00004609

000024300

June - 1987 EAC-420110-154

Rocky Flats Plant

Monthly Environmental Monitoring Report

Environmental Analysis and Control
G H Setlock, Manager
D L Barr, Report Coordinator

Contributors
M R Boss
R L Henry
M L. Paricio
HS&E Laboratories

RR-RP-00236

Rockwell International
Rocky Flats Plant
North American Space Operations
P O Box 464
Golden Colorado 80402-0464

A Prime Contractor to
The United States Department of Energy

Reviewed for Classification/UCNI/OUO
By: Janet Nesheim, Derivative Classifier
DOE, EMCBC
Date: 11/17/08 KG
Confirmed Unclassified, Not UCNI/Not OUO

Best Available Copy

ADMIN RECORD
SW-A-003629

1/29

D I S T R I B U T I O N

USDOE
Albuquerque Operations Office
Health Protection Branch
P. O. Box 5400
Albuquerque, NM 87115
C. L. Soden

USDOE
Rocky Flats Plant
A. E. Whiteman

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

Colorado Department of Health
4210 E. Eleventh Avenue
Denver, CO 80220
G. Broetzman M. L. Hanrahan
A. Stewart A.J. Hazle

Division of Environmental Health
Boulder City/County Health Dept.
3450 Broadway
Boulder, CO 80302
T. Douville

City of Arvada
Utilities Division
8101 Ralston Road
Arvada, CO 80002
S. Daniels

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

Jefferson County Health Department
260 South Kipling
Lakewood, CO 80226
Dr. C. Miller

City of Broomfield
No. 8 Garden Office Center
Broomfield, CO 80020
K. Kochevar

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

City of Northglenn
10701 Melody Drive - Suite 313
Northglenn, CO 80234
V. Hawker

City of Westminster
3031 W. 76th Avenue
Westminster, CO 80030
W. Christopher

Rocky Flats Monitoring Committee
c/o Resource Associates, Inc.
1700 Lincoln St./ Suite 3711
Denver, CO 80203
R. Kelley

Denver Water Dept.
Quality Control
1600 W. 12th Avenue
Denver, CO 80254
J. Dice

Air Pollution Control Spec.
c/o Colorado Dept. of Health
4210 E. Eleventh Avenue
Denver, CO 80220
H. Collier

Peak Rock Spring Water
3045 - 10th Street
Boulder, CO 80302
S. Dolson

2/29

D I S T R I B U T I O N (cont.)

Solar Energy Research Institute
1617 Cole Boulevard
Golden, CO 80401
B. Noun

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

Internal Distribution
Rocky Flats Plant
M. R. Boss
G. W. Campbell
L. E. Coldren
G. C. DeLullo
P. J. Etchart
K. J. Freiberg
R. L. Henry
C. R. Hodgin
D. D. Hornbacher
D. N. Ikle
C. R. Lagerquist
G. Langer
G. R. Langheim
R. A. Link
C. M. Marsh
G. W. Meyers
E. R. Naimon
M. L. Paricio
G. L. Potter
C. R. Rose
D. J. Sanchini
G. H. Setlock
C. Trice
J. M. West
W. F. Weston
EMF
IRF-Library

3/29

JUNE 1987 ENVIRONMENTAL MONITORING REPORT
ROCKY FLATS PLANT

This report summarizes the effluent and environmental monitoring programs at the Rocky Flats Plant for the month of June, 1987.

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 VI 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 VII through IX. 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 X.

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 XI. Daily flow data for surface water from the two Plant drainage systems are given in Tables XII and XIII.

The Rocky Flats Plant Environmental Monitoring Program includes evaluating plant compliance with all relevant guides, limits, and standards. All average results of monitoring effluent and ambient samples complied with the applicable standards as specified in Executive Order 12088 (rules, regulations, and requirements of the Department of Energy).

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.

DOES NOT CONTAIN
OFFICIAL USE ONLY INFORMATION
Name/Org: Shyn Nagle/PRC Date 11/17/08
Directed by: J.A. Nesheim DOE M471.3-1

4/29

Table I. 1987 Plutonium and Uranium Airborne Effluent Data

Month	Plutonium Release (uCi)	Plutonium CMax (pCi/m3)	Uranium Release (uCi)	Uranium CMax (pCi/m3)
CY 1986	14.33	0.047 ± 0.0082	21.24	0.133 ± 0.0152
January	1.39	0.095 ± 0.0155	2.15	0.017 ± 0.0013
February	0.89	0.071 ± 0.0081	1.99	0.095 ± 0.0091
March	1.84	0.229 ± 0.0278	1.12	0.005 ± 0.0004
April	2.02	0.016 ± 0.0013	0.87	0.004 ± 0.0005
May	1.28	0.104 ± 0.0175	0.94	0.003 ± 0.0004
June	0.69*	0.005 ± 0.0012	0.98	0.003 ± 0.0004
July				
August				
September				
October				
November				
December				
Year to Date	8.11*	0.229 ± 0.0278	8.05	0.095 ± 0.0091

NOTE· Beginning in January 1981, the plutonium, uranium, americium, and beryllium measured concentrations have been reported. These reported concentrations include values that are less than the corresponding calculated MDC's and in some cases, values less than zero. 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.

* Estimated June plutonium emissions are included for 12 of 37 sampling locations because of low chemical recoveries for those samples. Estimated June plutonium emissions are based on measured air emissions for 25 sampling locations (contributing 0.60 uCi total) and six-month averages for the 12 affected locations (contributing an additional 0.09 uCi total).

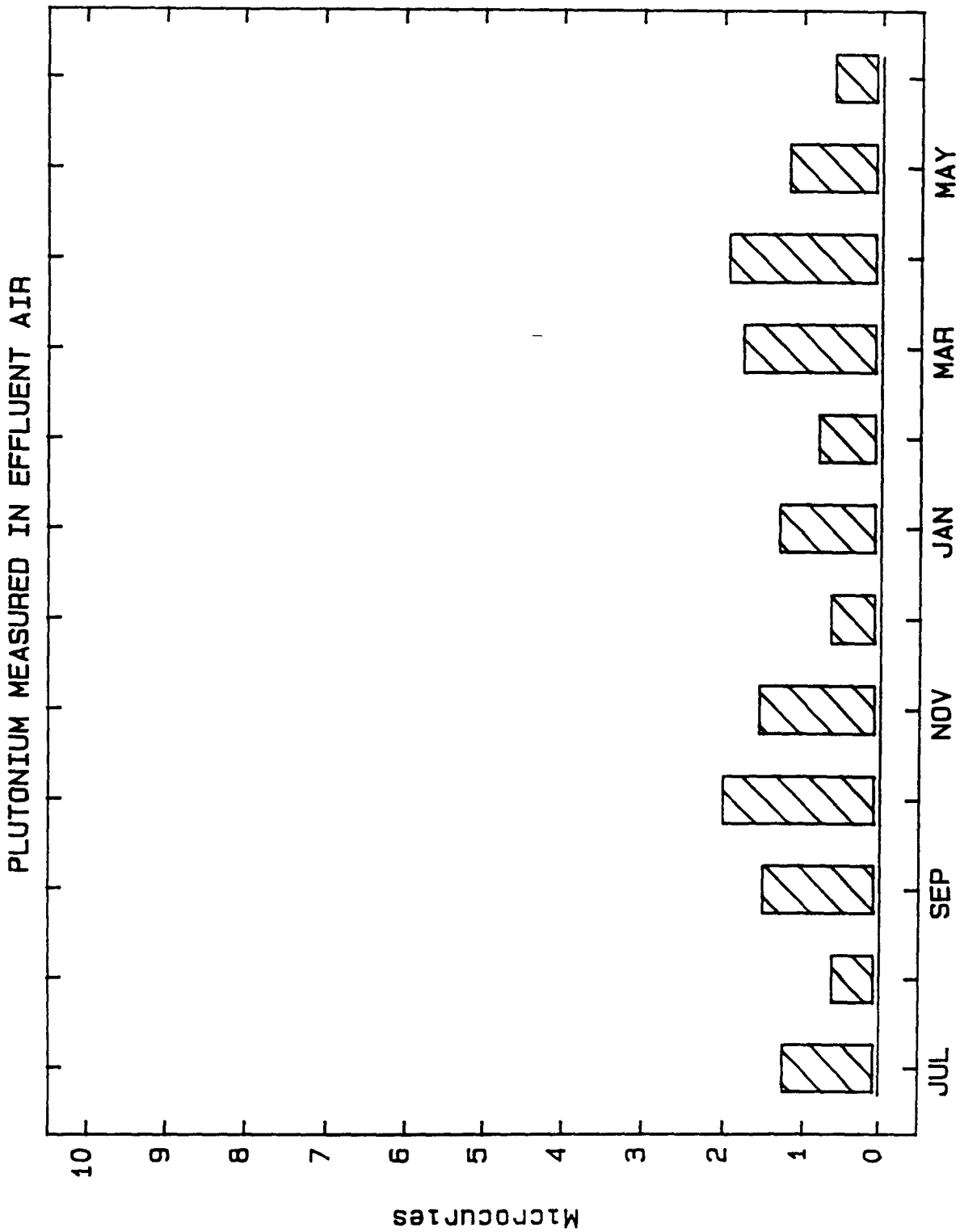
5/29

Table II. 1987 Tritium and Beryllium Airborne Effluent Data

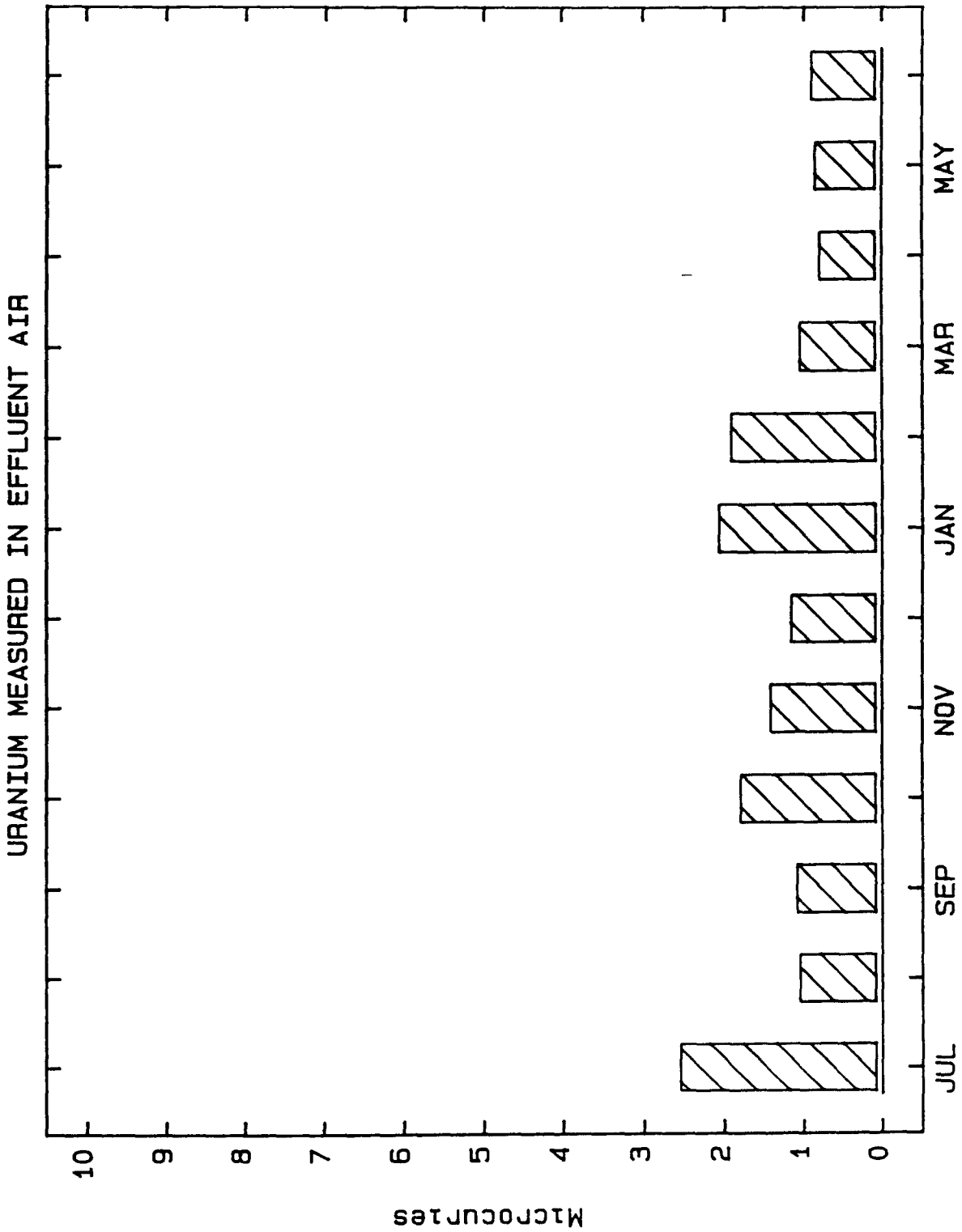
Month	Tritium Release (Ci)	Tritium CMax (pCi/m3)	Beryllium Release (gms)	Beryllium CMax (ug/m3)
CY 1986	0.218	36700 ± 950	0.1299	0.00053
January	0.005	410 ± 180	0.0276	0.00042
February	0.008	250 ± 80	0.0085	0.00006
March	0.004	470 ± 180	0.0091	0.00014
April	0.007	270 ± 60	0.0130	0.00010
May	0.013	560 ± 210	0.0143	0.00011
June	0.005	260 ± 60	0.0137	0.00014
July				
August				
September				
October				
November				
December				
Year to Date	0.042	560 ± 210	0.0862	0.00042

NOTE Beryllium measured at the remaining 36 locations was below the screening level of 0.1 gram per month.

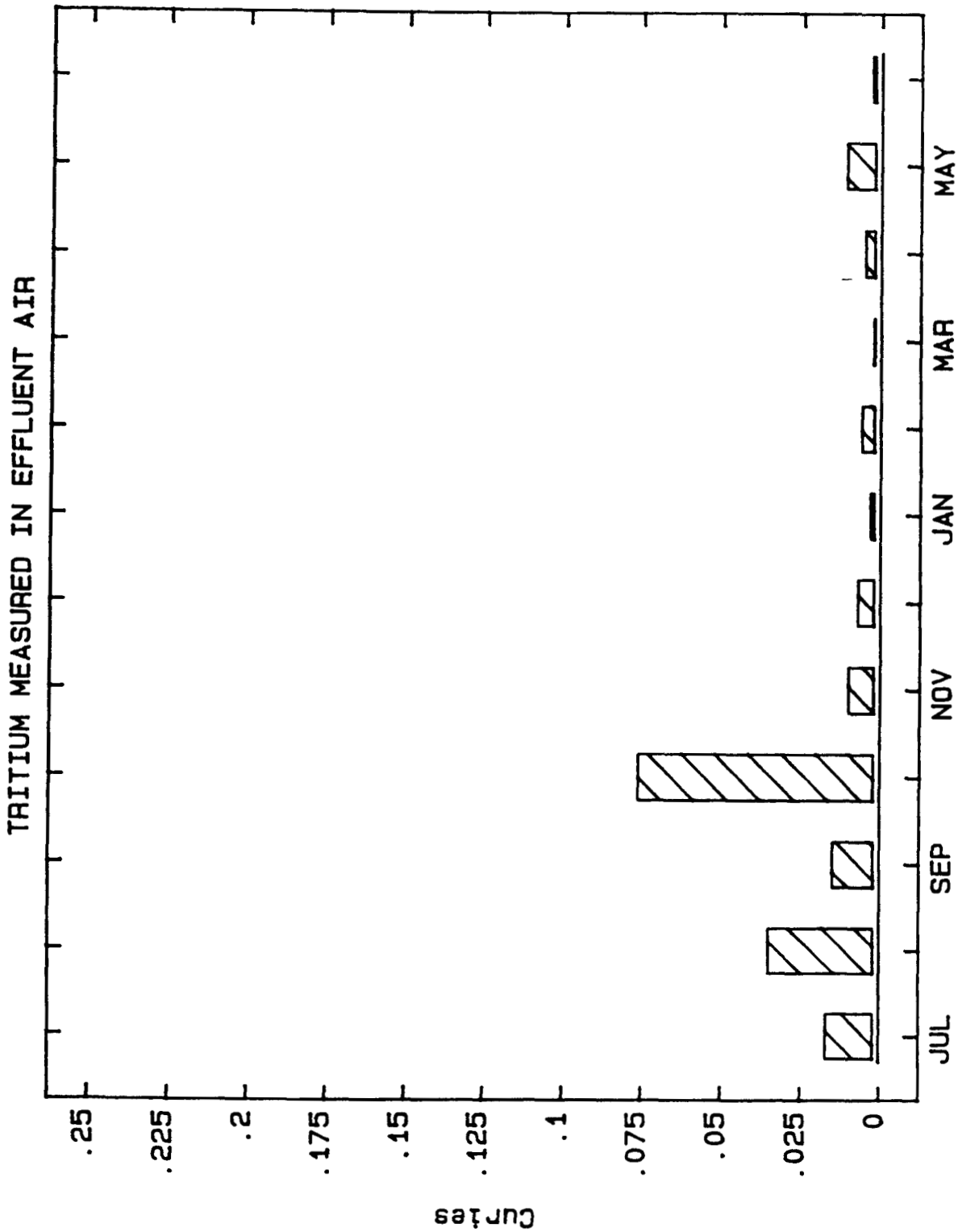
6/29


PLUTONIUM MEASURED IN EFFLUENT AIR
Microcuries
10
9
8
7
6
5
4
3
2
1
0
JUL
SEP
NOV
JAN
MAR
MAY

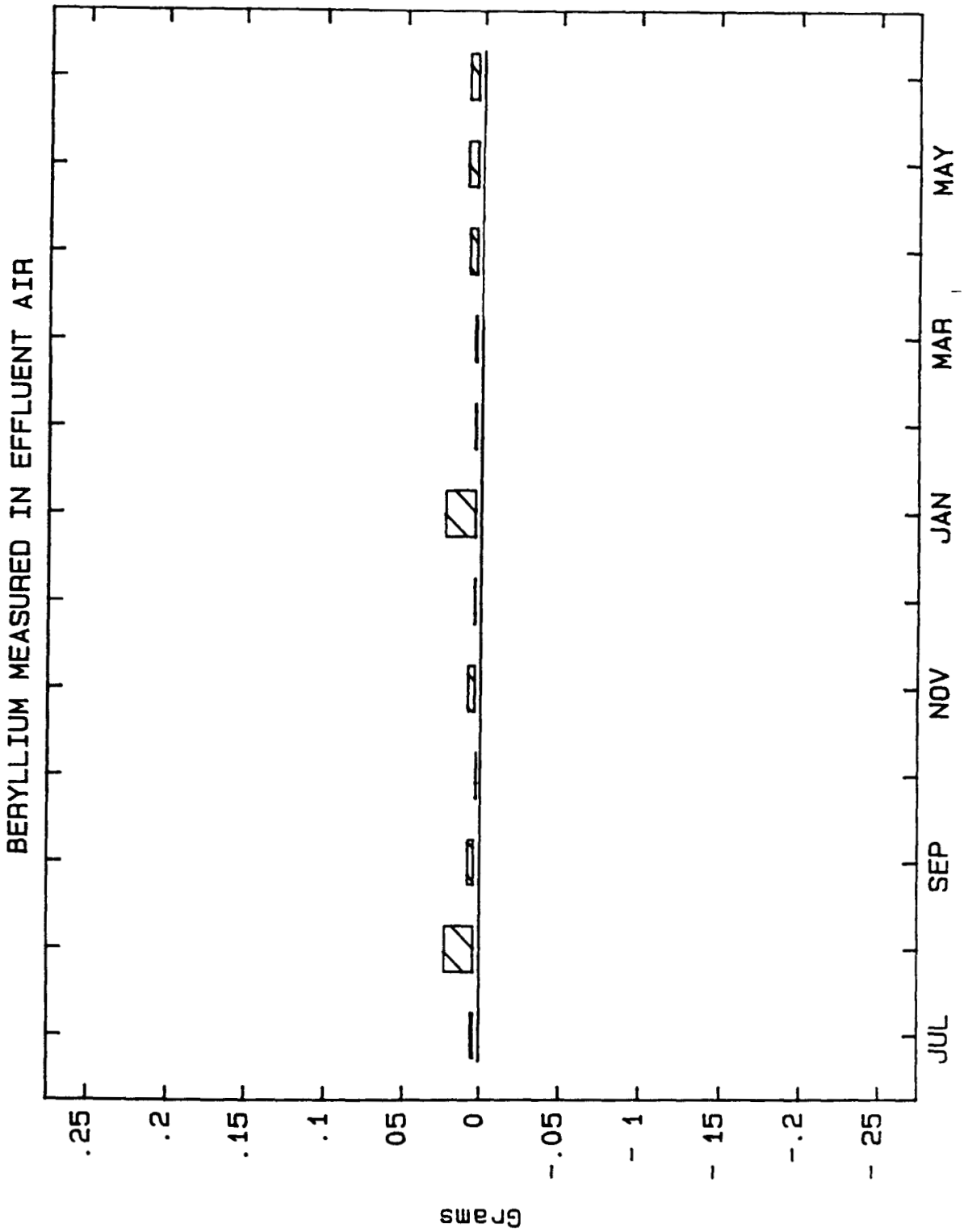
7/29


URANIUM MEASURED IN EFFLUENT AIR
Microcuries
10
9
8
7
6
5
4
3
2
1
0
JUL
SEP
NOV
JAN
MAR
MAY

8/29


TRITIUM MEASURED IN EFFLUENT AIR
Curies
.25
.225
.2
.175
.15
.125
.1
.075
.05
.025
0
JUL
SEP
NOV
JAN
MAR
MAY

9/29


BERYLLIUM MEASURED IN EFFLUENT AIR
Grams
.25
.2
.15
.1
05
0
-.05
-.1
-.15
-.2
-.25
JUL
SEP
NOV
JAN
MAR
MAY

10/29

JUNE 1987

Table III. Plutonium at Selected Onsite Ambient Air Locations
(05/19/87-06/30/87)

Location	n	Volume(m^3)	Concentration (pCi/m^3) Lower Confidence Limit	Point Estimate	Upper Confidence Limit
S-05	3	24,000	0.000048	0.000060	0.000072
S-06	3	43,000	0.000038	0.000046	0.000054
S-07	3	43,000	0.000820	0.000923	0.001026
S-08	3	39,000	0.001343	0.001550	0.001757
S-09	3	49,000	0.001339	0.001510	0.001681

NOTE: Total long-lived alpha at the remaining 18 onsite ambient air samplers was below the screening level of 0.01 pCi/m3.

Table IV. Tritium in Ambient Air
(05/02/87 to 06/30/87)

Location	n	Air Volume(m^3)	Point Estimate (pCi/m^3)	+/- Error (pCi/m^3)	Condensed Water Vapor (mls)
S-4	4	69	0.08	0.87	154
S-5	4	47	-0.48	1.43	172
S-16	4	49	-0.61	1.35	170

11/29

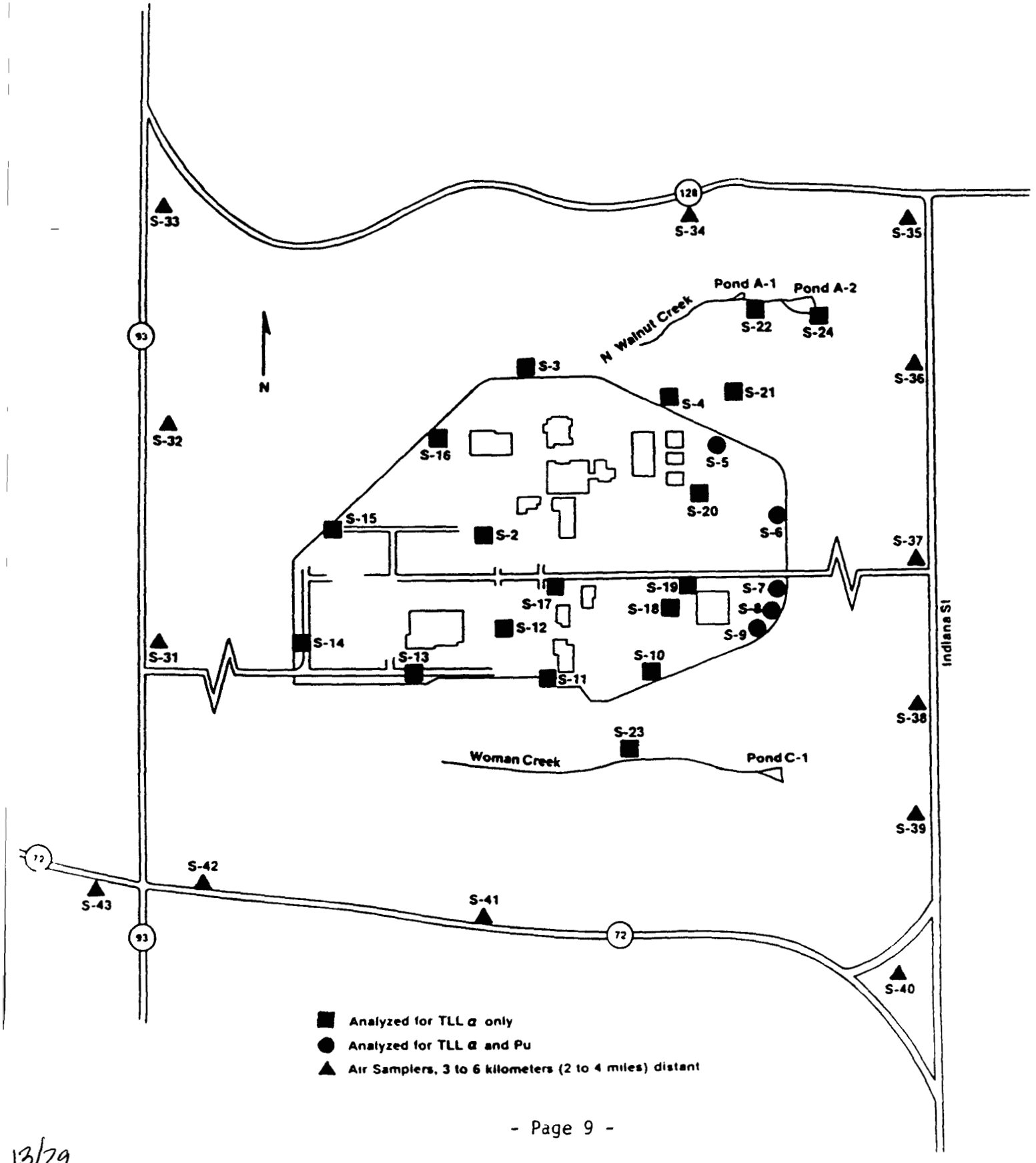
Table V. Plutonium in Perimeter Ambient Air
(05/26/87-06/23/87)

Location	n	Volume(m^3)	Concentration(pCi/m^3) Lower Confidence Limit	Point Estimate	Upper Confidence Limit
S-31	1	29,000	-0.000002	0.000000	0.000002
S-32	1	22,000	-0.000003	0.000000	0.000003
S-33	1	26,000	0.000001	0.000003	0.000005
S-34	1	23,000	-0.000001	0.000002	0.000005
S-35	1	21,000	-0.000003	0.000000	0.000003
S-36	1	27,000	0.000000	0.000002	0.000004
S-37	1	24,000	0.000008	0.000011	0.000014
S-38	1	17,000	-0.000002	0.000002	0.000006
S-39	1	31,000	-0.000001	0.000001	0.000003
S-40	1	25,000	0.000003	0.000006	0.000009
S-41	1	18,000	-0.000001	0.000002	0.000005
S-42	1	30,000	0.000000	0.000002	0.000004
S-43	1	31,000	-0.000001	0.000001	0.000003
S-44	1	28,000	-0.000001	0.000001	0.000003

Mean Point Estimate = 0.000002

12/29

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



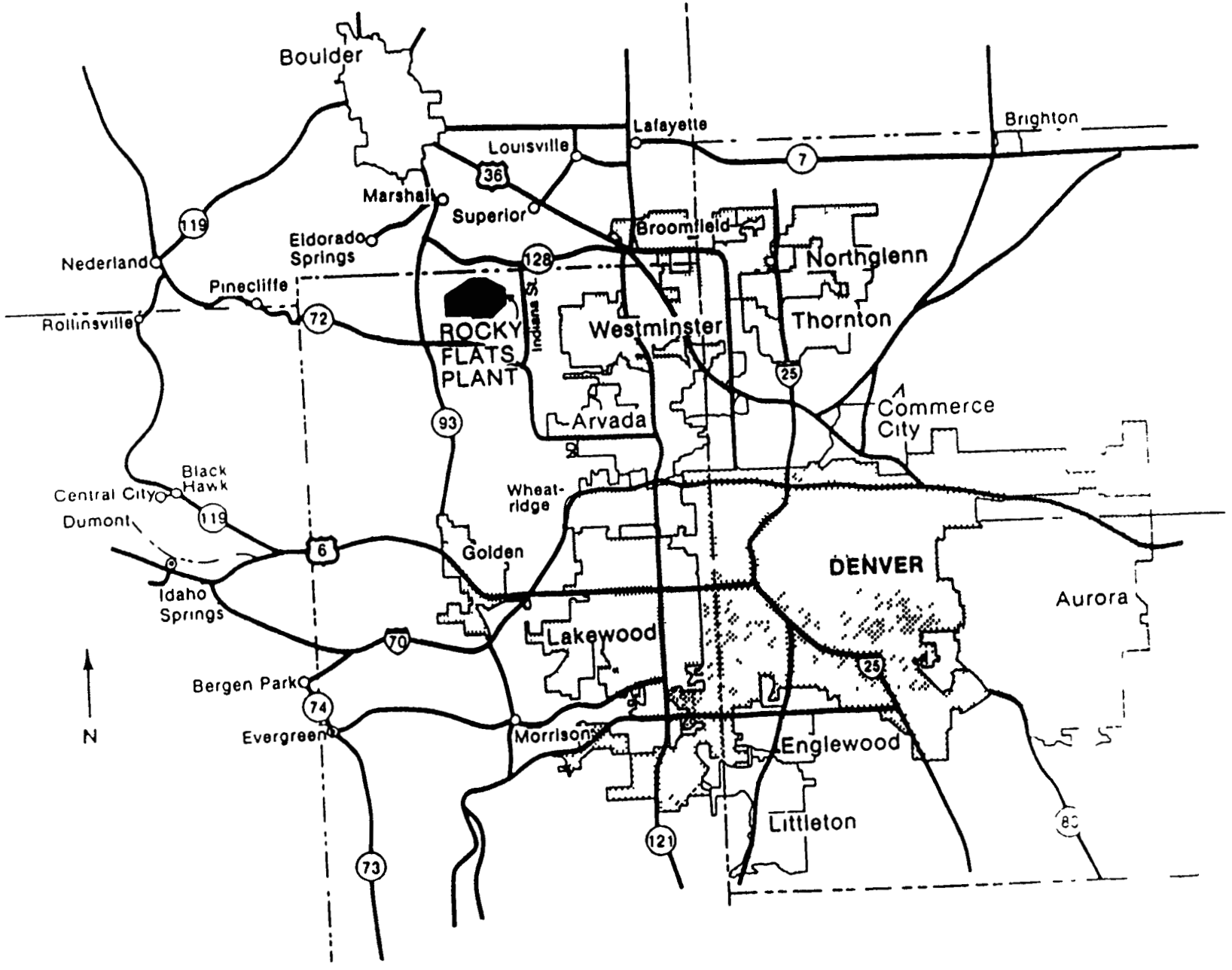
13/29

Table VI. Plutonium in Community Ambient Air
(05/27/87-06/24/87)

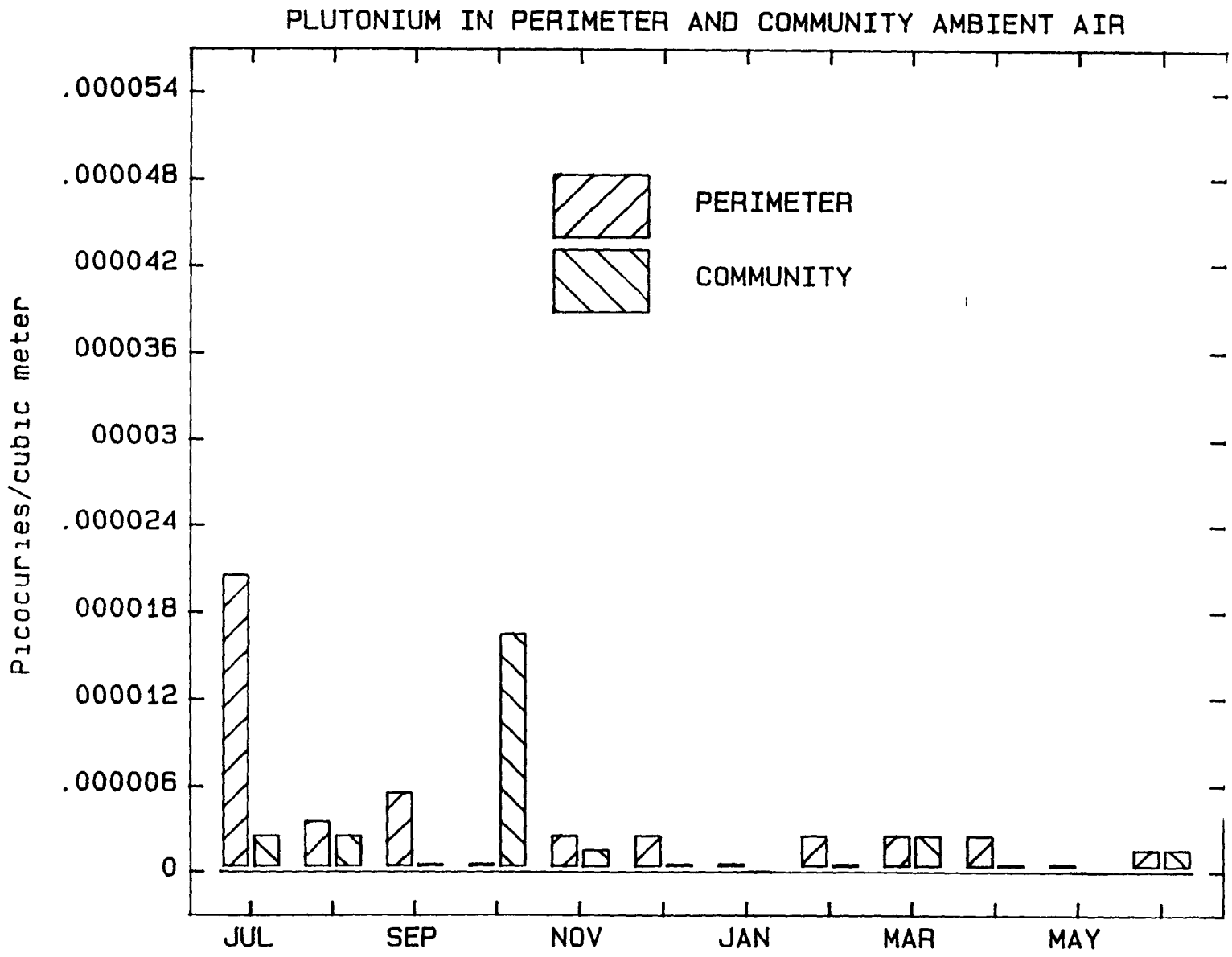
Location	n	Volume(m^3)	Concentration(pCi/m^3) Lower Confidence Limit	Point Estimate	Upper Confidence Limit
Marshall	1	25,000	-0.000003	-0.000001	0.000001
Jeffco Airport	1	25,000	0.000007	0.000010	0.000013
Superior	1	26,000	0.000001	0.000004	0.000007
Boulder	1	26,000	-0.000002	0.000000	0.000002
Lafayette	1	25,000	-0.000001	0.000002	0.000005
Broomfield	1	24,000	-0.000002	0.000001	0.000004
Walnut Creek	1	28,000	-0.000002	0.000000	0.000002
Wagner	1	28,000	0.000005	0.000007	0.000009
Leyden	1	23,000	-0.000002	0.000000	0.000002
Westminster	1	20,000	0.000001	0.000004	0.000007
Denver	1	29,000	-0.000001	0.000001	0.000003
Golden	1	26,000	0.000001	0.000003	0.000005
Lakeview Pointe	1	20,000	-0.000002	0.000001	0.000004
Cotton Creek	1	25,000	-0.000002	0.000000	0.000002
Mean Point Estimate				0.000002	

14/29

15/29



Area Map of Rocky Flats Plant and Surrounding Communities

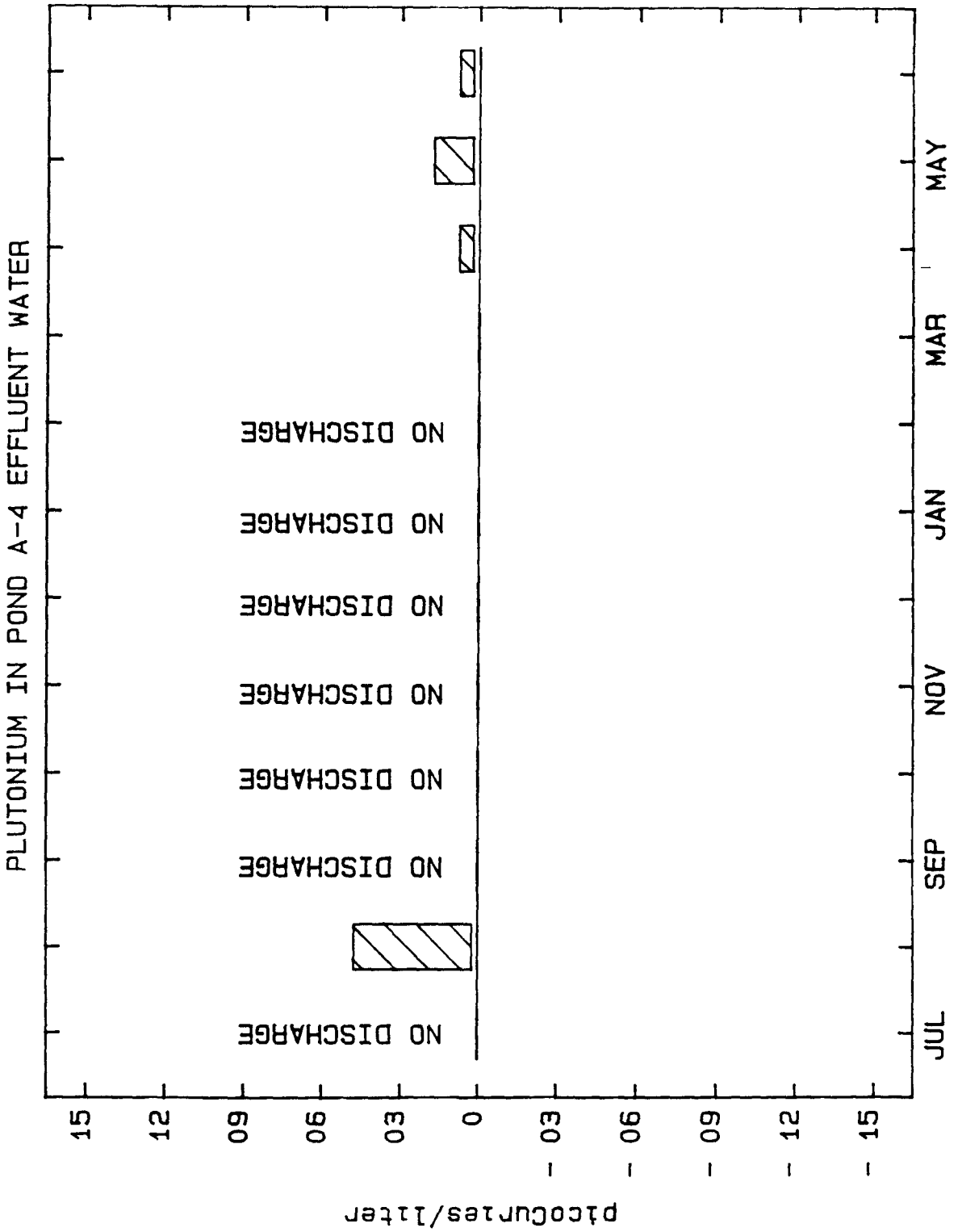

PLUTONIUM IN PERIMETER AND COMMUNITY AMBIENT AIR
Picocuries/cubic meter
.000054
.000048
000042
000036
00003
.000024
000018
000012
.000006
0
PERIMETER
COMMUNITY
JUL
SEP
NOV
JAN
MAR
MAY

JUNE 1987

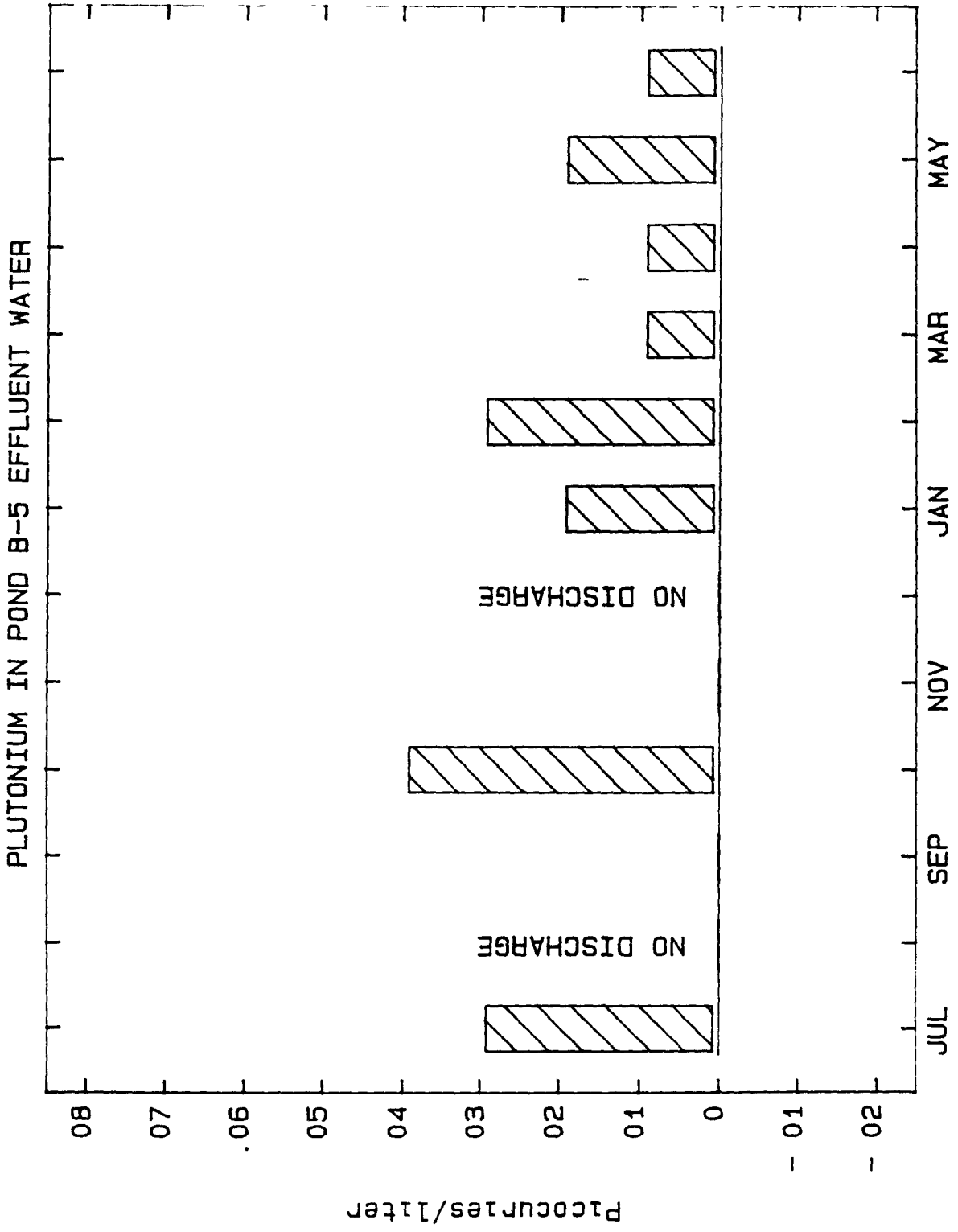
Table VII. Water Sample Results, Radioactive Parameters

Holding Pond Outfall (pCi/l)

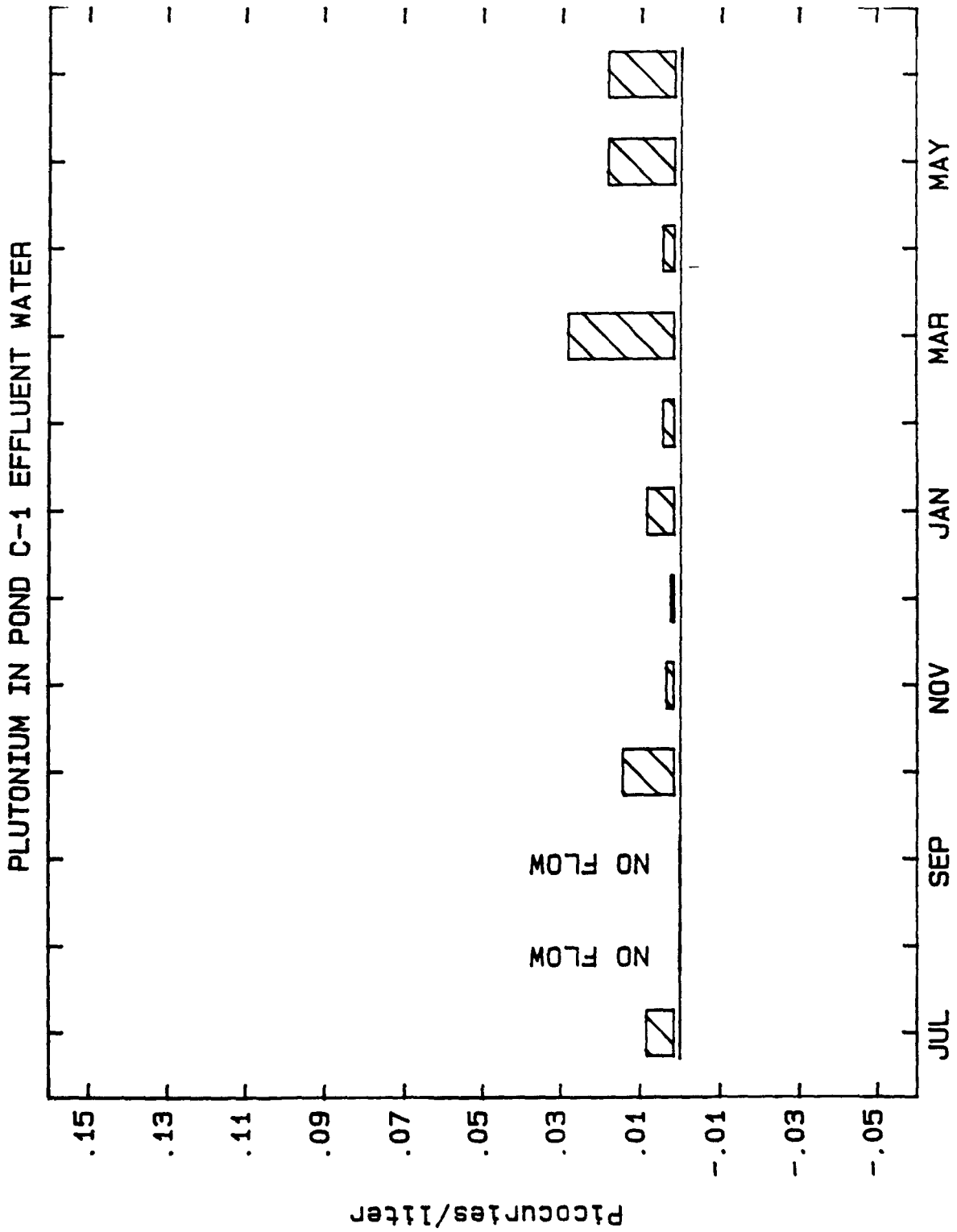
Location	Plutonium	Uranium	Americium
Pond A-4			
06/02/87 - 06/05/87	0.01 ± 0.03	10 ± 1	0.02 ± 0.02
Average Concentration	0.01 ± 0.03	10 ± 1	0.02 ± 0.02
Pond B-5			
06/02/87 - 06/05/87	0.01 ± 0.02	4.1 ± 0.4	0.00 ± 0.02
Average Concentration	0.01 ± 0.02	4.1 ± 0.4	0.00 ± 0.02
Pond C-1			
05/29/87 - 06/05/87	0.008 ± 0.006	3.0 ± 0.3	0.009 ± 0.006
06/05/87 - 06/12/87	0.02 ± 0.01	2.6 ± 0.2	0.01 ± 0.01
06/12/87 - 06/19/87	0.02 ± 0.01	2.6 ± 0.3	0.02 ± 0.01
06/19/87 - 06/26/87	0.05 ± 0.01	2.6 ± 0.3	0.02 ± 0.01
Average Concentration	0.02 ± 0.01	2.7 ± 0.1	0.01 ± 0.01
Pond C-2			
06/02/87 - 06/05/87	0.04 ± 0.03	6.9 ± 0.9	0.03 ± 0.02
Average Concentration	0.04 ± 0.03	6.9 ± 0.9	0.03 ± 0.02
Walnut Creek at Indiana			
06/29/87 - 06/05/87	0.005 ± 0.005	5.7 ± 0.6	0.02 ± 0.01
06/05/87 - 06/12/87	0.02 ± 0.01	3.0 ± 0.3	0.01 ± 0.01
06/12/87 - 06/19/87	0.01 ± 0.01	4.3 ± 0.6	0.02 ± 0.01
06/19/87 - 06/26/87	0.02 ± 0.03	4.1 ± 0.4	0.01 ± 0.01
Average Concentration	0.01 ± 0.01	4.3 ± 0.2	0.02 ± 0.01


PLUTONIUM IN POND A-4 EFFLUENT WATER
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
JUL
SEP
NOV
JAN
MAR
MAY
15
12
09
06
03
0
- 03
- 06
- 09
- 12
- 15
picocuries/liter

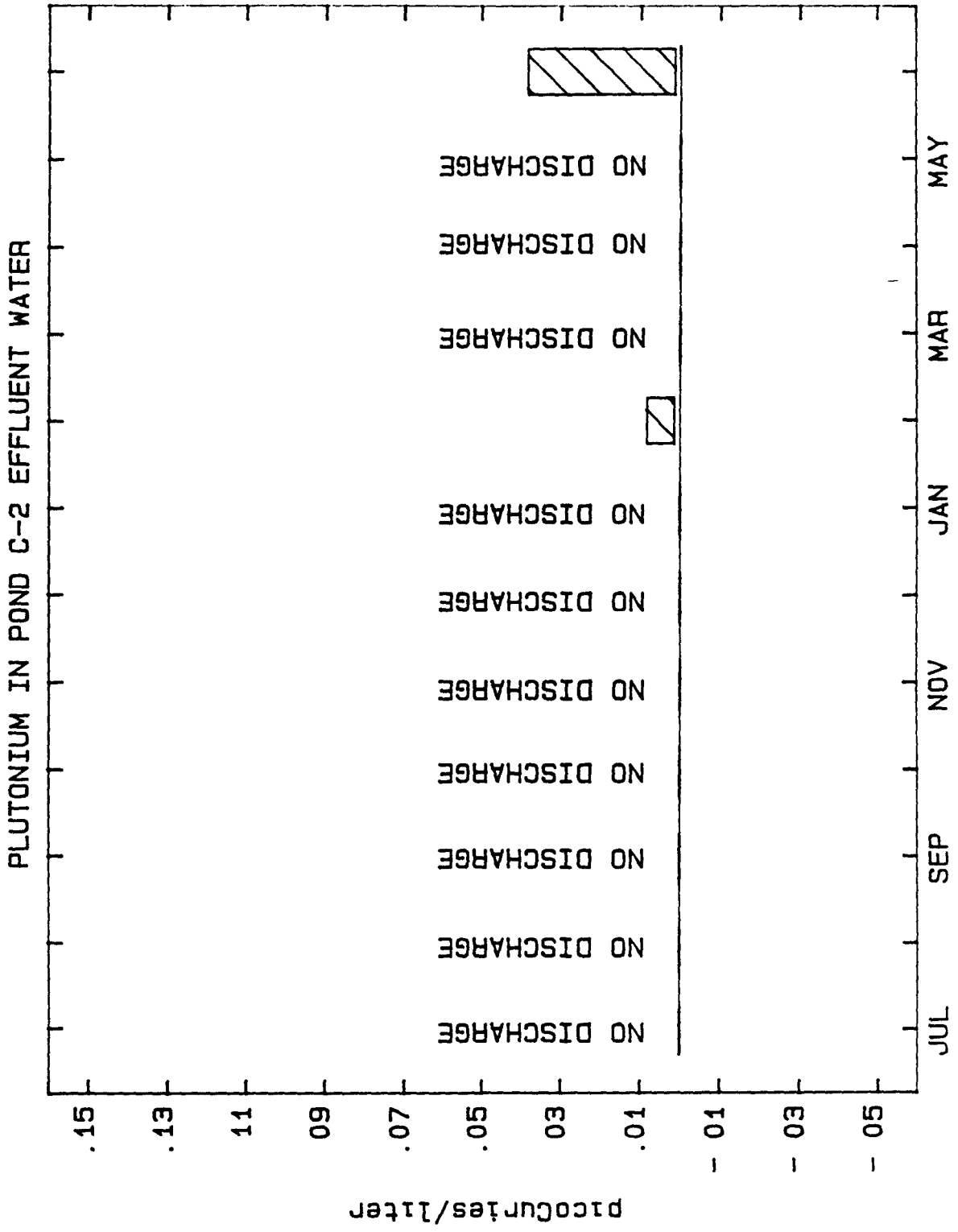
18/29


PLUTONIUM IN POND B-5 EFFLUENT WATER
Picocuries/liter
.08
.07
.06
.05
.04
.03
.02
.01
0
-.01
-.02
NO DISCHARGE
NO DISCHARGE
JUL
SEP
NOV
JAN
MAR
MAY

19/29


PLUTONIUM IN POND C-1 EFFLUENT WATER
Picocuries/liter
.15
.13
.11
.09
.07
.05
.03
.01
-.01
-.03
-.05
NO FLOW
NO FLOW
JUL
SEP
NOV
JAN
MAR
MAY

20/29


PLUTONIUM IN POND C-2 EFFLUENT WATER
picoCuries/liter
.15
.13
11
09
.07
.05
03
.01
- 01
- 03
- 05
JUL
SEP
NOV
JAN
MAR
MAY
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE
NO DISCHARGE

21/29

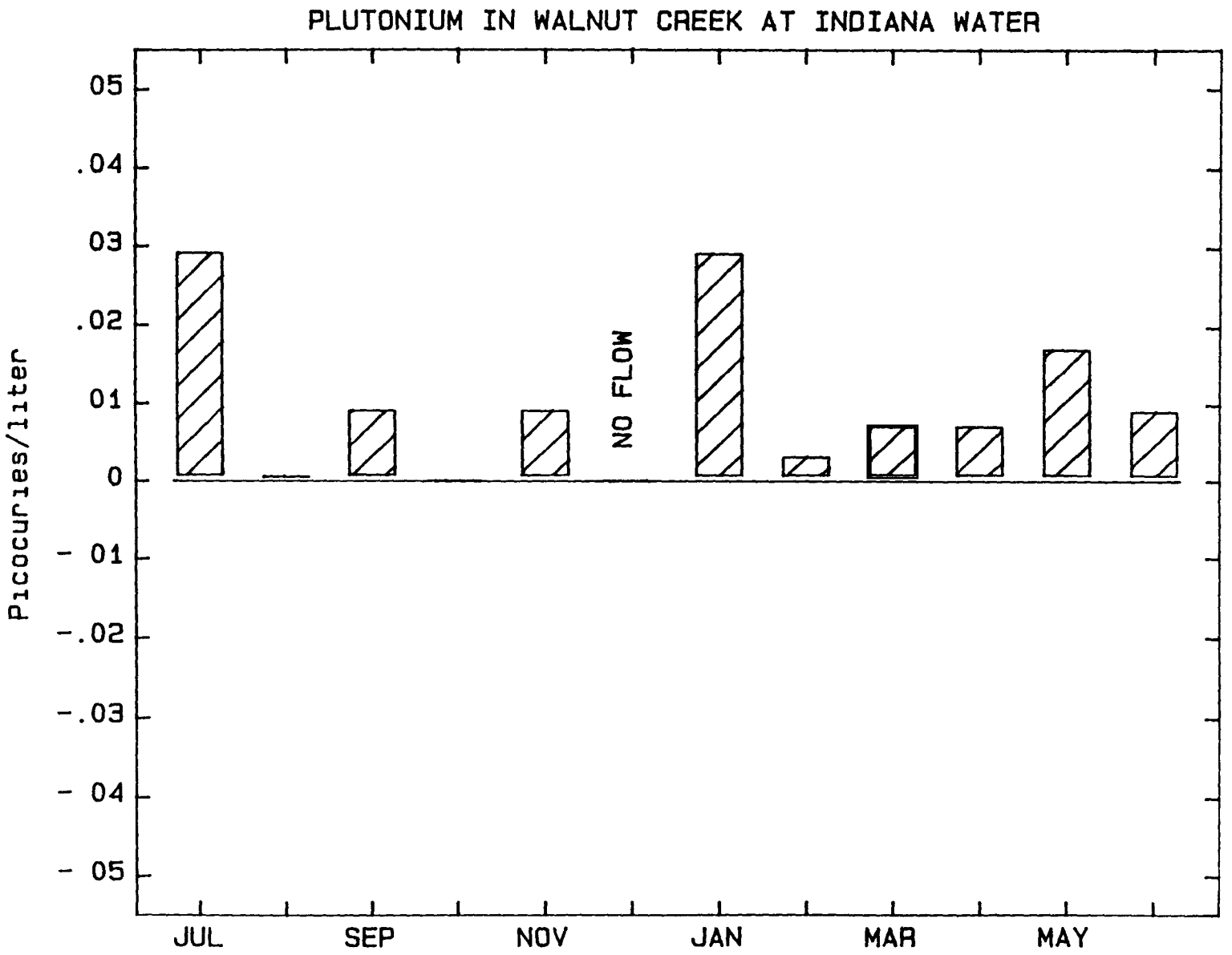

PLUTONIUM IN WALNUT CREEK AT INDIANA WATER
Picocuries/liter
05
.04
03
.02
01
0
- 01
-.02
-.03
- 04
- 05
NO FLOW
JUL
SEP
NOV
JAN
MAR
MAY

Table VIII. Water Sample Results, Radioactive Parameters

Reservoirs (pCi/l)

Location	n	Plutonium	Uranium	Americium
Great Western	1*	0.01 ± 0.01	2.2 ± 0.2	0.02 ± 0.01
Standley	1*	0.005 ± 0.007	1.8 ± 0.2	0.01 ± 0.01

Community Tap Water (pCi/l)

Location	n	Plutonium	Uranium	Americium
Arvada	1*	0.01 ± 0.01	0.2 ± 0.1	0.02 ± 0.01
Boulder	1*	0.001 ± 0.006	0.07 ± 0.08	0.02 ± 0.01
Broomfield	1*	0.02 ± 0.01	1.3 ± 0.2	0.008 ± 0.006
Denver	1	0.01 ± 0.03	0.2 ± 0.1	**
Golden	1	-0.01 ± 0.02	0.7 ± 0.1	0.04 ± 0.03
Lafayette	1	0.00 ± 0.03	0.2 ± 0.1	0.00 ± 0.02
Louisville	1	-0.01 ± 0.02	0.1 ± 0.1	0.02 ± 0.02
Thornton	1	-0.01 ± 0.02	3.8 ± 0.4	0.02 ± 0.02
Westminster	1*	0.02 ± 0.01	0.3 ± 0.1	0.06 ± 0.01

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

** Analysis incomplete.

Table IX. Water Sample Results, Radioactive Parameters

Tritium (pCi/l)

Location	n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
Pond A-4	3	100 ± 400	500 ± 400	400 ± 200
Pond B-5	4	300 ± 400	900 ± 400	700 ± 200
Pond C-1	5	-200 ± 400	700 ± 400	100 ± 200
Pond C-2	3	200 ± 400	700 ± 400	500 ± 200
Walnut Creek at Indiana	5	-300 ± 400	600 ± 400	200 ± 200
Arvada	1	0 ± 400	0 ± 400	0 ± 400
Boulder	4	-100 ± 400	900 ± 500	300 ± 200
Broomfield	4	-200 ± 400	400 ± 400	100 ± 200
Denver	1	-300 ± 400	-300 ± 400	-300 ± 400
Golden	1	-200 ± 400	-200 ± 400	-200 ± 400
Great Western	4	-400 ± 400	400 ± 400	100 ± 200
Lafayette	1	400 ± 400	400 ± 400	400 ± 400
Louisville	1	300 ± 400	300 ± 400	300 ± 400
Standley	4	0 ± 400	100 ± 400	0 ± 200
Thornton	1	1800 ± 400	1800 ± 400	1800 ± 400
Westminster	4	0 ± 400	800 ± 400	300 ± 200

24/29

JUNE 1987

Table X. Water Sample Results, Nonradioactive Parameters

Nitrate (as N) at Great Western Reservoir

Sample Date	Nitrate (as N) (mg/l)
06/05/87	0.3
06/11/87	0.3
06/18/87	0.3
06/25/87	0.3

Nitrate (as N) at Standley Lake

Sample Date	Nitrate (as N) (mg/l)
06/05/87	<0.2
06/11/87	<0.2
06/18/87	<0.2
06/25/87	<0.2

NOTE: For some parameters, the concentrations that are measured at or below the minimum detectable concentration (MDC) are assigned to MDC. The less than symbol (<) indicated MDC values and calculated values that include one or more MDC's.

JUNE 1987

Table XI. NPDES Permit Water Sample Results

Discharge 001 (Pond B-3)
Discharged two times

Parameter		30-Day Average	Limits 30-Day* Average	Daily Maximum	Limits Daily Maximum
Biochem. Oxygen Demand,5 Day	mg/l	<5.8	10	6.7	25
Total Suspended Soilds	mg/l	14	30	19	NA
Nitrates as N	mg/l	2.2	10	2.4	NA
Total Chromium	mg/l	<0.05	0.05	<0.05	0.1
Total Phosphorus	mg/l	0.5	8	0.6	NA
Oil and Grease, Visual		none	NA	none	NA
Total Residual Chlorine	mg/l	0.04	NA	0.1	0.5
Fecal Coliforms	#/100 ml	<1	200	<1	NA

		Minimum	Limits Minimum	Maximum	Limits Maximum
pH	S.U.	7.0	6.0	7.0	9.0

Discharge 002 (Pond A-3)
No Discharge

Parameters		Limits 30-Day Average	30-Day* Average	Limits Daily Maximum	Daily Maximum
Nitrates as N	mg/l		10		20
		Minimum	Maximum	Minimum	Maximum
pH	S.U.		6.0		9.0

Discharge 003 (RO Pilot Plant)
No Discharge

		Minimum	Limits Minimum	Maximum	Limits Maximum
pH	S.U.		6.0		9.0

Discharge 004 (RO Plant)
No Discharge

		30-Day Average	Limits 30-Day* Average	Daily Maximum	Limits Daily Maximum
Total Suspended Solids	mg/l		15		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		400		200
		Minimum	Minimum	Maximum	Maximum
pH	S.U.		6.0		9.0

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

D1/7a

Tables XI. NPDES Permit Water Sample Results (Continued)

Discharge 005 (Pond A-4)

Parameter		n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
pH	S.U.	3	7.9	8.1	-
Nitrates as N	mg/l	3	1.3	1.3	1.3
Nonvolatile Suspended Solids	mg/l	3	0.0	21.	7.0

Discharge 006 (Pond B-5)

Parameter		n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
pH	S.U.	4	7.5	8.7	-
Nitrates as N	mg/l	4	0.6	1.1	0.9
Nonvolatile Suspended Solids	mg/l	4	0.0	1.0	0.2

Discharge 007 (Pond C-2)

Parameter		n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
pH	S.U.	3	7.9	8.1	-
Nitrates as N	mg/l	3	<0.2	<0.2	<0.2
Nonvolatile Suspended solids	mg/l	3	0.0	4.0	1.5

Table XII. Water Sample Results, Nonradioactive Parameters

Walnut Creek at Indiana Street

Parameter		n	$C_{Minimum}$	$C_{Maximum}$	$C_{Average}$
pH	S.U.	21	6.7	7.8	-
Nitrates as N	mg/l	21	<0.2	1.0	<0.5

Total Volume (gallons) = 44,267,000

Table XII.
Daily Flow Data Recorded at the
Walnut Creek at Indiana Gauging Station,
Ponds A-4 and B-5 during June, 1987

Date	Walnut Creek at Indiana (gallons)	Pond A-4 (gallons)	Pond B-5 (gallons)
6/01/87	258,000	-	-
6/02/87	10,398,000	4,936,000	2,436,000
6/03/87	11,038,000	3,241,000	2,337,000
6/04/87	7,659,000	2,325,000	2,186,000
6/05/87	1,629,000	-	2,817,000
6/08/87	1,716,000	-	-
6/09/87	706,000	-	-
6/10/87	570,000	-	-
6/11/87	386,000	-	-
6/12/87	394,000	-	-
6/15/87	1,094,000	-	-
6/16/87	1,464,000	-	-
6/17/87	518,000	-	-
6/18/87	860,000	-	-
6/19/87	832,000	-	-
6/22/87	373,000	-	-
6/23/87	-	-	-
6/24/87	-	-	-
6/25/87	-	-	-
6/26/87	-	-	-
6/29/87	126,000	-	-
6/30/87	4,246,000	-	-
Total Volume	44,267,000	10,502,000	9,776,000

28/29

Table XIII.
Daily Flow Data Recorded at
Ponds C-1 and C-2 during June, 1987
(Woman Creek)

Date	Pond C-1 (gallons)	Pond C-2 (gallons)
6/01/87	636,000	-
6/02/87	145,000	5,741,000
6/03/87	121,000	4,725,000
6/04/87	112,000	-
6/05/87	334,000	-
6/08/87	-	-
6/09/87	209,000	-
6/10/87	239,000	-
6/11/87	110,000	-
6/12/87	78,000	-
6/15/87	155,000	-
6/16/87	29,000	-
6/17/87	23,000	-
6/18/87	262,000	-
6/19/87	244,000	-
6/22/87	247,000	-
6/23/87	27,000	-
6/24/87	28,000	-
6/25/87	10,000	-
6/26/87	60,000	-
6/29/87	165,000	-
6/30/87	709,000	-
Total Volume	3,943,000	10,466,000

29/29