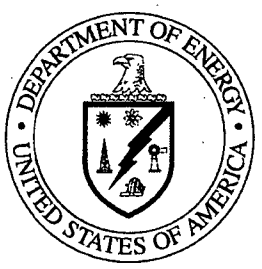
ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
QUARTERLY
ENVIRONMENTAL MONITORING REPORT
JULY - SEPTEMBER 2000

Air Pat Haines



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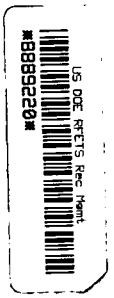

NOVEMBER 2000

Points of Contact:

R. McCallister, (303) 966-9692
Air, Meteorology, Climatology, and Groundwater Programs
Department of Energy, Rocky Flats Field Office

J. Stover, (303) 966-9735
Surface Water Programs
Department of Energy, Rocky Flats Field Office

R. Nininger, (303) 966-4663
Kaiser-Hill Company, L.L.C.

Contributors:

D. Daboll, RFCSS, Water Operations
L. Dunstan, RMRS, Water Monitoring
J. Euler, Radian, Ambient and Effluent Air
G. Euler, Radian, Meteorology, and Climatology
G. Squibb, RMRS, Water Monitoring

ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE
QUARTERLY
ENVIRONMENTAL MONITORING REPORT
JULY – SEPTEMBER 2000

PREPARED BY ROCKY MOUNTAIN REMEDIATION SERVICES, L.L.C.

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NOVEMBER 2000

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HIGHLIGHTS FOR JULY - SEPTEMBER 2000

This report is produced and distributed quarterly as part of our ongoing Agreement in Principle and as a forum for the Rocky Flats Cleanup Agreement (RFCA) quarterly monitoring requirement. As discussed at a previous Exchange of Information Meeting, the Site is consolidating its reporting for selected media. In an effort to provide a more meaningful interpretation of the data presented and to save some natural resources, namely trees, the Site will be providing analytical data in the following formats.

Airborne effluent data are represented by a single graph providing cumulative plutonium emissions for 1998, 1999, and 2000. Ambient air data are represented by two graphs – a summary of estimated off-site dose as compared to a 10 Mrem per year standard, and air concentrations at perimeter sample locations expressed as a percentage of EPA's air concentration-based dose limit for members of the public. Meteorological data are represented by one windrose and a climatic summary for each month in the reporting period.

Compliance data in support of the Site National Pollutant Discharge Elimination System (NPDES) permit are presented for the reporting period. Analytical data collected in support of RFCA will include the following locations: GS01, GS03, GS08, GS10, GS11, GS31, GS43, SW022, SW027, SW091, and SW093. Data include the hydrograph, mean daily flow and available water quality measurements for each location during the reporting period. Additional surface water locations supporting the Industrial Area Interim Measures/Interim Remedial Action (IA IM/IRA) program are GS27, GS32, GS39 and GS40 and are presented in the same manner as RFCA locations. Other stations may appear or be deleted, as performance monitoring locations are added or dropped, as well as any new source detection locations that may be required. Some locations, like GS32, have no flow monitoring capabilities and only analytical data are provided. An additional section provides quarterly summary information for the Incidental Waters program.

1.1 Airborne Effluent

Complete isotopic analytical data through August2000 are included in this report. All data are within the normally observed ranges of concentrations for their respective locations. Consistent with all other uses of these data, positive values only are included in the total release calculation (the negative values are treated as zeros). The uncertainty calculation reflects all values.

In June, the Building 374-MAI sampler normally scheduled for weekly filter exchange was allowed to run for two weeks due to access restrictions to the filter assembly. This deviation from the normal schedule did not produce analytical results that were out of the ordinary.

In August, an occurrence in Building 559 (sampler 559-561) triggered the need for a mid-week filter change. As a result, five filters made up the monthly composite sample instead of the usual four. The filter that was changed out as a result of the building occurrence showed activity in the normal range.

1.2 Ambient Air

Complete isotopic analytical data through August 2000 for coarse (>10 micrometers) and fine (<10 micrometers) ambient air samples are included in this report. All data are within the normally observed ranges of concentrations for their respective locations.

Due to the wildfire that occurred on 10 July, the filter cartridges from ambient air)samplers S-137, S-138, S-158, S-168 and S-207 were exchanged in the middle of the sampling period. The analytical results for the perimeter locations (S-137, S-138, and S-207) from the pre-burn period and post-burn period were combined to create one result (per location) for the month of July.

During the quarterly sample flow verification in July, several samplers were observed to have sample flow greater than the allowable flow rate. This was an unexpected and unprecedented circumstance. The NIST-traceable laminar flow measurement device was submitted to the manufacturer for an off-cycle calibration, and all samplers passed the subsequent flow verification.

1.3 Meteorology and Climatology

Meteorological data are routinely measured from instruments on a 61-meter tower located in the west buffer zone at an elevation of 1,870 meters (6,140 feet) above sea level. All meteorological data are collected on a real-time basis and are transmitted as 15-minute averaged values to the Computer Assisted Protective Action Recommendations System (CAPARS) model for emergency response purposes. The same data are logged at the tower and downloaded for air quality and surface water modeling purposes.

Climatic summaries and wind roses for July through September 2000 are included in this report.

As a result of the protocols used to validate the meteorological data, each 15-minute averaged observation is validated, rather than the entire observation record for the same time period (which might contain 70 different observations-i.e. temperature, wind speed, etc.). Missing data are reported with respect to the wind speed and wind direction values, for example, rather than recording all observations missing for the same 15 minute period. There were 187 hours of missing wind speed and/or direction data, as a result of lightning strikes during the quarter.

1.4 Surface Water

Surface water analytical data collected during fourth quarter of FY00 (July, August, and September) for NPDES/FFCA permit compliance are presented in this report.

The Site is reported an exceedance of the maximum pH limitations for the discharge from Pond A-3 (Outfall 002) during the July reporting period. Pond A-3 discharged from July 17, 2000 through July 24, 2000. On the last day of the discharge, July 24, 2000, a pH of 9.3 standard units (S.U.) was recorded. The maximum limitation for pH is 9.0. The pH measurement for the previous day was recorded at 9.0 S.U.. The pH measurments for the earlier portion of the discharge were within historical ranges for that location, that is 7.0 – 8.0 S.U. Somewhat warmer than normal temperatures may have contributed to alge

growth in the pond and are likely responsible for the increased pH measured at the end of the discharge. All other reported data were consistent with historical measurements and within permit limitations.

Included in this report are two surface water locations that monitor the Mound Site area. These locations are SW061 and SW132 and are sampled quarterly for isotopic Pu/Am, selected total and dissolved metals, and EPA VOA Method 8260.

1.5 Hydrologic Monitoring and Rocky Flats Cleanup Agreement (RFCA) Monitoring

All available analytical data collected during fourth quarter of FY00 (July, August, and September) from samples supporting RFCA and Hydrologic Monitoring programs are included in this report.

1.6 Incidental Water Monitoring

A summary of Incidental Waters dispositioned during fourth quarter of FY00 (July, August, and September) are presented in this report.

1.7 1999 Public Radiation Dose Assessment

Included in this report is the Public Radiation Dose Assessment for the Rocky Flats Environmental Technology Site for calendar year 1999.

1.0 AIR DATA

1.1. EFFLUENT AIR DATA

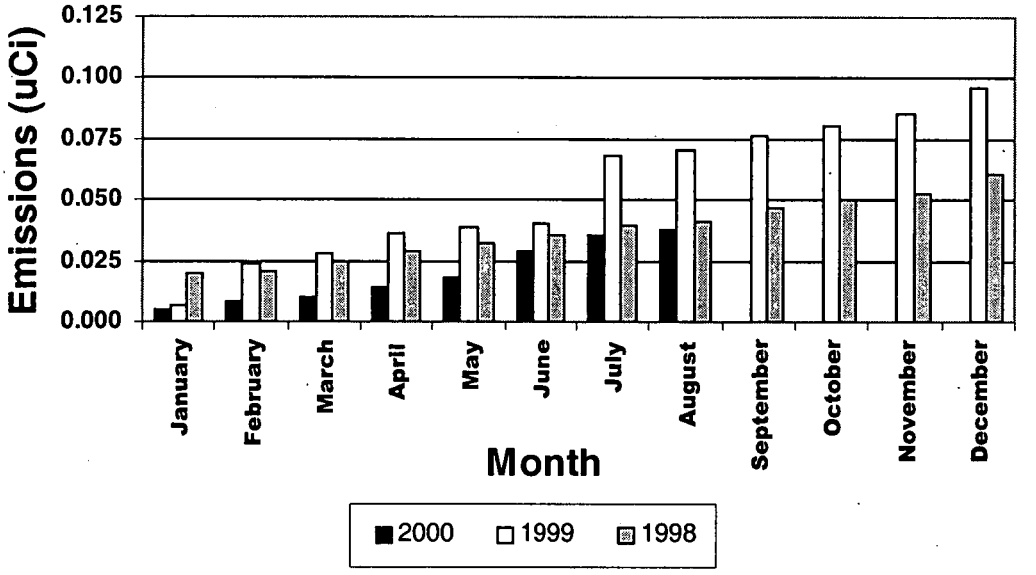


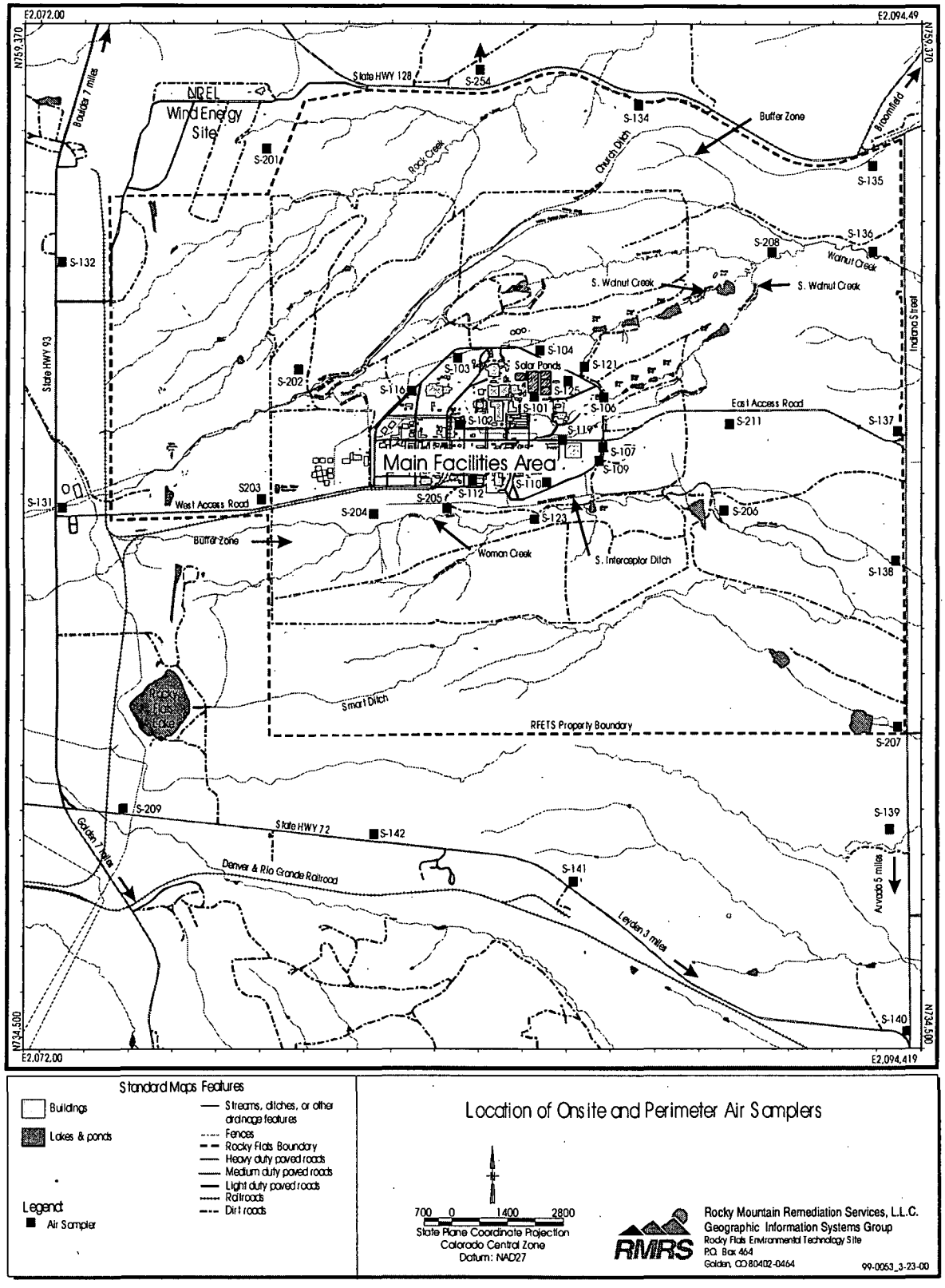
Figure 1-1. Cumulative Plutonium Airborne Effluent Emissions

Complete isotopic analytical data through August 2000 are included in this report. All data are within the normally observed ranges of concentrations for their respective locations. Consistent with all other uses of these data, positive values only are included in the total release calculation (the negative values are treated as zeros). The uncertainty calculation reflects all values.

In June, the Building 374-MAI sampler normally scheduled for weekly filter exchange was allowed to run for two weeks due to access restrictions to the filter assembly. This deviation from the normal schedule did not produce analytical results that were out of the ordinary.

In August, an occurrence in Building 559 (sampler 559-561) triggered the need for a mid-week filter change. As a result, five filters made up the monthly composite sample instead of the usual four. The filter that was changed out as a result of the building occurrence showed activity in the normal range.

Map 1-1. Location of Onsite and Perimeter Air Samplers



1.2. AMBIENT AIR DATA

1.2.1. Perimeter Sampler Locations

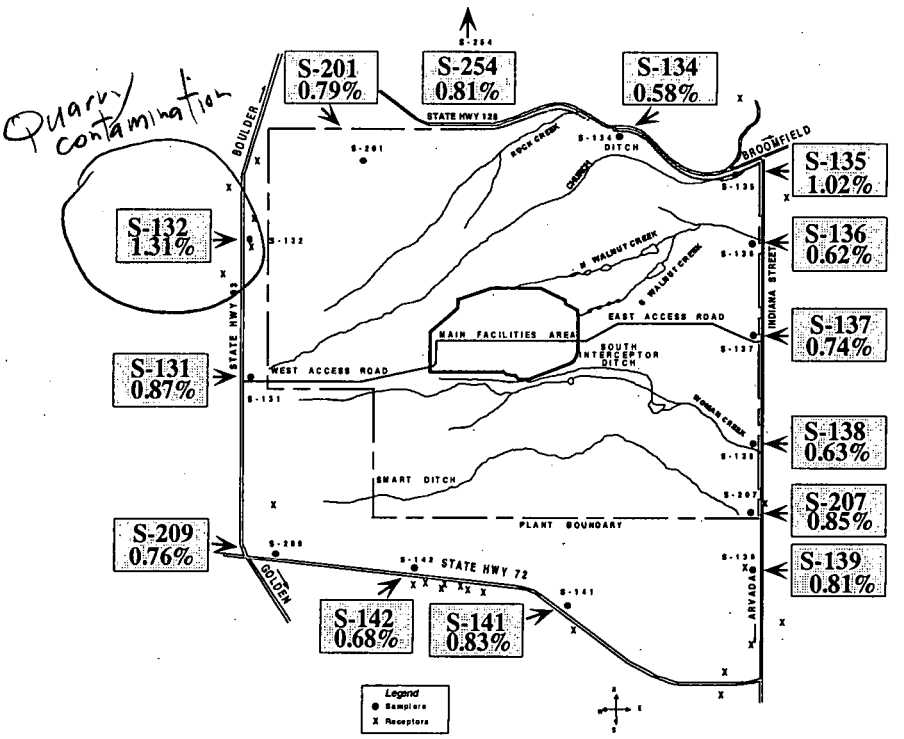


Figure 1-2. Perimeter Samplers Dose Map

The above map illustrates the perimeter Radioactive Ambient Air Monitoring Program (RAAMP) sampler locations and the twelve-month rolling-average maximum potential dose through August 2000, expressed as a percentage of EPA's air concentration-based dose limit for members of the public.

The percentages include the naturally occurring uranium isotopes as well as the isotopes from site contributions. The average concentration observed at location S-132 is projected to equate to the highest potential dose, which is consistent with the previously reported results.

The percentage values are based on the measured air concentrations, averaged over the year, converted as a percent of the Rad NESHAP concentration limits.

Perimeter Sampler Locations – Dose Rate Graphs

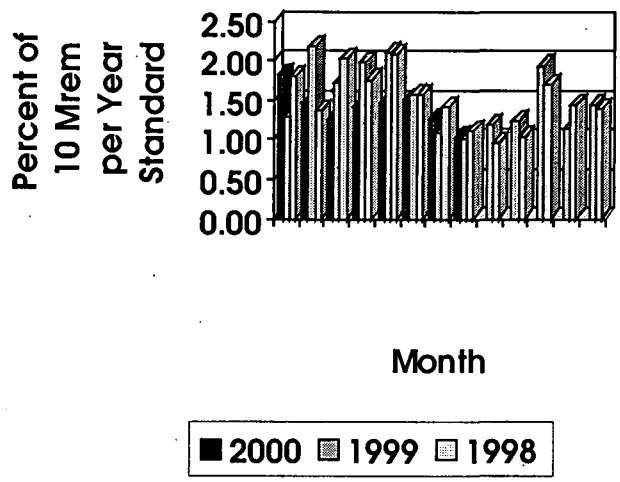


Figure 1-3. Offsite Dose Rate Summary

The above graph illustrates the monthly estimated maximum potential dose rates at the perimeter sampler showing highest total radionuclide concentrations, including contributions from naturally occurring uranium isotopes. The highest dose rates for June, July, and August 2000 were seen at location S-132. The maximum offsite dose rate remains below 2.5 percent of the 10 mrem standard.

1.2.2 Perimeter Sampler Locations – Dose Rate Graphs, continued

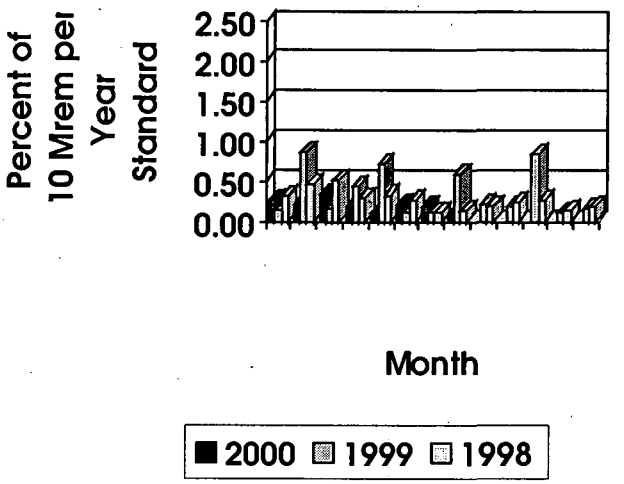


Figure 1-4. Offsite Dose Rate Summary Without U-234 and U-238

Omitting the dose contributions from uranium 234 and 238 may better reflect the contribution from Site operations. This view shows the maximum offsite dose rate, resulting from Site activities, to be less than 0.9 percent of the 10 mrem standard.

Ambient concentrations and dose rates for 2000 are similar to the rates observed in 1998 and 1999.

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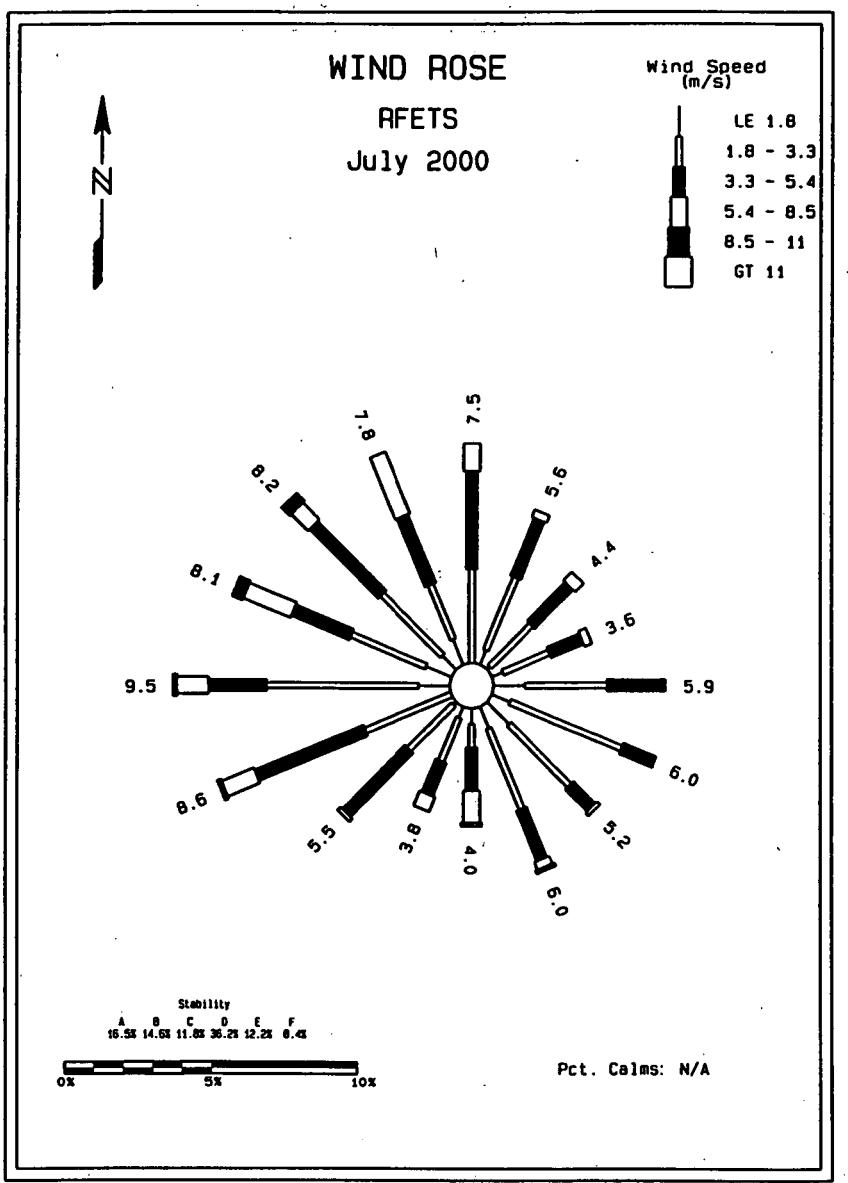
2.0 METEOROLOGY AND CLIMATOLOGY

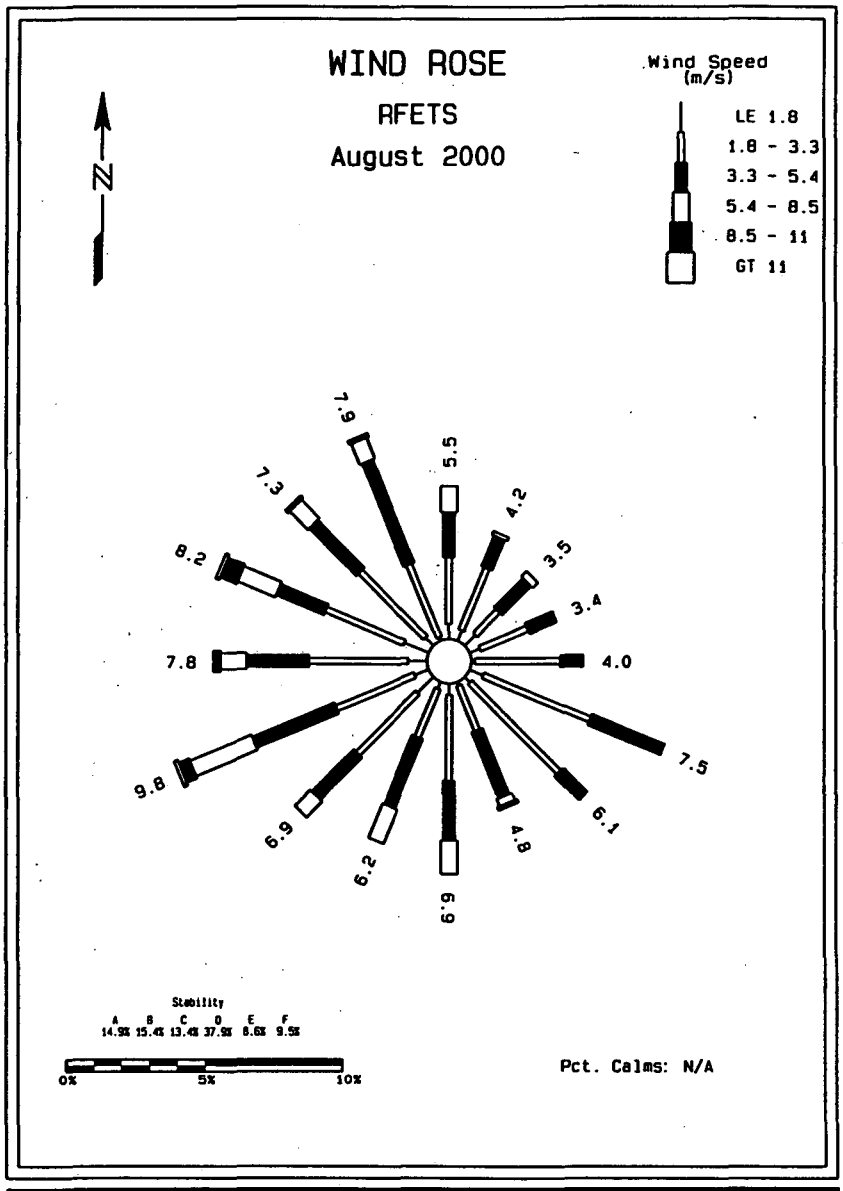
2.1. WIND ROSES FOR JULY, AUGUST, AND SEPTEMBER 2000



Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Daily Mean	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (kW-h/m²)	Precipitation (in) Total	Max
Jul-00	86.1	61.8	74.0	50.4	48.9	8.0	54.1	817.4	196.8	2.16	0.61

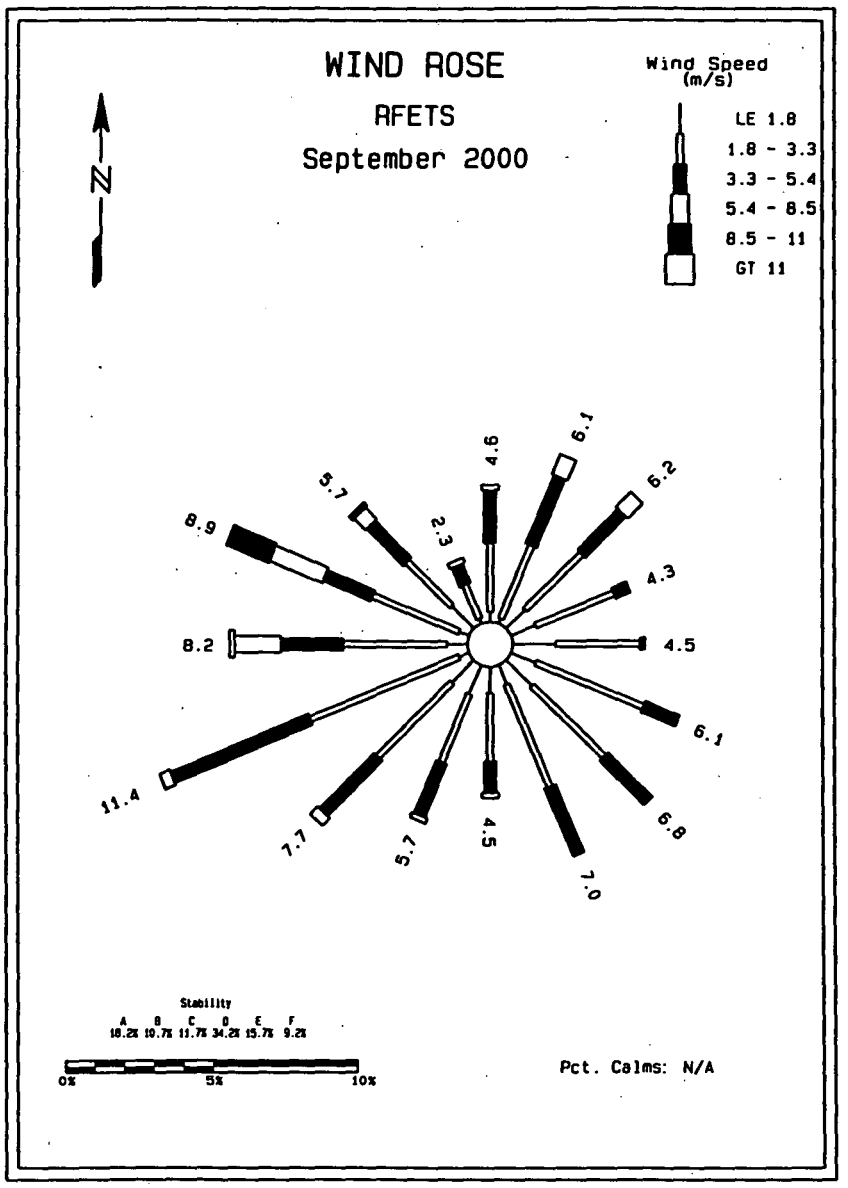
Figure 2-1. Wind Rose for Rocky Flats Environmental Technology Site for July 2000



Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Daily Mean	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (kW-h/m²)	Precipitation (in) Total	Max
Aug-00	83.25	61.61	72	51.14	54.07	8.12	60.85	817.86	161.43	2.25	0.26

Figure 2-2. Windrose for Rocky Flats Environmental Technology Site for August 2000



Monthly Climatic Summary

Month	Temperature (°F) Mean Daily High	Mean Daily Low	Daily Mean	Mean Dew Point (°F)	Mean Relative Humidity (%)	Wind Speed (mph) Mean	Max	Pressure Mean (mb)	Solar Total (kW-h/m²)	Precipitation (in) Total	Max
Sep-00	73.54	50.83	62.65	41.75	55.25	8.02	61.9	815.92	145.45	1.79	0.12

Figure 2-3. Windrose for Rocky Flats Environmental Technology Site for September 2000

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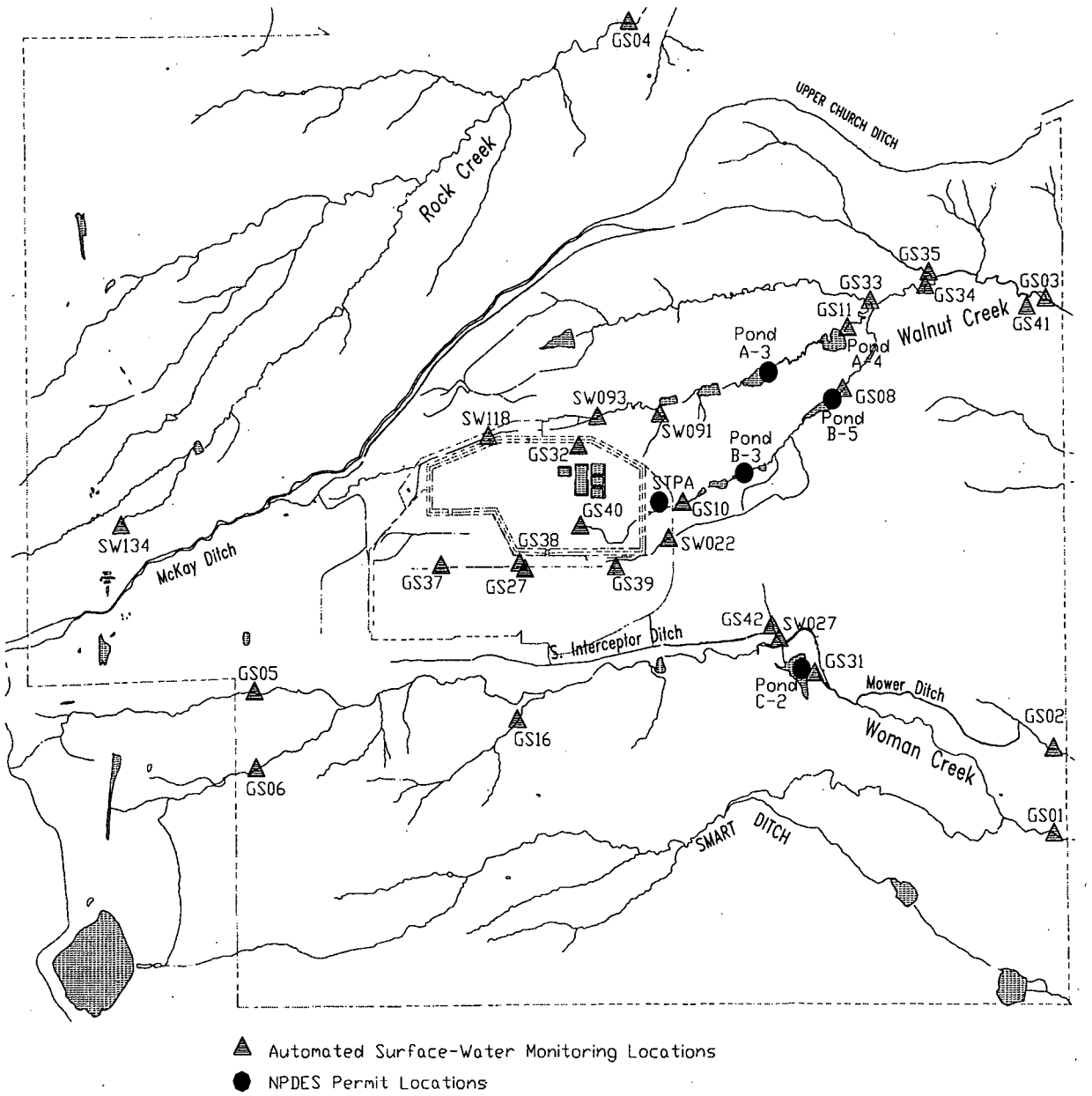
3.0 SURFACE WATER DATA

Map 3-1. Holding Ponds and Liquid Effluent Water Courses



3.1. NPDES SUMMARY DATA

Table 3-1. Pond B-3 (Outfall 001A)

Dates of discharge 07/01/00 – 09/30/00

Parameter & Units	Measured 30-day Average	Limit 30-Day Average	Measured 7-Day Average	Limit 7-Day Average	Measured Daily Maximum	Limit Daily Maximum
NO3/NO2, mg/l	3 - 6	10	5 - 7	20	N/A	N/A
TRC, mg/l	N/A	N/A	N/A	N/A	0.04 – 0.06	0.5
BOD5, mg/l	<3 - 3	a	N/A	N/A	4 - 7	a
CBOD5, mg/l	<2 - 2	a	N/A	N/A	3 - 6	a
TSS, mg/l	<10	a	N/A	N/A	<5 - 42	a

a Report Only
N/A Not Applicable
TRC Total Residual Chlorine
TSS Total Suspended Solids
BOD5 Biochemical Oxygen Demand, 5-Day Test
CBOD5 Carbonaceous Biochemical Oxygen Demand, 5-Day Test

Note: Results are the range of value measured during the reporting period

Table 3-2. Sewage Treatment Plant (Outfall STP A)

Dates of Discharge 07/01/00 – 09/30/00. Metals and VOA samples collected 07/05/00, 08/01/00, 09/05/00.

Parameter & Units	Measured 30-day Average	Limit 30-Day Average	Measured 7-Day Average	Limit 7-Day Average	Measured Daily Minimum	Limit Daily Minimum	Measured Daily Maximum	Limit Daily Maximum	Observed Sheen	Measured Result
pH, SU	N/A	N/A	N/A	N/A	6.7 – 6.8	6.0	7.5 – 8.1	9.0	N/A	N/A
TSS, mg/l	<5	30	<5	45	N/A	N/A	N/A	N/A	N/A	N/A
Total Phos., mg/l	1 - 2	8	N/A	N/A	N/A	N/A	3 - 5	12	N/A	N/A
TRC, mg/l	<0.01	a	<0.02	a	N/A	N/A	N/A	N/A	N/A	N/A
Total Cr., ug/l	<1.0	50	N/A	N/A	N/A	N/A	<1.0	100	N/A	N/A
F. Coliform, #/100ml	<6	200b	<2 - 43	400b	N/A	N/A	N/A	N/A	N/A	N/A
CBOD5, mg/l	<3	10	N/A	N/A	N/A	N/A	2 - 7	25	N/A	N/A
Oil & Grease	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	c	N/A
WET										
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Antimony, ug/l	<0.55	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Arsenic, ug/l	<0.80–2.3	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Beryllium, ug/l	<0.02	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Cadmium, ug/l	<0.10	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Copper, ug/l	1.3 – 1.5	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Iron, ug/l	22.0–60.4	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Lead, ug/l	<0.58	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Manganese, ug/l	6.8 – 13.2	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Mercury, ug/l	<0.10	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Nickel, ug/l	1.3 – 1.5	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Silver, ug/l	<0.28	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Zinc, ug/l	24.1–35.1	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
VOC's, ug/l	d	a	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

a	Report Only	TRC	Total Residual Chlorine
b	Geometric Mean	CBOD5	Carbonaceous Biochemical Oxygen Demand, 5-Day Test
c	No Sheen Observed	PQL	Practical Quantitation Limit
d	None Detected Above PQL	WET	Whole Effluent Toxicity
N/A	Not Applicable	SU	Standard Units
TSS	Total Suspended Solids		

Table 3-3. Ponds – Interior and Terminal

Pond A-3 discharged 07/17/00 – 07/24/00 and 08/28/00 – 08/31/00. Pond B-5 discharged 08/03/00 – 08/17/00 and 09/14/00 – 09/26/00. Pond A-4 and Pond C-2 did not discharge during the reporting period.

Location, Parameter and Units	Measured 30-day Average	Limit 30-Day Average	Measured 7-Day Average	Limit 7-Day Average	Measured Daily Minimum	Limit Daily Minimum	Measured Daily Maximum	Limit Daily Maximum	Measured Result
Pond A-3 (Outfall 002) pH, SU	N/A	N/A	N/A	N/A	7.4 – 7.9	6.0	8.4 – 9.3	9.0	N/A
NO3/NO2, mg/l	2	10	N/A	N/A	N/A	N/A	2 - 5	20	N/A
Pond A-4 (Outfall 005A) Total Cr., ug/l	N/A	N/A	N/A	N/A	N/A	N/A		50	N/A
WET									
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Pond B-5 (Outfall 006A) Total Cr., ug/l	N/A	N/A	N/A	N/A	N/A	N/A	<1	50	N/A
WET									
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	>100
NO3/NO2, mg/l*	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Pond C-2 (Outfall 007A) Total Cr., ug/l	N/A	N/A	N/A	N/A	N/A	N/A		50	N/A
WET									
Ceriodaphnia	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	
Fathead Minnows	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	

* Sample and analysis required only if Pond B-3 is bypassed
N/A Not applicable
SU Standard units
TRC Total residual chlorine
WET Whole Effluent Toxicity

3.2. MOUND PLUME SUMMARY DATA

Table 3-4. Mound Plume Locations SW061 and SW132

Analyte	SW061	SW132
	08/23/00	08/23/00
Pu 239/240, pCi/l	0.004 +/- 0.011	-0.001 +/- 0.002
Am 241, pCi/l	0.001 +/- 0.012	-0.005 +/- 0.005
Silver, dissolved, ug/l	<0.28	<0.28
Aluminum, total, ug/l	29.9	18.8
Arsenic, total, ug/l	0.97	<0.85
Barium, total, ug/l	247	110
Beryllium, total, ug/l	<0.02	<0.02
Cadmium, dissolved, ug/l	0.21	0.11
Copper, dissolved, ug/l	0.80	2.0
Iron, total, ug/l	333	112
Mercury, total, ug/l	0.16	0.15
Manganese, total, ug/l	43.5	39.7
Nickel, dissolved, ug/l	1.9	2.3
Lead, dissolved, ug/l	<0.52	<0.52
Antimony, total, ug/l	0.60	7.4
Selenium, dissolved, ug/l	1.1	1.2
Zinc, dissolved, ug/l	8.9	87.9
EPA VOA Method 8260, compounds found >RFCA Seg 5 Action Level	None detected	None detected

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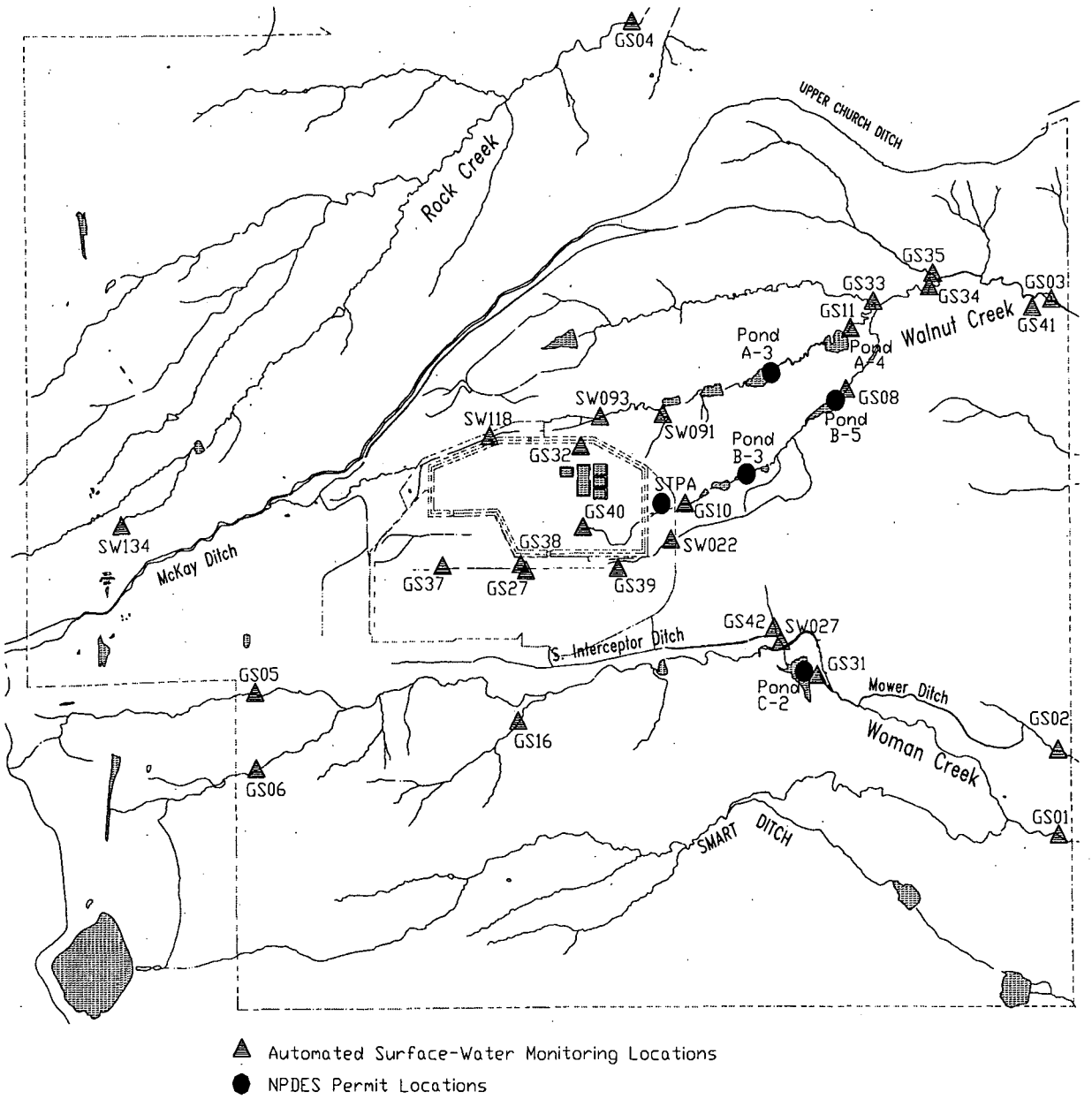
4.0 HYDROLOGIC AND ROCKY FLATS CLEAN-UP AGREEMENT (RFCA) DATA

Map 4-1. Gaging Station Locations



4.1. FLOW MONITORING

Table 4-1. Gaging Station GS01: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000a
6	0.000	0.000	0.000a
7	0.000	0.000	0.000a
8	0.000	0.000	0.000a
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000	0.000	0.000
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.001	0.000	0.000
17	0.000	0.001	0.000
18	0.000	0.000	0.000
19	0.000	0.000	0.000
20	0.000	0.000	0.000
21	0.000	0.000	0.000
22	0.000	0.000	0.000
23	0.000	0.000	0.000
24	0.000	0.000	0.000
25	0.000	0.000	0.000
26	0.000	0.000	0.000
27	0.000	0.000a	0.000
28	0.000	0.000a	0.000
29	0.000	0.000a	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.000	0.000	0.000

Monthly Discharge

Cubic Feet	147	68	3
Gallons	1103	511	25
Acre-Feet	0.00	0.00	0.00

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station GS01 is located at 39° 52' 40"N, 105° 09' 55"W, at Woman Creek and Indiana Street (See Section 4 Map). This station is a RFCA Point of Compliance, a Buffer Zone Monitoring Location and a monitoring point for water leaving the Site and flowing to Woman Creek Reservoir. This station collects samples for selected radionuclides using continuous flow-paced sampling and storm event sampling for selected water quality parameters, metals, and major ions.

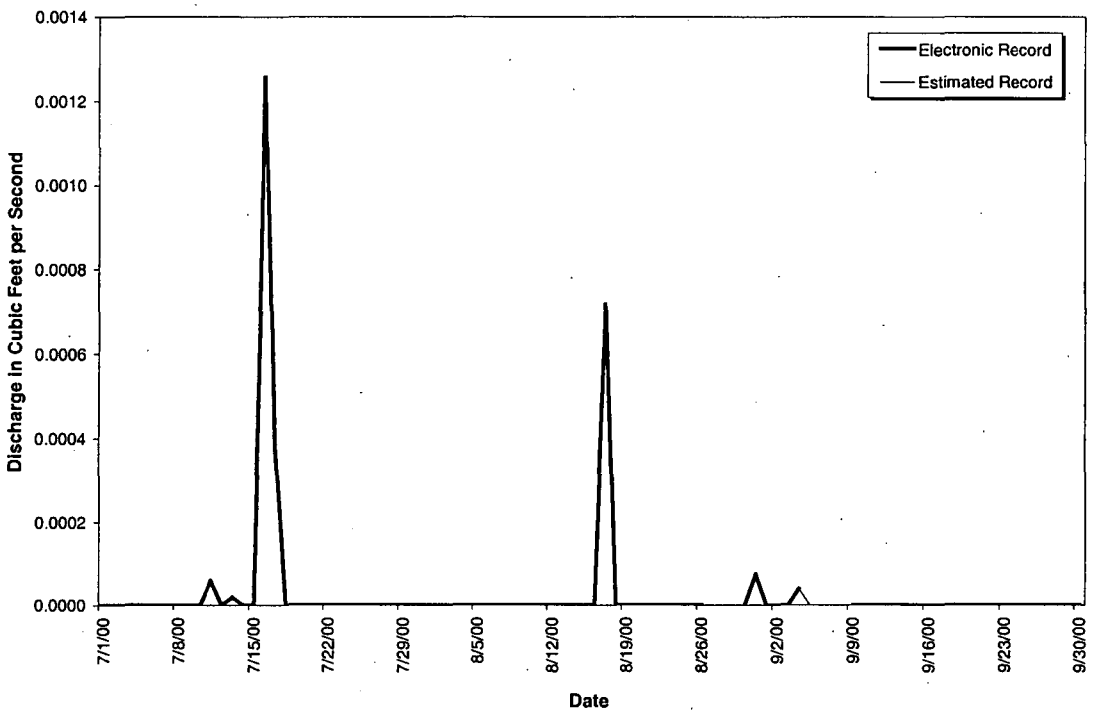


Figure 4-1. Mean Daily Discharge at GS01, Water Year 2000 (July, August, and September)

Table 4-2. Gaging Station GS03: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.007	0.000	0.001
2	0.008	0.000	0.002
3	0.004	0.500	0.001
4	0.002	1.986	0.001
5	0.002	1.979	0.000
6	0.002	1.978	0.000
7	0.000	1.436	0.000
8	0.000	1.159	0.000
9	0.000	0.958	0.000
10	0.000	1.123	0.000
11	0.000	0.848	0.000
12	0.000	0.936	0.000
13	0.000	0.702	0.000
14	0.000	0.700	0.254
15	0.000	0.899	1.120
16	0.001	0.970	1.159
17	0.007	0.382	1.145
18	0.000	0.034	1.091
19	0.000	0.024	1.049
20	0.000	0.017	1.394
21	0.000	0.009	1.345
22	0.000	0.006	1.357
23	0.000	0.004	1.807
24	0.000	0.003	1.856
25	0.000	0.001	1.653
26	0.000	0.000	0.550
27	0.000	0.002	0.009
28	0.000	0.355	0.005
29	0.000	0.008	0.005
30	0.000	0.002	0.006
31	0.000	0.001	NA
Monthly Average (cfs)	0.001	0.549	0.527

Monthly Discharge

Cubic Feet	3001	1470678	1365978
Gallons	22446	11001438	10218225
Acre-Feet	0.07	33.76	31.35

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station GS03 is located at 39° 54' 7"N, 105° 9' 59"W, at Walnut Creek and Indiana Street (See Section 4 Map). This station is a RFCA Point of Compliance, a Buffer Zone Monitoring Location and a monitoring point for water leaving the Site and flowing to the Broomfield Diversion Ditch. This station collects samples for selected radionuclides using continuous flow-paced sampling and storm event sampling for selected water quality parameters, metals, and major ions.

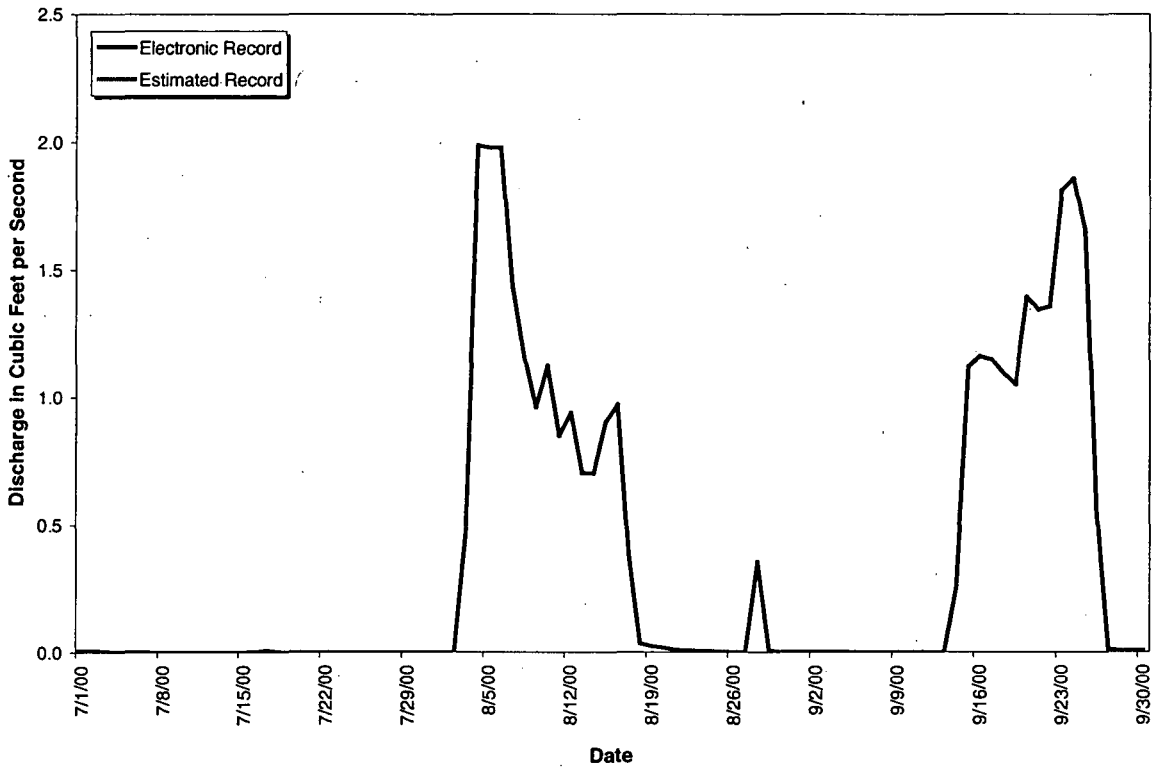


Figure 4-2. Mean Daily Discharge at GS03, Water Year 2000 (July, August, and September)

Table 4-3. Gaging Station GS08: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	1.665	0.000
4	0.000	3.059	0.000
5	0.000	2.931	0.000
6	0.000	2.922	0.000
7	0.000	2.179	0.000
8	0.000	1.734	0.000
9	0.000	1.547	0.000
10	0.000	1.698	0.000
11	0.000	1.321	0.000
12	0.000	1.404	0.000
13	0.000	1.000	0.000
14	0.000	1.115	1.253
15	0.000	1.439	2.017
16	0.000	1.385	1.942
17	0.000	0.351	1.850
18	0.000	0.000	1.736
19	0.000	0.000	1.670
20	0.000	0.000	2.013
21	0.000	0.000	1.906
22	0.000	0.000	1.930
23	0.000	0.000	2.417
24	0.000	0.000	2.355
25	0.000	0.000	2.056
26	0.000	0.000	0.478
27	0.000	0.000	0.000
28	0.000	0.000	0.000
29	0.000	0.000	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.000	0.831	0.788

Monthly Discharge

Cubic Feet	0	2224851	2041237
Gallons	0	16643045	15269513
Acre-Feet	0.00	51.08	46.86

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station GS08 is located 39° 53' 54"N, 105° 10' 48"W, at the Pond B-5 Outfall on South Walnut Creek (See Section 4 Map). This station is a RFCA Point of Compliance and monitors water discharged from Pond B-5 to South Walnut Creek. This station collects samples for selected radionuclides using continuous flow-paced sampling.

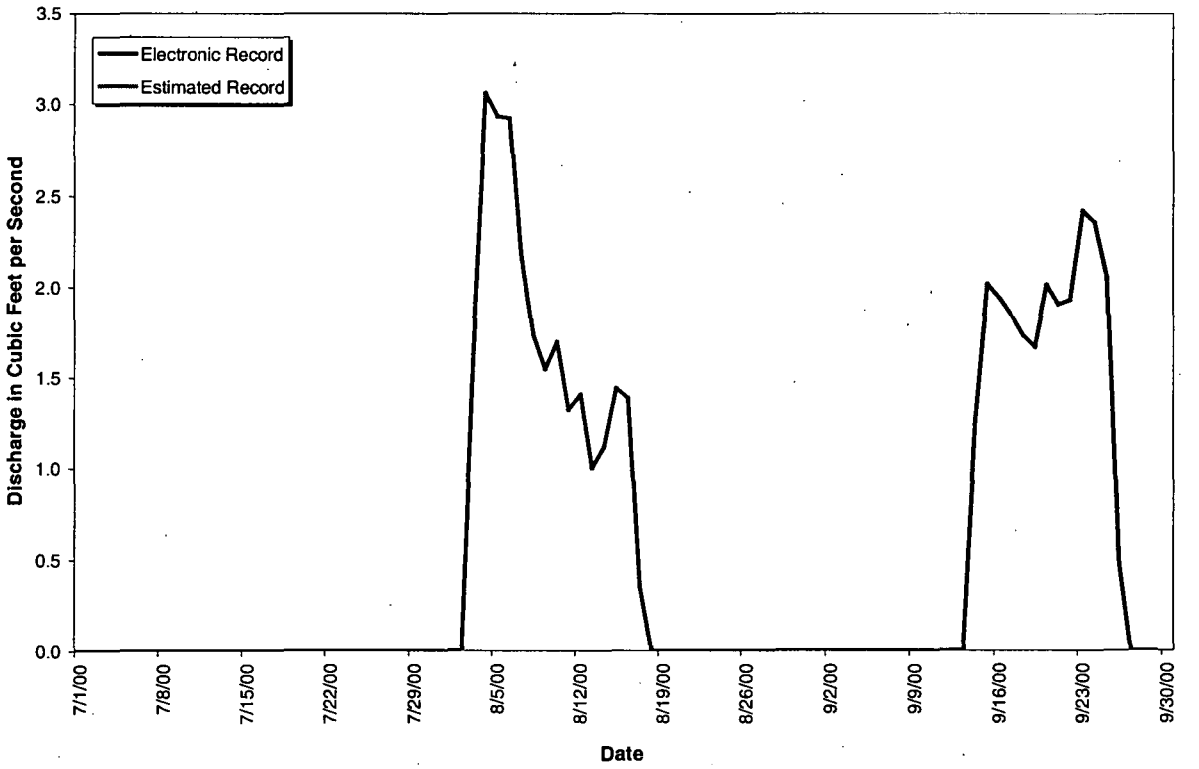


Figure 4-3. Mean Daily Discharge at GS08, Water Year 2000 (July, August, and September)

Table 4-4. Gaging Station GS10: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.117	0.048	0.053
2	0.102	0.048	0.049
3	0.105	0.052	0.048
4	0.100	0.104	0.047
5	0.100	0.046	0.047
6	0.082	0.044	0.049
7	0.054	0.042	0.046
8	0.057	0.040	0.082
9	0.068	0.041	0.049
10	0.058	0.042	0.048
11	0.062	0.047	0.053
12	0.071	0.046	0.051
13	0.305	0.044	0.051
14	0.081	0.042	0.051
15	0.051	0.043	0.051
16	4.478	0.061	0.051
17	1.887	1.190	0.053
18	0.090	0.255	0.054
19	0.072	0.043	0.099
20	0.068	0.185	1.092
21	0.065	0.041	0.145
22	0.061	0.038	0.301
23	0.058	0.037	0.839
24	0.056	0.039	0.750
25	0.055	0.039	0.216
26	0.054	0.051	0.090
27	0.053	5.157	0.077
28	0.052	0.148	0.073
29	0.050	0.140	0.071
30	0.049	0.071	0.069
31	0.047	0.058	NA
Monthly Average (cfs)	0.278	0.267	0.158

Monthly Discharge

Cubic Feet	743658	715526	410707
Gallons	5562947	5352506	3072299
Acre-Feet	17.07	16.42	9.43

Note: mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station GS10 is located 39° 53' 35"N, 105° 11' 27"W on South Walnut Creek above the Pond B-1 Bypass (See Section 4 Map). This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water leaving the Site Industrial Area and entering the B-Series Ponds and South Walnut Creek. This station collects samples for selected radionuclides, metals, and water quality parameters using continuous flow-paced sampling.

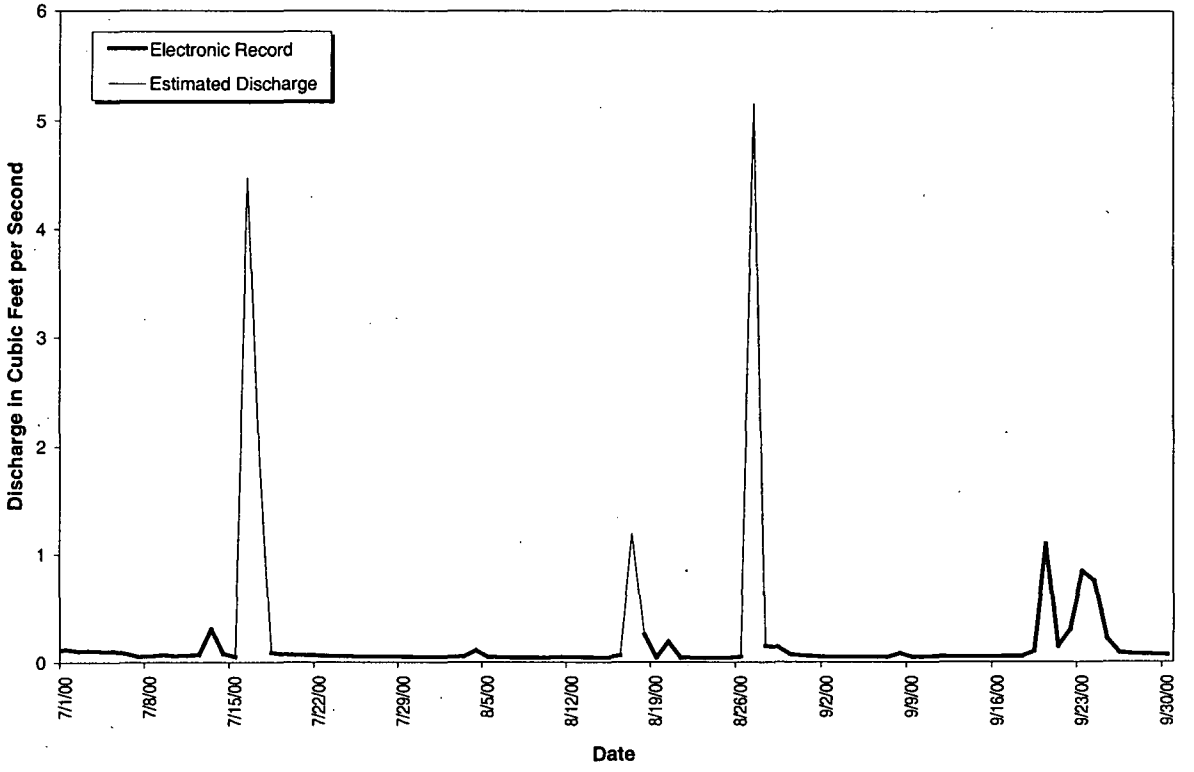


Figure 4-4. Mean Daily Discharge at GS10, Water Year 2000 (July, August, and September)

Table 4-5. Gaging Station GS11: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000	0.000	0.000
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.000	0.000	0.000
17	0.000	0.000	0.000
18	0.000	0.000	0.000
19	0.000	0.000	0.000
20	0.000	0.000	0.000
21	0.000	0.000	0.000
22	0.000	0.000	0.000
23	0.000	0.000	0.000
24	0.000	0.000	0.000
25	0.000	0.000	0.000
26	0.000	0.000	0.000
27	0.000	0.000	0.000
28	0.000	0.000	0.000
29	0.000	0.000	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.000	0.000	0.000

Monthly Discharge

Cubic Feet	0	0	0
Gallons	0	0	0
Acre-Feet	0.00	0.00	0.00

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station GS11 is located 39° 54' 3"N, 105° 10' 47"W, at the Pond A-4 Outfall on North Walnut Creek (See Section 4 Map). This station is a RFCA Point of Compliance and monitors water discharged from Pond A-4 to North Walnut Creek. This station collects samples for selected radionuclides using continuous flow-paced sampling.

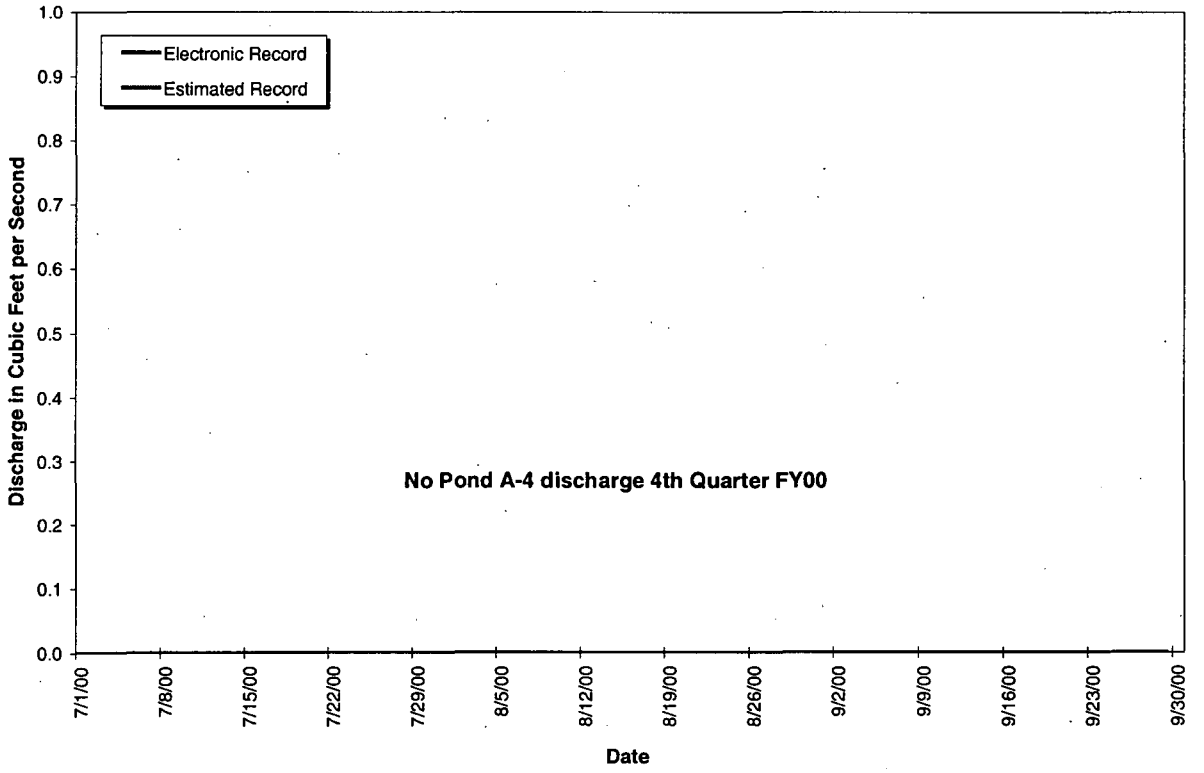


Figure 4-5. Mean Daily Discharge at GS11 Water Year 2000 (July, August, and September)

Table 4-6. Gaging Station GS27: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000
4	0.0000	0.0001	0.0000
5	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000
13	0.0005	0.0000	0.0000
14	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000
16	0.0129a	0.0000	0.0000
17	0.0019	0.0027	0.0000
18	0.0000	0.0002	0.0000
19	0.0000	0.0000	0.0000
20	0.0000	0.0002	0.0021
21	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0002
23	0.0000	0.0000	0.0015
24	0.0000	0.0000	0.0014
25	0.0000	0.0000	0.0000
26	0.0000	0.0000	0.0000
27	0.0000	0.0120a	0.0000
28	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000
31	0.0000	0.0000	NA
Monthly Average (cfs)	0.000	0.000	0.000

Monthly Discharge

Cubic Feet	1326	1312	452
Gallons	9922	9816	3384
Acre-Feet	0.030	0.030	0.010

Note: mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station GS27 is located at State Plane 2080529; 751216, at the small drainage ditch NW of Building 884 (see Section 4 Map). This location is a Performance and Best Management Practices Monitoring Location and monitors water draining from the Building 889 area. This station collects samples for selected radionuclides using continuous, flow-paced sampling.

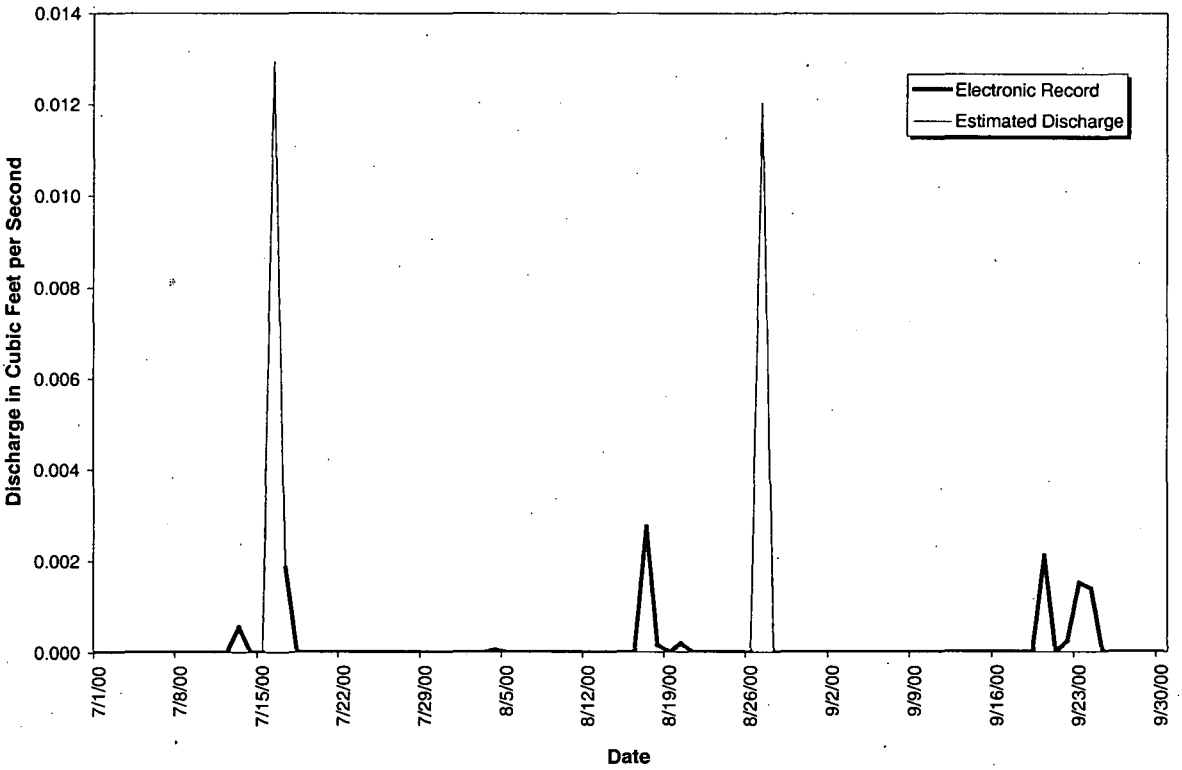


Figure 4-6. Mean Daily Discharge at GS27 Water Year 2000 (July, August, and September)

Table 4-7. Gaging Station GS31: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000	0.000	0.000
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.000	0.000	0.000
17	0.000	0.000	0.000
18	0.000	0.000	0.000
19	0.000	0.000	0.000
20	0.000	0.000	0.000
21	0.000	0.000	0.000
22	0.000	0.000	0.000
23	0.000	0.000	0.000
24	0.000	0.000	0.000
25	0.000	0.000	0.000
26	0.000	0.000	0.000
27	0.000	0.000	0.000
28	0.000	0.000	0.000
29	0.000	0.000	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.000	0.000	0.000

Monthly Discharge

Cubic Feet	0	0	0
Gallons	0	0	0
Acre-Feet	0.00	0.00	0.00

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station GS31 is located at State Plane 2089268: 747506, at the Pond C-2 Outfall (See Section 4 Map). This station is a RFCA Point of Compliance and monitors water discharged from Pond C-2. This station collects samples for selected radionuclides using continuous flow-paced sampling.

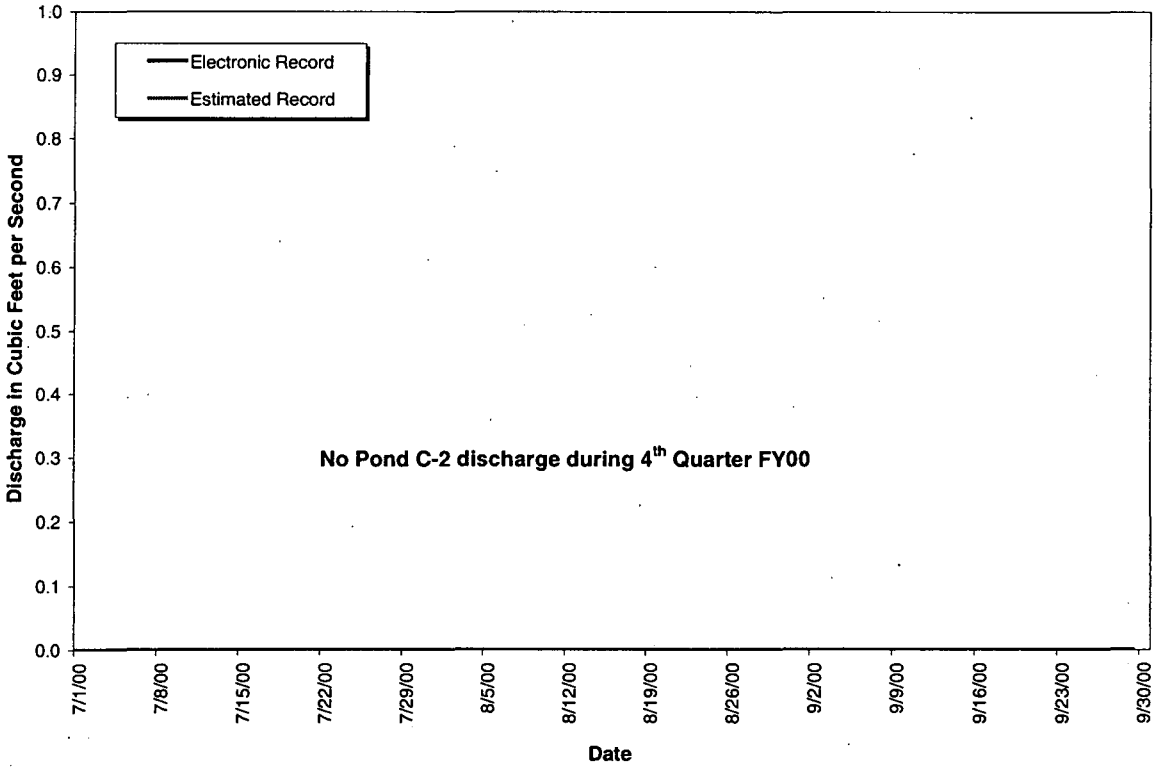


Figure 4-7. Mean Daily Discharge at GS31 Water Year 2000 (July, August, and September)

Table 4-8. Gaging Station GS39: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000
3	0.0000a	0.0000	0.0000
4	0.0000	0.0000	0.0000
5	0.0000a	0.0000	0.0000
6	0.0000	0.0000	0.0000
7	0.0000a	0.0000	0.0000
8	0.0000a	0.0000	0.0000
9	0.0000a	0.0000	0.0000
10	0.0000a	0.0000	0.0000
11	0.0000a	0.0000	0.0000
12	0.0000a	0.0000	0.0000
13	0.0212	0.0000	0.0000
14	0.0002	0.0000	0.0000
15	0.0000	0.0000	0.0000
16	0.2231a	0.0000	0.0000
17	0.0709	0.0489	0.0000
18	0.0000	0.0081	0.0000
19	0.0000	0.0000	0.0000
20	0.0000	0.0118	0.0542
21	0.0000	0.0000	0.0040
22	0.0000	0.0000	0.0140
23	0.0000	0.0000	0.0373
24	0.0000	0.0000	0.0381
25	0.0000	0.0000	0.0005
26	0.0000	0.0000	0.0000
27	0.0000	0.1540a	0.0000
28	0.0000	0.0010	0.0000
29	0.0000	0.0021	0.0000
30	0.0000	0.0000	0.0000
31	0.0000	0.0000	NA
Monthly Average (cfs)	0.010	0.007	0.005

Monthly Discharge

Cubic Feet	27246	19514	12804
Gallons	203811	145978	95784
Acre-Feet	0.63	0.45	0.29

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station GS39 is located in the drainage ditch northwest of the 904 Pad. This location is a RFCA Source Location station monitoring water flowing from the area of the 903 Pad as well as part of the 904 Pad and contractor yard to South Walnut Creek. This station collects samples for selected radionuclides using continuous, flow-paced sampling.

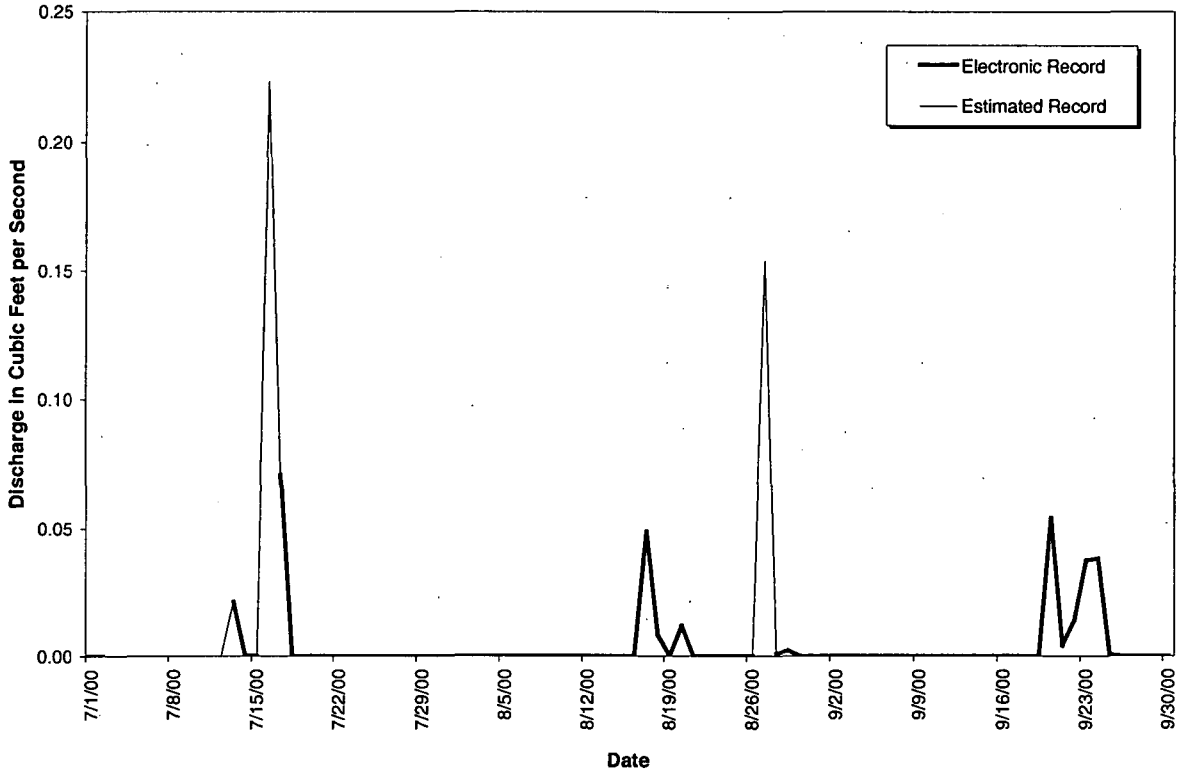


Figure 4-8. Mean Daily Discharge at GS39 Water Year 2000 (July, August, and September)

Table 4-9. Gaging Station GS40: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.039	0.020	0.025
2	0.023	0.023	0.025
3	0.023	0.022	0.026
4	0.020	0.065	0.024
5	0.018	0.012	0.020
6	0.017	0.020	0.016
7	0.017	0.022	0.013
8	0.018	0.024	0.038
9	0.026	0.023	0.005
10	0.014	0.023	0.006
11	0.017	0.029	0.018
12	0.020	0.024	0.028
13	0.129	0.024	0.023
14	0.030	0.024	0.025
15	0.026	0.025	0.027
16	1.141a	0.044	0.028
17	0.350	0.383	0.032
18	0.031	0.103	0.034
19	0.026	0.030	0.096
20	0.024	0.093	0.352
21	0.028	0.037	0.086
22	0.034	0.040	0.161
23	0.037	0.039	0.262
24	0.037	0.040	0.213
25	0.043	0.041	0.129
26	0.038	0.052	0.048
27	0.030	1.291a	0.042
28	0.026	0.070	0.038
29	0.021	0.084	0.039
30	0.022	0.032	0.039
31	0.019	0.032	NA
Monthly Average (cfs)	0.075	0.090	0.064

Monthly Discharge

Cubic Feet	202193	241166	165569
Gallons	1512507	1804044	1238544
Acre-Feet	4.64	5.54	3.80

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station GS40 is located on the concrete spillway east of Tenth Street, south of Building 997. This location is a RFCA Performance Monitoring Location monitoring water flowing from the 700 area to South Walnut Creek. This station samples for selected radionuclides using continuous, flow-paced sampling.

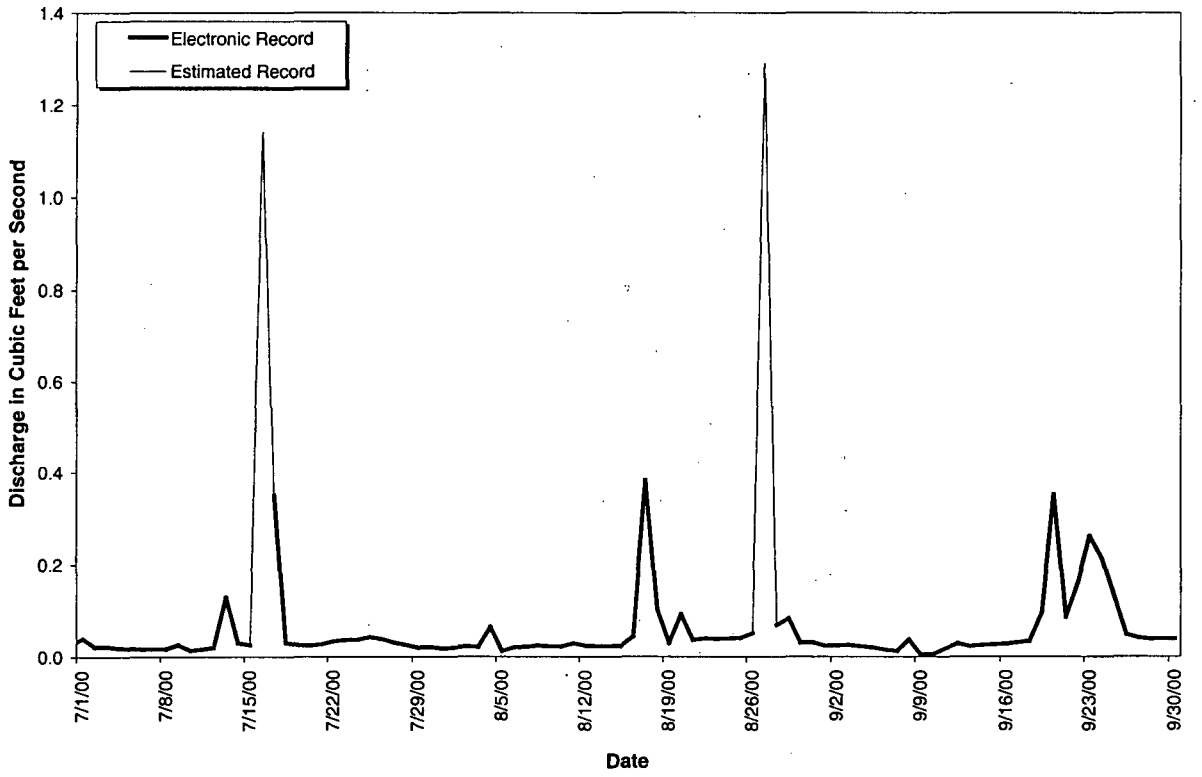


Figure 4-9. Mean Daily discharge at GS40 Water Year 2000 (July, August, and September)

Table 4-10. Gaging Station GS43: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0013
3	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000
6	0.0000	0.0001	0.0000
7	0.0000	0.0001	0.0000
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000
16	0.0128	0.0000	0.0000
17	0.0126	0.0000	0.0000
18	0.0004	0.0000	0.0000
19	0.0000	0.0000	0.0000
20	0.0000	0.0006	0.0000
21	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0001
23	0.0000	0.0000	0.0000
24	0.0000	0.0000	0.0000
25	0.0000	0.0000	0.0000
26	0.0000	0.0000	0.0000
27	0.0000	0.0159	0.0003
28	0.0000	0.0007	0.0000
29	0.0000	0.0001	0.0053
30	0.0000	0.0010	0.0003
31	0.0000	0.0000	NA
Monthly Average (cfs)	0.001	0.001	0.000

Monthly Discharge

Cubic Feet	2235	1598	633
Gallons	16719	11957	4736
Acre-Feet	0.05	0.04	0.01

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging station GS43 is located in the ditch at the northeast corner of T886A. This location is a RFCA Performance Monitoring Location monitoring runoff from the eastern portion of the 800 area including Building 875, T886A, and the eastern half of Building 886. Water passing this monitoring location continues to South Walnut Creek. This station samples for selected radionuclides and metals using continuous, flow-paced sampling.

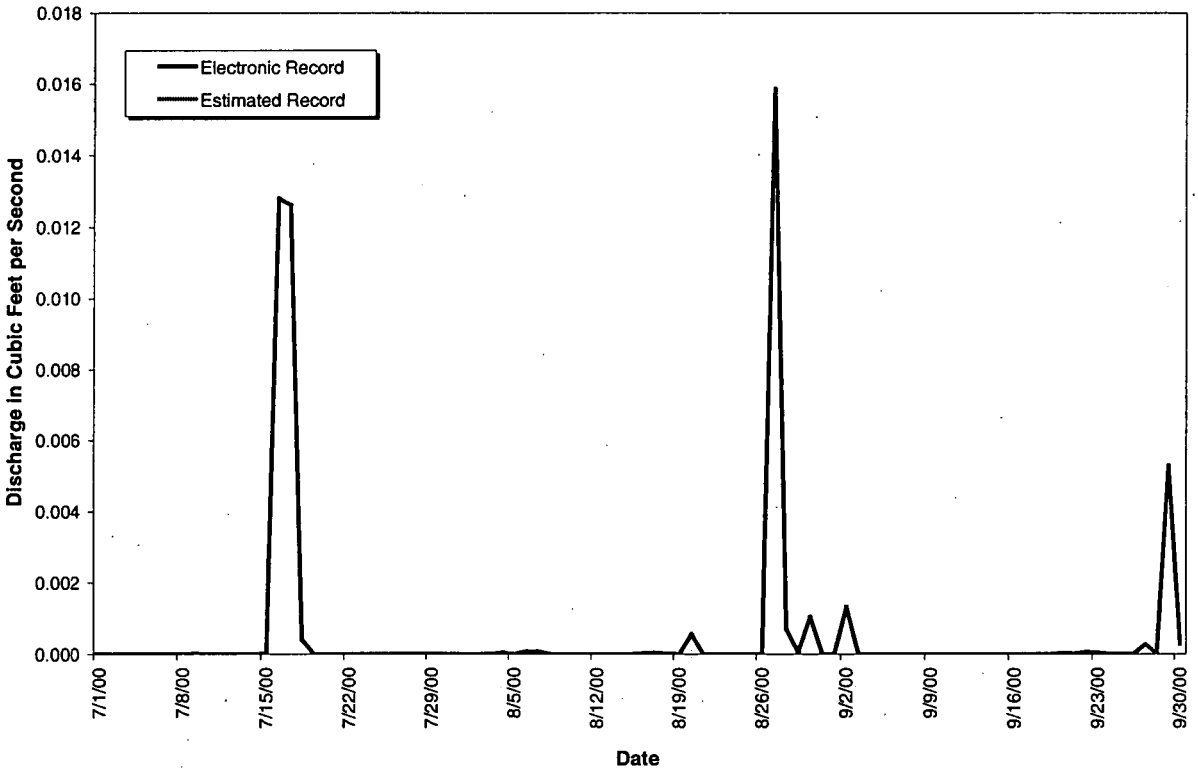


Figure 4-10. Mean Daily Discharge at GS43, Water Year 2000 (July, August, and September)

Table 4-11. Gaging Station SW022: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000	0.000	0.000
13	0.058	0.000	0.000
14	0.002	0.000	0.000
15	0.000	0.000	0.000
16	0.854a	0.000	0.000
17	0.685a	0.467	0.000
18	0.001	0.081	0.000
19	0.000	0.000	0.000
20	0.000	0.057	0.378
21	0.000	0.000	0.000
22	0.000	0.000	0.062
23	0.000	0.000	0.312
24	0.000	0.000	0.304
25	0.000	0.000	0.023
26	0.000	0.000	0.000
27	0.000	0.806a	0.000
28	0.000	0.012	0.000
29	0.000	0.005	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.052	0.046	0.036

Monthly Discharge

Cubic Feet	138187	123321	93282
Gallons	1033710	922504	697797
Acre-Feet	3.17	2.83	2.14

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station SW022 is located 39° 53' 30"N, 105° 11' 30"W, at the Central Avenue Ditch at the Inner East Gate (See Section 4 Map). This location is a RFCA New Source Detection Location and monitors water in the Central Avenue Ditch entering the B-Series Ponds and South Walnut Creek. Storm event samples are collected for selected radionuclides.

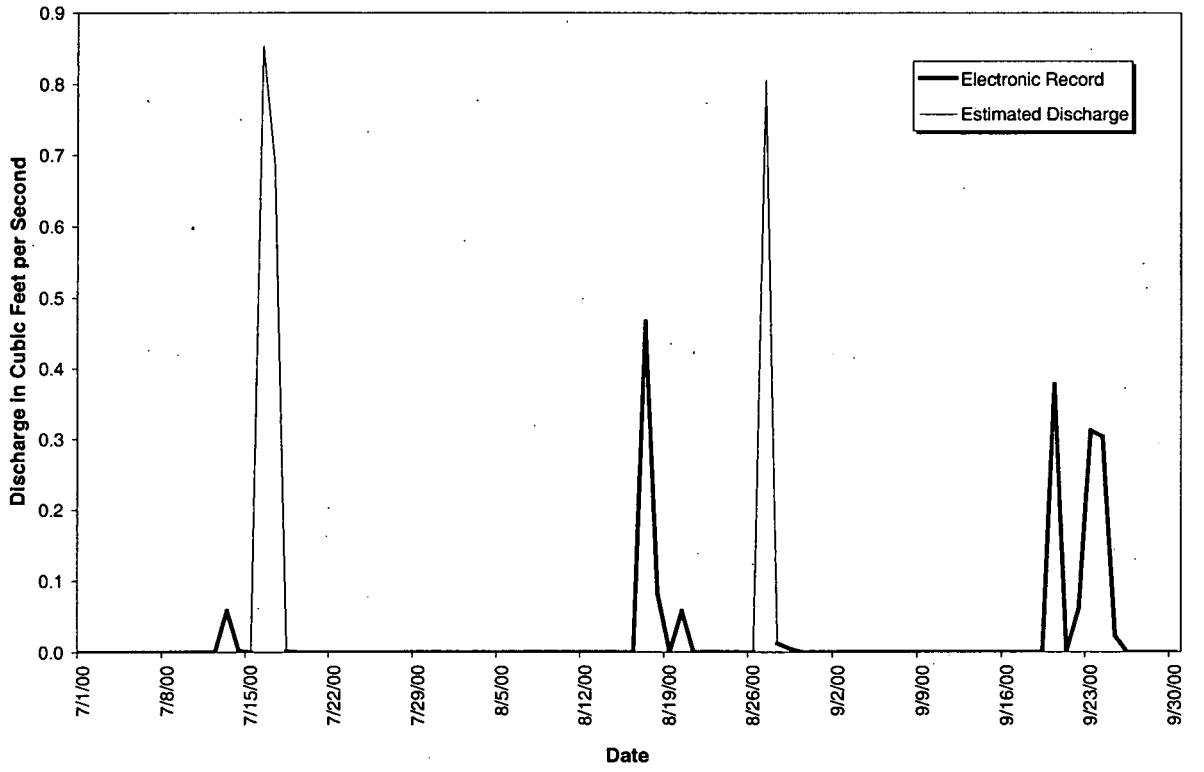


Figure 4-11. Mean Daily Discharge at SW022, Water Year 2000 (July, August, and September)

Table 4-12. Gaging Station SW027: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.002
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000	0.000	0.000
13	0.000	0.000	0.000
14	0.000	0.000	0.000
15	0.000	0.000	0.000
16	0.000	0.000	0.000
17	1.573	0.000	0.000
18	0.012	0.154	0.000
19	0.003	0.003	0.000
20	0.001	0.001	0.100
21	0.000	0.000	0.006
22	0.000	0.000	0.005
23	0.000	0.000	0.046
24	0.000	0.000	0.380
25	0.000	0.000	0.150
26	0.000	0.000	0.043
27	0.000	0.729	0.007
28	0.000	0.339	0.004
29	0.000	0.007	0.002
30	0.000	0.005	0.001
31	0.000	0.004	NA
Monthly Average (cfs)	0.051	0.040	0.025

Monthly Discharge

Cubic Feet	137317	107291	64507
Gallons	1027202	802596	482547
Acre-Feet	3.15	2.46	1.48

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

Gaging Station SW027 is located 39° 53' 12" N, 105° 11' 4"W, at the South Interceptor Ditch above Pond C-2 (See Section 4 Map). This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water in the South Interceptor Ditch entering Pond C-2. This station collects samples for selected radionuclides, metals, and water quality parameters using continuous flow-paced sampling.

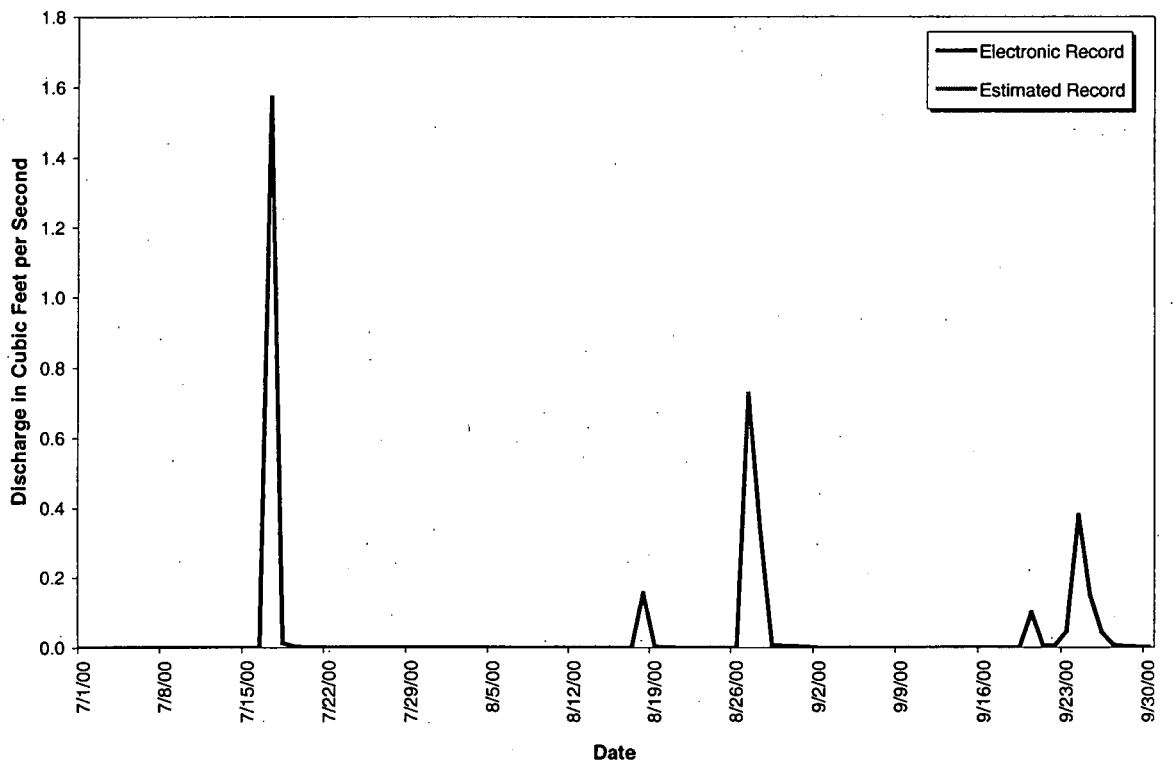


Figure 4-12. Mean Daily Discharge at SW027, Water Year 2000 (July, August, and September)

Table 4-13. Gaging Station SW091: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.0000	0.0000	0.0000
2	0.0000	0.0000	0.0000
3	0.0000	0.0000	0.0000
4	0.0000	0.0000	0.0000
5	0.0000	0.0000	0.0000
6	0.0000	0.0000	0.0000
7	0.0000	0.0000	0.0000
8	0.0000	0.0000	0.0000
9	0.0000	0.0000	0.0000
10	0.0000	0.0000	0.0000
11	0.0000	0.0000	0.0000
12	0.0000	0.0000	0.0000
13	0.0000	0.0000	0.0000
14	0.0000	0.0000	0.0000
15	0.0000	0.0000	0.0000
16	0.0000	0.0000	0.0000
17	0.0000	0.0000	0.0000
18	0.0000	0.0000	0.0000
19	0.0000	0.0000	0.0000
20	0.0000	0.0000	0.0000
21	0.0000	0.0000	0.0000
22	0.0000	0.0000	0.0000
23	0.0000	0.0000	0.0000
24	0.0000	0.0000	0.0000
25	0.0000	0.0000	0.0000a
26	0.0000	0.0000	0.0000
27	0.0000	0.0000	0.0000
28	0.0000	0.0000	0.0000
29	0.0000	0.0000	0.0000
30	0.0000	0.0000	0.0000
31	0.0000	0.0000	NA
Monthly Average (cfs)	0.0000	0.0000	0.0000

Monthly Discharge

Cubic Feet	5	0	1
Gallons	41	0	10
Acre-Feet	0.00	0.00	0.00

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station SW091 is located at State Plane 2086064; 751322, along the drainage NE of the Solar Ponds draining to the A-Series Ponds (See Section 4 Map). This location is a RFCA New Source Detection Location and monitors water draining from the area NE of the Solar Ponds. Storm event samples are collected for selected radionuclides.

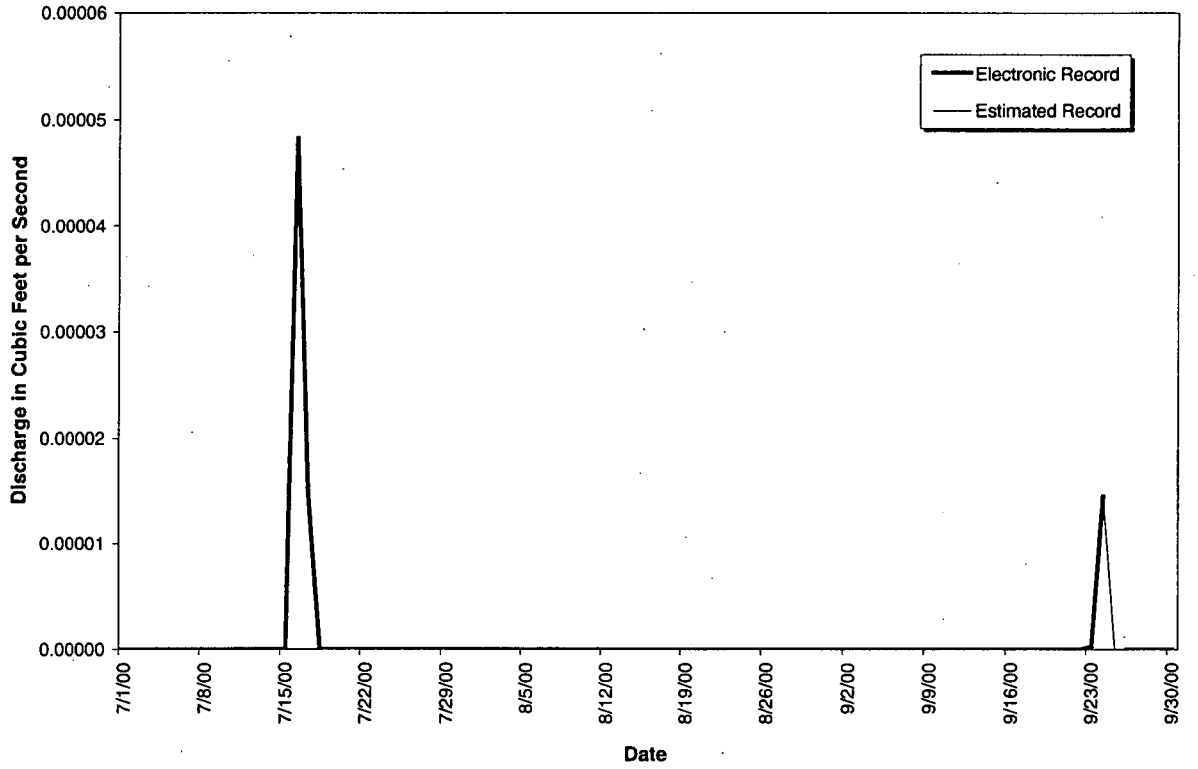


Figure 4-13. Mean Daily Discharge at SW091, Water Year 2000 (July, August, and September)

Table 4-14. Gaging Station SW093: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.090	0.067	0.097
2	0.087	0.068	0.089
3	0.089	0.071	0.083
4	0.082	0.128	0.083
5	0.076	0.083	0.084
6	0.063	0.071	0.083
7	0.060	0.071	0.085
8	0.069	0.071	0.137
9	0.076	0.073	0.090
10	0.079	0.079	0.086
11	0.079	0.083	0.088
12	0.113	0.077	0.091
13	0.245	0.068	0.091
14	0.211	0.063	0.093
15	0.233	0.058	0.096
16	4.810a	0.066	0.097
17	2.665a	1.336	0.100
18	0.256	0.329	0.101
19	0.160	0.089	0.109
20	0.133	0.161	0.980
21	0.114	0.076	0.188
22	0.143	0.073	0.361
23	0.136	0.075	0.946
24	0.120	0.080	1.029
25	0.110	0.084	0.394
26	0.101	0.097	0.187
27	0.099	3.822a	0.128
28	0.159	0.413	0.108
29	0.126	0.231	0.099
30	0.072	0.141	0.087
31	0.073	0.109	NA
Monthly Average (cfs)	0.353	0.268	0.210

Monthly Discharge

Cubic Feet	944460	718568	543194
Gallons	7065054	5375264	4063375
Acre-Feet	21.68	16.49	12.47

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station SW093 is located 39° 53' 51"N, 105° 11' 48"W, along North Walnut Creek at the 72" culvert 1000 feet above the Pond A-1 Bypass (See Section 4 Map). This station is a RFCA Action Level Framework and a New Source Detection Location and monitors water leaving the Site Industrial Area and entering the A-Series Ponds and North Walnut Creek. This station collects samples for selected radionuclides, metals, and water quality parameters using continuous flow-paced sampling.

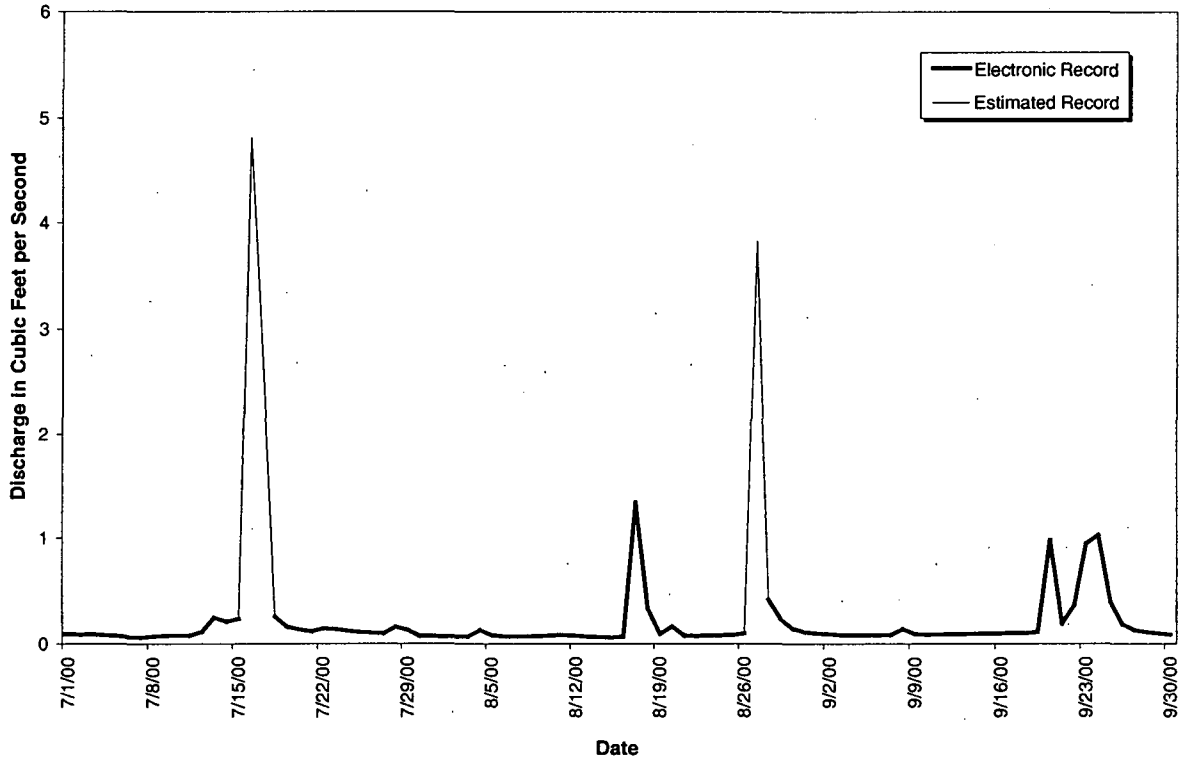


Figure 4-14. Mean Daily Discharge at SW093, Water Year 2000 (July, August, and September)

Table 4-15. Gaging Station SW120: Mean Daily Discharge (cubic feet per second)

Day	July-00	August-00	September-00
1	0.000	0.000	0.000
2	0.000	0.000	0.000
3	0.000	0.000	0.000
4	0.000	0.000	0.000
5	0.000	0.000	0.000
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	0.000
10	0.000	0.000	0.000
11	0.000	0.000	0.000
12	0.000a	0.000	0.000
13	0.000a	0.000	0.000
14	0.000a	0.000	0.000
15	0.000a	0.000	0.000
16	0.224a	0.000	0.000
17	0.135	0.006	0.000
18	0.000	0.007	0.000
19	0.000	0.000	0.000
20	0.000	0.000	0.011
21	0.000	0.000	0.000
22	0.000	0.000	0.008
23	0.000	0.000	0.035
24	0.000	0.000	0.037
25	0.000	0.000	0.011
26	0.000	0.000	0.002
27	0.000	0.110a	0.000
28	0.000	0.006	0.000
29	0.000	0.001	0.000
30	0.000	0.000	0.000
31	0.000	0.000	NA
Monthly Average (cfs)	0.012	0.004	0.003

Monthly Discharge

Cubic Feet	31074	11103	8936
Gallons	232447	83059	66846
Acre-Feet	0.71	0.25	0.21

Note: Mean flow values are reported to the nearest 0.001 cfs, values less than 0.0005 cfs are reported as zero.

[a] Contains data estimated from field observations and electronic record at adjacent or comparable gages.

Gaging Station SW120 is located at state plane 2084681.6 E 751269 N, in the drainage ditch north of the Solar Ponds along the south side of the PA Perimeter Road. This location is a Performance monitoring location in support of D&D activities for the B771/774 area. SW120 also serves as a Source Location monitoring point in support of Source Evaluation efforts for POE SW093. This location collects continuous flow-paced samples that are analyzed for Pu, U, Am, CLP metals, and TSS.

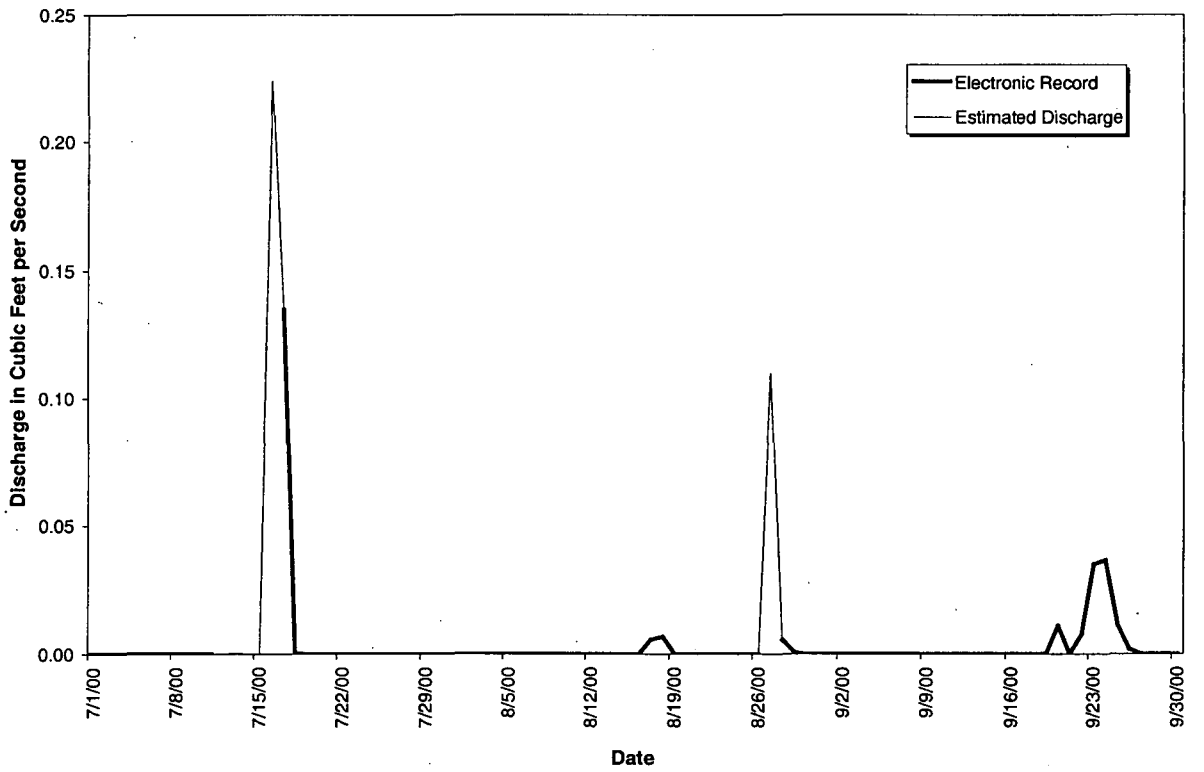


Figure 4-15. Mean Daily Discharge at SW120, Water Year 2000 (July, August, and September)

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4.2. WATER QUALITY DATA

Table 4-16. Radionuclides, Water Year 2000 (July, August, and September)

Location	Sample Dates	Result (MDA) Pu-239, -240 [pCi/l]	Result (MDA) Am-241 [pCi/l]	Result (MDA) Total Uranium [pCi/l]	Result (MDA) Tritium [pCi/l]
GS01	5/2 - 11/6/00	c	c	a	c
GS03	7/17 - 8/3/00	d	d	a	d
GS03	8/3 - 8/7/00	-0.003 (0.020)	-0.002 (0.012)	a	-180 (250)
GS03	8/7 - 8/11/00	0.010 (0.020)	0.006 (0.012)	a	35 (320)
GS03	8/11 - 8/17/00	0.001 (0.004)	0.003 (0.015)	a	180 (300)
GS03	8/17 - 8/31/00	c	c	a	-80 (251)
GS03	8/31 - 9/14/00	d	d	a	d
GS03	9/14 - 9/19/00	-0.005 (0.016)	0.001 (0.017)	a	110 (260)
GS03	9/19 - 9/27/00	c	c	a	95 (260)
GS03	9/27 - 11/13/00	d	d	a	d
GS08	8/3 - 8/7/00	-0.004 (0.020)	-0.005 (0.026)	0.521 (0.023)	a
GS08	8/7 - 8/11/00	0.005 (0.013)	0.041 (0.009)	0.196 (0.050)	a
GS08	8/11 - 8/17/00	c	c	c	a
GS08	9/14 - 9/19/00	-0.002 (0.017)	-0.001 (0.027)	0.507 (0.020)	a
GS08	9/19 - 9/26/00	-0.007 (0.021)	-0.007 (0.026)	0.566 (0.022)	a
GS10	7/3 - 7/7/00	0.034 (0.019)	0.058 (0.032)	2.867 (0.024)	a
GS10	7/7 - 7/14/00	0.500 (0.020)	0.640 (0.027)	2.333 (0.024)	a
GS10	7/14 - 7/17/00	0.329 (0.026)	0.335 (0.025)	0.954 (0.027)	a
GS10	7/17 - 7/28/00	-0.004 (0.016)	0.005 (0.025)	4.010 (0.031)	a
GS10	7/28 - 8/18/00	0.101 (0.036)	0.091 (0.044)	1.356 (0.050)	a
GS10	8/18 - 8/28/00	0.203 (0.020)	0.147 (0.020)	0.890 (0.023)	a
GS10	8/28 - 9/12/00	0.009 (0.008)	0.030 (0.019)	3.724 (0.035)	a
GS10	9/12 - 9/20/00	0.045 (0.018)	0.023 (0.024)	1.291 (0.021)	a
GS10	9/20 - 9/24/00	0.041 (0.019)	0.024 (0.029)	0.645 (0.020)	a
GS10	9/24 - 10/5/00	c	c	c	a
GS27	7/13/00	1.880 (0.019)	0.373 (0.028)	0.452 (0.024)	a
GS27	8/4/00	0.540 (0.018)	0.141 (0.025)	0.126 (0.023)	a
GS27	8/17/00	6.900 (0.061)	0.325 (0.047)	0.219 (0.060)	a
GS27	8/27/00	4.820 (0.019)	1.020 (0.024)	0.444 (0.022)	a
GS27	9/20/00	0.106 (0.019)	0.057 (0.029)	0.034 (0.020)	a

a Not applicable
b Not collected
c Incomplete analysis
d Non-sufficient quantity

Table 4-15. Radionuclides, Water Year 2000 (July, August, and September), continued

Location	Sample Dates	Result (MDA) Pu-239, -240 [pCi/l]	Result (MDA) Am-241 [pCi/l]	Result (MDA) Total Uranium [pCi/l]	Result (MDA) Tritium [pCi/l]
GS32	7/13/00	6.340 (0.021)	4.060 (0.027)	1.992 (0.040)	a
GS32	7/16/00	4.820 (0.022)	3.290(0.026)	1.906 (0.037)	a
GS32	8/17/00	4.260 (0.023)	2.200 (0.079)	1.034 (0.040)	a
GS39	7/17/00	0.033	0.012	a	a
GS39	8/27/00	0.170 (0.024)	0.062 (0.018)	a	a
GS39	8/28/00	0.022 (0.016)	-0.006 (0.023)	a	a
GS40	7/17 - 8/17/00	0.031 (0.018)	0.024 (0.020)	a	a
GS40	8/17 - 8/28/00	0.039 (0.018)	0.061 (0.027)	a	a
GS40	8/28 - 9/29/00	0.040 (0.018)	0.052 (0.025)	2.274 (0.022)	140 (250)
GS40	9/29 - 10/21/00	c	c	c	c
GS43	7/17 - 8/28/00	0.028 (0.027)	0.018 (0.026)	1.193 (0.022)	a
GS43	8/28 - 10/2/00	0.005 (0.019)	0.001 (0.024)	15.383 (0.021)	a
SW022	7/17 - 9/20/00	0.143 (0.021)	0.004 (0.025)	0.287 (0.023)	a
SW022	9/20 - 9/27/00	0.019 (0.016)	0.013 (0.023)	0.325 (0.021)	a
SW022	9/27/00 -	e	e	e	a
SW027	7/17 - 8/28/00	0.055 (0.020)	0.008 (0.023)	0.350 (0.024)	a
SW027	8/28 - 9/28/00	0.007 (0.016)	0.001 (0.023)	0.855 (0.021)	a
SW027	9/28/2000 -	e	e	e	a
SW093	7/6 - 7/14/00	0.054 (0.020)	0.073 (0.027)	2.122 (0.025)	a
SW093	7/14 - 7/17/00	0.108 (0.019)	0.050 (0.024)	0.877 (0.023)	a
SW093	7/17 - 7/20/00	0.004 (0.019)	-0.004 (0.026)	1.777 (0.022)	a
SW093	7/20 - 7/28/00	-0.003 (0.018)	-0.005 (0.025)	1.450 (0.025)	a
SW093	7/28 - 8/18/00	0.080 (0.031)	0.037 (0.033)	2.344 (0.088)	a
SW093	8/18 - 8/28/00	0.174 (0.019)	0.060 (0.024)	0.953 (0.023)	a
SW093	8/28 - 9/7/00	0.006 (0.012)	-0.002 (0.020)	2.405 (0.038)	a
SW093	9/7 - 9/19/00	0.005 (0.017)	0.020 (0.024)	1.190 (0.020)	a
SW093	9/19 - 9/22/00	0.017 (0.017)	0.050 (0.024)	1.124 (0.021)	a
SW093	9/22 - 9/24/00	0.017 (0.018)	0.037 (0.029)	0.823 (0.020)	a
SW093	9/24 - 10/2/00	0.002 (0.015)	-0.006 (0.024)	2.351 (0.022)	a
SW120	7/17 - 9/28/00	0.724 (0.018)	0.269 (0.024)	1.495 (0.022)	99 (250)
SW120	9/28/2000 -	e	e	e	e

a Not applicable
b Not collected
c Incomplete analysis
d Non-sufficient quantity
e Composite sample in progress

Table 4-17. POE Metals, Water Year 2000 (July, August, and September)

Location	Sample Dates	Analyte Be ug/L	Analyte Dissolved Cd ug/L	Analyte Cr ug/L	Analyte Dissolved Ag ug/L
GS10	7/3 - 7/7/00	<0.020	<0.10	0.15	<0.12
GS10	7/7 - 7/14/00	0.19	<0.10	4.65	<0.12
GS10	7/14 - 7/17/00	0.72	<0.10	10.65	<0.12
GS10	7/17 - 7/28/00	0.02	<0.10	<0.15	<0.12
GS10	7/28 - 8/18/00	0.09	<0.10	1.50	<0.12
GS10	8/18 - 8/28/00	0.45	0.08	8.75	<0.12
GS10	8/28 - 9/12/00	c	c	c	c
GS10	9/12 - 9/20/00	c	c	c	c
GS10	9/20 - 9/24/00	c	c	c	c
GS10	9/24 - 10/5/00	c	c	c	c
SW027	7/17 - 8/28/00	0.21	0.07	3.50	<0.12
SW027	8/28 - 9/28/00	<0.020	<0.10	0.90	<0.12
SW027	9/28/2000 -	e	e	e	e
SW093	7/6 - 7/14/00	0.12	<0.10	3.50	<0.12
SW093	7/14 - 7/17/00	1.00	<0.10	17.30	<0.12
SW093	7/17 - 7/20/00	0.26	<0.10	1.20	<0.12
SW093	7/20 - 7/28/00	0.07	<0.10	1.70	<0.12
SW093	7/28 - 8/18/00	0.12	<0.10	3.00	<0.12
SW093	8/18 - 8/28/00	0.37	0.09	7.40	<0.12
SW093	8/28 - 9/7/00	0.52	<0.10	9.10	<0.12
SW093	9/7 - 9/19/00	0.04	<0.10	1.20	0.45
SW093	9/19 - 9/22/00	0.08	<0.10	2.00	<0.12
SW093	9/22 - 9/24/00	0.03	<0.10	0.67	<0.12
SW093	9/24 - 10/2/00	<0.020	<0.10	1.10	<0.12

a Not applicable
b Not collected
c Incomplete analysis
d Non-sufficient quantity
e Composite sample in progress

Table 4-18. Other Metals, Water Year 2000 (July, August, and September)

Analyte ug/l	Result GS32, 07/13/00	Result GS32, 07/16/00	Result GS32, 08/17/00	Result GS40, 08/28/00 – 09/29/00
Aluminum	20900	23600	16900	2010
Antimony	11	13.4	16.5	12.8
Arsenic	8.8	10.3	7.1	1.3
Barium	229	255	190	147
Beryllium	1.2	1.4	0.92	0.17
Cadmium	2.5	2.4	1.5	0.1
Calcium	66200	74700	53700	47300
Chromium	32.5	39.7	26.3	2.3
Cobalt	9	10.1	6.6	0.6
Copper	65.4	77.6	55.6	4
Iron	23500	27500	17900	1750
Lead	62.8	69.8	53.3	2.2
Lithium	24.8	36.2	22.6	8.6
Magnesium	6980	7940	5800	15400
Manganese	491	571	378	100
Mercury	<0.10	<0.10	0.21	<0.10
Molybdenum	2.6	3	3.2	1.3
Nickel	22.3	25.8	17.6	2.3
Potassium	11600	13400	11700	4310
Selenium	2.3	<1.1	2	<1.1
Silver	<0.12	0.49	<0.12	<0.12
Sodium	18700	18000	18400	66900
Strontium	196	214	185	425
Thallium	<0.95	<0.95	0.94	<0.95
Tin	0.8	0.9	1.1	<0.85
Vanadium	56	63	44.4	4.8
Zinc	909	939	960	62.1

Table 4-19. Other Metals, Water Year 2000 (July, August, and September) continued

Analyte ug/l	Result GS43, 07/17/00 – 08/28/00	Result GS43, 08/28/00 – 10/02/00	Result SW120, 07/17/00 – 09/28/00	Result SW120, 09/28/00 -
Aluminum	1190	44.2	a	b
Antimony	0.56	0.69	a	b
Arsenic	1	<1.0	a	b
Barium	23.7	112	a	b
Beryllium	0.08	0.12	a	b
Cadmium	0.22	<0.2	a	b
Calcium	9880	50400	a	b
Chromium	1.7	0.66	a	b
Cobalt	0.34	<0.20	a	b
Copper	3.8	0.87	a	b
Iron	860	36.4	a	b
Lead	2.6	<0.52	a	b
Lithium	2.3	14.6	a	b
Magnesium	2060	18700	a	b
Manganese	16.5	1.5	a	b
Mercury	<0.10	<0.10	a	b
Molybdenum	0.73	4	a	b
Nickel	1.2	0.57	a	b
Potassium	2720	4140	a	b
Selenium	<1.1	2.9	a	b
Silver	<0.12	<0.12	a	b
Sodium	3660	36000	a	b
Strontium	59.9	536	a	b
Thallium	<0.95	<0.95	a	b
Tin	<0.85	<0.85	a	b
Vanadium	3.8	2.8	a	b
Zinc	34.9	210	a	b

a Incomplete analysis
b Composite sample in progress

Table 4-20. Water Quality Parameters, Water Year 2000 (July, August, and September)

Location	Sample Dates	Analyte Hardness mg/L
GS10	7/3 - 7/7/00	240
GS10	7/7 - 7/14/00	170
GS10	7/14 - 7/17/00	95
GS10	7/17 - 7/28/00	260
GS10	7/28 - 8/18/00	120
GS10	8/18 - 8/28/00	84
GS10	8/28 - 9/12/00	250
GS10	9/12 - 9/20/00	86
GS10	9/20 - 9/24/00	80
GS10	9/24 - 10/5/00	a
SW027	5/11 - 7/17/00	62
SW027	7/17 - 8/28/00	64
SW027	8/28 - 9/28/00	94
SW027	9/28/2000 -	b
SW093	6/27 - 7/6/00	290
SW093	7/6 - 7/14/00	210
SW093	7/14 - 7/17/00	98
SW093	7/17 - 7/20/00	170
SW093	7/20 - 7/28/00	160
SW093	7/28 - 8/18/00	200
SW093	8/18 - 8/28/00	92.5
SW093	8/28 - 9/7/00	250
SW093	9/7 - 9/19/00	310
SW093	9/19 - 9/22/00	140
SW093	9/22 - 9/24/00	110
SW093	9/24 - 10/2/00	78

a Incomplete laboratory analysis
b Composite sample in progress

5.0 INCIDENTAL WATERS

5.1. INCIDENTAL WATERS DEFINITION AND ROUTING MATRIX

An incidental water is defined as precipitation, surface water, groundwater, utility water, process water, or waste water collecting in one or more of several types of containments. These containments can include excavation sites, foundation drains, secondary containment berms, electrical vaults, utility pits and manholes, or other natural or manmade depressions, which must be dewatered.

Water collected in this manner has the potential to become contaminated via contact with the surrounding containment material. Sampling and disposition of incidental waters is conducted per Site Procedure 1-C91-EPR-SW.01, *Control and Disposition of Incidental Waters.* Incidental waters are typically sampled for pH, nitrates, conductivity, and gross alpha and gross beta (when radionuclides are suspected). Additional testing for volatile organic compounds and metals is performed when a specific potential contaminant source is known to exist. Disposition depends on the analytical results. Routing options for incidental waters are outlined in the following table.

Table 5-1. Incidental Waters Routing Matrix

Incidental Water Routing	Routing Criteria	Treatment Processes
Ground/Storm Drain	• Water meets discharge limits per Incidental Waters procedure	N/A
Building 995 Waste Water Treatment Plant (WWTP)	• Water above discharge to ground limits • Water meets Internal Waste Streams Program review criteria	Activated Sludge w/ tertiary clarifiers Dual media filtration UV disinfection
Building 891 Consolidated Water Treatment Facility (CWTF)	• Water above discharge to ground limits • Water not accepted by WWTP • Water meets CWTF acceptance criteria and has both radionuclide and organic constituents	Chemical precipitation Microfiltration UV/ peroxide oxidation Granular activated carbon Ion exchange
Building 374	• Water above discharge to ground limits • Water not accepted by WWTP • Water has radionuclides, but no organic constituents	Flash evaporation (Steam-heated reactor with spray evaporation)

5.2. QUARTERLY INCIDENTAL WATER DISPOSITIONS

Twenty-one incidental waters were sampled and dispositioned during the fourth quarter of FY00. The following table summarizes the location and route of disposal.

Table 5-2. Quarterly Incidental Water Dispositions FY2000 (July, August, and September)

Location/ Building	Location Type	Location Description	# of Incidental Waters	Route of Disposal
T664	Culvert	Water in culvert	1	Treatment (B995)
333	Domestic Water System	Piping	1	Discharge to ground
371	Ext. Elec. Conduit	Junction box & conduit outside of 371, near portal	1	Discharge to ground
440	Steam System	Steam system delivering steam from B443	1	Discharge to ground
460	Cooling Tower	Cooling Tower Discharge	1	Discharge to ground
563	Cooling Tower	Cooling tower discharge	1	Discharge to ground
664	Steam System	Steam system delivering steam from B443	1	Discharge to ground
664	Leaking Roof	Trash can collecting rain water	1	Discharge to ground
702	Cooling Tower Area	Leaking raw water pipe is causing water to puddle on ground surface	1	Discharge to ground
702	Excavation	Water in excavation pit, just SW of 702	1	Discharge to ground
713	Portable Tank	Collection Tank No. 1984 containing water from excavation	1	Discharge to ground
750	Waste box	"Cold" waste box used in demonstration	1	Discharge to ground
771	Manhole	Manhole W of 771, between bathrooms and road.	1	Treatment (B374)
771	Drain Pipe	Leak at drain pipe, approximately 1 gal/min, Mtc. Dock Area	1	Discharge to ground
776	Dock	Dock No. 5 & 6,	2	Discharge to ground

Location/ Building	Location Type	Location Description	# of Incidental Waters	Route of Disposal
777	Dock	Dock No. 2, SE corner of 777	1	Discharge to ground
875	Foundation Drain	B875 Foundation Drain	1	Discharge to ground
881	Building Pit	Room 248, run off from roof.	1	Treatment (B995)
881	Drum	Water from breathing air piping (non-rad area).	1	Treatment (B995)
886	Foundation Drain	B886 Foundation Drain	1	Discharge to ground
980	Secondary Containment	980 pad, water collection area at SE corner of pad.	1	Treatment (B374)

The five incidental waters requiring treatment were routed to the following Site treatment facilities:

- Building 995 – WWTP 3
- Building 891 – CWTF 0
- Building 374 2

6.0 1999 PUBLIC RADIATION DOSE ASSESSMENT FOR THE ROCKY FLATS ENVIRONMENTAL TECHNOLOGY SITE

6.1. INTRODUCTION

A public radiation dose assessment was performed for calendar year (CY) 1999 to support the requirements of DOE Order 5400.5, "Radiation Protection of the Public and the Environment." This DOE Order states that the radiation dose to the public will be assessed from exposures to radiation sources from routine activities at a DOE facility and from property released subsequent to remedial action at that facility. This public radiation dose will be compared with the annual radiation dose limit of 100 mrem from this Order to assure that the radiation dose limit is not exceeded. The member of the public that received the highest radiation dose from radiation sources at the Rocky Flats Environmental Technology Site (RFETS) is called the Maximally Exposed Individual (MEI). The radiation dose received by the MEI will be compared with the annual radiation dose limit of 100 mrem. For CY 1999, the MEI was located at Mower Lake. The radiation dose received by this MEI was 0.38 mrem. This radiation dose is well within the annual radiation dose limit of 100 mrem.

6.2. RADIATION PROTECTION STANDARDS FOR THE PUBLIC

Standards for protection of the public from radiation sources are based on the concept of radiation dose. This concept provides a means for quantifying the biological effect or risk from all types of radiation on a common basis. Radiation dose is expressed in rem or mrem (1 rem = 1,000 mrem). Radiation protection standards are based on guidance from the National Council on Radiation Protection and Measurement (NCRP) and the International Commission on Radiological Protection (ICRP). These organizations are internationally recognized for their expertise in radiation protection principles. DOE Order 5400.5 prescribes an annual public radiation dose limit of 100 mrem which is based on guidance from the NCRP and ICRP.

6.3. RADIATION DOSE ASSESSMENT METHODOLOGY

In order to assess the radiation dose to a member of the public from radiation sources at RFETS, a number of steps need to be followed. These steps are identified as:

1. The radiation sources at RFETS that release radioactive material to the environment need to be analyzed, and the releases from these sources need to be quantified,

2. The members of the public closest to the boundary of RFETS need to be located,

3. The exposure pathways (inhalation, ingestion, etc.) by which these members of the public may be exposed to the released radioactive material need to be defined, and

4. The radiation dose received by these members of the public from RFETS activities needs to be calculated and assessed.

DOE Order 5400.5 encourages the use of realistic, but conservative, approaches to radiation dose assessment. The radiation dose assessment performed in this report uses such an approach.

6.4. SOURCES OF RADIOACTIVE MATERIAL

The radioactive material released to the environment at RFETS includes isotopes of americium, plutonium, uranium and tritium. For CY 1999, these radioactive materials were released from RFETS through air emissions and through surface water emissions. There have also been past releases from RFETS that have deposited americium and plutonium on surface soils east of RFETS. These surface soils were investigated as Operable Unit #3 at RFETS. Annual emissions of radioactive material in air and water plus past depositions of radioactive material in surface soils will be used to assess the radiation dose to the public during CY 1999.

The radioactive material released in air from RFETS is quantified in the Radionuclide Air Emissions Annual Report, Calendar Year 1999. This report was developed to comply with the requirements from the Environmental Protection Agency (EPA) in Title 40 of the Code of Federal Regulations (CFR), Part 61 and from the Colorado Air Quality Control Commission Regulations. All sources of radioactive material (Both point sources and area sources) at RFETS are assessed in this report with their associated air emissions. Air emissions are then translated into air concentrations of radioactive material outside of the boundary of RFETS through modeling. Measured air concentrations are also reported at the boundary of RFETS. The highest radionuclide concentration from the modeled and measured data was used to assess radiation dose. Air concentrations of radioactive material from this report are used to quantify the amount of radioactive material inhaled by members of the public. The deposition rate of radioactive material onto surface soils is also assessed in this report. Surface soil concentrations of radioactive material will be used to quantify the amount of radioactive material ingested in soil by a member of the public as well as to quantify external radiation exposure to a member of the public.

The radioactive material released in water from RFETS is quantified through routine surface water monitoring activities. In 1999, Ponds A-4 and B-5 released water offsite in a batch manner while Pond C-2 did not release any water. Pond discharge water was analyzed for radioactive material. The volume of water was recorded for each release. Volume-weighted average surface water concentrations of radioactive material are used to quantify the amount of radioactive material ingested by members of the public.

As a result of past releases of radioactive material at RFETS, there are elevated levels of radioactive material in surface soils east of RFETS. The amount of radioactive material in surface soils is documented in the Final Resource Conservation and Recovery Act Facility Investigation/Remedial Investigation Report for Operable Unit #3 (Offsite Areas), June 1996. Surface soil samples taken to support the Operable Unit #3 Report will be used to quantify the amount of radioactive material near a

member of the public. Surface soil concentrations of radioactive material will be used to quantify the amount of radioactive material ingested in soil by a member of the public as well as to quantify external radiation exposure to a member of the public.

6.5. LOCATION OF MEMBERS OF THE PUBLIC SURROUNDING RFETS

In order to compare the radiation dose to a member of the public with radiation dose limits, it is necessary to identify the MEI member of the public. This member of the public will receive the highest radiation dose from radioactive material released from RFETS. The radiation dose received by the MEI member of the public will be used to compare with public radiation dose limits.

To identify the MEI member of the public, seven locations surrounding RFETS were investigated. The nearest member of the public was assessed in the northeast, northwest, south and east (4 locations) directions from RFETS. All of these locations are private residents.

6.6. EXPOSURE PATHWAY ANALYSIS

The most significant exposure pathways for a resident will be assessed in this radiation dose assessment. The exposure pathways of 1) Inhalation of radioactive material in air, 2) Ingestion of radioactive material in surface soil, 3) External exposure from radioactive material in surface soil, and 4) Ingestion of surface water will be assessed in this radiation dose assessment. The ingestion of homegrown produce was not assessed due to the high dilution during tilling of radioactive material deposited on surface soil.

All of these exposure pathways may not be applicable to each of the seven locations being examined and/or may not be significant to each of these seven locations at the boundary of RFETS. This is because surface water is preferentially released to the east of RFETS and because the surface soils east of RFETS contain elevated concentrations of radioactive material. Therefore, the ingestion of radioactive material in surface water will only be applicable to those locations east of RFETS. Also, the ingestion of radioactive material in surface soil as well as the external exposure from radioactive material in surface soil will be most significant east of RFETS.

For the inhalation of radioactive material in air, ingestion of radioactive material in surface soil and external exposure from radioactive material in surface soil exposure pathways, the EPA's Reasonable Maximum Exposure (RME) exposure parameters for a resident will be used. Exposure parameters were taken from EPA's OSWER Directive 9285.6-03, "Human Health Evaluation Manual, Supplemental Guidance: 'Standard Default Exposure Factors'." The RME exposure parameters represent the maximum exposure reasonably expected by an individual.

1. For the ingestion of surface water exposure pathway, it is not reasonable to assume that a resident would use the surface water released from RFETS for household use. Surface water from RFETS is released intermittently in both Walnut Creek and Woman Creek and is not a reliable water supply. In Walnut Creek, surface water is released to a waterway that is not used as a drinking water supply.

Surface water released from RFETS into Walnut Creek is diverted around Great Western Reservoir to Big Dry Creek and subsequently to the South Platte River. Big Dry Creek contributes less than 0.2 percent to the total flow in the South Platte River. There is no drinking water supply use of the South Platte River from the confluence of Big Dry Creek along the entire reach to the confluence of the North Platte River in Nebraska. In Woman Creek, surface water is discharged to the creek where water flows to any one of three cells in the Woman Creek Reservoir, located just east of Indiana Avenue. The surface water within these cells is pumped to Walnut Creek just east of Great Western Reservoir. The water then follows the same path as the waters released into Walnut Creek. Due to these circumstances, it is not reasonable to assume that a resident would use the surface water released from RFETS for household use. It is reasonable to assume though that the residents near the eastern boundary of RFETS may come into contact with surface waters released from RFETS in a recreational capacity. It is therefore assumed that residents might wade in surface waters periodically and incidentally ingest these surface water at these times. Exposure parameters for this recreational exposure were taken from the open space exposure scenario which is defined in Appendix N, "Programmatic Preliminary Remediation Goals Tables," of the Implementation Guidance Document within the Rocky Flats Cleanup Agreement (RFCA).

6.7. RADIATION DOSE ASSESSMENT

In order to develop the radiation dose to the MEI member of the public, the location of the MEI must be determined. From the Radionuclide Air Emissions Annual Report, Calendar Year 1999, the individuals receiving the highest radiation dose through the air inhalation pathway were located south, northwest, northeast and east (4 locations) of RFETS. Since surface water is preferentially released to the east of RFETS and the surface soils east of RFETS contain elevated concentrations of radioactive material, the four locations east of RFETS were investigated along with the locations south, northwest and northeast of RFETS to determine the MEI individual. After assessing the radiation dose to an individual at all seven locations, the MEI individual for CY 1999 was located at Mower Lake.

To calculate radiation dose due to inhalation and ingestion, concentrations of radioactive material in air, water and soil are first multiplied by the amount of time the MEI is exposed to these media (i.e., 24 hrs/day, 350 days/yr, etc.) and then the intake rates (i.e., breathing rate, water ingestion rate, etc.) appropriate to the MEI individual. This product is the total amount of radioactive material inhaled and ingested by the MEI individual. The total amount of radioactive material inhaled and ingested is then multiplied by the radiation dose conversion factors found in Federal Guidance Report No. 11, Limiting Values of Radionuclide Intake and Air Concentrations and Dose Conversion Factors for Inhalation, Submersion and Ingestion, to calculate the radiation dose to the MEI due to inhalation and ingestion of radioactive material.

To calculate radiation dose due to external irradiation, concentrations of radioactive material in soil are multiplied by the external radiation dose conversion factors found in Federal Guidance Report No. 12, External Exposure to Radionuclides in Air, Water and Soil.

From the aforementioned analyses, the radiation dose received by the MEI individual is 0.38 mrem. 12% of this 0.38 mrem is due air and surface water emissions in CY 1999. 88% of this 0.38 mrem is due air emissions in years prior to CY 1999, which are deposited on offsite soils. The radiation dose of 0.38 mrem is well within the radiation dose limit of 100 mrem in DOE Order 5400.5.

The following table gives the breakdown of radiation dose by radionuclide and by exposure pathway for the MEI:

Table 3: Radiation Dose by Radinuclide and Exposure Pathway

Radionuclide	Soil Inhalation Radiation Dose (mrem)	Soil Ingestion Radiation Dose (mrem)	External Irradiation Radiation Dose (mrem)	Water Ingestion Radiation Dose (mrem)	Total Radiation Dose By Radionuclide (mrem)
Am-241	1.37E-03	5.84E-02	5.54E-03	1.64E-04	6.54E-02
Pu-239/240	4.21E-03	2.70E-01	1.29E-04	2.65E-04	2.74E-01
U-234	2.04E-02	2.75E-06	2.95E-08	1.22E-03	2.16E-02
U-235	1.55E-03	2.11E-07	2.27E-06	5.05E-05	1.60E-03
U-238	1.66E-02	2.25E-06	1.17E-08	1.10E-03	1.77E-02
H-3	8.07E-09	0.00E+00	0.00E+00	3.52E-05	3.52E-05
TOTAL	4.4E-02	3.3E-01	5.7E-03	2.8E-03	3.8E-01

6.8. COLLECTIVE DOSE

DOE Order 5400.5 requires the assessment of collective population radiation dose to a distance of 80 km (50 miles). Collective population dose is calculated as the average radiation dose to an individual in a specified area, multiplied by the number of individuals in that area. In assessing the 1999 collective population dose to the public from RFETS, the assessment was limited to airborne emissions of radioactive materials from the Site as the major contributor to population dose.

The collective dose assessment was performed in the Radionuclide Air Emissions Annual Report, Calendar Year 1999 using the computer model CAP88-PC. The population surrounding RFETS was based on 1994 data adjusted for regional growth. The collective dose was calculated to be 0.98 person-rem for CY 1999.