December - 1989 EM-4180110-183

ROCKY FLATS PLANT

MONTHLY ENVIRONMENTAL MONITORING REPORT

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DECEMBER 1989 ENVIRONMENTAL MONITORING REPORT
ROCKY FLATS PLANT

This report summarizes the effluent and environmental monitoring programs at the Rocky Flats Plant for the month of December 1989. The data presented herein are the best information available to the Rocky Flats Plant at this time. Should subsequent analyses indicate that any data presented herein are inaccurate or misleading appropriate revisions will be issued promptly.

Included in the report are monitoring results for radioactive and nonradioactive airborne effluents continuously sampled from Plant buildings, Tables I and II. Tables III through V summarize environmental monitoring data from the Rocky Flats Plant ambient air sampling network. This network is comprised of continuously operating air samplers located on plantsite, around the Plant boundary, and in neighboring communities.

Water sampling results for radioactive constituents are given in Tables VI through VIII. 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 which can receive surface water discharges from the Plant, are summarized in Table IX.

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 well as applicable discharge limitations imposed by that permit, are reported in Table X. Analytical results for nonradioactive parameters in water at the Walnut Creek at Indiana Street location are summarized in Table XI. Daily flow data for surface water from the two Plant drainage systems are given in Tables XI, XII, and XIII.

The data provided in this report are provided as a matter of comity 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 prior to publication of any data contained within this report.

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Table I. 1989 Plutonium and Uranium Airborne Effluent Data

Month	Plutonium (11/27/89 - 12/21/89 - DEC.) Release (uCi)	Plutonium C_{Max} (pCi/m3)	Uranium (11/28/89 - 01/02/90 - DEC.) Release (uCi)	Uranium C_{Max} (pCi/m3)
CY 1988	15.07	0.023 ± 0.0052	11.28	0.009 ± 0.0009
January	0.33	0.005 ± 0.0005	0.15	0.000 ± 0.0001
February	0.15	0.001 ± 0.0001	0.20	0.001 ± 0.0002
March	0.07	0.001 ± 0.0001	0.04	0.002 ± 0.0002
April	0.28	0.001 ± 0.0001	0.04	0.001 ± 0.0001
May	0.18	0.001 ± 0.0001	-0.03	0.001 ± 0.0001
June	0.06	0.001 ± 0.0001	0.06	0.001 ± 0.0002
July	0.18	0.001 ± 0.0002	0.15	0.001 ± 0.0002
August	0.07	0.001 ± 0.0002	1.87	0.000 ± 0.0002
September	0.16	0.032 ± 0.0096*	0.03	0.022 ± 0.0046*
October	0.05	0.000 ± 0.0000	0.07	0.000 ± 0.0002
November	0.32	0.002 ± 0.0002	0.21	0.001 ± 0.00002
December	3.03	0.145 ± 0.0060	4.83	0.217 ± 0.0231
Year to Date	4.88	0.145 ± 0.0060	7.60	0.217 ± 0.0231

551 Annex Filter Plenum 1984 last filter Δ

U-233, 234 ~~235/238~~

filter change dislodged contaminated material

551 e54 process enriched uranium

* These maximum concentrations are for a 4-day sampling period only.

remote operation of new main 6/day plenum

NOTE: The plutonium, uranium, americium, and beryllium measured concentrations in this report include values that are less than the corresponding calculated minimum detectable concentrations (MDC's). In some cases, the values are less than zero. This method of reporting began in January 1981. These negative values result when the measured value for the laboratory reagent blank is subtracted from an analytical result which was measured as a smaller value than the reagent blank. This may happen when measuring concentrations which are very close to zero.

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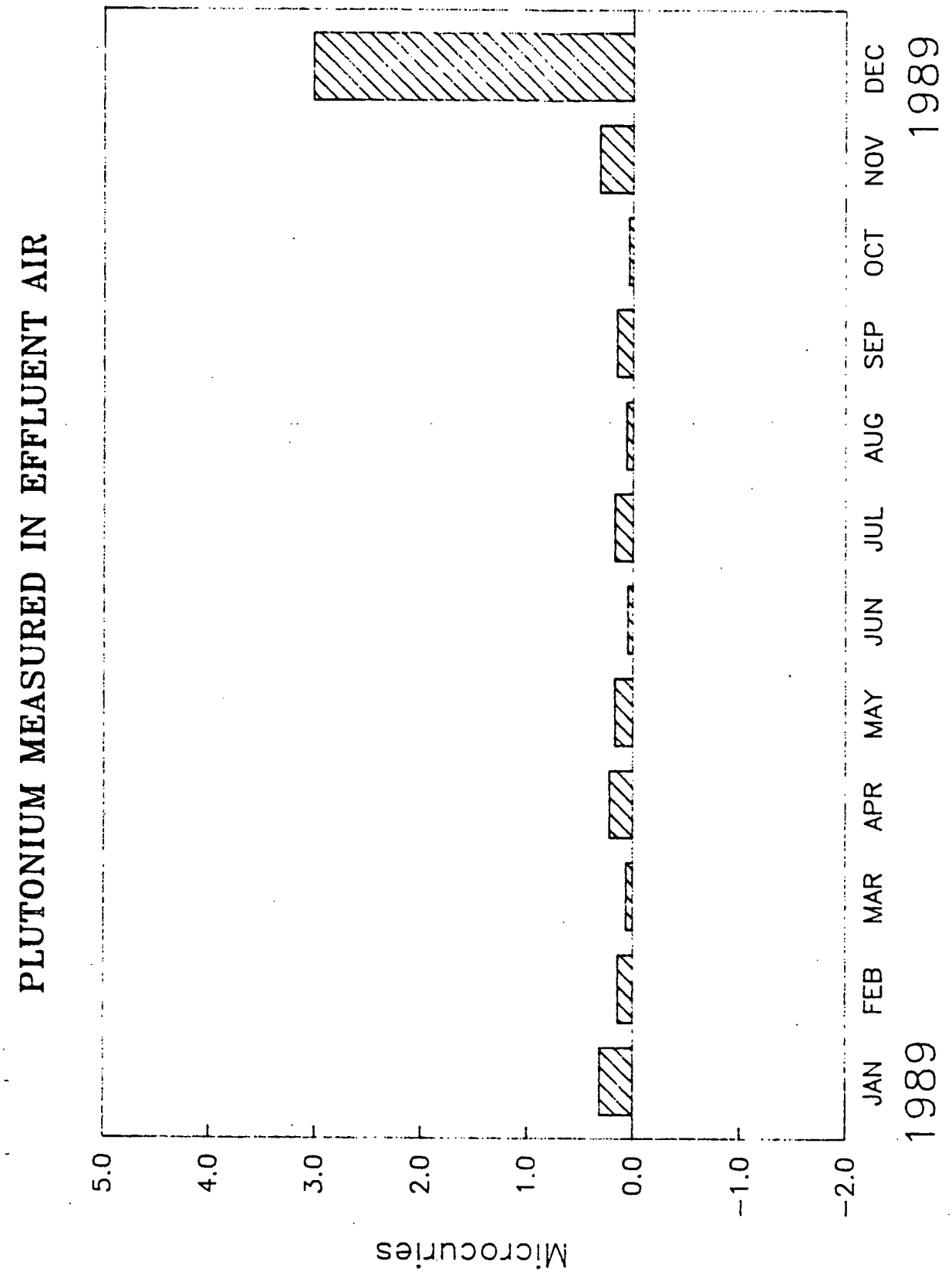
Table II. 1989 Tritium and Beryllium Airborne Effluent Data

Month	Tritium (12/04/89 - 01/03/90 - DEC.) Release (Ci)	Tritium C_{Max} (pCi/m3)	Beryllium (11/28/89 - 01/02/90 - DEC.) Release (grams)	Beryllium C_{Max} (ug/m3)
CY 1988	0.014	417 ± 250	0.1322	0.00041
January	0.001	97 ± 145	0.0285	0.00033
February	0.002	166 ± 120	-0.0392	-0.00005
March	0.007	389 ± 220	-0.0025	0.00000
April	0.152	14000 ± 320	-0.0031	0.00017
May	0.003	65 ± 35	0.0024	0.00004
June	0.001	99 ± 10	0.0525[a]	0.00025
July	0.001	108 ± 13	0.1727[a]	0.00106
August	0.006	2735 ± 34	0.1343[a]	0.00100
September	0.001	85 ± 10	0.0522[a,b]	0.00028[a,b]
October	0.001	64 ± 6	0.0704[a,b]	0.00029[a,b]
November	0.001	46 ± 7	0.1013[a,b]	0.00071[a,b]
December	0.000	24 ± 3	0.0747[a,b]	0.00056[a,b]
Year to Date	0.176	14000 ± 320	0.6442	0.00106

a. These results include no correction for analytical background.

b. The calibration methodology for the beryllium analyses was changed beginning with the September samples to improve quality assurance. The previous procedure used the single-point, "simple method of additions," one of the methods recommended by the manufacturerer 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.

NOTE: Beryllium measured at the remaining 44 locations was below the screening level of 0.1 gram per month.


PLUTONIUM MEASURED IN EFFLUENT AIR
Microcuries
5.0
4.0
3.0
2.0
1.0
0.0
-1.0
-2.0
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1989
1989

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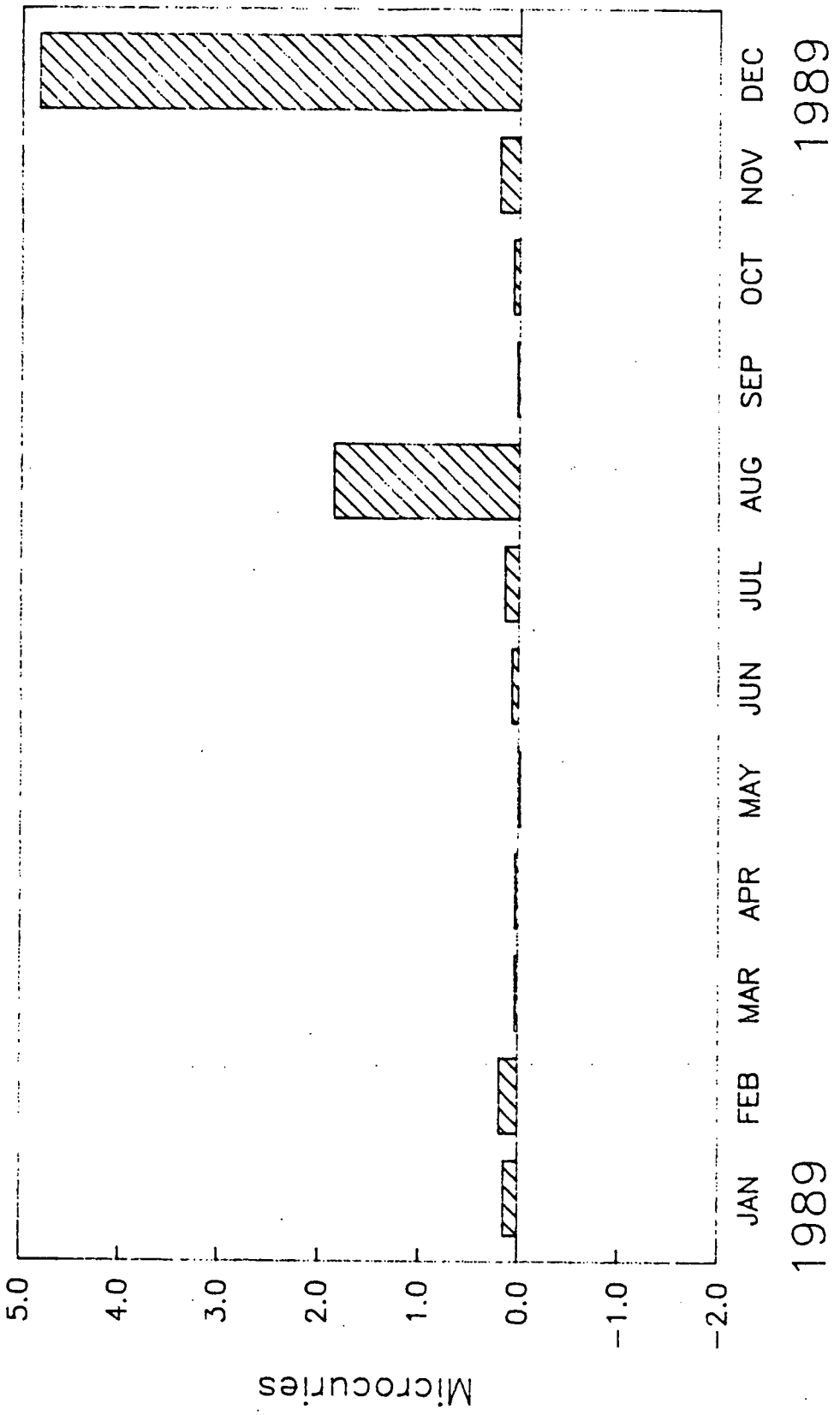
URANIUM MEASURED IN EFFLUENT AIR



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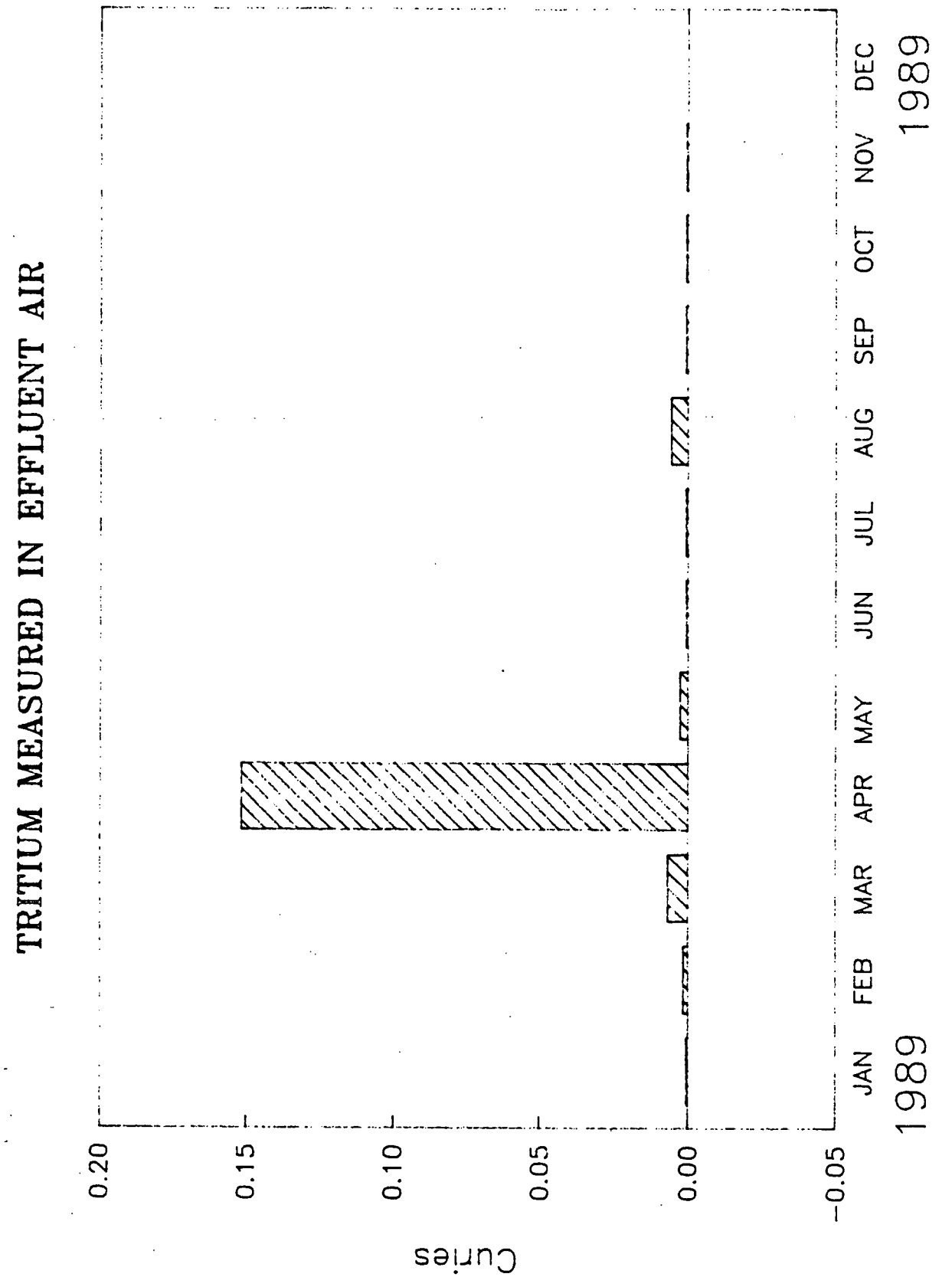
TRITIUM MEASURED IN EFFLUENT AIR
Curies
0.20
0.15
0.10
0.05
0.00
-0.05
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1989
1989

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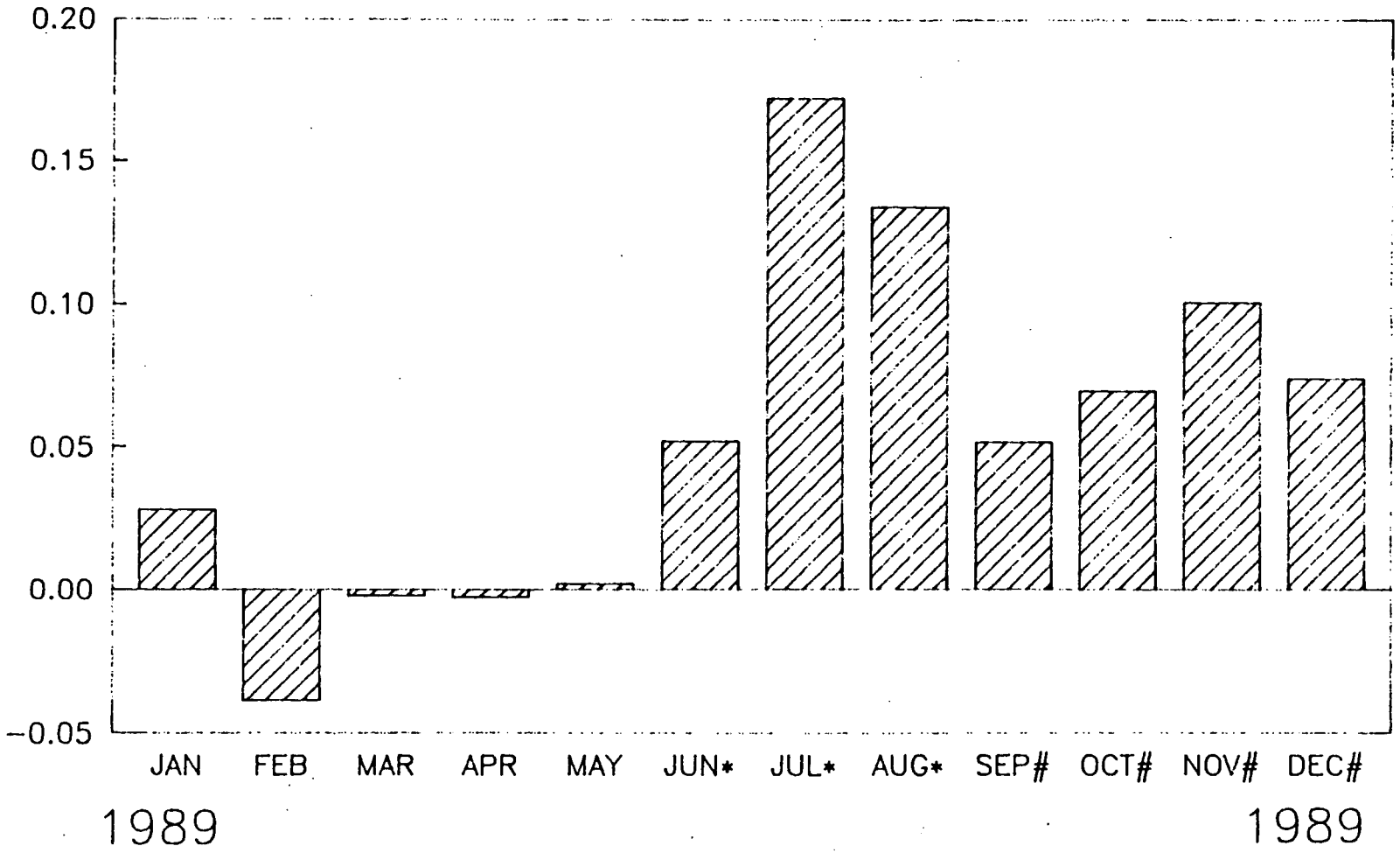
BERYLLIUM MEASURED IN EFFLUENT AIR



* NOT BLANK CORRECTED
\# NEW CALIBRATION TECHNIQUE

Table III.

Plutonium Concentration in Ambient Air for Selected Onsite Samplers

DECEMBER 1989

Location	N	Volume (m3)	Avg. Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-05	2	32000	0.000053	0.000007
S-06	2	26000	0.000065	0.000008
S-07	2	32000	0.000133 3/6	0.000016 4/6
S-08	2	40000	0.000031 4/6	0.000004 5/6
S-09	2	38000	0.000082	0.000010

NOTE: The total long-lived alpha activities of the remaining onsite ambient air sampler filters were below 0.01 pCi/m^3. Plutonium- specific analyses are performed and reported if any filter from these air samplers exceeds the Rocky Flats Plant screening level of 0.01 pCi/m^3 total long-lived alpha activity. Plutonium concentration data is routinely reported only for the five locations (above) which have historically produced the largest total long-lived alpha activities of the 23 onsite ambient air sampler locations.

Air samplers S-02 and S-04 were inoperational during this period.

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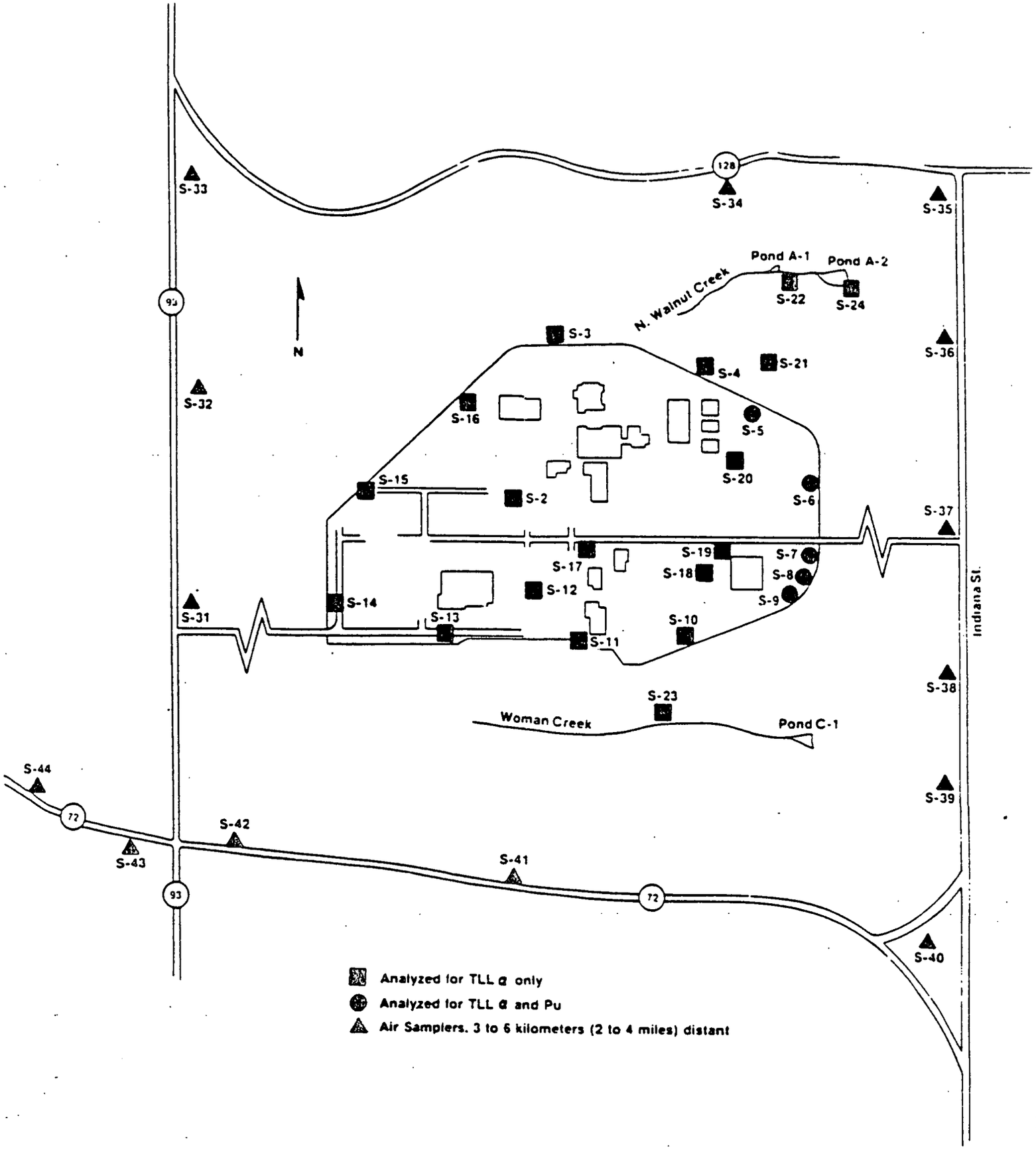

Location of Onsite and Plant Perimeter Ambient Air Samplers
(Portions of figure are not to scale.)

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CH

Table IV.

Plutonium Concentration in Ambient Air for Perimeter Samplers

DECEMBER 1989

Location	N	Volume (m3)	Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-31	1	35000	0.000002	0.000001
S-32	1	36000	0.000000	0.000001
S-33	1	34000	0.000000	0.000001
S-34	1	34000	0.000000	0.000001
S-35	1	36000	0.000001	0.000001
S-36	1	36000	0.000001	0.000001
S-37	1	32000	0.000002	0.000001
S-38	1	35000	0.000003 s/o	0.000001 s/o
S-39	1	34000	0.000001	0.000001
S-40	*			
S-41	1	35000	0.000001	0.000001
S-42	1	34000	0.000000	0.000001
S-43	1	34000	-0.000001 s/o	0.000001 s/o
S-44	1	34000	0.000002	0.000001

* S-40 air sampler was inoperational during this period.

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PLUTONIUM CONCENTRATIONS IN PERIMETER AMBIENT AIR

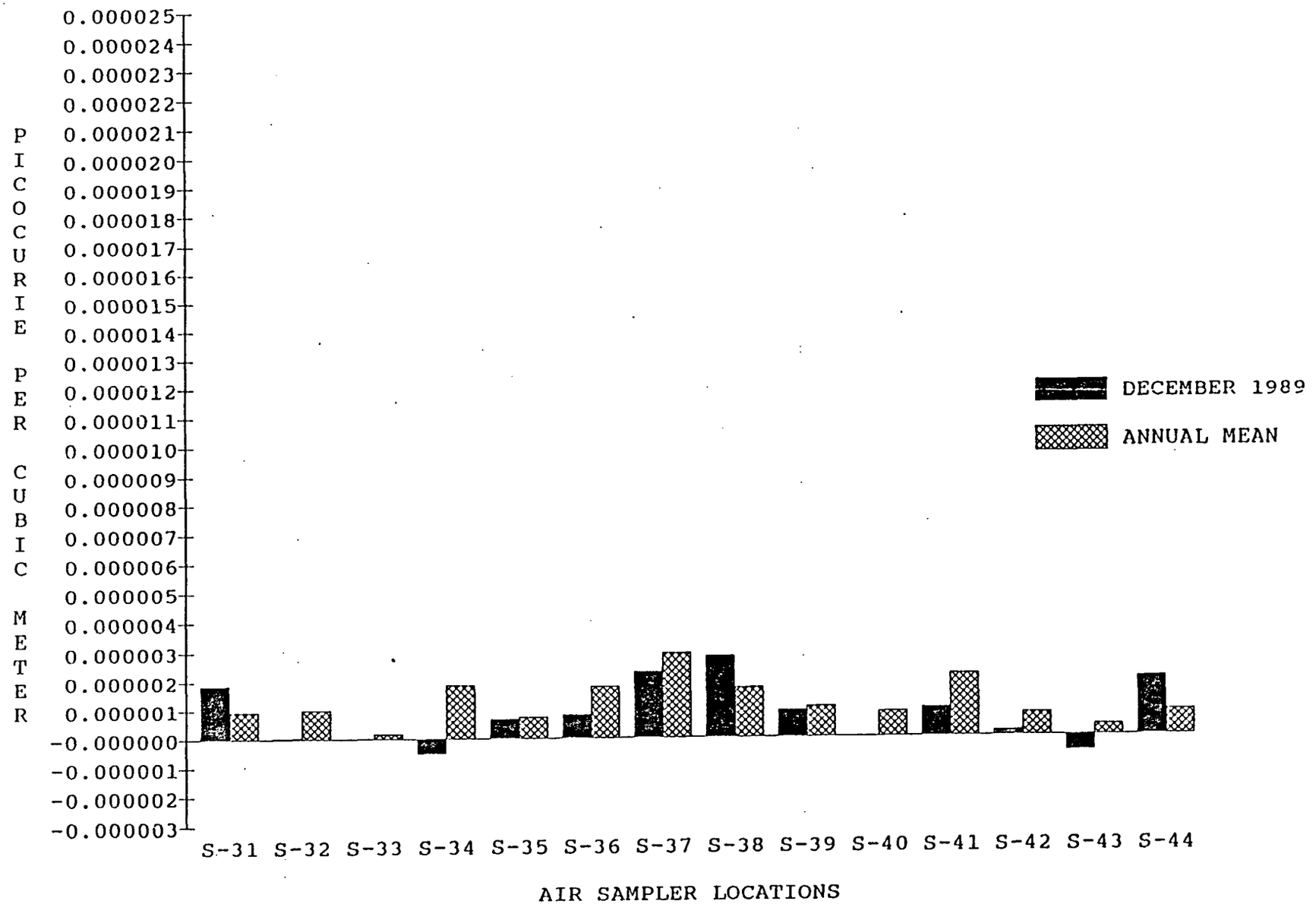

Table V.

Plutonium Concentration in Ambient Air for Community Samplers

DECEMBER 1989

Location	Community Name	n	Volume (m3)	Pu Conc. (pCi/m3)	+/- Error (pCi/m3)
S-51	MARSHALL	1	34000	0.000002 s/o	0.000001 s/o
S-52	JEFFCO AIRPORT	1	39000	0.000002 "	0.000001
S-53	SUPERIOR	1	32000	0.000000	0.000001
S-54	BOULDER	1	36000	0.000000	0.000001
S-55	LAFAYETTE	1	34000	0.000000	0.000001
S-56	BROOMFIELD	*			
S-57	WALNUT CREEK	1	34000	0.000000	0.000001
S-58	WAGNER	1	39000	0.000001	0.000001
S-59	LEYDEN	1	37000	0.000001	0.000001
S-60	WESTMINSTER	1	35000	0.000000	0.000001
S-61	DENVER	*			
S-62	GOLDEN	1	32000	0.000000	0.000001
S-68	LAKEVIEW POINTE	1	40000	0.000000	0.000001
S-73	COTTON CREEK	1	36000	-0.000001 "	0.000001 s/o

* Samplers S-56 and S-61 were inoperational during this period.

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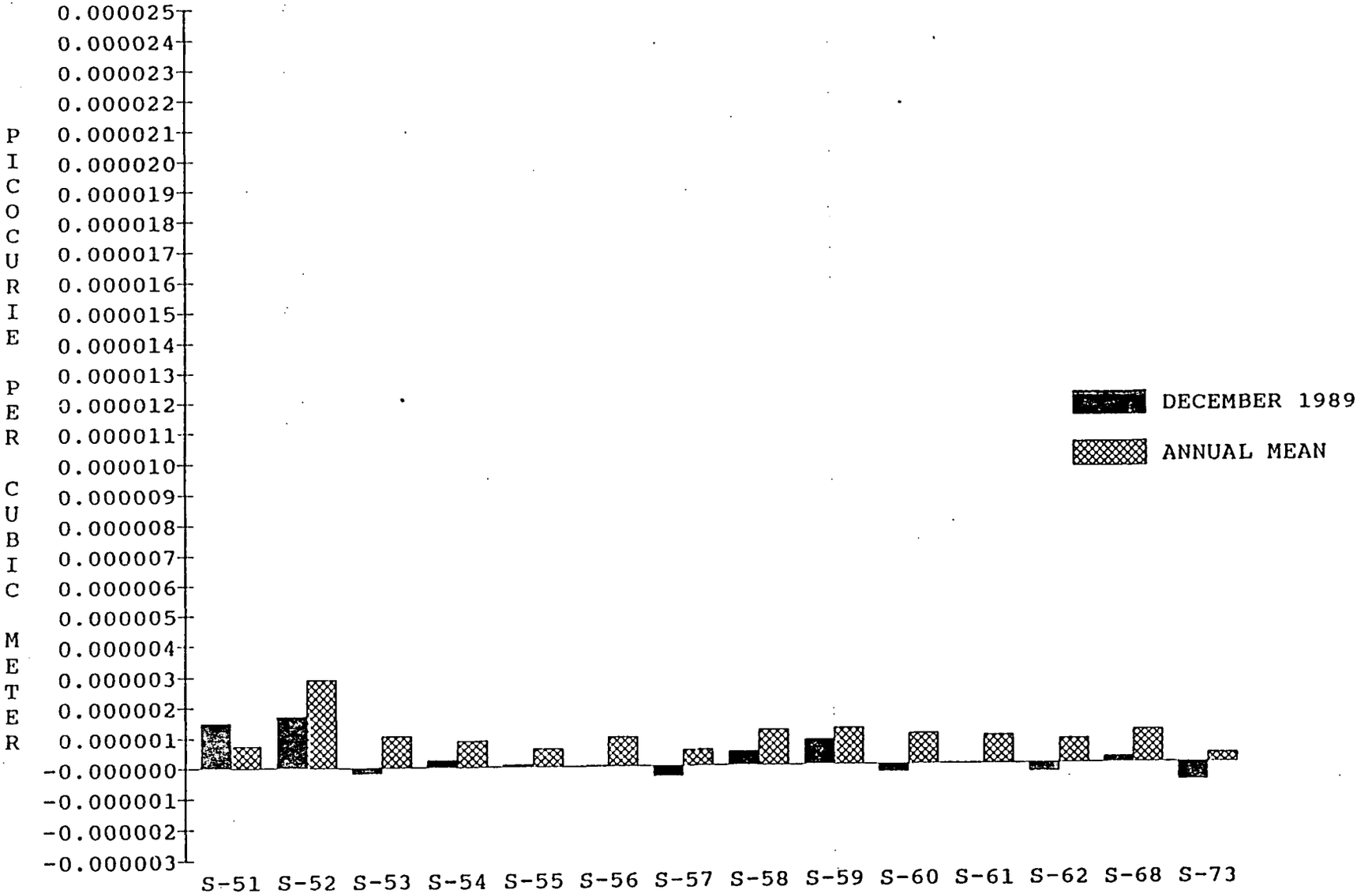
PLUTONIUM CONCENTRATIONS IN COMMUNITY AMBIENT AIR



Location of Community Ambient Air Samplers

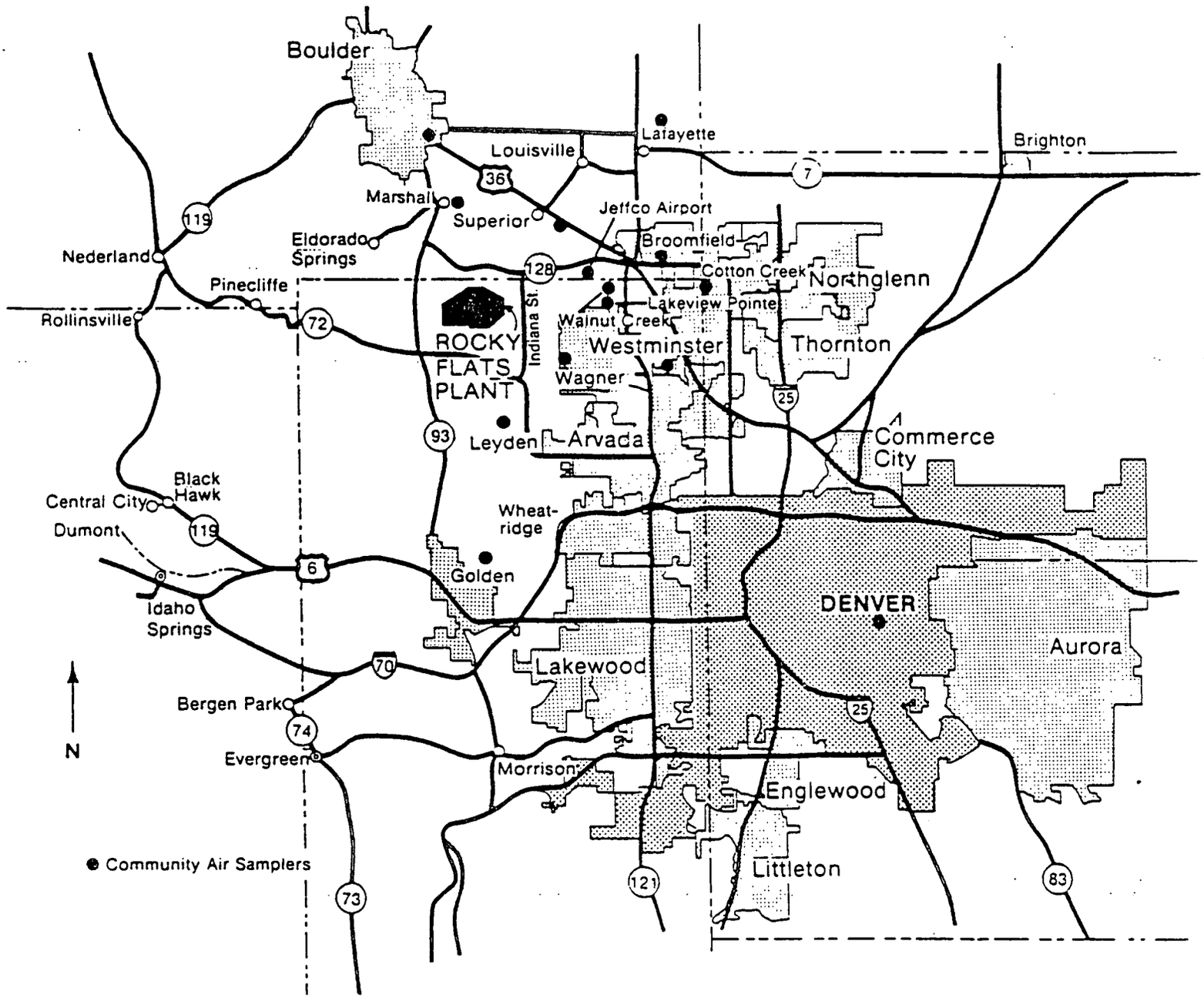


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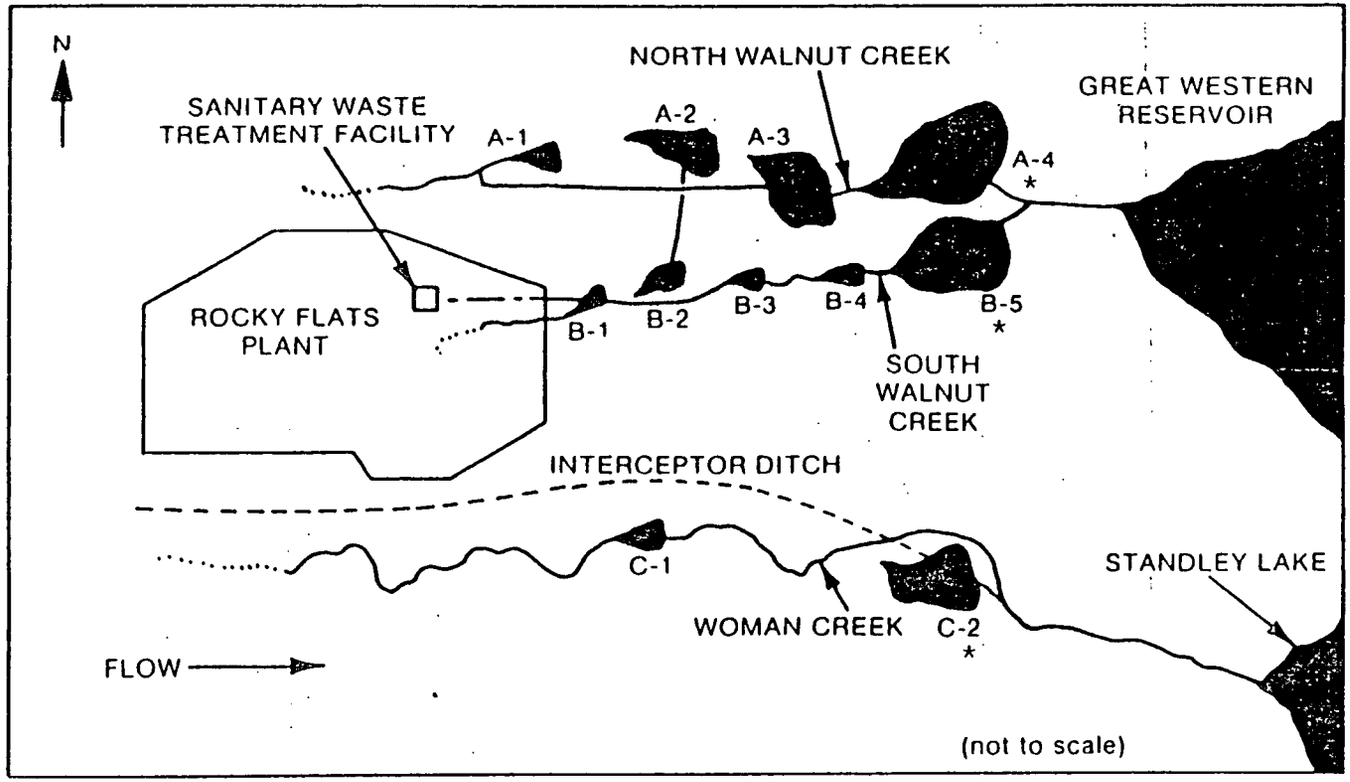
Table VI. Onsite Water Sample Results - Plutonium, Uranium, and Americium

Holding Pond Outfall (pCi/l)

Location	Plutonium	Uranium	Americium
Pond A-4			
No Discharge			
Average Concentration			
Pond B-5			
No Discharge			
Average Concentration			
Pond C-1			
12/04/89 to 12/08/89	0.008 ± 0.006	1.73 ± 0.12	0.001 ± 0.007
12/11/89 to 12/15/89	0.014 ± 0.030	1.92 ± 0.13	0.002 ± 0.007
12/18/89 to 12/22/89	0.078 ± 0.014*	2.06 ± 0.14	0.002 ± 0.007
Average Concentration	0.033 ± 0.005	1.90 ± 0.08	0.002 ± 0.004
Pond C-2			
No Discharge			
Average Concentration			
Walnut Creek at Indiana			
No Flow			
Average Concentration			

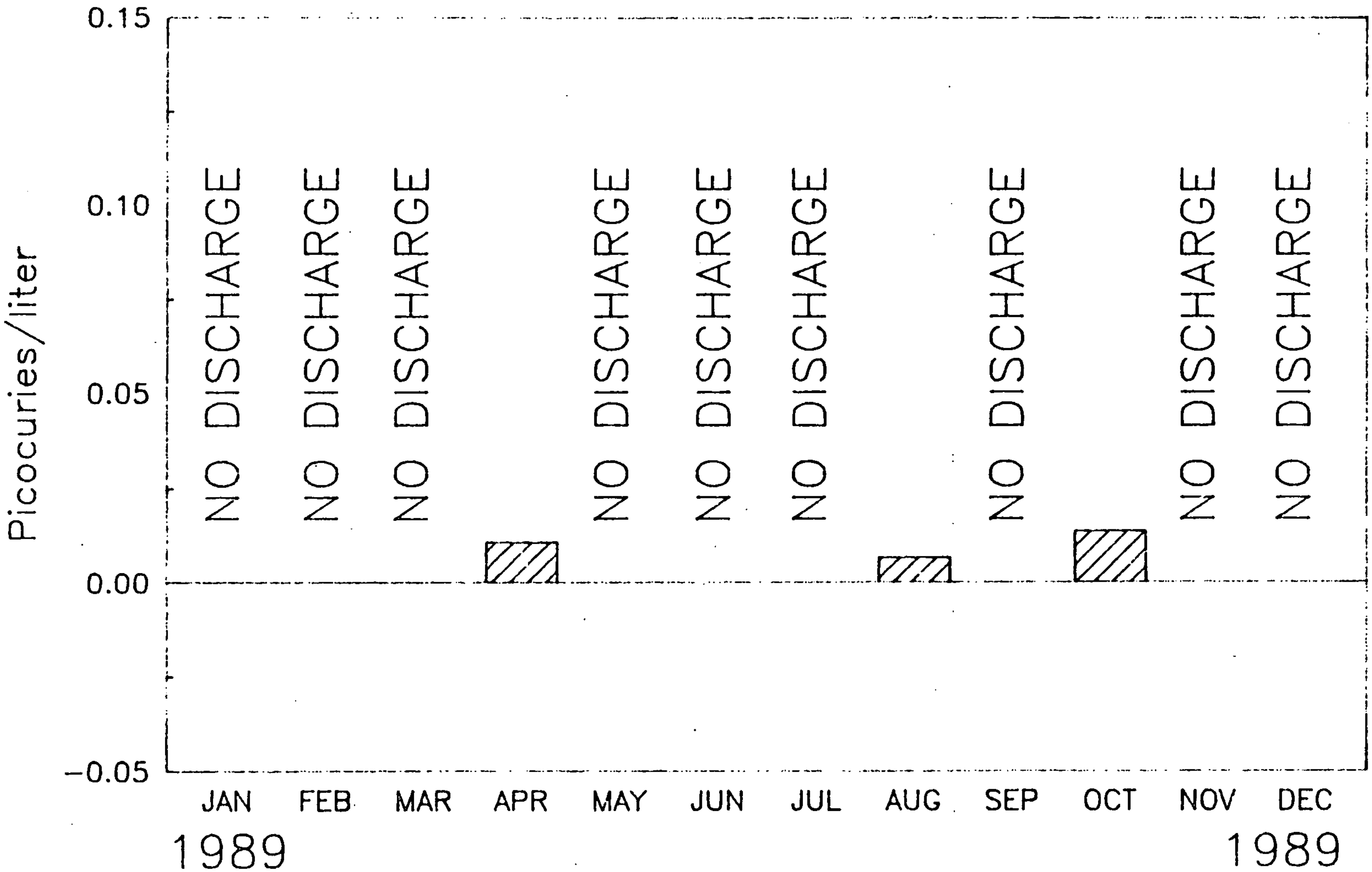
* Duplicate analyses being run to verify this value.



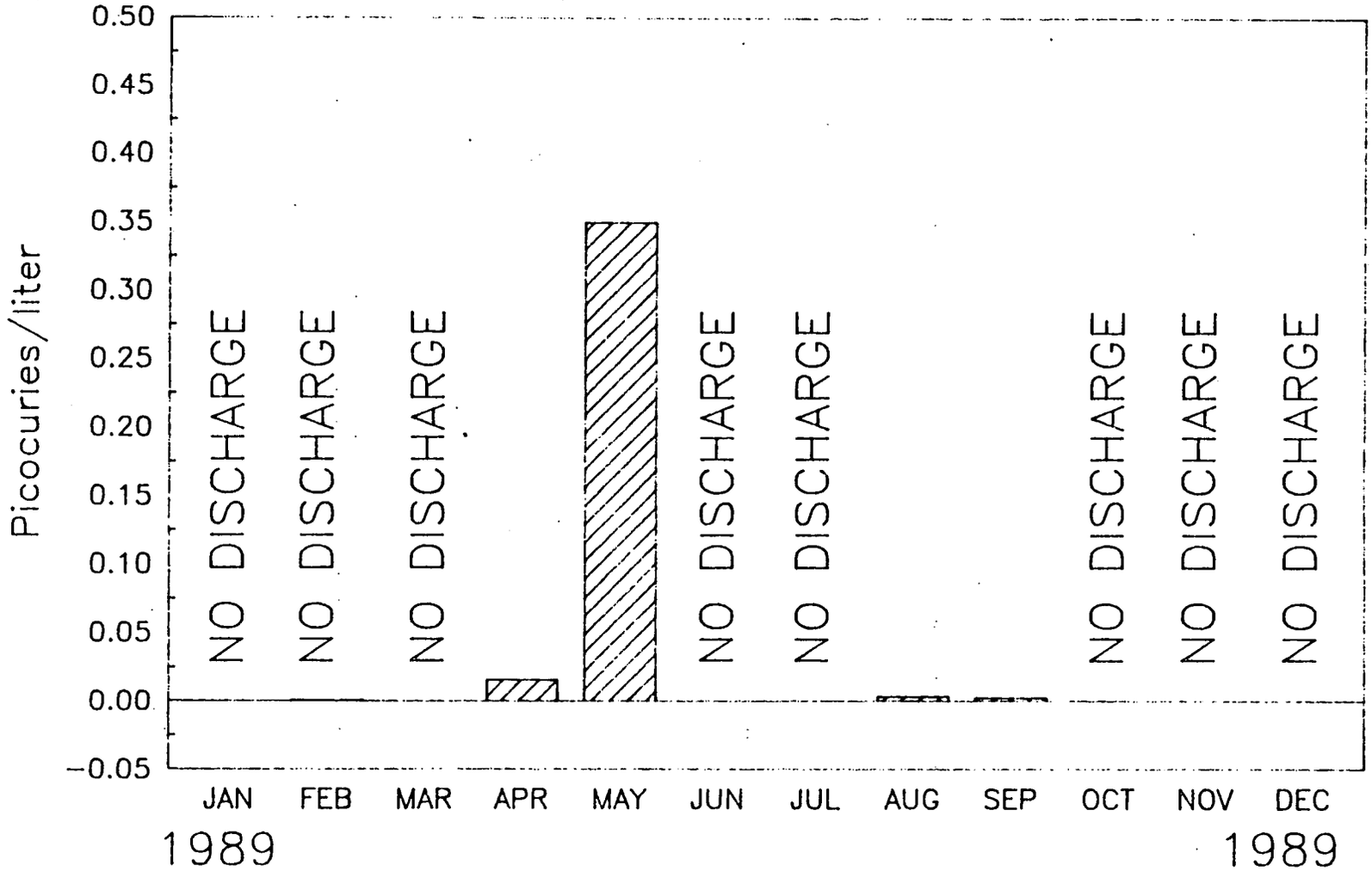
HOLDING PONDS AND LIQUID EFFLUENT WATERCOURSES

* Diversion capabilities exist for indicated locations.

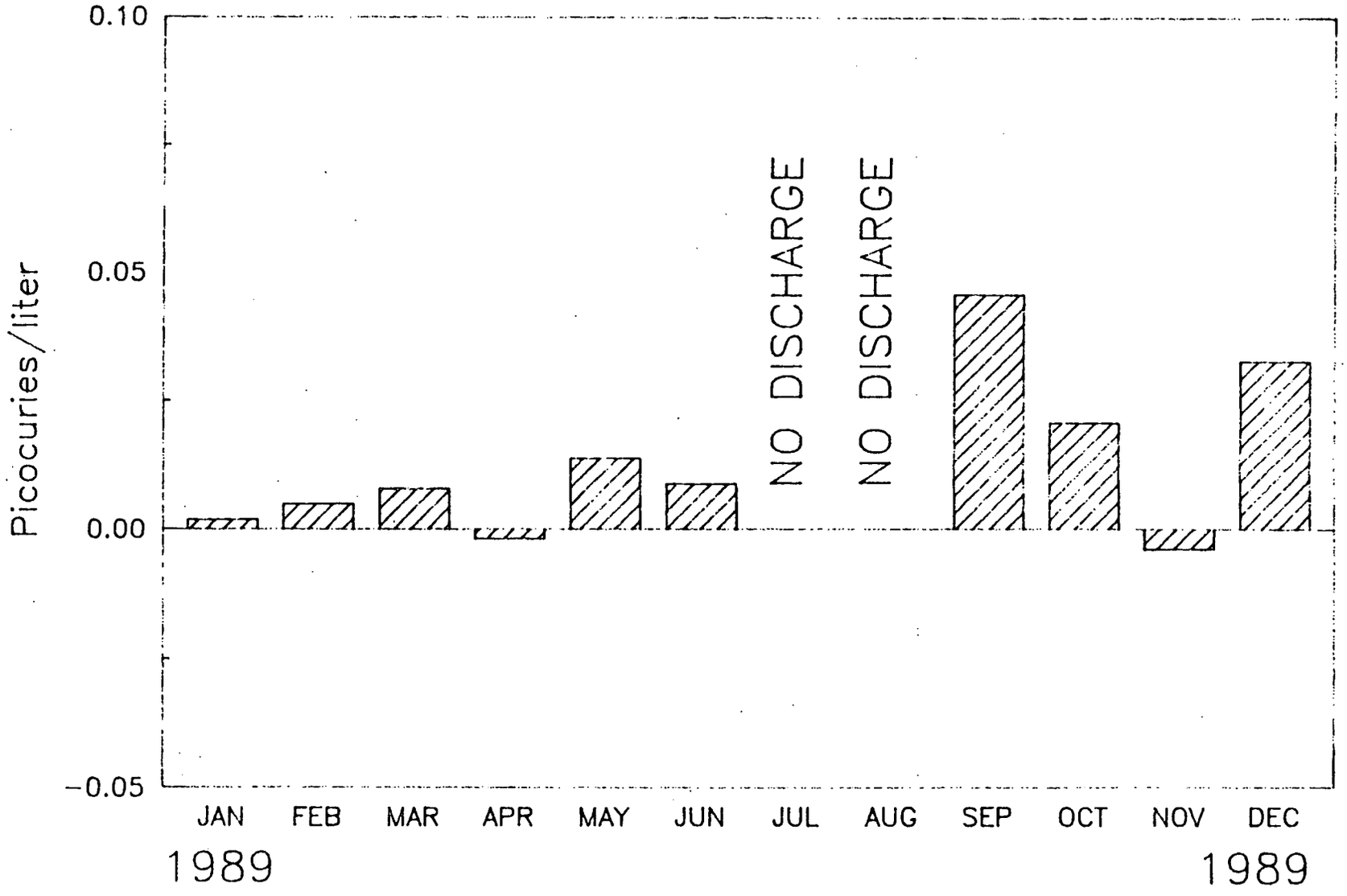
PLUTONIUM IN POND A-4 EFFLUENT WATER



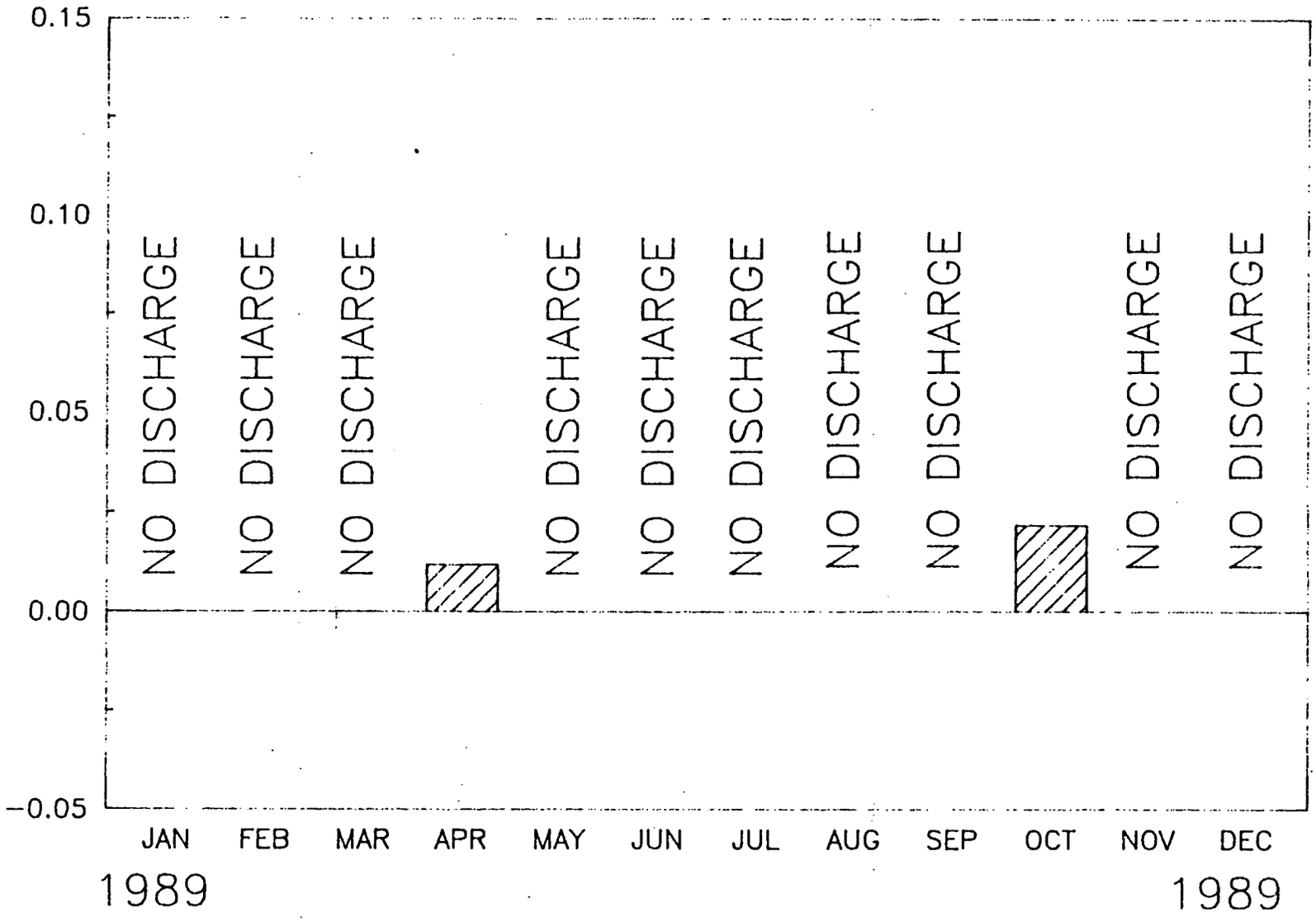
PLUTONIUM IN POND B-5 EFFLUENT WATER

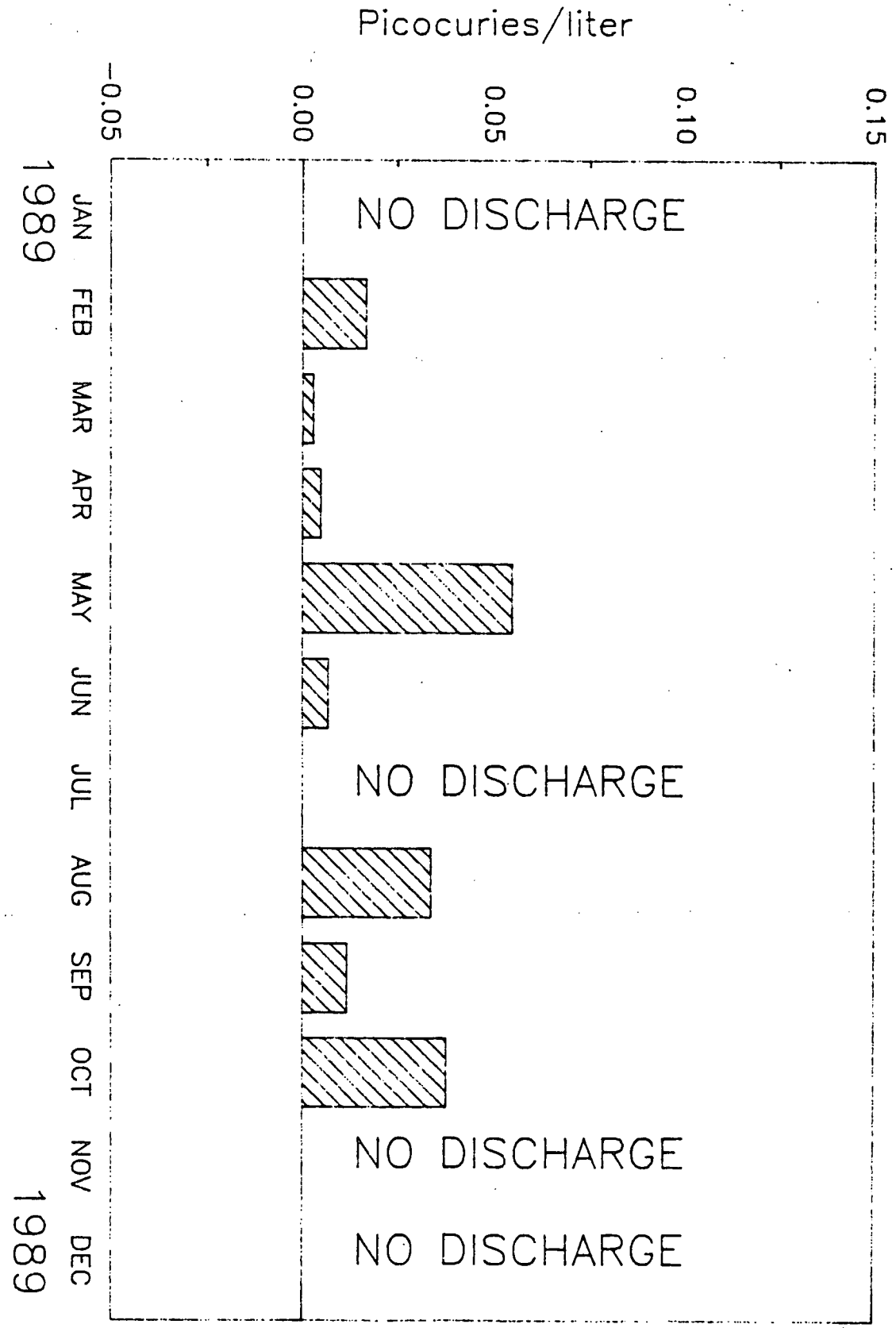


PLUTONIUM IN POND C-1 EFFLUENT WATER



PLUTONIUM IN POND C-2 EFFLUENT WATER




PLUTONIUM IN WALNUT CREEK AT INDIANA WATER
Picocuries/liter
-0.05
0.00
0.05
0.10
0.15
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
JAN
FEB
MAR
APR
MAY
JUN
JUL
AUG
SEP
OCT
NOV
DEC
1989
1989

DECEMBER 1989

Table VII. Offsite Water Sample Results - Plutonium, Uranium, and Americium

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	0.002 ± 0.011	1.07 ± 0.09	0.025 ± 0.012
Standley Lake	1*	0.001 ± 0.010	**	-0.004 ± 0.011

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Arvada	1	-0.017 ± 0.030	0.51 ± 0.09	0.018 ± 0.035
Boulder	1*	0.000 ± 0.011	0.14 ± 0.08	0.010 ± 0.012
Broomfield	1*	0.006 ± 0.013	0.55 ± 0.09	0.001 ± 0.011
Denver	1	-0.006 ± 0.031	1.57 ± 0.11	0.063 ± 0.038***
Golden	1	-0.018 ± 0.030	0.60 ± 0.09	-0.025 ± 0.031
Lafayette	1	0.004 ± 0.034	0.08 ± 0.08	0.020 ± 0.034
Louisville	1	-0.003 ± 0.032	0.16 ± 0.08	0.033 ± 0.034
Thornton	1	-0.003 ± 0.031	0.89 ± 0.09	0.005 ± 0.034
Westminster	1*	0.001 ± 0.011	0.46 ± 0.08	0.003 ± 0.011

* Plutonium, uranium and americium analyses were performed on one sample composited from four weekly grab samples.

** Incomplete analysis.

*** This sample is currently being rerun in duplicate to verify this result.

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Table VIII. Onsite and Offsite Water Sample Results - Tritium

Tritium (pCi/l)

Location	n	CMinimum	CMaximum	CMean
Pond C-1	3	-20 ± 100	30 ± 100	10 ± 100
Arvada	1	-40 ± 100	-40 ± 100	-40 ± 100
Boulder	3	-10 ± 100	60 ± 120	10 ± 100
Broomfield	3	-70 ± 100	120 ± 110	30 ± 110
Denver	1	-70 ± 100	-70 ± 100	-70 ± 100
Golden	1	-60 ± 100	-60 ± 100	-60 ± 100
Great Western	3	-60 ± 100	100 ± 110	30 ± 110
Lafayette	1	-30 ± 100	-30 ± 100	-30 ± 100
Louisville	1	-20 ± 100	-20 ± 100	-20 ± 100
Standley	3	-90 ± 110	170 ± 110	0 ± 110
Thornton	1	-30 ± 100	-30 ± 100	-30 ± 100
Westminster	3	-30 ± 120	50 ± 110	10 ± 110

NOTE: No community samples were collected during the week of 12/25/89 due to the annual plantwide shutdown for Christmas.

Table IX. Offsite Water Sample Results - Nitrate as Nitrogen

Nitrate (as N) at Great Western Reservoir

Sample Date	Nitrate (as N) (mg/l)
12/07/89	<0.02
12/15/89	<0.02
12/21/89	<0.02

Nitrate (as N) at Standley Lake

Sample Date	Nitrate (as N) (mg/l)
12/07/89	<0.02
12/15/89	<0.02
12/21/89	<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 MDC's.

No community samples were collected during the week of 12/25/89 due to the annual plantwide shudown for Christmas.

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DECEMBER 1989

Table X. NPDES Permit Water Sample Results

Discharge 001 (Pond B-3)
One day of discharge (12/13/89)

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Biochem. Oxygen Demand, 5 Day	mg/l	**	10	2.64	25
Total Suspended Solids	mg/l	**	30	0	NA
Nitrates as N	mg/l	**	10	7.14	NA
Total Chromium	mg/l	**	0.05	0.011	0.1
Total Phosphorus	mg/l	**	8	0.50	NA
Oil and Grease, Visual		**	NA	no sheen	NA
Total Residual Chlorine	mg/l	**	NA	0.05	0.5
Fecal Coliforms	#/100 ml	**	200	780/100 ml	NA

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	6.4	6.0	6.4	9.0

Discharge 002 (Pond A-3)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Nitrates as N	mg/l	No Discharge	10	No Discharge	20

		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 003 (RO Pilot Plant)
No Discharge

Parameter		Measured Daily Minimum	Limits Daily Minimum	Measured Daily Maximum	Limits Daily Maximum
pH	S.U	No Discharge	6.0	No Discharge	9.0

* This limitation applies when a minimum of 3 consecutive samples are taken during separate weeks.

** Result for single sample for six hours of discharge on 12/13/89 is 780/100 ml.

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Table X. NPDES Permit Water Sample Results (Continued)

Discharge 004 (RO Plant)
No Discharge

Parameters		Measured 30-Day Average	Limits 30-Day* Average	Measured Daily Maximum	Limits Daily Maximum
Total Suspended Solids	mg/l	No Discharge	15	No Discharge	25
Total Organic Compounds	mg/l		22		30
Total Phosphorus	mg/l		8		12
Nitrates as N	mg/l		10		20
Total Chromium	mg/l		0.05		0.1
Total Residual Chlorine	mg/l		NA		0.5
		7-Day Average	7-Day Average	30-Day Average	30-Day Average
Fecal Coliform	#/100 ml	No Discharge	400	No Discharge	200
		Daily Minimum	Daily Minimum	Daily Maximum	Daily Maximum
pH	S.U.	No Discharge	6.0	No Discharge	9.0

Discharge 005 (Pond A-4)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 006 (Pond B-5)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

Discharge 007 (Pond C-2)
No Discharge

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Discharge			
Nitrates as N	mg/l				
Nonvolatile Suspended Solids	mg/l				

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Table XI. Water Sample Results, Nonradioactive Parameters

Walnut Creek at Indiana Street
.No Flow

Parameters		n	CMinimum	CMaximum	CAverage
pH	S.U.	No Flow			
Nitrates as N	mg/l				

Total Volume (gallons) =

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Table XII.
Daily Flow Data Recorded at the
Walnut Creek at Indiana Gaging Station
Ponds A-4 and B-5,
December, 1989

Date	Walnut Creek At Indiana (gallons)	Pond A-4 (Gallons)	Pond B-5 (Gallons)
12/01/89	No Flow	No Discharge	No Discharge
12/02/89	" "	" "	" "
12/03/89	" "	" "	" "
12/04/89	" "	" "	" "
12/05/89	" "	" "	" "
12/06/89	" "	" "	" "
12/07/89	" "	" "	" "
12/08/89	" "	" "	" "
12/09/89	" "	" "	" "
12/10/89	" "	" "	" "
12/11/89	" "	" "	" "
12/12/89	" "	" "	" "
12/13/89	" "	" "	" "
12/14/89	" "	" "	" "
12/15/89	" "	" "	" "
12/16/89	" "	" "	" "
12/17/89	" "	" "	" "
12/18/89	" "	" "	" "
12/19/89	" "	" "	" "
12/20/89	" "	" "	" "
12/21/89	" "	" "	" "
12/22/89	" "	" "	" "
12/23/89	" "	" "	" "
12/24/89	" "	" "	" "
12/25/89	" "	" "	" "
12/26/89	" "	" "	" "
12/27/89	" "	" "	" "
12/28/89	" "	" "	" "
12/29/89	" "	" "	" "
12/30/89	" "	" "	" "
12/31/89	" "	" "	" "
TOTAL	No Flow	No Discharge	No Discharge

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Table XIII.
Daily Flow Data Recorded at
Ponds C-1 and C-2 During
December, 1989

(Woman Creek)

Date	Pond C-1 (Gallons)	Pond C-2 (Gallons)
12/01/89	No Discharge	No Discharge
12/02/89	" "	" "
12/03/89	" "	" "
12/04/89	" "	" "
12/05/89	" "	" "
12/06/89	" "	" "
12/07/89	" "	" "
12/08/89	" "	" "
12/09/89	" "	" "
12/10/89	" "	" "
12/11/89	" "	" "
12/12/89	" "	" "
12/13/89	" "	" "
12/14/89	" "	" "
12/15/89	" "	" "
12/16/89	" "	" "
12/17/89	" "	" "
12/18/89	" "	" "
12/19/89	" "	" "
12/20/89	" "	" "
12/21/89	" "	" "
12/22/89	" "	" "
12/23/89	" "	" "
12/24/89	" "	" "
12/25/89	" "	" "
12/26/89	" "	" "
12/27/89	" "	" "
12/28/89	" "	" "
12/29/89	" "	" "
12/30/89	" "	" "
12/31/89	" "	" "
Total	No Discharge	No Discharge

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Appendix

RADIATION STANDARDS FOR PROTECTION OF THE PUBLIC

Introduction

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 exposure times (for external exposure to penetrating radiation), then by the appropriate radiation dose conversion factors. That is:

RADIATION DOSE =
(RADIOACTIVITY CONCENTRATION) X
(INTAKE RATE/EXPOSURE TIME) X
(DOSE CONVERSION FACTOR)

The 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).

The 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 of Radiation Protection and Measurements (NCRP) and the International Commission on Radiological Protection (ICRP).

The radioactive materials of importance in calculating radiation dose to the public from Rocky Flats Plant activities include plutonium, uranium, americium, and tritium. The alpha radiation emissions from the plutonium, uranium, and americium are the primary contributors to the projected radiation dose.

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.

Calculation of Potential Plant Contribution to Public Radiation Dose

Pending final revision of its DOE Order for radiation protection standards for the public, DOE adopted an interim radiation protection standard for DOE environmental activities to be implemented in CY1985 (Va85). This interim standard incorporates guidance from the National Council on Radiation Protection and Measurements (NCRP), as well as the Environmental Protection Agency Clean Air Act air emission standards (as implemented in 40 CFR 61, Subpart H). Included in the interim standard 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 International Commission on Radiological Protection (ICRP) Publications 30 and 48 methodology and biological models for radiation dosimetry. The DOE interim standard and the dose conversion factor tables are used for assessment of any potential Rocky Flats Plant contribution to public radiation dose. The DOE radiation standards for protection of the public are given below:

DOE RADIATION PROTECTION STANDARDS FOR THE PUBLIC

ICRP-, NCRP- RECOMMENDED STANDARDS FOR ALL PATHWAYS:

OCCASIONAL EXPOSURES -	500 mrem/year EFFECTIVE DOSE EQUIVALENT*
PROLONGED EXPOSURES - (>5 YEARS)	100 mrem/year EFFECTIVE DOSE EQUIVALENT
INDIVIDUAL ORGAN -	5,000 mrem/year DOSE EQUIVALENT

EPA CLEAN AIR ACT STANDARDS FOR THE AIR PATHWAY ONLY:

WHOLE BODY -	25 mrem/year DOSE EQUIVALENT
ANY ORGAN -	75 mrem/year DOSE EQUIVALENT

Secondary radioactivity concentration guides can be calculated from the primary radiation dose standards and used as comparison values for measured radioactivity concentrations. DOE provided guidance for calculating these concentration guides - called "Derived Concentration Guides" - in a 1985 memorandum to its facilities (St85). Derived Concentration Guides (DCGs) are the concentrations which 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 assume a water intake of 730 liters at the calculated DCG for the year. The following table lists the air and water DCGs for the principal radionuclides of interest at the Rocky Flats Plant.

To determine compliance with the EPA air emissions standards, measured airborne effluent radioactivity emissions and estimated radioactivity resuspension from soil are entered into the EPA-approved atmospheric dispersion/dose calculation computer model, AIRDOS-EPA, 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 Rocky Flats Plant activities is typically less than 1 mrem, or less than 1percent of the recommended annual standard for all pathways.

DOE DERIVED CONCENTRATION GUIDES FOR RADIONUCLIDES OF INTEREST AT THE ROCKY FLATS PLANT

AIR INHALATION:

Radionuclide	DCG (pCi/m^3)
Pu-239, -240	0.02

WATER INGESTION:

Radionuclide	DCG (pCi/l)
Pu-239, -240	30
Am-241	30
U-233, -234, -238	500
H-3	2,000,000

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References

US88a DOE/EH-0070, "External Dose-Rate Conversion Factors for Calculation of Dose to the Public," U. S. Dept. of Energy, Asst. Secretary for Environment, Safety and Health, Office of Environmental Guidance and Compliance, July 1988.

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

Va85 Vaughan, W. A., Asst. Secretary, "Radiation Standards for Protection of the Public in the Vicinity of DOE Facilities," DOE memorandum from Environment, Safety and Health, August 5, 1985.

St86 Stern, R. J., Director, "Preparation of Annual Site Environmental Reports for Calendar Year 1985," DOE memorandum, Office of Environmental Guidance, February 28, 1986.

*NOTE: "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 artificially-produced sources of radiation.

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