maximum (<math>\text{pCi}/\text{m}^3</math>)</b>
<b>1991</b>				
Year to Date	0.843 $\pm$ 0.167	0.0030 $\pm$ 0.0006	0.1500 $\pm$ 0.0680	0.0006 $\pm$ 0.0001
<b>1992</b>				
January	0.031 $\pm$ 0.011 <sup>a</sup>	0.0005 $\pm$ 0.0001 <sup>a</sup>	0.0103 $\pm$ 0.0056 <sup>a</sup>	0.0003 $\pm$ 0.0001 <sup>a</sup>
February	0.024 $\pm$ 0.007 <sup>a</sup>	0.0002 $\pm$ 0.0000 <sup>a</sup>	0.0090 $\pm$ 0.0061 <sup>a</sup>	0.0003 $\pm$ 0.0001 <sup>a</sup>
March	b	b	b	b
April	b	b	b	b

<sup>a</sup> Previously reported as incomplete analysis.

<sup>b</sup> Incomplete laboratory analysis.

**Table 2**

**Uranium Airborne Effluent Data**

Month	Uranium-233, -234 (03/16/92 - 04/17/92)		Uranium-238 (03/16/92 - 04/17/92)	
	Release ( $\mu\text{Ci}$ )	C Maximum ( $\text{pCi}/\text{m}^3$ )	Release ( $\mu\text{Ci}$ )	C Maximum ( $\text{pCi}/\text{m}^3$ )
<b>1991</b>				
Year to Date	0.629 $\pm$ 0.233	0.0001 $\pm$ 0.0001	1.002 $\pm$ 0.235	0.0005 $\pm$ 0.0002
<b>1992</b>				
January	-0.1012 $\pm$ 0.014 <sup>a</sup>	0.0001 $\pm$ 0.0000 <sup>a</sup>	0.046 $\pm$ 0.016 <sup>a</sup>	0.0001 $\pm$ 0.0001 <sup>a</sup>
February	0.0407 $\pm$ 0.019 <sup>a</sup>	0.0001 $\pm$ 0.0000 <sup>a</sup>	0.115 $\pm$ 0.024 <sup>a</sup>	0.0004 $\pm$ 0.0001 <sup>a</sup>
March	b	b	b	b
April	b	b	b	b

a Previously reported as incomplete analysis.

b Incomplete laboratory analysis.

**Table 3**

**Tritium and Beryllium Airborne Effluent Data**

<b>Month</b>	<b>Tritium, H-3</b> <b>(04/01/92 - 04/30/92)</b>		<b>Beryllium</b> <b>(03/16/92 - 04/17/92)</b>		
	<b>Release</b> <b>(mCi)</b>	<b>C Maximum</b> <b>(pCi/m<sup>3</sup>)</b>	<b>Release</b> <b>(grams)</b>	<b>C Maximum</b> <b>(ug/m<sup>3</sup>)</b>	
<b>1991</b>					
Year to Date	4.760	94 ± 55	1.2538 ± 0.083	0.00184	
<b>1992</b>					
January	0.129	34 ± 9 <sup>a</sup>	0.0485 ± 0.011 <sup>a</sup>	0.00042 <sup>a</sup>	
February	0.090	28 ± 15 <sup>a</sup>	0.0496 ± 0.009 <sup>a</sup>	0.00019 <sup>a</sup>	
March		b	b		
April		b	b		

*NOTE: Beryllium measured at the remaining 44 locations was below the screening level of 0.1 gram per month. Beryllium emissions from Rocky Flats Plant are regulated by the State of Colorado under Colorado Air Quality Control Regulation #8. The limit for beryllium air emissions is 10 grams per stationary source in a 24-hour period.*

*The calibration methodology for the beryllium analyses was changed beginning with the September 1990 samples to improve quality assurance. The previous procedure used the single-point, "simple method of additions," one of the methods recommended by the manufacturer of the graphite furnace atomic absorption analytical equipment. The current method is based on EPA Contract Laboratory Program protocol. It uses multi-point calibration curves, periodic validation of the curve with EPA validation standards, and periodic blank and sample checks to assure absence of equipment contamination and matrix effects during the analysis. No blank corrections are made to any beryllium data.*

- <sup>a</sup> Previously reported as incomplete analysis.
- <sup>b</sup> Incomplete lab analysis.

**Table 4**

**Plutonium Concentrations in Ambient Air for Onsite Samplers**

(03/30/92 - 04/27/92)

<u>Location</u>	<u>Number Composited Monthly Samples</u>	<u>Volume (m<sup>3</sup>)</u>	<u>Plutonium Concentration (pCi/m<sup>3</sup>)</u>	<u>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</u>
S-01 <sup>a</sup>				
S-02 <sup>a</sup>				
S-03 <sup>a</sup>				
S-04 <sup>a</sup>				
S-05 <sup>a</sup>				
S-06 <sup>a</sup>				
S-07 <sup>a</sup>				
S-08 <sup>a</sup>				
S-09 <sup>a</sup>				
S-10 <sup>a</sup>				
S-11 <sup>a</sup>				
S-13 <sup>a</sup>				
S-14 <sup>a</sup>				
S-16 <sup>a</sup>				
S-17 <sup>a</sup>				
S-18 <sup>a</sup>				
S-19 <sup>a</sup>				
S-20 <sup>a</sup>				
S-21 <sup>a</sup>				
S-22 <sup>a</sup>				
S-23 <sup>a</sup>				
S-24 <sup>a</sup>				
S-25 <sup>a</sup>				
S-81 <sup>a</sup>				

<sup>a</sup> Incomplete laboratory analysis.

**Table 5****Plutonium Concentrations in Ambient Air for Perimeter Samplers****(03/24/92 - 04/21/92)**

<b>Location</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-31a				
S-32a				
S-33a				
S-34a				
S-35a				
S-36a				
S-37a				
S-38a				
S-39a				
S-40	1	33388	.000000	.000001
S-41	1	32052	.000001	.000001
S-42	1	29762	.000001	.000001
S-43	1	31133	.000000	.000001
S-44	1	29764	.000000	.000001

<sup>a</sup> Incomplete laboratory analysis.

**Table 6****Plutonium Concentrations in Ambient Air for Community Samplers**

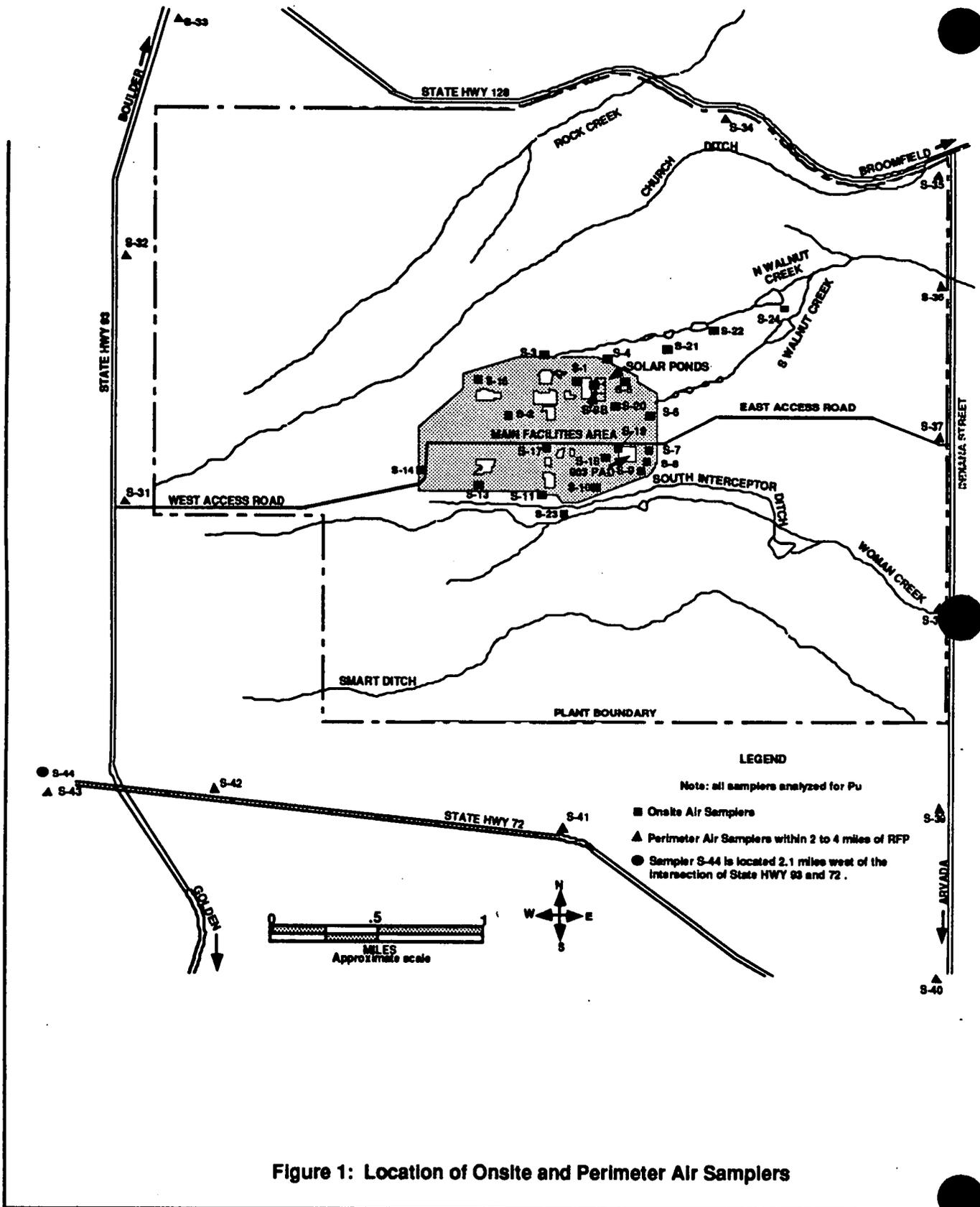
(03/25/92 - 04/22/92)

<b>Location</b>	<b>Community Name</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-51 <sup>a</sup>	Marshall				
S-52 <sup>a</sup>	Jeffco Airport				
S-53 <sup>a</sup>	Superior				
S-54 <sup>a</sup>	Boulder				
S-55 <sup>b</sup>	Lafayette				
S-56 <sup>a</sup>	Broomfield				
S-57 <sup>b</sup>	Walnut Creek				
S-58 <sup>a</sup>	Wagner				
S-59 <sup>a</sup>	Leyden				
S-60 <sup>a</sup>	Westminster				
S-61 <sup>c</sup>	Denver				
S-62 <sup>a</sup>	Golden				
S-68 <sup>a</sup>	Lakeview Pointe				
S-73 <sup>a</sup>	Cotton Creek				

<sup>a</sup> Incomplete laboratory analysis.

<sup>b</sup> This sampler was damaged beyond repair and must be replaced.

<sup>c</sup> Sampler S-61 located in Denver was inoperative during this period. This sampler has been temporarily removed because of construction activities on the building where it is installed.



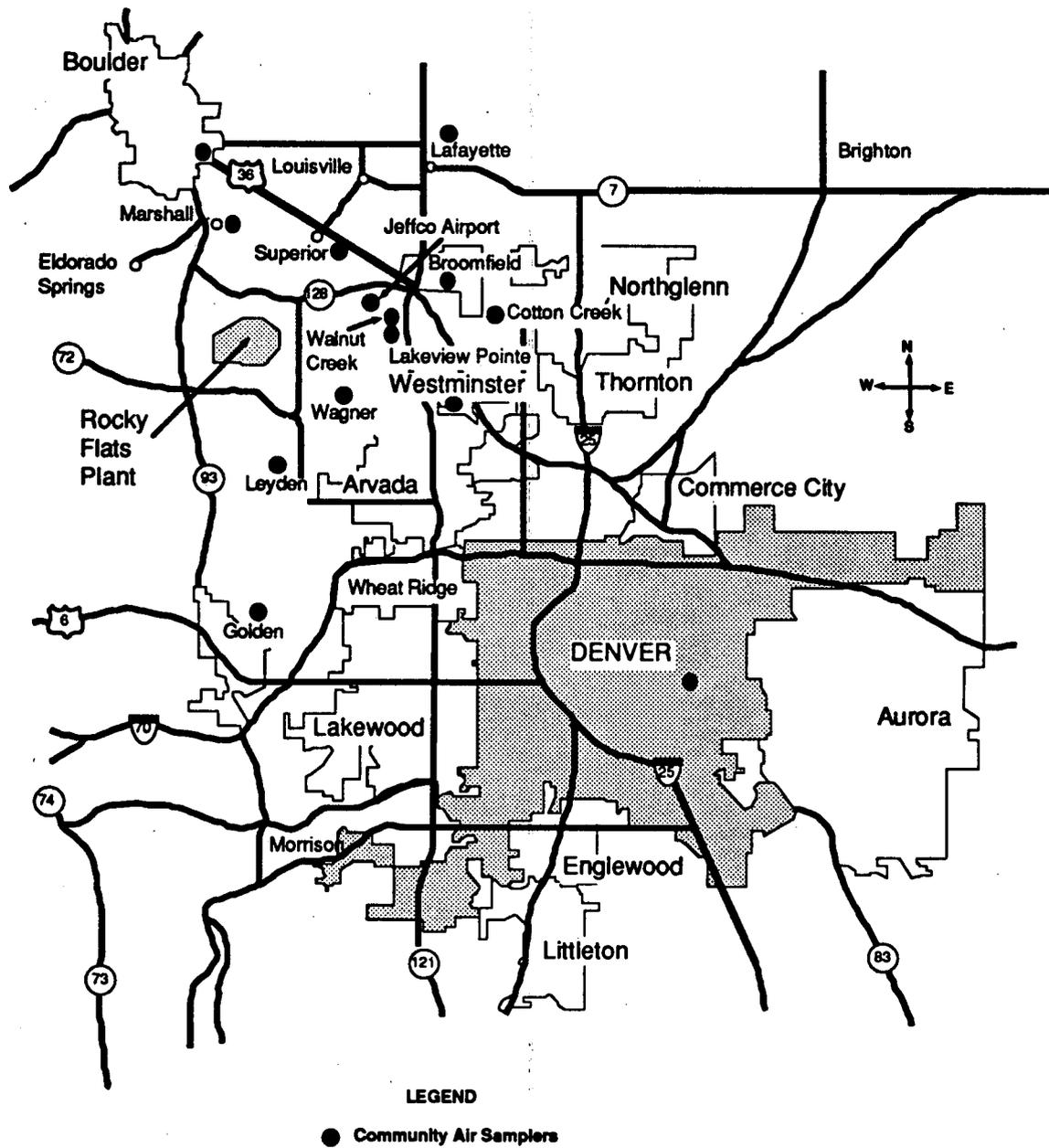


Figure 2: Location of Community Air Samplers

**Table 7**

**Onsite Water Sample Results - Plutonium and Americium**

**Holding Pond Outfall (pCi/l)**

<u>Location</u>	<u>Plutonium-239, -240</u>	<u>Americium-241</u>
<b><u>Pond A-4</u></b>		
04/04/92 - 04/05/92	a	0.003 ± 0.003
04/10/92 - 04/16/92	a	a
Volume weighted average concentration	a	a
<b><u>Pond B-5</u> - No discharge.</b>		
<b><u>Pond C-1</u></b>		
04/04/92 - 04/10/92	a	a
04/11/92 - 04/17/92	a	a
04/18/92 - 04/24/92	a	0.005 ± 0.002
04/25/92 - 05/01/92	a	a
Average concentration	a	a
<b><u>Pond C-2</u></b>		
04/04/92 - 04/07/92	a	0.002 ± 0.003
Volume weighted average concentration	a	a
<b><u>Walnut Creek at Indiana</u><sup>b</sup></b>		
04/04/92 - 04/10/92	a	a
04/11/92 - 04/17/92	a	a
Volume weighted average concentration	a	a

<sup>a</sup> Incomplete lab analysis.

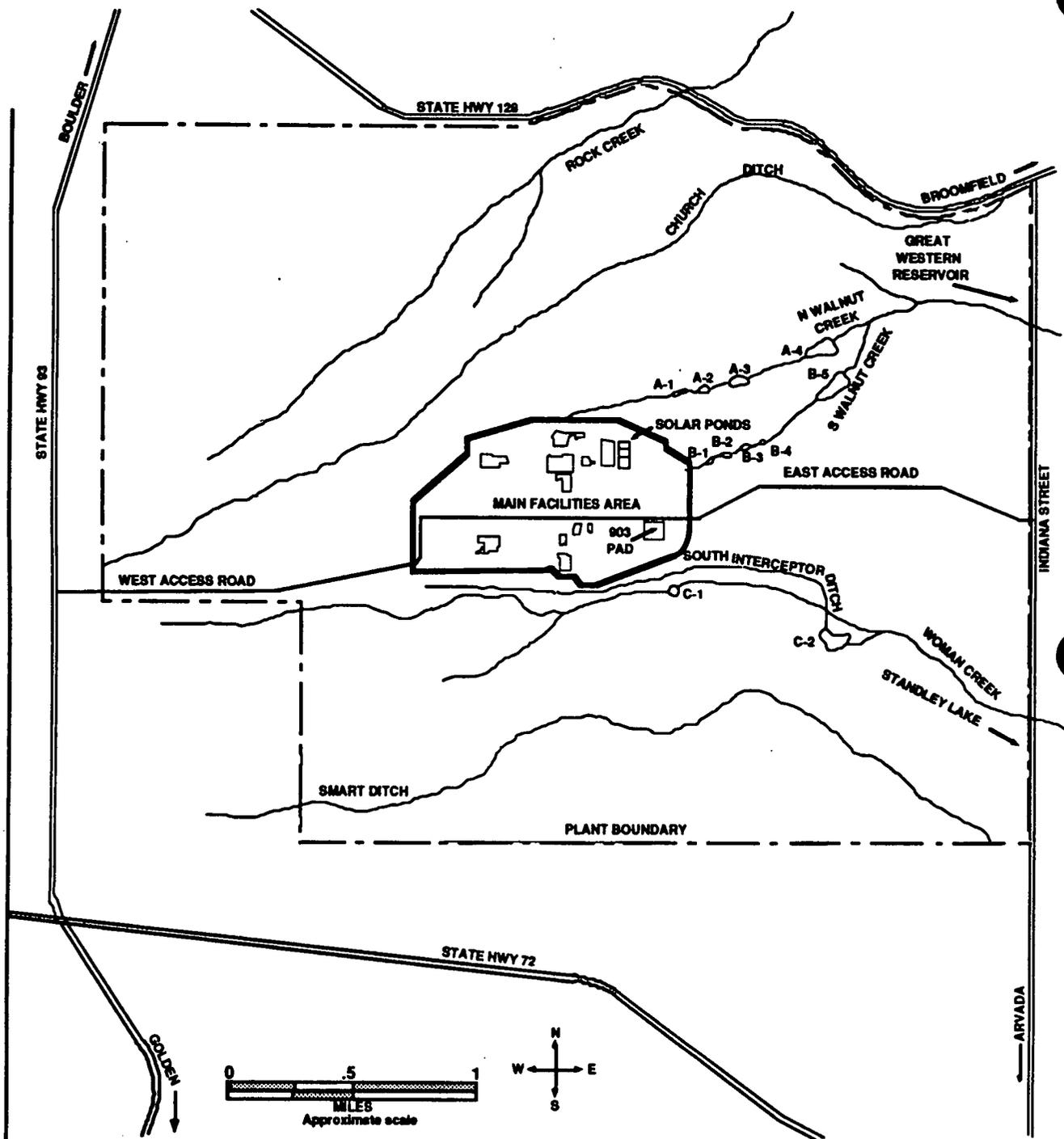
<sup>b</sup> Samples were collected from 04/06/92-04/09/92 and represent continued spring run-off and residual from discharge.

**Table 8****Onsite Water Sample Results - Uranium****Holding Pond Outfall (pCi/l)**

<u>Location</u>	<u>Uranium-233, -234</u>		<u>Uranium-238</u>	
<b><u>Pond A-4</u></b>				
04/04/92 - 04/05/92	0.83	± 0.12	1.12	± 0.14
04/10/92 - 04/16/92		a		a
Volume weighted average concentration		a		a
<b><u>Pond B-5</u> - No discharge.</b>				
<b><u>Pond C-1</u></b>				
04/04/92 - 04/10/92		a		a
04/11/92 - 04/17/92		a		a
04/18/92 - 04/24/92	0.60	± 0.10	0.32	± 0.08
04/25/92 - 05/01/92		a		a
Average concentration		a		a
<b><u>Pond C-2</u></b>				
04/04/92 - 04/07/92	0.98	± 0.14	1.39	± 0.17
Volume weighted average concentration	0.98	± 0.14	1.39	± 0.17
<b><u>Walnut Creek at Indiana</u><sup>b</sup></b>				
04/04/92 - 04/10/92	1.44	± 0.16	1.06	± 0.13
04/11/92 - 04/17/92		a		a
Volume weighted average concentration		a		a

a Incomplete lab analysis.

b Samples were collected from 04/06/92-04/09/92 and represent continued spring run-off and residual from discharge.



Note: Stream flow in the Rocky Flats area is to the east.

Figure 3: Holding Pond and Liquid Effluent Water Courses

**Table 9**

**Offsite Water Sample Results - Plutonium and Americium**

<b>Location</b>	<b>Number of Samples</b>	<b>Reservoirs (pCi/l)</b>	
		<b>Plutonium-239, -240</b>	<b>Americium-241</b>
Great Western	1 <sup>a</sup>	b	b
Standley Lake	1 <sup>a</sup>	b	b
<b>Community Tap Water (pCi/l)</b>			
Boulder	1 <sup>a</sup>	b	b
Broomfield	1 <sup>a</sup>	b	b
Westminster	1 <sup>a</sup>	b	b

<sup>a</sup> Plutonium and americium analyses are performed on one sample composited from four weekly grab samples.  
<sup>b</sup> Incomplete lab analysis.

**Table 10**

**Offsite Water Sample Results - Uranium**

<b>Location</b>	<b>Number of Samples</b>	<b>Reservoirs (pCi/l)</b>	
		<b>Uranium-233, -234</b>	<b>Uranium-238</b>
Great Western	1a	b	b
Standley Lake	1a	b	b
<b>Community Tap Water (pCi/l)</b>			
Boulder	1a	b	b
Broomfield	1a	b	b
Westminster	1a	b	b

a Uranium analyses are performed on one sample composited from four weekly grab samples.  
b Incomplete lab analysis.

**Table 11**

**Onsite and Offsite Water Sample Results - Tritium**

<u>Location</u>	<u>Number of Samples</u>	<u>Tritium (pCi/l)</u>		
		<u>C Minimum</u>	<u>C Maximum</u>	<u>C Average</u>
Pond A-4 <sup>b</sup>	12	a	a	a
Pond C-1	5	a	a	a
Boulder	5	a	a	a
Broomfield	5	a	a	a
Great Western	5	a	a	a
Standley Lake	5	a	a	a
Westminster	5	a	a	a
Walnut at Indiana <sup>b</sup>	17	a	a	a

<sup>a</sup> Incomplete lab analysis.

<sup>b</sup> Volume weighted average concentration.

**Table 12**

**Offsite Water Sample Results - Nitrate as Nitrogen**

**Nitrate (as N) at Great Western Reservoir**

<u>Sample Date</u>	<u>Nitrate (as N) (mg/l)</u>
04/02/92	0.03
04/09/92	<0.02
04/16/92	<0.02
04/23/92	<0.02
04/30/92	<0.02

**Nitrate (as N) at Standley Lake**

04/02/92	<0.02
04/09/92	<0.02
04/16/92	0.04
04/23/92	<0.02
04/30/92	<0.02

**Note:** For some nonradioactive parameters, the concentrations that are measured at or below the minimum detectable concentration (MDC) are assigned to MDC. The less than symbol (<) indicates MDC values and calculated values that include one or more MDCs.

**Table 13**

**NPDES/FFCA Permit Water Sample Results**

**Discharge 001-A (Pond B-3)** Discharged continuously from 04/01/92 - 04/30/92.

<u>Parameters</u>		<u>Measured 30-Day Average</u>	<u>Limit 30-Day Average</u>	<u>Measured Max. 7-Day Average</u>	<u>Limit Max. 7-Day Average</u>
Nitrate	mg/l	4.4	10	6	20
Total Residual Chlorine	mg/l		<u>Measured Maximum</u> 0.11	<u>Limit Maximum</u> 0.5	

**Discharge 001-B (Sewage Treatment Plant)** Discharged continuously from 04/01/92 - 04/30/92.

<u>Parameters</u>		<u>Measured 30-Day Average</u>	<u>Limit 30-Day Average</u>	<u>Measured Maximum</u>	<u>Limit Maximum</u>
CBOD5	mg/l	1.8	10	5.1	25
Total Phosphorus	mg/l	0.1	8	0.8	12
Total Chromium	mg/l	0.009	0.05	0.012	0.10
Fecal Coliforms	#/100 ml	<u>Measured 30-Day Average</u> 2 (Geometric)	<u>Limit 30-Day Average</u> 200 (Geometric)	<u>Measured Max. 7-Day Average</u> 5 (Geometric)	<u>Limit Max. 7-Day Average</u> 400 (Geometric)
Total Suspended Solids	mg/l	6	30	8	45
pH	SU	<u>Measured Minimum</u> 6.3	<u>Limit Minimum</u> 6.0	<u>Measured Maximum</u> 7.3	<u>Limit Maximum</u> 9.0
Oil and Grease		<u>Observed Sheen</u> No visual	<u>Limit Sheen</u> No visual		

**Discharge 002 (Pond A-3)** Discharged continuously from 04/01/92 - 04/03/92 and 04/29/92 - 04/30/92.

<u>Parameters</u>		<u>Measured 30-Day Average</u>	<u>Limit 30-Day Average</u>	<u>Measured Maximum</u>	<u>Limit Maximum</u>
Nitrates as N	mg/l	2.4	10	3.3	20
pH	SU	<u>Measured Minimum</u> 7.2	<u>Limit Minimum</u> 6.0	<u>Measured Maximum</u> 8.1	<u>Limit Maximum</u> 9.0

**Table 13**

**NPDES/FFCA Permit Water Sample Results (Continued)**

*Discharge 003 (RO Pilot Plant) and Discharge 004 (RO Plant) are inactive outfalls and will be eliminated from the new NPDES permit.*

**Discharge 005 (Pond A-4)** Discharged continuously from 04/01/92 - 04/05/92 and 04/10/92 - 04/16/92.

<u>Parameters</u>		<u>Measured Maximum</u>	<u>Limit Maximum</u>
Total Chromium	mg/l	<0.007	0.05

**Discharge 006 (Pond B-5)** No discharge.

<u>Parameters</u>		<u>Measured 30-Day Average</u>	<u>Limit 30-Day Average</u>	<u>Measured Max. 7-Day Maximum</u>	<u>Limit Max. 7-Day Maximum</u>
Nitrate as N <sup>a</sup>	mg/l		10		20
Total Residual Chlorine <sup>a</sup>	mg/l				0.5
Total Chromium	mg/l				0.05

**Discharge 007 (Pond C-2)** Discharged continuously from 04/01/92 - 04/07/92.

<u>Parameters</u>		<u>Measured Maximum</u>	<u>Limit Maximum</u>
Total Chromium	mg/l	<0.007	0.05

<sup>a</sup> These parameters are measured only in the event that Waste Water Treatment Plant effluent bypasses Pond B-3 and flows directly into Pond B-5.

**Table 14**

**NPDES/FFCA Effluent Monitoring**

**Discharge 001-A (Pond B-3)** Discharged continuously from 04/01/92 - 04/30/92.

<u>Parameters</u>		<u>Measured Maximum</u>	<u>Measured 30-Day Average</u>
BOD5	mg/l	7.8	5.5
CBOD5	mg/l	2.9	2.4
Total Suspended Solids	mg/l	5	4

**Discharge 001-B (Sewage Treatment Plant [STP])** Discharged continuously from 04/01/92 - 04/30/92.

<u>Parameters</u>		<u>Measured Maximum</u>	<u>Measured 30-Day Average</u>
Nitrate as N	mg/l	9.14	4.25
Total Residual Chlorine	mg/l	0.11	0.01

Whole Effluent Toxicity<sup>a</sup>      Sampled quarterly; data reported March 1992  
 Ceriodaphnia      % Eff to LC50:  
 Fathead Minnows      % Eff to LC50:

<u>Metals</u>		<u>Measured 30-Day Average</u>
Antimony	ug/l	<25
Arsenic	ug/l	<1.0
Beryllium	ug/l	<1.0
Cadmium	ug/l	<0.25
Copper	ug/l	<7.1
Iron	ug/l	92.1
Lead	ug/l	3.8
Manganese	ug/l	31.1
Mercury	ug/l	<0.2
Nickel	ug/l	33
Silver	ug/l	<0.1
Zinc	ug/l	58.5

Metals were sampled on 04/01/92 and 04/08/92.

		<u>PQL<sup>b</sup></u>	<u>Concentrations that were above PQL</u>	
Volatile Organic Compounds (VOCs)	ug/l			
Chloroform	ug/l	6	5	sampled 04/01/92
Chloroform	ug/l	6	5	sampled 04/22/92

**Table 14**

**NPDES/FFCA Effluent Monitoring (Continued)**

**Discharge 003 (Reverse Osmosis Pilot Plant) and Discharge 004 (Reverse Osmosis Plant) are inactive outfalls and will be eliminated from the new NPDES permit.**

**Discharge 005 (Pond A-4)** Discharged continuously from 04/01/92 - 04/05/92 and 04/10/92 - 04/16/92.

Whole Effluent Toxicity<sup>a</sup>      Sampled quarterly; data reported March 1992

Ceriodaphnia	% Eff to LC50:
Fathead Minnows	% Eff to LC50:

**Discharge 006 (Pond B-5)** No discharge.

Whole Effluent Toxicity<sup>a</sup>

Ceriodaphnia	% Eff to LC50:
Fathead Minnows	% Eff to LC50:

**Discharge 007 (Pond C-2)** Discharged continuously from 04/01/92 - 04/07/92.

Whole Effluent Toxicity<sup>a</sup>      Sampled quarterly; data reported March 1992

Ceriodaphnia	% Eff to LC50:
Fathead Minnows	% Eff to LC50:

<sup>a</sup> Results for whole effluent toxicity are given in percentage of effluent sample that will cause mortality to half the test result organisms within the time frame of the test. For example, >100 percent indicates that 100 percent pure effluent did not cause acute toxicity to at least half of the organisms. A lower percentage LC<sub>50</sub> (lethal concentration to 50 percent of test organisms) indicates a greater toxic effect since less of the sample is required to observe a sufficiently extensive adverse effect.

<sup>b</sup> PQL is the Practical Quantitation Limit. It is equal to ten times the Method Detection Limit and represents the quantity at which 70 percent of laboratories can report in the 95 percent confidence interval.

**Table 15**

**Water Sample Results, Nonradioactive Parameters**

**Walnut Creek at Indiana Street**

<u>Parameters</u>		<u>Number of Samples</u>	<u>C Minimum</u>	<u>C Maximum</u>	<u>C Average</u>
pH	SU	17	7.10	8.32	N/A
Nitrates as N	mg/l	17	0.91	2.27	1.8

Flow occurred 04/01/92 - 04/17/92.

**Table 16**

**Daily Flow Data Recorded at the Walnut Creek at Indiana Gaging Station, Ponds A-4 and B-5**

<u>Date</u>	<u>Walnut Creek at Indiana (Gallons)</u>	<u>Pond A-4 (Gallons)</u>	<u>Pond B-5 (Gallons)</u>
04/01/92	2,746,000	2,617,000	No discharge
04/02/92	2,660,000	2,184,000	
04/03/92	2,872,000	2,640,000	
04/04/92	2,759,000	2,748,000	
04/05/92	1,283,000	978,000	
04/06/92	162,000 <sup>a</sup>	No discharge	
04/07/92	112,000 <sup>a</sup>		
04/08/92	104,000 <sup>a</sup>		
04/09/92	82,000 <sup>a</sup>	No discharge	
04/10/92	866,000	192,000	
04/11/92	1,272,000	1,017,000	
04/12/92	1,327,000	1,241,000	
04/13/92	1,289,000	1,087,000	
04/14/92	1,090,000	989,000	
04/15/92	1,047,000	890,000	
04/16/92	869,000	895,000	
04/17/92	182,000	No discharge	
04/18/92	No flow		
04/19/92			
04/20/92			
04/21/92			
04/22/92			
04/23/92			
04/24/92			
04/25/92			
04/26/92			
04/27/92			
04/28/92			
04/29/92			
04/30/92	No flow	No discharge	No discharge
<b>Total</b>	<b>20,722,000</b>	<b>17,478,000</b>	<b>No discharge</b>

<sup>a</sup> Volume represents continued spring run-off and residual from discharge.

**Table 17**

**Daily Flow Data Recorded at Ponds C-1 and C-2 (Woman Creek)**

<u>Date</u>	<u>Pond C-1 (Gallons)</u>	<u>Pond C-2 (Gallons)</u>
04/01/92	733,000	1,115,300
04/02/92	719,000	1,217,000
04/03/92	639,000	1,227,100
04/04/92	521,000	1,221,000
04/05/92	504,000	1,066,400
04/06/92	469,000	1,027,800
04/07/92	459,000	723,300
04/08/92	445,000	No discharge
04/09/92	416,000	
04/10/92	410,000	
04/11/92	413,000	
04/12/92	432,000	
04/13/92	376,000	
04/14/92	408,000	
04/15/92	526,000	
04/16/92	707,000	
04/17/92	638,000	
04/18/92	537,000	
04/19/92	526,000	
04/20/92	513,000	
04/21/92	325,000	
04/22/92	364,000	
04/23/92	343,000	
04/24/92	225,000	
04/25/92	249,000	
04/26/92	353,000	
04/27/92	181,000	
04/28/92	171,000	
04/29/92	153,000	
04/30/92	153,000	No discharge
Total	12,908,000	7,597,900

**Table 18**

**Daily Transfer Flow Data Recorded for Pond B-5 to Pond A-4**

<u>Date</u>	<u>Pond B-5 to Pond A-4 (gallons)</u>
04/01/92	912,000
04/02/92	975,500
04/03/92	944,100
04/04/92	779,900
04/05/92	162,600
04/06/92	No transfer
04/07/92	
04/08/92	
04/09/92	
04/10/92	
04/11/92	
04/12/92	
04/13/92	
04/14/92	
04/15/92	
04/16/92	
04/17/92	
04/18/92	
04/19/92	
04/20/92	
04/21/92	No transfer
04/22/92	414,300
04/23/92	922,900
04/24/92	1,129,700
04/25/92	1,034,600
04/26/92	1,006,500
04/27/92	1,032,100
04/28/92	1,041,600
04/29/92	1,007,500
04/30/92	931,900
Total	11,474,400

# Site Meteorology and Climatology

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Meteorological data were collected on the plantsite during April 1992 from instrumentation installed on a 61-meter (200-foot) tower located in the west buffer zone. Meteorological information in this report represents over 100 percent data recovery. Table 19 is the April 1992 summary of the percent frequency of wind directions (16 compass points) divided into four wind-speed categories. The compass point designations indicate the true bearing when facing against the wind. These frequency values are represented graphically in the accompanying wind rose. The wind rose vectors also represent the bearing against the wind (i.e., wind along each vector blows toward the center).

Wind directions from the west through northwest occur most frequently at the Rocky Flats Plant, especially when speeds are greater than 3 m/s (6.7 mph). At lighter wind speeds less than 3 m/s (6.7 mph), the distribution of wind directions is more even. Wind speeds greater than 7 m/s (15.7 mph) from the ESE through S occur infrequently. The distribution of winds during April 1992 was quite typical.

April was dry and unusually warm as high pressure systems, located over the western United States much of the time, forced Pacific storms well north of Colorado. The month's climatic summary is shown in Table 20. The only significant precipitation fell on April 14-16, when showers and thundershowers produced 1.2 cm (0.46 in.). Another storm travelling through Wyoming caused strong Chinook winds on April 18, but caused little precipitation. The remainder of the month was dry with unusually warm weather occurring on the final 4 days. The maximum temperature reached 28 °C (82 °F) on April 30. The low temperature on this date was also noteworthy, reaching only 16 °C (61 °F).

The mean wind speed during April was 3.8 m/s (8.5 mph). The peak wind gust during the month was 28 m/s (63 mph), which occurred during Chinook winds on April 18 at about 1:15 a.m. MST. The mean temperature recorded for April was 11.1 °C (52.0 °F). The maximum temperature recorded was about 28 °C (82 °F), which occurred on the last day of the month. The minimum

temperature recorded was -5 °C (23 °F) on the morning of April 1.

Water equivalent precipitation totalled 1.3 cm (0.53 inches) during April. The greatest daily precipitation occurred on April 16 when 0.5 cm (0.21 inches) was recorded.

**Table 19**

**Rocky Flats Plant Wind Direction Frequency (Percent) by Four Wind-Speed Classes**

(Fifteen-Minute Averages - April 1992)

	<u>Calm</u>	<u>1-3</u> <u>(m/s)</u>	<u>3-7</u> <u>(m/s)</u>	<u>7-15</u> <u>(m/s)</u>	<u>&gt; 15</u> <u>(m/s)</u>	<u>Total</u>
N	-	2.89	2.44	0.49	0.00	5.82
NNE	-	2.19	1.91	0.07	0.00	4.17
NE	-	2.12	1.46	0.00	0.00	3.58
ENE	-	2.19	1.39	0.00	0.00	3.58
E	-	3.27	1.22	0.00	0.00	4.49
ESE	-	3.13	1.22	0.00	0.00	4.35
SE	-	3.03	2.65	0.00	0.00	5.68
SSE	-	2.61	2.54	0.03	0.00	5.18
S	-	2.37	2.37	.14	0.00	4.88
SSW	-	2.23	2.65	0.03	0.00	4.91
SW	-	2.16	5.05	0.14	0.00	7.35
WSW	-	2.02	3.97	0.77	0.00	6.76
W	-	2.89	3.97	1.67	0.00	8.53
WNW	-	2.85	5.15	3.24	0.14	11.38
NW	-	3.41	5.40	1.74	0.00	10.55
NNW	-	3.17	3.20	0.87	0.00	7.24
<b>TOTAL</b>	<b>1.55</b>	<b>42.53</b>	<b>46.59</b>	<b>9.19</b>	<b>0.14</b>	<b>100.00</b>

**Table 20**

**Climatic Summary**

Date	TEMPERATURE AND DEWPOINT				WIND DATA		PRECIPITATION		PRESSURE
	High (°F)	Low	Mean	Dew-point	Mean (mph)	Maximum (1 sec)	Maximum (15 min)	Total Inches	Actual Mean (Millibars)
04/01/92	49.1	22.6	37.7	15.2	6.3	19.6	0	0	814.0
04/02/92	50.6	32.0	43.4	25.4	6.5	25.5	0	0	812.3
04/03/92	63.5	40.1	54.9	23.5	8.8	31.4	0	0	808.9
04/04/92	64.9	49.2	57.8	24.3	11.6	30.8	0	0	807.2
04/05/92	61.7	45.2	54.8	27.1	9.0	34.4	0	0	806.1
04/06/92	58.9	39.8	50.0	30.9	8.2	35.9	0	0	809.3
04/07/92	51.8	29.9	42.0	28.4	5.9	24.5	0	0	813.1
04/08/92	66.2	41.8	56.9	25.1	12.6	36.8	0	0	809.9
04/09/92	67.9	38.8	55.7	26.1	8.1	20.2	0	0	809.1
04/10/92	70.7	52.3	61.7	26.3	11.4	36.6	0	0	806.6
04/11/92	59.7	40.6	50.9	33.6	8.0	25.7	0.06	0.03	812.5
04/12/92	65.1	38.6	52.0	38.8	3.9	12.9	0	0	813.8
04/13/92	74.3	48.3	64.5	24.9	8.0	33.8	0	0	813.2
04/14/92	64.0	43.2	54.3	35.5	6.8	20.6	0.12	0.03	811.7
04/15/92	54.9	43.2	48.0	37.4	4.8	17.5	0.13	0.02	812.0
04/16/92	45.5	39.2	42.8	34.4	6.2	22.3	0.21	0.04	811.3
04/17/92	68.2	40.9	55.0	32.3	10.2	48.5	0	0	804.6
04/18/92	50.2	35.2	43.2	20.2	17.5	62.5	0	0	801.4
04/19/92	51.2	31.5	42.9	22.1	10.1	34.4	0	0	806.9
04/20/92	54.1	29.5	41.1	22.9	9.5	35.7	0	0	807.8
04/21/92	62.5	32.8	50.3	22.1	7.0	22.8	0	0	806.2
04/22/92	61.1	39.9	50.9	29.1	6.9	31.0	0.01	0.01	805.6
04/23/92	56.3	34.7	49.1	26.2	12.2	45.4	0	0	813.0
04/24/92	54.3	30.1	43.3	23.3	6.5	18.0	0	0	819.5
04/25/92	53.0	30.7	43.1	21.2	5.3	16.4	0	0	819.7
04/26/92	62.3	32.4	49.7	25.7	6.0	17.3	0	0	818.3
04/27/92	77.2	44.2	64.6	27.2	10.2	48.9	0	0	815.3
04/28/92	71.7	54.2	63.6	31.5	8.2	30.6	0	0	816.1
04/29/92	75.4	49.7	63.6	31.8	7.1	17.5	0	0	815.4
04/30/92	82.1	61.4	72.5	24.5	11.6	35.9	0	0	808.5

MONTHLY TEMPERATURES				WIND DATA		PRECIPITATION		PRESSURE
Mean High (°F)	Mean Low	Mean	Mean Dew-point	Mean (mph)	Monthly Maximum	Monthly Maximum	Total	Monthly Average
61.6	39.7	52.0	27.2	8.5	62.5	<del>0.53</del> 0.21	<del>0.04</del> 0.57	811.0



# Appendix A

## Radiation Standards for Protection of the Public

### Calculation of Potential Plant Contribution to Public Radiation Dose

The primary standards for protection of the public from radiation are based on radiation dose. Radiation dose is a means of quantifying the biological damage or risk of ionizing radiation. The unit of radiation dose is the rem or the millirem (1 rem = 1,000 mrem). Radiation protection standards for the public are annual standards, based on the projected radiation dose from a year's exposure to or intake of radioactive materials.

Radiation dose is a calculated value. It is calculated by multiplying radioactivity concentrations in air and water or on contaminated surfaces by assumed intake rates (for internal exposures) or by exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

$$\text{Radiation Dose} = \text{Radioactivity Concentration} \times \text{Intake Rate/Exposure Time} \times \text{Dose Conversion Factor}$$

Radioactivity concentrations can be determined either by measurements in the environment or by calculations using computer models. These computer models perform airborne dispersion/dose modeling of measured building radioactivity effluents and estimated diffuse source term emissions (e.g., from resuspension from contaminated soil areas).

Assumed intake rates and dose conversion factors used are based on recommendations of national and international radiation protection advisory organizations, such as the National Council on Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

Radioactive materials of importance in calculating radiation dose to the public from Rocky Flats Plant (RFP) activities include plutonium, uranium, americium, and tritium. Alpha radiation emissions from plutonium, uranium, and americium are primary contributors to the projected radiation dose.

#### DOE Radiation Protection Standards for the Public

##### ICRP-Recommended Standards for all Pathways:

Temporary Increase - 500 mrem/year  
Effective Dose Equivalent  
(with prior approval of DOE EH-2)

Normal Operations - 100 mrem/year  
Effective Dose Equivalent

##### EPA Clean Air Act Standards for the Air Pathway Only:

10 mrem-year Effective Dose  
Equivalent

**DOE Derived Concentration Guides for Radionuclides of Interest at the Rocky Flats Plant**

**Air Inhalation:**

Radionuclide	DCG (pCi/m <sup>3</sup> )
Plutonium-239, -240	0.02

**Water Ingestion:**

Radionuclide	DCG (pCi/l)
Plutonium-239, -240	30
Americium-241	30
Uranium-233, -234	500
Uranium-238	600
Hydrogen-3 (Tritium)	2,000,000

**DOE Derived Concentration Guides**

Potential public radiation dose commitments, which could have resulted from plant operations and from background (i.e., non-Plant) contributions, are calculated from average radionuclide concentrations measured at the Department of Energy (DOE) property boundary and in surrounding communities. Inhalation and water ingestion are the principal potential pathways of human exposure.

On February 8, 1990, DOE adopted DOE Order 5400.5, "Radiation Protection of the Public and the Environment," a radiation protection standard for DOE environmental activities (US 90). This standard incorporates guidance from the International Commission on Radiological Protection (ICRP), as well as from the Environmental Protection Agency Clean Air Act air emission standards (as implemented in 40 CFR 61, Subpart H). Included in DOE Order 5400.5 is a revision of the dose limits for members of the public. Tables of radiation dose conversion factors currently used for calculating dose from intakes of radioactive materials were issued in July 1988 (US88a, US88b). The dose factors are based on the ICRP Publications 30 and 48 methodology and biological models for radiation dosimetry. The DOE Order 5400.5 and the dose conversion factor tables are used for assessment of any potential RFP contribution to public radiation dose. On December 15, 1989, EPA published revised Clean Air Act air emission standards for DOE facilities (US89). DOE radiation standards for protection of the public are given in this Appendix and include the December 15, 1989, EPA Clean Air Act air pathway standards.

Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations. DOE provides tables of these "Derived Concentration Guides" - in Order 5400.5. Derived Concentration Guides (DCGs) are the concentrations that would result in an effective dose equivalent of 100 mrem from one year's chronic exposure or intake. In calculating air inhalation DCGs, DOE assumes that the exposed individual inhales 8,400 cubic meters of air at the calculated DCG during the year. Ingestion DCGs

**Compliance with EPA  
Clean Air Act Standards**

assume a water intake of 730 liters at the calculated DCG for the year. The table on page 40 lists the most restrictive air and water DCGs for the principal radionuclides of interest at the RFP.

To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions are entered into the EPA-approved atmospheric dispersion/dose calculation computer model, AIRDOS-PC, for calculation of the maximum radiation dose that an individual in the public could receive from the air pathway only.

For comparison with the annual radiation dose standards for protection of the public, the maximum annual effective dose equivalent that a member of the public could receive as a result of RFP activities is typically less than 1 mrem, or less than 1 percent of the recommended annual standard for all pathways.

**Dose Equivalent and Effective Dose Equivalent**

Dose equivalent is a calculated value used to quantify radiation dose; it reflects the degree of biological effect from ionizing radiation. Differences in the biological effect of different types of ionizing radiation (e.g., alpha, beta, gamma, or x-rays) are accounted for in the calculation of dose equivalent.

Effective dose equivalent is a calculated value used to allow comparisons of total health risk (based primarily on the risk of cancer mortality) from exposures of different types of ionizing radiation to different body organs. It is calculated by first calculating the dose equivalent to those organs receiving significant exposures, multiplying each organ dose equivalent by a health risk weighting factor, and then summing those products. One millirem effective dose equivalent from natural background radiation would have the same health risk as one millirem effective dose equivalent from an artificially produced source of radiation.

## References

**US88a** DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary for Environment, Safety and Health, July 1988.

**US88b** DOE/EH-0071, "Internal Dose Conversion Factors for Calculation of Dose to the Public," United States Department of Energy, Asst. Secretary of Environment, Safety and Health, July 1988.

**US89** United States Environmental Protection Agency, Code of Federal Regulations 40 CFR 61, Subpart H, "National Emission Standards for Emissions of Radionuclides other than Radon from Department of Energy Facilities," Washington, D.C., December 15, 1989.

**US90** United States Department of Energy, DOE Order 5400.5, "Radiation Protection of the Public and the Environment," Washington, D.C., February 8, 1990.

# Appendix B

## National Pollution Discharge Elimination System/Federal Facilities Compliance Agreement Volatile Organic Compounds

The following is a list of volatile organic compounds (VOCs) for which monitoring is required by the Environmental Protection Agency National Pollution Discharge Elimination System/Federal Facilities Compliance Agreement (NPDES/FFCA).

<u>Compound</u>	<u>PQL (ug/l)</u>	<u>Compound</u>	<u>PQL (ug/l)</u>
Benzene	5	1,3-dichloropropylene	5
Bromoform	5	Ethylbenzene	5
Methyl bromide	10	Methyl chloride	10
Carbon Tetrachloride	5	Methylene chloride	5
Chlorobenzene	5	1,1,2,2-tetrachloroethane	5
Chlorodibromomethane	5	Tetrachloroethylene	5
Chloroethane	10	Toluene	5
Chloroform	5	1,2-trans-dichloroethylene	5
Dichlorobromomethane	5	1,1,1-trichloroethane	5
1,1-dichloroethane	5	1,1,2-trichloroethane	5
1,2-dichloroethane	5	Trichloroethylene	5
1,1-dichloroethylene	5	Vinyl chloride	10
1,2-dichloropropane	5		



# Appendix C

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## *Colorado Water Quality Control Commission Standards*

The Colorado Water Quality Control Commission has promulgated new standards for the Walnut Creek and Woman Creek drainages downstream from the Rocky Flats Plant. The Environmental Protection Agency has not yet written a new National Pollutant Discharge Elimination System permit that reflects these standards; however, in the spirit of the Agreement in Principle completed between the Department of Energy and the State of Colorado, the plant is attempting to meet the standards at this time.



# **Appendix D**

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## **for Corrections and Updates Previously Reported Information**

**Table 4 - Errata January 1992**

**Plutonium Concentrations in Ambient Air for Onsite Samplers**

(12/23/91 - 1/20/92)

<b>Location</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-01 <sup>a</sup>	1	18000	0.000183	0.000017
S-02	1	36000	0.000002	0.000001
S-03	1	28000	0.000002	0.000001
S-04	1	28000	0.000002	0.000001
S-05	1	34000	0.000018	0.000003
S-06	1	32000	0.000144	0.000012
S-07	1	29000	0.000068	0.000007
S-08	1	34000	0.000068	0.000014
S-09 <sup>b</sup>	1	34000	0.000053	0.000010
S-10	1	33000	0.000002	0.000001
S-11	1	32000	0.000012	0.000003
S-13	1	33000	0.000004	0.000001
S-14	1	29000	0.000002	0.000001
S-16	1	33000	0.000001	0.000001
S-17	1	32000	0.000004	0.000001
S-18	1	32000	0.000009	0.000002
S-19	1	33000	0.000009	0.000002
S-20	1	33000	0.000006	0.000001
S-21	1	34000	0.000004	0.000001
S-22	1	28000	0.000004	0.000001
S-23	1	32000	0.000008	0.000001
S-24	1	34000	0.000003	0.000001
S-25	1	28000	0.000036	0.000004
S-81 <sup>c</sup>				

- <sup>a</sup> Sampler was inoperable for part of the sampling period.
- <sup>b</sup> Previously reported as incomplete lab analyses.
- <sup>c</sup> Sampler was inoperable during the sampling period.

**Table 5 - Errata January 1992**

**Plutonium Concentrations in Ambient Air for Perimeter Samplers**

(12/17/91 - 1/28/92)

<u>Location</u>	<u>Number Composited Monthly Samples</u>	<u>Volume (m<sup>3</sup>)</u>	<u>Plutonium Concentration (pCi/m<sup>3</sup>)</u>	<u>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</u>
S-31	1	52000	0.000000	0.000000
S-32 <sup>a</sup>	1	51000	0.000000	0.000001
S-33	1	49000	0.000000	0.000000
S-34	1	48000	0.000000	0.000000
S-35	1	47000	0.000000	0.000000
S-36	1	51000	0.000001	0.000000
S-37	1	48000	0.000002	0.000000
S-38	1	47000	0.000001	0.000000
S-39	1	48000	0.000002	0.000001
S-40	1	51000	0.000001	0.000000
S-41	1	47000	0.000003	0.000001
S-42	1	45000	0.000004	0.000001
S-43	1	48000	0.000002	0.000001
S-44 <sup>a</sup>	1	46000	0.000001	0.000001

<sup>a</sup> Previously reported as incomplete lab analysis.

**Table 7 - Errata January 1992**

**Onsite Water Sample Results - Plutonium and Americium**

**Holding Pond Outfall (pCi/l)**

<u>Location</u>	<u>Plutonium-239, -240</u>	<u>Americium-241</u>
<b><u>Pond A-4</u></b>		
01/04/92 - 01/10/92	-0.004 ± 0.003	-0.001 ± 0.003
Volume weighted average concentration	-0.004 ± 0.003	-0.001 ± 0.003
<b><u>Pond B-5</u> - No discharge.</b>		
<b><u>Pond C-1</u></b>		
01/04/92 - 01/10/92	0.004 ± 0.002	0.001 ± 0.002
01/11/92 - 01/17/92	0.002 ± 0.002	0.001 ± 0.002
01/18/92 - 01/24/92	0.002 ± 0.003	-0.002 ± 0.002
01/25/92 - 01/31/92	0.001 ± 0.002	-0.003 ± 0.001
Average concentration	0.002 ± 0.001	-0.001 ± 0.002
<b><u>Pond C-2</u> No discharge</b>		
<b><u>Walnut Creek at Indiana</u></b>		
01/04/92 - 01/10/92	0.014 ± 0.004	0.002 ± 0.002
Volume weighted average concentration	0.014 ± 0.004	0.002 ± 0.002

**Table 9 - Errata January 1992**

**Offsite Water Sample Results - Plutonium and Americium**

<b>Location</b>	<b>Number of Samples</b>	<b>Reservoirs (pCi/l)</b>		<b>Americium-241</b>
		<b>Plutonium-239, -240</b>		
Great Western	1 <sup>a</sup>	-0.032 ± 0.015	-0.002 ± 0.002	
Standley Lake	1 <sup>a</sup>	-0.007 ± 0.005	-0.002 ± 0.002	
<b>Community Tap Water (pCi/l)</b>				
Boulder	1 <sup>a</sup>	-0.012 ± 0.003	-0.001 ± 0.002	
Broomfield	1 <sup>a</sup>	-0.014 ± 0.004	0.001 ± 0.002	
Westminster	1 <sup>a</sup>	-0.006 ± 0.007	-0.003 ± 0.012	

<sup>a</sup> Plutonium and americium analyses are performed on one sample composited from four weekly grab samples.

**Table 4 - Errata February 1992**

**Plutonium Concentrations in Ambient Air for Onsite Samplers**

(01/20/92 - 02/17/92)

<u>Location</u>	<u>Number Composited Monthly Samples</u>	<u>Volume (m<sup>3</sup>)</u>	<u>Plutonium Concentration (pCi/m<sup>3</sup>)</u>	<u>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</u>
S-01a	1			
S-02	1	35000	0.000019	0.000005
S-03	1	28000	0.000005	0.000002
S-04	1	28000	0.000007	0.000003
S-05b	1	33000	0.000042	0.000010
S-06b	1	31000	0.002126	0.000352
S-07b	1	27000	0.001002	0.000184
S-08	1	30000	0.001290	0.000208
S-09b	1	31000	0.002149	0.000381
S-10	1	30000	0.000023	0.000006
S-11	1	30000	0.000007	0.000003
S-13b	1	30000	0.000003	0.000002
S-14	1	28000	0.000002	0.000002
S-16	1	32000	0.000003	0.000002
S-17	1	30000	0.000016	0.000005
S-18b	1	30000	0.000033	0.000009
S-19	1	30000	0.000110	0.000020
S-20	1	33000	0.000093	0.000021
S-21	1	21000	0.000021	0.000006
S-22	1	26000	0.000010	0.000004
S-23	1	32000	0.000008	0.000003
S-24	1	32000	0.000005	0.000002
S-25	1	25000	0.000151	0.000032
S-81a				

a. Sampler was inoperable during the sampling period.

b. Previously reported as incomplete lab analyses.

**Table 5 - Errata February 1992**

**Plutonium Concentrations in Ambient Air for Perimeter Samplers**

(01/29/91 - 02/26/91)

<b>Location</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-31a	1	34000	0.000000	0.000001
S-32a	1	33000	0.000004	0.000001
S-33b	1			
S-34a	1	31000	0.000001	0.000001
S-35a	1	30000	0.000000	0.000001
S-36a	1	33000	0.000003	0.000002
S-37a	1	32000	0.000005	0.000003
S-38a	1	31000	0.000003	0.000002
S-39a	1	32000	0.000000	0.000001
S-40a	1	34000	0.000001	0.000001
S-41a	1	33000	0.000004	0.000005
S-42b	1			
S-43a	1	31000	0.000001	0.000001
S-44b	1			

- a Previously reported as incomplete lab analyses.
- b Incomplete lab analyses.

**Table 6 - Errata February 1992**

**Plutonium Concentrations in Ambient Air for Community Samplers**

(01/30/91 - 02/27/91)

<b>Location</b>	<b>Community Name</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-51	Marshall	1	30000	0.000001	0.000001
S-52	Jeffco Airport	1	33000	0.000001	0.000001
S-53	Superior	1	32000	0.000000	0.000001
S-54	Boulder	1	34000	0.000000	0.000001
S-55 <sup>a</sup>	Lafayette				
S-56	Broomfield	1	28000	0.000001	0.000001
S-57 <sup>a</sup>	Walnut Creek				
S-58	Wagner	1	33000	0.000000	0.000001
S-59	Leyden	1	34000	0.000000	0.000001
S-60	Westminster	1	32000	0.000001	0.000001
S-61 <sup>b</sup>	Denver				
S-62	Golden	1	34000	0.000000	0.000001
S-68	Lakeview Pointe	1	37000	0.000001	0.000001
S-73	Cotton Creek	1	29000	0.000002	0.000001

<sup>a</sup> Sampler was damaged beyond repair and must be replaced.

<sup>b</sup> Sampler S-61 located in Denver was inoperative during this period. This sampler has been temporarily removed because of construction activities on the building where it is installed.

**Table 9 - Errata February 1992**

**Offsite Water Sample Results - Plutonium and Americium**

<b>Location</b>	<b>Number of Samples</b>	<b>Reservoirs (pCi/l)</b>	
		<b>Plutonium-239, -240</b>	<b>Americium-241</b>
Great Western	1 <sup>a</sup>	0.000 ± 0.002	-0.001 ± 0.002
Standley Lake	1 <sup>a</sup>	-0.002 ± 0.002	-0.007 ± 0.001
<b>Community Tap Water (pCi/l)</b>			
Boulder	1 <sup>a</sup>	-0.002 ± 0.001	-0.001 ± 0.002
Broomfield	1 <sup>a</sup>	0.001 ± 0.003	0.016 ± 0.006
Westminster	1 <sup>a</sup>	0.008 ± 0.003	0.014 ± 0.004

<sup>a</sup> Plutonium and americium analyses are performed on one sample composited from four weekly grab samples.

**Table 10 - Errata February 1992**

**Offsite Water Sample Results - Uranium**

<b>Reservoirs (pCi/l)</b>				
<u>Location</u>	<u>Number of Samples</u>	<u>Uranium-233, -234</u>		<u>Uranium-238</u>
Great Western	1 <sup>a</sup>	0.14	± 0.06	0.18 ± 0.06
Standley Lake	1 <sup>a</sup>	0.51	± 0.09	0.42 ± 0.08
<b>Community Tap Water (pCi/l)</b>				
Boulder	1 <sup>a</sup>	-0.19	± 0.05	-0.18 ± 0.04
Broomfield	1 <sup>a</sup>	0.15	± 0.06	0.14 ± 0.06
Westminster	1 <sup>a</sup>	0.09	± 0.06	0.10 ± 0.05

<sup>a</sup> Uranium analyses were performed on one sample composited from four weekly grab samples.

**Table 4 - Errata March 1992**

**Plutonium Concentrations in Ambient Air for Onsite Samplers**

(02/17/92 - 03/30/92)

<u>Location</u>	<u>Number Composited Monthly Samples</u>	<u>Volume (m<sup>3</sup>)</u>	<u>Plutonium Concentration (pCi/m<sup>3</sup>)</u>	<u>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</u>
S-01a	1			
S-02a	1			
S-03a	1			
S-04a	1			
S-05a	1			
S-06a	1			
S-07a	1			
S-08a	1			
S-09b	1	49000	0.000246	0.000064
S-10a	1			
S-11a	1			
S-13a	1			
S-14a	1			
S-16a	1			
S-17a	1			
S-18a	1			
S-19a	1			
S-20a	1			
S-21a	1			
S-22a	1			
S-23a	1			
S-24a	1			
S-25a	1			
S-81a	1			

<sup>a</sup> Incomplete laboratory analysis.  
<sup>b</sup> Previous reported as incomplete laboratory analysis.

**Table 6 - Errata March 1992**

**Plutonium Concentrations in Ambient Air for Community Samplers**

(02/26/92 - 03/25/92)

<b>Location</b>	<b>Community Name</b>	<b>Number Composited Monthly Samples</b>	<b>Volume (m<sup>3</sup>)</b>	<b>Plutonium Concentration (pCi/m<sup>3</sup>)</b>	<b>± 95 percent Confidence Interval (pCi/m<sup>3</sup>)</b>
S-51	Marshall	1	30000	0.000002	0.000001
S-52	Jeffco Airport	1	33000	0.000002	0.000001
S-53	Superior	1	33000	0.000001	0.000001
S-54	Boulder	1	33000	0.000000	0.000001
S-55 <sup>a</sup>	Lafayette				
S-56	Broomfield	1	28000	0.000001	0.000001
S-57 <sup>a</sup>	Walnut Creek				
S-58	Wagner	1	33000	0.000002	0.000001
S-59	Leyden	1	34000	0.000001	0.000001
S-60 <sup>c</sup>	Westminster	1			
S-61 <sup>b</sup>	Denver				
S-62 <sup>c</sup>	Golden	1			
S-68 <sup>c</sup>	Lakeview Pointe	1			
S-73 <sup>c</sup>	Cotton Creek	1			

<sup>a</sup> This sampler was damaged beyond repair and must be replaced.

<sup>b</sup> Sampler S-61 located in Denver was inoperative during this period. This sampler has been temporarily removed because of construction activities on the building where it is installed.

<sup>c</sup> Incomplete lab analyses.

# Distribution

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## Federal Agencies

USDOE, RFO  
Attn: R.M. Nelson, Jr.  
Bldg. 115

USEPA  
Attn: Dr. M. Lammering,  
R. Rutherford  
One Denver Place - Suite 1300  
999 18th Street  
Denver, CO 80202-2413

USEPA  
Attn: B. Lavelle  
999 18th Street, Suite 500  
8 HWM-FF  
Denver, CO 80202-2405

## State Government Agencies

Colorado Water Conservation Board  
Attn: N.C. Ioannides  
823 State Centennial Building  
1313 Sherman Street  
Denver, CO 80203

Denver Regional Council of  
Governments  
Attn: L. Mugler  
2480 W. 27th Avenue, #200B  
Denver, CO 80211

Department of Natural Resources  
Attn: B. Hamlett III  
1313 Sherman Street  
Denver, CO 80203

Rocky Flats Environmental  
Monitoring Council  
Attn: G. Swartz  
1536 Cole Blvd., Suite 325  
Denver West Office Park #4  
Golden, CO 80401

## City Governments

City of Arvada  
Utilities Division  
Attn: M. Mauro  
8101 Ralston Road  
Arvada, CO 80002

City of Boulder  
Office of the City Manager  
Attn: J. Piper, A. Struthers  
P.O. Box 791  
Boulder, CO 80302

City of Broomfield  
Attn: H. Mahan, K. Schnoor  
#6 Garden Office Center  
P.O. Box 1415  
Broomfield, CO 80038-1415

City of Fort Collins  
Office of the City Manager  
Attn: S. Burkett  
300 La Porte  
Fort Collins, CO 80525

City of Northglenn  
Attn: T. Ambalam  
11701 Community Center Drive  
Northglenn, CO 80233-1099

City of Thornton  
Attn: J. Ethredge, City Manager  
9500 Civic Center Drive  
Thornton, CO 80229-1120

City of Westminster  
Attn: W. Christopher, S. Ramer  
4800 W. 92nd Avenue  
Westminster, CO 80030

Denver Water Department  
Quality Control  
Attn: J. Dice  
1600 W. 12th Avenue  
Denver, CO 80254

## Health Departments

Boulder City/County Health  
Department - Division of  
Environmental Health  
Attn: T. Douville, V. Harris  
3450 Broadway  
Boulder, CO 80020

Colorado Department of Health  
4210 E. Eleventh Avenue  
Denver, CO 80020  
Attn: B. Barry, J. Bruch, G. Dancik,  
D. Fox, P. Frohardt, D. Holme,  
J. Jacobi, A. Lockhart, R. Quillin,  
J. Sowinski, R. Terry, T. Vernon

Jefferson County Health Department  
Attn: Dr. M. Johnson, C. Sanders  
260 South Kipling  
Lakewood, CO 80226

Tri County District Health  
Attn: S. Salyards  
4301 E. 72nd Avenue  
Commerce City, CO 80022

## Environmental

Advance Sciences, Inc.  
Attn: D. Kaskie, M.G. Waltermire  
405 Urban Street, Suite 401  
Lakewood, CO 80228

American Friends Service Co.  
Attn: T. Rauch  
1535 High Street, 3rd Floor  
Denver, CO 80218

Doty and Associates  
F.H. Blaha  
408 22nd Street  
Golden, CO 80401

P. Eloffson-Gardine  
8470 W. 52nd Place, Suite 9  
Arvada, CO 80002-3447

IT Corporation  
Attn: C. Rayburn  
5600 S. Quebec, Suite 280D  
Englewood, CO 80111

L.C. Holdings  
Attn: M. Jones  
18300 Hwy 72  
Golden, CO 80403-8222

Margie Reynolds  
8882 Comanche Drivet  
Longmont, CO 80503-8657

National Renewable Energy Laboratory  
Attn: R. Noun  
1617 Cole Blvd.  
Golden, CO 80402

PRC Environmental Management, Inc.  
Attn: R.J. Fox  
1099 18th Street, Suite 1960  
Denver, CO 80202

Peak Rock Spring Water  
Attn: S. Dolson  
4615 Broadway Street  
Boulder, CO 80304-0509

Rocky Flats Cleanup Commission  
Attn: K. Korkia  
1738 Wynkoop, Suite 302  
Denver, CO 80202

Sierra Club - Rocky Mountain Chapter  
Attn: Dr. E. DeMayo  
11684 Ranch Elsie Road  
Golden, CO 80203

W. Gale Biggs Associates  
Attn: Dr. W. Gale Biggs  
P.O. Box 3344  
Boulder, CO 80307

Woodward Clyde/ERCE  
Attn: W. Glasgow  
Stanford Place 3, Suite 415  
4582 S. Ulster Street Pkwy.  
Denver, CO 80237

Wright Water Engineers  
Attn: J. Jones  
2490 W. 26th Avenue, Suite 100A  
Denver, CO 80211

### Print Media

Boulder Daily Camera  
Attn: G. Todd  
1048 Pearl Street  
Boulder, CO 80302

Denver Post  
Attn: M. Obmascik  
1560 Broadway  
Denver, CO 80216

Longmont Times-Call  
Attn: J. Paul  
350 Terry Street  
Longmont, CO 80501

Rocky Mountain News  
Attn: B. Scanlon  
400 W. Colfax Avenue  
Denver, CO 80204

### Other

National Center for Atmospheric  
Research  
Attn: S. Sadler  
P.O. Box 3000  
Boulder, CO 80307-3000

Physicians for Social  
Responsibility  
Attn: T. Perry  
1000 16th NW, Suite 810  
Washington, D.C. 20036

R.M. Borinsky  
13004 Lowell Court  
Broomfield, CO 80020

R.D. Morgenstern  
3213 W. 133rd Avenue  
Broomfield, CO 80020

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11767 W. 74th Way  
Arvada, CO 80005

L.S. Newton  
5993 W. 75th Avenue  
Arvada, CO 80003

F.H. Shoemaker  
13631 W. 54th Avenue  
Arvada, CO 80002

D.L. Weiland  
7648 Owens Court  
Arvada, CO 80005

### EG&G Rocky Flats

Rocky Flats Plant Public Reading  
Room  
c/o Front Range Community College  
3645 W. 112th Avenue  
Westminster, CO 80037  
R.S. Almquist, Air Quality &  
Chemical Tracking Division

S.K. Andrews, Surface Water  
Division

M.B. Arndt, Environmental  
Operations Management Division

S. Barros, Surface Water Division

D.L. Bokowski, Radiological Health  
Laboratory

E.A. Brovsky, General Chemistry

M.S. Brugh, Gen. Spect. Laboratory

S.A. Buckie, Op. Health Physics

W.S. Busby, Earth Resources  
Division

R.J. Crocker, Air Quality &  
Chemical Tracking Division

J.A. Cuicci, Liquid Waste

S.L. Cunningham, Info. Security

N.M. Daugherty, Air Quality & Chemical Tracking Division

N.S. Demos, Earth Resources Division

B. M. Bowen, Air Quality & Chemical Tracking Division

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L.A. Dunstan, Surface Water Division

J.E. Evered, Director Environmental Management

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H. Jordan, Safety Analysis

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F.G. McKenna, Legal Counsel

T.L. Morrow, Communications

W.E. Osborne, Air Quality & Chemical Tracking Division

B.J. Pauley, Air Quality & Chemical Tracking Division

D.R. Pierson, Pondrete Ops.

F. Primozic Waste Quality Engineering

J.G. Quillin, Radiological Health Laboratory

R.L. Renne, Radiological Health Laboratory

R.S. Roberts, Remediation Programs Division

J.K. Schwartz, Media Communications

G.H. Setlock, Manager, Air Quality & Chemical Tracking Division

T.A. Smith, Community Relations

D.B. Stuit, Radiological Health Laboratory

M.T. Sullivan, Radiation Protection

C. Trice, Radiological Health Laboratory

J.M. Wilson, Director, Communications

J.O. Zane, General Manager

J. Zarret, Analytical Labs