APPENDIX E

TABLES RELATING TO SURFACE AND DRINKING WATER MONITORING

This appendix provides the detailed tables of data related to the surface water monitoring program at the Rocky Flats Plant that were too lengthy or detailed to place in Chapter VI. The tables appear in the order the material is presented in Chapter VI. References cited here are included in the list at the end of Chapter VI.

Table E-1. Streamflow in North Walnut Creek at Rocky Flats Plant (Station No. 06720780)[a]

Date	Days with no flow	Max	Mean	Min	Total volume Cubic ft	Total volume Acre-ft
Jun-72	12	2	0.19	b	5.61	11
Jul-72	31		No flow			
Aug-72	18	1.5	0.16	b	5.05	10
Sep-72	10	0.98	0.15	b	4.41	8.7
Oct-72	22	0.05	0.009	b	0.27	0.5
Nov-72	18	0.17	0.031	b	0.92	1.8
Dec-72	4	0.11	0.047	b	1.46	2.9
Jan-73	0	0.3	0.21	0.05	6.4	13
Feb-73	0	0.3	0.27	0.2	7.65	15
Mar-73	0	1.9	0.66	0.17	20.49	41
Apr-73	0	8	3.9	0.87	116.87	232
May-73	0	21	2.84	0.01	88.11	175
Jun-73	3	0.14	0.03	b	0.91	1.8
Jul-73	6	0.21	0.019	b	0.59	1.2
Aug-73	31	no flow				
Sep-73	25	0.4	0.037	b	1.1	2.2
Oct-73	26	0.92	0.064	b	1.98	3.9
Nov-73	21	0.52	0.038	b	1.14	2.3
Dec-73	0	1.4	0.26	0.01	8.16	16
Jan-74	0	2.1	0.86	0.5	26.59	53
Feb-74	0	1.2	0.67	0.19	18.73	37
Mar-74	0	2.5	1.5	0.8	46.35	92
Mean		2.3	0.60	0.25	18	34
Median		0.95	0.18	0.18	5.3	10

[a] U.S. Geological Survey gauging station at latitude 395357, longitude 1051103 (Hurr 1976).

[b] Minimum is no flow.

Table E-2. Streamflow in South Walnut Creek at Rocky Flats Plant (Station No. 06720790) [a]

				Total volume	
Date	Max	Mean	Min	Cubic ft	Acre-ft
Jul-72	0.52	0.36	0.15	11.03	22
Aug-72	1.6	0.29	0.09	9.14	18
Sep-72	1	0.41	0.02	12.22	24
Oct-72	0.88	0.21		6.52	13
Nov-72	0.75	0.35	0.09	10.4	21
Dec-72	0.3	0.28	0.25	8.8	17
Jan-73	0.35	0.33	0.3	10.31	20
Feb-73	0.37	0.28	0.16	7.97	16
Mar-73	0.63	0.36	0.2	11.09	22
Apr-73	2.2	0.81	0.09	24.4	48
May-73	40	3.14	0.12	97.3	193
Jun-73	0.5	0.4	0.16	11.94	24
Jul-73	0.75	0.26	0.12	8.09	16
Aug-73	0.28	0.13	0.05	4.13	8.2
Sep-73	1	0.31	0.04	9.38	19
Oct-73	1	0.27	0.02	8.3	16
Nov-73	0.64	0.17	0.01	5.19	10
Dec-73	0.92	0.3	0.02	9.17	18
Jan-74	1.7	0.31	0.1	9.74	19
Feb-74	0.35	0.22	0.03	6.08	12
Mar-74	2	0.3	0.1	9.21	18
Apr-74	1.1	0.42	0.1	12.66	25
May-74	0.47	0.16	0.01	4.89	9.7
Jun-74	2.4	0.16	0.01	4.86	9.6
Jul-74	0.2	0.023	0.01	0.7	1.4
Aug-74	0.12	0.036	0.01	1.12	2.2
Sep-74	0.14	0.036	0.01	1.07	2.1
Oct-74	0.61	0.19	0.01	5.8	12
Mean	2.2	0.38	0.08	11.5	23
Median	0.70	0.29	0.08	9.0	18

[a] U.S. Geological Survey gauging station at latitude 395414, longitude 1051103 (Hurr 1976).

Table E-3. Streamflow in Woman Creek at the Rocky Flats Plant (Station No. 06720700) [a]

Date	Days with no flow	Max	Mean	Min	Total volume Cubic ft	Total volume Acre-ft
Aug-72	3	0.19	0.037	0.01	1.13	2.2
Sep-72	0	0.98	0.17	0.03	5.2	10
Oct-72	0	0.61	0.18	0.02	5.7	11
Nov-72	0	0.78	0.49	0.34	14.57	29
Dec-72	0	0.61	0.42	0.12	13.08	26
Jan-73	0	0.98	0.61	0.15	18.76	37
Feb-73	0	1.7	0.91	0.54	25.35	50
Mar-73	0	2.6	1.09	0.54	33.8	67
Apr-73	0	50	17.2	1.5	516.6	1020
May-73	0	60	11.5	0.5	357.5	709
Jun-73	0					
Jul-73 [b]		0.49	0.17	0.03	5.24	10
Aug-73		0.38	0.13	0.04	4.10	8.1
Sep-73		0.47	0.12	0.04	3.74	7.4
Oct-73		0.28	0.09	0.05	2.74	5.4
Nov-73		0.36	0.22	0.13	6.49	13
Dec-73		0.52	0.28	0.19	8.82	17
Jan-74		2.00	0.50	0.20	15.45	31
Feb-74		0.67	0.43	0.26	12.14	24
Mar-74		1.20	0.37	0.22	11.58	23
Apr-74		3.8	0.9	0.19	26.87	53
May-74		2	0.75	0.41	23.1	46
Jun-74		2.5	0.44	0.14	13.27	26
Jul-74		0.48	0.29	0.12	9.03	18
Aug-74		0.4	0.3	0.19	9.24	18
Sep-74		0.64	0.3	0.15	8.96	18
Oct-74		0.73	0.31	0.14	9.63	19
Mean		5.0	1.4	0.24	43	88
Median		0.67	0.36	0.15	9.6	21

[a] U.S Geological Survey gauging station at latitude 395308, longitude 1051105 (Hurr 1976).

[b] Location on Woman Creek changed to Plainview station, latitude 395307, longitude 1051152 (Hurr 1976).

Table E-4. Annual Average Concentrations of Gross Alpha Radioactivity and Plutonium in Drinking Water in Colorado (pCi L^{-1}) [a]

	Gross alpha		^{238}Pu		$^{239,240}Pu$	
Year	Denver	Platteville	Denver	Platteville	Denver	Platteville
1980	4.0	4.0	0.008	[b]	[b]	[b]
1981	3.7	4.9	–0.004	0.042	0.006	0.005
1982	2.7	10.1	0.009	0.000	[b]	–0.002
1983	2.0	12.0	0.017	0.006	0.003	0.002
1984	2.7	18.2	0.008	0.038	0.002	0.012
1985	1.1	21.4	[b]	0.738	[b]	0.081
1986	1.1	19.0	[b]	0.011	[b]	0.002
1987	–0.1	9.3	[b]	0.007	[b]	–0.002
1988	1.0	11.6	0.005	0.001	0.004	0.003
1989	2.6	13.4	[d]	0.002	[c]	[c]
1990	0.7	7.1	[b]	[b]	[b]	[b]
1991	1.2	9.2	[b]	[c]	[b]	0.003
1992	1.8	14.3	0.008	0.022	0.001	0.005

[a] Data are analyses of annual composite samples by the EPA. For the last two columns of data here, results were reported as ^{239}Pu, but we assume they are actually $^{239,240}Pu$.
[b] No sample was obtained.
[c] Sample analysis result was “not detected.”

Table E-5. Annual Average Concentrations of Plutonium in Precipitation at Denver, Colorado (pCi L^{-1}) [a]

Year	^{238}Pu	$^{239,240}Pu$
1980	[b]	[b]
1981	–0.001	–0.007
1982	0.003	0.002
1983	–0.001	0.002
1984	0.001	0.003
1985	–0.005	0.002
1986	0.024	0.015
1987	[b]	[b]
1988	0.006	–0.001
1989	[b]	[b]
1990	[c]	[c]
1991	[d, e]	[d, e]
1992	0.002 [e]	0.003 [e]
1993	0.003	0.002

[a] Data are analyses of annual composite samples, by the EPA (see text for citations). For the last column of data here, results were reported as ^{239}Pu, but we assume they are actually $^{239,240}Pu$.
[b] No sample was obtained.
[c] The appropriate report for these results was not obtained by us.
[d] Sample analysis result was "not detected."
[e] Sample was a composite for January to June.

Table E-6. Characteristics of the Solar Evaporation Ponds[a]

Ponds	Date in service	Area (acres)	Max. depth (feet)	Dates of Modifications
207A	Aug 1956	3	7.5	Nov 1963 (asphalt concrete); 1984 (equipment installed to clean out pond).
207B North	June 1960	1	6.5	Aug 1961 (asphalt concrete); Apr 1967 (filled cracks with mastic); Nov 1967(repaired sidewalls with burlap and asphalt covering); Oct 1968 (additional coat of asphalt); Nov 1969 (covered all side walls with burlap and asphalt); Oct 1971 and Sep 1973 (covered side walls with petromat and hydraulic sealant); July 1977- (decommissioned).
207B Central	June 1960	1	6.5	Aug 1961 (asphalt concrete); Apr 1967 (filled cracks with mastic); Nov 1967 (repaired sidewalls with burlap & asphalt covering); Oct 1968, Oct 1969 (repaired cracked side walls with burlap and asphalt); Oct 1971 (covered side walls with petromat and hydraulic sealant); July 1977- (decommissioned).
207B South	June 1960	1	5.5	Nov 1960 (asphalt concrete); Apr 1967 (filled cracks with mastic); Sep 1970 (covered all side walls with burlap and asphalt); July 1977 (decommissioned).
207C	Dec 1970	1	7	

[a] From Farrell (1955), White (1963), Owen (1974), DOE 1980, Rockwell (1988).

Table E-7. Historic Water and Vegetation Sampling Locations[a]

Sample No.	Location Description
VW-1	Upper Church Ditch at East Cattle Fence
VW-2	Walnut Creek Retaining Pond
VW-3	Rock Creek at North Cattle Fence
VW-4	Woman Creek Retaining Pond
VW-4A	Woman Creek at East Cattle Fence
VW-5	Springs SW of 44 (NE Spring)
VW-6	Springs SW of 44 (NW Spring) SW 1/4 NE 1/4 Sec 15
VW-7	Springs SW of 44 (SE Spring) R70W T2S
VW-9	Draw North of Walnut Creek at East Cattle Fence
VW-10	Draw by 95-Bldg. at East Cattle Fence
VW-11	Great Western Reservoir
VW-15	Lake South of Ketner Reservoir NW 1/4 SW 1/4 Sec 15 R69W T2S
VW-16	Coal Creek at Plainview Road
VW-17	South Boulder Creek East of Eldorado Springs SE 1/4 NW 1/4 Sec 30 R70W T1S
VW-18	Community Ditch at Point Due North of 71 Bldg.
VW-19	Marshall Lake
VW-20	Standley Lake
VW-21	Leyden Lake
VW-22	Rocky Flats Lake
VW-23	West Twin Lake (upper)
VW-24	East Twin Lake (lower)
VW-26	Baseline Reservoir
VW-27	Stearns Lake
VW-29	Nissen Reservoir #2
VW-30	Lower Church Lake
VW-31	Ralston Reservoir
VW -32	Louisville Reservoir
VW -32A	Louisville Tap
VW-33	Lafayette Reservoir
VW-34	Chautauqua Reservoir
VW-34A	Boulder Tap
VW-35	Sunshine Reservoir
VW-36	South Boulder Diversion Canal at Upper Church Ditch Crossing
VW-37	Long Lake
VW-38	Lookout Mountain Reservoir
VW-38A	Golden Tap
VW-39	Arvada Tap
VW-40	South Boulder Creek West of Eldorado Springs
VW-41	Eastlake Reservoir
VW-42	Sloans Lake
VW-43	Mud Lake
VW-44	Rocky Mountain Lake
VW-45	Berkeley Lake
VW-46	City Park Lake

Table E-7. (continued) [a]

Sample No.	Location Description
VW-48	Baller Lake
VW-50	Clear Creek at Golden
VW-51	Marston Lake
VW-52	McKay Lake
VW-53	Lafayette Tap
VW-54	Westminster Tap
VW-55	95-Bldg. Effluent
VW-55A	95-Bldg. Draw Retaining Pond
VW-56	Smith Lake
VW-57	Broomfield Tap
VW-58	Rocky Flats Tap
VW-60	South Fork Woman Creek at West Cattle Fence
VW-61	Woman Creek at West Cattle Fence
VW-62	McKay Ditch (Walnut Creek) at West Cattle Fence
VW-63	Upper Church Ditch at West Cattle Fence
VW-64	Rock Creek at West Cattle Fence
VW-65	Walnut Creek at East Cattle Fence
VW-66	Walnut Creek Retaining Pond
VW-67	East Fork Rock Creek at North Cattle Fence
VW-68	Spring--Northeast Slope of Nitrate Pond
VW-69	Lindsey Pond
VW-70	Untreated Plant Water--Bldg. 24
Ppt	Precipitation--Roof of Bldg. 23
VW-71	Holding Pond from Spring--below 81 Bldg.

[a] These locations were originally established for the background survey in 1951. Figure VI-8 shows many of these locations.

Table E-8. Historic Vegetation Sampling Locations (VG) [a]

Sample No.	Location description
VG-1	Ralston Creek--Hwy. 93
VG-2	Cressman Gulch--Hwy. 93
VG-3	Ulysses St.--W. 64th Ave.
VG-4	Hwy. 72 at Ralston School Site
VG-5	Hwy. 72--Ward Road
VG-6	Ward Road--C&S RR Tracks
VG-7	Simms St.--W. 72nd Ave.
VG-8	Miller St.--Ralston Road
VG-9	Kipling St.--W. 72nd Ave.
VG-10	Carr St.--W. 68th Ave.
VG-11	Wadsworth St.--W. 44th Ave.
VG-12	Pecos St.--W. 84th Ave.
VG-13	Sheridan Blvd.--W. 80th Ave.
VG-14	Wadsworth St.--W. 80th Ave.
VG-15	Kipling St.--W. 80th Ave.
VG-16	Semper School
VG-17	Sheridan Blvd.--Blackham Road
VG-18	Mandalay School
VG-19	Sheridan Blvd.--W. 104th Ave.
VG-20	Sheridan Blvd.--US 287
VG-21	RR ôYö at Coaton
VG-22	Hwy. 170--Township Road (1 mile N. Stearns Lake)
VG-23	Louisville Cemetery
VG-24	US 287--South Boulder Road
VG-25	Hwy. 168--South Boulder Road
VG-26	Hwy. 170 by Turnpike Crossing
VG-27	Hwy. 170--Crown Mine
VG-28	Hwy. 93--Hwy. 398
VG-29	Marshalville School
VG-30	Hwy. 93--South Boulder Road
VG-31	Hwy. 93--Turnpike
VG-32	Hwy. 7--Valley Road School
VG-33	Hwy. 7--Fairview School
VG-34	South Boulder Road--Shamrock School Site
VG-35	Broomfield Air Sampling Station
VG-36	Westminster Air Sampling Station
VG-37	Arvada Air Sampling Station
VG-38	Wadsworth Blvd. at Clear Creek
VG-39	Fenton St.--W. 33rd Ave. (Wheatridge Air Sampling Station)
VG-40	River Drive--W. Florida Ave.

[a] These locations were more distant from the site, beyond the grid system established for the 1951 background survey. Figure VI-8 shows many of these locations.

Table E-9. Sample from Early Laboratory Logbooks of the Analysis of Water Samples [a]

Lab No.	Sample location #	Collection date	Sample type	Collector	Sample Size	Lab. date	Analyst	Gross cpm	Bkgd	Af(NO_3)$_3$ blank	Net cpm	Process efficiency	dpm per liter	Report date	Remarks
1	PPT	1/5/59	water	JB	7 L	1/8/59	JB	20.67	0.10	0.18	20.39	0.434	6.7	2/10/59	
2	W-20	1/6/59	water	HT	"	"	"	5.05	0.11	0.18	4.76	"	1.6	"	
3	W-26	"	water	"	"	"	"	14.03	0.07	0.18	13.78	"	4.5	"	
4	W-11	"	water	"	"	"	"	19.22	0.11	0.18	18.93	"	6.2	"	
5	W-31	"	water	"	"	"	"	5.2	0.06	0.18	4.96	"	1.6	"	
6	W-20	1/13/59	water	"	"	1/20/59	"	3.52	0.11	0.18	3.23	"	1.1	2/18/59	
7	W-26	"	water	"	"	"	"	5.14	0.11	0.18	4.85	"	1.6	"	
8	W-11	"	water	"	"	"	"	12.01	0.06	0.18	11.77	"	3.9	"	
9	W-31	"	water	"	"	"	"	9.39	0.09	0.18	9.12	"	3.0	"	
10	W-58	1/31/59	water	"	"	2/2/59	HJ	0.28	0.09	0.00	0.19	"	0.1	2/25/59	
11	W-70	"	water	"	"	"	"	5.42	0.06	0.14	5.22	"	1.7	3/24/59	
12[b]	W-31	2/11/59	water	"	"	2/12/59	"	7.77	0.06	0.14	7.57	"	2.5	3/24/59	
21[b]	W-2	3/4/59	water	"	"	3/5/59	"	18.39	0.08	0.09	18.22	"	6.0	4/8/59	(+/- 5%)
								20.46	0.08	0.09	20.29	"	6.7	4/8/59	(+/- 5%)
22	W-4	"	water	"	"	"	"	5.08	0.07	0.09	4.92	"	1.6	4/8/59	(+/- 2%)
								4.87	0.07	0.09	4.71	"	1.6	4/8/59	(+/- 2%)
23	W-55	"	water	"	"	"	"	38.4	0.08	0.09	38.23	"	12.6	4/8/59	
24	W-55-A	"	water	"	"	"	"	42.52	0.08	0.09	42.35	"	13.9	4/8/59	(+/- 5%)
								47.06	0.08	0.09	46.89	"	15.4	4/8/59	(+/- 5%)
25	W-26	3/10/59	water	"	"	3/11/59	"	15.4	0.05	0.14	15.21	0.434	5.0	3/24/59	
26	W-22	"	water	"	"	"	"	7.93	0.04	0.14	7.75	"	2.6	3/24/59	
27	W-20	"	water	"	"	"	"	14.17	0.06	0.01	14.10	"	4.6	4/6/59	
28	W-31	"	water	"	"	"	"	8.39	0.08	0.01	8.30	"	2.7	"	
29	W-21	3/12/59	water	BT	"	3/18/59	"	7.66	0.05	0.01	7.60	"	2.5	"	
30	W-20	"	water	"	"	"	"	5.86	0.05	0.01	5.80	"	1.9	"	
31	W-31	"	water	"	"	"	"	9.82	0.06	0.01	9.75	"	3.2	"	

32	W-11	3/23/59	water	DL	"	3/24/59	"	17.99	0.08	0	17.91	0.434	5.9	5/1/59	
33	W-26	"	water	"	"	"	"	3.04	0.05	0	2.99	"	1.0	5/1/59	
34	W-20	"	water	"	"	"	"	4.91	0.07	0	4.84	"	1.6	"	
35	W-2	4/1/59	water	BT	"	4/16/59	BT	15.77	0.25	0	15.52	"	5.1	"	used high result
								5.91	0.06	0	5.85	"	1.9	"	used high result
36	W-55-A	"	water	"	"	"	"	36.16	0.07	0	36.09	"	11.9	"	(+/- 17%)
								25.4	0.07	0	25.33	"	8.3	"	(+/- 17%)

[a] From 1/1/59 through 12/31/60; samples were numbered sequentially as they were brought into the laboratory for analysis.
b Samples 13 through 20 not shown here but were included in the handwritten logbooks (Dow 1952–1979).

Table E-10. Background Concentrations of Alpha Activity and Uranium in Rocky Flats Area Waterways and Water Bodies in 1951 [a]

Location [b]	Sample location	No. of samples	Total Pu+U [c] (pCi L^{-1})	U conc. [c] (μg L^{-1})	U Activity [c] (pCi L^{-1})
ONSITE					
Walnut Creek	W-2	4	1.20	1.8	1.2
Rock Creek	W-3	4	1.40	2.9	2
Woman Creek	W-4	4	0.55	0.8	0.55
Woman Creek	W-5	4	0.38	0.4	0.27
Woman Creek	W-6	4	0.50	0.7	0.48
Smart Creek	W-7	4	1.80	1.6	1.1
OFFSITE					
Great Western	W-11	3	0.73	1.2	0.82
Mower Reservoir	W-12	4	1.10	2.2	1.5
Upper Church Lake	W-13	4	1.50	2.4	1.6
Unknown	W-14	4	2.50	3.5	2.4
Unknown	W-15	4	1.60	3	2.1
Coal Creek	W-16	4	1.30	1.9	1.3
Boulder Creek	W-17	4	1.00	1.9	1.3
Coal Creek	W-18	4	0.95	1.3	0.89
Marshall Lake	W-19	4	0.95	1.4	0.96
Standley Lake	W-20	4	1.10	2.2	1.5
Leyden Lake	W-21	4	2.30	5.6	3.8
Rocky Flats Lake	W-22	4	0.68	1.1	0.76
Ralston Reservoir	W-31	4	0.68	1.5	1
Louisville Reservoir	W-32	4	0.73	1.1	0.76
Lafayette Reservoir	W-33	4	0.38	0.3	0.21
So Boulder Diversion Canal	W-35	4	2.60	4.5	3.1
Arvada	W-37	2	0.64	0.3	0.21
Eastlake R. #3	W-41				
Average			1.16	1.90	1.30
Std dev			0.65	1.32	0.90

[a] Samples were taken during July, August, September, and November 1951, and shipped to Hanford Plant for analysis. A combined plutonium-uranium radiochemical analysis was used in which total radioactivity was determined with a parallel-plate alpha counter.

[b] From near center of the Rocky Flats Plant to greater distance.

[c] Uranium concentration was determined by fluorometry; the plutonium concentration was assumed to be the difference.

Table E-11. Highlights of the Effluent Monitoring History at the Rocky Flats Plant

- Waste Disposal Unit was organized in January 1953 under John Epp and F. Langell to supervise the "ultimate disposal of processed liquid and solid wastes and the correlations of the allied data". E.S. Ryan was the chemist in charge of correlating the data. Issued monthly progress reports.

- Water Laboratory of the General Laboratory conducted analyses of liquid effluent for total solids, pH, nitrates with a major effort to remove or reduce nitrate content of liquid waste.

- Ponds to east of Building 95 under construction reported in June 1953.

- In August 1953, liquid wastes from Building 23 went directly to the sanitary system instead of to Building 741 reservoir.

- In July 1953, sampling of the retention ponds began; the number of discharges, volume, total activity, and average concentration were reported.

- In September 1953, the inlet and outlet of the Lower Retention Pond B was sampled daily for pH and nitrates.

- In October 1953, the Waste Disposal Unit progress report included the quantity of solid wastes in storage.

- In February 1954, there was a disruption of Building 95 (now called 995) sewage treatment plant due to the release of steam condensate from Building 81 (now called Building 881). The waste contained chromate and was at high enough temperature to raise the temperature of the influent going to Building 95, by "several degrees."

- On March 10, 1954, water was first released from the Pond A on North Walnut Creek. Weekly samples were taken from the effluent.

- Four retention ponds on Woman Creek were completed; the first effluent discharged from the large pond occurred on March 29, 1955.

- In August 1955, a crude continuous sampler was installed at the outlet of Pond B-3 (or, also called Pond 5); collected a 50-gallon sample over a 24-hour period.

- By 1963, the first renovations to the Process Waste Treatment Facility (Building 774) were completed.

- By the end of 1972, effluents from Building 995 were higher in plutonium concentrations than influent; related to 2 causes: (1) Building 990 pre-aeration plant being closed since September 4, 1972 for construction work. In absence of Building 990, surges of high volume to Building 995 were overloading system; (2) supernate, high in radioactivity, pumped from digester to primary clarifier instead of to sludge drying beds.

Table E-12. Reported Releases of Gross Alpha and Plutonium from B Ponds to South Walnut Creek[a]

Month[b]	Gross alpha (mCi)	Plutonium (mCi)	Ratio[c] (Pu/alpha)	Month[b]	Gross alpha (mCi)	Plutonium (mCi)	Ratio[c] (Pu/alpha)
Jan-70	0.36	0.10	0.26	Apr-72	0.83	0.32	0.38
Feb-70	0.23	0.07	0.31	May-72	0.49	0.13	0.27
Mar-70	0.24	0.09	0.38	Jun-72	0.42	0.15	0.34
Apr-70	0.24	0.12	0.50	Jul-72	0.23	0.08	0.36
May-70	0.44	0.12	0.26	Aug-72	0.13	0.08	0.56
Jun-70	0.10	0.04	0.38	Sep-72	0.30	0.16	0.52
Jul-70	0.37	0.03	0.08	Oct-72	0.54	0.27	0.49
Aug-70	0.07	0.01	0.17	Nov-72	1.97	1.57	0.79
Sep-70	0.12	0.01	0.12	Dec-72	1.86	1.62	0.87
Oct-70	0.40	0.05	0.13	Jan-73	1.06	0.70	0.66
Nov-70	0.74	0.22	0.29	Feb-73	1.45	0.80	0.55
Dec-70	0.40	0.06	0.14	Mar-73	0.74	0.36	0.49
Jan-71	0.26	0.08	0.32	Apr-73	0.85	0.32	0.38
Feb-71	0.95	0.10	0.11	May-73	2.64	0.45	0.17
Mar-71	0.65	0.14	0.22	Jun-73	1.29	0.59	0.46
Apr-71	0.61	0.12	0.20	Jul-73	0.36	0.34	0.94
May-71	0.41	0.09	0.21	Aug-73	0.12	0.10	0.83
Jun-71	0.23	0.05	0.19	Sep-73	0.15	0.12	0.80
Jul-71	0.15	0.07	0.48	Oct-73	0.11	0.08	0.73
Aug-71	0.35	0.03	0.09	Nov-73	0.07	0.04	0.57
Sep-71	0.24	0.09	0.38	Dec-73	0.15	0.11	0.70
Oct-71	0.24	0.04	0.18				
Nov-71	0.51	0.02	0.05	Average	0.57	0.22	0.37
Dec-71	0.62	0.06	0.10	Std dev	0.55	0.34	0.24
Jan-72	0.35	0.06	0.16	Median	0.39	0.10	0.33
Feb-72	1.31	0.25	0.19	Max	2.64	1.62	0.94
Mar-72	1.07	0.15	0.14	Min	0.07	0.01	0.05

[a] From *Status Report--Waste Management Waste Disposal* monthly reports.
[b] Both gross alpha and plutonium were measured during this 3-year period.
[c] The ratio of plutonium to gross alpha forms the basis for estimating plutonium releases for earlier years when only gross alpha was measured.

Table E-13. Monthly Plutonium Release Estimates from Pond B to South Walnut Creek for 1953–1969 (mCi)[a]

	Percentile values				Percentile values				Percentile values		
Date	95th	50th	5th	Date	95th	50th	5th	Date	95th	50th	5th
Jul-53	0.22	0.06	0.02	Jul-56	0.16	0.04	0.01	Jul-59	0.11	0.04	0.02
Aug-53	0.23	0.05	0.01	Aug-56	0.09	0.03	0.01	Aug-59	0.28	0.11	0.04
Sep-53	0.23	0.06	0.01	Sep-56	0.06	0.02	0.01	Sep-59	0.12	0.05	0.02
Oct-53	0.19	0.06	0.02	Oct-56	0.04	0.01	0.00	Oct-59	0.44	0.16	0.06
Nov-53	0.21	0.06	0.02	Nov-56	0.05	0.02	0.00	Nov-59	0.33	0.13	0.05
Dec-53	0.20	0.06	0.01	Dec-56	0.06	0.02	0.00	Dec-59	0.48	0.18	0.07
Jan-54	1.30	0.33	0.08	Jan-57	0.07	0.02	0.01	Jan-60	0.19	0.08	0.03
Feb-54	0.55	0.14	0.03	Feb-57	0.08	0.02	0.01	Feb-60	0.46	0.17	0.06
Mar-54	0.32	0.08	0.02	Mar-57	0.12	0.03	0.01	Mar-60	0.56	0.21	0.09
Apr-54	0.98	0.25	0.07	Apr-57	0.33	0.09	0.02	Apr-60	0.72	0.26	0.10
May-54	0.79	0.22	0.05	May-57	0.43	0.13	0.04	May-60	0.82	0.33	0.13
Jun-54	0.16	0.05	0.01	Jun-57	0.26	0.07	0.02	Jun-60	0.52	0.20	0.07
Jul-54	0.10	0.02	0.01	Jul-57	0.16	0.04	0.01	Jul-60	0.11	0.04	0.02
Aug-54	0.17	0.05	0.01	Aug-57	0.06	0.02	0.00	Aug-60	0.14	0.05	0.02
Sep-54	0.15	0.05	0.01	Sep-57	0.06	0.02	0.01	Sep-60	0.17	0.06	0.02
Oct-54	0.24	0.07	0.02	Oct-57	0.12	0.03	0.01	Oct-60	0.27	0.11	0.04
Nov-54	0.18	0.05	0.01	Nov-57	0.05	0.01	0.00	Nov-60	0.34	0.12	0.05
Dec-54	0.18	0.05	0.01	Dec-57	0.11	0.03	0.01	Dec-60	0.16	0.07	0.02
Jan-55	0.18	0.05	0.01	Jan-58	0.13	0.04	0.01	Jan-61	0.42	0.16	0.06
Feb-55	0.22	0.06	0.02	Feb-58	0.12	0.03	0.01	Feb-61	0.36	0.14	0.05
Mar-55	0.37	0.09	0.03	Mar-58	0.24	0.07	0.02	Mar-61	0.47	0.16	0.06
Apr-55	0.24	0.07	0.02	Apr-58	0.35	0.10	0.03	Apr-61	0.39	0.16	0.06
May-55	0.11	0.03	0.01	May-58	0.31	0.09	0.02	May-61	0.52	0.20	0.07
Jun-55	0.14	0.04	0.01	Jun-58	0.16	0.04	0.01	Jun-61	0.26	0.10	0.04
Jul-55	0.21	0.06	0.01	Jul-58	0.14	0.04	0.01	Jul-61	0.22	0.09	0.03
Aug-55	0.17	0.05	0.01	Aug-58	0.12	0.03	0.01	Aug-61	0.37	0.15	0.06
Sep-55	0.15	0.04	0.01	Sep-58	0.31	0.08	0.02	Sep-61	0.49	0.18	0.07
Oct-55	0.15	0.04	0.01	Oct-58	0.20	0.06	0.02	Oct-61	0.44	0.17	0.06
Nov-55	0.20	0.05	0.01	Nov-58	0.17	0.06	0.02	Nov-61	0.47	0.17	0.06
Dec-55	0.18	0.05	0.01	Dec-58	0.20	0.07	0.03	Dec-61	0.58	0.21	0.08
Jan-56	0.19	0.05	0.02	Jan-59	0.43	0.16	0.06	Jan-62	1.22	0.44	0.16
Feb-56	0.18	0.05	0.02	Feb-59	0.26	0.10	0.04	Feb-62	0.79	0.29	0.11
Mar-56	0.12	0.03	0.01	Mar-59	0.17	0.06	0.02	Mar-62	0.50	0.20	0.08
Apr-56	0.14	0.04	0.01	Apr-59	0.45	0.16	0.06	Apr-62	0.50	0.18	0.07
May-56	0.34	0.08	0.02	May-59	0.32	0.12	0.05	May-62	0.41	0.16	0.06
Jun-56	0.11	0.03	0.01	Jun-59	0.25	0.10	0.04	Jun-62	0.38	0.15	0.06

Table E-13. (continued) [a]

	Percentile values				Percentile values				Percentile values		
Date	95th	50th	5th	Date	95th	50th	5th	Date	95th	50th	5th
Jul-62	0.17	0.06	0.02	Jan-65	0.18	0.07	0.03	Jul-67	0.20	0.08	0.03
Aug-62	0.13	0.05	0.02	Feb-65	0.16	0.06	0.02	Aug-67	0.10	0.04	0.01
Sep-62	0.09	0.03	0.01	Mar-65	0.16	0.06	0.02	Sep-67	0.16	0.06	0.02
Oct-62	0.17	0.06	0.02	Apr-65	0.15	0.06	0.02	Oct-67	0.05	0.02	0.01
Nov-62	0.14	0.05	0.02	May-65	0.09	0.03	0.01	Nov-67	0.11	0.04	0.01
Dec-62	0.14	0.05	0.02	Jun-65	0.16	0.06	0.02	Dec-67	0.19	0.07	0.03
Jan-63	0.22	0.08	0.03	Jul-65	0.16	0.07	0.02	Jan-68	0.37	0.14	0.06
Feb-63	0.16	0.06	0.02	Aug-65	0.17	0.07	0.02	Feb-68	0.34	0.13	0.05
Mar-63	0.19	0.07	0.03	Sep-65	0.11	0.04	0.01	Mar-68	0.33	0.13	0.05
Apr-63	0.15	0.06	0.02	Oct-65	0.17	0.07	0.02	Apr-68	0.35	0.13	0.05
May-63	0.19	0.08	0.03	Nov-65	0.27	0.10	0.04	May-68	0.23	0.09	0.04
Jun-63	0.15	0.06	0.02	Dec-65	0.26	0.10	0.04	Jun-68	0.18	0.08	0.03
Jul-63	0.11	0.04	0.02	Jan-66	0.23	0.10	0.04	Jul-68	0.23	0.09	0.04
Aug-63	0.13	0.05	0.02	Feb-66	0.41	0.16	0.06	Aug-68	0.08	0.03	0.01
Sep-63	0.18	0.07	0.03	Mar-66	0.41	0.16	0.06	Sep-68	0.25	0.09	0.03
Oct-63	0.16	0.06	0.02	Apr-66	0.25	0.10	0.04	Oct-68	0.27	0.10	0.03
Nov-63	0.09	0.03	0.01	May-66	0.18	0.07	0.02	Nov-68	0.25	0.09	0.04
Dec-63	0.21	0.08	0.03	Jun-66	0.37	0.13	0.05	Dec-68	0.24	0.09	0.03
Jan-64	0.17	0.07	0.02	Jul-66	0.26	0.10	0.03	Jan-69	0.32	0.11	0.04
Feb-64	0.19	0.07	0.03	Aug-66	0.24	0.10	0.04	Feb-69	0.31	0.11	0.04
Mar-64	0.24	0.09	0.03	Sep-66	0.24	0.09	0.03	Mar-69	0.25	0.10	0.04
Apr-64	0.34	0.11	0.05	Oct-66	0.25	0.09	0.03	Apr-69	0.31	0.12	0.05
May-64	0.15	0.06	0.02	Nov-66	0.24	0.09	0.03	May-69	0.34	0.13	0.05
Jun-64	0.21	0.08	0.03	Dec-66	0.25	0.09	0.04	Jun-69	0.52	0.20	0.08
Jul-64	0.08	0.03	0.01	Jan-67	0.24	0.10	0.03	Jul-69	0.33	0.12	0.05
Aug-64	0.12	0.04	0.01	Feb-67	0.23	0.09	0.04	Aug-69	0.27	0.11	0.04
Sep-64	0.12	0.05	0.02	Mar-67	0.38	0.14	0.06	Sep-69	0.11	0.04	0.01
Oct-64	0.25	0.10	0.03	Apr-67	0.32	0.12	0.05	Oct-69	0.08	0.03	0.01
Nov-64	0.18	0.07	0.03	May-67	0.36	0.14	0.05	Nov-69	0.07	0.03	0.01
Dec-64	0.16	0.06	0.02	Jun-67	0.23	0.09	0.03	Dec-69	0.16	0.06	0.02

[a] Based on monthly ratios of alpha to plutonium measurements from 1970-1973 that were applied to early gross alpha data; this method allows the estimation of plutonium releases for earlier years when only gross alpha was measured.

Table E-14. Tritium Levels in the Great Western Reservoir Measured by the Colorado Department of Health [a]

Date	Conc. (pCi L^{-1})	Error [b] (pCi L^{-1})	Date	Conc. (pCi L^{-1})	Error [b] (pCi L^{-1})	Date	Conc. (pCi L^{-1})	Error [b] (pCi L^{-1})
6/25/70	1722	534	5/10/73	3717	516	12/12/73	9256	572
9/17/70	1156	508	5/16/73	3686	514	12/18/73	9541	593
9/17/70	1154	506	5/16/73	4378	525	12/28/73	9248	590
4/13/71	1018	472	5/24/73	3555	518	1/9/74	9646	599
4/13/71	1112	472	5/24/73	3778	517	1/15/94	10234	584
4/13/71	703	467	6/1/73	22844	728	1/21/94	10231	584
10/7/71	-500	MDA	6/1/73	23293	735	1/30/74	9606	577
			6/7/73	18994	690	2/5/74	8881	579
9/12/72	1206	489	6/7/73	18394	686	2/13/74	9499	570
9/20/72	1497	493	6/15/73	19439	697	2/21/74	8721	561
9/30/72	959	477	6/21/73	16019	662	2/16/74	9034	580
10/6/72	1085	479	6/27/73	16934	672	4/3/74	8726	570
10/14/72	773	474	7/3/73	15809	660	4/5/74	8167	567
10/20/72	1182	478	7/11/73	14625	647	4/8/74	8277	558
10/26/72	500	MDA	7/19/73	12520	627	5/8/74	7371	556
11/4/72	706	471	7/25/73	12429	666	5/14/74	6457	545
11/14/72	838	473	8/2/73	13286	635	5/20/74	6434	550
11/22/72	1150	478	8/8/73	13139	922	5/28/74	5284	512
11/28/72	1303	480	8/14/73	12354	912	7/1/74	4290	510
			8/24/73	10847	893	7/10/74	3846	493
1/4/73	500	MDA	8/31/73	12525	914	7/16/74	3590	490
1/10/73	703	501	9/7/73	11222	898	7/22/74	3574	490
1/20/73	1884	525	9/13/73	10558	980	7/30/74	2948	603
1/26/73	684	526	8/8/73	10795	723	8/7/74	3091	605
2/1/73	1082	562	8/14/73	11144	727	8/12/74	2795	602
2/9/73	769	558	8/24/73	10232	576	8/21/74	3059	572
2/15/73	908	560	8/28/73	10162	575	8/26/74	2858	570
2/23/73	753	558	9/7/73	10350	577	9/9/74	3079	573
3/1/73	737	557	9/20/73	9918	572	9/16/74	3193	508
3/9/73	643	556	9/27/73	6865	536	9/24/74	3263	487
3/15/73	978	561	10/3/73	9774	571	10/3/74	3572	492
3/25/73	500	MDA	10/11/73	9806	571	10/7/74	3007	483
3/29/73	683	478	10/17/73	10373	577	10/16/74	3064	484
4/4/73	514	417	10/23/73	9976	482	10/21/74	3037	483
4/12/73	854	472	10/25/73	10272	566	10/30/74	3677	500
4/18/73	1462	481	10/31/73	10317	573	11/4/74	3345	496
4/26/73	2694	519	11/8/73	10144	571	11/11/74	3109	507
4/26/73	3531	518	11/12/73	10183	571	11/18/74	3609	516
5/4/73	4030	518	11/20/73	9279	567	11/25/74	3553	515
5/4/73	4786	530	11/26/73	9269	567	12/2/74	3469	504
5/10/73	3496	511	12/4/73	9893	580	12/9/74	3282	501

Table E-14. (continued) [a]

Date	Conc. (pCi L^{-1})	Error [b] (pCi L^{-1})	Date	Conc (pCi L^{-1})	Error [b] (pCi L^{-1})	Date	Conc (pCi L^{-1}l)	Error [b] (pCi L^{-1}
12/16/74	3337	485	9/15/75	892	474	6/28/76	978	467
12/23/74	3136	482	9/22/75	1288	480	7/6/76	760	455
1/3/75	3406	486	9/29/75	554	469	7/12/76	571	452
1/13/75	3598	489	10/6/75	796	454	7/19/76	893	457
1/20/75	2867	580	10/13/75	885	455	7/26/76	500	MDA
1/27/75	2699	577	10/20/75	1160	448	8/16/76	500	MDA
2/3/75	3224	584	10/31/75	1213	449	8/23/76	563	449
2/10/75	3419	500	11/3/75	788	443	8/30/76	1172	454
2/19/75	3038	495	11/10/75	667	458	9/8/76	500	MDA
2/26/75	3069	469	11/17/75	1176	466	9/13/76	500	MDA
3/3/75	2691	494	11/24/75	899	462	9/20/76	588	463
3/10/75	2890	496	12/1/75	910	462	9/27/76	1184	472
3/17/75	3269	502	12/8/75	1088	459	10/4/76	716	462
3/24/75	2982	498	12/15/75	812	453	10/13/76	500	MDA
4/14/75	3026	501	12/22/75	1006	455	10/18/76	1414	473
4/21/75	2816	494	12/29/75	1072	456	10/27/76	586	450
4/28/75	2321	487	2/2/76	766	465	11/1/76	500	MDA
5/5/75	3239	506	2/9/76	1038	475	11/8/76	660	464
5/12/75	3441	492	2/18/75	704	470	11/15/76	642	452
5/19/75	2828	483	2/23/76	656	469	11/22/76	991	458
5/27/75	2972	485	4/6/76	583	470	11/29/76	1092	474
7/7/75	1677	455	4/12/76	1366	481	12/6/76	500	MDA
7/14/75	1058	469	4/19/76	857	474	12/13/76	804	475
7/21/75	1421	475	4/26/76	970	476	12/20/76	500	MDA
7/28/75	1024	487	5/3/76	1254	479	12/27/76	500	MDA
8/6/75	988	449	5/10/76	747	493	1/3/77	500	MDA
8/11/75	735	455	5/17/76	758	493	1/12/77	500	MDA
8/18/75	1065	460	5/24/76	1488	503	1/17/77	500	MDA
8/28/75	1006	471	6/7/76	1178	468	1/24/77	500	MDA
9/1/75	718	472	6/14/76	853	471	1/31/77	500	MDA
9/8/75	822	474	6/21/76	1007	468	2/7/77	1143	460

[a] From CDH (1970–1978); MDA = less than the minimum detectable activity.
[b] Error term is the 2 sigma counting error for the single determination.