INTEGRATED ENVIRONMENTAL MONITORING STATUS REPORT FOR FOURTH QUARTER 1997

FERNALD ENVIRONMENTAL MANAGEMENT PROJECT
FERNALD, OHIO

MARCH 1998

U.S. DEPARTMENT OF ENERGY
FERNALD AREA OFFICE

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LIST OF ACRONYMS

AMS	air monitoring station
AMSL	feet above mean sea level
AWWT	Advanced Waste Water Treatment
BTVs	benchmark toxicity values
DMRs	discharge monitoring reporting
DOE	U.S. Department of Energy
EMP	Environmental Monitoring Plan
EPA	U.S. Environmental Protection Agency
FEMP	Fernald Environmental Management Project
FERMCO	Fernald Environmental Restoration Management Corporation
FFCA	Federal Facilities Compliance Agreement
FRLs	final remediation levels
gpm	gallons per minute
HEPA	High Efficiency Particulate Air
IEMP	Integrated Environmental Monitoring Plan
lbs	pounds
LCS	Leachate Collection System
LDS	Leak Detection System
M gal	million gallons
mg/L	milligrams per liter
mgpd	million gallons per day
mrem	millirem
NESHAP	National Emissions Standards for Hazardous Air Pollutant
NPDES	National Pollutant Discharge Elimination System
OEPA	Ohio Environmental Protection Agency
OSDF	on-site disposal facility
pCi/L	picoCuries per liter
pCi/m^3	picoCuries per cubic meter
PRRS	Paddys Run Road Site
RCRA	Resource Conservation and Recovery Act
RI	Remedial Investigation
ROD	record of decision
RW	Recovery Well
SOWC	Southwest Ohio Water Company
SWIFT	Sandia Waste Isolation Flow and Transport
SWRB	Storm Water Retention Basin
TLD	thermoluminescent dosimeter
μg/L	micrograms per liter

FOREWORD

The U.S. Department of Energy (DOE) has prepared this report to meet the quarterly reporting obligation defined in the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997b) for the Fernald Environmental Management Project (FEMP). It provides an incremental assessment of the environmental data collected under the routine monitoring programs defined in the IEMP and includes selected project-specific information as necessary to support a comprehensive data evaluation. The report is organized around the principal environmental media and contaminant migration pathways routinely monitored under the IEMP including groundwater, surface water and treated effluent, air, as well as natural resources. The format is designed to provide a summary level presentation of data utilizing figures and tables to highlight key performance indicators and significant findings associated with each environmental media. By emphasizing the use of tabular and graphical data presentations and focusing text discussions on significant findings, the quarterly status report is designed to efficiently fill its primary objective of tracking and communicating the collective effects of remediation activities on the surrounding environment as defined in the IEMP.

Environmental and operational data available through the fourth quarter of 1997 are highlighted in this report. However, the data sets provided for each media-specific monitoring program will vary, based on program sampling schedules and analytical complexity. Data from routine sampling activities conducted during the fourth quarter of 1997 that are not available for presentation in this report will be included in the June 1998 transitional IEMP annual report. The specific data sets included for each environmental media are defined within the corresponding section. In addition, comments received from the U.S. Environmental Protection Agency (EPA) and the Ohio Environmental Protection Agency (OEPA) on the IEMP Status Report for Third Quarter 1997 (DOE 1997c) have been incorporated into the content of this report, as appropriate. It is expected that the content and format of future quarterly status reports will continue to evolve as additional stakeholder input is received and incorporated. To facilitate this process, DOE will continue to provide a written response to all comments received. However, actions resulting from the comments which require a change to the report or reporting format will be incorporated into subsequent reports.

1.0 GROUNDWATER MONITORING UPDATE

1.1 INTRODUCTION

This section provides a summary of the monitoring activities and analytical results for the Integrated Environmental Monitoring Plan (IEMP) (DOE 1997b) groundwater monitoring program reported for the fourth quarter of 1997. Figure 1-1 identifies the data included in this section. Figure 1-2 shows the IEMP groundwater monitoring wells by module/monitoring activity and Figure 1-3 shows the IEMP routine water-level (groundwater elevation) monitoring wells.

1.2 FINDINGS

The principal findings from the reporting period are summarized below:

Operational Summary

- The South Plume Module was operated in the four-well, 1400 gallons per minute (gpm) target pumping configuration during October and the first week of November. The pumping rate on Recovery Well 3927 (RW-4) was increased from 400 gpm to 500 gpm on November 6, 1997 to maximize the eastern extent of the capture zone. This 100 gpm pumping rate increase equates to 1500 gpm for the four-well system. The module will continue to operate at the 1500 gpm pumping rate until after the South Field - Phase I, South Plume Optimization, and Injection Demonstration modules are brought on line later in 1998 when it is anticipated that capture of the northeastern lobe of the total uranium plume will be confirmed.

- During the fourth quarter, 185.4 million gallons of groundwater were pumped and 25.9 pounds of uranium were removed from the Great Miami Aquifer. Since system startup in August 1993, 2.8 billion gallons of water have been pumped, resulting in a removal of 389.4 pounds of uranium.

  (Refer to Figures 1-4 through 1-15 and Tables 1-1 through 1-5.)

Remedy Construction

- Construction continues on the pipeline distribution network for three groundwater restoration modules: South Plume Optimization Module, South Field Extraction Module (Phase 1), and Injection Demonstration Module. These modules are scheduled to begin operating during 1998. (Figure 1-16 shows the near-term aquifer restoration modules which are already installed or currently under construction.)

- The two new recovery wells, 32308 (RW-6) and 32309 (RW-7), that comprise the South Plume Optimization Module have been installed and well development was

completed in December 1997 and January 1998, respectively. Samples collected near the end of well development indicated total uranium concentrations of 123 micrograms per liter (μg/L) for 32308 (RW-6) and 143 μg/L for 32309 (RW-7).

- Construction continues on the Advanced Waste Water Treatment (AWWT) expansion. The AWWT expansion is scheduled to be on line in the spring of 1998.

- The Final Re-Injection Demonstration Test Plan for the Re-Injection Demonstration Module was issued in February 1998 (DOE 1998a) and the Draft Start-Up Monitoring Plan for the South Field Extraction and South Plume Optimization Modules was issued January 1998 (DOE 1998b).

(Refer to Figure 1-16.)

Total Uranium Plume

- Figure 1-17 shows the maximum total uranium plume for the third quarter of 1997, the most recent quarter for which such data are available. All total uranium results above the 20 μg/L final remediation level (FRL) are within the current projected 10-year, uranium-based restoration footprint with the exception of Monitoring Well 3067.

- Monitoring Well 3067, located along the eastern edge of the property boundary, which is sampled as a part of the Resource Conservation and Recovery Act (RCRA) Property Boundary Monitoring Activity had a total uranium result of 57.4 μg/L in September 1997. This result is considered anomalous because historically the total uranium concentration for this well has been 1 μg/L or lower. The preliminary result of 0.3 μg/L from the January 1998 sample also indicates that the September result was anomalous.

- Groundwater sample data collected during the third quarter of 1997 in the South Field and South Plume areas indicate that the total uranium plume in the southern half of the South Field area and in the South Plume area has not changed significantly in size or concentration from the results presented in Appendix G of the Baseline Remedial Strategy Report, Remedial Design for Aquifer Restoration (DOE 1997a).

- The northern half of the South Field area was sampled during this period. As in the southern portion of the plume, no significant change in concentration or plume size was noted.

(Refer to Figure 1-17.)

Groundwater Elevation Data and Capture Assessment

- Capture of the main portion of the South Plume continued during the fourth quarter.

- Groundwater elevation data collected from Type 2 and Type 3 monitoring wells in January 1998 are presented in Figures 1-18 and 1-19, respectively. The general

location of important flow divides, the capture zone produced by the South Plume system, and the 20 μg/L total uranium concentration contour from Figure 1-17 are also shown in Figures 1-18 and 1-19.

- Figure 1-20 presents borescope data collected during fourth quarter 1997 south of the South Plume Recovery System. The borescope data supports the capture zone interpretation from groundwater elevation data.

- Figure 1-21 is a composite of modeled flow directions/capture zones, groundwater elevation contours, and flow directions from colloidal borescope measurements. Evaluation of the information provided on Figure 1-21 confirms that the modeled capture zone and groundwater flow directions are in close agreement with the capture zone and flow directions interpreted from groundwater elevation and borescope data, except in the northeast corner of the figure. The model predicts more southerly flow directions in the area of the northeastern lobe of the plume than are interpreted from water level data. When the pumping rate on South Plume Recovery Well 3927 (RW-4) was increased from 400 gpm to 500 gpm, flow directions changed at Monitoring Well 21063 from 100° to 137° from North. Based on this observation and borescope data collected at Monitoring Well 2093, the capture zone appears to be located between Monitoring Wells 2093 and 21063.

- Preliminary analysis reveals that the difference between modeled and observed flow directions in the area of the northeast lobe of the plume may be due to increased pumping at Southwest Ohio Water Company (SOWC) Collector Well 2 from 10 million gallons per day (mgpd) to 12 mgpd. Model boundary conditions may have to be changed near the collector wells along the eastern edge of the model to improve model predictions of flow in the area of the northeast lobe of the plume. These changes to the model will be incorporated into the model upgrade project which is currently ongoing.

- Significant expansion of the capture zone is likely to occur in the area of the northeast lobe of the plume once the South Field Extraction (Phase 1), the South Plume Optimization, and the Injection Demonstration modules come on line later in 1998.

(Refer to Figures 1-18 through 1-21.)

Influence to Paddys Run Road Site Plume

- Capture of the main portion of the South Plume is having a negligible influence on the Paddys Run Road Site (PRRS) Plume based on results of the third quarter 1997 analyses for the PRRS indicator constituents: arsenic, phosphorus, potassium, and sodium, which indicate that concentrations are within the historical minimum-maximum range and are, in most cases, close to the statistical averages.

(Refer to Table 1-6.)

Non-Uranium Final Remediation Level (FRL) Exceedances

- With the exception of total uranium, no radiological FRL exceedances were observed. Of the remaining 41 non-radiological FRLs from the Record of Decision (ROD) for Remedial Actions at Operable Unit 5 (DOE 1996), occasional exceedances for four constituents (cadmium, lead, manganese, and zinc) occurred in six monitoring wells located outside the projected 10-year, uranium-based restoration footprint. The exceedances outside the footprint are minimally above their associated FRLs and will be further evaluated in the June 1998 transitional IEMP annual report.

  (Refer to Figure 1-22 for the location of these exceedances and Table 1-7 for the summary statistics of the exceedances associated with the third quarter 1997 sampling results.)

KC-2 Warehouse Well Analytical Results

- Sampling of this well (Well 67) in August 1997 revealed higher concentrations of hazardous substance list metals than routinely indicated in previous sampling results. Unusually high concentrations have been reported previously for this well (the January 1995 sampling event). These anomalous high concentrations are likely due to sediment from the bottom of the well having been collected in the groundwater sample. The well was resampled in January 1998 and preliminary results were significantly lower than the August 1997 concentrations.

  (Refer to Table 1-8 for results and summary statistics.)

On-site Disposal Facility Sampling

- For the third quarter (July through September), five aquifer sampling events were completed for Cell 1 and three sample events were completed for Cell 2. Six of the 16 constituents sampled were detected in the Great Miami Aquifer (Table 1-9). However, no concentrations were above the associated FRLs.

- The baseline sampling status for On-Site Disposal Facility (OSDF) Cell 1 is as follows: baseline sampling for aquifer wells (22201 and 22198) was initiated in March 1997 and completed as of October 1997; and the horizontal till well (12338) was installed mid-October and baseline sampling was initiated in late October and completed early in December 1997 prior to waste placement.

- The baseline sampling status of OSDF Cell 2 is as follows: baseline sampling for aquifer wells (22199 and 22200) was initiated in June 1997 and is expected to be complete in May 1998; and the horizontal till well is expected to be installed during the second quarter of 1998.

- Construction of the Leachate Collection System (LCS) and the Leak Detection System (LDS) for Cell 1 was completed as of December 1997 with sampling to be initiated in February 1998. Construction of the LCS and the LDS for Cell 2 is expected to be completed in late 1998 with sampling to be initiated either in late 1998 or early 1999.

  (Refer to Figure 1-23 for sampling locations and Table 1-9 for detected results from the third quarter of 1997.)

Monitoring activities defined under the IEMP will continue as planned. Additionally, the June 1998 transitional IEMP annual report will provide a comprehensive evaluation which will include statistical trends.

TABLE 1-1

RECOVERY WELL 3924 (RW-1)
OPERATIONAL SUMMARY SHEET
FOR FOURTH QUARTER (OCTOBER THROUGH DECEMBER) 1997

Reference Elevation (feet above mean sea level [AMSL]) - 531.9 (top of casing)
Northing Coordinate ('83) - 474,190.37
Easting Coordinate ('83) - 1,379,783.13

Hours in reporting period - 2,208 Hours pumped - 1,793 Target pumping rate - 300 gpm
Hours not pumped - 415 Operational percent - 81.2

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration[a] (μg/L)	Well Efficiency[a] (lbs/M gal)
10/97[b]	149	6.6	NS[c]	NA
11/97	295	12.8	42	0.35
12/97	308	13.7	47	0.39
		Total 33.1	Quarterly Average 45	Average 0.37

[a]NS = not sampled
NA = not applicable
[b]Recovery well was out of service 17 days due to well rehabilitation.
[c]A sample was not obtained because recovery well was shut down for rehabilitation during sampling period.

TABLE 1-2

RECOVERY WELL 3925 (RW-2)
OPERATIONAL SUMMARY SHEET
FOR FOURTH QUARTER (OCTOBER THROUGH DECEMBER) 1997

Reference Elevation (feet AMSL) - 540.3 (top of casing)
Northing Coordinate ('83) - 474,290.32
Easting Coordinate ('83) - 1,380,034.28

Hours in reporting period - 2,208
Hours not pumped - 54

Hours pumped - 2,154
Operational percent - 97.6

Target pumping rate[b] - 300, 400 gpm

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
10/97[a]	336[b]	15.0	32	0.27
11/97	305	13.2	33	0.28
12/97	296	13.2	33	0.28
		Total 41.4	Quarterly Average 33	Average 0.28

[a]Recovery well was out of service two days for back pressure control valve maintenance.
[b]Pumping rate increased to 400 gpm to maintain capture during the 17 day interval that RW-1 was out of service.

TABLE 1-3

RECOVERY WELL 3926 (RW-3)
OPERATIONAL SUMMARY SHEET
FOR FOURTH QUARTER (OCTOBER THROUGH DECEMBER) 1997

Reference Elevation (feet AMSL) - 585.0 (top of casing)
Northing Coordinate ('83) - 474,399.22
Easting Coordinate ('83) - 1,380,306.40

Hours in reporting period - 2,208 | Hours pumped - 2,090 | Target pumping rate - 400 gpm
Hours not pumped - 118 | Operational percent - 94.7

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
10/97[a]	374	16.7	12	0.10
11/97[b]	376	16.3	12	0.10
12/97	393	17.5	13	0.11
	Total	50.5	Quarterly Average 12	Average 0.10

[a]Recovery well was out of service two days for back pressure control valve maintenance.
[b]Recovery well was out of service two days for pump and motor replacement.

TABLE 1-4

RECOVERY WELL 3927 (RW-4)
OPERATIONAL SUMMARY SHEET
FOR FOURTH QUARTER (OCTOBER THROUGH DECEMBER) 1997

Reference Elevation (feet AMSL) - 589.0 (top of casing)
Northing Coordinate ('83) - 474,512.49
Easting Coordinate ('83) - 1,380,596.15

Hours in reporting period - 2,208
Hours not pumped - 54

Hours pumped - 2,154
Operational percent - 97.6

Target pumping rate[b] - 400, 500 gpm

Monthly Measurements at Wellfield

Month	Monthly Average Pumping Rate (gpm)	Million Gallons Pumped	Average Monthly Uranium Concentration (μg/L)	Well Efficiency (lbs/M gal)
10/97[a]	379	17.0	1.1	0.01
11/97	484	20.9	1.2	0.01
12/97	502	22.4	1.2	0.01
	Total	60.3	Quarterly Average 1.2	Average 0.01

[a]Recovery well was out of service two days for back pressure control valve maintenance.
[b]Target pumping rate increased from 400 to 500 gpm on November 6, 1997.

TABLE 1-5

SOUTH PLUME WELLFIELD OPERATIONAL SUMMARY SHEET FROM INCEPTION THROUGH FOURTH QUARTER 1997 (August 1993 through December 1997)

Total gallons pumped this reporting period (M gal) - 185.4
Total uranium removed this reporting period (lbs) - 25.9
Average system efficiency this reporting period (lbs/M gal) - 0.14
Gallons pumped from August 1993 to December 1997 (billion gal) - 2.8
Total uranium removed from August 1993 to December 1997 (lbs) - 389.4
System efficiency from August 1993 to December 1997 (lbs/M gal) - 0.14

Monthly Measurements at Storm Water Retention Basin Valve House for Fourth Quarter (October through December) 1997

Month	Monthly Average Well Pumping Rates (gpm)					Average System Pumping Rate (gpm)	Water Pumped from Recovery Wells (M gal)	Water Treated from Recovery Wells (M gal)	Total Uranium Concentration from South Plume System[a,b] (μg/L)		
	3924	3925	3926	3927	3928				Min.	Max.	Avg.
10/97	149	336	374	379	0	1238	55.4	36.7	12.0	21.1	15.9
11/97	295	305	376	484	0	1460	63.2	40.4	9.0	20.8	16.5
12/97	308	296	393	502	0	1499	66.8	35.7	5.6	22.1	17.8
						Total	185.4	112.8			

[a]These concentrations represent both the concentrations that are sent to treatment and to the outfall.
[b]Monthly averages are flow-weighted calculations of daily grab samples collected at the storm water retention basin valve house from the South Plume groundwater.

TABLE 1-6

PADDYS RUN ROAD SITE GROUNDWATER SUMMARY STATISTICS
(August 1993 through Third Quarter [September] 1997)

Constituent	Sampling Period									
	August 27, 1993 - June 30, 1997						July 1, 1997 - September 30, 1997			
	Monitoring Well	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b] (mg/L)	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d,e] (mg/L)
Arsenic										
	2128	188	0.00095	0.1876	0.0145	0.0260	6	0.0009	0.005	0.0043
	2548	107	0.00065	0.706	0.0344	0.0784	0[f]	NS	NS	NS
	2625	180	0.00315	0.0706	0.0114	0.0093	6	0.005	0.0249	0.0125
	2636	154	0.01	0.0939	0.045	0.0183	6	0.0168	0.0307	0.0226
	2898	17	0.00035	0.0063	0.0018	0.0015	1	0.00115	NA	NA
	2899	18	0.00035	0.003	0.0016	0.0009	1	0.00085	NA	NA
	2900	188	0.0007	0.05	0.0052	0.0039	6	0.0011	0.005	0.0044
	3128	18	0.00085	0.234	0.0166	0.0546	1	0.0015	NA	NA
	3636	19	0.0009	0.014	0.0025	0.0029	1	0.0012	NA	NA
	3898	18	0.00095	0.0062	0.0025	0.0013	1	0.0012	NA	NA
	3899	18	0.00035	0.003	0.0018	0.0009	1	0.00044	NA	NA
	3900	18	0.0012	0.0045	0.0026	0.0009	1	0.00155	NA	NA
	3924	148	0.005	0.0118	0.005	0.0006	5	0.005	0.005	0.005
	3925	147	0.005	0.005	0.005	3.0718	5	0.005	0.005	0.005
Phosphorus										
	2128	17	0.09	6.4	2.0313	1.9483	1	0.17	NA	NA
	2548	13	0.05	6.2	1.9392	1.9485	0[f]	NS	NS	NS
	2625	16	0.307	12.3	3.1045	3.6017	1	2.94	NA	NA
	2636	16	9.6	170	96.5344	49.6783	1	96	NA	NA
	2898	18	0.005	0.0905	0.0477	0.0243	1	1.05[g]	NA	NA
	2899	18	0.005	0.086	0.0412	0.0248	1	0.01	NA	NA
	2900	18	0.05	0.96	0.4163	0.2686	1	0.8	NA	NA
	3128	17	0.005	13	0.8187	3.1397	1	0.11	NA	NA

TABLE 1-6
(Continued)

Constituent	Sampling Period									
	August 27, 1993 - June 30, 1997						July 1, 1997 - September 30, 1997			
	Monitoring Well	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b] (mg/L)	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d,e] (mg/L)
Phosphorus (Cont'd.)										
	3636	18	0.02	0.23	0.0676	0.05	1	0.03	NA	NA
	3898	18	0.02	0.34	0.0917	0.0837	1	1.24[h]	NA	NA
	3899	18	0.025	0.83	0.1514	0.1887	1	0.32	NA	NA
	3900	18	0.005	1.26	0.1278	0.2845	1	0.025	NA	NA
Potassium										
	2128	18	1.69	18	5.3683	5.8485	1	2.21	NA	NA
	2548	13	1.36	40	12.645	10.794	0[f]	NS	NS	NS
	2625	16	0.64	6.26	3.2694	1.8430	1	3.62	NA	NA
	2636	16	8.51	218	97.176	58.449	1	38.4	NA	NA
	2898	18	2.5	5.05	3.7767	0.6350	1	4.13	NA	NA
	2899	19	1.36	4.42	3.3547	0.7085	1	3.8	NA	NA
	2900	19	0.711	6	1.9085	1.2551	1	1.03	NA	NA
	3128	18	1.79	3.7	2.595	0.5597	1	2.38	NA	NA
	3636	18	1.375	3.5	2.6319	0.4629	1	2.24	NA	NA
	3898	18	1.335	3.93	2.3797	0.5949	1	2.28	NA	NA
	3899	18	1.335	3.3	2.4858	0.4234	1	2.7	NA	NA
	3900	18	0.975	3.19	1.78	0.5450	1	1.93	NA	NA
Sodium										
	2128	18	27.7	75.2	41.172	13.379	1	22.9	NA	NA
	2548	13	18.2	35	25.608	5.8849	0[f]	NS	NS	NS
	2625	16	16.5	50.7	35.369	9.0476	1	28.4	NA	NA
	2636	16	30.8	79.9	54.538	12.591	1	28.3	NA	NA
	2898	18	17	29.2	20.933	3.9029	1	17.1	NA	NA
	2899	18	11.2	22.9	16.744	3.7859	1	18.5	NA	NA
	2900	18	23.4	43.3	32.4	6.9364	1	18.1	NA	NA

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TABLE 1-6
(Continued)

Constituent	Sampling Period									
	August 27, 1993 - June 30, 1997						July 1, 1997 - September 30, 1997			
	Monitoring Well	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d] (mg/L)	SD[a,b] (mg/L)	Number of Samples[a,b]	Min.[a,b,c,d,e] (mg/L)	Max.[a,b,c,d,e] (mg/L)	Avg.[a,b,c,d,e] (mg/L)
Sodium (Cont'd.)										
	3128	18	4.42	13.5	7.7939	3.3808	1	5.02	NA	NA
	3636	18	6.39	15.1	9.9122	2.7106	1	5.42	NA	NA
	3898	18	7	14.6	9.0356	1.8592	1	7.74	NA	NA
	3899	18	6.24	14.6	9.3294	2.0845	1	8.02	NA	NA
	3900	18	4.45	10.8	6.6278	2.2505	1	5.11	NA	NA

[a]If more than one sample is collected per well per day (e.g., duplicate), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for determining the summary statistics (minimum, maximum, average, and standard deviation [SD]).
[b]Rejected data qualified with either a R or Z was not included in this count or the summary statistics.
[c]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then the data point is reported as the minimum.
[d]For values where the concentrations are below the detection limit, the results used in the summary statistics are each set at half the detection limit.
[e] NA = not applicable
NS = not sampled
[f]Well was not sampled because there is no access agreement with CSX railroad.
[g]This phosphorus concentration is significantly above historical levels. The preliminary result from the fourth quarter sampling round is 0.05 mg/L, which is consistent with historical levels. Therefore, the third quarter result is considered to be anomalous.
[h]This phosphorus concentration is significantly above historical levels. The preliminary result from the fourth quarter sampling round is 0.87 mg/L, which is above historical levels.

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TABLE 1-7

NON-URANIUM CONSTITUENTS WITH THIRD QUARTER 1997 RESULTS ABOVE FINAL REMEDIATION LEVELS

Constituent	Monitoring Well	Module/ Monitoring Activity[a]	Number of Validated Samples Since 1988[b,c]	Number of Validated Samples with FRL Exceedances Since 1988[b,c]	Number of Validated Samples with FRL Exceedances for 3rd Quarter 1997[b,c]	FRL[d] (mg/L)	Validated Results with FRL Exceedances for 3rd Quarter 1997[e] Sample Result; Validation Qualifier; (Date Sampled) (mg/L)
Boron						0.33	
	2049	So. Field	1	1	1		0.497 - (9/3/97)
Cadmium						0.014	
	3432	RCRA	17	1	1		0.0147 J (7/9/97)
Chromium, Total						0.022[f]	
	2386	So. Field	3	1	1		0.165 - (9/10/97)
	2387	So. Field	2	1	1		0.023 - (9/3/97)
	2398	RCRA, So. Plume	19	7	2		0.171 - (7/7/97) 0.212 - (9/22/97)
	3045	So. Field	2	1	1		0.0488 - (9/3/97)
	3068	So. Field	2	1	1		0.039 - (9/8/97)
	3385	So. Field	2	1	1		0.0266 - (9/2/97)
	3397	So. Field	2	1	1		0.0288 - (9/10/97)
Lead						0.015	
	3045	So. Field	2	1	1		0.0268 - (9/3/97)
	3068	So. Field	2	2	1		0.0159 J (9/8/97)
	3733	RCRA	18	2	1		0.028 - (9/18/97)
Manganese						0.9	
	2426	RCRA	18	4	1		2.86 - (7/15/97)
	2430	RCRA	19	3	2		0.956 J (7/14/97) 0.965 - (9/22/97)

TABLE 1-7
(Continued)

Constituent	Monitoring Well	Module/ Monitoring Activity[a]	Number of Validated Samples Since 1988[b,c]	Number of Validated Samples with FRL Exceedances Since 1988[b,c]	Number of Validated Samples with FRL Exceedances for 3rd Quarter 1997[b,c]	FRL[d] (mg/L)	Validated Results with FRL Exceedances for 3rd Quarter 1997[e] Sample Result; Validation Qualifier; (Date Sampled) (mg/L)
Manganese (Cont'd.)						0.9	
	2431	RCRA	17	3	1		1.31 J (7/9/97)
	3045	So. Field	2	1	1		1.17 - (9/3/97)
	3068	So. Field	2	1	1		1.39 J (9/8/97)
	3385	So. Field	2	1	1		0.952 - (9/2/97)
	3397	So. Field	2	1	1		1.13 - (9/10/97)
Nickel						0.1	
	2398	RCRA	19	5	2		0.252 - (7/7/97) 0.227 - (9/22/97)
Zinc						0.021	
	2068	So. Field	2	1	1		0.071 - (9/8/97)
	2106	RCRA, So. Plume	20	4	2		0.0331 - (7/15/97) 0.122 J (9/15/97)
	3045	So. Field	2	1	1		0.0951 - (9/3/97)
	3068	So. Field	2	1	1		0.0613 - (9/8/97)
	3385	So. Field	2	1	1		0.0543 - (9/2/97)
	3387	So. Field	2	1	1		0.0372 - (9/3/97)
	3397	So. Field	2	1	1		0.114 - (9/10/97)
	3426	RCRA	17	2	1		0.0307 - (7/15/97)

Note: Highlighting indicates well is outside the 10-year, uranium-based restoration footprint.
[a]From IEMP, Table 3-4
[b]If there was more than one sample result per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[c]Rejected data qualified with either a R or Z was not used in this comparison.
[d]From OU5 ROD, Table 9-4
[e]Data from September for the RCRA Property Boundary represent fourth quarter sample data.
[f]FRL based on Chromium VI, from OU5 ROD, Table 9-5

TABLE 1-8

KC-2 WAREHOUSE GROUNDWATER SUMMARY STATISTICS
(January 1993 through Fourth Quarter [December] 1997)

Constituent	Number of Samples[a,b]	FRL (mg/L)	Min.[a,b,c,d] (mg/L)	Max.[a,b,c,d] (mg/L)	Avg.[a,b,c,d,e] (mg/L)	SD[a,b,c,d,e] (mg/L)	1997 Data Sample Result (mg/L); Validation Qualifier; (1998 Data)[f]
Aluminum	10	NA	0.0466	80	16.7290	26.8602	11.5 J (0.212)
Antimony	10	0.0060	0.002	0.22	0.0626	0.0739	0.128 J (0.0016)
Arsenic	10	0.050	0.0008	0.0873	0.0194	0.0326	0.025 - (0.0013)
Barium	10	2.0	0.103	0.867	0.3735	0.2823	0.342 - (0.359)
Beryllium	10	0.0040	0.00011	0.005	0.0017	0.0016	0.00058 - (0.0004)
Cadmium	10	0.014	0.0001	0.0671	0.0132	0.0233	0.0097 - (0.0033)
Calcium	10	NA	46.3	1310	391.25	474.1690	361 J (112)
Chromium	10	0.022[g]	0.0039	2.35	0.5198	0.8147	0.801 - (0.0117)
Cobalt	10	0.17	0.0016	0.102	0.0307	0.0404	0.0277 - (0.0043)
Copper	10	1.3	0.0015	0.373	0.1151	0.1530	0.116 - (0.0041)
Cyanide	2	NA	0.00125	0.0025	NA	NA	0.0025 U (0.005)
Iron	10	NA	3.18	620	179.814	243.8911	171 J (9.27)
Lead	10	0.015	0.001	3.8	0.9556	1.4120	0.895 J (0.0103)
Magnesium	10	NA	33.9	322	116.75	111.0513	121 J (40)
Manganese	10	0.900	0.0733	8.52	2.4387	3.2829	2.36 J (0.122)
Mercury	10	0.0020	0.00005	0.0022	0.0004	0.00068	0.00011 - (0.00010)
Nickel	10	0.10	0.0051	1.21	0.2995	0.4297	0.431 - (0.0146)
Potassium	9	NA	0.922	14.6	3.733	4.4820	4.42 J (2.180)
Selenium	10	0.050	0.00039	0.0099	0.0032	0.0030	0.0061 U (0.0022)
Silver	10	0.050	0.00035	0.0312	0.0065	0.0096	0.0007 U (0.0008)
Sodium	9	NA	17.5	23.9	20.1778	2.0425	23.9 J (22)
Thallium	10	NA	0.000445	1.8	0.1852	0.5675	0.0039 U (0.0018)
Vanadium	10	0.038	0.00135	0.19	0.0450	0.0594	0.0343 - (0.0110)
Zinc	10	0.021	0.008	1.79	0.4568	0.6213	0.507 - (0.212)
		(μg/L)	(μg/L)	(μg/L)	(μg/L)	(μg/L)	(μg/L)
Uranium, Total	10	20	0.2	2400	248.13	756.2395	4.4 (0.4)

[a]If more than one sample is collected per well per day (e.g., duplicate), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for determining the summary statistics (minimum, maximum, average, and standard deviation [SD]).
[b]Rejected data qualified with either a R or Z was not included in this count or the summary statistics.
[c]For values where the concentrations are below the detection limit, the results used in the summary statistics are set at half the detection limit.
[d]If the total number of samples is greater than or equal to three, then all of the summary statistics are reported. If the total number of samples is equal to two, the minimum and maximum are reported. If the total number of samples is equal to one, then the data point is reported as the minimum.
[e]NA = not applicable
[f]The January 1998 data is preliminary and therefore is not included in the total number of samples or summary statistics.
[g]FRL based on Chromium VI, from OU5 ROD, Table 9-5.

TABLE 1-9

OSDF MONITORING WELL DATA WITH DETECTIONS FROM INCEPTION THROUGH THIRD QUARTER 1997 (March through September 1997)

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with Detections[a,b]	Number of Validated Samples with Detections for 3rd Quarter 1997[a,b]	FRL[c,d]	Validated Results with Detections for 3rd Quarter 1997 Sample Result; Validation Qualifier; (Date Sampled)
Total Organic Carbon					NA	(mg/L)
	22198	11	11	5		3.67 - (7/9/97) 2.1 J (7/31/97) 4.9 J (8/7/97) 24.1 - (8/26/97) 0.0143 J (9/16/97)
	22199	4	4	3		19.3 J (7/30/97) 3.7 J (8/7/97) 0.0266 J (9/16/97)
	22200	4	4	3		19.4 J (7/31/97) 3.4 J (8/7/97) 0.0232 J (9/16/97)
	22201	12	11	5		4.48 - (7/9/97) 22.5 J (7/30/97) 20.9 J (8/7/97) 9.66 J (8/26/97) 0.0186 J (9/16/97)
Total Organic Halogens					NA	(mg/L)
	22201	11	7	2		0.0069 J (7/9/97) 0.0055 J (8/26/97)
Boron					0.33 mg/L	(mg/L)
	22198	11	6	2		0.0514 - (8/26/97) 0.0576 - (9/16/97)
	22199	4	1	1		0.046 - (9/16/97)
	22200	4	1	1		0.0473 - (9/16/97)
	22201	11	6	2		0.0819 - (8/26/97) 0.102 - (9/16/97)

TABLE 1-9
(Continued)

Constituent	Monitoring Well	Number of Validated Samples[a,b]	Number of Validated Samples with Detections[a,b]	Number of Validated Samples with Detections for 3rd Quarter 1997[a,b]	FRL[c,d]	Validated Results with Detections for 3rd Quarter 1997 Sample Result; Validation Qualifier; (Date Sampled)
Technetium-99					94.0 pCi/L	(pCi/L)
	22201	12	2	1		13.41 J (8/26/97)
Tetrachloroethene					NA	(µg/L)
	22201	11	1	1		1.0 J (9/16/97)
Uranium, Total					20 µg/L	(µg/L)
	22198	11	11	5		0.645 J (7/9/97) 1.62 J (7/31/97) 1.86 J (8/7/97) 1.757 J (8/26/97) 1.489 J (9/16/97)
	22199	4	4	3		0.375 J (7/30/97) 0.325 J (8/7/97) 0.442 J (9/16/97)
	22200	4	4	3		0.311 J (7/31/97) 0.261 J (8/7/97) 0.292 J (9/16/97)
	22201	11	10	5		0.129 J (7/9/97) 0.161 J (7/30/97) 0.175 J (8/7/97) 0.204 J (8/26/97) 0.195 J (9/16/97)

[a]If there was more than one sample collected per well per constituent per day (e.g., a duplicate sample), then only the maximum sample concentration was counted and compared to the FRL.
[b]Rejected data qualified with either a R or Z was not included in this count.
[c]From OU5 ROD, Table 9-4
[d]NA = not applicable

FIGURE 1-1

GROUNDWATER SAMPLING ACTIVITIES COVERED IN THIS REPORT

SAMPLING ACTIVITIES	1997						1998					
	3rd Quarter			4th Quarter			1st Quarter			2nd Quarter		
	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
South Plume Module (Operational)				♦	♦	♦						
South Plume Module (Restoration)		♦										
Routine Water-Level Monitoring[a]							♦					
RCRA Property Boundary Monitoring[b]	♦		♦									
OSDF Groundwater Monitoring	♦	♦	♦									
Private Well Monitoring		♦										
South Field Extraction Module			♦									
KC-2 Warehouse Monitoring		♦										

♦ Data summarized/ evaluated in this report

[a]Fourth quarter 1997 groundwater elevation data was collected in September 1997 to correspond to the RCRA Property Boundary Program and was presented in the IEMP Status Report for Third Quarter 1997. Groundwater elevation data from January 1998 is provided in this report to illustrate the effect of the change from the 1400 gpm to 1500 gpm pumping rate that occurred on November 6, 1997.
[b]Due to pre-IEMP reporting protocol, the September 1997 RCRA Property Boundary monitoring serves as the fourth quarter 1997 sampling requirement. The RCRA Property Boundary sampling schedule will be adjusted in 1998 so that the fourth quarter samples will be collected in October.

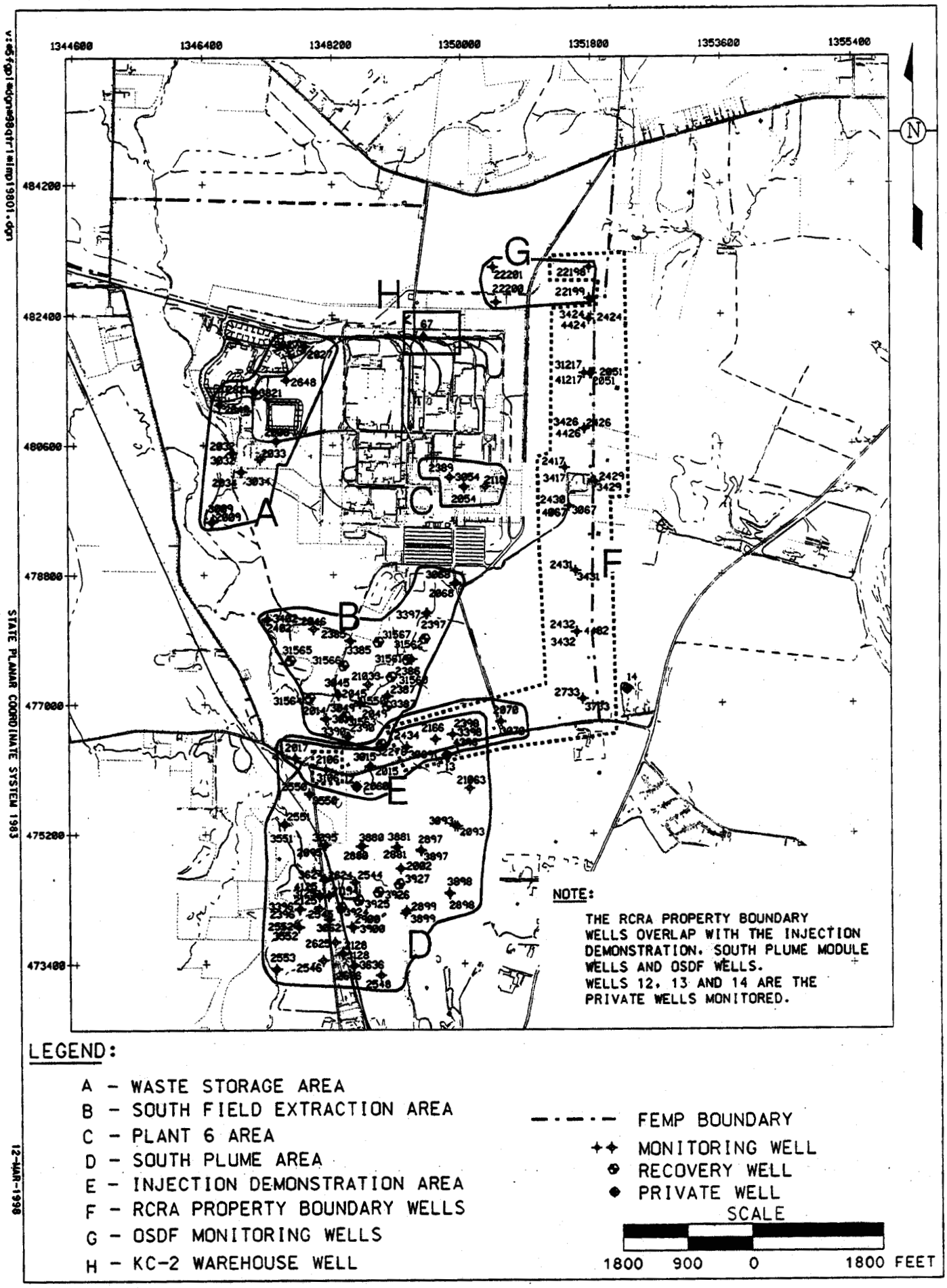

FIGURE 1-2. IEMP WATER QUALITY MONITORING WELLS AND RECOVERY WELLS

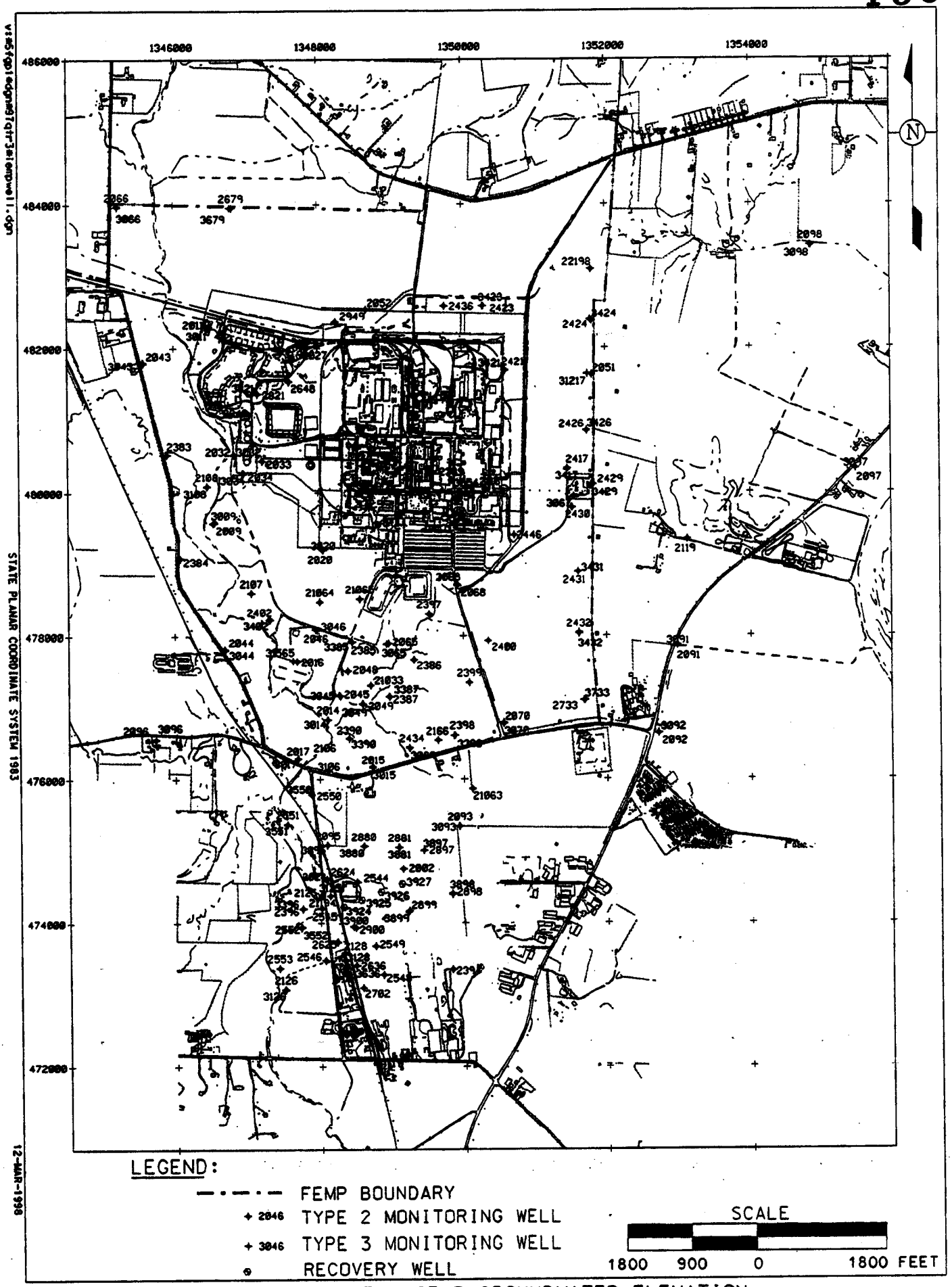

FIGURE 1-3. IEMP GROUNDWATER ELEVATION MONITORING WELLS FOR 1997 AND 1998

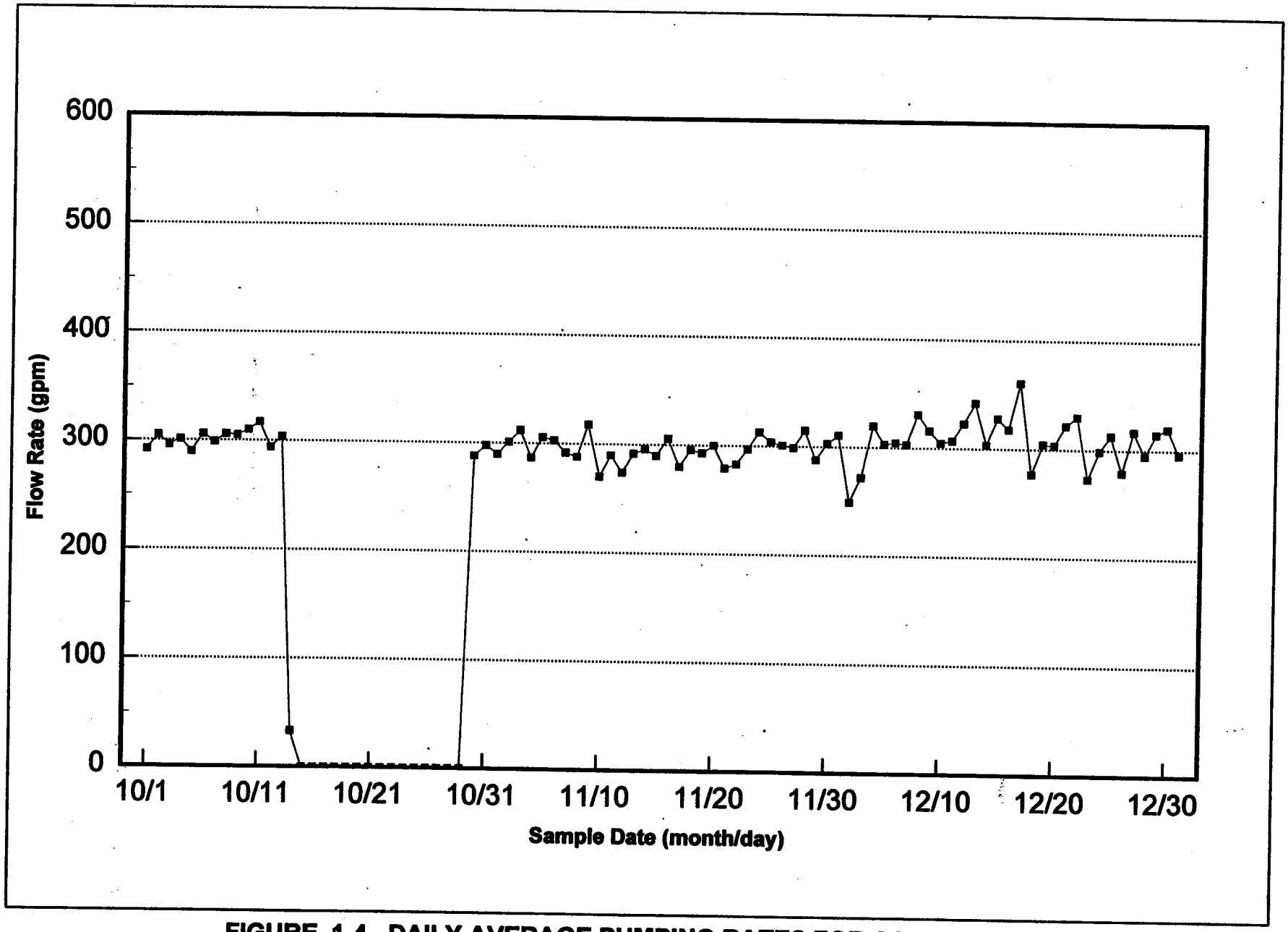

FIGURE 1-4. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME RECOVERY WELL 3924 (RW-1), 10/97 - 12/97

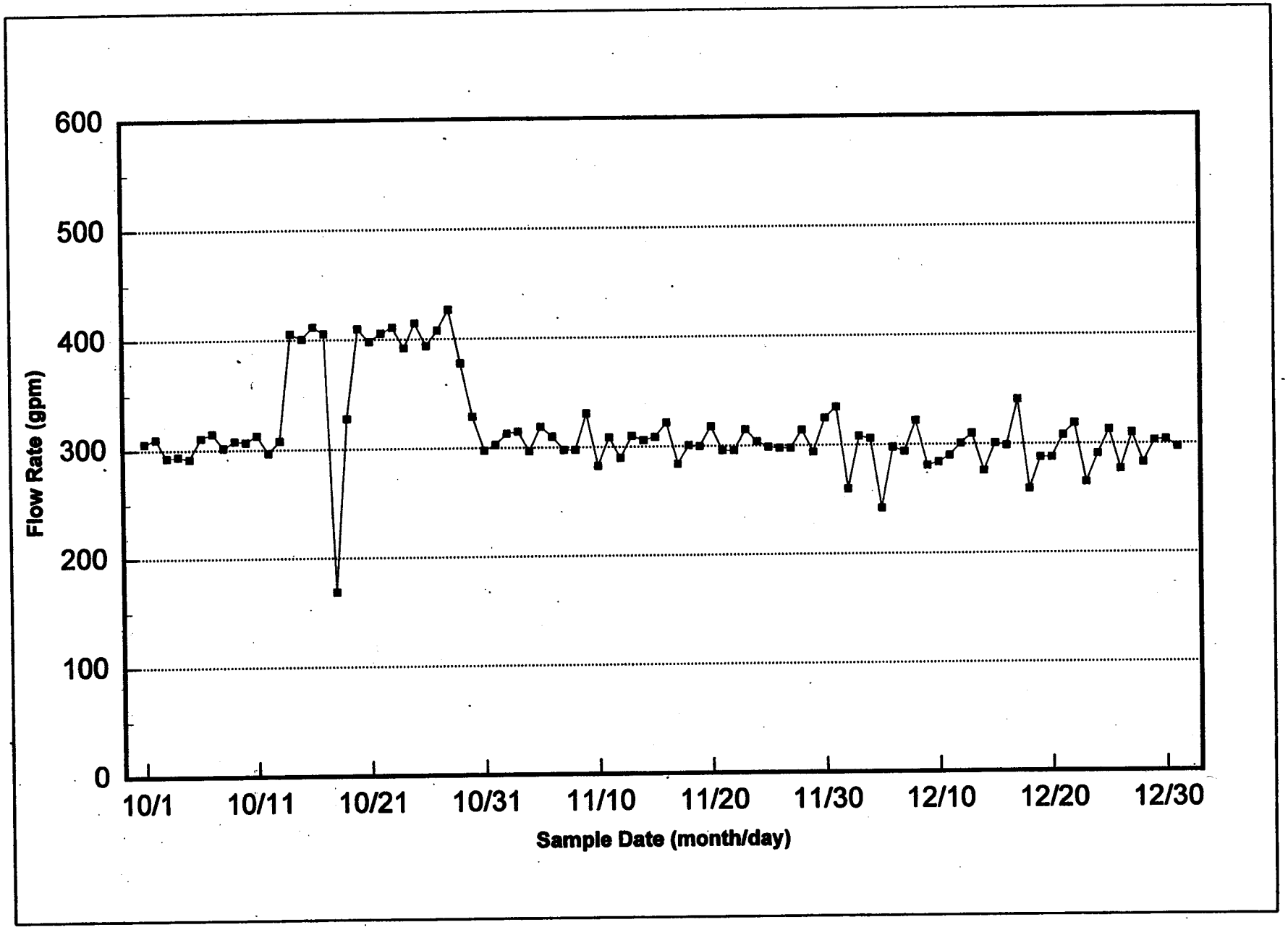

FIGURE 1-5. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME RECOVERY WELL 3925 (RW-2), 10/97 - 12/97

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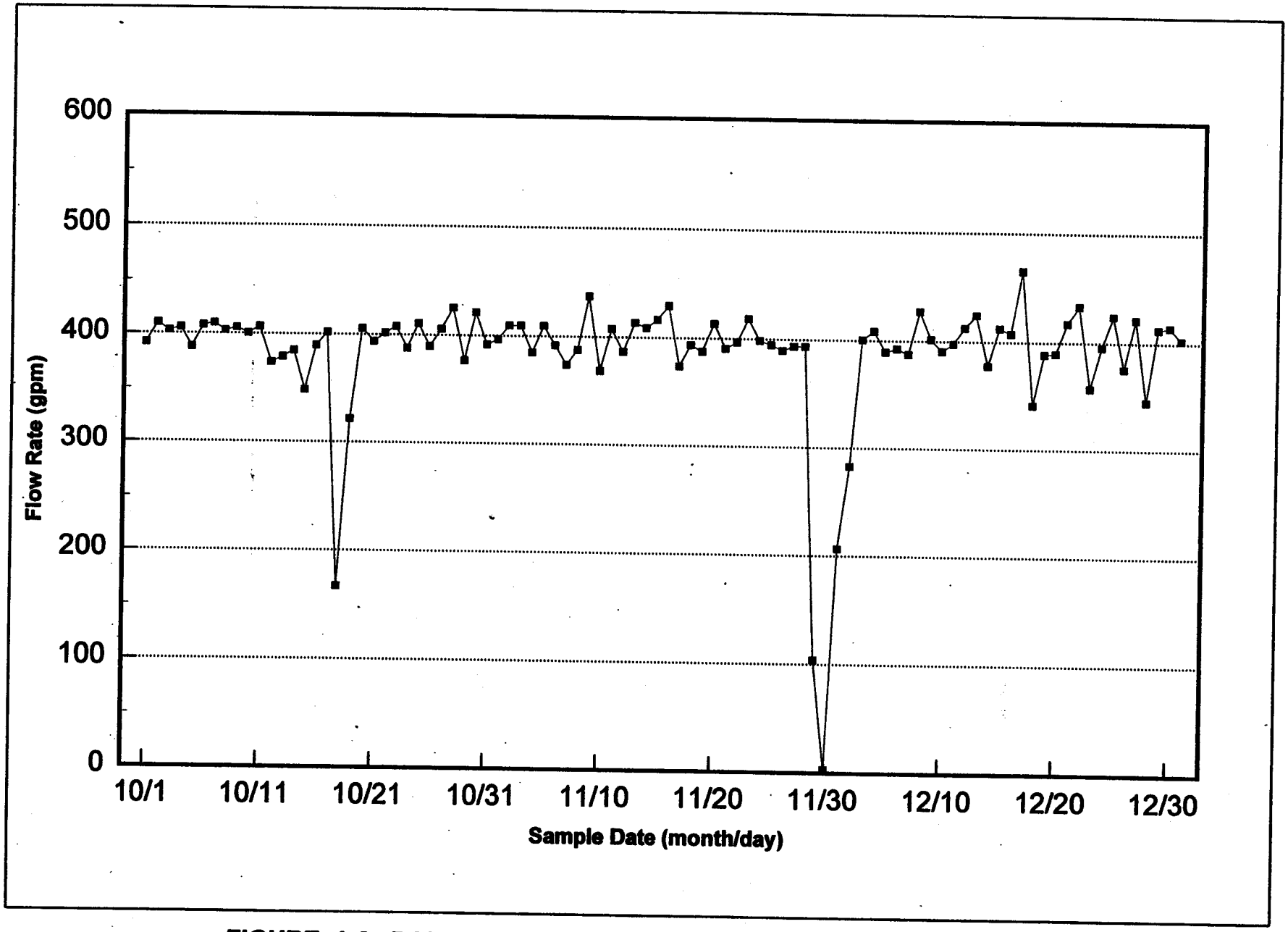


FIGURE 1-6. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME RECOVERY WELL 3926 (RW-3), 10/97 - 12/97

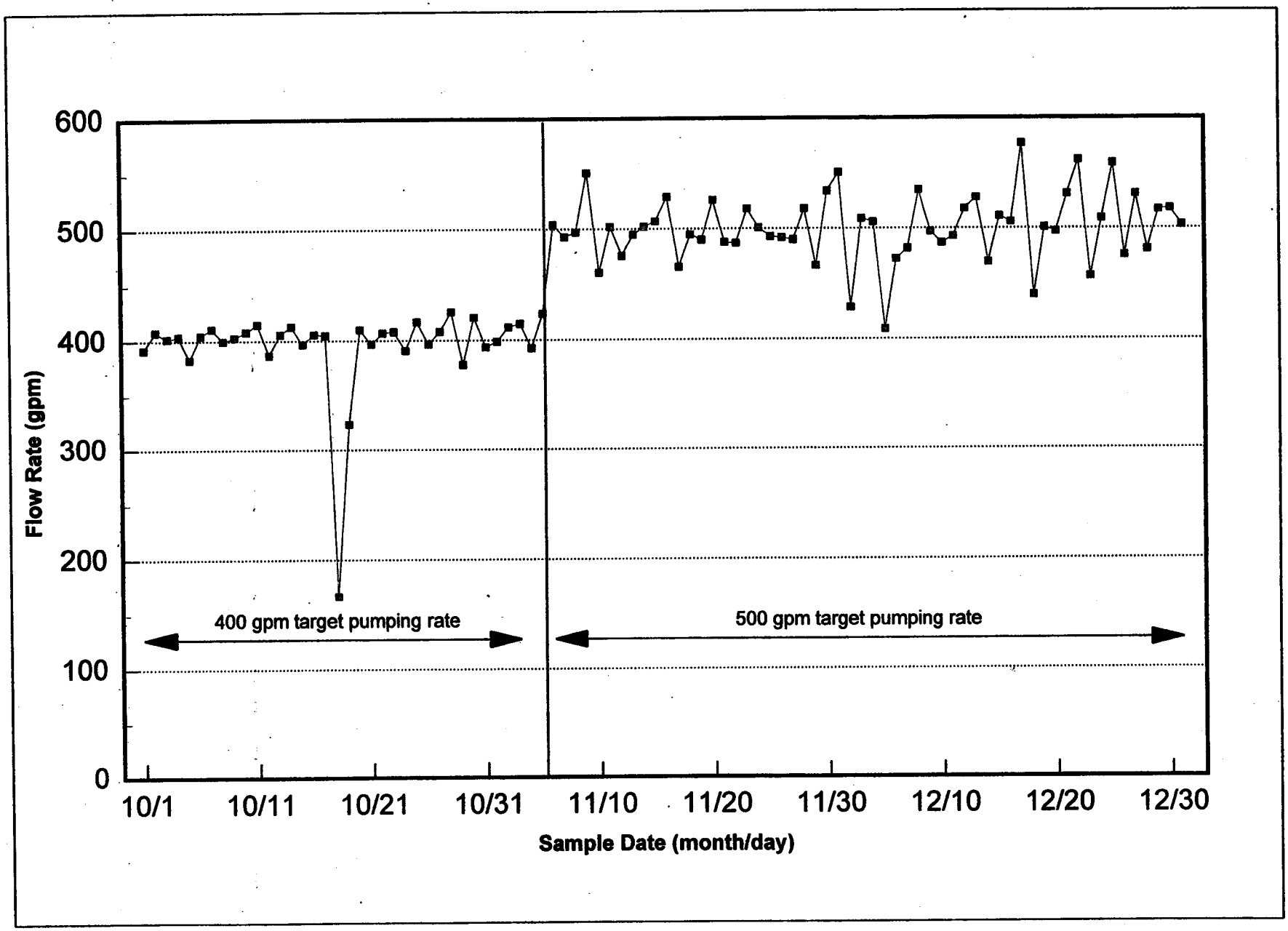


FIGURE 1-7. DAILY AVERAGE PUMPING RATES FOR SOUTH PLUME RECOVERY WELL 3927 (RW-4), 10/97 - 12/97

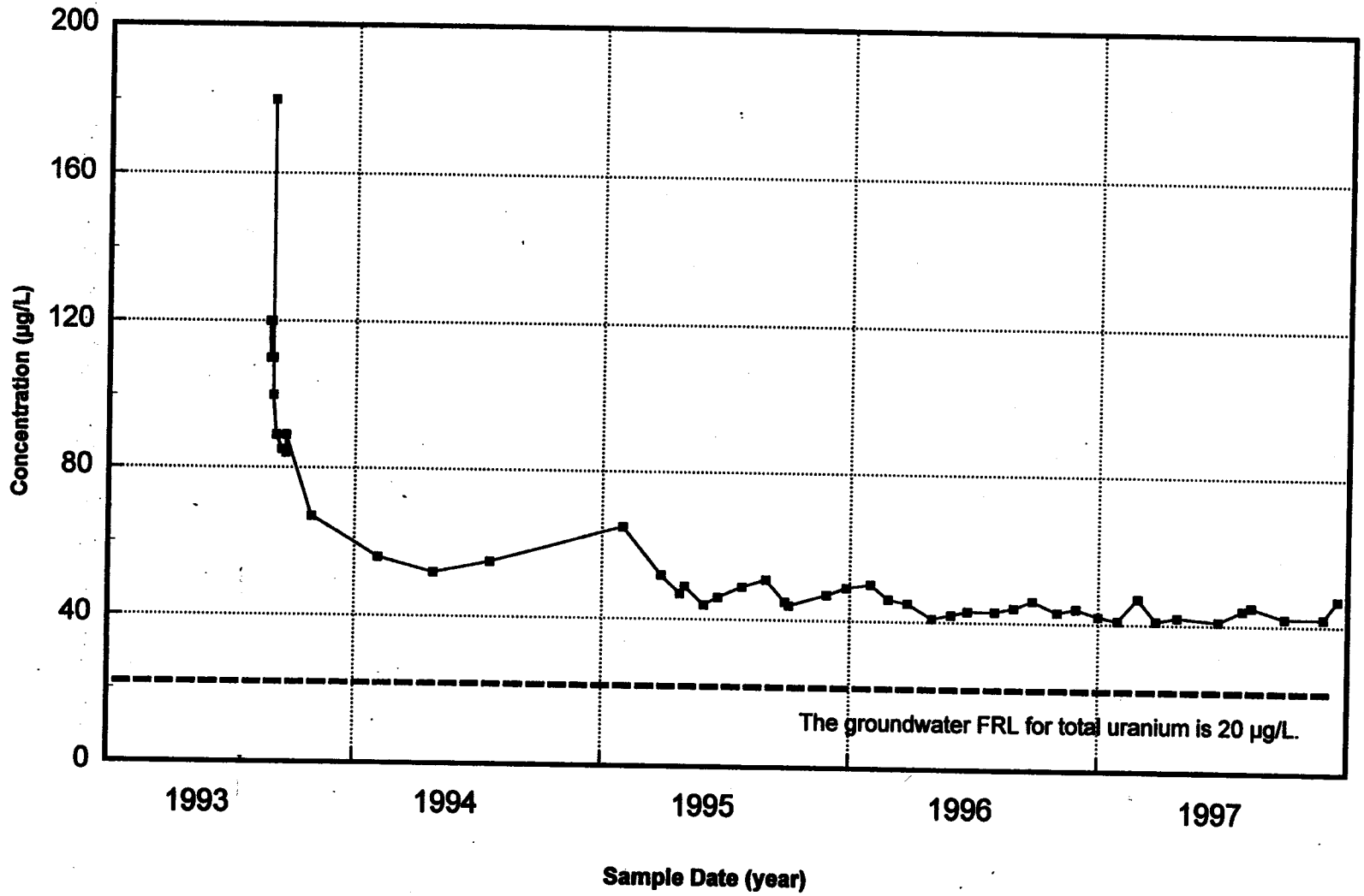


FIGURE 1-8. RECOVERY WELL 3924 (RW-1) TOTAL URANIUM CONCENTRATIONS

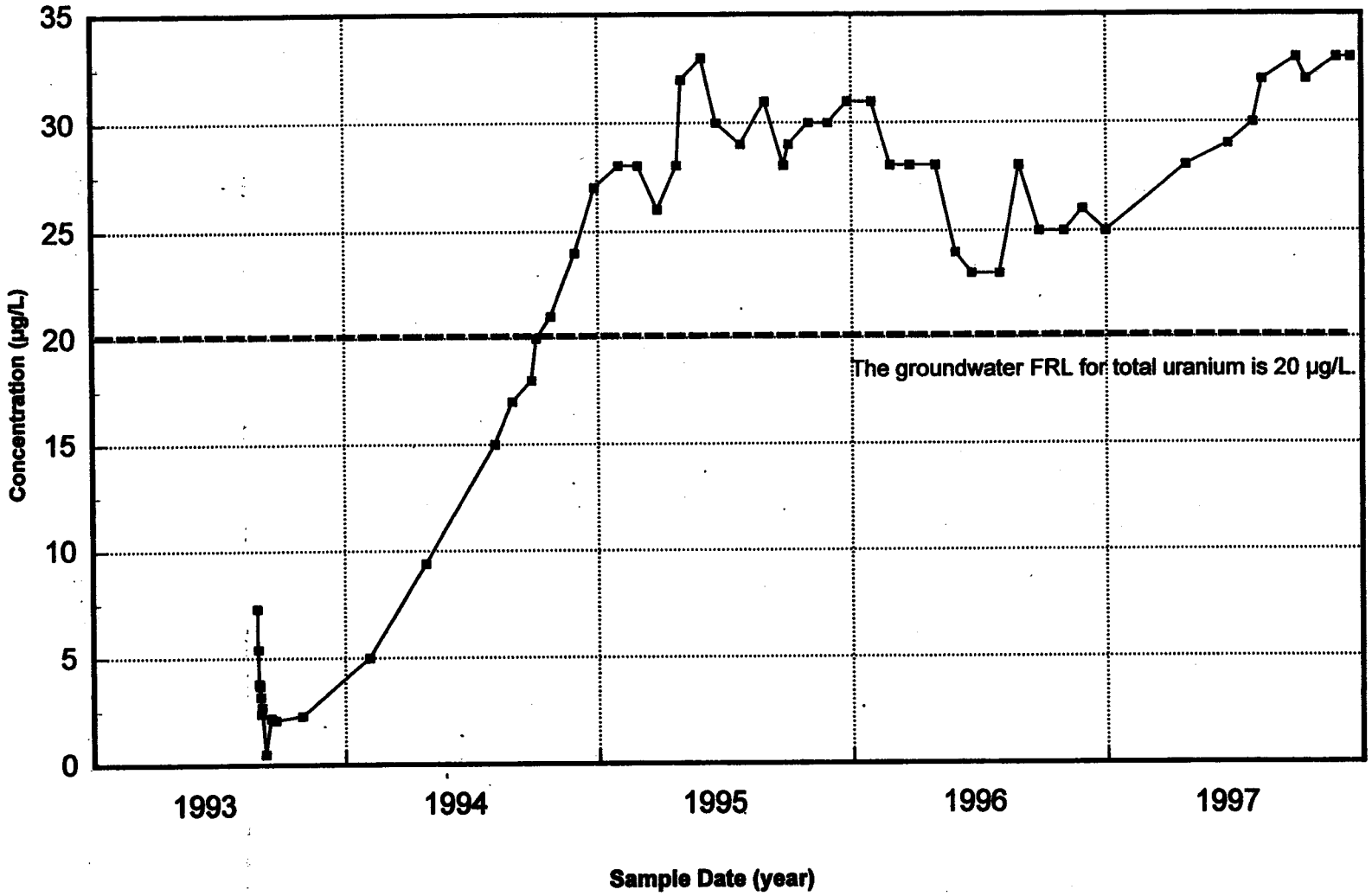


FIGURE 1-9. RECOVERY WELL 3925 (RW-2) TOTAL URANIUM CONCENTRATIONS

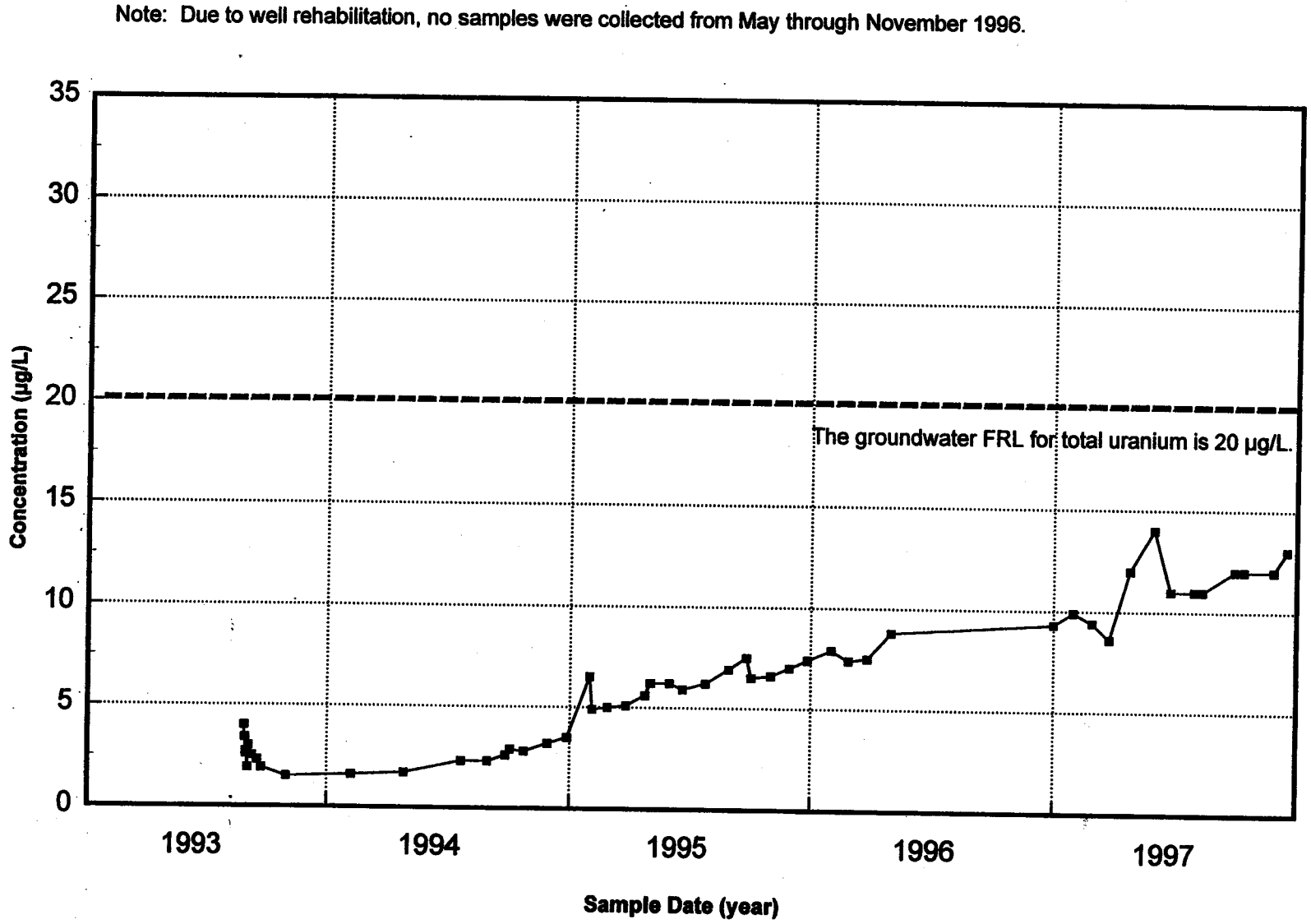


FIGURE 1-10. RECOVERY WELL 3926 (RW-3) TOTAL URANIUM CONCENTRATIONS

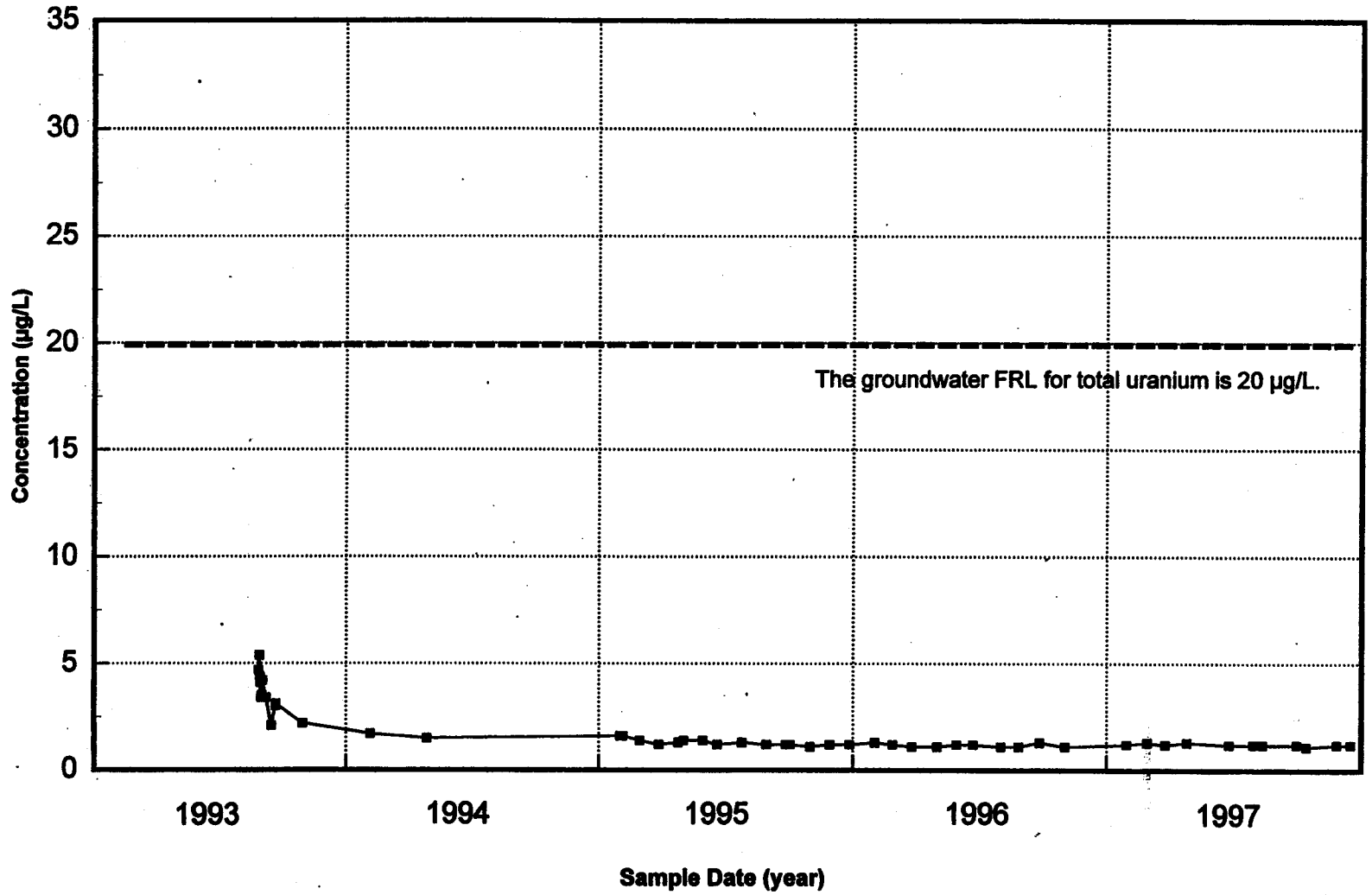


FIGURE 1-11. RECOVERY WELL 3927 (RW-4) TOTAL URANIUM CONCENTRATIONS

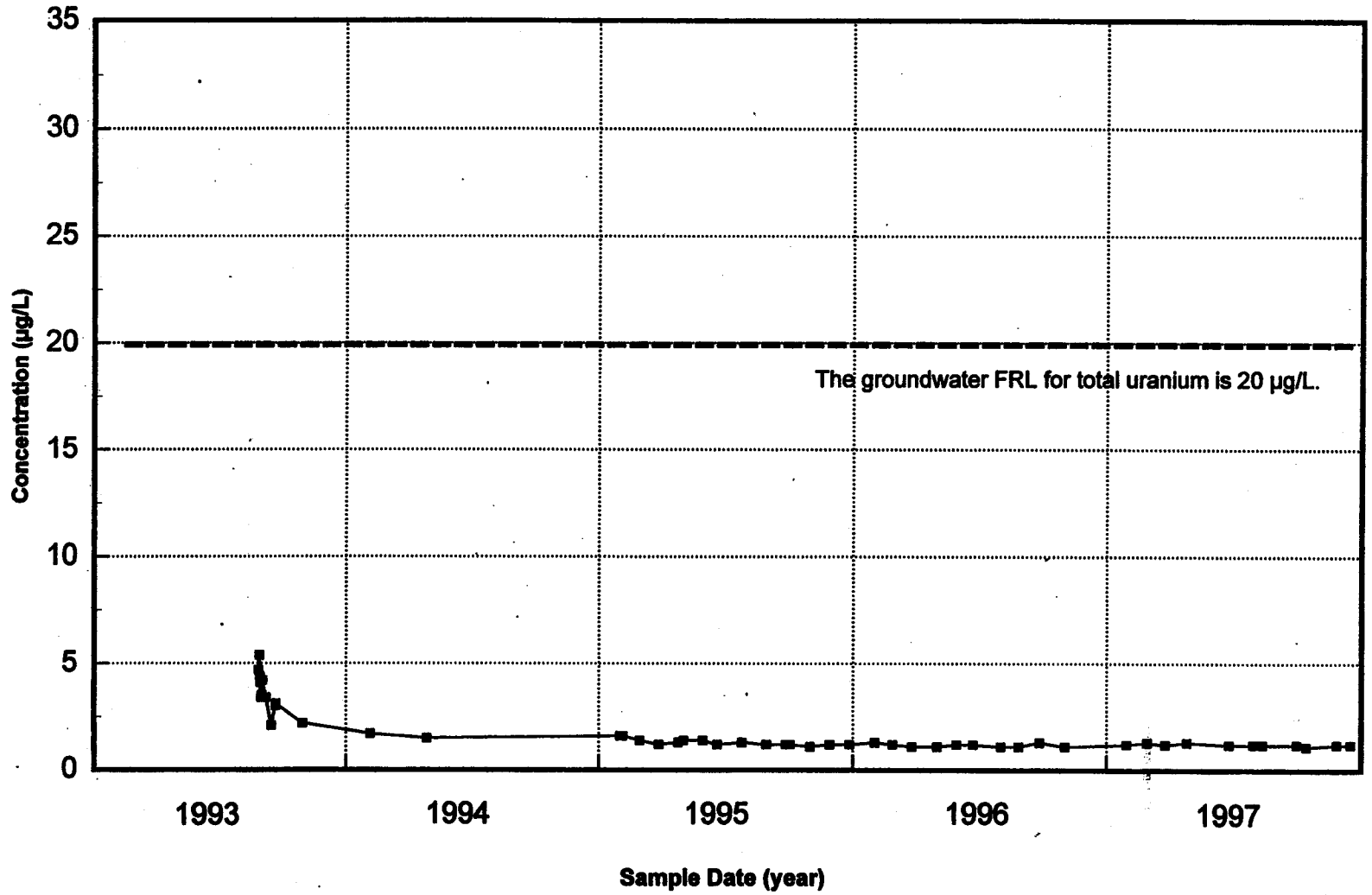


FIGURE 1-11. RECOVERY WELL 3927 (RW-4) TOTAL URANIUM CONCENTRATIONS

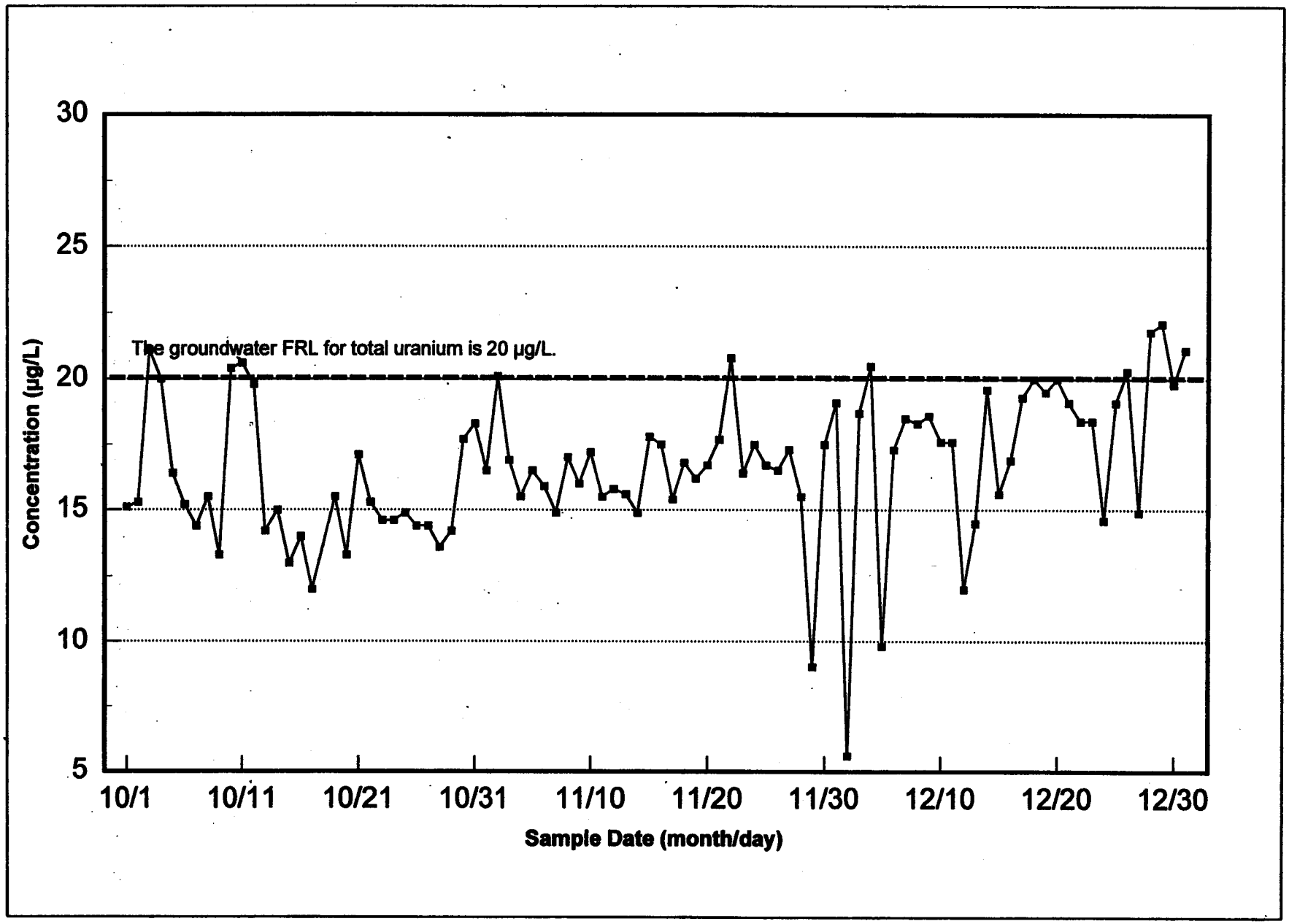


FIGURE 1-12. DAILY TOTAL URANIUM CONCENTRATIONS IN EXTRACTED SOUTH PLUME GROUNDWATER, 10/97 - 12/97

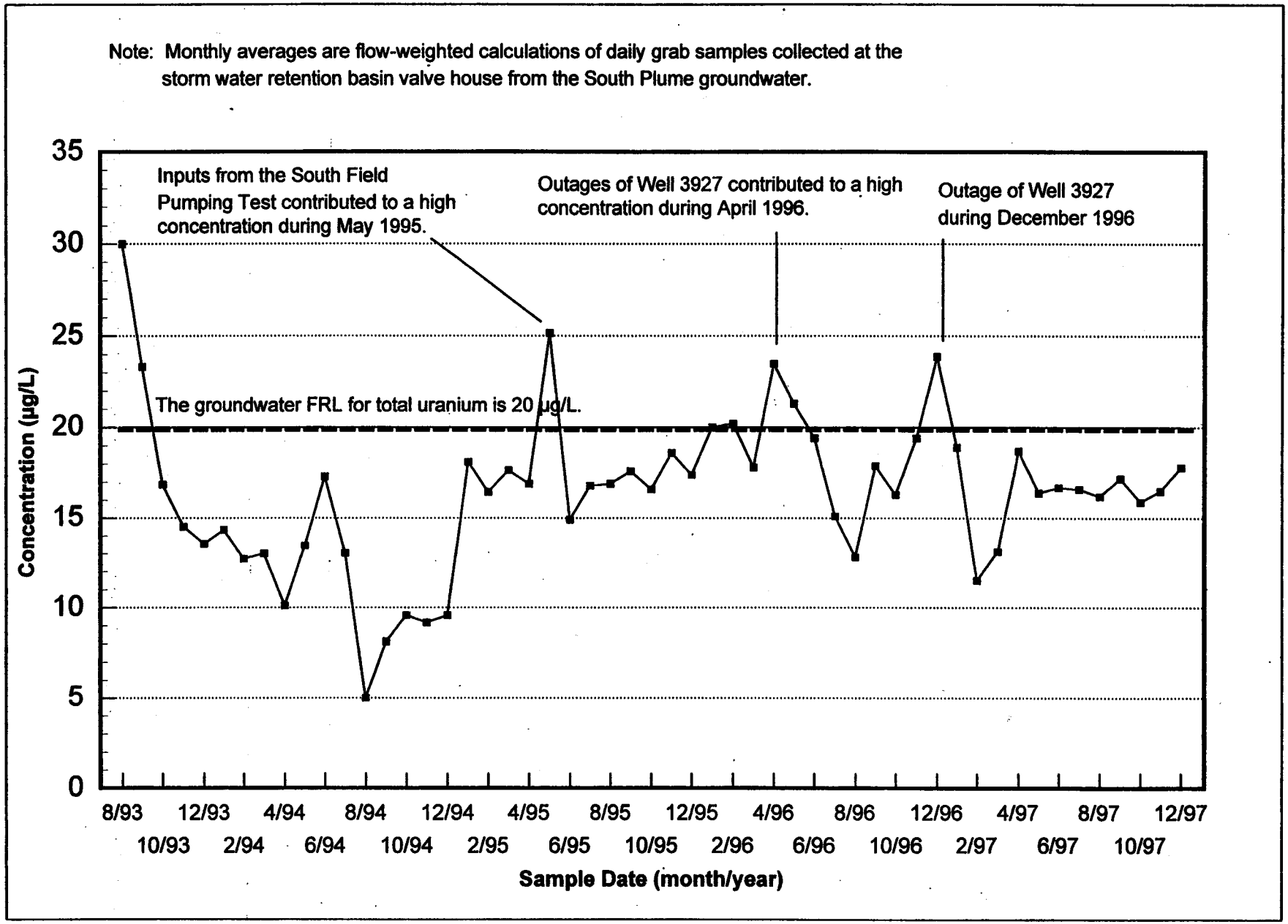


FIGURE 1-13. MONTHLY AVERAGE TOTAL URANIUM CONCENTRATIONS IN EXTRACTED SOUTH PLUME GROUNDWATER, 8/93 - 12/97

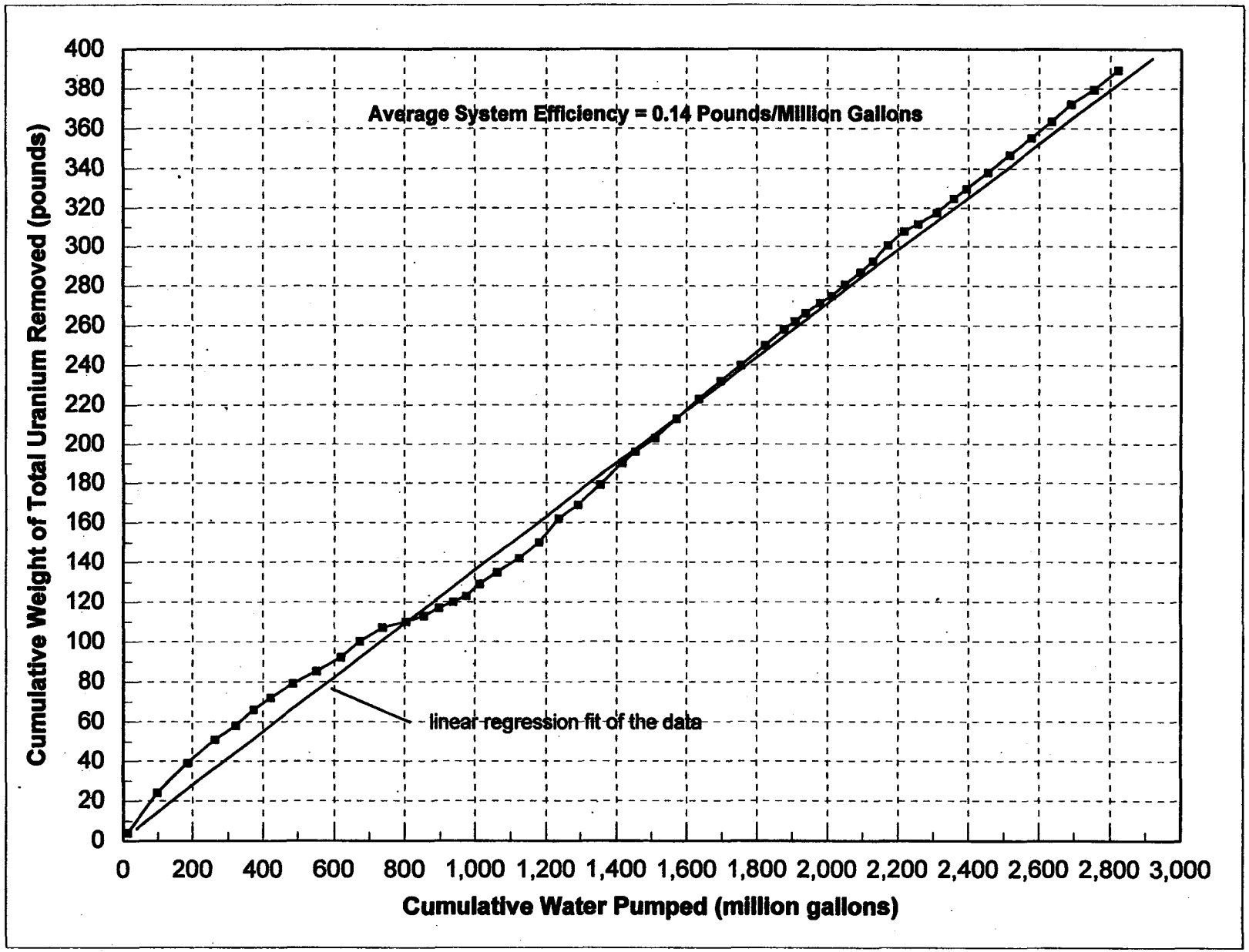


FIGURE 1-14. CUMULATIVE TOTAL URANIUM REMOVED VERSUS CUMULATIVE WATER PUMPED FROM SOUTH PLUME WELLFIELD, 8/93 - 12/97

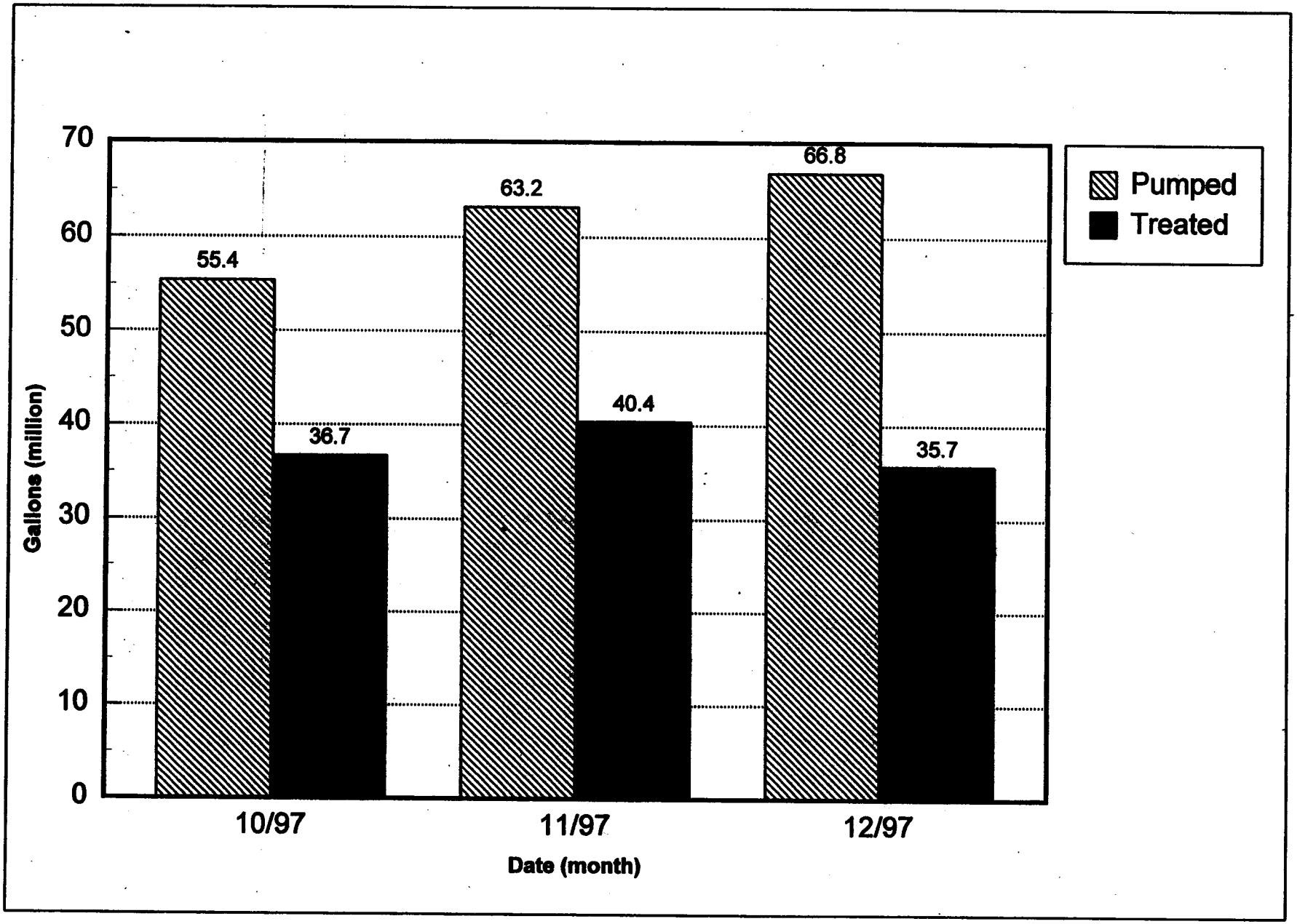


FIGURE 1-15. TOTAL GROUNDWATER PUMPED VERSUS GROUNDWATER TREATED FOR FOURTH QUARTER 1997

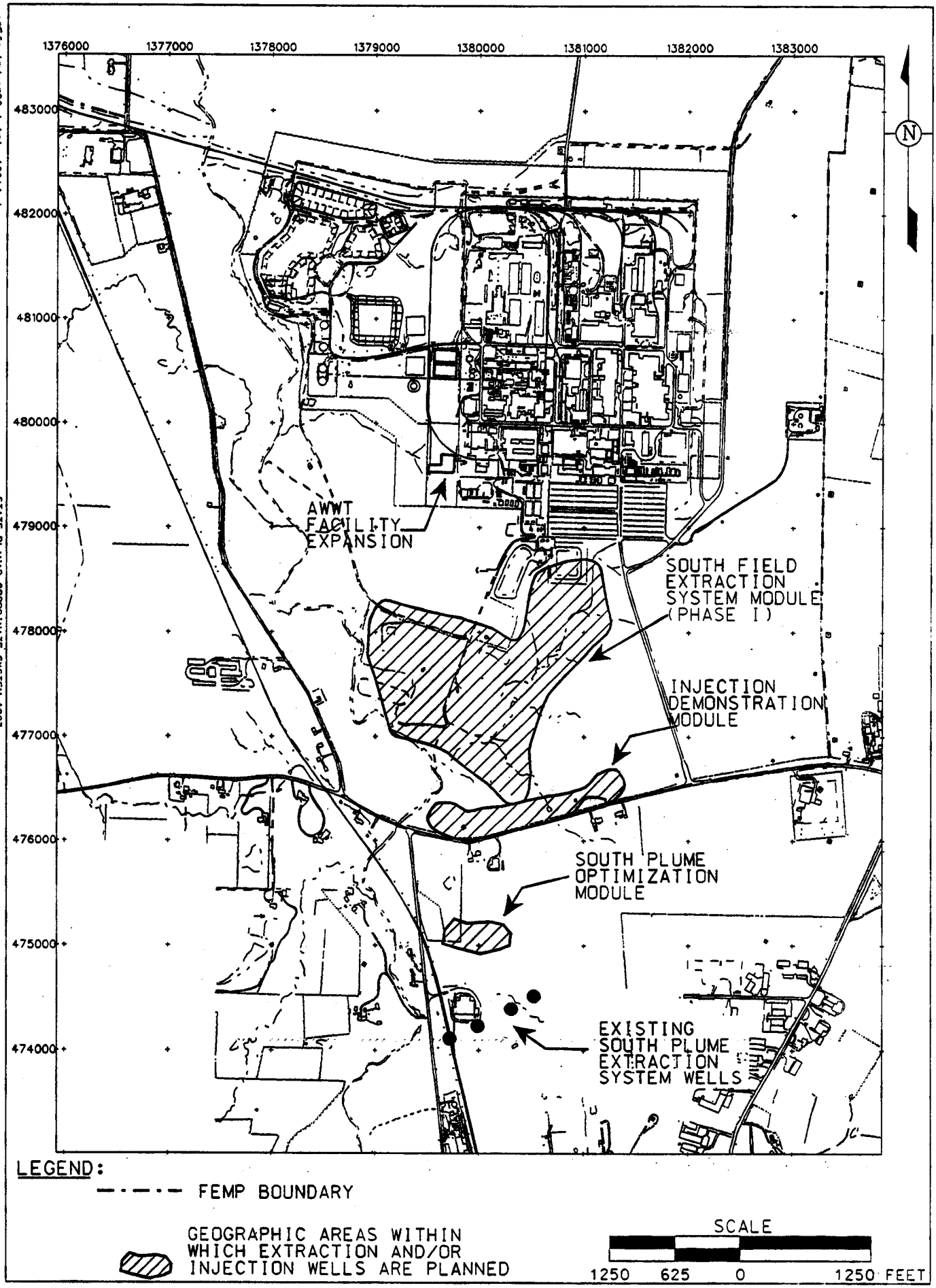


FIGURE 1-16. LOCATION OF NEAR-TERM AQUIFER RESTORATION MODULES

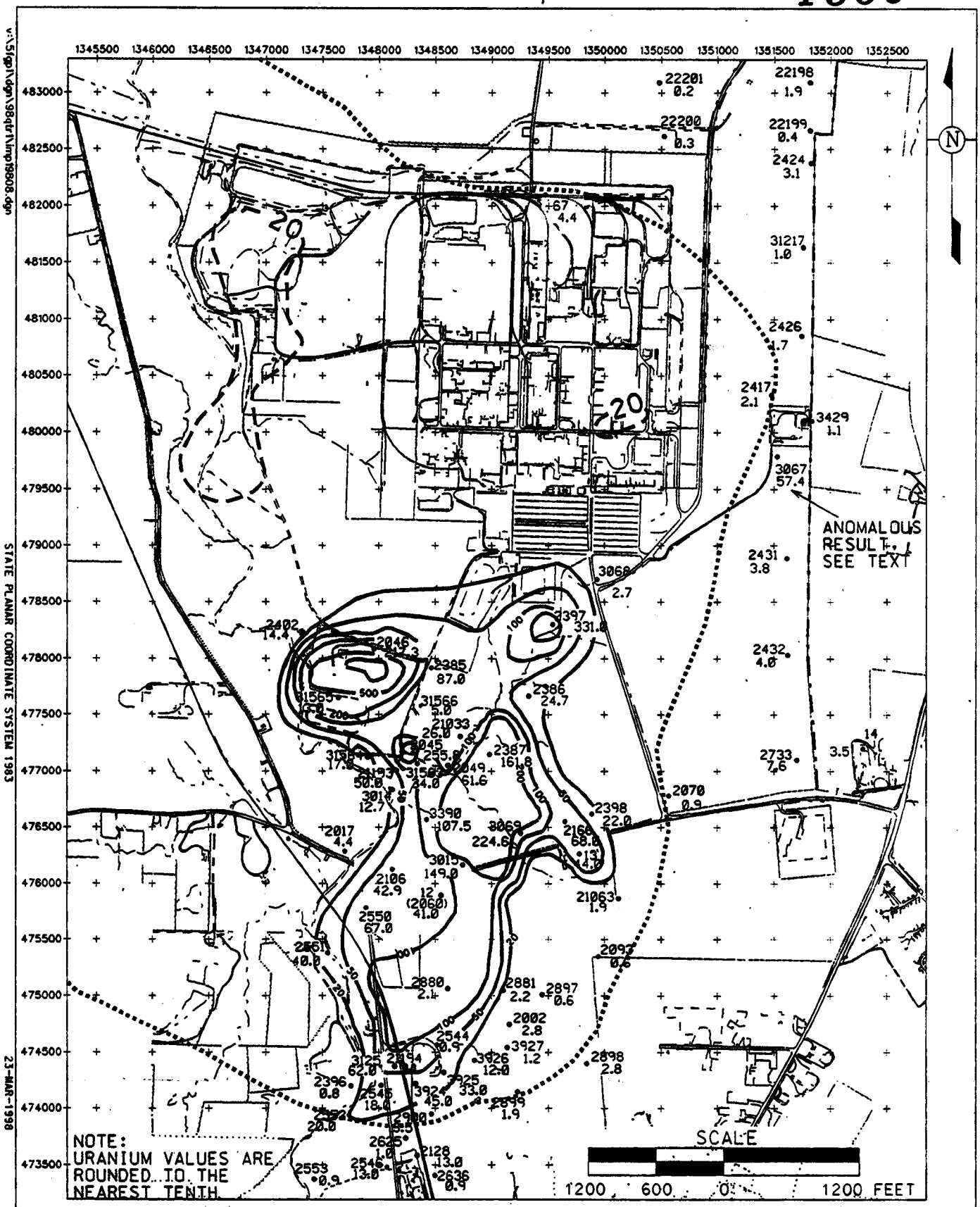


FIGURE 1-17. MAXIMUM TOTAL URANIUM PLUME MAP, THIRD QUARTER 1997

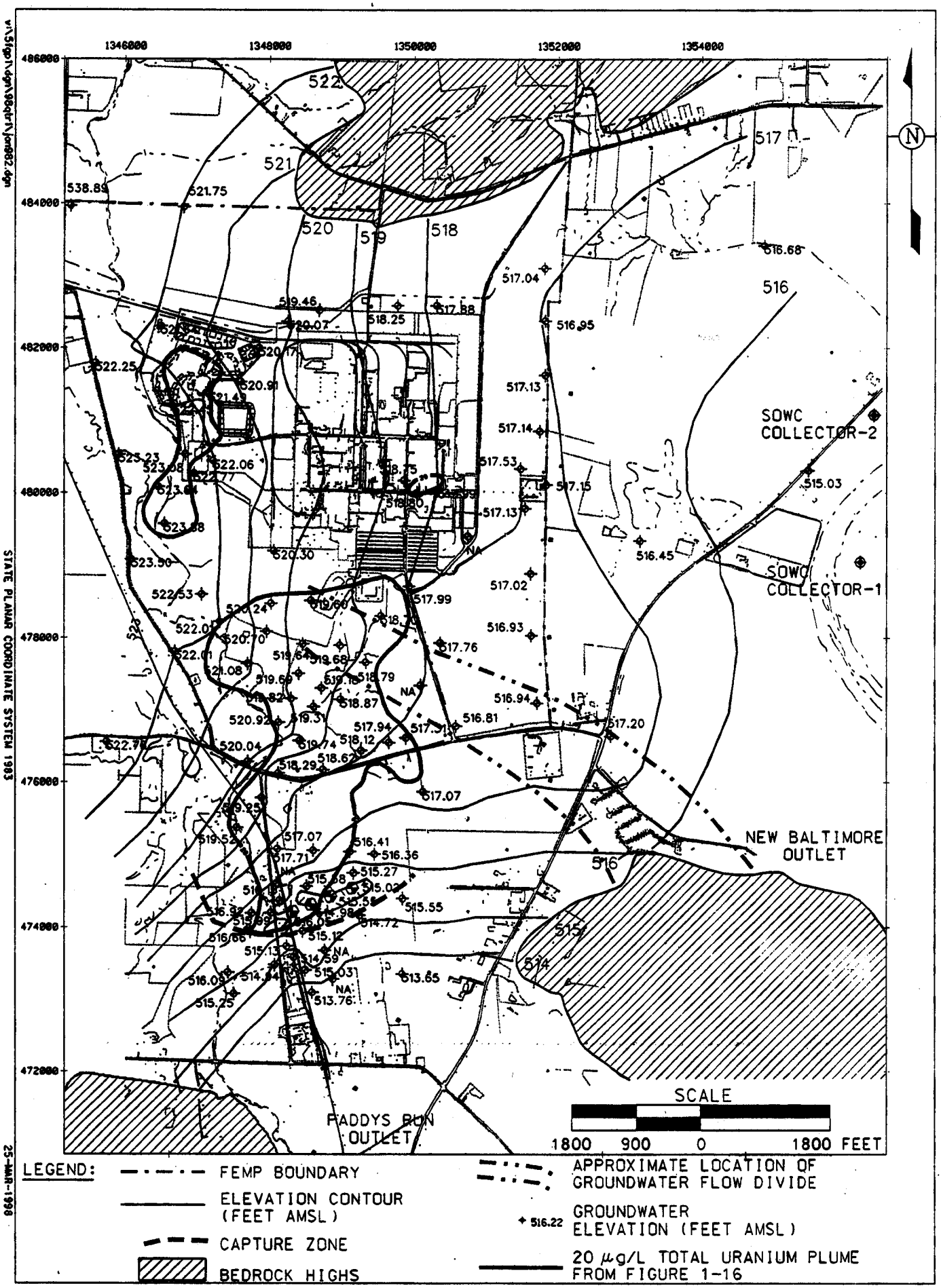


FIGURE 1-18. GROUNDWATER ELEVATIONS, TYPE 2 WELLS, JANUARY 1998

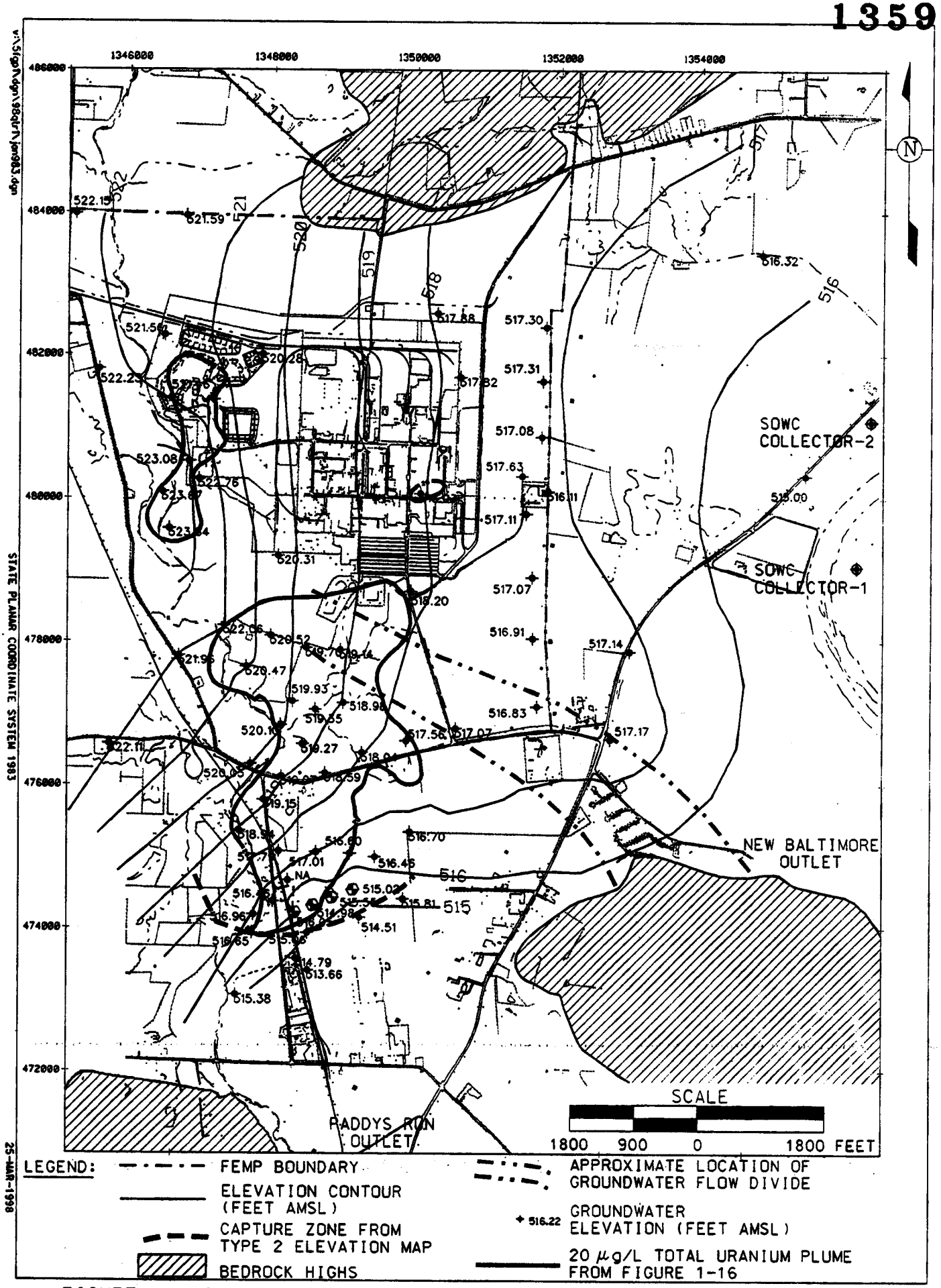
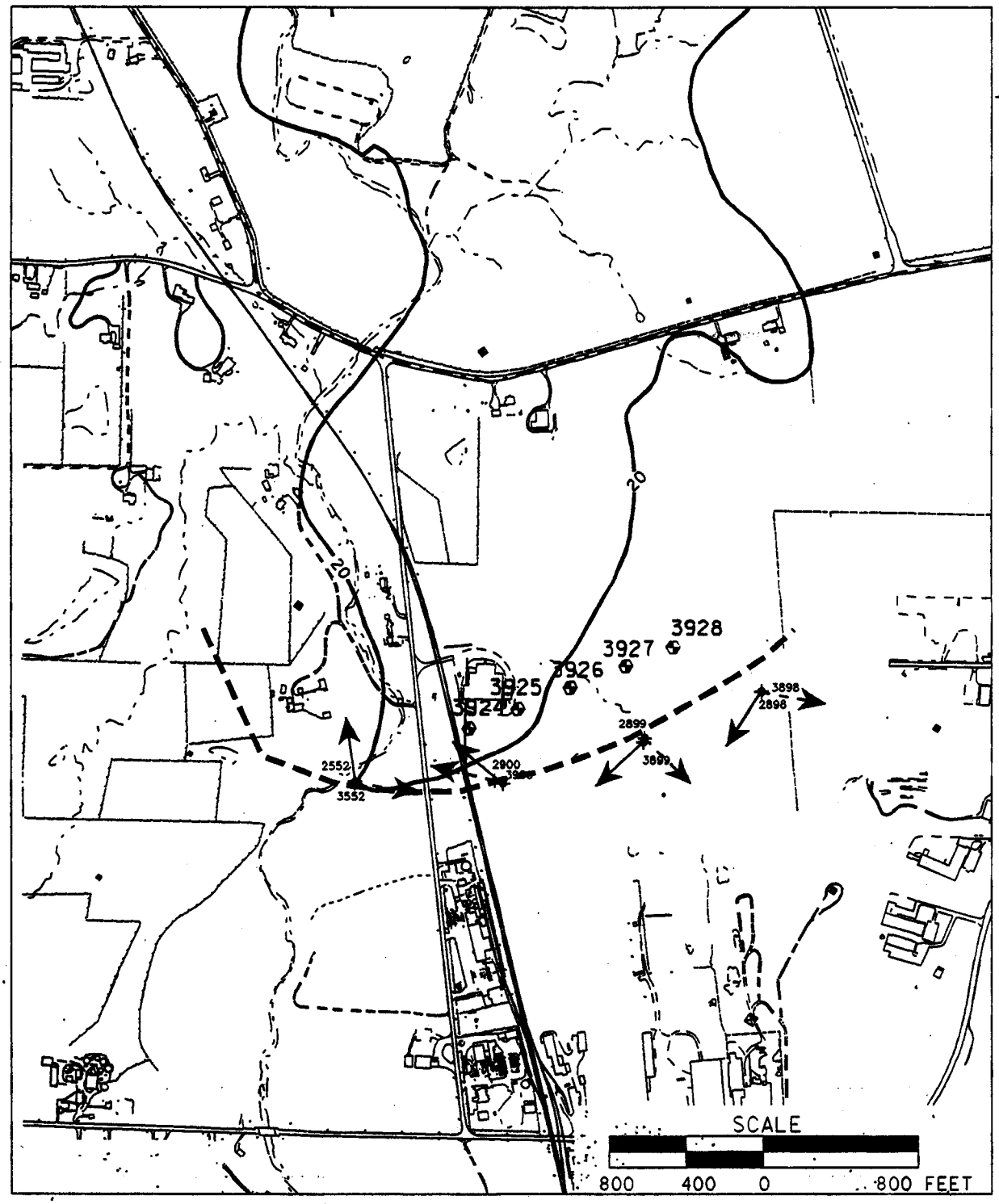


FIGURE 1-19. GROUNDWATER ELEVATIONS, TYPE 3 WELLS, JANUARY 1998



LEGEND:

FEMP BOUNDARY

CAPTURE ZONE BASED ON JANUARY 1998 GROUNDWATER ELEVATIONS

GROUNDWATER FLOW FOR TYPE 3 WELL

GROUNDWATER FLOW FOR TYPE 2 WELL

20 μg/L TOTAL URANIUM PLUME FROM FIGURE 1-16

FIGURE 1-20. HYDRAULIC CAPTURE ZONE AND COLLOIDAL BORESCOPE FLOW VECTORS FOR THE SOUTH PLUME MODULE, FOURTH QUARTER 1997

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STATE PLANAR COORDINATE SYSTEM 1983

12-MAR-1998

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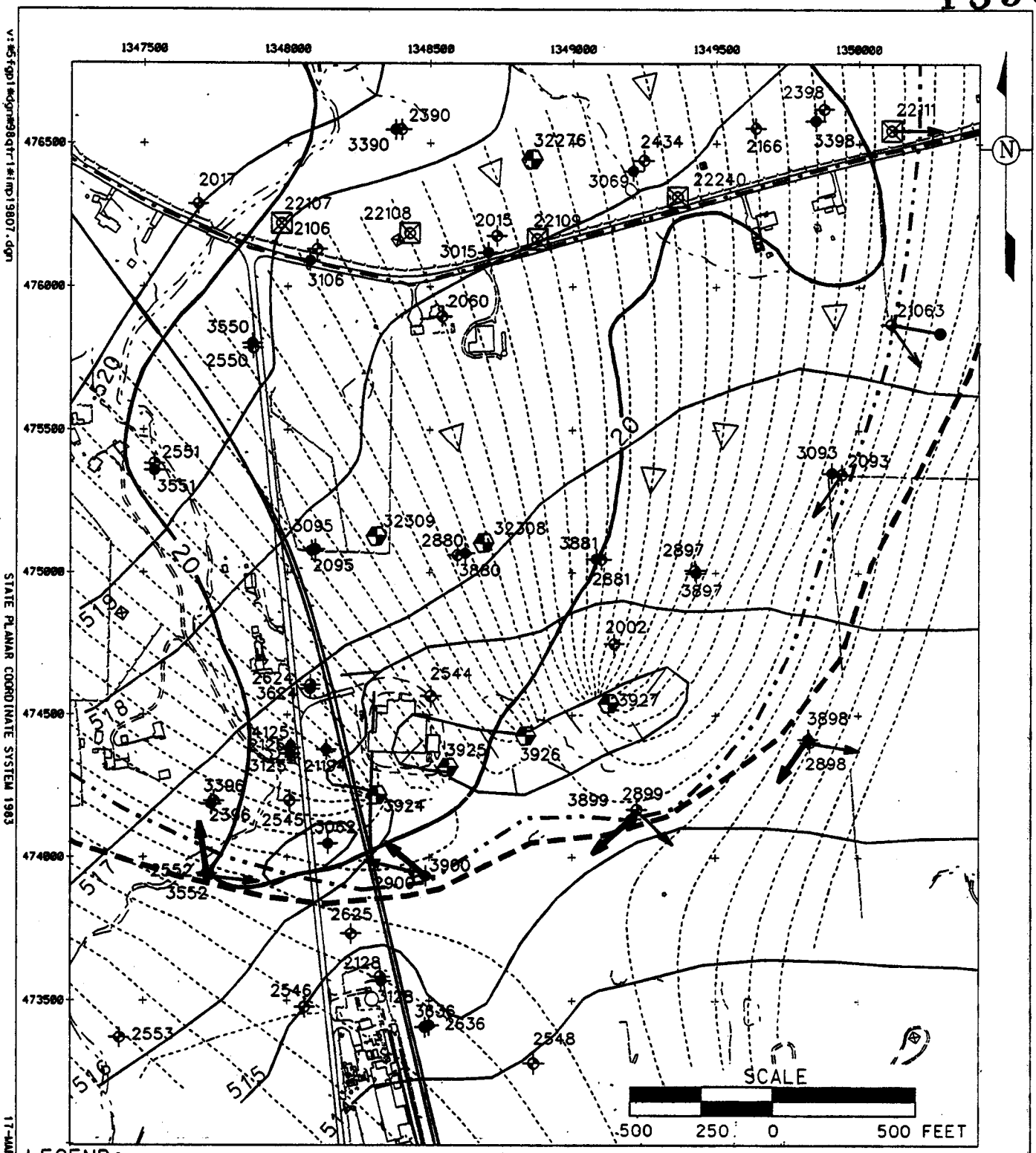

LEGEND:

- FEMP BOUNDARY
- GROUNDWATER FLOW DIRECTION MEASURED WITH BORESCOPE
- SOUTH PLUME SYSTEM PUMPING AT 1400 gpm
- SOUTH PLUME SYSTEM PUMPING AT 1500 gpm TYPE 2 WELLS
- SOUTH PLUME SYSTEM PUMPING AT 1500 gpm TYPE 3 WELLS
- MODELED CAPTURE ZONE (1500 gpm)
- 10-YEAR, URANIUM-BASED RESTORATION FOOTPRINT
- MODELED PARTICLE TRACK (1500 gpm)
- JANUARY 1998 GROUNDWATER ELEVATION CONTOUR (FEET AMSL)
- 20 μg/L URANIUM PLUME, APRIL 1997
- MONITORING WELL
- EXTRACTION WELL
- INJECTION WELL

FIGURE 1-21. MODELED VERSUS ACTUAL GROUNDWATER FLOW DIRECTIONS

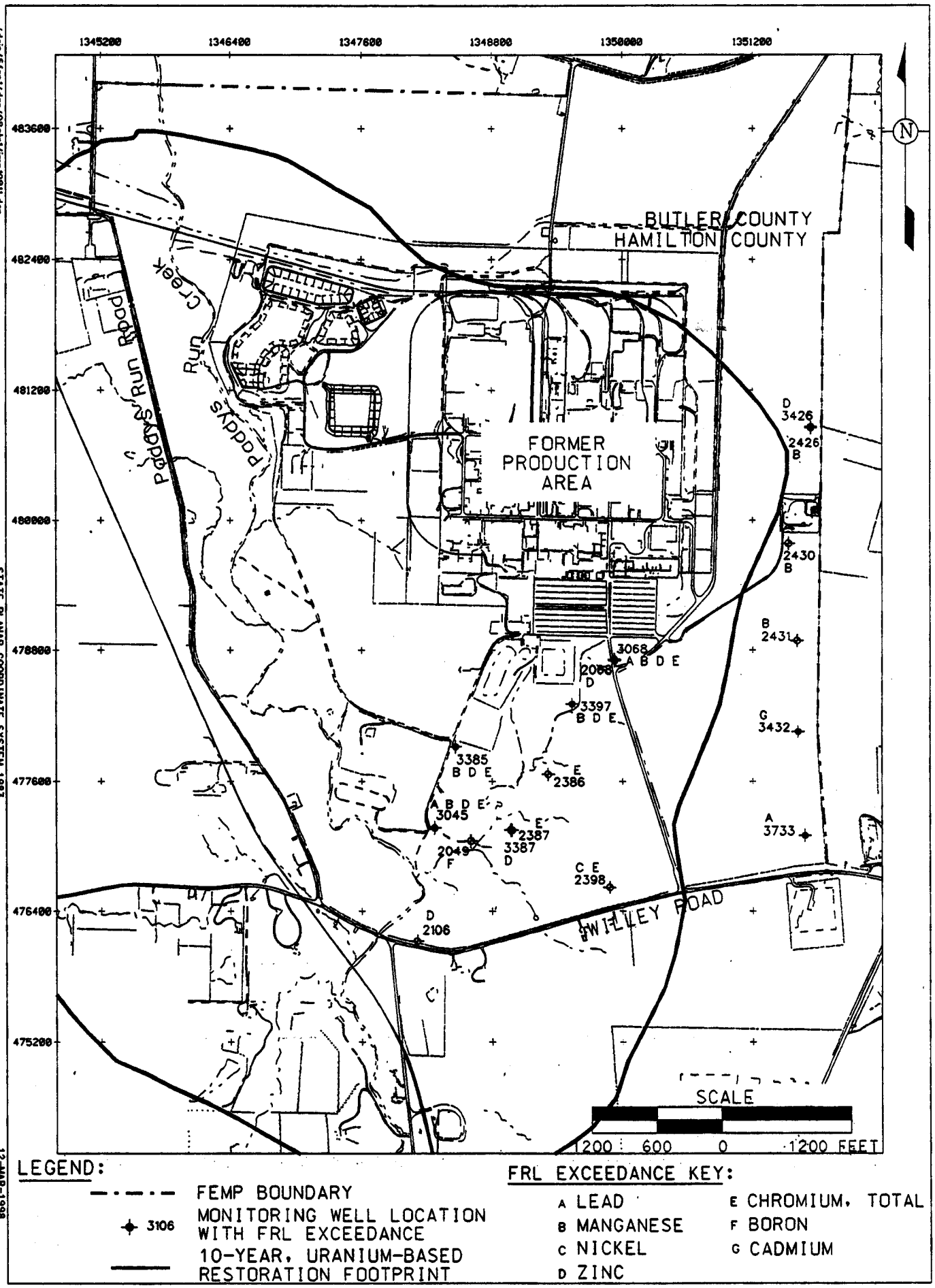

FIGURE 1-22. NON-URANIUM FRL EXCEEDANCES FOR THIRD QUARTER 1997

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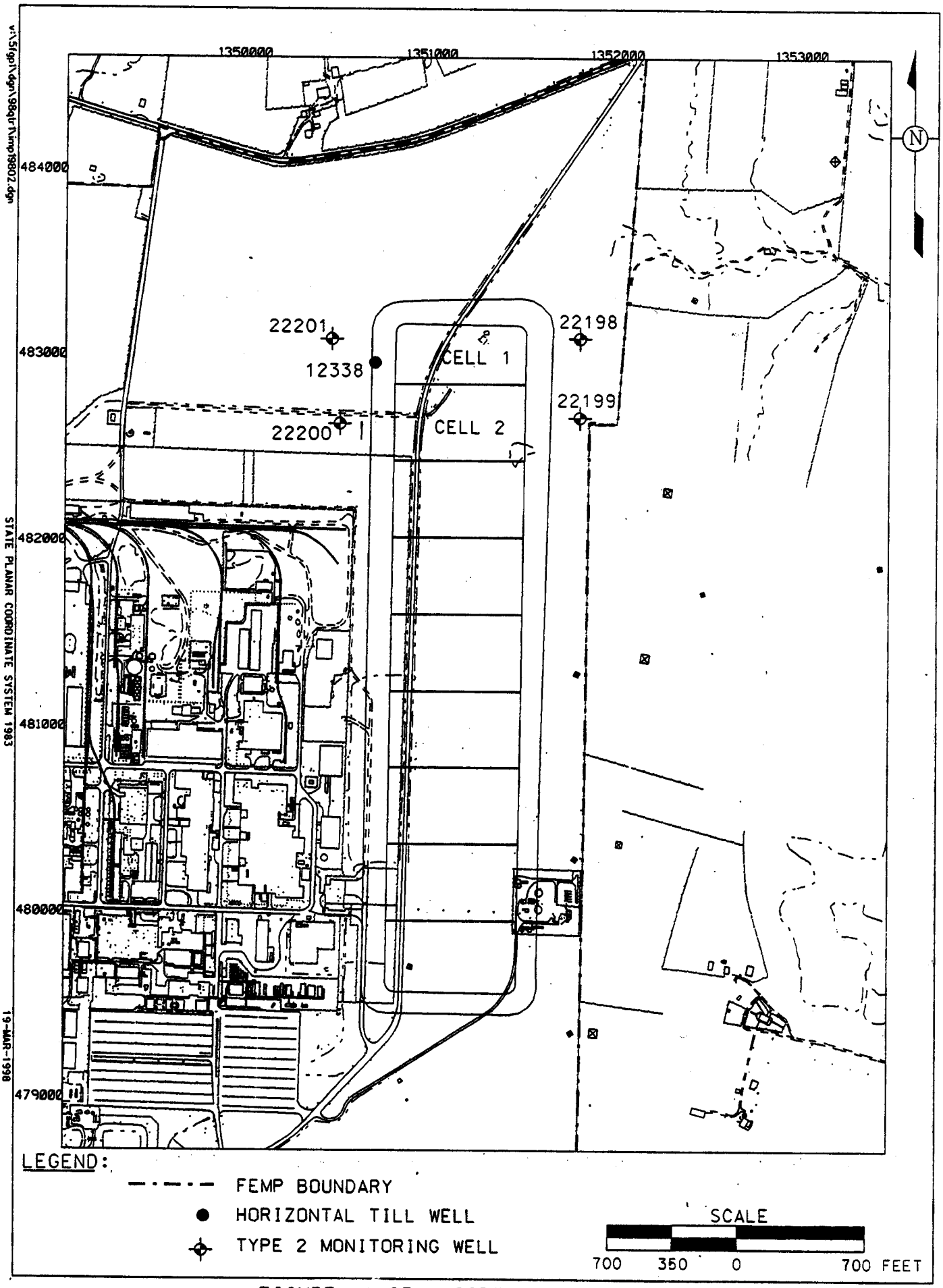


FIGURE 1-23. OSDF WELL LOCATIONS

2.0 SURFACE WATER AND TREATED EFFLUENT UPDATE

2.1 INTRODUCTION

This section provides a status of the surface water and treated effluent monitoring reported for the fourth quarter of 1997. Figure 2-1 identifies the data included in this section. Figure 2-2 and Table 2-1 identifies monitoring locations associated with surface water and treated effluent monitoring. Analytical results from the following three routine monitoring program elements were utilized to complete the reporting requirements identified in Section 4.6.2 of the IEMP:

- National Pollutant Discharge Elimination System (NPDES) permit (data obtained from October through December 1997)
- Federal Facilities Compliance Agreement (FFCA) requirements (data obtained from October through December 1997)
- IEMP characterization (data obtained during August and September 1997).

2.2 FINDINGS

The principal findings from the reporting period are summarized below:

NPDES Permit Compliance

- Wastewater and storm water discharges from the Fernald Environmental Management Project (FEMP) were in compliance 100 percent of the time during fourth quarter 1997.
- During the fourth quarter of 1997, construction on a series of diversion ditches and retention basins was initiated to collect storm water runoff from the southern waste unit area and route it to the Storm Water Retention Basin (SWRB). These construction activities have reduced the drainage area associated with STRM 4004 and therefore, the amount of uncontrolled surface water runoff flowing to STRM 4004 has decreased. Construction on the stormwater diversion system will continue and is scheduled to be completed in the spring of 1998.

FFCA and Operable Unit 5 Record of Decision Compliance

- The cumulative total of 126 pounds of uranium discharged to the Great Miami River from January through December 1997 was well below the stipulated annual limit of 600 pounds (Figure 2-3).

- The monthly average total uranium concentration limit of 20 μg/L in water discharged to the Great Miami River (effective January 1, 1998) was met throughout the year (Figure 2-4).

  (Refer to Figure 2-3 and Figure 2-4.)

Surveillance Monitoring

- No FRL or benchmark toxicity value (BTV) exceedances attributable to the FEMP were observed in the Great Miami River. (Refer to Table 2-2 and Table 2-3 for FRL and BTV exceedances, respectively.)

- No surface water FRL exceedances were observed for total uranium, and results from the property boundary at Paddys Run (SWP-03) indicates that total uranium concentrations in surface water leaving the site are consistently below both the surface water FRL and the groundwater FRL. (Refer to Figure 2-5 for total uranium concentrations at SWP-03.)

- FRL exceedances were limited to a single exceedance for zinc in the northeast drainage at location SWD-01. This isolated exceedance is not considered to be significant at this time. However, recognizing that a portion of the drainage area (Area 1, Phase I) feeding the northeast drainage has been certified as meeting soil FRLs specified in the Operable Unit 5 Record of Decision, zinc concentrations in this drainage will continue to be monitored and tracked over time to determine the significance of this exceedance.

- BTV exceedances were limited to four constituents (ammonia, aluminum, manganese, and zinc) at various monitoring locations. Based on the isolated nature of these exceedances, they are not considered significant. In addition, it has been identified that background concentrations of certain trace elements (such as aluminum) in surface water are higher than the corresponding BTVs. To address this issue, an assessment of the applicability of certain BTVs in regard to surface water monitoring is being conducted and will be presented in the Draft Final Sitewide Excavation Plan scheduled for submittal April 1998.

  (Refer to Figure 2-5, Table 2-2, and Table 2-3.)

As sufficient data becomes available through the IEMP sampling efforts, they will be presented in future IEMP status reports to document exceedances, provide statistical analyses, compare to historical ranges, refine background concentrations, assess for cross-media impacts, and determine if additional administrative or engineering controls are required.

TABLE 2-1

LISTING OF SURFACE WATER SAMPLE LOCATIONS

Sample Location	Surface Water Program
PF 4001[a]	NPDES/FFCA/IEMP Characterization
SWRB 4002[a]	NPDES/FFCA/IEMP Characterization
STP 4601[a]	NPDES
STRM 4003[a]	NPDES
STRM 4004[a]	NPDES
STRM 4005[a] (W10DD)	NPDES/IEMP Characterization/(Pre-IEMP Environmental Monitoring Program)
STRM 4006[a]	NPDES
SWD-01	IEMP Characterization
SWD-02	IEMP Characterization
SWD-03	IEMP Characterization
SWP-01 (W5)	IEMP Characterization/(Pre-IEMP Environmental Monitoring Program)
SWP-02	IEMP Characterization
SWP-03 (W7)	IEMP Characterization/(Pre-IEMP Environmental Monitoring Program)
SWR-01 (W1)	IEMP Characterization/(Pre-IEMP Environmental Monitoring Program)

[a]Permitted NPDES Outfall

TABLE 2-2

SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE FRL, INCLUDING SUMMARY STATISTICS

Location	Constituent	Total Number of Samples Since 1997[a,b,c]	Number of Samples with FRL Exceedances Since 1997[a,b,c]	Number of Samples with FRL Exceedances for 3rd/4th Quarter 1997[c]	FRL[d] (mg/L)	Summary Statistics[a,b,c,f] Min. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with FRL Exceedances for 3rd/4th Quarter 1997 Sample Result (mg/L); Validation Qualifier, (Date Sampled)[a]
SWD-01 (Northeast Drainage)	Zinc	2	1	1	0.11	0.0766	0.366	NA	0.366 - (9/10/97)

[a]Total number of samples for all surface water programs (see Table 2-1). Refer to Figure 2-1 for reporting schedule (i.e., third quarter versus fourth quarter).
[b]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples, and the sample with the maximum concentration is used for the summary statistics and in determining FRL exceedances.
[c]Rejected data qualified with either a R or Z was not used for this table.
[d]From OU5 ROD, Table 9-5
[e]If the total number of samples is greater than or equal to three, then the minimum, maximum, and average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.
[f]NA = not applicable

TABLE 2-3

SURFACE WATER LOCATIONS WITH RESULTS ABOVE THE BTV, INCLUDING SUMMARY STATISTICS

Location	Constituent[a]	Total Number of Samples Since 1997[b,c,d]	Number of Samples with BTV Exceedances Since 1997[a,c,d]	Number of Samples with BTV Exceedances for 3rd/4th Quarter 1997[b,d]	BTV[e] (mg/L)	Summary Statistics[b,c,f,g] Min. (mg/L)	Max. (mg/L)	Avg. (mg/L)	Results with BTV Exceedances for 3rd/4th Quarter 1997 Sample Result (mg/L); Validation Qualifier, Date Sampled)[b]
SWD-01 (Northeast Drainage)	Zinc	2	1	1	0.28	0.0766	0.366	NA	0.366 - 9/10/97)
SWD-02 (Storm Sewer Outfall Ditch)	Aluminum	2	2	2	0.087	0.479	1.7	NA	0.479 J (8/27/97) 1.7 - (9/10/97)
	Manganese	2	2	2	0.098	0.125	0.248	NA	0.248 - (8/27/97) 0.125 - (9/10/97)
SWD-03 (Waste Storage Area)	Manganese	1	1	1	0.098	0.142	NA	NA	0.142 - (8/27/97)
SWP-02 (Paddys Run)	Aluminum	2	1	1	0.087	0.001	0.102	NA	0.102 J (8/27/97)
SWP-03 (Paddys Run at Downstream Property Boundary)	Aluminum	1	1	1	0.087	2.34	NA	NA	2.34 J (8/13/97)
SWR-01 (Great Miami River Background)	Aluminum	1	1	1	0.087	0.448	NA	NA	0.448 - (9/25/97)
STRM 4005 (Pilot Plant Drainage Ditch)	Ammonia	3	1	1	1.0	0.05	1.73	0.665	1.73 (12/4/97)

[a]Highlighted results are also FRL exceedances.
[b]Total number of samples for all surface water programs (see Table 2-1). Refer to Figure 2-1 for reporting schedule (i.e., third quarter versus. fourth quarter).
[c]If more than one sample is collected per surface water location per day (e.g., duplicate, grab, composite), then only one sample is counted for the total number of samples and the sample with the maximum concentration is used for the summary statistics and in determining BTV exceedances.
[d]Rejected data qualified with either a R or Z was not used for this table.
[e]From IEMP Table 4-2
[f]If the total number of samples is greater than or equal to three, then the minimum, maximum, and arithmetical average are reported. If the total number of samples is equal to two, then the minimum and maximum are reported. If the total number of samples is equal to one, then none of the summary statistics are reported.
[g]NA = not applicable

FIGURE 2-1

SURFACE WATER AND TREATED EFFLUENT ACTIVITIES COVERED IN THIS REPORT

	1997						1998					
	3rd Quarter			4th Quarter			1st Quarter			2nd Quarter		
SAMPLING ACTIVITIES	JUL	AUG	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
NPDES[a]				♦	♦	♦						
FFCA[b]				♦	♦	♦						
IEMP Characterization		♦	♦									

♦ Data summarized/ evaluated in this report

[a]Reported in the monthly discharge monitoring reporting (DMRs) to OEPA
[b]Reported to EPA and OEPA in the quarterly FFCA reports

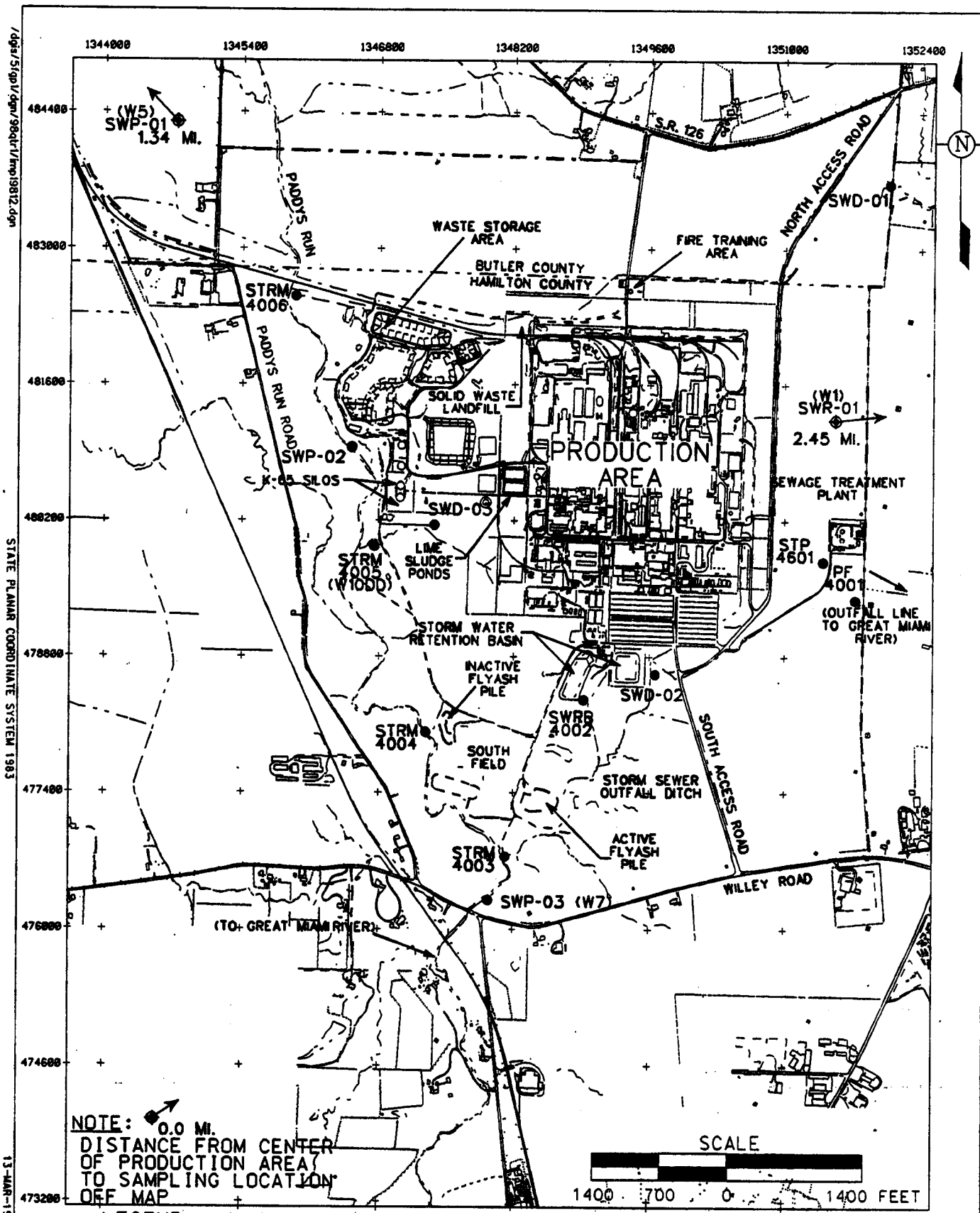
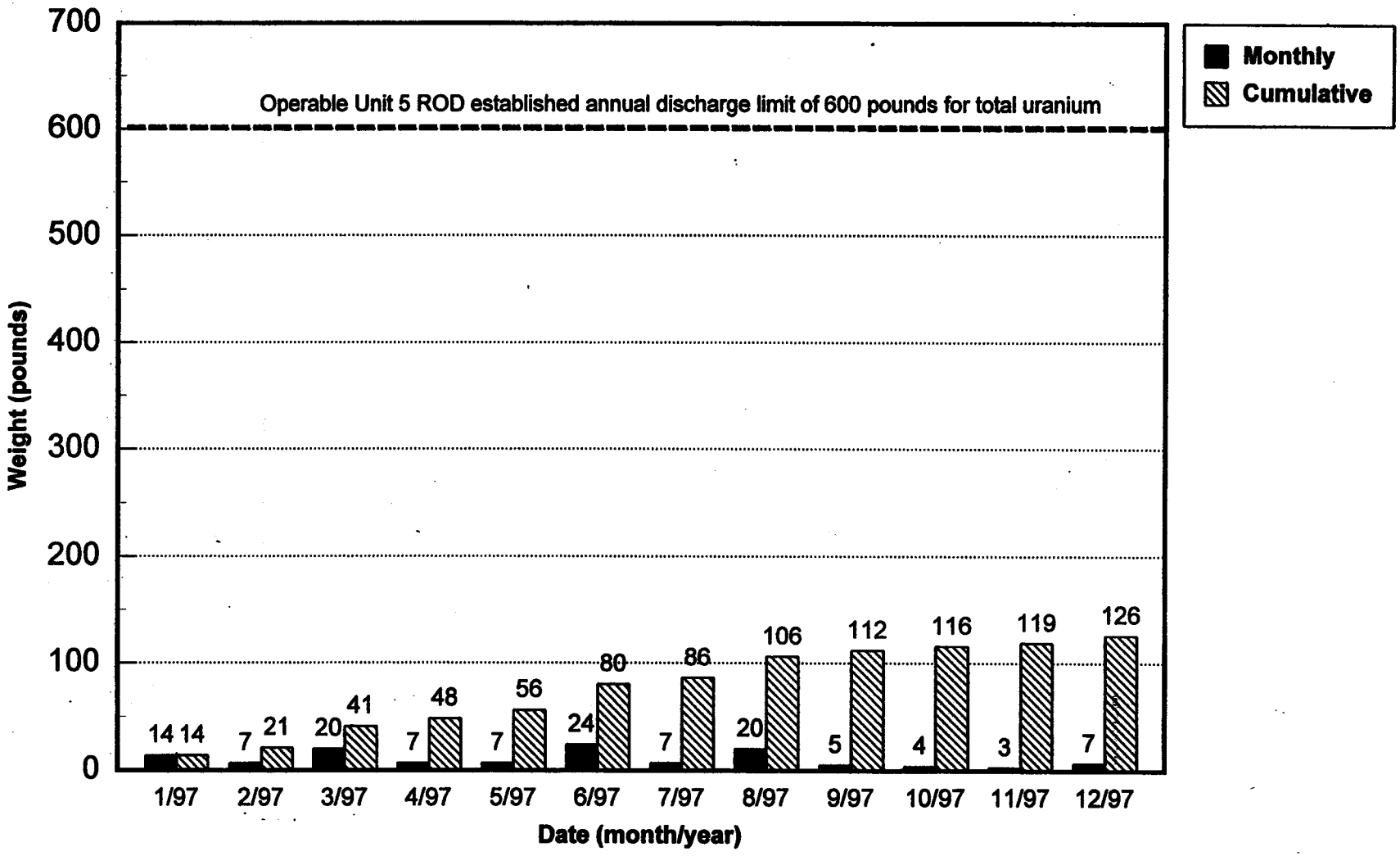
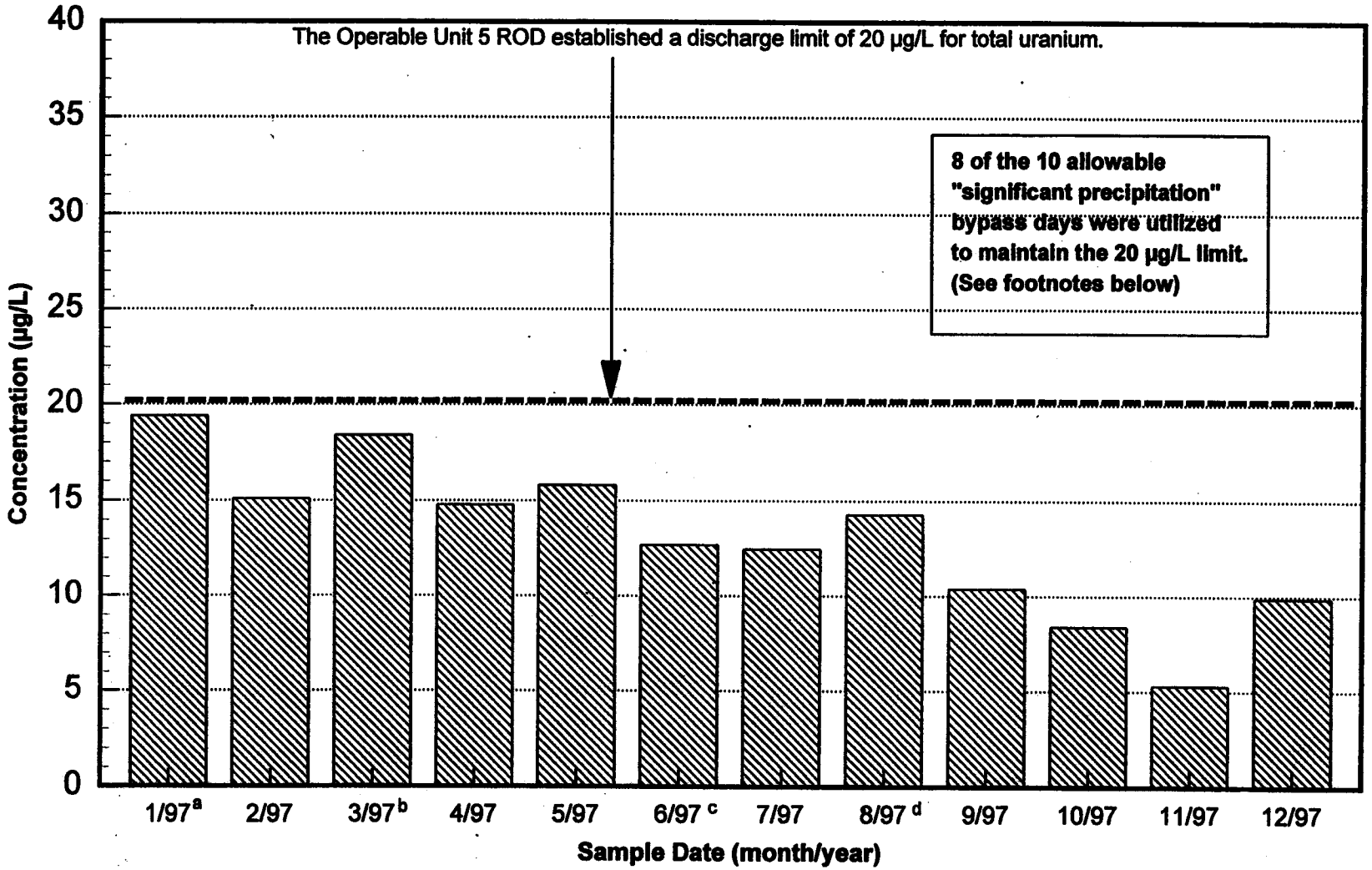


FIGURE 2-2. IEMP SURFACE WATER AND TREATED EFFLUENT MONITORING LOCATIONS



Note: Sum of monthly discharges may not always agree with cumulative total because of rounding differences.

FIGURE 2-3. POUNDS OF URANIUM DISCHARGED TO THE GREAT MIAMI RIVER FROM THE PARSHALL FLUME (PF 4001) IN 1997



[a]Actual concentration was 24.7 µg/L. Eliminating 1 "significant precipitation" bypass day reduces average to 19.4 µg/L.
[b]Actual concentration was 32.6 µg/L. Eliminating 2 "significant precipitation" bypass days reduces average to 18.4 µg/L.
[c]Actual concentration was 27.6 µg/L. Eliminating 5 "significant precipitation" bypass days reduces average to 12.7 µg/L.
[d]Actual concentration was 35.2 µg/L. Eliminating 3 "treatment plant maintenance" bypass days reduces average to 14.3 µg/L.

FIGURE 2-4. 1997 AVERAGE MONTHLY TOTAL URANIUM CONCENTRATION IN WATER DISCHARGED FROM THE PARSHALL FLUME (PF 4001) TO THE GREAT MIAMI RIVER

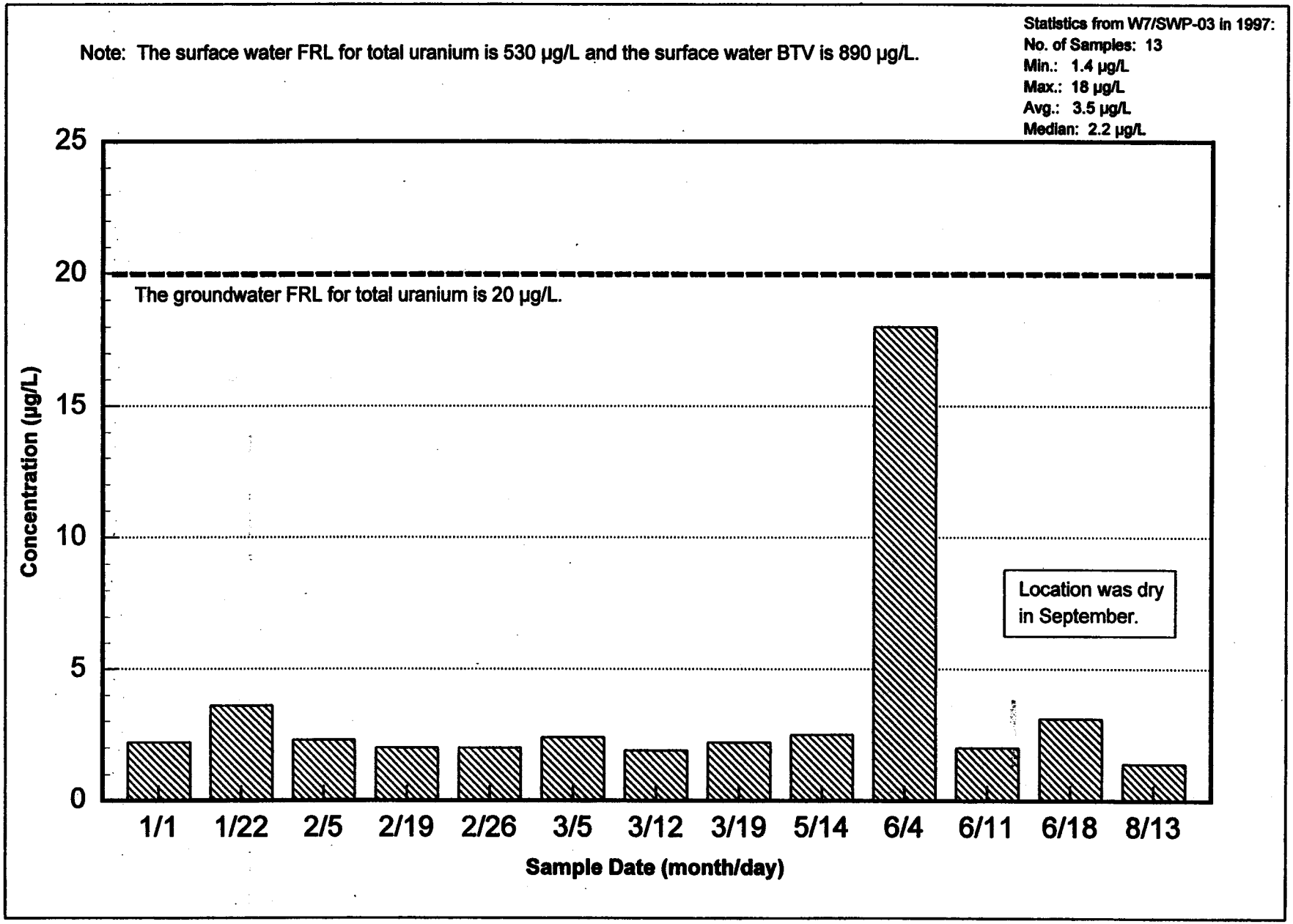


FIGURE 2-5. 1997 TOTAL URANIUM CONCENTRATIONS IN PADDYS RUN AT WILLEY ROAD (SWP-03/W7) SAMPLE LOCATION

3.0 AIR MONITORING UPDATE

3.1 INTRODUCTION

This section provides a summary of the monitoring activities and analytical results for the IEMP air monitoring program for October 1, 1997 through December 31, 1997 (fourth quarter). A snapshot of the data included in this section is provided in Figure 3-1. Results from the following routine air monitoring program elements and project-specific air monitoring activities are included in this section:

- Radiological Air Particulate Monitoring
  - Transition to a monitoring-based National Emissions Standards for Hazardous Air Pollutant (NESHAP) Subpart H Compliance
  - Close-out of project-specific air monitoring for Operable Unit 1
- Radon Monitoring
- Direct Radiation Monitoring (via thermoluminescent dosimeters [TLDs])
- NESHAP Stack Emissions Monitoring.

3.2 FINDINGS

The principle findings from the reporting period are summarized below:

Radiological Air Particulate Monitoring

- Total uranium concentrations at all air monitoring stations (AMS) were within historical ranges and did not exhibit any increasing trends during October through December 1997. A temporary increase in total uranium and total particulate concentration was observed at AMS-3 during early October. This increase corresponds with dry weather and a high level of construction activities associated with the on-site disposal facility and the new north access road.

  (Refer to Figure 3-2 for location of monitoring stations and Tables 3-1 and 3-2 and Figures 3-3 through 3-13 for data evaluation.)

- The maximum estimated dose (based on total uranium results) at the facility fenceline for 1997 was calculated to be 0.22 millirem (mrem) at AMS-3. This represents 2.2 percent of the 10 mrem NESHAP Subpart H limit.

Transition to a Monitoring-Based NESHAP Subpart H Compliance Program

- Installation of the eight new high volume air monitoring stations (AMS-22 through AMS-29) and relocation of one existing monitoring station (AMS-9B moved to location AMS-9C) on the FEMP property boundary are complete. The NESHAP compliance monitoring network consisting of 18 monitoring stations, as defined in Section 6.4.2.1 and Appendix C of the IEMP, began compliance monitoring on January 1, 1998.

  (Refer to Figure 3-2.)

- Five off-property monitors were removed from service during the fourth quarter of 1997 (AMS-10, AMS-11, AMS-13, AMS-14, and AMS-21). These monitors were not identified as part of the IEMP radiological air particulate monitoring network. It is anticipated that the Ohio Environmental Protection Agency (OEPA) will begin operating monitors at two of these locations (AMS-11 and AMS-13) in 1998 to support its oversight role at the facility.

  (Refer to Figure 3-2.)

- AMS-24 was removed from service in October due to electrical interference at a nearby residence. Corrective actions were implemented and this location was returned to service in late December. The DOE has recieved verbal approval from the EPA to relocate this monitor away from the current location to avoid any future inconvenience for the property owners.

Project-Specific Air Monitoring Activities

- The four project-specific waste pit area environmental air monitors (AMS-17 through AMS-20) were removed from service as of January 9, 1998. (Note: This action occurred after the time frame included in this report, but is reported here to keep the EPA and OEPA informed of changes in a timely manner.) These monitors were part of a project-specific monitoring network installed in 1992 to evaluate fugitive emissions from the waste pit area. With implementation of the radiological air particulate monitoring program specified in the IEMP, fugitive emissions associated with the waste pit area will be monitored collectively with other project emissions to evaluate compliance with NESHAP Subpart H requirements. As implementation of the remedy for Operable Unit 1 proceeds, future needs for project-specific air monitoring will be evaluated based on the pertinent regulatory drivers and process control needs of the project.

  (Refer to Figure 3-2.)

Radon Monitoring

- During October through December 1997, there were two days on which the 100 picoCuries per liter (pCi/L) radon limit specified in DOE Order 5400.5 was exceeded. The exceedances were detected in continuous radon monitors located immediately adjacent to the K-65 silos, were of short-duration, and were not observed

outside the immediate vicinity of the K-65 exclusion fence. As in the past, these exceedances were associated with particularly strong atmospheric inversions rather than with any operational change associated with the K-65 silos. Based on the limited occurrence, short duration, and limited areal extent of the exceedances, no additional actions are planned.

(Refer to Figure 3-14 for radon monitoring-continuous alpha scintillation locations.)

- Observed increases in annual average radon concentrations at the K-65 exclusion fence correspond to increasing radon concentrations in the K-65 silo head space (head space data provided previously through Enclosure C of the FFCA Quarterly Reports). However, concentrations at the exclusion fence remain well below the DOE limit of 30 pCi/L (annual average above background, sitewide), and well below radon concentrations observed prior to the addition of the bentonite to the silos in 1991. In addition, no corresponding increases in radon concentrations have been observed at the facility property boundary, where radon concentrations remain similar to background levels and well below the DOE property boundary limit of 3.0 pCi/L (annual average above background).

  (Refer to Figure 3-15 for the results of this comparison.)

- The radon data from alpha track-etch cups for the period July through December was not available for inclusion in this report due to the collection period occurring at the beginning of January. However, these data will be reported in the June 1998 transitional IEMP annual report.

Direct Radiation Monitoring

- All monitoring results from environmental direct radiation measurements for October through December 1997 were within historical ranges. A slight positive trend in the immediate area of the K-65 silos has been identified and will continue to be monitored. This trend is attributable to a corresponding increase in radon concentrations observed in the K-65 silo headspace as reported through Enclosure C of the FFCA quarterly report. The increase in environmental direct radiation measurements adjacent to the silos is still well below the levels observed prior to the addition of bentonite to the silos in 1991 and is not observed at the facility fenceline.

  (Refer to Table 3-3 and Figures 3-16 and 3-17.)

NESHAP Stack Emissions Monitoring

- The available data for the three monitoring locations are within historical ranges and no significant changes in the source operations associated with the monitored stacks were noted.

  (Refer to Figure 3-18 for monitoring locations.)

- One anomalous condition was identified during the fourth quarter of 1997. It was observed during the year-end inspection and sample recovery operations at Building 71 that the monitoring probe was mounted perpendicular to the direction of the stack air flow rather than parallel to the flow as required. This probe is mounted down stream of a high efficiency particulate air (HEPA) filter with a collection efficiency of 99.97 percent for 0.3 micron particles. The filter integrity was verified through di-octyl phthalate (DOP) testing before and after the sampling period. Because particles of < 0.3 microns in size act similar to gases, it is believed that the mounting of the sampling probe in a perpendicular position did not significantly impact the data collection. As with other samplers operating downstream of a HEPA filter, the analysis was at or below the detection limit for total uranium, thorium-230, and thorium-232. Data collected following reinstallation of the probe will be evaluated to detect discernable changes in the data.

Monitoring activities defined under the IEMP for radiological particulate, radon, and direct radiation monitoring will continue as planned during the first quarter of 1998.

TABLE 3-1

TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR

	Fourth Quarter Results[a,b,c,d]				1997 Year End Results[b,c,d]				Summary of 1996 Results[b,c,d,e]				Summary of 1990-1995 Results[d]	
Location[f,g]	No. of	Min.	Max.	Avg.	No.	Min.	Max.	Avg.	No. of	Min.	Max.	Avg.	Min.	Max.
AMS-2	7	0.0E+00	1.1E-04	4.3E-05	28	0.0E+00	2.5E-04	5.1E-05	27	0.0E+00	9.4E-04	1.0E-04	0.0E+00	3.5E-03
AMS-3	7	2.3E-05	1.2E-03	2.2E-04	28	2.5E-06	1.2E-03	1.9E-04	27	5.3E-06	7.2E-04	1.7E-04	0.0E+00	1.7E-02
AMS-4	7	7.7E-06	7.1E-05	2.7E-05	28	0.0E+00	2.6E-04	3.3E-05	27	5.3E-06	4.1E-04	6.3E-05	0.0E+00	2.3E-03
AMS-5	7	0.0E+00	3.3E-05	1.8E-05	28	0.0E+00	2.2E-04	2.7E-05	27	5.4E-06	3.7E-04	7.3E-05	0.0E+00	4.4E-03
AMS-6	7	5.0E-06	7.9E-05	3.0E-05	28	5.0E-06	1.4E-04	4.2E-05	27	2.7E-06	5.1E-04	9.1E-05	0.0E+00	3.2E-03
AMS-7	7	1.0E-05	1.1E-04	4.4E-05	28	0.0E+00	1.5E-04	3.6E-05	27	0.0E+00	2.0E-04	2.4E-05	0.0E+00	7.8E-03
AMS-8A	7	1.0E-05	2.3E-04	5.9E-05	28	1.0E-05	2.3E-04	8.2E-05	11	1.3E-05	9.0E-04	3.1E-04	NA[h]	NA[h]
AMS-9C	6	2.4E-05	8.7E-05	4.8E-05	6	2.4E-05	8.7E-05	4.8E-05	0[i]	NA	NA	NA	NA	NA
AMS-22	6	0.0E+00	2.9E-05	1.4E-05	6	0.0E+00	2.9E-05	1.4E-05	0[i]	NA	NA	NA	NA	NA
AMS-23	6	9.8E-06	5.3E-05	2.9E-05	6	9.8E-06	5.3E-05	2.9E-05	0[i]	NA	NA	NA	NA	NA
AMS-24	1	1.1E-04	NA	NA	1	1.1E-04	NA	NA	0[i]	NA	NA	NA	NA	NA
AMS-25	6	6.7E-06	3.0E-05	1.9E-05	6	6.7E-06	3.0E-05	1.9E-05	0[i]	NA	NA	NA	NA	NA
AMS-26	6	0.0E+00	4.1E-05	1.9E-05	6	0.0E+00	4.1E-05	1.9E-05	0[i]	NA	NA	NA	NA	NA
AMS-27	6	0.0E+00	3.0E-05	2.0E-05	6	0.0E+00	3.0E-05	2.0E-05	0[i]	NA	NA	NA	NA	NA
AMS-28	6	0.0E+00	2.9E-05	1.3E-05	6	0.0E+00	2.9E-05	1.3E-05	0[i]	NA	NA	NA	NA	NA
AMS-29	6	0.0E+00	7.6E-05	2.9E-05	6	0.0E+00	7.6E-05	2.9E-05	0[i]	NA	NA	NA	NA	NA
AMS-10[j]	1	4.0E-05	NA	NA	22	0.0E+00	4.5E-05	2.1E-05	26	0.0E+00	7.2E-05	2.2E-05	0.0E+00	2.2E-04
AMS-11[j]	7	0.0E+00	2.3E-05	1.2E-05	28	0.0E+00	3.0E-05	1.2E-05	27	0.0E+00	2.2E-04	2.1E-05	0.0E+00	1.6E-04
AMS-12	7	0.0E+00	1.8E-05	8.9E-06	28	0.0E+00	2.9E-05	8.1E-06	27	0.0E+00	3.7E-05	7.7E-06	0.0E+00	4.8E-04
AMS-13[j]	5	0.0E+00	7.1E-05	2.5E-05	26	0.0E+00	7.1E-05	1.9E-05	27	4.5E-06	2.0E-04	2.7E-05	0.0E+00	2.3E-04
AMS-14[j]	3	0.0E+00	3.3E-05	1.6E-05	24	0.0E+00	3.7E-05	1.8E-05	27	0.0E+00	7.5E-05	2.1E-05	0.0E+00	4.4E-04
AMS-16	7	0.0E+00	4.9E-05	1.7E-05	28	0.0E+00	1.1E-04	1.9E-05	27	0.0E+00	6.2E-05	1.1E-05	0.0E+00	3.5E-04
AMS-21[j]	1	4.4E-05	NA	NA	22	0.0E+00	4.4E-05	1.2E-05	27	0.0E+00	6.2E-05	1.8E-05	0.0E+00	4.3E-05

[a]Fourth quarter 1997 sample dates are October 14 to December 30.
[b]For blank corrected concentrations less than or equal to 0.0E+00 pCi/m^3, the concentration is set as 0.0E+00 pCi/m^3.
[c]If the total number of samples is equal to one, then the data point is reported as the minimum.
[d]NA = not applicable
[e]1996 summary average results may be slightly higher than those reported in the 1996 SER (due to reporting sample activity that was less than the blank activity as a zero value).
[f]See Figure 3-2
[g]AMS-2 to AMS-9C & AMS-22 to AMS-29 are on-site/fenceline monitors.
AMS-10 to AMS-21 are off-site/background monitors.
[h]AMS-8A was placed in service in 1996.
[i]AMS locations were placed in service in 1997.
[j]AMS locations were taken out of service during the fourth quarter.

TABLE 3-2

TOTAL PARTICULATE CONCENTRATIONS IN AIR

Location[a,b]	Fourth Quarter Results[c,d,e] ($\mu g/m^3$)				1997 Year End Results[d,e] ($\mu g/m^3$)				Summary of 1996 Results[e] ($\mu g/m^3$)				Summary 1990-1995 Results[e] ($\mu g/m^3$)	
	# Samples	Min.	Max.	Avg.	# Samples	Min.	Max.	Avg.	# Samples	Min.	Max.	Avg.	Min.	Max.
AMS-2	7	21	55	32	28	16	77	31	20	7	52	28	11	67
AMS-3	7	20	159	43	28	17	159	39	20	16	56	33	8	128
AMS-4	7	17	51	28	28	14	51	30	20	19	63	34	13	69
AMS-5	7	23	41	27	28	11	42	28	20	17	56	33	12	62
AMS-6	7	22	47	28	28	8	53	29	20	19	56	32	8	69
AMS-7	7	24	55	30	28	24	55	34	20	18	59	34	13	76
AMS-8A	7	21	89	35	27	18	89	35	11	19	53	31	NA[f]	NA[f]
AMS-9C	6	24	39	29	6	24	39	29	0[g]	NA	NA	NA	NA	NA
AMS-22	6	21	30	27	6	21	30	27	0[g]	NA	NA	NA	NA	NA
AMS-23	6	22	28	25	6	22	28	25	0[g]	NA	NA	NA	NA	NA
AMS-24	1	74	NA	NA	1	74	NA	NA	0[g]	NA	NA	NA	NA	NA
AMS-25	6	26	40	33	6	26	40	33	0[g]	NA	NA	NA	NA	NA
AMS-26	6	20	23	22	6	20	23	22	0[g]	NA	NA	NA	NA	NA
AMS-27	6	33	49	38	6	33	49	38	0[g]	NA	NA	NA	NA	NA
AMS-28	6	16	30	19	6	16	30	19	0[g]	NA	NA	NA	NA	NA
AMS-29	6	19	30	25	6	19	30	25	0[g]	NA	NA	NA	NA	NA
AMS-10[h]	0	NS	NS	NS	0	NS	NS	NS	0	NS	NS	NS	21	110
AMS-11[h]	0	NS	NS	NS	0	NS	NS	NS	0	NS	NS	NS	15	88
AMS-12[h]	7	18	35	22	14	18	41	27	0	NS	NS	NS	6	416
AMS-13[h]	0	NS	NS	NS	0	NS	NS	NS	0	NS	NS	NS	18	95
AMS-14[h]	0	NS	NS	NS	0	NS	NS	NS	0	NS	NS	NS	19	126
AMS-16[h]	7	28	62	37	14	27	79	46	0	NS	NS	NS	22	59
AMS-21[h]	0	NS	NS	NS	0	NS	NS	NS	0	NS	NS	NS	NS[i]	NS[i]

[a]See Figure 3-2
[b]AMS-2 to AMS-9C & AMS-22 to AMS-29 are on-site/fenceline monitors.
AMS-10 to AMS-21 are off-site/background monitors.
[c]Fourth Quarter 1997 sample dates are October 14 to December 30.
[d]If the total number of samples is equal to one, then the data point is reported as the minimum.
[e]NA = not applicable
NS = not sampled
[f]AMS-8A was not yet in operation prior to 1996.
[g]AMS locations were not yet in operation prior to 1997.
[h]Total particulate analysis was discontinued during 1994 and was reinstated for AMS-12 and AMS-16 in 1997.
[i]AMS-21 was not sampled for total particulate during 1990-1995.

TABLE 3-3

DIRECT RADIATION (TLD) MEASUREMENTS

TLD Location #	Direct Radiation ± Uncertainty[a] (mrem)					
	1st Quarter[b,c,d] 1997	2nd Quarter[c,d,e] 1997	3rd Quarter[c,d,f] 1997	4th Quarter 1997	Year End Results 1997	Year End Results[c,d] 1996
Fenceline						
2	17 ± 1.3	18 ± 2.3	19 ± 3.1	18 ± 3.5	72 ± 10	73 ± 7.0
3	15 ± 1.1	16 ± 2.0	17 ± 2.8	17 ± 3.2	65 ± 9.0	67 ± 6.4
4	15 ± 1.1	18 ± 2.2	17 ± 2.8	16 ± 3.1	65 ± 9.1	64 ± 6.1
5	15 ± 1.1	17 ± 2.1	17 ± 2.9	17 ± 3.2	67 ± 9.3	67 ± 6.5
6	18 ± 1.4	20 ± 2.5	21 ± 3.5	20 ± 3.9	79 ± 11	75 ± 7.2
7	15 ± 1.1	17 ± 2.1	17 ± 2.8	16 ± 3.1	65 ± 9.0	67 ± 6.5
8A	17 ± 1.3	19 ± 2.4	19 ± 3.2	19 ± 3.5	74 ± 10	77 ± 7.5
9B/C[g]	18 ± 1.3	22 ± 2.7	20 ± 3.3	20 ± 3.9	80 ± 11	83 ± 8.0
13	17 ± 1.3	18 ± 2.2	18 ± 3.0	18 ± 3.4	71 ± 9.9	71 ± 6.9
14	16 ± 1.2	18 ± 2.2	18 ± 2.9	19 ± 3.5	70 ± 9.8	71 ± 6.9
15	17 ± 1.3	18 ± 2.3	20 ± 3.3	19 ± 3.6	74 ± 10	73 ± 7.0
16	17 ± 1.3	20 ± 2.5	20 ± 3.3	20 ± 3.9	77 ± 11	78 ± 7.5
17	15 ± 1.1	17 ± 2.2	19 ± 3.1	19 ± 3.6	70 ± 9.7	70 ± 6.8
34[h]	NA	NA	NA	18 ± 3.5	73 ± 14	NA
35[h]	NA	NA	NA	17 ± 3.2	67 ± 13	NA
36[h]	NA	NA	NA	15 ± 2.9	60 ± 12	NA
37[h]	NA	NA	NA	19 ± 3.6	75 ± 14	NA
38[h]	NA	NA	NA	15 ± 2.9	60 ± 11	NA
39[h]	NA	NA	NA	19 ± 3.6	76 ± 14	NA
40[h]	NA	NA	NA	16 ± 3.1	65 ± 12	NA
41[h]	NA	NA	NA	17 ± 3.3	70 ± 13	NA
Min.	**15 ± 1.1**	**16 ± 2.0**	**17 ± 2.8**	**15 ± 2.9**	**60 ± 12**	**64 ± 6.1**
Max.	**18 ± 1.4**	**22 ± 2.7**	**21 ± 3.5**	**20 ± 3.9**	**80 ± 11**	**83 ± 8.0**
Onsite						
1B	20 ± 1.5	21 ± 2.7	21 ± 3.5	21 ± 4.1	84 ± 12	82 ± 7.9[i]
22	204 ± 15	163 ± 20	177 ± 29	233 ± 45	778 ± 108	630 ± 60
23	157 ± 12	169 ± 21	172 ± 29	214 ± 41	712 ± 99	630 ± 61
24	111 ± 8.3	119 ± 15	133 ± 22	149 ± 29	512 ± 71	460 ± 44
25	157 ± 12	134 ± 17	151 ± 25	200 ± 38	641 ± 89	560 ± 54
26	97 ± 7.3	85 ± 11	113 ± 19	130 ± 25	425 ± 59	330 ± 32
32	13 ± 1.0	15 ± 1.8	13 ± 2.2	13 ± 2.4	54 ± 7.5	55 ± 5.4
Min.	**13 ± 1.0**	**15 ± 1.8**	**13 ± 2.2**	**13 ± 2.4**	**54 ± 7.5**	**55 ± 5.4**
Max.	**204 ± 15**	**169 ± 21**	**177 ± 29**	**233 ± 45**	**778 ± 108**	**630 ± 61**
Offsite						
10	12 ± 0.9	14 ± 1.7	13 ± 2.2	13 ± 2.5	52 ± 7.3	55 ± 5.3
11	15 ± 1.2	17 ± 2.1	17 ± 2.8	16 ± 3.1	65 ± 9.1	67 ± 6.5
12	14 ± 1.0	16 ± 2.0	15 ± 2.5	15 ± 2.8	59 ± 8.2	60 ± 5.8
30	14 ± 1.0	16 ± 2.0	14 ± 2.4	14 ± 2.8	59 ± 8.2	60 ± 5.8
Min.	**12 ± 0.9**	**14 ± 1.7**	**13 ± 2.2**	**13 ± 2.5**	**52 ± 7.3**	**55 ± 5.3**
Max.	**15 ± 1.2**	**17 ± 2.1**	**17 ± 2.8**	**16 ± 3.1**	**65 ± 9.1**	**67 ± 6.5**

TABLE 3-3
(Continued)

	Direct Radiation ± Uncertainty[a] (mrem)					
TLD Location #	1st Quarter[b,c,d] 1997	2nd Quarter[c,d,e] 1997	3rd Quarter[c,d,f] 1997	4th Quarter 1997	Year End Results 1997	Year End Results[c,d] 1996
Background						
18	16 ± 1.2	19 ± 2.4	19 ± 3.2	19 ± 3.6	74 ± 10	74 ± 7.2
19	14 ± 1.0	16 ± 2.0	15 ± 2.6	15 ± 2.9	60 ± 8.4	63 ± 6.0
20	13 ± 1.0	15 ± 1.8	14 ± 2.4	15 ± 2.8	57 ± 8.0	59 ± 5.7
21	15 ± 1.1	17 ± 2.2	18 ± 3.0	17 ± 3.2	67 ± 9.4	68 ± 6.6
27	14 ± 1.1	16 ± 2.0	15 ± 2.5	15 ± 2.9	60 ± 8.3	62 ± 5.9
33	16 ± 1.2	17 ± 2.1	16 ± 2.7	16 ± 3.1	65 ± 9.1	69 ± 6.7
Min.	**13 ± 1.0**	**15 ± 1.8**	**14 ± 2.4**	**15 ± 2.8**	**57 ± 8.0**	**59 ± 5.7**
Max.	**16 ± 1.2**	**19 ± 2.4**	**19 ± 3.2**	**19 ± 3.6**	**74 ± 10**	**74 ± 7.2**

[a]Associated laboratory uncertainty
[b]First quarter 1997 sample dates are January through March.
[c]Some of the numbers are slightly different than reported previously, due to rounding.
[d]NA = not applicable
[e]Second quarter 1997 sample dates are April through June.
[f]Third quarter sample dates are July through September.
[g]Locations 9B and 9C are combined to determine 1997 year end results.
[h]Annual total for location 34 through 41 calculated from fourth quarter (October through December) measurement. These locations were established during fourth quarter 1997.
[i]1996 year end results for 1B are extrapolated from third and fourth quarter measurements.

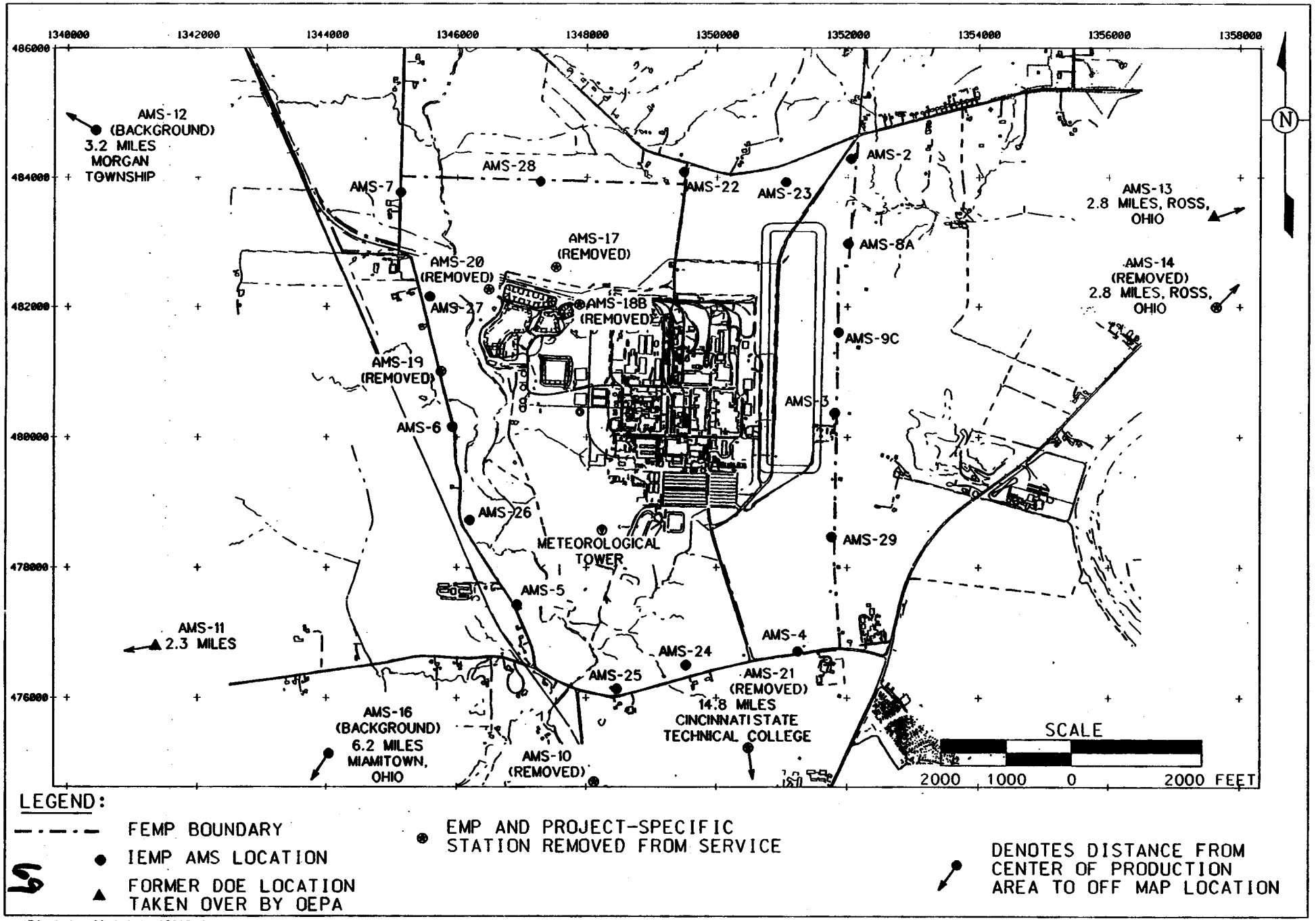
FIGURE 3-1

AIR SAMPLING ACTIVITIES COVERED IN THIS REPORT

SAMPLING ACTIVITIES	1997			1998								
	4th Quarter			1st Quarter			2nd Quarter			3rd Quarter		
	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP
Pre-IEMP Radiological Particulate Monitoring[a]	♦	♦	♦									
Radon Monitoring-Continuous Alpha Scintillation Monitors[b]			♦									
Direct Radiation (TLD) Monitoring			♦									
NESHAP Stack Emissions Monitoring			♦									

♦ Data summarized/ evaluated in this report

[a]Biweekly results
[b]Reported to EPA and OEPA in the quarterly FFCA reports



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STATE PLANAR COORDINATE SYSTEM 1983

FIGURE 3-2. IEMP RADIOLOGICAL AIR MONITORING PROGRAM

25-MAR-1998

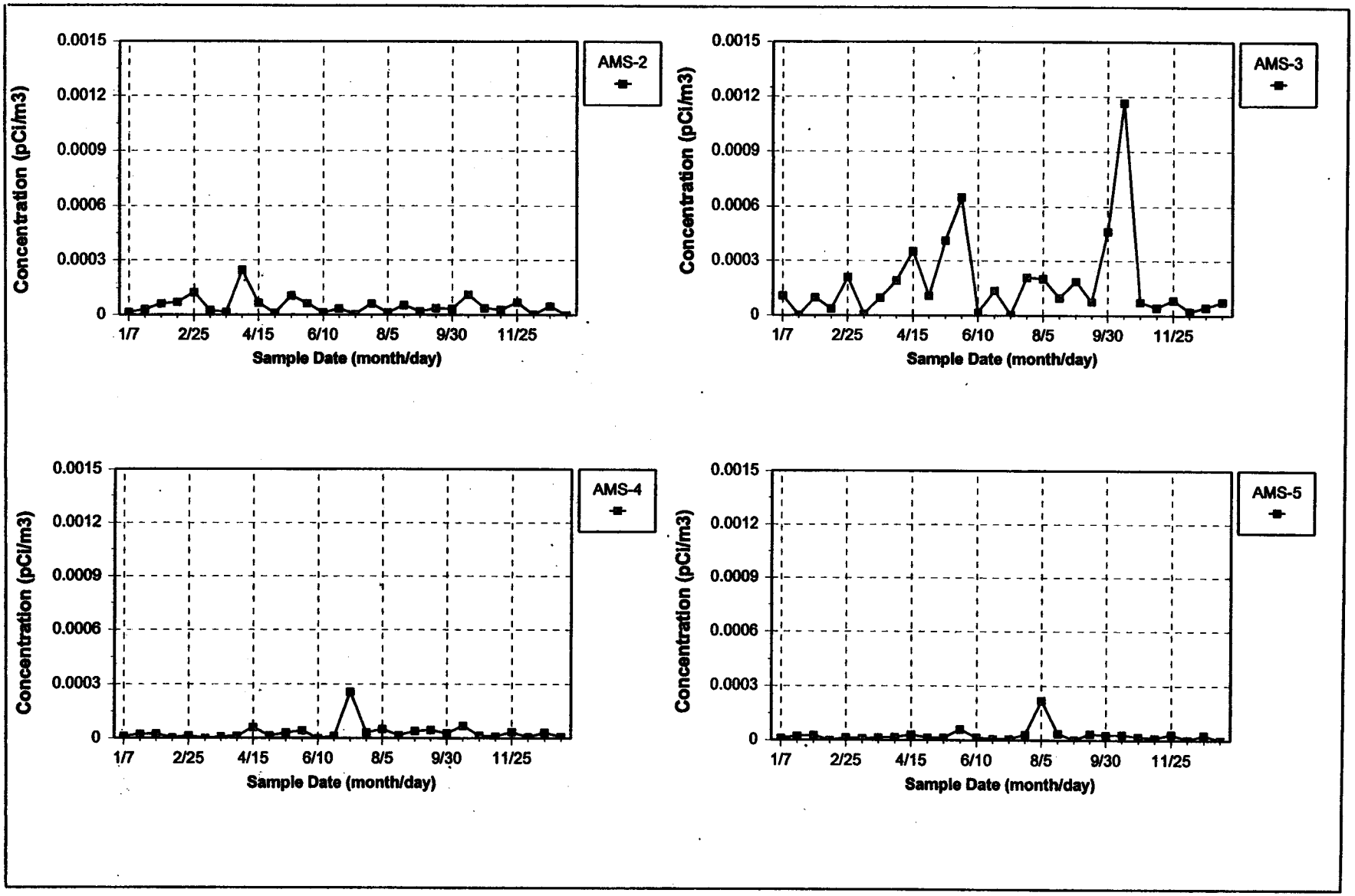


FIGURE 3-3. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-2, AMS-3, AMS-4, AND AMS-5)

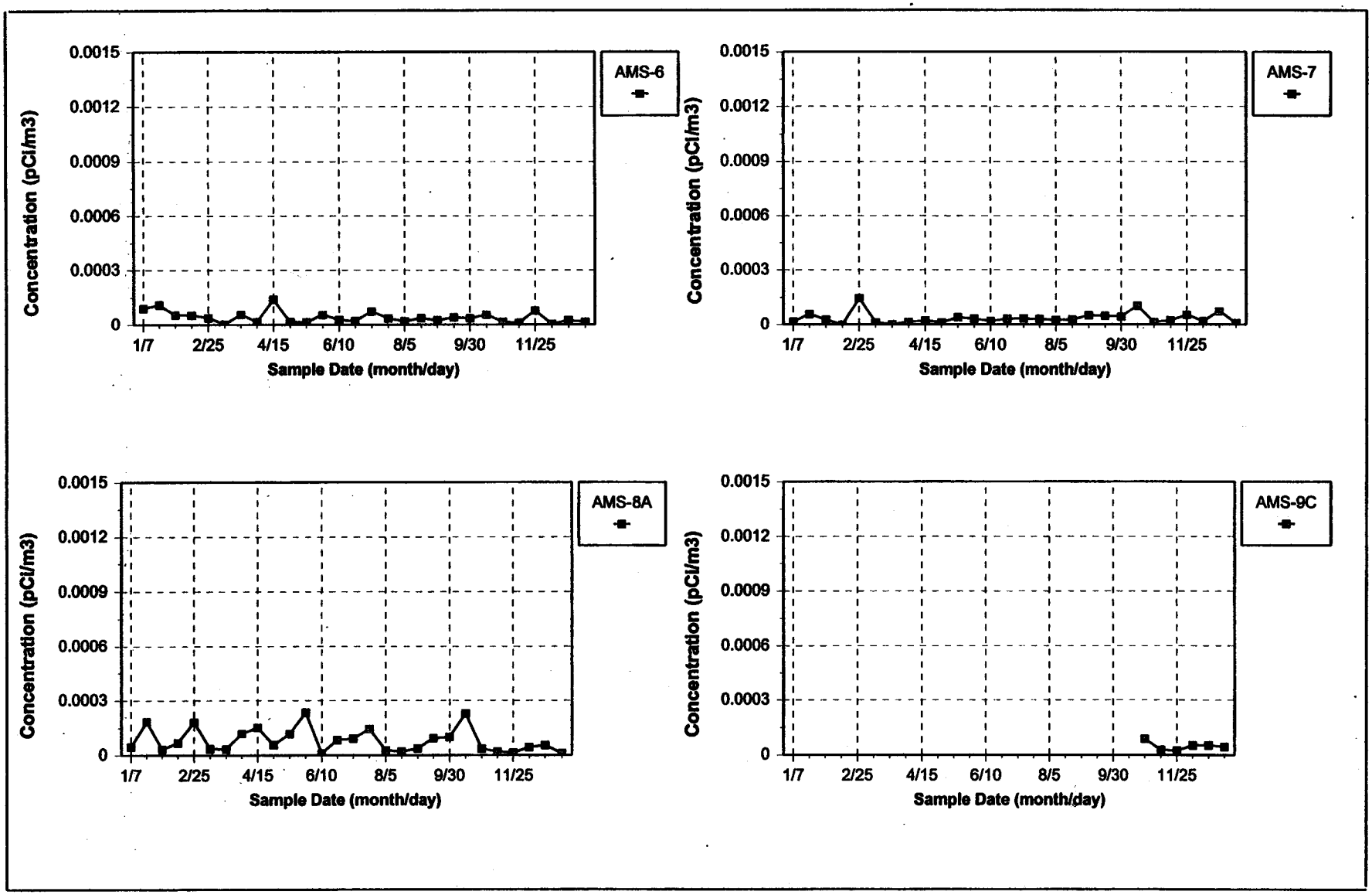


FIGURE 3-4. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-6, AMS-7, AMS-8A, AND AMS-9C)

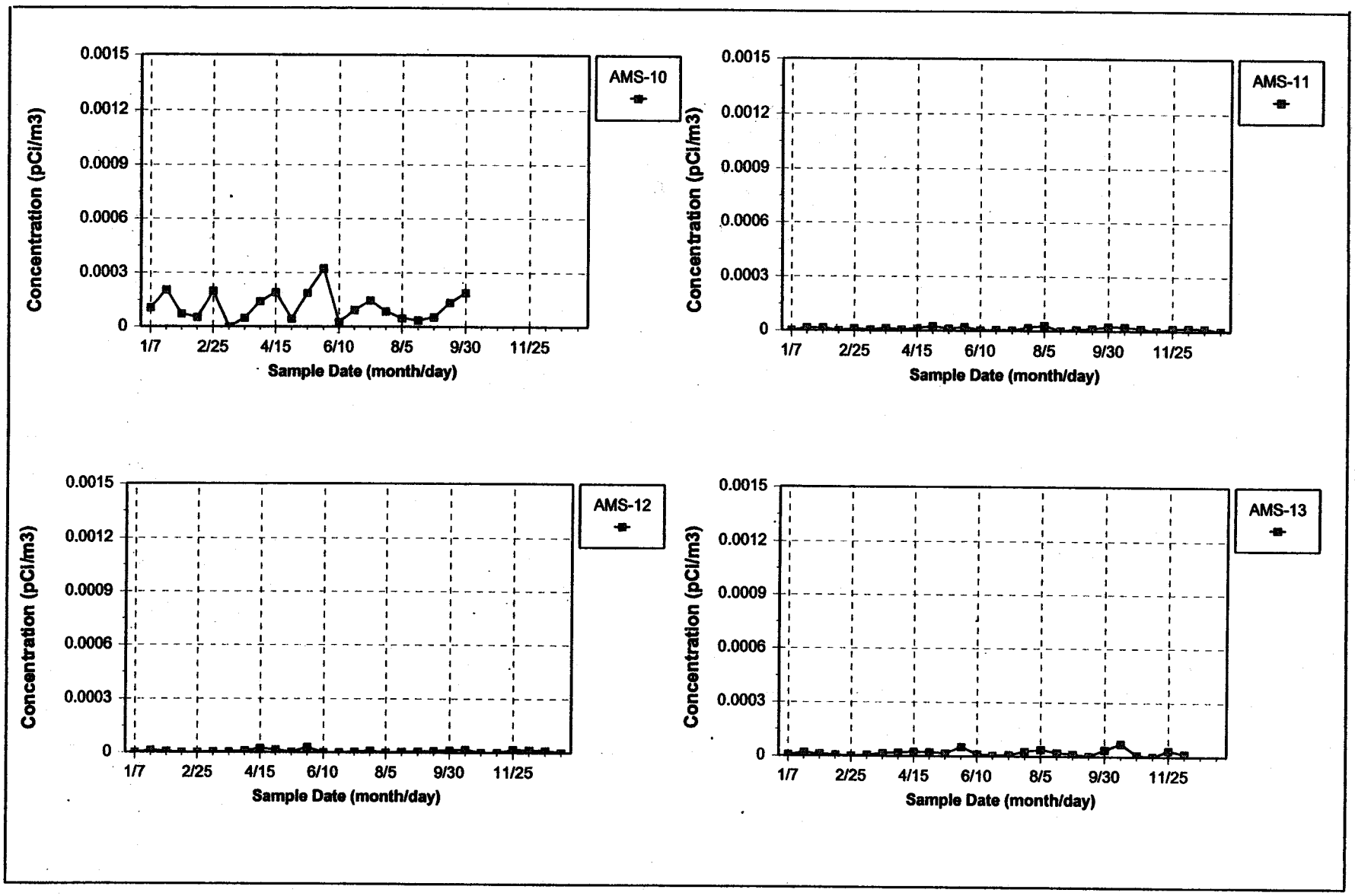


FIGURE 3-5. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-10, AMS-11, AMS-12, AND AMS-13)

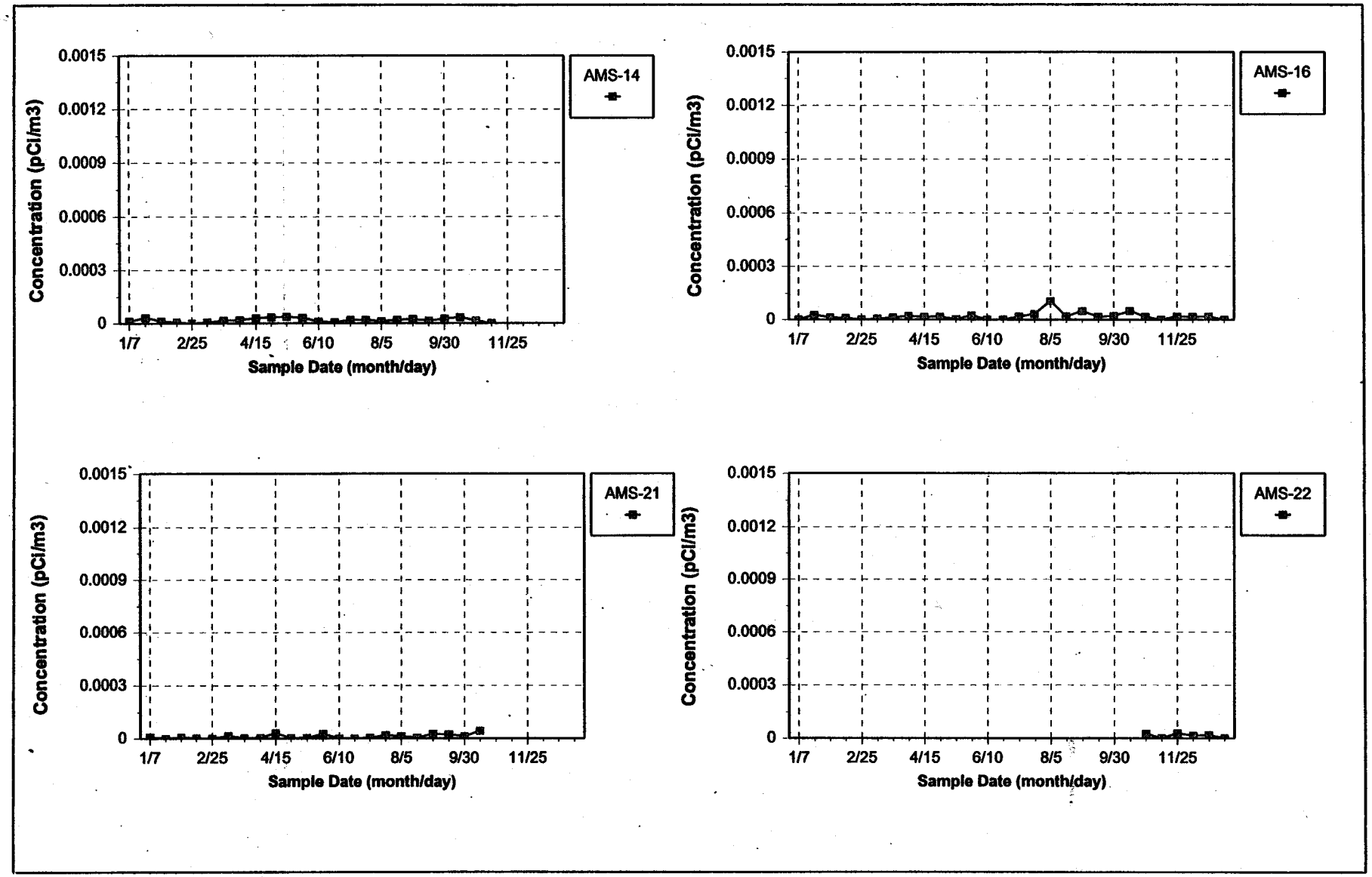


FIGURE 3-6. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-14, AMS-16, AMS-21, AND AMS-22)

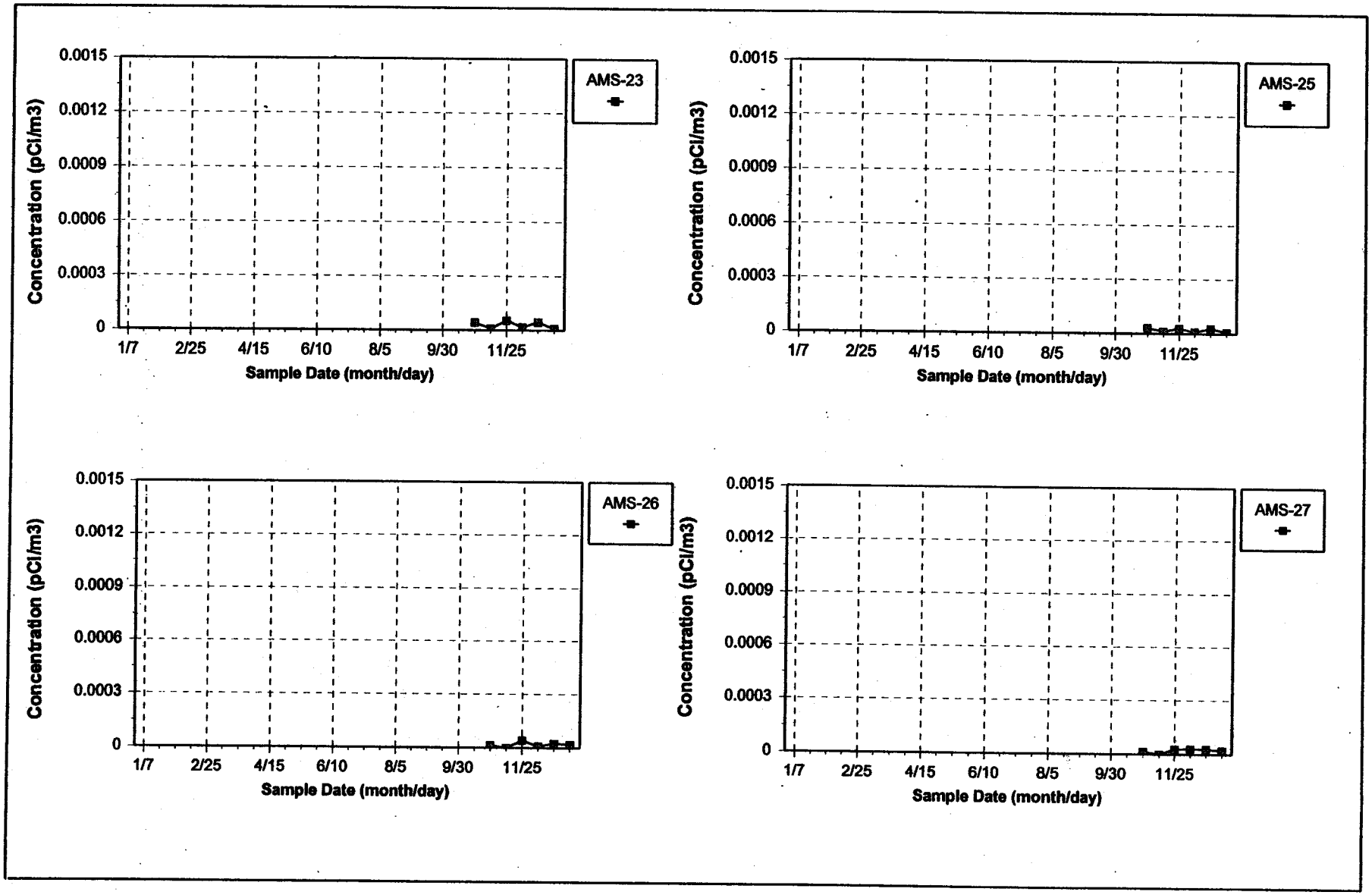


FIGURE 3-7. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-23, AMS-25, AMS-26, AND AMS-27)

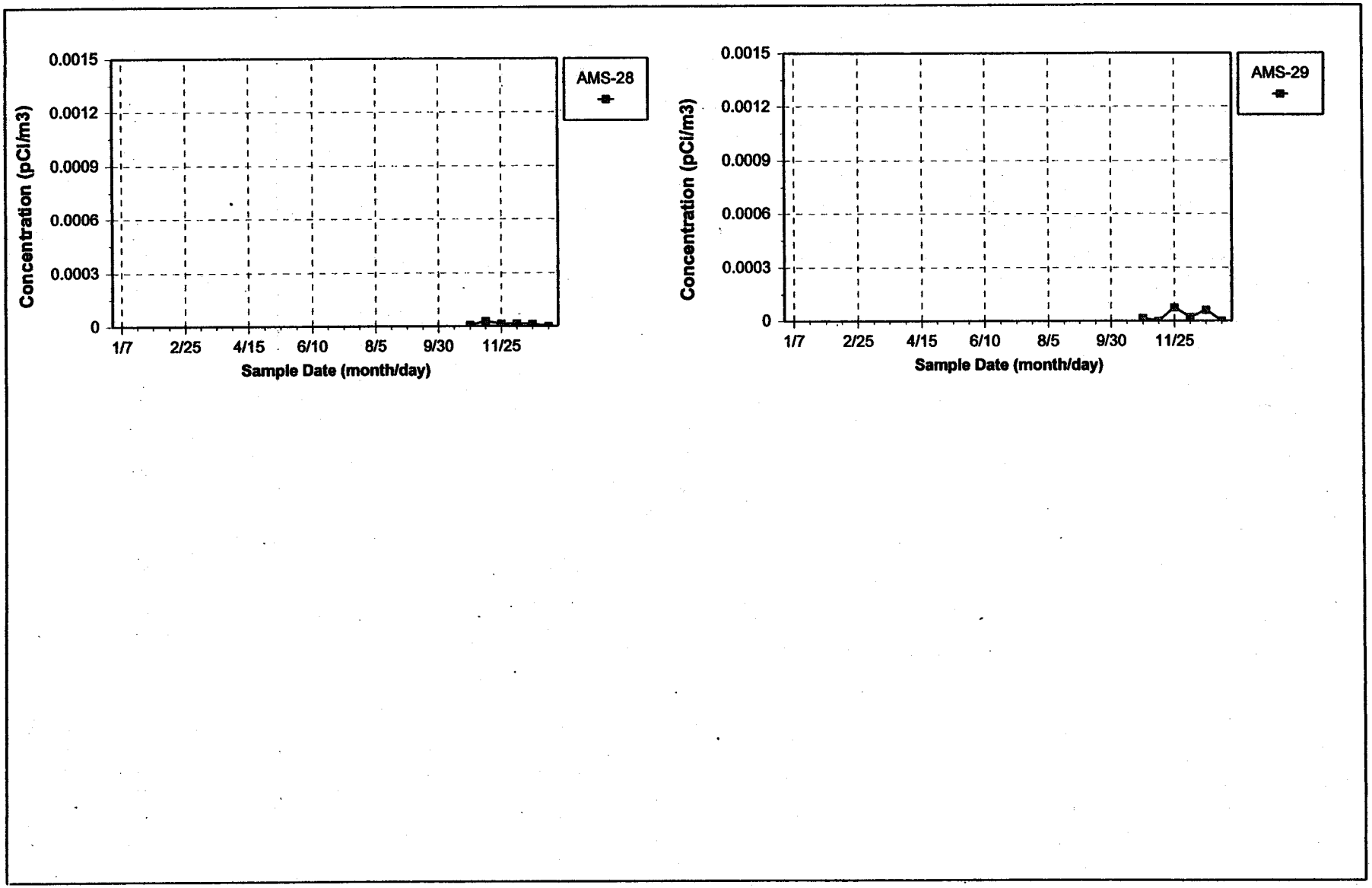


FIGURE 3-8. 1997 TOTAL URANIUM PARTICULATE CONCENTRATIONS IN AIR (AMS-28 AND AMS-29)

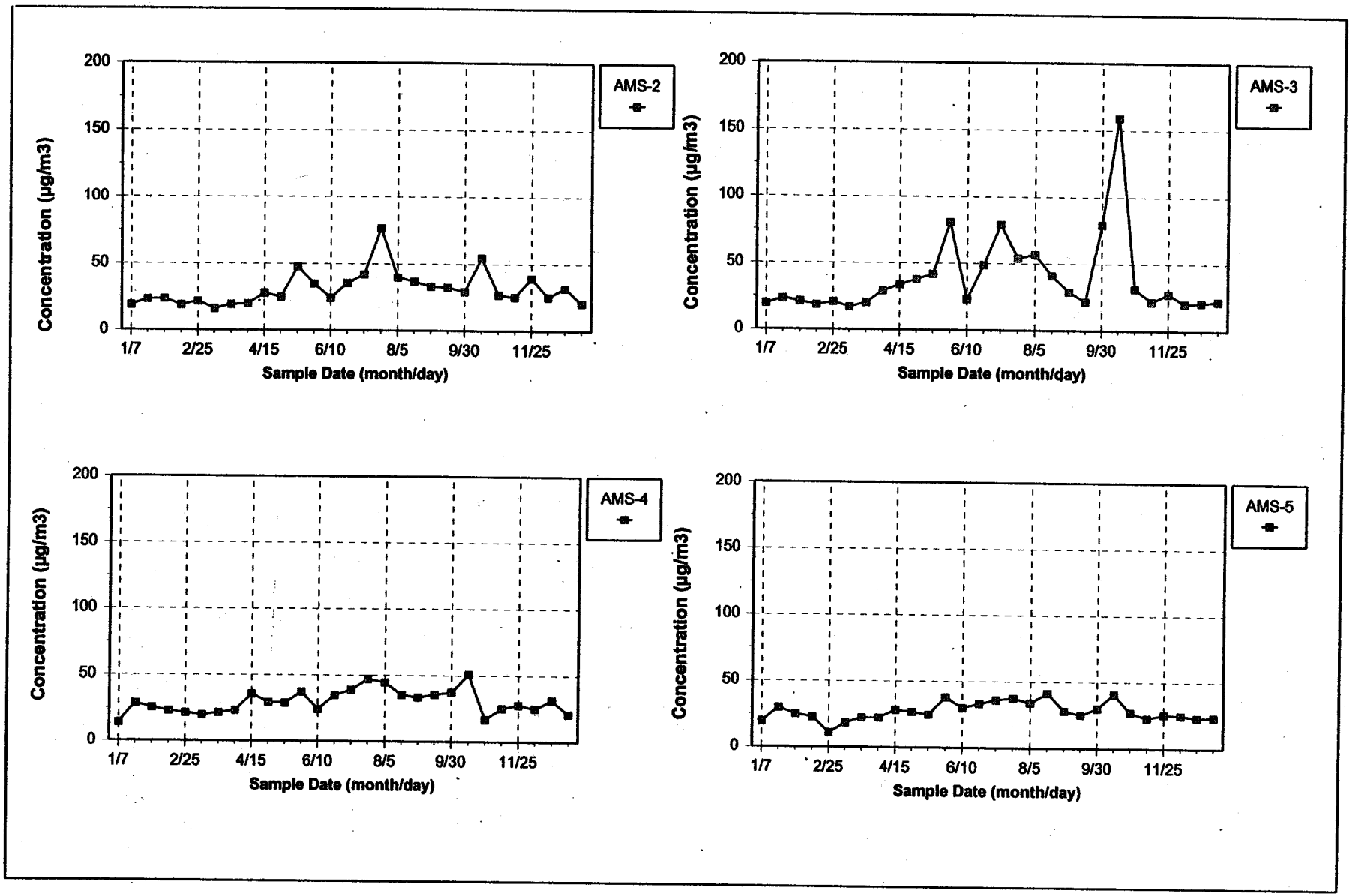


FIGURE 3-9. 1997 TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-2, AMS-3, AMS-4, AND AMS-5)

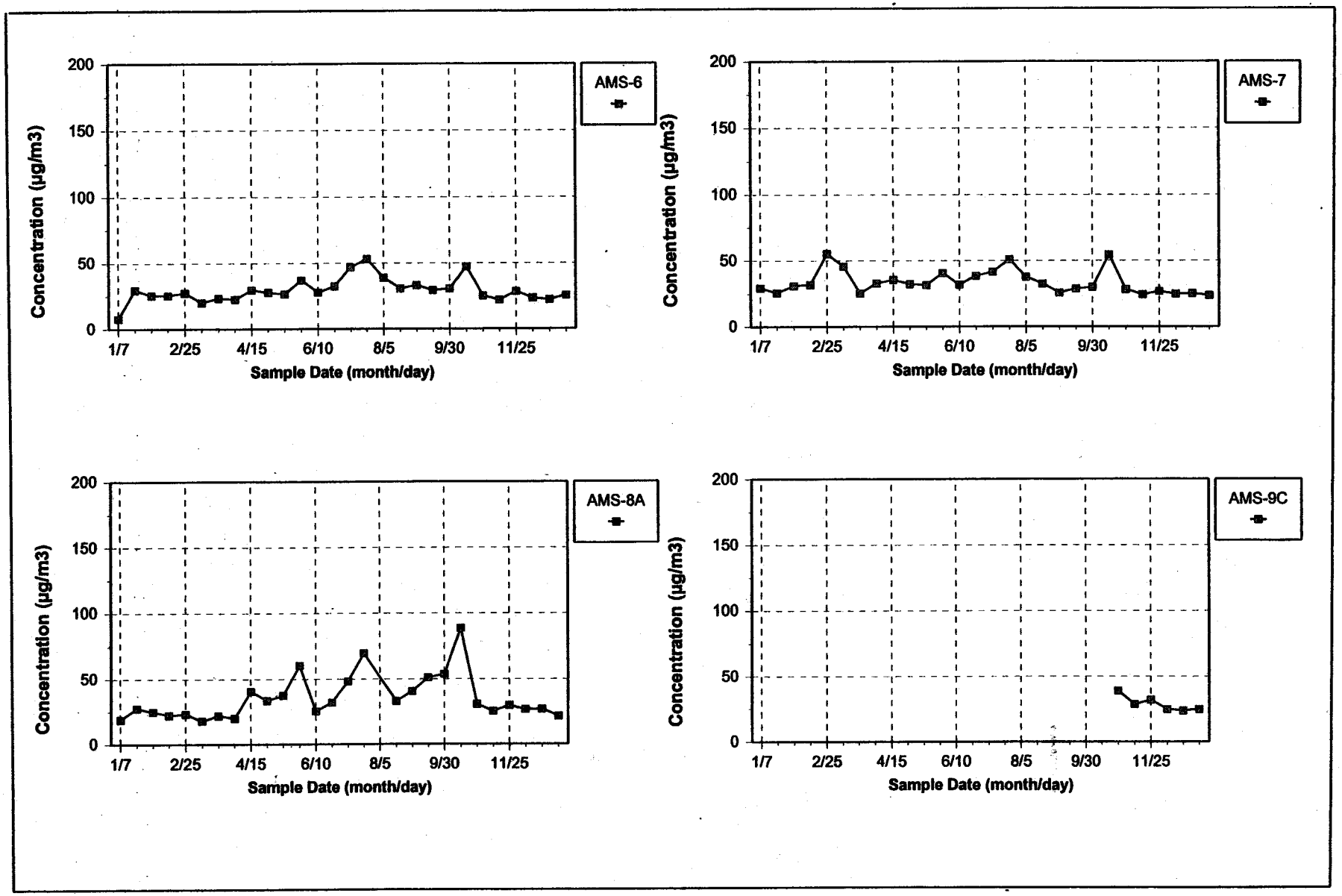


FIGURE 3-10. 1997 TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-6, AMS-7, AMS-8A, AND AMS-9C)

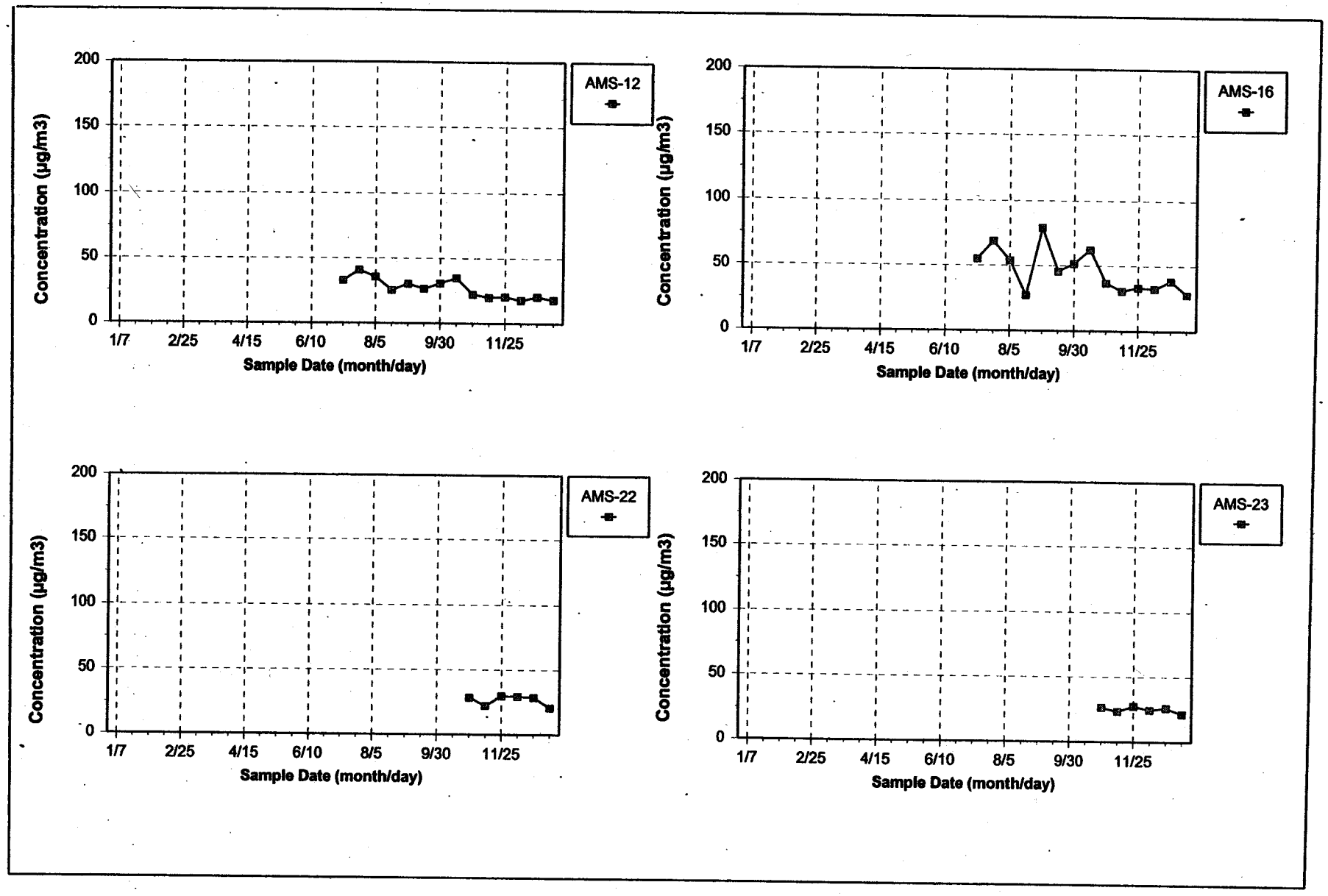


FIGURE 3-11. 1997 TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-12, AMS-16, AMS-22, AND AMS-23)

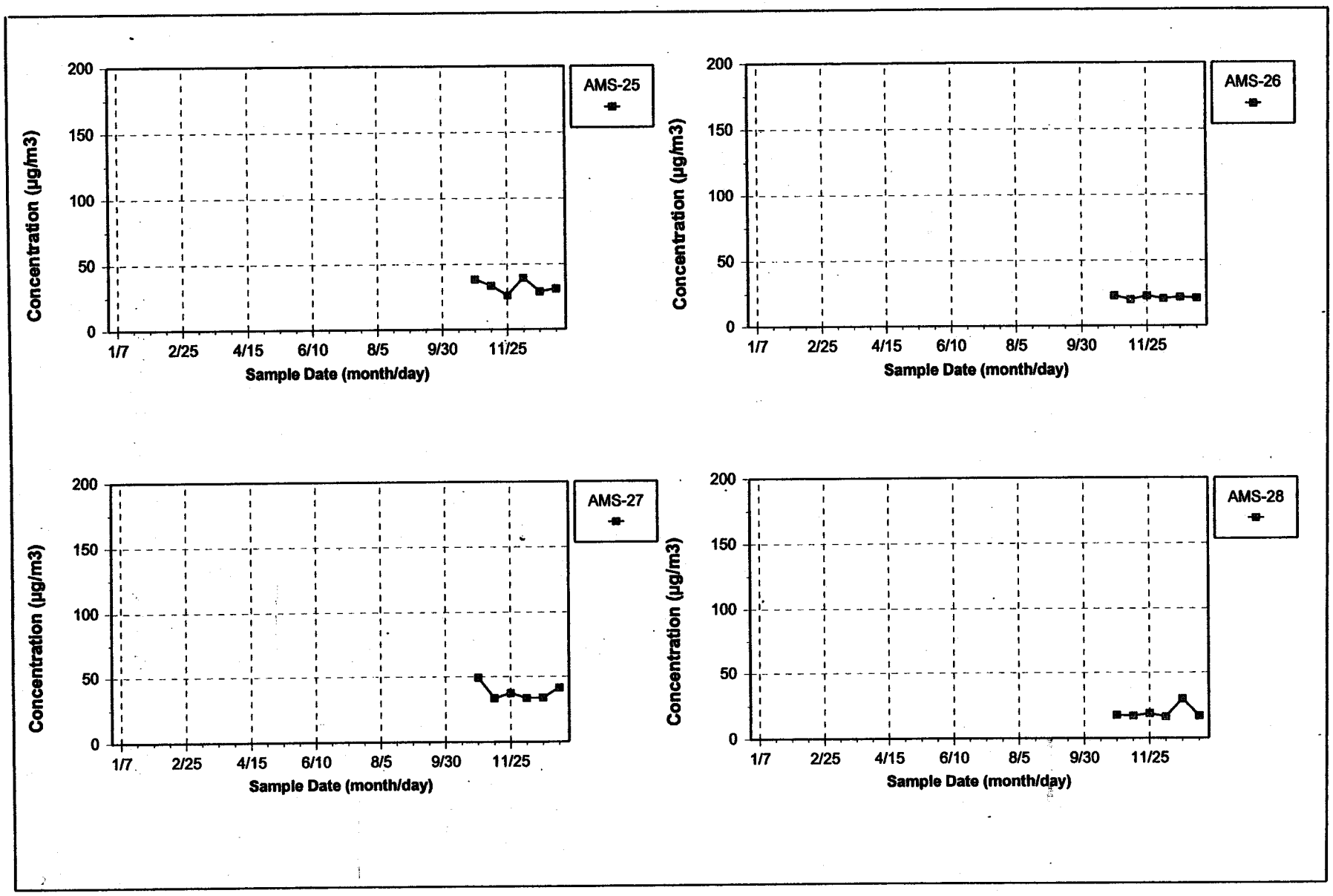


FIGURE 3-12. 1997 TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-25, AMS-26, AMS-27, AND AMS-28)

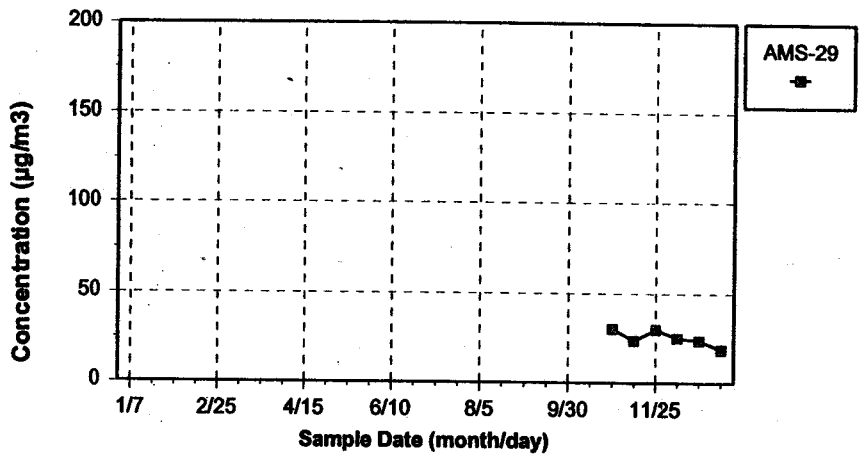
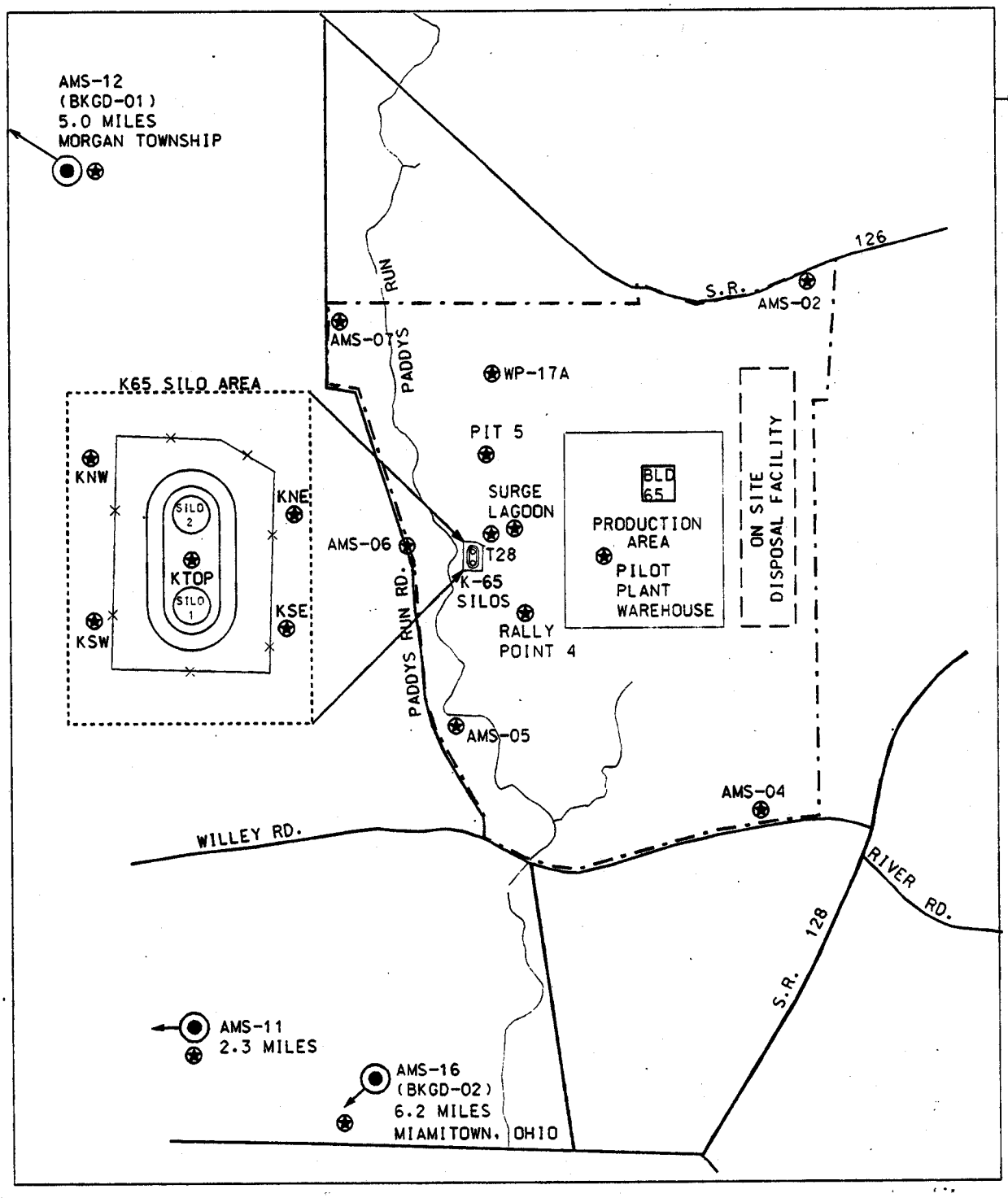


FIGURE 3-13. 1997 TOTAL PARTICULATE CONCENTRATIONS IN AIR (AMS-29)



LEGEND:

FEMP BOUNDARY

RADON MONITORING-CONTINUOUS ALPHA SCINTILLATION LOCATION

DISTANCE FROM CENTER OF PRODUCTION AREA TO LOCATION OFF THE MAP

NOT TO SCALE

FIGURE 3-14. RADON MONITORING-CONTINUOUS ALPHA SCINTILLATION LOCATIONS

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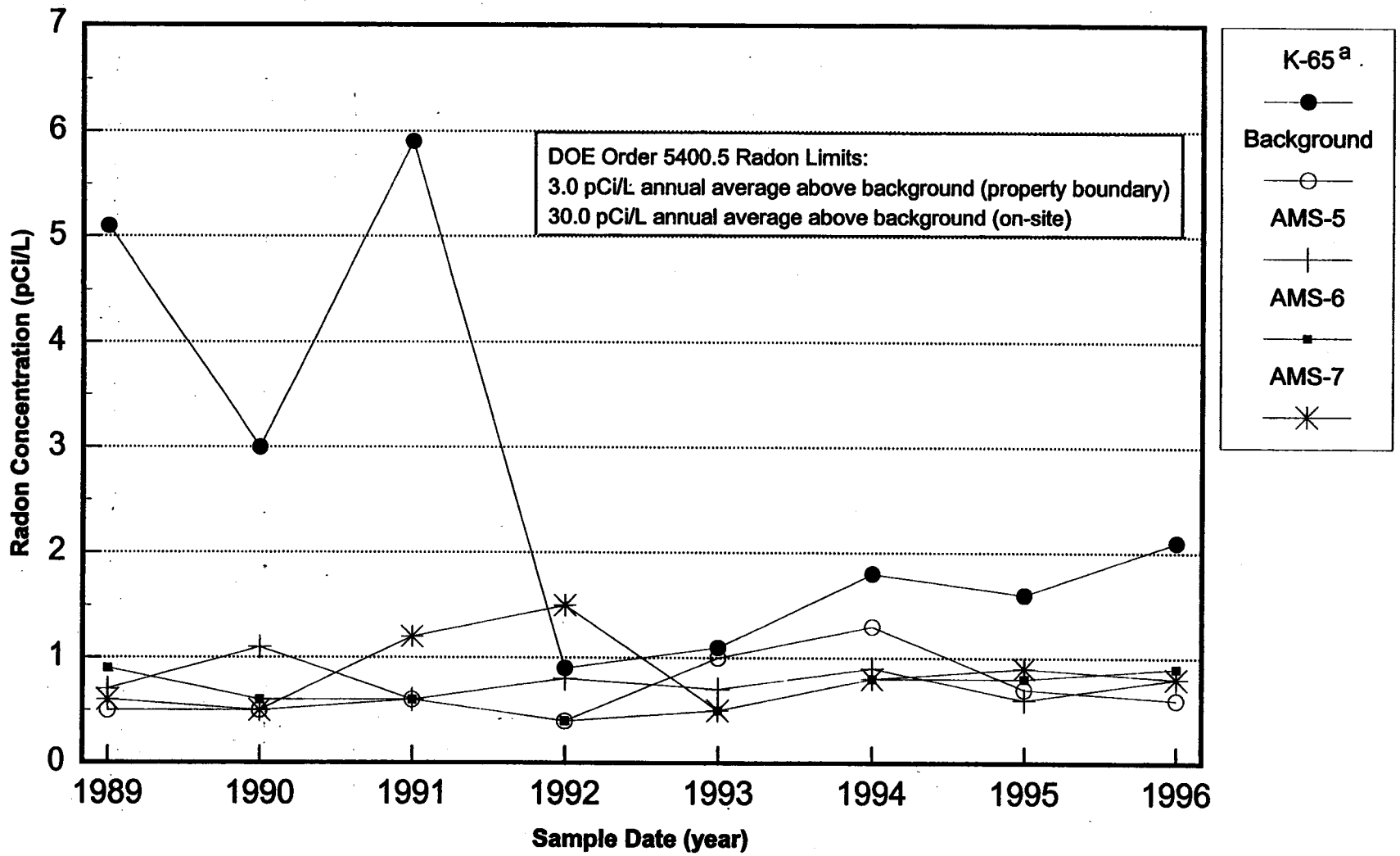
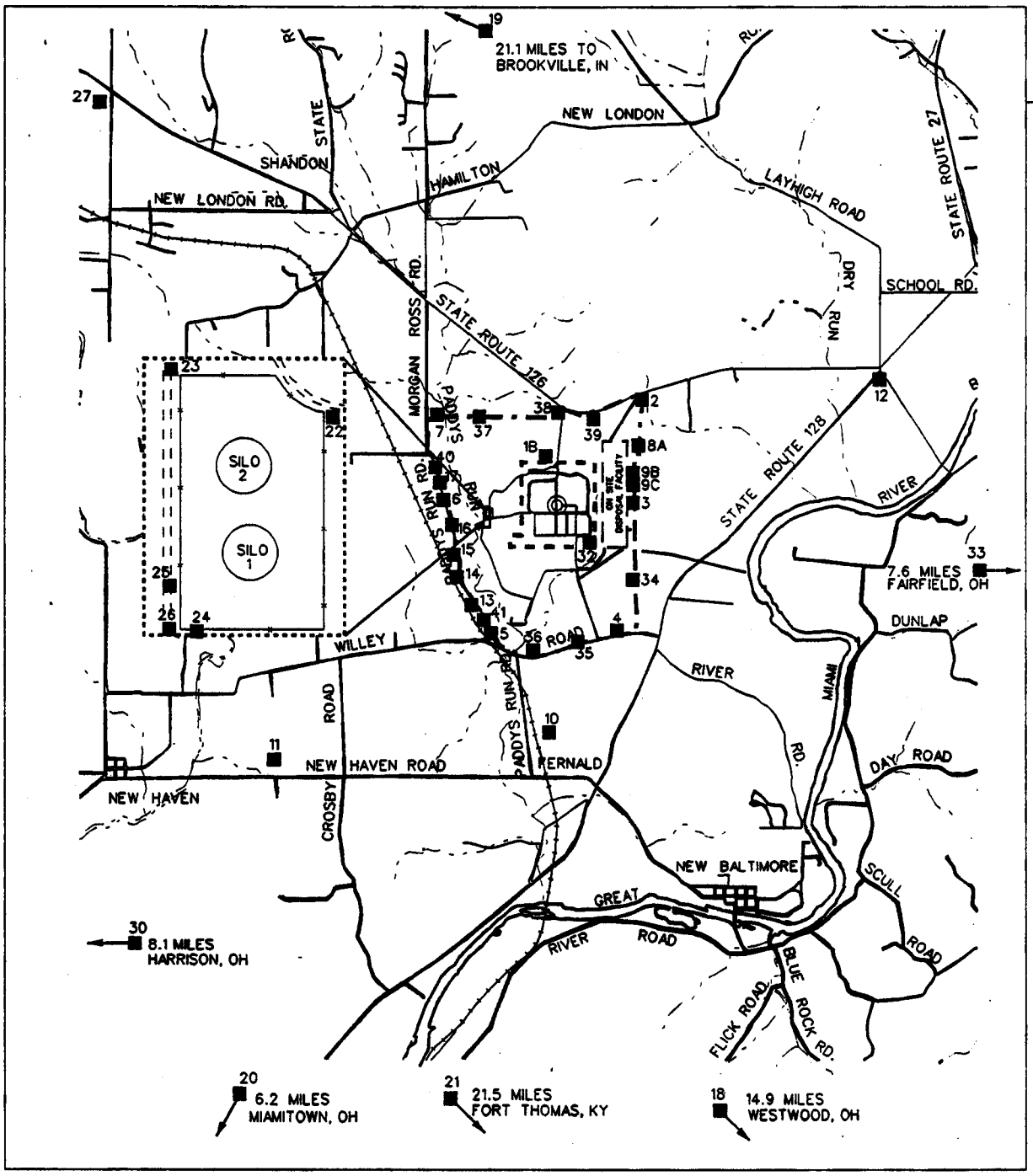
23-MAR-1998



K-65[a]= Average of all track-etch cup monitoring points at the K-65 exclusion fence.

FIGURE 3-15. ANNUAL AVERAGE RADON CONCENTRATIONS AT SELECTED RADON LOCATIONS



LEGEND:

- DISTANCE FROM CENTER OF PRODUCTION AREA TO SAMPLE LOCATIONS OFF MAP
- DIRECT RADIATION (TLD) MONITORING LOCATION
- FEMP BOUNDARY
- PRODUCTION AREA BOUNDARY

SCALE

1 ½ 0 1 MILE

FIGURE 3-16. DIRECT RADIATION (TLD) MONITORING LOCATIONS

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STATE PLANAR COORDINATE SYSTEM 1983

23-MAR-1998

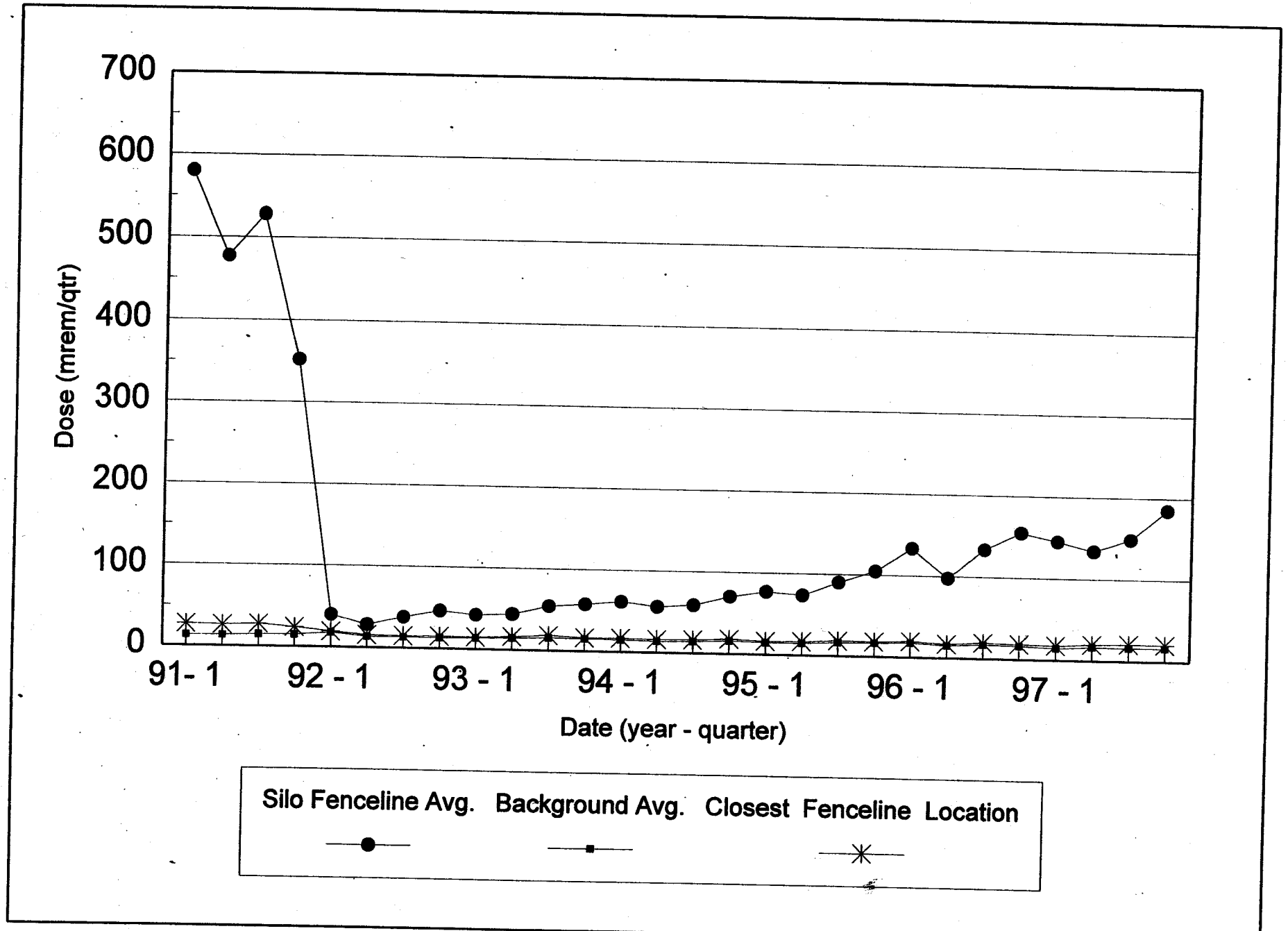

FIGURE 3-17. QUARTERLY DIRECT RADIATION (TLD) MEASUREMENTS (1991 - 1997)

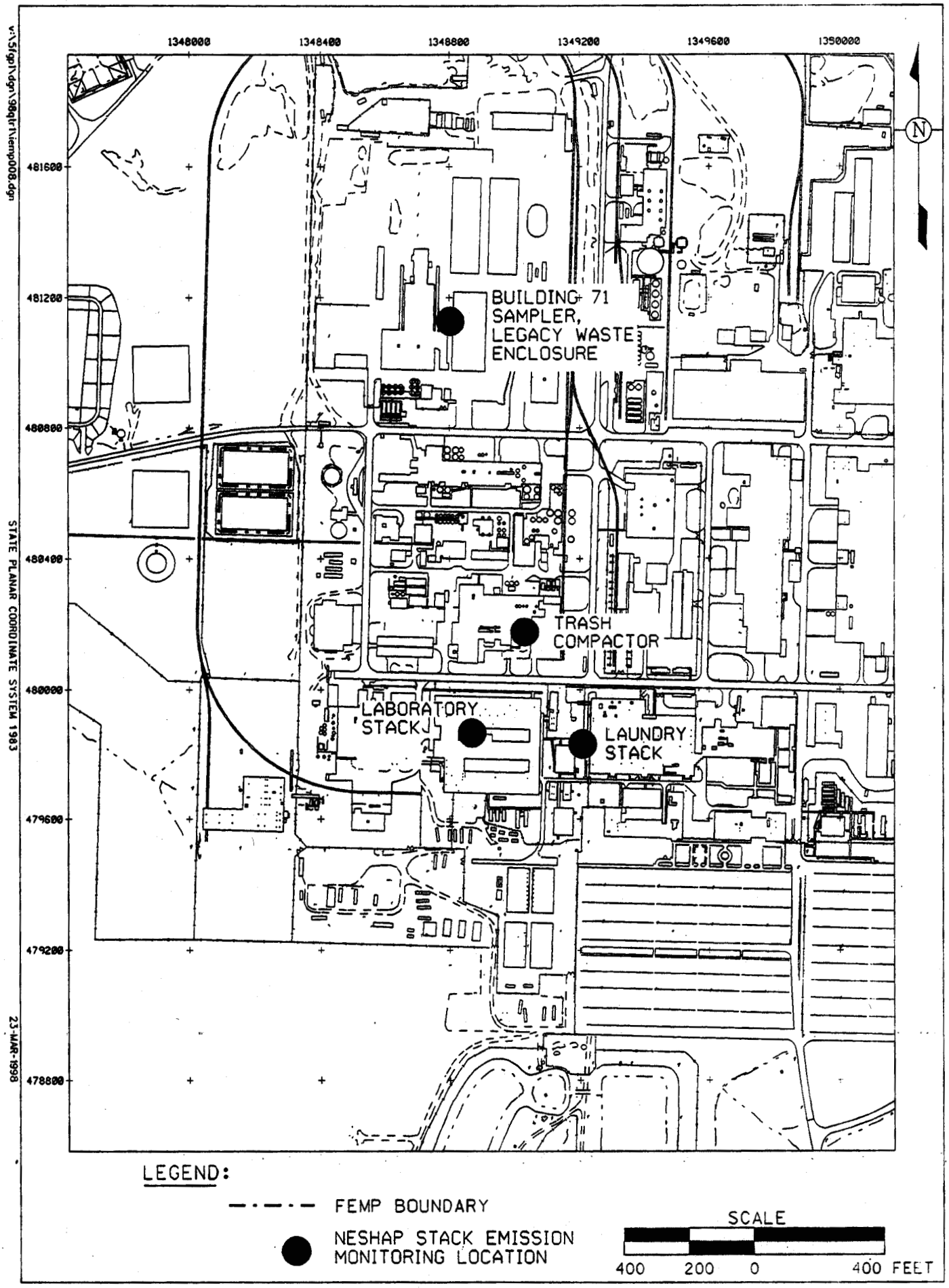

FIGURE 3-18. NESHAP STACK EMISSION MONITORING LOCATIONS

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4.0 NATURAL RESOURCES UPDATE

4.1 INTRODUCTION

This section provides a status of the natural resource monitoring activities conducted under the Natural Resource Impact Monitoring Plan (Appendix D of the IEMP) that are reported for the fourth quarter of 1997. The information provided covers the period of October 1, 1997, through December 31, 1997 (fourth quarter) and fulfills the reporting requirements outlined in Section D.5.0 of the IEMP.

4.2 FINDINGS

The principal findings from the reporting period are summarized below:

Sloan's Crayfish Monitoring

- Consistent with the previous findings presented in the IEMP Status Report for Third Quarter 1997 (DOE 1997c), visual observations of sediment loading to Paddys Run conducted during the fourth quarter of 1997 indicated no significant site contribution to the sediment loading in the Sloan's crayfish habitat area of Paddys Run.

  (Refer to Table 4-1.)

Impacted Habitat

- Three habitat areas were impacted during fourth quarter 1997: northern woodlot/pines, southern pines and waste units, and Paddys Run corridor.

- The 1997 annual impacted habitat comprises 55.16 acres (90 percent) of the projected 61 acres. In general, the disparity of impacted acreage versus project impacted acreage is due to change in the design of the on-site disposal facility which caused less impact in the northern woodlot/pines (9.77 impacted acres versus 40 acres projected) and activities in the southern pines and waste units being initiated a year ahead of schedule (24.32 impacted acres versus 0 acre projected).

- The cumulative habitat acreage impacted is 110.26 acres (36 percent) of the total projected 305 acres expected to be impacted by remediation activities.

  (Refer to Figure 4-1 and Table 4-2.)

Cultural Resources

- The remediation activities conducted during fourth quarter 1997 which disturbed soil at the FEMP yielded no unexpected cultural resource discoveries.

Status of Wetlands

- No additional wetlands were identified during fourth quarter 1997.

- 0.3 acre of jurisdictional wetlands located in the northern woodlot/pines was permanently impacted during the fourth quarter of 1997 due to construction of an access road to a new FEMP air monitoring station.

  (Refer to Figure 4-1 and Table 4-2.)

Threatened and Endangered Species Surveys

- During fourth quarter 1997, no surveys were conducted for the Indiana Bat, Running Buffalo Clover, or Spring Coral Root because no remediation activities occurred within their respective habitat areas.

  (Refer to Figure 4-1 for actual and potential location of these species.)

Future monitoring will be inclusive of the above-noted activities with the exception of the sediment loading inspections related to Sloan's crayfish. OEPA has agreed with DOE's proposal to discontinue visual observations of sediment loading to Paddys Run until either significant soil disturbances occur in the drainage area discharging to Paddys Run via the northern drainage ditch or storm water control inspections indicate that sediment controls are not functioning properly. EPA also has given verbal approval to cease monitoring sediment loading to Paddys Run.

TABLE 4-1

SLOAN'S CRAYFISH MONITORING IN 1997

Date	Precipitation (Inches)[a]	Visual Observation	Action
2/05/97	1.37	High flow, no turbidity	No further action
3/03/97	2.16	High flow, turbid upstream and downstream of ditch	Monitor 3/4/97
3/04/97	0.33	Flow reduced, no turbidity	No further action
3/10/97	0.70	Medium flow, no turbidity	No further action
3/14/97	0.80	Medium flow, no turbidity	No further action
3/20/97	0.50	Medium flow, no turbidity	No further action
3/31/97	0.69	Medium flow, no turbidity	No further action
5/01/97	0.76	Medium flow, slight turbidity upstream and downstream of ditch	No further action
5/05/97	2.00	Medium flow, slight turbidity upstream and downstream of ditch	No further action
5/27/97	1.92	Medium flow, slight turbidity upstream and downstream of ditch	No further action
6/02/97	3.52	Medium flow, slight turbidity upstream and downstream of ditch	No further action
6/09/97	2.40	High flow, turbid upstream and downstream of ditch	Monitor 6/10/97
6/10/97	0.37	Flow reduced, no turbidity	No further action
6/17/97	1.22	Medium flow, slight turbidity upstream and downstream of ditch	No further action
7/24/97	0.56	Low flow, no turbidity	No further action
8/18/97	2.31	Low flow, slight turbidity upstream and downstream of ditch	No further action
10/26/97	0.87	Medium flow, no turbidity	No further action
11/13/97	0.58	Flow reduced, no turbidity	No further action
11/30/97	0.87	Medium flow, no turbidity	No further action
12/24/97	0.69	Medium flow, no turbidity	No further action

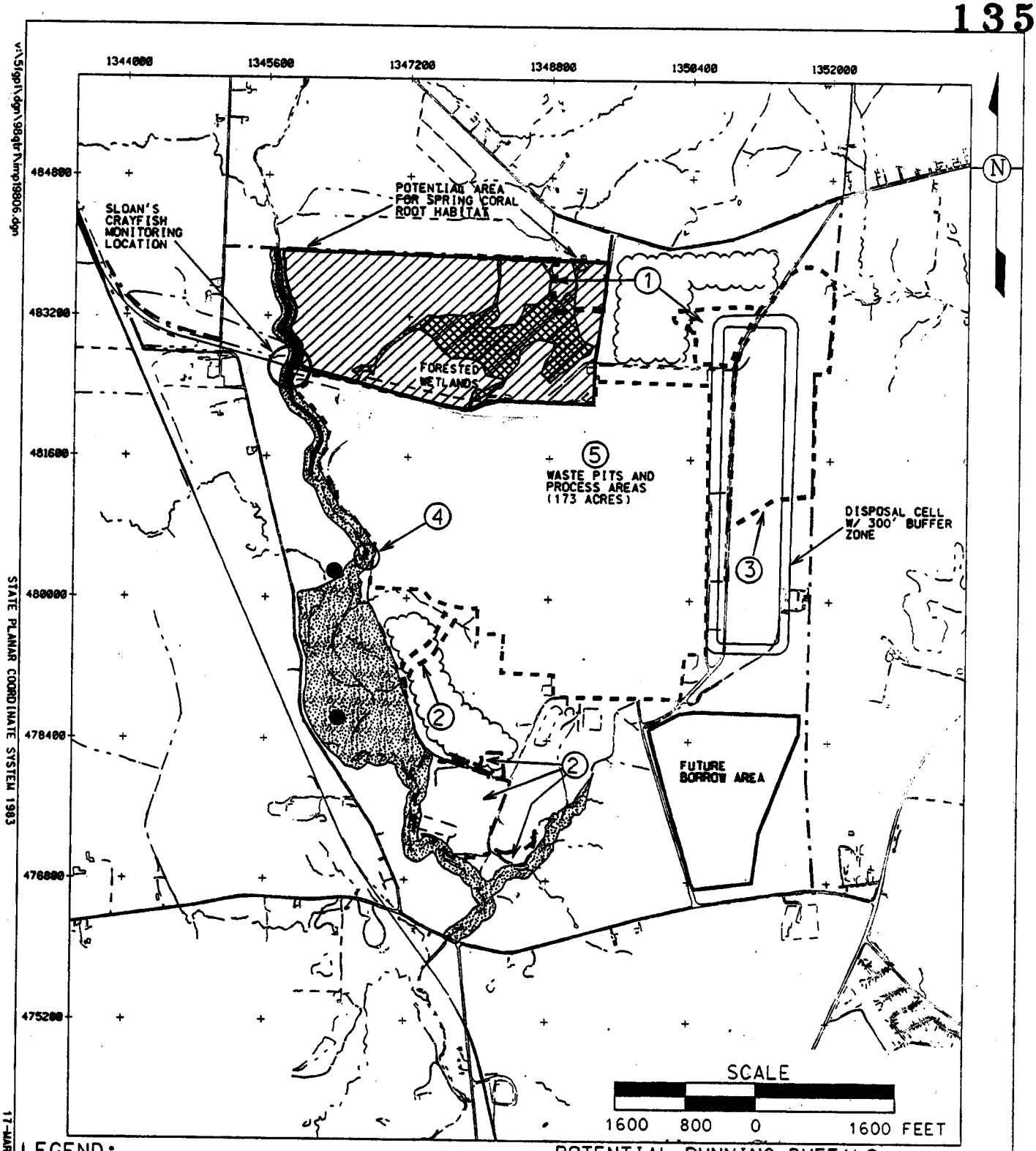
[a]Precipitation values are 24-hour totals for the day previous to monitoring, but may be cumulative over longer periods of time (i.e., rain events over a weekend).

TABLE 4-2

IMPACTED HABITAT AREAS IN 1997

Number[a]	Habitat Area	Impacted Acreage (approx.)	Activity Associated with Impact	Total Impacted Acreage for 1997	Projected 1997 Annual Impact[b]	Wetlands Impacted (acres)	Cumulative Impact To-Date (acres)	Cumulative Total Anticipated Impact (acres)
1	Northern Woodlot/Pines	9	Construction of OSDF	9.77	40		9.77	40
		0.77	Installation of access road			0.3		
2	Southern Pines and Waste Units	1.96	Construction of waste haul road	24.32	0[c]	0	24.32	17
		22.36	Area 2, Phase I soil remediation					
3	Grasslands	55.10[d]	Soil certification of Area 1, Phase I and construction of OSDF	0	0	0	55.10	204
4	Paddys Run Corridor	0.07	Development of near-vertical slope from continued erosion	11.07	11	0	11.07	34
		11	Area 2, Phase I soil remediation					
5	Waste Pits/Process Area[e]	10	Dredge and/or fill activities	10	10	10	10	10
	Total Impact			55.16 (90% of Annual Projected Impact)	61	10.3	110.26 (36% of Total Projected Impact)	305

Note: Highlighting indicates what areas were impacted during the fourth quarter of 1997.
[a]These numbers are associated with Figure 4-1.
[b]Derived from the future impacts outlined in the Habitat Equivalency Analysis, Addendum B, Natural Resource Restoration Plan
[c]Activities were initiated one year ahead of schedule.
[d]55.10 acres were impacted in 1996.
[e]There are 173 acres associated with the waste pits/process area; however, only 10 acres are wetlands.



LEGEND:

- FEMP BOUNDARY
- RIPARIAN CORRIDOR
- SLOAN'S CRAYFISH AREA
- INDIANA BROWN BAT HABITAT
- WETLANDS
- NORTHERN WOODLOT AREA
- PINES
- POTENTIAL RUNNING BUFFALO CLOVER AREAS

IMPACTED HABITAT AREAS:		ACREAGE:
1	NORTHERN WOODLOT/PINES	9.77
2	SOUTHERN PINES/ WASTE UNITS	24.32
3	GRASSLAND	55.10
4	PADDYS RUN CORRIDOR	11.07
5	WETLANDS ASSOCIATED WITH WASTE PITS/PROCESS AREA	10

FIGURE 4-1. HABITAT MONITORING MAP

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