TABLE 3-2

ANNUAL BERYLLIUM RELEASES BY BUILDING (grams)

Building	1960	1961	1962	1963	1964	1965	1966	1967	1968	1969	1970
331	ND	0.09	1.5	0.1	0.3	1.4	0.02	NA	NA	NA	NA
441	13	11	4.3	6.4	1.2	1.8	0.9	NA	NA	NA	NA
444	0.064	0.01	0.9	3.7	6.9	21	23	17	31	9.3	9.3
447	ND	ND	ND	1.6	2.8	5.6	7.2	4.9	2.3	2.8	1.9
774	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.03
779	ND	ND	ND	ND	ND	ND	ND	0.03	0.2	0.3	0.08
883	NA	NA	NA	NA	NA	NA	1.8	11	4.1	13	2.6
886	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.06
991	ND	ND	ND	ND	0.3	1.3	0.005	ND	ND	ND	ND
YEARLY TOTALS	13	11	6.7	12	12	31	33	33	38	25	14

NA = No Beryllium Processing Activity
ND = No Beryllium Monitoring Data Located

TABLE 3-1

ANNUAL AVERAGE BERYLLIUM CONCENTRATIONS
(μg m^{-3})

Building and Release Point	Calendar Year										
	1960	**1961**	**1962**	**1963**	**1964**	**1965**	**1966**	**1967**	**1968**	**1969**	**1970**
331	ND	0.0022 (7 mo.)	0.022	0.0025	0.0044	0.020	0.00075 (4 mo.)	NA	NA	NA	NA
441	0.77 (3 mo.)	0.16	0.067 (11 mo.)	0.092	0.018	0.028 (11 mo.)	0.039 (4 mo.)	NA	NA	NA	NA
444 Duct 2	ND	ND	0.00039 (7 mo.)	0.00099	0.0024	0.0083	0.0065	0.0049	0.013	0.0039	0.0036
444 Duct 3	0.000060	0.0000055	0.00047	0.0018	0.0026	0.0062	0.011	0.0073	0.0067	0.0031	0.0027
447	ND	ND	ND	0.0019 (11 mo.)	0.0029	0.0060	0.0076	0.0052	0.0025	0.0033	0.0020
774	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00014
779	ND	ND	ND	ND	ND	ND	ND	0.0015 (11 mo.)	0.00088	0.0012	0.00034
883-A	NA	NA	NA	NA	NA	NA	0.0012 (11 mo.)	0.0069	0.0024	0.0078	0.0017 (11 mo.)
886	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0010
991	ND	ND	ND	ND	0.0050 (5 mo.)	0.0097	0.00050 (1 mo.)	ND	ND	ND	ND

NA = No Beryllium Processing Activity
ND = No Beryllium Monitoring Data Located

TABLE 3-3

REPORTED ANNUAL BERYLLIUM RELEASES

Year	Release (grams)
1971	16
1972	<2.0
1973	<7.1
1974	<10
1975	<5.2
1976	<3.7
1977	<4.9
1978	<17
1979	<1.5
1980	<1.1
1981	0.2
1982	0.1
1983	- 0.1
1984	0.3
1985	0.5
1986	0.1
1987	0.2
1988	0.1
1989	0.6

Sources of Data: Rocky Flats Annual Environmental Reports

TABLE 3-4

1984 BERYLLIUM EMISSIONS DATA

Location	Total 1984 Release (grams)
371-NO1	6.9×10^{-4}
371-NO2	1.6×10^{-3}
371-SSS	1.0×10^{-2}
374-MAI	5.2×10^{-4}
374-SPD	6.8×10^{-4}
444-D02	9.3×10^{-2}
444-DO1	2.1×10^{-2}
444-DO5	7.3×10^{-3}
447-MAI	3.0×10^{-3}
559-561	1.7×10^{-2}
707-101	9.4×10^{-5}
707-102	8.2×10^{-4}
707-105	2.1×10^{-3}
707-106	1.1×10^{-4}
707-107	6.7×10^{-4}
707-108	2.7×10^{-3}
771-C Roo	7.5×10^{-4}
771-C Main	4.2×10^{-4}
771-Main 2	5.2×10^{-3}
771-Main	1.2×10^{-2}
774-202	5.5×10^{-4}
776-201	1.2×10^{-3}
776-202	8.2×10^{-4}
776-204	6.6×10^{-3}
776-205	3.8×10^{-4}
776-206	3.4×10^{-3}

(continued on next page)

TABLE 3-4

1984 BERYLLIUM EMISSIONS DATA

Location	Total 1984 Release (grams)
776-251	2.5×10^{-3}
776-252	3.4×10^{-3}
776-50C	1.7×10^{-3}
776-50D	2.8×10^{-3}
778-LDY	1.2×10^{-2}
779-729	1.8×10^{-2}
779-782	9.1×10^{-3}
865-EEE	6.7×10^{-3}
865-WWW	2.3×10^{-3}
881-D12	3.6×10^{-3}
881-D34	5.2×10^{-3}
881-D56	7.4×10^{-3}
883-AAA	1.5×10^{-2}
883-BBB	1.8×10^{-2}
886-875	2.7×10^{-3}
889-MAI	1.4×10^{-3}
991-985	5.8×10^{-3}
991-MAI	2.9×10^{-3}
TOTAL	**0.31 grams**

TABLE 3-5

CARBON TETRACHLORIDE EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting Carbon Tetrachloride Emission Rate (tons/yr)
Report on Handling and Monitoring of CCl_4 (Fruehauf & Richter, 1974)	Estimates of quantities used, with complete evaporation assumed.	1973		81
Stack Emission Monitoring, CCl_4 in B-776/777 Booster 1 (Johnson, 1973)	Gas chromatograph monitoring in Building 776/777 exhaust. Daily emissions are given in pounds and gallons.	June 4 through July 9, 1973		12
Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials kept on hand in 1974.	1974	22	
Report of CCl_4 Emissions from Production Areas (Hobbs, 1982)	Monitoring and material balance methods.	1974-1975		Monitoring: 56 Material Balance: 34 & 106
Final Environmental Impact Statement (USDOE, 1980)	"Normal average" release rate given for 1975 based on monitoring. Estimates of 1977 quantities used, with complete evaporation assumed.	1975 1977		66 36
USDOE Environmental Team Audit (USDOE, 1989)	Estimates of quantities used, with complete evaporation assumed.	1988		93
Air Stack Release Tabulation (EG&G, circa 1990)	Estimates of quantities used, with complete evaporation assumed.	1988 and 1989		1988: 65 1989: 24
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials kept on hand in 1988-1989.	1988-1989	12	
Report of Building 707 Halogenated Solvent Usage (Ferrera, 1988)	Estimates of quantities used, with complete evaporation assumed.	July 1988 to July 1989		Average: 48 Maximum: 76
Air Pollution Emission Notices (EG&G, 1990-1991)	Use estimates, with assumed complete evaporation. Some use of USEPA emission factors.	1989		40
Volatile Organic Emission Monitoring (Hamilton and Moser, 1990)	Duct sampling at six points.	1989		89

TABLE 3-6

CHLOROFORM EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting Chloroform Emission Rate (tons/yr)
Harmful and Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials kept on hand in 1974.	1974	8.9	
Rocky Flats Plant Warehouse Purchasing Records (EG&G, 1974-1988)	Records of dates and quantities of purchases of certain chemicals.	1985-1986	1985: 2.2 1986: 1.8	
Air Pollution Emission Notices, Buildings 559/561, 881, 374, and 460 (EG&G,1990-1991)	Estimates of quantities used, with assumed complete evaporation.	1986		0.84
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials kept on hand in 1988-1989.	1988-1989	0.55	

TABLE 3-7

METHYLENE CHLORIDE EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting Methylene Chloride Emission Rate (tons/yr)
Harmful and Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials kept on hand in 1974.	1974	2.2	
Rocky Flats Plant Warehouse Purchasing Records (EG&G, 1974-1988)	Records of dates and quantities of purchases of certain chemicals.	1980, 1984	1980: 4.6 1984: 3.4	
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials kept on hand in 1988-1989.	1988-1989	0.3	
Report of Rocky Flats Usage of Methylene Chloride (Grocki, 1989a)	Estimates of inventories in 1989; present in Buildings 123, 440, 559, 771, 881, T452B.	1989	0.3	
Air Pollution Emission Notices, Buildings 776/777, 771, 881, 451, 460, 374, and 228A/B (EG&G, 1990-1991)	Estimates of quantities used, with assumed complete evaporation.	around 1989		3.3

TABLE 3-8

TETRACHLOROETHYLENE EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting PCE Emission Rate (tons/yr)
Worker Interview (ChemRisk, 1991-1992; Interview No. 39)	Personal recollection of PCE usage rates in oralloy processing.	1952-1962		100 (25 drums/month, with 10% recycled)
Harmful and Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials kept on hand in 1974.	1974	8.0	
Air Pollution Emission Notices (EG&G, 1990-1991)	Estimates of quantities used, with complete evaporation assumed.	1986-1987		0.00007
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials kept on hand in 1988-1989.	1988-1989	0.003	
Report of Rocky Flats Usage of Tetrachloroethylene (Grocki, 1989a)	Estimates of 1989 inventories of PCE in Buildings 881, 559, 452B.	1989	0.00004	

TABLE 3-9

1,1,1-TRICHLOROETHANE EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting 1,1,1-TCA Emission Rate (tons/yr)
Harmful and Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials kept on hand in 1974.	1974	34	
Final Environmental Impact Statement (USDOE, 1980)	Estimate of 1977 consumption.	1977		26
Rocky Flats Plant Warehouse Purchasing Records (EG&G, 1974-1988)	Records of dates and quantities of purchases of certain chemicals.	1980-1984		70-80
Monthly Status Report of Halogenated Solvent Use (Ferrera, 1988)	Estimates of quantities used, with complete evaporation assumed.	1987-1988		44
B-707 Chlorinated Solvent Usage Report (Weis, 1988b)	Estimates of quantities used, with assumed complete evaporation.	1988		20
USDOE Environmental Team Audit (USDOE, 1989)	Estimates of quantities used, with complete evaporation assumed.	1988		24
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials in 1988-1989.	1988-1989	2.6	
Air Stack Release Tabulation (EG&G, circa 1990)	Estimates of quantities used, with complete evaporation assumed.	1988-1989		1988: 24 1989: 23
Halogenated Solvent Usage Update (Church, 1989)	Estimates of quantities used, with complete evaporation assumed.	July 1988 to July 1989		17
Volatile Organic Emission Monitoring (Hamilton and Moser, 1990)	Duct sampling at six points. Highest concentrations used to estimate emission rates.	1989		46
Air Pollution Emission Notices (EG&G, 1990-1991)	Estimates of quantities used, with complete evaporation assumed.	1989		20.8

TABLE 3-10

TRICHLOROETHYLENE EMISSION AND INVENTORY ESTIMATES

Information Source	Basis for Value(s)	Time Period of Estimate	Inventory (tons)	Resulting TCE Emission Rate (tons/yr)
Worker Interview (ChemRisk, 1991-1992; Interview No. 39)	Personal recollection of TCE usage rates in oralloy processing.	1952-1962		92 (25 drums/month, with 10% recycled)
Report on Use of TCE for Degreasing of Be, Pu, and U (Musgrave and Hornbacher, 1973)	Quantity estimate of TCE used for ultrasonic vapor degreasing of metal parts.	1973		62
Dow Chemical Trichloroethylene Folder (Dow Chemical, 1972-1974)	Estimates of quantities used, including by building and user.	1973		60
Stack Emission Monitoring, TCE in B-776/777 Booster 1 (Johnson, 1973) CH-850	Gas chromatograph monitoring in Building 776/777 exhaust. Daily emissions in pounds and gallons.	June 4 through July 9, 1973		5.0 average
Harmful and Potentially Harmful Materials Inventory (Barrick, 1974)	Estimates of inventories of hazardous materials.	1974	25	
Rocky Flats Plant Warehouse Purchasing Records (EG&G, 1974-1988)	Records of dates and quantities of purchases of certain chemicals.	1974, 1979, 1981, 1983		1974: 5 1979: 0.67 1981: 1.0 1983: 0.67
Final Environmental Impact Statement (USDOE, 1980)	Estimates of 1977 quantities used.	1977		2
Chemical Inventory Database (Setlock, 1990)	Estimates of inventories of hazardous materials.	1988-1989	0.15	
Report of Rocky Flats Usage of Trichloroethylene (Grocki, 1989b)	Estimates of inventories of TCE in Buildings 559 and 881.	1989	0.000014	
Air Pollution Emission Notices, Building 374 (EG&G, 1991d)	Estimates of quantities used, with complete evaporation assumed.	1987		1.5×10^{-3}

TABLE 3-11

UPPER AND LOWER BOUNDS OF CARBON TETRACHLORIDE EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1957	4.0	20
1958	13	65
1959	22	110
1960	31	160
1961-1970	40	200
1971	39	200
1972	38	190
1973	37	180
1974	36	180
1975	35	170
1976	34	170
1977	33	160
1978	32	160
1979	31	150
1980	29	150
1981	28	140
1982	27	140
1983	26	130
1984	25	130
1985	24	120
1986	23	120
1987	22	110
1988	21	100
1989	20	100

TABLE 3-12

UPPER AND LOWER BOUNDS OF CHLOROFORM EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1974	2.0	20
1975	1.9	19
1976	1.8	18
1977	1.7	17
1978	1.6	16
1979	1.5	15
1980	1.4	14
1981	1.3	13
1982	1.2	12
1983	1.1	11
1984	1.0	10
1985	0.90	9.0
1986	0.80	8.0
1987	0.70	7.0
1988	0.60	6.0
1989	0.50	5.0

TABLE 3-13

UPPER AND LOWER BOUNDS OF METHYLENE CHLORIDE EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1974	3.0	15
1975	2.8	14
1976	2.7	14
1977	2.5	13
1978	2.3	12
1979	2.2	12
1980	2.0	11
1981	1.8	10
1982	1.7	9.7
1983	1.5	9.0
1984	1.3	8.3
1985	1.2	7.7
1986	1.0	7.0
1987	0.83	6.3
1988	0.67	5.7
1989	0.50	5.0

TABLE 3-14

UPPER AND LOWER BOUNDS OF TETRACHLOROETHYLENE EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1961	50	300
1962	44	260
1963	38	220
1964	32	180
1965	26	140
1966	20	100
1967	18	91
1968	16	82
1969	15	73
1970	13	64
1971	11	55
1972	9.1	46
1973	7.3	37
1974	5.5	28
1975	3.6	19
1976	1.8	10
1977-1989	0.000010	1.0

TABLE 3-15

UPPER AND LOWER BOUNDS OF 1,1,1-TRICHLOROETHANE EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1957	0	5.0
1958	3.3	14
1959	6.7	23
1960	10	32
1961	13	42
1962	17	51
1963-1973	20	60
1974	30	90
1975-1984	40	120
1985	34	110
1986	28	96
1987	22	84
1988	16	72
1989	10	60

TABLE 3-16

UPPER AND LOWER BOUNDS OF TRICHLOROETHYLENE EMISSIONS (1953-1989)

Year	Lower Bound (tons/year)	Upper Bound (tons/year)
1953-1962	50	200
1963	48	190
1964	46	180
1965	45	170
1966	43	160
1967	41	150
1968	39	140
1969	37	130
1970	35	120
1971	34	110
1972	32	100
1973	30	90
1974	18	58
1975	5.0	25
1976	4.6	23
1977	4.3	22
1978	3.9	20
1979	3.6	18
1980	3.2	16
1981	2.9	15
1982	2.5	13
1983	2.1	11
1984	1.8	9.6
1985	1.4	7.9
1986	1.1	6.1
1987	0.72	4.4
1988	0.36	2.7
1989	0.0010	1.0

TABLE 4-1

CORRECTION FACTORS TO COMPENSATE FOR THE ANALYTICAL ERRORS IN THE MONITORING RESULTS REPORTED FROM 1974 THROUGH 1989

Year	Plutonium-239/240	Uranium-234, -235, -238	Americium-241	Tritium	Beryllium
1974	1.34	1.44	1.20	1.03	2.27
1975	1.17	1.35	1.49	1.06	1.41
1976	1.09	1.13	1.16	1.07	1.55
1977	1.09	NA	NA	1.05	1.31
1978	1.16	1.14	NA	0.96	NA
1979	0.88	1.16	1.24	0.93	1.44
1980	1.35	0.97	1.23	0.97	2.16
1981	0.92	0.96	1.08	0.95	0.75
1982	0.95	0.71	1.17	0.97	0.47
1983	1.09	1.13	1.05	0.91	0.95
1984	1.10	1.10	1.11	0.92	0.96
1985	1.12	1.13	1.30	0.90	0.96
1986	1.02	1.07	1.02	0.93	1.05
1987	0.96	0.97	1.10	0.89	0.99
1988	1.06	0.75	0.95	0.76	0.94
1989	0.89	0.87	1.06	0.90	0.95
Mean =	1.07	1.06	1.15	0.95	1.21
Standard Deviation =	0.14	0.20	0.13	0.08	0.49

N/A = Not Available

TABLE 4-2
AIRBORNE EMISSION ESTIMATES AND UNCERTAINTIES—PLUTONIUM

Year	Plutonium Alpha Activity (μCi)			Plutonium-241 (μCi)		
	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit
1953	0.81	2.1	5.3	4.4	11	29
1954	27	69	180	130	320	830
1955	30	77	200	140	360	920
1956	97	250	630	450	1,200	2,900
1957	6,100	16,000	40,000	30,000	76,000	190,000
1958	1,300	3,300	8,300	6,100	16,000	40,000
1959	560	1,400	3,700	2,700	7,000	18,000
1960	560	1,400	3,700	2,500	6,500	17,000
1961	610	1,600	4,000	3,000	7,600	19,000
1962	1,300	3,300	8,300	6,100	16,000	40,000
1963	1,500	3,900	10,000	7,000	18,000	46,000
1964	1,200	3,000	7,700	5,600	14,000	37,000
1965	2,700	6,900	18,000	13,000	32,000	83,000
1966	130	340	870	610	1,600	4,000
1967	170	430	1,100	800	2,000	5,200
1968	200	520	1,300	940	2,400	6,100
1969	560	1,400	3,700	2,700	7,000	18,000
1970	160	400	1,000	750	1,900	4,900
1971	31	79	200	150	370	950
1972	25	65	170	120	300	770
1973	26	66	170	120	310	800
1974	490	1,200	3,200	2,300	6,000	15,000
1975	5.1	13	33	24	62	160
1976	2.0	5.2	13	9.8	25	65
1977	2.0	5.2	13	9.8	25	65
1978	1.4	3.6	9.3	7.0	18	46
1979	2.8	7.2	18	14	35	89
1980	6.1	16	40	29	74	190
1981	4.2	11	27	20	52	130
1982	10	26	67	47	120	310
1983	40	100	260	190	490	1,300
1984	40	100	260	190	490	1,300
1985	4.7	12	31	23	58	150
1986	15	38	97	70	180	460
1987	7.6	20	50	37	94	240
1988	7.6	20	50	37	94	240
1989	2.3	5.9	15	11	28	71

TABLE 4-3
AIRBORNE EMISSION ESTIMATES AND UNCERTAINTIES—URANIUM

Year	Enriched Uranium (μCi)			Depleted Uranium (μCi)		
	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit
1953	4.6	12	30	610	1,600	4,000
1954	4.6	12	30	610	1,600	4,000
1955	38	96	250	1,100	2,700	7,000
1956	560	1,400	3,700	510	1,300	3,300
1957	180	470	1,200	370	950	2,400
1958	160	400	1,000	810	2,100	5,300
1959	270	700	1,800	140	350	900
1960	440	1,100	2,900	180	460	1,200
1961	240	620	1,600	260	680	1,700
1962	130	320	830	190	480	1,200
1963	170	430	1,100	250	640	1,600
1964	96	250	630	120	310	800
1965	96	250	630	140	360	930
1966	120	300	770	71	180	470
1967	56	140	370	71	180	470
1968	81	210	530	71	180	470
1969	25	65	170	81	210	530
1970	33	83	210	96	250	630
1971	21	53	140	29	75	190
1972	2.0	5.2	13	21	55	140
1973	6.1	16	40	27	70	180
1974	14	35	90	4.6	12	30
1975	14	36	93	14	36	93
1976	8.1	21	53	6.1	16	40
1977	11	27	70	9.7	25	63
1978	11	27	70	17	43	110
1979	4.7	12	31	13	34	87
1980	7.6	20	50	7.6	20	50
1981	6.1	16	40	9.1	23	60
1982	6.1	16	40	9.7	25	63
1983	10	26	67	16	40	100
1984	10	26	67	2.8	7.2	18
1985	4.0	10	26	20	51	130
1986	5.6	14	37	1.5	3.8	9.7
1987	2.3	6.0	15	6.1	16	40
1988	1.3	3.4	8.7	4.7	12	31
1989	2.6	6.8	17	1.3	3.3	8.3

TABLE 4-4
AIRBORNE EMISSION ESTIMATES AND UNCERTAINTIES—AMERICIUM-241 AND TRITIUM

Year	Americium-241 (μCi)			Tritium (Ci)		
	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit	95% Lower Confidence Limit[1]	Geometric Mean[1]	95% Upper Confidence Limit[1]
1953	0.20	0.50	1.3	1	NA	800
1954	6.6	17	43	1	NA	800
1955	7.1	18	47	1	NA	800
1956	22	57	150	1	NA	800
1957	1,500	3,800	9,700	1	NA	800
1958	310	780	2,000	1	NA	800
1959	140	350	900	1	NA	800
1960	130	320	820	1	NA	800
1961	150	380	970	1	NA	800
1962	300	760	1,900	1	NA	800
1963	360	910	2,300	1	NA	800
1964	270	700	1,800	1	NA	800
1965	660	1,700	4,300	1	NA	800
1966	32	81	210	1	NA	800
1967	39	100	260	1	NA	800
1968	48	120	320	140	NA	390
1969	140	350	900	140	NA	390
1970	37	95	240	140	NA	390
1971	7.1	18	47	140	NA	390
1972	6.0	15	39	140	NA	390
1973	6.0	15	39	140	NA	390
1974	110	290	750	11	25	57
1975	12	31	79	1.7	3.9	8.8
1976	0.48	1.2	3.2	1.4	3.1	7.0
1977	0.48	1.2	3.2	0.61	1.4	3.1
1978	0.34	0.87	2.2	1.0	2.3	5.3
1979	0.66	1.7	4.3	0.97	2.2	4.9
1980	1.4	3.6	9.3	0.90	2.0	4.6
1981	0.98	2.5	6.5	0.51	1.1	2.6
1982	2.4	6.2	16	0.27	0.60	1.4
1983	9.3	24	61	0.18	0.42	0.94
1984	9.3	24	61	0.16	0.36	0.82
1985	1.1	2.8	7.2	0.18	0.42	0.94
1986	5.0	13	33	0.25	0.57	1.3
1987	1.8	4.5	12	0.20	0.44	0.99
1988	1.1	2.8	7.2	0.030	0.068	0.15
1989	0.60	1.5	3.9	0.20	0.44	0.99

[1] Tritium emissions for 1953 through 1973 are treated as uniform distributions with identified lower and upper bounds.

NA = Not Applicable

TABLE 4-5

AIRBORNE EMISSION ESTIMATES AND UNCERTAINTIES— BERYLLIUM (g)

Year	95% Lower Confidence Limit	Geometric Mean	95% Upper Confidence Limit
1958	6.2	25	99
1959	6.2	25	99
1960	6.2	25	99
1961	5.2	21	84
1962	3.2	13	51
1963	5.7	23	91
1964	5.7	23	91
1965	15	59	240
1966	16	63	250
1967	16	63	250
1698	18	72	290
1969	12	48	190
1970	6.7	27	110
1971	6.2	22	81
1972	0.78	2.8	10
1973	2.8	9.9	36
1974	3.9	14	51
1975	2.0	7.3	26
1976	1.4	5.2	19
1977	1.9	6.9	25
1978	6.6	24	86
1979	0.58	2.1	7.6
1980	0.43	1.5	5.6
1981	0.078	0.28	1.0
1982	0.039	0.14	0.51
1983	0	0	0
1984	0.12	0.43	1.6
1985	0.19	0.70	2.5
1986	0.039	0.14	0.51
1987	0.078	0.28	1.0
1988	0.039	0.14	0.51
1989	0.23	0.84	3.0

TABLE 5-1

RETENTION POND ORIGINAL AND CURRENT DESIGNATIONS

Original Number	Current Designator
Pond 1	Pond A-1
Pond 2	Solar Evaporation Pond
Pond 3	Pond B-1
Pond 4	Pond B-2
Pond 5	Pond B-3
Pond 6	Pond no longer present
Pond 7	Pond no longer present
Pond 8	Pond no longer present
Pond 9	Pond C-1

TABLE 5-2

REPORTED ANNUAL GROSS ALPHA RADIOACTIVITY RELEASES TO WALNUT CREEK, 1952-1970

Year	Total (µCi)
1952	No release reported
1953	1,126
1954	1,226
1955	1,099
1956	1,653
1957	1,863
1958	2,736
1959	5,800
1960	5,900
1961	6,110
1962	5,500
1963	2,360
1964	2,620
1965	2,630
1966	4,227
1967	3,765
1968	2,982
1969	4,384
1970	3,369

Source: Boss, M. 1973. Release History Folder. ChemRisk Repository Number RE-357.

TABLE 5-3

ANNUAL RAINFALL AT THE ROCKY FLATS PLANT
(inches)

Year	Rainfall	Year	Rainfall
1953	11.26	1965	18.87
1954	7.76	1966	10.24
1955	14.77	1967	22.54
1956	13.42	1968	12.71
1957	22.67	1969	24.67
1958	18.07	1970	18.56
1959	19.65	1971	14.30
1960	13.72	1972	14.78
1961	16.08	1973	21.55
1962	8.26	1974	13.73
1963	12.23	1975	12.22
1964	8.79	1976	13.51

TABLE 5-4

THEORETICAL INCREASE IN GROSS ALPHA CONCENTRATIONS IN GREAT WESTERN RESERVOIR USING ROCKY FLATS REPORTED RELEASE TOTALS, 1953-1970

Year	Theoretical Increase in Gross Alpha Concentration in Great Western Reservoir at 75% Capacity* (pCi L^{-1})
1953	0.86
1954	0.93
1955	0.83
1956	1.26
1957	1.41
1958	0.93
1959	1.9
1960	2.0
1961	2.0
1962	1.8
1963	0.8
1964	0.87
1965	0.87
1966	1.4
1967	1.3
1968	1.0
1969	1.5
1970	1.1

* Providing no inflow or outflow occurs throughout the year.

TABLE 5-5

ANNUAL GROSS ALPHA CONCENTRATION IN BASELINE AND GREAT WESTERN RESERVOIRS AND STANDLEY LAKE

(pCi L^{-1})

Year	Baseline Reservoir	Great Western Reservoir Annual Average Gross Alpha Concentration	Standley Lake Annual Average Gross Alpha Concentration
1952	1.22	1.42	1.2
1953	not sampled	2.6	3.3
1954	not sampled	2.9	1.5
1955	3.0	1.5	1.5
1956	1.7	1.1	1.4
1957	1.5	1.1	0.76
1958	1.1	1.3	1.3
1959	1.3	1.8	1.3
1960	1.2	1.5	1.2
1961	0.44	1.2	0.8
1962	1.2	1.9	1.7
1963	1.6	2.4	2.8
1964	1.4	2.4	2.5
1965	2.4	2.3	1.8
1966	2.0	5.0	3.9
1967	1.1	2.0	1.8
1968	0.98	1.7	1.5
1969	1.1	2.1	1.7
1970	1.7	1.4	2.0
1952-1970 Average	1.5	2.0	1.8

TABLE 5-7

ANNUAL GROSS ALPHA CONCENTRATIONS FOR DRINKING WATER
(pCi L^{-1})

Year	"Background"[1]	Broomfield Drinking Water[2]	Westminster Drinking Water[3]
1955	Not Sampled	0.9	Not Applicable
1956	Not Sampled	1.1	Not Applicable
1957	0.4 (just Arvada & Boulder)	1.4	Not Applicable
1958	Not Sampled	Not Sampled	Not Applicable
1959	Not Sampled	Not Sampled	Not Applicable
1960	0.6	0.6	Not Applicable
1961	0.2	0.6	Not Applicable
1962	0.7	0.3	Not Applicable
1963	1.1 (just Arvada & Boulder)	Not Sampled	Not Applicable
1964	1.7	1.3	Not Applicable
1965	1.7	1.3	2.0
1966	1.5	3.0	1.2
1967	0.6	0.8	0.8
1968	1.8	0.6	0.6
1969	1.3	0.5	0.6
1970	2.3	1.4	0.6
1955-1970 Average	1.2	1.1	1.0

1 The background level is the average of the annual average gross alpha concentrations in the drinking water of Arvada, Boulder, and Golden.
2 Broomfield drinking water derived at least in part from Great Western Reservoir.
3 Westminster drinking water derived at least in part from Standley Lake after 1965.

TABLE 5-6

1952-1953 MOWER RESERVOIR MONITORING DATA

Date	Gross Alpha Activity (pCi L^{-1})
5/26/52	1.7
7/17/52	1.0
9/15/52	3.2
11/10/52	1.8
4/6/53	9.0
5/5/53	8.8
5/21/53	9.5
6/24/53	1.2
7/27/53	6.0

TABLE 5-8

ANNUAL AVERAGE DRINKING WATER CONCENTRATION OF PU-238

(pCi L^{-1})

Year	"Background"[1,2]	Westminster[2] Value	Broomfield[2]
1970	0.015	0.015	0.015
1971	0.015	0.015	0.015
1972	0.015	0.015	0.016
1973	0.028	0.051	0.02
1974	0.014	0.021	0.039
1975	0.17	0.017	0.02
1976	no samples	0.015	0.013
1977	no samples	no samples	0.014
1978	0.015	0.015	0.015
1979	0.015	0.015	0.018
1980	0.015	0.015	0.015
1981	0.014	0.015	0.015
1982	0.015	0.02	0.02
1983	0.015	0.015	0.015
1984-1989	Did not analyze for Pu-238		
1970-1983 Average	0.03	0.02	0.02

1 Background concentrations were determined by averaging the Pu-238 annual average for drinking water from the cities of Arvada, Boulder, and Golden.

2 Annual averages were calculated by summing all samples and dividing by the number of samples. When a sample result was below the limit of detection, the contaminant was considered to be present at one-half the limit of detection.

TABLE 5-9

ANNUAL AVERAGE DRINKING WATER CONCENTRATION OF PU-239/240

(pCi L^{-1})

Year	"Background"[1,2]	Westminster[2]	Broomfield[2]
1970	0.018	0.11	0.027
1971	0.010	0.01	0.022
1972	0.021	0.07	0.073
1973	0.021	0.055	0.174
1974	0.012	0.02	0.063
1975	0.24	0.02	0.02
1976	no samples	0.01	0.02
1977	no samples	no samples	0.02
1978	0.023	0.01	0.01
1979	0.010	0.02	0.084
1980	0.010	0.01	0.01
1981	0.010	0.01	0.01
1982	0.014	0.017	0.01
1983	0.026	0.029	0.02
1984	0.028	0.07	0.03
1985	0.21	0.02	0.02
1986	0.010	0.006	0.006
1987	0.04	0.006	0.006
1988	0.02	0.006	0.002
1989	no samples	0.002	0.004
1970-1989 Average	0.041	0.034	0.032

1 Background concentrations were determined by averaging the Pu-239/240 annual average for drinking water from the cities of Arvada, Boulder, and Golden.

2 Annual averages were calculated by summing all samples and dividing by the number of samples. When a sample result was below the limit of detection, the contaminant was considered to be present at one-half the limit of detection.

TABLE 5-10

ANNUAL AVERAGE DRINKING WATER CONCENTRATION OF NATURAL URANIUM

(pCi L^{-1})

Year	"Background"[1,2]	Westminster[2]	Broomfield[2]
1970	no samples	no samples	no samples
1971	no samples	3.8	3.5
1972	7.7	4.5	3.3
1973	6.5	5.8	5.5
1974	7.4	6.2	5.2
1975	1.5	3.6	4.5
1976	no samples	0.85	16.7
1977	no samples	1.5	1
1978	2.1	0.99	1.3
1979	0.58	0.69	0.85
1980	5.8	1.8	2.2
1981	2.6	1.7	2.9
1982	2.4	2.0	2.9
1983	1.6	1.3	1.1
1984	1.1	1.2	1.2
1985	1.1	1	1
1986	1	1.1	1.2
1987	1.2	1	1.8
1988	1.4	1	1
1989	no samples	1	1
1970-1989 Average	2.9	2.2	3.1

1 Background concentrations were determined by averaging the natural uranium annual average for drinking water from the cities of Arvada, Boulder, and Golden.

2 Annual averages were calculated by summing all samples and dividing by the number of samples. When a sample result was below the limit of detection, the contaminant was considered to be present at one-half the limit of detection.

TABLE 5-11

ANNUAL AVERAGE DRINKING WATER CONCENTRATION OF TRITIUM
(pCi L^{-1})

Year	"Background"[1,2]	Westminster[2]	Broomfield[2]
1970	no samples	1200	1100
1971	1200	NA	840
1972	590	890	1000
1973	480	680	8600
1974	370	650	5400
1975	370	720	1900
1976	330	540	750
1977	360	370	450
1978	500	350	360
1979	240	280	300
1980	250	250	280
1981	340	280	440
1982	380	330	300
1983	210	280	270
1984	180	240	220
1985	180	210	210
1986	200	190	190
1987	200	200	190
1988	180	190	190
1989	no samples	100	100
1970-1989 Average	360	420	1200

1 Background concentrations were determined by averaging the tritium annual average for drinking water from the cities of Arvada, Boulder, and Golden.

2 Annual averages were calculated by summing all samples and dividing by the number of samples. When a sample result was below the limit of detection, the contaminant was considered to be present at one-half the limit of detection.

N/A = Not Available

TABLE 6-1

AIR MONITORING RESULTS OIL BURN PIT #2

Date	Location/Comments	Result (dis min^{-1} m^{-3})
6/4/59	50 yards downwind of oil pit #2, south of Building 991	4.9
8/13/59	South of Building 991	3.9
4/25/60	South of Building 991	4.3
5/27/60	50 yards downwind of oil pit #2, south of Building 991	0.0
7/7/60	South of Building 991	0.062
8/11/60	50 yards downwind of oil pit #2, south of Building 991	0.0
1/23/61	30 yards downwind of oil pit #2, south of Building 991	2.6
2/2/61	100 yards downwind of oil pit #2, southeast of Building 991	0.6
2/15/61	30 yards downwind of oil pit #2, southeast of Building 991	4.4
3/13/61	50 yards downwind of oil pit #2, southeast of Building 991	2.74
4/19/61	Unspecified location in "heavy smoke"	7.22
4/28/61 (1)	Unspecified location, at first "very black smoke"	14.6
4/28/61 (2)	Unspecified location, "grey smoke after fire had burned down"	4.35
5/12/61	South of Building 991	7.54
5/18/61	Unspecified location	10.2
6/8/61 (1)	Unspecified location, "very heavy smoke"	2.5

(continued on next page)

TABLE 6-1

AIR MONITORING RESULTS OIL BURN PIT #2

Date	Location/Comments	Result (dis min^{-1} m^{-3})
6/8/61 (2)	Unspecified location, "light smoke"	1.5
6/21/61	Unspecified location	3.2
7/19/61 (1)	Unspecified location, "heavy black smoke"	3.7
7/19/61 (2)	Unspecified location, "light smoke"	1.9
8/3/61	Unspecified location	3.3
8/7/61	Above Building 991	2.1
8/29/61	Unspecified location	7.9
9/13/61 (1)	Above Building 991 "at height of fire"	9.2
9/13/61 (2)	Above Building 991 "near end of fire"	5.8
9/27/61	Above Building 991	1.2
2/7/62	Unspecified location	1.72
5/15/63	Unspecified location	8.6
10/2/63	Unspecified location	4.58
10/3/63 (1)	50 yards to "right of oil pit"	0.33
10/3/63 (2)	30 yards from fire	0.76
10/15/63	"At oil pit"	4.9
1/16/64	Southeast of Building 991	0.449
2/11/64	"At oil pit"	16.7