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744 Heartland Trail
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Rcvd 3-3-93

February 25, 1993

Ms. Jill Fermanich
Wisconsin Department of Natural Resources
Hazardous Waste Management Section
Bureau of Solid Waste Management
101 S. Webster Street
Madison, WI 53707

RE: 1992 ANNUAL GROUNDWATER REPORT

Dear Jill:

Enclosed are two copies of the 1992 Annual Groundwater Report for the Cook Composites & Polymers' (CCP's) Saukville facility. The report presents a summary of the analytical data collected during the four quarterly sampling events conducted at CCP in 1992, and provides an evaluation of water level and groundwater quality trends at the site. The data indicate that the remedial systems currently operating at CCP are effectively preventing groundwater contamination from migrating off-site. Volatile organic compound (VOC) concentration trends over the past 4 years suggest that the contamination is diminishing near the site boundaries, and is being removed via the extraction wells and collection systems.

If you have any questions concerning the Annual Report, please contact me or Stacy McAnulty at 608-831-4444.

Sincerely,

James S. Rickun
Program Manager
Air Pollution Engineering

gmm

Enclosure

cc: Mr. Craig Bostwick (2 copies)
Mr. Robert Smith (2 copies)
Mr. Franklin Schultz (2 copies)

1832.33 0000:MSD:fermanic

RMT, Inc.
744 Heartland Trail
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1992 ANNUAL REPORT

PREPARED FOR
COOK COMPOSITES AND POLYMERS
SAUKVILLE, WISCONSIN

PREPARED BY
RMT, INC.
MADISON, WISCONSIN

FEBRUARY 1993

Gordon Keating
Staff Hydrogeologist

Gwen Porus
Project Hydrogeologist

James S. Rickun
Program Manager
Air Pollution Engineering

1832.33 0000:RTE:ccp0106

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EXECUTIVE SUMMARY

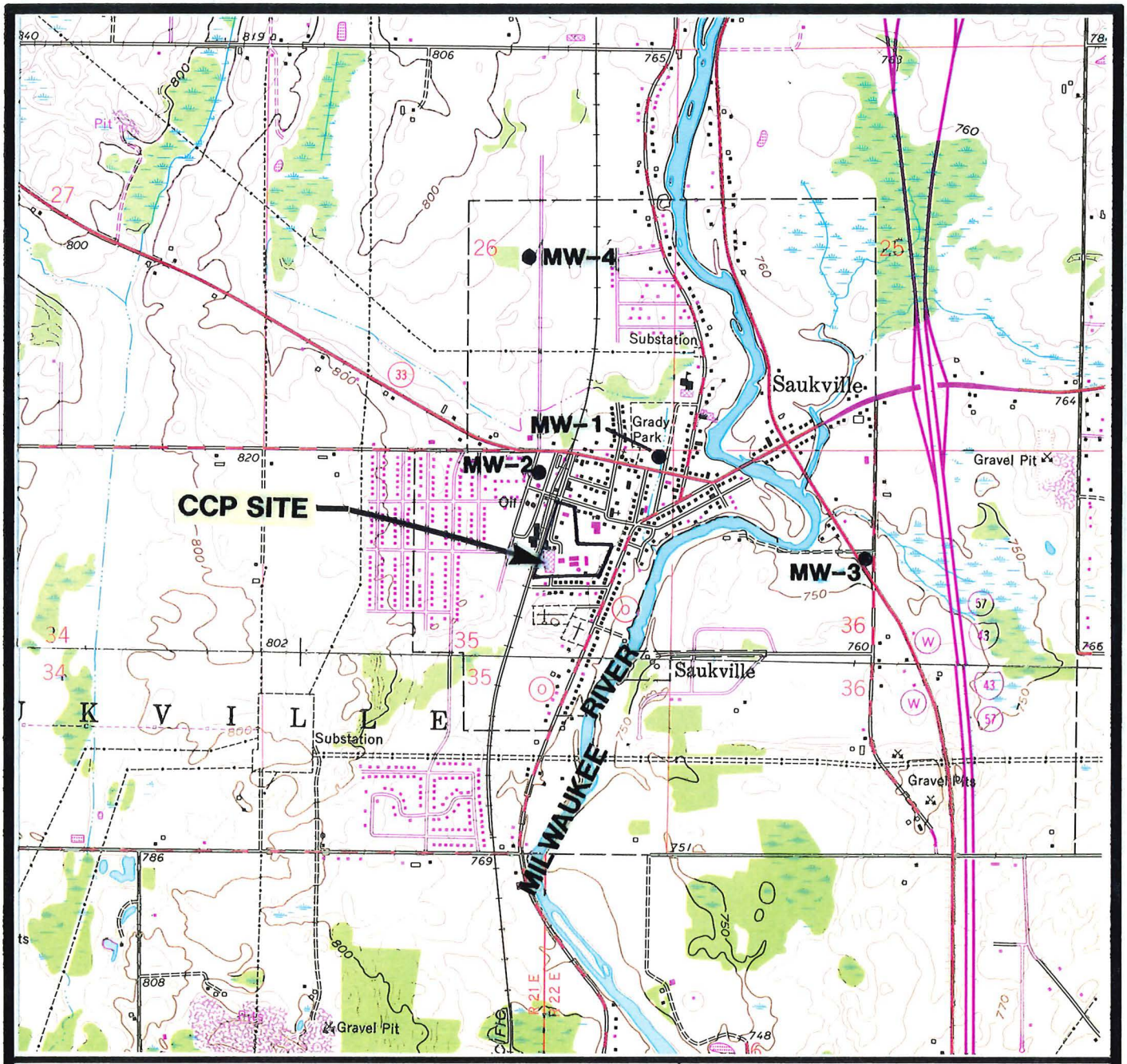
The groundwater flow and quality information presented in this report indicate that the remedial systems operating at the Cook Composites and Polymers Company (CCP) site are effectively preventing contamination from migrating off-site. The VOC concentration trends over the past 4 years indicate that contamination is being reduced in the outer areas of the site and removed via the extraction wells and collection systems.

The existing monitoring data indicates that the site cleanup will require long-term monitoring. A quarterly sampling frequency is therefore unnecessary to characterize these long-term remediation trends. On behalf of CCP, RMT has recommended that the sampling program be adjusted according to the table in Appendix A. This program was approved by the United States Environmental Protection Agency (USEPA) and the Wisconsin Department of Natural Resources (WDNR) in the fall of 1992.

Section 1
INTRODUCTION

CCP operates a polyester, alkyd, and urethane resin manufacturing plant in Saukville, Wisconsin (Figure 1). The plant was owned and operated by Freeman Chemical Corporation prior to 1991.

In compliance with the 1987 Corrective Action Order on Consent (CAO) V-W-88-R-002, CCP completed four rounds of groundwater sampling and analysis in 1992, including January (winter), April (spring), July (summer), and October (fall) sampling events. The fall event comprised the annual sampling event and included all site monitoring wells. Groundwater sampling was conducted by Sigma Environmental Services, Inc. (Sigma), Oak Creek, Wisconsin, and the samples were analyzed at RMT Laboratories, Inc., Madison, Wisconsin. All field data and results of chemical analyses of groundwater were compiled by RMT, Inc. (RMT), Madison, Wisconsin, and were submitted in quarterly reports by CCP to the USEPA Region V and the WDNR. VOC exceedances of Wisconsin Administrative Code NR 141 Preventive Action Limits (PALs) are reported quarterly by CCP in accordance with NR 508.



STATE LOCATION

0 2000 4000

SCALE: 1"=2000'

N

SITE LOCATION MAP
COOK COMPOSITES AND POLYMERS

SOURCE: BASE MAP FROM PORT WASHINGTON WEST AND CEDARBURG WISCONSIN 7.5 MINUTE USGS QUADRANGLES.

RMT INC.

DWN. BY:	DJW
DATE:	JANUARY 1993
PROJ.#	1832.33
FILE #	18323301

FIGURE 1

Section 2

PURPOSE AND SCOPE

This document presents a summary of data collected during the four quarterly groundwater sampling events conducted at CCP in 1992 and provides an evaluation of water level and groundwater quality trends at the site. Since the water quality data have been submitted to the USEPA and the WDNR in the quarterly reports, they will not be reproduced in this document.

The scope of this report includes the following:

- A summary of water levels measured in on-site monitoring wells in 1992 and potentiometric surface maps of the glacial and shallow dolomite hydrogeologic units for selected quarters
- An evaluation of groundwater flow directions in the glacial and shallow dolomite units, and the effects of precipitation and well pumping on these patterns of groundwater flow
- A summary of the site groundwater monitoring program and quarterly total volatile organic compound (VOC) concentrations by well
- A presentation of VOC data in the form of isoconcentration maps for the glacial and shallow dolomite wells
- A presentation of VOC concentration trends by well
- An evaluation of the trends in groundwater quality for each monitoring well group for 1992, compared to historical data
- An evaluation of the effectiveness of plume containment by shallow dewatering and deep pumping, based on groundwater flow and quality data

Section 3

SUMMARY OF RESULTS

3.1 Groundwater Monitoring Program Summary

The groundwater monitoring program at CCP's Saukville site consists of 44 monitoring points, including 20 glacial drift wells, 12 shallow dolomite wells, and 6 deep dolomite wells, as well as 3 Ranney collectors (essentially French drains) and 3 publicly owned treatment works (POTW) sampling points. The monitoring points are grouped according to three sampling objectives: receptor, perimeter, and remediation progress monitoring. This well organization is presented in Table 1.

Receptor points include four municipal water supply wells (MW-1, MW-2, MW-3, and MW-4); POTW influent, effluent, and sludge monitoring points, and the Ranney collectors (RC-1, RC-2, and RC-3). The Ranney collectors are monitored because they discharge to the sanitary sewer. Perimeter points are monitoring wells on- and off-site that are located at or beyond the edge of the contamination plume. These wells are intended to provide the information necessary to define the lateral extent of the plume. Remediation progress points are monitoring wells located within the contamination plume. These wells provide information concerning the effectiveness of the on-site remedial systems.

Each of these well groupings is further subdivided into glacial drift and shallow dolomite hydrogeologic units. Some monitoring points, such as the deep municipal wells, are not easily categorized under this system, but the majority of the monitoring points are wells screened in one of these two units. This subdivision allows for more effective evaluation of on-site groundwater flow and quality trends.

3.2 Groundwater Flow

3.2.1 Description of Hydrogeologic Units

The glacial drift hydrogeologic unit consists of clay, silt, sand, and gravel of glacial till, glaciolacustrine, and glaciofluvial origin. These sediments generally range from approximately 10 to 25 feet in thickness. The stratigraphic order of the deposits from

TABLE 1

COOK COMPOSITES & POLYMERS
GROUNDWATER MONITORING PROGRAM SUMMARY, 1992

Monitoring Objective	Well I.D.	Well Depth (ft)	Hydrogeologic[2] Unit	VOC Analysis Method			
				Winter (January)	Spring (April)	Summer (July)	Fall (October[1])
Receptor	* RC-1	< 20	Glacial	8020	8020	8020	8240
	* RC-2	< 20	Glacial	8020	8020	8020	8240
	* RC-3	< 20	Glacial	8020	8020	8020	8240
	* MW-1	492	Deep Dolo.	8240	8240	8240	8240
	* MW-2	480	Deep Dolo.	8240	8240	8240	8240
	* MW-3	~500	Deep Dolo.	8240	8240	8240	8240
	* MW-4	~500	Deep Dolo.	---	---	---	8240
	POTW-I	NA	POTW	8240	8240	8240	8240
	POTW-E	NA	POTW	8240	8240	8240	8240
	POTW-S	NA	POTW	8240	8240	8240	8240
Perimeter	W-01A	15	Glacial	---	---	---	8240
	W-03A	233	Sh. Dolo.	8240	8240	8240	8240
	W-03B	70	Glacial	---	---	---	8240
	W-04A	17	Glacial	---	---	---	8240[3]
	W-07	22	Sh. Dolo.	8240	8240	8240	8240
	W-08	10	Glacial	---	---	---	8240[3]
	W-14B	15	Glacial	8240	8240	8240	8240
	W-16A	14.5	Glacial	---	---	---	8240[3]
	W-18A	16	Glacial	---	---	---	8240
	W-20	123	Glacial	8240	8240	8240	8240
	W-22	66	Sh. Dolo.	---	---	---	8240
	W-23	65	Sh. Dolo.	8240	8240	8240	8240
	W-25	84	Sh. Dolo.	---	---	---	8240
	W-27	23	Glacial	8020	8020	8020	8240
	W-39	70	Sh. Dolo.	---	---	---	8240
	W-40	48	Sh. Dolo.	8240	8240	8240	8240
	PW-08	455	Deep Dolo.	8240	8240	8240	8240

TABLE 1 (CONTINUED)

COOK COMPOSITES & POLYMERS
GROUNDWATER MONITORING PROGRAM SUMMARY, 1992

Monitoring Objective	Well I.D.	Well Depth (ft)	Hydrogeologic[2] Unit	VOC Analysis Method			
				Winter (January)	Spring (April)	Summer (July)	Fall (October[1])
Remediation Progress	W-06A	15	Glacial	8240	8240	8240	8240
	W-19A	23	Glacial	---	---	---	8240
	* W-21A	80	Sh. Dolo.	8020	8020	8020	8240
	* W-24A	85	Sh. Dolo.	8020	8020	8020	8240
	* W-28	90.5	Sh. Dolo.	8020	8020	8020	8240
	* W-29	81.5	Sh. Dolo.	8240	8240	8240	8240
	* W-30	556	Deep Dolo.	8240	8240	8240	8240
	* W-37	18.5	Glacial	8020	8020	8020	8240
	W-38	49	Sh. Dolo.	8020	8020	8020	8240
	W-41	18	Glacial	8020	8020	8020	8240
	W-42	20	Glacial	8020	8020	8020	8240
	W-43	15	Glacial	8020	8020	8020	8240
	W-44[4]	15	Glacial	--	--	--	8240[3]
	W-45[4]	13	Glacial	--	--	--	8240[3]
	W-46	15	Glacial	8240	8240	8240	8240
	W-47	15	Glacial	8020	8020	8020	8240
	W-48	19	Glacial	8020	8020	8020	8240
				8240	8240	8240	8240

NOTES:

1 The October sampling round constituted the annual sampling event.
2 Sh. dolo. = shallow dolomite; deep dolo. = deep dolomite.
3 The well was in the sampling program for this round, but it was not sampled because it was dry.
4 Wells W-44 and W-45 were dry in all sampling rounds.
* Pumping wells
--- Well was not sampled as part of this round's program.

the ground surface down is typically sand and silt overlying a laterally continuous layer of laminated silt and clay (glaciolacustrine) above dense clay (glacial till). A thin layer of sand and gravel (glacial outwash) lies between this till unit and bedrock.

The shallow bedrock beneath the site is the Niagara Dolomite, which is highly fractured in its upper 10 to 15 feet and contains abundant solution channels and cavities at depth. The elevation of the bedrock surface is highly variable across the site, as defined by soil boring and seismic reflection investigations (MGA, 1989). A bedrock high (20 feet below ground surface [BGS]) is located near the center of the site, and a dramatic closed depression in the bedrock surface, located in the northeastern corner of the site, has been characterized as a karst feature. In this area, the depth to bedrock is up to 205 feet BGS.

3.2.2 Groundwater Levels and Flow Patterns in 1992

Groundwater levels in site monitoring wells were measured prior to purging during quarterly sampling events. Table 2 presents a summary of water levels for each quarter, and the location of site monitoring wells are shown on Figure 2. The water level data were used to construct potentiometric surface maps for the glacial drift and the shallow dolomite units. The annual high and low water levels were depicted for the glacial drift (spring and fall quarters, respectively) because this unit is most affected by seasonal variation in groundwater levels, which averaged 3 feet of water level change in 1992. A single potentiometric surface map was constructed for the shallow dolomite using the spring quarter data, as this unit did not show as much variation in head in the course of the year. The potentiometric surface maps are included in Appendix B.

3.2.2.1 The Glacial Unit

The potentiometric surfaces shown in Figures 3a and 3b (Appendix B) provide information regarding the degree to which shallow groundwater withdrawal is dewatering the glacial unit. A comparison of these maps to the summary of well running times tabulated in Table 4 indicates that the greatest influence on the groundwater level by pumping is found in the vicinity of those wells with the most continuous pumping schedule. An example of one of these areas is

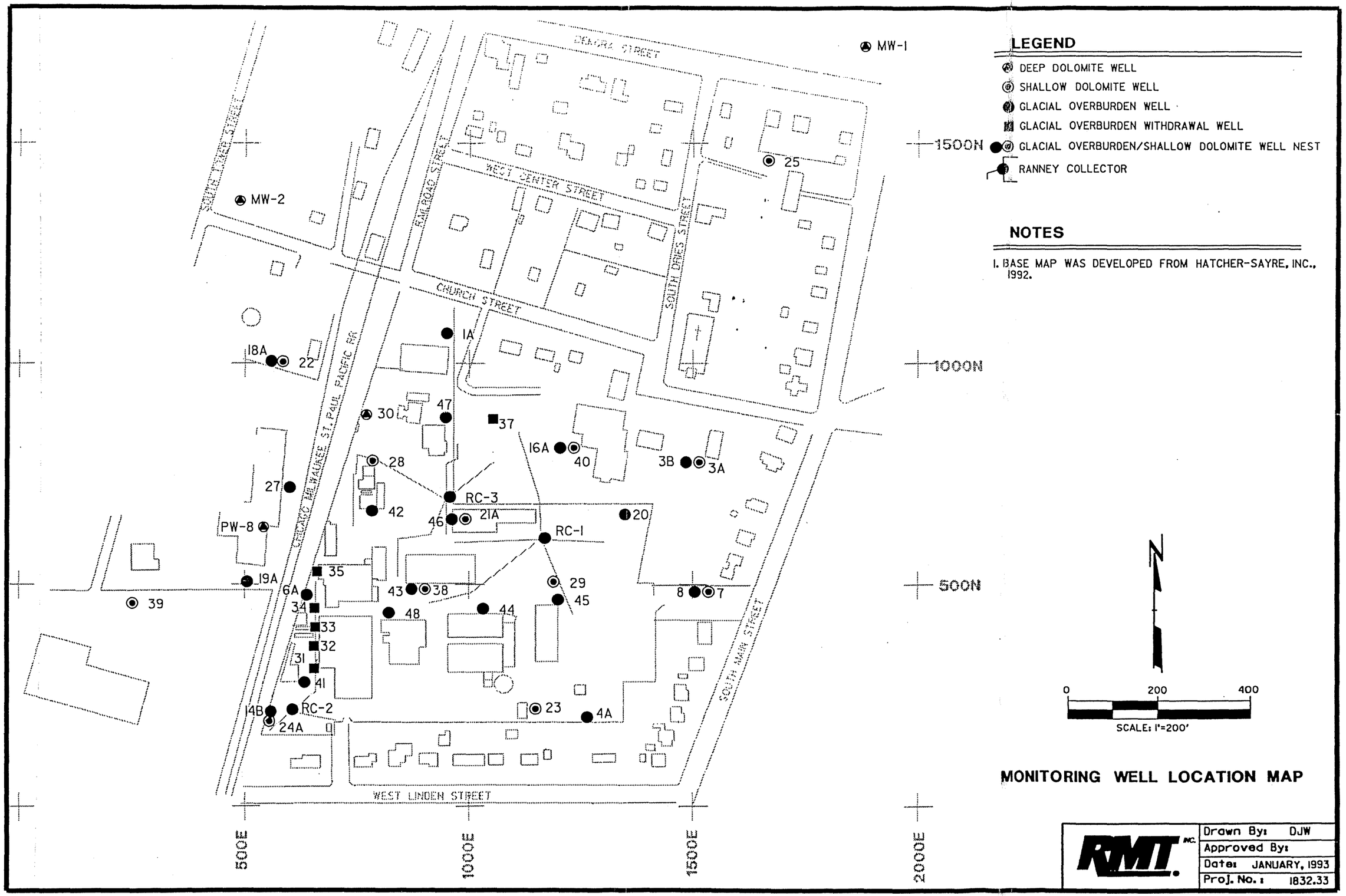
TABLE 2

COOK COMPOSITES & POLYMERS
SUMMARY OF WATER LEVELS, 1992

Hydrogeologic Unit	Well I.D.	Water Levels (ft, MSL)			
		Winter (January)	Spring (April)	Summer (July)	Fall (October)
Glacial Drift	W-01A	760.10	760.77	NM	756.21
	W-03B	NM	738.12	NM	736.19
	W-04A	754.61	755.86	NM	Dry
	W-06A	765.47	766.79	763.97	765.19
	W-08	NM	753.45	NM	Dry
	W-14B	765.57	766.92	762.89	762.65
	W-16A	NM	760.07	NM	Dry
	W-18A	767.02	768.67	NM	766.67
	W-19A	765.98	762.84	NM	763.70
	W-20	NM	733.33	732.48	732.89
	W-27	767.57	768.89	765.66	767.10
	W-37	766.32	760.94	756.82	757.90
	W-41	757.59	758.44	756.85	754.74
	W-42	760.44	761.19	759.04	757.92
	W-43	NM	758.25	759.13	756.25
	W-44	NM	Dry	NM	Dry
	W-45	Dry	Dry	NM	Dry
	W-46	761.26	762.20	755.22	759.88
	W-47	760.91	762.25	758.73	759.21
	W-48	NM	762.61	759.81	762.12
Shallow Dolomite	W-03A	NM	737.60	735.25	735.24
	W-07	NM	745.85	742.86	742.02
	W-21A	NM	698.24	703.09	NM
	W-22	730.71	731.55	NM	728.15
	W-23	743.01	741.89	744.03	741.57
	W-24A	758.11	759.46	756.75	752.79
	W-25	NM	751.08	NM	744.89
	W-28	707.25	726.23	712.21	701.91
	W-29	NM	NM	NM	731.84
	W-38	NM	750.35	750.19	749.04
	W-39	758.08	759.10	NM	753.90
	W-40	NM	742.04	741.47	738.68
Deep Dolomite	MW-1	546	541	542	548
	MW-2	601	599	602	606
	MW-3	NA	NA	NA	NA
	MW-4	NA	NA	NA	NA
	W-30	678.20	678.04	673.59	679.64
	PW-8	738.82	741.52	736.30	736.55

NOTES:
1. Water levels in Ranney Collectors (RC-1 through RC-4) and withdrawal wells W-31 through W-35 were not measured.

NM = Not measured on this date. NA = Not available.



MONITORING WELL LOCATION MAP

RMT INC.	Drawn By: DJW
	Approved By:
	Date: JANUARY, 1993
	Proj. No.: 1832.33

FIGURE 2

RMT COMPUTER AIDED DESIGN & DRAFTING

Plot Data

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Plot File = mwloc.prf
Pen Table = h:\1832\table\mwloc.tbl
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Scale = 1:200.000000
Rotation = 0.000000
Plot Date = Sat Feb 06 17:55:57 1993
Levels On = 8,10

Reference Files

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Ref. File 2 = bmclient.dgn
Ref. File 3 = border.dgn
Ref. File 4 = *no ref name*
Ref. File 5 = *no ref name*
Ref. File 6 = *no ref name*
Ref. File 7 = *no ref name*
Ref. File 8 = *no ref name*
Ref. File 9 = *no ref name*
Ref. File 10 = *no ref name*

Logical Names / *Levels*

(1) bmr — (1) 36-40,46-50
(2) bmc — (2) 1-63
(3) bdr — (3) 1-63
(4) *no ref logical* — (4) *no ref levels*
(5) *no ref logical* — (5) *no ref levels*
(6) *no ref logical* — (6) *no ref levels*
(7) *no ref logical* — (7) *no ref levels*
(8) *no ref logical* — (8) *no ref levels*
(9) *no ref logical* — (9) *no ref levels*
(10) *no ref logical* — (10) *no ref levels*

the southwestern corner of the site near RC-2 and W-34. Here the 760-foot contour is offset to the west, possibly due to dewatering in this area. The other withdrawal wells in the glacial unit, including the other Ranney collectors, appear to have little effect on groundwater flow patterns across the site, perhaps because they are pumped less frequently (Table 3). The water table remained within the glacial unit, even at its lowest level during the fall quarter, when it was located approximately 8 feet above the bedrock surface over much of the site. Over the past 5 years, water levels have remained fairly constant in glacial monitoring wells; water elevations measured in 1992 equal or exceed those measured in these wells from 1988 to 1991.

The direction of shallow groundwater flow across the site may be influenced by several factors, including recharge (precipitation), topography, the presence of the Milwaukee River to the east, and pumping in many of the on- and off-site wells. The potentiometric surface in the glacial drift as shown in Figures 3a and 3b is coincident with the water table in all areas, and slopes to the east toward the Milwaukee River at an approximate gradient of 0.03 ft/ft (Appendix E). The overall flow pattern in the glacial drift, as well as the water levels, are similar to that described in the 1991 Annual Report (Hatcher-Sayre, Inc., 1992).

Seasonal fluctuation in head values in the glacial unit varies with on-site location. Water levels from the spring to fall quarters showed an average decrease of about 3 feet, from on the order of 1 foot in western areas to greater than 10 feet in the eastern parts. Wells W-4A, W-8, and W-16A were dry by the fall quarter.

The main influence on the pattern of shallow on-site groundwater flow is the Milwaukee River, which controls the overall eastward direction of flow. Local bedrock highs appear to produce plateaus in the water table in the southern and central portions of the site.

TABLE 3
SUMMARY OF WELL RUNNING TIMES, 1992[1]

Well ID	Hydrogeologic Unit	Total Running Time	Weekly Average	Daily Average	Last Date Operations	Comments
RC1	Glacial	309 hr 12 min	6 hr 7 min	53 min	12/16/92	None over 100 hrs/mo; peaked in March
RC2	Glacial	2643 hr 24 min	52 hr 20 min	7 hr 32 min	12/16/92	October only low month; otherwise consistent
RC3	Glacial	648 hr 6 min	12 hr 50 min	1 hr 50 min	12/15/92	Dormant June-September; peak in November
W31	Glacial	10 hr 24 min	12 min	.02 min	4/21/92	Pumped January-April; no pumping since
W32	Glacial	916 hr 48 min	18 hr 9 min	2 hr 36 min	5/3/92	Peaked in March-April
W33	Glacial	109 hr 24 min	2 hr 10 min	18 min	12/16/92	Consistent; no real peaks and no zeros
W34	Glacial	8076 hr 36 min	159 hr 56 min	23 hr 0 min	12/16/92	Constantly over 600 hrs/mo
W35	Glacial	23 hr 27 min	28 min	.04 min	12/16/92	Consistantly 1-2 hrs/mo
W37	Glacial	78 hr 22 min	1 hr 33 min	13 min	12/16/92	No pumping January-March; peak in April, minimal since
W21A	Shallow dolomite	5674 hr 0 min	112 hr 21 min	16 hr 10 min	12/16/92	July-January high months; peaked in August
W24A	Shallow dolomite	1406 hr 54 min	27 hr 51 min	4 hr 1 min	12/16/92	June-September and February slow; consistent otherwise
W28	Shallow dolomite	3195 hr 18 min	63 hr 16 min	9 hr 6 min	12/16/92	Peaked in October-November
W29	Shallow dolomite	1095 hr 6 min	21 hr 41 min	3 hr 7 min	12/16/92	Peaked in January, after March; none over 50 hrs/mo
W30	Deep dolomite	NA	NA	NA	NA	Pumped consistently at 380 gpm

NOTES:
[1] These times include pumping between January 1 and December 16, 1992.
[2] Data provided by CCP.
NA Not available.

Individual precipitation events appear to have little local effect on the groundwater levels and flow direction. While groundwater levels generally decreased across the site from the spring to the fall quarter, precipitation in the spring, summer, and fall quarters varied little, and rainfall measured during the fall quarter actually exceeded that of the spring quarter (see Table 4). This apparent lack of groundwater response to local precipitation events may be due in part to the fact that much of the site is paved, reducing infiltration.

Long-term recharge events and long-term precipitation trends appear to exert greater control on groundwater levels at the site. The below-average rainfall over the past 5 years (13 to 16 inches below the normal 39 inches), may have resulted in several of the glacial wells going dry (i.e., W-04A, W08, W-16A, W-44, and W-45). In addition, the total precipitation measured in 1992 (Table 4) was 5 inches below the average of the previous 4 years. As stated in the 1991 annual report (Hatcher-Sayre, 1992), the glacial wells were designed under normal precipitation conditions, and they may again yield water when this recent period of below-normal precipitation ends.

3.2.2.2 The Shallow Dolomite Unit

The potentiometric surface in the shallow dolomite unit during the spring quarter is shown in Figure 4 (Appendix B). The variation in water levels was generally uniform throughout the year, dropping 1 to 3 feet between the spring and fall quarters. Water levels in the shallow dolomite have been fairly constant over the past 2 years, with a slight increasing trend over the last 5 years. A notable exception is W-22, which shows a marked decrease in the last year.

The contours on Figure 4 indicate that groundwater in the shallow dolomite flows inward toward the center of the site, predominantly from the southwest as a result of the topographic highs to the south and west of the site. Horizontal gradients range from approximately 0.07 to 0.3 ft/ft (Appendix E). A cone of depression up to 60 feet deep is defined centering on withdrawal well W-21A.

TABLE 4

SUMMARY OF PRECIPITATION, 1992[1]

Month	Precipitation, in inches				
	1988	1989	1990	1991	1992
January	2.01	0.67	1.84	0.11	0.73
February	0.87	1.01	0.6	0.2	1.25
March	0.82	2.71	2.47	1.85	1.77
April	3.43	0.9	1.36	1.15	1.7
May	0.44	3.49	4.01	3.32	0.58
June	0.89	1.88	3.79	4.04	0.57
July	1.28	4.01	1.38	2.37	2.49
August	1.88	5.15	2.21	2	2.35
September	5.48	1.44	2.46	1.82	2.2
October	1.68	1.74	2.74	2.88	0.88
November	4.4	0.49	2.52	2.62	3.26
December	2.08	0.2	1.07	0.77	1.04[2]

NOTES

[1] Precipitation was measured in an on-site gauge by CCP personnel.

[2] December 1992 figure is through December 16th.

3.3 Groundwater Quality

3.3.1 Background

Table 1 presents the sampling schedule that was developed for 1992 groundwater monitoring, along with the VOC analysis method used each quarter. Parameters included in Methods 8240 and 8020 are listed in Table 5. Winter, spring, and summer quarter samples were analyzed for either the shorter aromatic VOC list (8020) or the full VOC list (8240), and the fall quarter samples were analyzed for the full VOC list as part of the annual sampling event. This distinction is important because the possibility of additional parameter detections in some wells during the fall quarter may result in higher total VOC concentrations for this quarter.

3.3.2 Total VOC Data

The tabulated results of VOC concentrations in each well and the supporting laboratory data sheets were presented in the four quarterly reports (RMT, 1992a, 1992b, 1992c, and 1992d). Tables 6, 7, and 8 present a summary of total VOC concentrations in each well for each of the four quarters. The wells are organized by monitoring objective group and hydrogeologic unit as described in Section 3.1 and Table 1. Figure 2 shows the locations of the monitoring wells. The VOC data were used to construct three isoconcentration maps that depict that lateral distribution of VOCs in the glacial unit for spring and fall quarters and in the shallow dolomite unit for the spring quarter. These sampling quarters were chosen to parallel those used for the potentiometric surface maps to allow comparison of groundwater flow and VOC plume patterns. The isoconcentration maps are included in Appendix C as Figures 5a, 5b, and 6.

3.3.2.1 VOC Patterns in the Glacial Unit

The extent of VOC contamination in the glacial unit is shown in Figures 5a and 5b for spring and fall quarters, respectively (Appendix C). Isoconcentration contours in the glacial unit (Figure 5a) do not include VOC detections in the Ranney collectors because these are composite groundwater samples collected from areas of the site through the radial collection lines.

TABLE 5

COOK COMPOSITES & POLYMERS
SUMMARY OF ANALYTES IN METHODS 8240 AND 8020

Volatile Organic Compounds by Method 8240		Aromatic Volatile Organic Compounds by Method 8020
Chloroethane	1,1,2,2-Tetrachloroethane	Benzene
Chloromethane	1,2-Dichloropropane	Toluene
Bromomethane	trans-1,2-Dichloropropene	Ethylbenzene
Vinyl Chloride	Trichloroethene	Chlorobenzene
Methylene Chloride	Dibromochloromethane	Xylenes (total)
Acetone	1,1,2-Trichloroethane	1,4-Dichlorobenzene
Carbon Disulfide	Benzene	1,3-Dichlorobenzene
1,1-Dichloroethene	cis-1,3-Dichloropropene	1,2-Dichlorobenzene
1,1-Dichloroethane	Bromoform	
1,2-Dichloroethene (total)	2-Hexanone	
Chloroform	4-Methyl-2-Pentanone	
1,2-Dichloroethane	Tetrachloroethene	
2-Butanone	Toluene	
1,1,1-Trichloroethane	Chlorobenzene	
Carbon Tetrachloride	Ethylbenzene	
Vinyl Acetate	Styrene	
Bromodichloromethane	Xylenes (total)	

TABLE 6A - TOTAL VOCS DETECTED, 1992
RECEPTOR GROUP - GLACIAL UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
RC-1	12265	UG/L	7979	UG/L	9271	UG/L	13503	UG/L
RC-2	74290	UG/L	11487	UG/L	10382	UG/L	12280	UG/L
RC-2 DUP	72000	UG/L	8008	UG/L	11175	UG/L	12096	UG/L
RC-3	32004	UG/L	27455	UG/L	74330	UG/L	14706	UG/L

TABLE 6B - TOTAL VOCS DETECTED, 1992
RECEPTOR GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
MW-01	1	UG/L	ND	UG/L	ND	UG/L	ND	UG/L
MW-02	9	UG/L	ND	UG/L	.6	UG/L	ND	UG/L
MW-03	ND	UG/L	ND	UG/L	ND	UG/L	ND	UG/L
MW-04							ND	UG/L
MW-04 DUP							ND	UG/L
POTW-E	ND	UG/L	8.7	UG/L	ND	UG/L	ND	UG/L
POTW-I	1237.8	UG/L	74.8	UG/L	227.6	UG/L	59	UG/L
POTW-S	5039	UG/KG	9521	UG/KG	134100	UG/KG	556	UG/KG

1. Wells MW-1, MW-2, MW-3, and MW-4 are screened in the deep dolomite; monitoring points POTW-E, POTW-I, and POTW-S are sampled at the wastewater treatment facility. Ranney collectors RC-1, RC-2, and RC-3 are shallow groundwater drains sampled at the manhole, prior to discharge to the POTW.

2. Blank entries mean that the monitoring point was not part of the sampling program for that quarter.

3. The fall quarter (10/92) analyses included the full VOC list of analyses, while the first three quarters included only the shorter aromatics VOC list.

4. Refer to summary tables in quarterly reports (RMT, Inc., 1992a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, xylenes, 1,2-dichloroethene, trichloroethene, tetrachloroethene, and vinyl chloride.

5. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

   ND = None detected.

08-FEB-93:cksitvoc TAB6.BJC

TABLE 7A - TOTAL VOCS DETECTED, 1992
PERIMETER GROUP - GLACIAL UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
W-01A							ND	UG/L
W-03B							ND	UG/L
W-14B	2	UG/L	2	UG/L	1.7	UG/L	ND	UG/L
W-18A							ND	UG/L
W-20	47.9	UG/L	3.5	UG/L	ND	UG/L	ND	UG/L
W-27	ND	UG/L	ND	UG/L	ND	UG/L	287	UG/L

TABLE 7B - TOTAL VOCS DETECTED, 1992
PERIMETER GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
W-03A	18.9	UG/L	3.6	UG/L	ND	UG/L	ND	UG/L
W-03A DUP	18.7	UG/L	3.6	UG/L	ND	UG/L	ND	UG/L
W-07	5	UG/L	ND	UG/L	ND	UG/L	ND	UG/L
W-22							21	UG/L
W-23	15.9	UG/L	11	UG/L	16.4	UG/L	9	UG/L
W-25							ND	UG/L
W-39							ND	UG/L
W-40	20	UG/L	6.4	UG/L	6.6	UG/L	ND	UG/L
W-40 DUP	19.8	UG/L	6	UG/L	6.7	UG/L	ND	UG/L
PW-08	18.6	UG/L	16.6	UG/L	1.6	UG/L	ND	UG/L

1. Wells W-04A, W-08, and W-16A are part of the Glacial unit but were dry during the fall sampling round; they were not included in the sampling plan for the other quarters. Groundwater quality data is not available for these wells in 1992.

2. Blank entries mean that the monitoring point was not part of the sampling program for that quarter.

3. The fall quarter (10/92) analyses included the full VOC list of analyses, while the first three quarters included only the shorter aromatics VOC list.

4. Refer to summary tables in quarterly reports (RMT, Inc., 1992a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, xylenes, 1,2-dichloroethene, trichloroethene, tetrachloroethene, and vinyl chloride.

5. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

6. Well PW-08 is a deep dolomite well.

ND = None detected.

08-FEB-93:cksitvoc TAB7.BJC

TABLE 8A - TOTAL VOCS DETECTED, 1992
REMEDIATION PROGRESS GROUP - GLACIAL UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
W-06A	235680	UG/L	199239	UG/L	180940	UG/L	235600	UG/L
W-19A							670	UG/L
W-37	145450	UG/L	148430	UG/L	147700	UG/L	170732	UG/L
W-37 DUP	146640	UG/L	152510	UG/L	150630	UG/L	163371	UG/L
W-41	1.1	UG/L	662.2	UG/L	256.8	UG/L	340	UG/L
W-42	17560	UG/L	18690	UG/L	7400	UG/L	6748	UG/L
W-43	36400	UG/L	29000	UG/L	25500	UG/L	26900	UG/L
W-46	2	UG/L	14	UG/L	ND	UG/L	68	UG/L
W-47	381000	UG/L	170520	UG/L	95740	UG/L	113726	UG/L
W-48	ND	UG/L	ND	UG/L	ND	UG/L	ND	UG/L

TABLE 8B - TOTAL VOCS DETECTED, 1992
REMEDIATION PROGRESS GROUP - SHALLOW DOLOMITE UNIT

SAMPLE ID	01/92		04/92		07/92		10/92	
W-21A	30300	UG/L	32130	UG/L	27290	UG/L	31000	UG/L
W-24A	ND	UG/L	ND	UG/L	ND	UG/L	41	UG/L
W-28	49.8	UG/L	110.7	UG/L	60.4	UG/L	18	UG/L
W-29	3908.8	UG/L	4338.9	UG/L	3910.8	UG/L	3406	UG/L
W-30	15	UG/L	8	UG/L	16.6	UG/L	ND	UG/L
W-38	11046	UG/L	2068.3	UG/L	5129	UG/L	7112	UG/L

1. Wells W-44 and W-45 are part of the Glacial unit but were dry all four quarters. Groundwater quality data is not available for these wells in 1992.

2. Blank entries mean that the monitoring point was not part of the sampling program for that quarter.

3. The fall quarter (10/92) analyses included the full VOC list of analyses, while the first three quarters included only the shorter aromatics VOC list.

4. Refer to summary tables in quarterly reports (RMT, Inc., 1992a,b,c,d) for specific analytes detected. Typical VOC detections included benzene, toluene, ethylbenzene, xylenes, 1,2-dichloroethene, trichloroethene, tetrachloroethene, and vinyl chloride.

5. Total VOCs were calculated by summing all measured and estimated values, except those qualified with a "U", which are considered undetected because of associated blank contamination.

   ND = None detected.

05-JAN-93:cksitvoc TAB8.BJC

Throughout 1992 the distribution of contamination in the glacial unit did not vary significantly. The patterns of VOC concentrations in 1992, as depicted in Figures 5a and 5b, are similar to those observed in 1991 and in previous years (Hatcher-Sayre, Inc., 1992).

Three major features are apparent in the pattern of VOC concentrations in the glacial unit (Figures 5a and 5b). Two areas of total VOC concentrations greater than 100,000 μg/L, are located in the northern and southwestern areas of the site. The northern plume is centered at the former hazardous waste incinerator/former urethane laboratory area and extends off-site to the east under the church yard. The eastern (downgradient) extent of this plume is defined by low or nondetectable concentrations of VOCs in wells W-20 and W-03B. The southwestern plume is centered in the area of the former dry well and extends a short distance to the south and east. Shallow groundwater is effectively controlled by RC-2 in this area. The extent of this plume is defined by nondetectable levels of VOCs observed in W-14B and W-48.

The third salient feature observed on these maps is centered around W-43, which has a total VOC concentration greater than 10,000 μg/kg. This plume may extend to the east based upon previous analyses of samples from W-44 and W-45. This plume appears to originate in the vicinity of the former tank farm area and is effectively captured by the collection lines of RC-1.

3.3.2.2 VOC Patterns in the Shallow Dolomite Unit

The extent of VOC contamination in the shallow dolomite unit for spring quarter is shown in Figure 6 (Appendix C). The spring quarter VOC distribution was chosen as representative of the pattern in 1992. The distribution of VOC concentrations in the shallow dolomite system did not vary significantly during 1992. The level and pattern of VOC concentrations are similar to that documented in 1991 (Hatcher-Sayre, Inc., 1992).

The highest concentrations of VOCs detected in the shallow dolomite were found near the center of the site (wells W-38 and W-21A), and the

concentrations decrease uniformly with distance in all directions to levels generally below 10 μg/L at the perimeter of the site.

3.3.3 VOC Trends by Monitoring Objective

This section describes trends in total VOC concentrations for each of the monitoring objectives. The variation in total VOC concentrations for individual wells is presented in Appendix D. The discussion that follows is organized by the monitoring objective (receptor, perimeter, remediation progress) followed by the hydrogeologic unit (glacial, shallow dolomite, deep dolomite). The total VOC data shown prior to 1992 were obtained from Hatcher-Sayre, Inc.

3.3.3.1 Receptor Monitoring

Ranney Collectors and POTW

Total VOCs and total phenolics were monitored in the shallow groundwater discharged from the Ranney collectors (RC-1, RC-2, and RC-3) and in the influent, effluent, and sludge samples taken at the POTW. These analyses were performed to monitor the levels of chemical compounds leaving the CCP site and being processed at the POTW. The total VOC and total phenolic trends for 1992 are presented in Table 9. These data show that there is no correlation between the total VOCs and total phenolics discharged from the Ranney collectors and the influent arriving at the POTW. Ranney collector discharge is diluted with wastewaters from diverse sources upon arrival at the POTW, which explains the variability in POTW influent VOC and phenolic concentrations. The low or nondetectable levels of VOCs and phenolics in the effluent demonstrate that the POTW is capable of processing the discharge from CCP as well as waste streams from other sources. Since sufficient baseline information has been collected regarding phenolic trends at the POTW, total phenolics monitoring as the POTW will be discontinued in 1993. Total VOC monitoring will continue.

TABLE 9

COOK COMPOSITES & POLYMERS
TOTAL VOC AND PHENOLIC RESULTS IN RANNEY COLLECTORS AND POTW

Date	Total VOC Results			
	Discharged From CCP (mg/L)[1]	POTW Influent (mg/L)	POTW Effluent (mg/L)	POTW sludge (mg/kg)
January 1992	12 - 74	1.24	ND	5.0
April 1992	8 - 27	0.07	0.01	9.5
July 1992	9 - 74	0.23	ND	134.1
October 1992	12 - 15	0.06	ND	0.6
Date	**Total Phenolic Results**			
	Discharged From CCP (mg/L)[1]	POTW Influent (mg/L)	POTW Effluent (mg/L)	POTW sludge (mg/kg)
January 1992	0.2 - 0.44	0.035	ND	2.0
April 1992	0.12 - 0.2	0.081	0.015	68.0
July 1992	0.12 - 0.21	0.045	0.023	28.0
October 1992	0.3 - 1.2	0.044	ND	30.0

NOTES:

[1] The range in values of VOCs discharged from CCP results from varying concentrations in RC-1, RC-2, and RC-3.

ND = No VOCs detected at or above method detection limit.

Municipal Wells (Deep Dolomite Wells)

VOC concentrations in the municipal wells (MW-1, MW-2, MW-3, and MW-4) were at nondetectable levels (or below the reporting limits) for 1992, indicating that the Village water supply wells continue to be protected from site groundwater contamination.

3.3.3.2 Perimeter Monitoring

Glacial Wells

VOC concentrations in glacial perimeter wells in 1992 generally showed trends to low or nondetectable levels. The exception was well W-27, which contained nondetectable levels of VOCs until the fall quarter, when chlorinated hydrocarbons were detected. These decreasing trends are consistent with those of the last 4 years.

Exceedances of NR 140 Enforcement Standards (ES) were limited to wells W-27 and W-14B. These wells contained the chlorinated hydrocarbons trichloroethene (TCE) and/or perchloroethene at levels above the ES. The presence of these compounds suggests migration from an upgradient source.

Shallow Dolomite Wells

Perimeter wells screened in the shallow dolomite generally showed trends to very low or nondetectable levels of VOCs. Exceptions include wells W-22, W-23, and W-40, which contained total VOCs ranging from 10 to 20 μg/L. Wells W-22 and W-40 contained benzene, toluene, ethylbenzene, and xylene (BTEX) compounds at levels exceeding the NR 140 ES. Well W-23 contained vinyl chloride in exceedance of the ES. Again, the presence of chlorinated hydrocarbons suggests migration from an upgradient source.

3.3.3.3 Remediation Progress Monitoring

Glacial Wells

The remediation progress wells in the glacial unit showed more variability in trends than the perimeter and receptor wells. In general, VOC levels were within ranges established over the past 3 years.

Several glacial remediation progress wells contained VOCs in excess of NR 140 ES. These wells include W-06A, W-19A, W-37, W-42, W-43, and W-47, which contained elevated levels of BTEX and/or chlorinated hydrocarbons such as 1,2-dichloroethene, tetrachloroethene, 2-butanone, TCE, and vinyl chloride. The presence of some of the BTEX compounds may be consistent with past site activities, but the presence of TCE and related compounds suggests migration from an upgradient source.

Shallow Dolomite Wells

VOC levels in remediation progress wells in the shallow dolomite displayed trends similar to those in the glacial unit, with most of the wells' VOC concentrations remaining within ranges established over the past 3 years.

Several wells contained VOCs at concentrations exceeding the ES. These wells include W-21A, W-24A, W-28, W-29, W-30, and W-38. Specific compounds in excess of ES include BTEX (generally near the center of the site) and chlorinated hydrocarbons such as 1,2-dichloroethene and vinyl chloride (in wells W-24A and W-29 in southern and eastern portions of the site). Again, the presence of these compounds in upgradient wells may suggest migration of VOCs from an upgradient source.

3.4 Plume Containment

The discussion in this section combines groundwater flow and quality trends from the receptor, perimeter, and remediation progress wells in the glacial overburden and dolomite to present an evaluation of the plume containment effectiveness of the remedial system at the Saukville site.

3.4.1 The Glacial Unit

Although groundwater levels in the glacial overburden remain relatively high, and a moderate hydraulic gradient is seen to the east across the site, the groundwater quality data suggest little or no off-site migration of site contaminants. The variability of VOC trends in **remediation progress** wells is within ranges established over the past 3 years. **Perimeter wells** show decreasing trends in VOC concentrations in 1992

and previous years. These data indicate that shallow groundwater contamination in the glacial unit is being effectively controlled.

3.4.2 The Shallow Dolomite Unit

Over the past 4 years, VOC concentrations in the shallow dolomite have remained moderate to high in **remediation progress** wells (e.g., W-21A and W-38). The **perimeter** wells in this unit generally have contained low (<20 μg/L) or nondetectable levels of VOCs. The contaminant plume in the shallow dolomite is being effectively controlled.

3.4.3 The Deep Dolomite Unit

VOC concentrations in the **deep dolomite receptor and remediation progress** wells (e.g., MW-1, MW-2, W-30, and PW-08) have consistently decreased to below detection limits.

3.4.4 Hydraulic Communication Between the Aquifers

Although the patterns of VOC concentrations in the glacial overburden and shallow dolomite have remained different and distinct from one another, the hydrogeologic data indicate a degree of hydraulic communication between the two units. Downward seepage from source areas in the glacial overburden into the shallow dolomite through fractures in the upper portion of the bedrock has been documented in previous studies (e.g., Hatcher-Sayre, 1988a). In addition, the similarity of heads measured in wells screened in the karst feature to heads measured in the shallow dolomite at similar depths suggests the possibility of hydraulic communication between the glacial drift and the bedrock in this vicinity (Table 2, Figures 3a, 3b, and 4 of Appendix B).

Section 5

REFERENCES

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RMT, Inc. 1992c. 1992 Summer quarter groundwater results. Prepared for: Cook Composites and Polymers Co. October 1992.

RMT, Inc. 1992d. 1992 Fall quarter groundwater results. Prepared for: Cook Composites and Polymers Co. December 1992.

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APPENDIX A

SUMMARY OF 1993 GROUNDWATER SAMPLING PROGRAM

APPENDIX A

COOK COMPOSITES AND POLYMERS
SUMMARY OF 1993 GROUNDWATER SAMPLING PROGRAM

Monitoring Objective/ Well Group	Unit Monitored	Sampling Point	Sampling Frequency and EPA Method Number		
			Quarterly	Semi-annually[3]	Annually[4]
Receptor	Glacial	RC-1	8020		
		RC-2	8020		
		RC-3	8020		
	Deep Dolomite	MW-1	8240		
		MW-2*	8240		
		MW-3	8240		
		MW-4	8240		
	POTW	POTW-I[2]	8240		
		POTW-E[2]	8240		
		POTW-S[2]	8240		
Perimeter	Glacial	W-01A		8240	
		W-03B		8240	
		W-04A		8240	
		W-08		8240	
		W-08A[1] (proposed)		8240	
		W-20		8240	
		W-27		8240	
	Shallow Dolomite	W-03A		8240	
		W-07		8240	
		W-07A[1] (proposed)		8240	
		W-22		8240	
		W-23		8240	
		W-25		8240	
	Deep Dolomite	PW-08		8240	

APPENDIX A (CONTINUED)

COOK COMPOSITES AND POLYMERS
SUMMARY OF 1993 GROUNDWATER SAMPLING PROGRAM

Monitoring Objective/ Well Group	Unit Monitored	Sampling Point	Sampling Frequency and EPA Method Number		
			Quarterly	Semi-annually[3]	Annually[4]
Remediation Progress	Glacial	W-06A			8240
		W-19A			8240
		W-37			8240
		W-41			8240
		W-42			8240
		W-43			8240
		W-47			8240
	Shallow Dolomite	W-21A			8240
		W-24A			8240
		W-28			8240
		W-29			8240
		W-38			8240
	Deep Dolomite	W-30			8240

NOTES:

[1] Wells W-07 and W-08 will be replaced in 1993 by wells W-07A and W-08A. Samples will be taken in one nest or the other, depending on which well nest is currently in use.

[2] The POTW samples will be analyzed for VOCs only; analysis for phenolics will be discontinued in 1993.

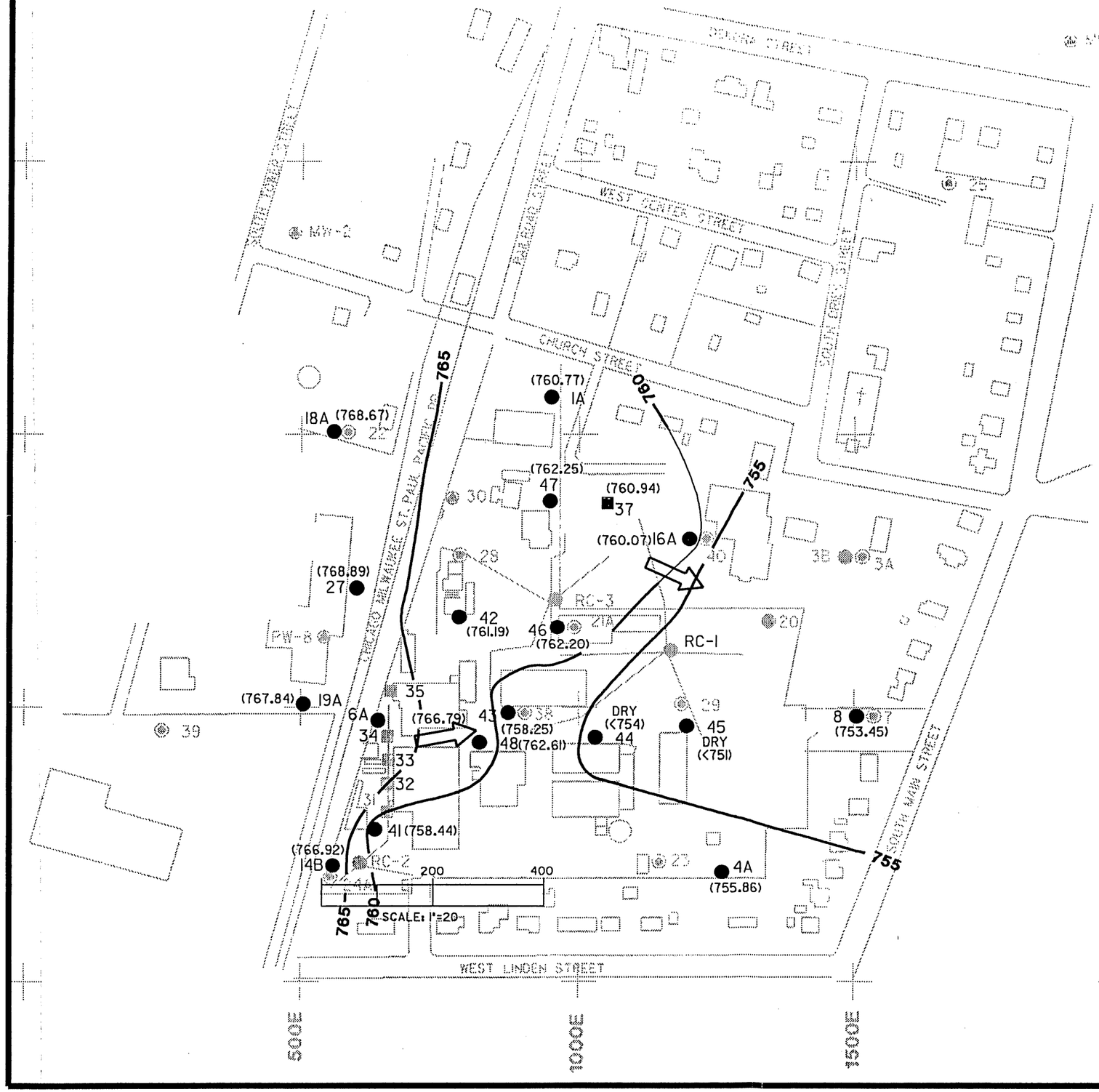
[3] Semi-annual samples will be collected in April and October.

[4] Annual samples will be collected in July.

* MW-2 will be monitored once per year because it is not used for water supply purposes.

APPENDIX B

POTENTIOMETRIC SURFACE MAPS



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- 750 — WATER TABLE CONTOUR. ELEVATIONS ARE IN FEET RELATIVE TO MEAN SEA LEVEL. CONTOUR INTERVAL IS 5 FEET.
- DIRECTION OF GROUNDWATER FLOW
- (738.12) ELEVATION OF WATER IN MONITORING WELL (FEET, MSL)

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. WATER LEVELS WERE MEASURED ON APRIL 13-16, 1992.
3. THE MILWAUKEE RIVER IS LOCATED APPROXIMATELY 1000 FEET EAST OF THE SITE.

N

0 0'

WATER TABLE MAP - GLACIAL DRIFT HIGH LEVEL : SPRING QUARTER, APRIL 1992

RMT INC.

Drawn By:	DJW
Approved By:	
Date:	FEBRUARY, 1993
Proj. No.:	1832.33

FIGURE 3A

RMT COMPUTER AIDED DESIGN & DRAFTING

Plot Data

Design File	= /usr2/1832/hipot.dll
User ID	= project
Plot File	= hipot.prf
Pen Table	= h:\1832\table\hipot.tbl
Plotter	= VERSATEC
Scale	= 1:200.000000
Rotation	= 90.000000
Plot Date	= Wed Feb 10 09:11:13 1993
Levels Un	= 1,8,43,45,58

Reference Files

Ref. File 1	= bmrmt.dgn
Ref. File 2	= bmclient.dgn
Ref. File 3	= border.dgn
Ref. File 4	= *no ref name*
Ref. File 5	= *no ref name*
Ref. File 6	= *no ref name*
Ref. File 7	= *no ref name*
Ref. File 8	= *no ref name*
Ref. File 9	= *no ref name*
Ref. File 10	= *no ref name*

Logical Names

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(7)	*no ref logical*
(8)	*no ref logical*
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(10)	*no ref logical*

Levels

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(3)	1-63
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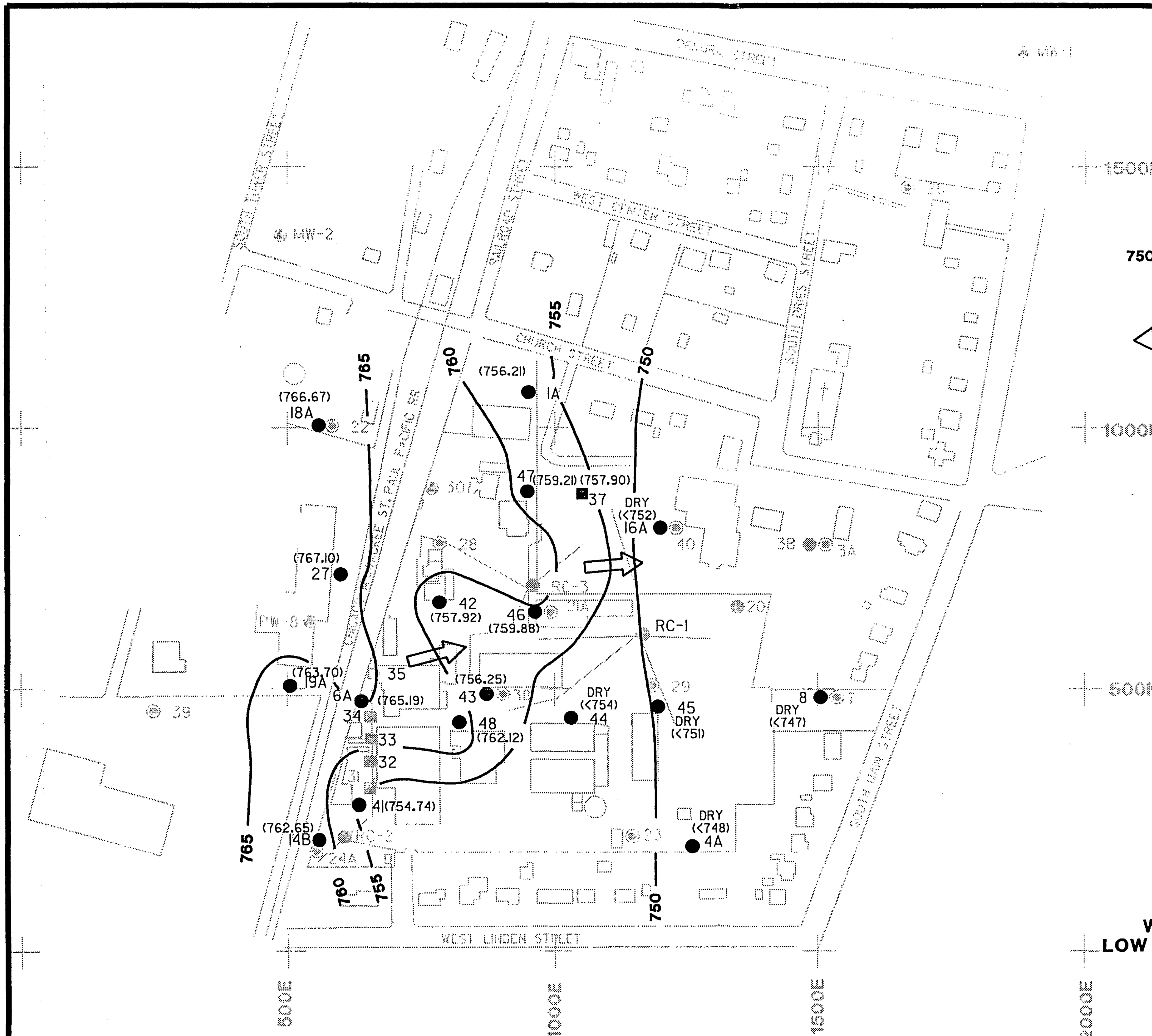
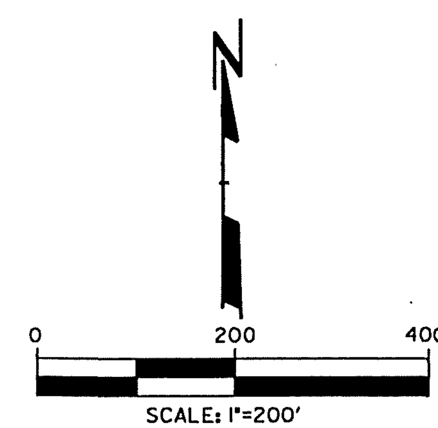


LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- 750 WATER TABLE CONTOUR. ELEVATIONS ARE IN FEET RELATIVE TO MEAN SEA LEVEL. CONTOUR INTERVAL IS 5 FEET.
- DIRECTION OF GROUNDWATER FLOW
- (738.12) ELEVATION OF WATER IN MONITORING WELL (FEET, MSL)

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. WATER LEVELS WERE MEASURED ON OCTOBER 12-15, 1992.
3. THE MILWAUKEE RIVER IS LOCATED APPROXIMATELY 1000 FEET EAST OF THE SITE.



WATER TABLE MAP - GLACIAL DRIFT
LOW LEVEL : FALL QUARTER, OCTOBER 1992

RMT INC.	Drawn By: DJW
	Approved By:
	Date: FEBRUARY, 1993
	Proj. No.: 1832.33

FIGURE 3B

RMT COMPUTER AIDED DESIGN & DRAFTING

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Rotation = 0.000000
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Ref. File 3 = border.dgn
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Ref. File 6 = •no ref name•
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Ref. File 10 = •no ref name•

Logical Names
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(2) bmc
(3) bdr
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(5) •no ref logical•
(6) •no ref logical•
(7) •no ref logical•
(8) •no ref logical•
(9) •no ref logical•
(10) •no ref logical•

Levels
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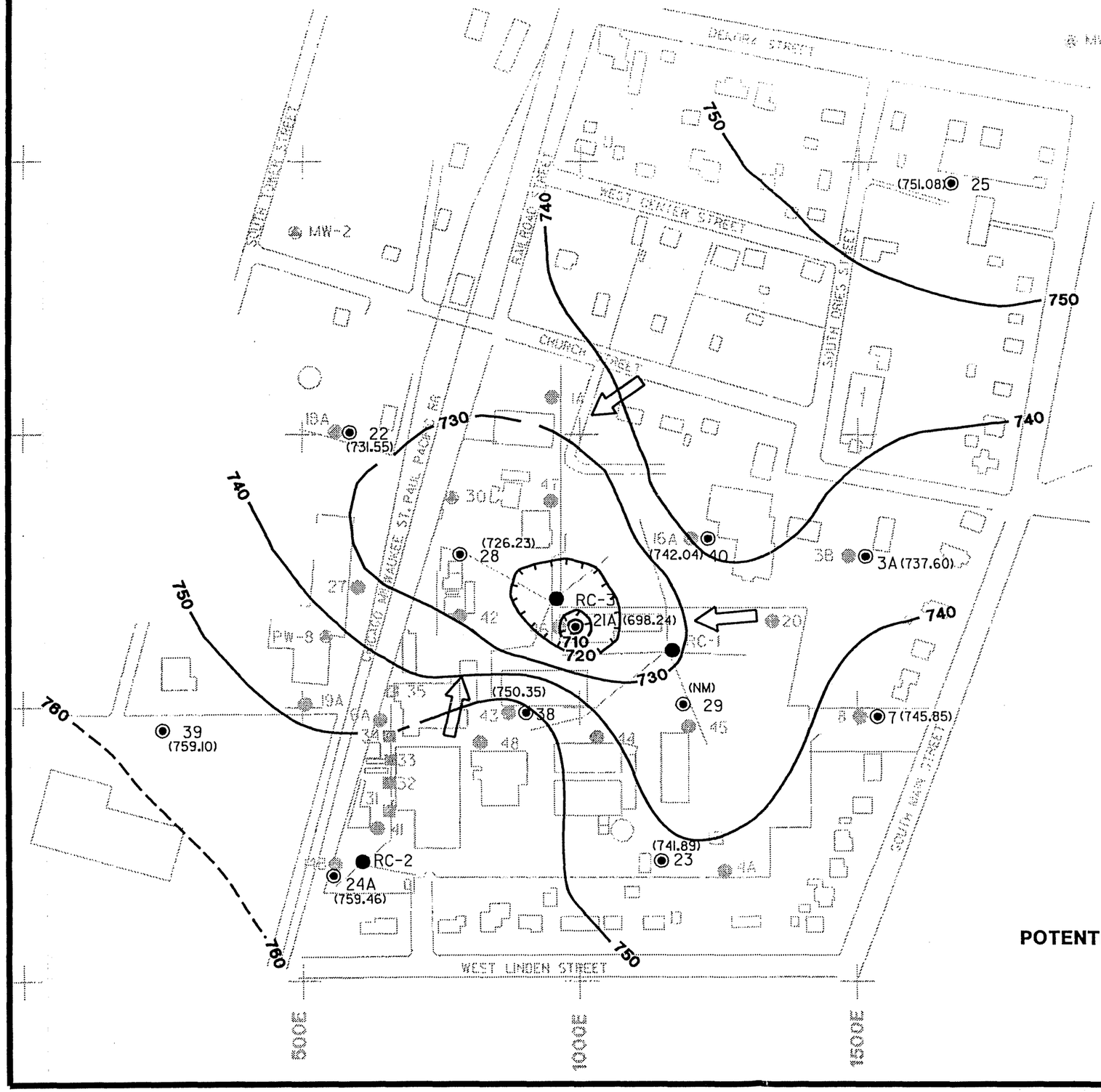
(2) 1-63
(3) 1-63
(4) •no ref levels•
(5) •no ref levels•
(6) •no ref levels•
(7) •no ref levels•
(8) •no ref levels•
(9) •no ref levels•
(10) •no ref levels•



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- 750 — POTENTIOMETRIC SURFACE CONTOUR. ELEVATIONS ARE IN FEET RELATIVE TO MEAN SEA LEVEL. CONTOUR INTERVAL IS 10 FEET.
- DIRECTION OF GROUNDWATER FLOW
- (738.12) ELEVATION OF WATER IN SHALLOW DOLOMITE MONITORING WELL (FEET, MSL). NM MEANS NOT MEASURED ON THIS DATE.

NOTES

1. BASE MAP WAS DEVELOPED FROM HATCHER-SAYRE, INC., 1992.
2. WATER LEVELS WERE MEASURED ON APRIL 13-16, 1992.
3. THE MILWAUKEE RIVER IS LOCATED APPROXIMATELY 1000 FEET EAST OF THE SITE.

POTENTIOMETRIC SURFACE MAP - SHALLOW DOLOMITE SPRING QUARTER, 1992

RMT, INC.

Drawn By:	DJW
Approved By:	
Date:	FEBRUARY, 1993
Proj. No.:	1832.33

RMT COMPUTER AIDED DESIGN & DRAFTING

FIGURE 4

Plot Data

Design File = /usr2/1832/dolpot.plt
User ID = project
Plot File = dolpot.prf
Pen Table = h:\1832\table\dolplot.tbl
Plotter = VERSATEC
Scale = 1:200.000000
Rotation = 0.000000
Plot Date = Tue Feb 09 17:07:15 1993
Levels On = 8,46-50,57,59

Reference Files

Ref. File 1 = bmrmt.dgn
Ref. File 2 = bmelem1.dgn
Ref. File 3 = borderdgn
Ref. File 4 = *no ref name*
Ref. File 5 = *no ref name*
Ref. File 6 = *no ref name*
Ref. File 7 = *no ref name*
Ref. File 8 = *no ref name*
Ref. File 9 = *no ref name*
Ref. File 10 = *no ref name*

Logical Names

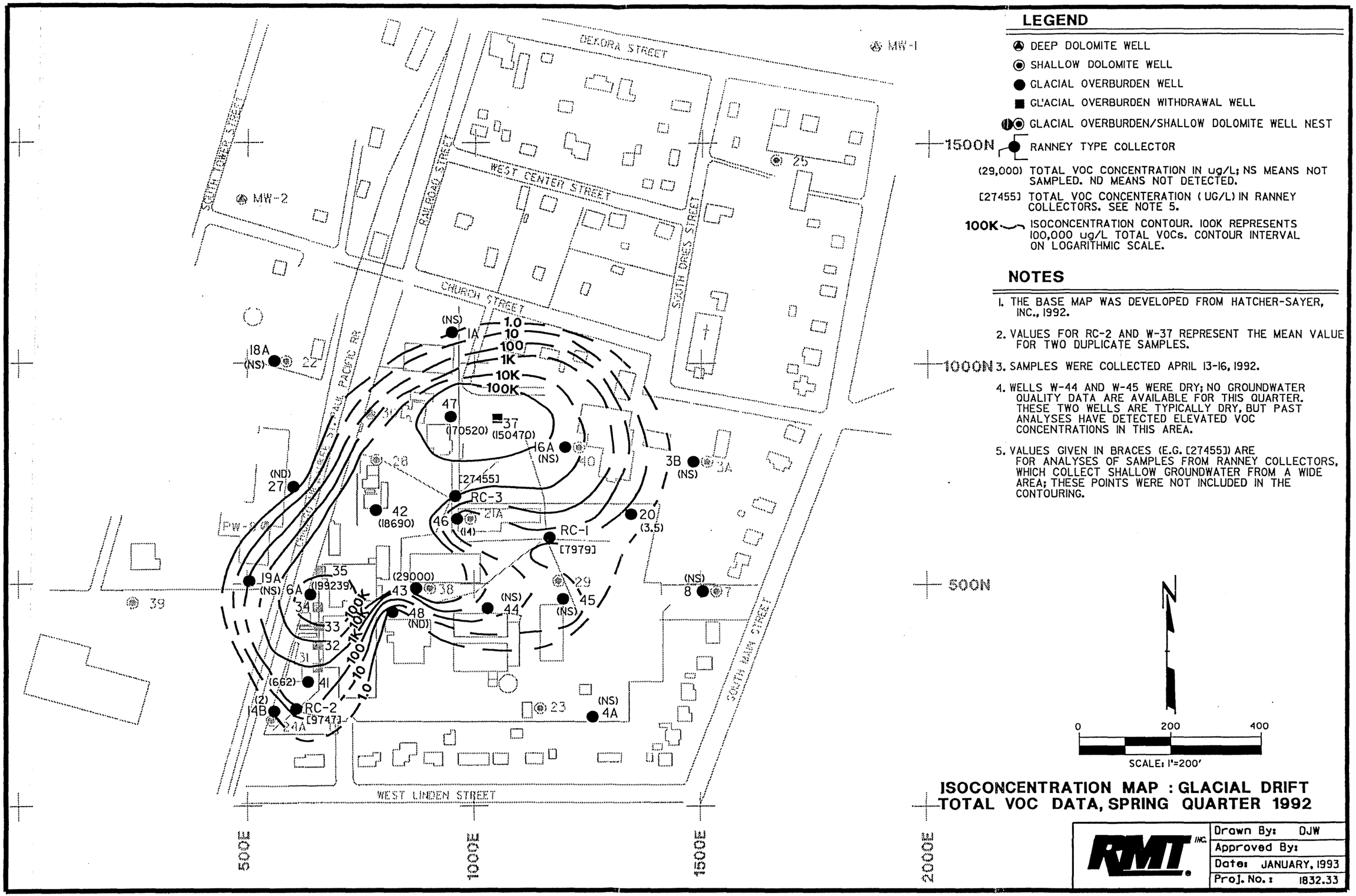
(1) bmr
(2) bmc
(3) bdr
(4) *no ref logical*
(5) *no ref logical*
(6) *no ref logical*
(7) *no ref logical*
(8) *no ref logical*
(9) *no ref logical*
(10) *no ref logical*

Levels

(1) 46-50,57
(2) 1-63
(3) 1-63
(4) *no ref levels*
(5) *no ref levels*
(6) *no ref levels*
(7) *no ref levels*
(8) *no ref levels*
(9) *no ref levels*
(10) *no ref levels*

APPENDIX C

ISOCONCENTRATION MAPS



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- (29,000) TOTAL VOC CONCENTRATION IN ug/L; NS MEANS NOT SAMPLED. ND MEANS NOT DETECTED.
- [27455] TOTAL VOC CONCENTERATION (UG/L) IN RANNEY COLLECTORS. SEE NOTE 5.
- 100K ISOCONCENTRATION CONTOUR. 100K REPRESENTS 100,000 ug/L TOTAL VOCs. CONTOUR INTERVAL ON LOGARITHMIC SCALE.

NOTES

1. THE BASE MAP WAS DEVELOPED FROM HATCHER-SAYER, INC., 1992.
2. VALUES FOR RC-2 AND W-37 REPRESENT THE MEAN VALUE FOR TWO DUPLICATE SAMPLES.
3. SAMPLES WERE COLLECTED APRIL 13-16, 1992.
4. WELLS W-44 AND W-45 WERE DRY; NO GROUNDWATER QUALITY DATA ARE AVAILABLE FOR THIS QUARTER. THESE TWO WELLS ARE TYPICALLY DRY, BUT PAST ANALYSES HAVE DETECTED ELEVATED VOC CONCENTRATIONS IN THIS AREA.
5. VALUES GIVEN IN BRACES (E.G. [27455]) ARE FOR ANALYSES OF SAMPLES FROM RANNEY COLLECTORS, WHICH COLLECT SHALLOW GROUNDWATER FROM A WIDE AREA; THESE POINTS WERE NOT INCLUDED IN THE CONTOURING.

ISOCONCENTRATION MAP : GLACIAL DRIFT TOTAL VOC DATA, SPRING QUARTER 1992

RMT INC.

Drawn By:	DJW
Approved By:	
Date:	JANUARY, 1993
Proj. No.:	1832.33

RMT COMPUTER AIDED DESIGN & DRAFTING

FIGURE 5A

Logical Names

(1) bmr
(2) bmc
(3) bdr
(4) *no ref logical*
(5) *no ref logical*
(6) *no ref logical*
(7) *no ref logical*
(8) *no ref logical*
(9) *no ref logical*
(10) *no ref logical*

Levels

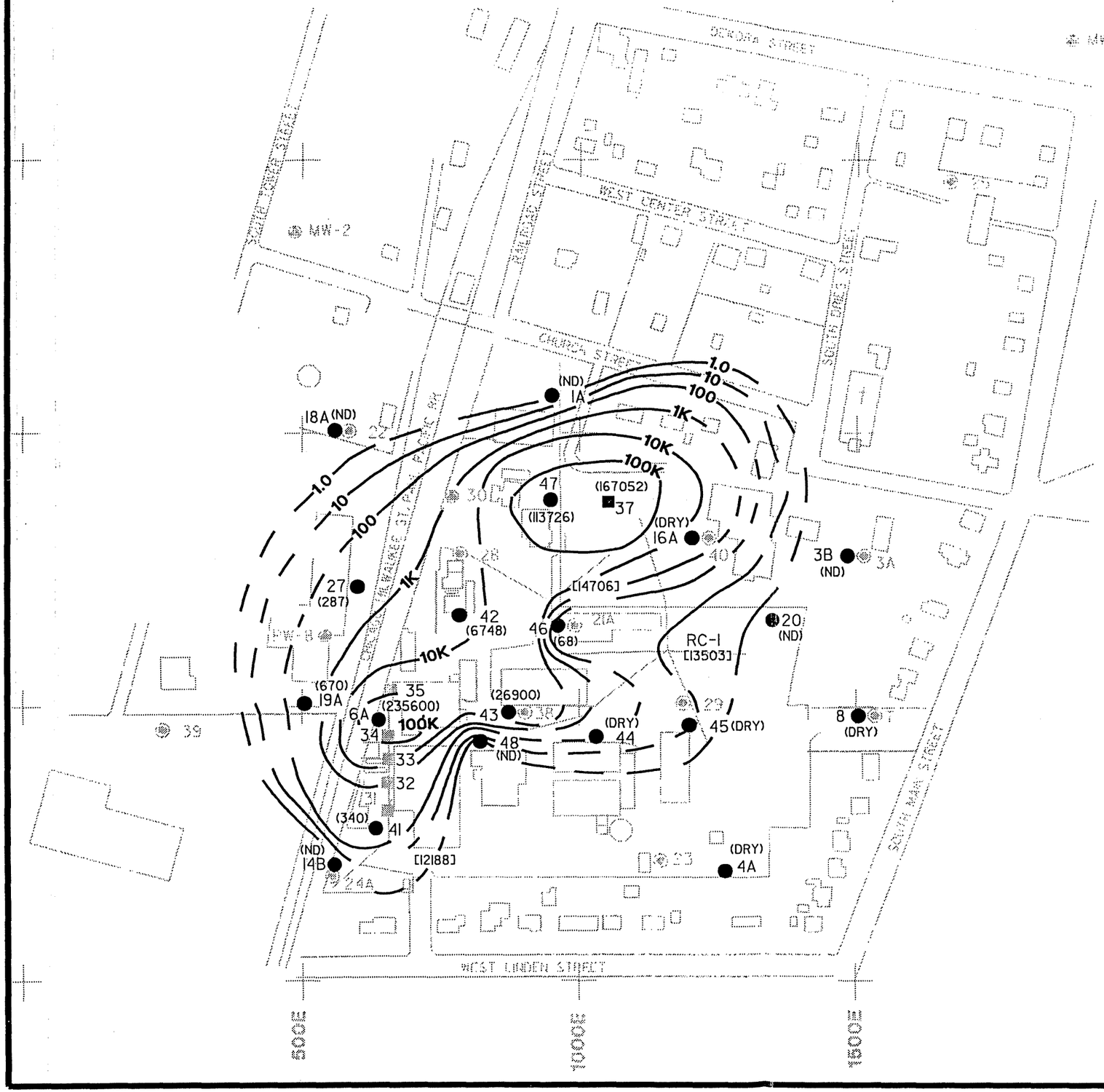
(1) 20,36-40,46-50
(2) 1-63
(3) 1-63
(4) *no ref levels*
(5) *no ref levels*
(6) *no ref levels*
(7) *no ref levels*
(8) *no ref levels*
(9) *no ref levels*
(10) *no ref levels*

Reference Files

Ref. File 1= bmrmt.dgn
Ref. File 2 = bmellent.dgn
Ref. File 3 = border.dgn
Ref. File 4 = *no ref name*
Ref. File 5 = *no ref name*
Ref. File 6 = *no ref name*
Ref. File 7 = *no ref name*
Ref. File 8 = *no ref name*
Ref. File 9 = *no ref name*
Ref. File 10 = *no ref name*

Plot Data

Design File = ./usr2/1832/hlso.plt
User ID = project
Plot File = hlso.prf
Pen Table = h:\1832\table\hldrift.tbl
Plotter = VERSATEC
Scale = 1:200.000000
Rotation = 0.000000
Plot Date = Sat Feb 06 17:33:58 1993
Levels On = 1-63



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- (29,000) TOTAL VOC CONCENTRATION IN ug/L. ND MEANS NOT DETECTED
- [14706] TOTAL VOC CONCENTRATION (ug/L) IN RANNEY COLLECTORS. SEE NOTE 6.
- 100K ISOCONCENTRATION CONTOUR. 100K REPRESENTS 100,000 ug/L TOTAL VOCs. CONTOUR INTERVAL ON LOGARITHMIC SCALE.

NOTES

1. THE BASE MAP WAS DEVELOPED FROM HATCHER-SAYER, INC., 1992.
2. VALUES FOR RC-2 AND W-37 REPRESENT THE MEAN VALUE FOR TWO DUPLICATE SAMPLES.
3. SAMPLES WERE COLLECTED OCTOBER 12-15, 1992.
4. THE FALL QUARTER ANALYSES INCLUDE THE FULL VOLATILE ORGANIC COMPOUND LIST, WHILE THE FIRST 3 QUARTER ANALYSES INCLUDED ONLY THE SHORTER AROMATIC VOLATILE ORGANIC COMPOUND LIST.
5. WELLS W-04A, W-08, W-16A, W-44 AND W-45 WERE DRY; NO GROUNDWATER QUALITY DATA ARE AVAILABLE FOR THIS QUARTER. WELLS W-44 AND W-45 ARE TYPICALLY DRY, BUT PAST ANALYSES HAVE DETECTED ELEVATED VOC CONCENTRATIONS IN THIS AREA.
6. VALUES GIVEN IN BRACES (E.G. [27455]) ARE FOR ANALYSES OF SAMPLES FROM RANNEY COLLECTORS, WHICH COLLECT SHALLOW GROUNDWATER FROM A WIDE AREA; THESE POINTS WERE NOT INCLUDED IN THE CONTOURING.

N

0 200 400

SCALE: 1"=200'

ISOCONCENTRATION MAP : GLACIAL DRIFT TOTAL VOC DATA, FALL QUARTER 1992

RMT INC.

Drawn By:	DJW
Approved By:	
Date:	FEBRUARY, 1993
Proj. No.:	1832.33

FIGURE 5B

RMT COMPUTER AIDED DESIGN & DRAFTING

Logical Names

(1) 3mr
(2) bmc
(3) bdr
(4) *no ref logical*
(5) *no ref logical*
(6) *no ref logical*
(7) *no ref logical*
(8) *no ref logical*
(9) *no ref logical*
(10) *no ref logical*

Levels

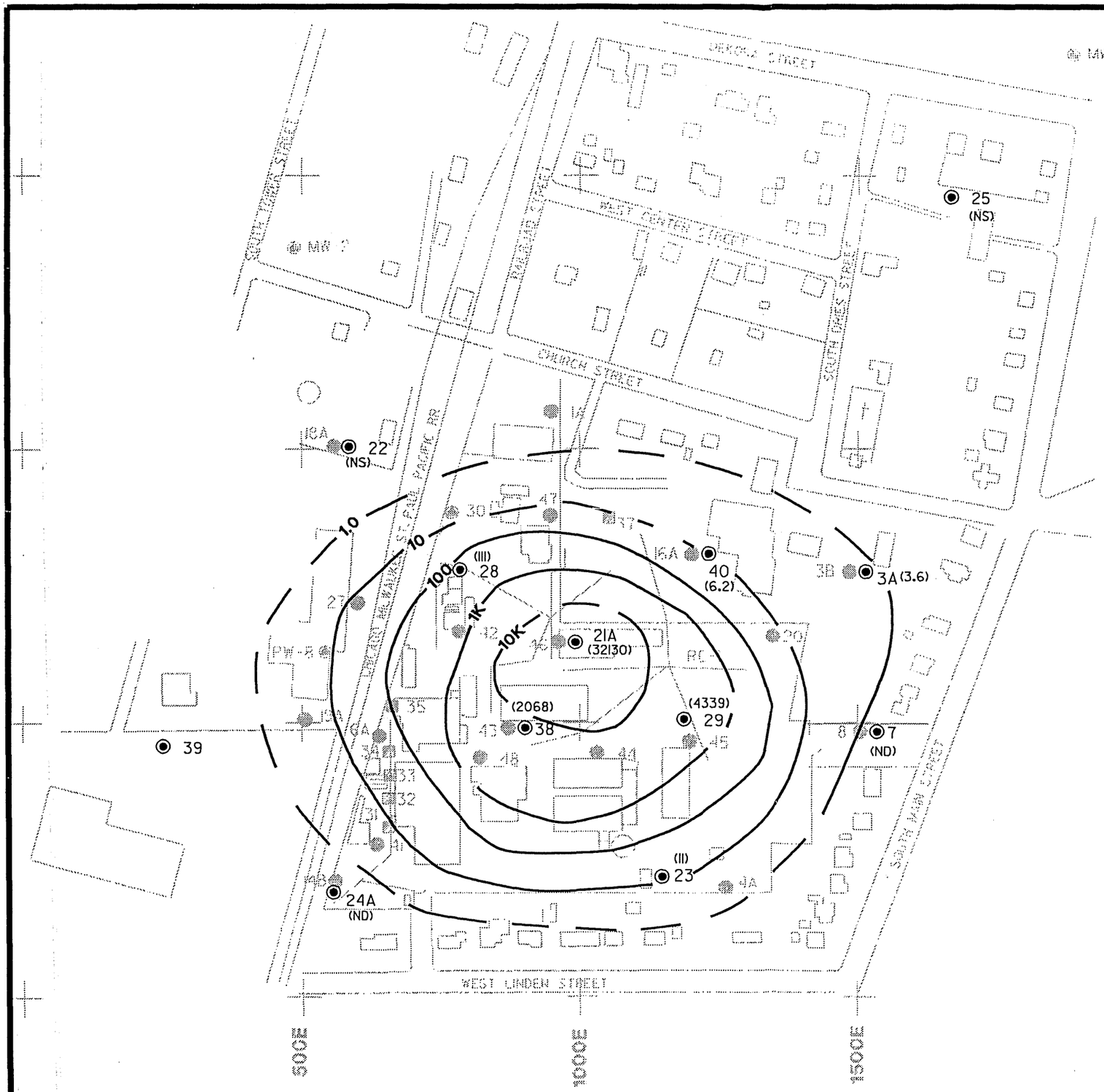
(1) 21,36-40,45-47,49,50
(2) 1-63
(3) 1-63
(4) *no ref levels*
(5) *no ref levels*
(6) *no ref levels*
(7) *no ref levels*
(8) *no ref levels*
(9) *no ref levels*
(10) *no ref levels*

Reference Files

Ref. File 1 = bmrmt.dgn
Ref. File 2 = bmclient.dgn
Ref. File 3 = border.dgn
Ref. File 4 = *no ref name*
Ref. File 5 = *no ref name*
Ref. File 6 = *no ref name*
Ref. File 7 = *no ref name*
Ref. File 8 = *no ref name*
Ref. File 9 = *no ref name*
Ref. File 10 = *no ref name*

Plot Data

Design File = /usr2/1832/illso.dgn
User ID = project
Plot File = illso.prf
Per Table = m:\1832\tables\illso.tbl
Plotter = VERSATEC
Scale = 1:200.000000
Rotation = 0.000000
Plot Date = Tue Feb 09 17:52:46 1993
Levels On = 8,21



LEGEND

- DEEP DOLOMITE WELL
- SHALLOW DOLOMITE WELL
- GLACIAL OVERBURDEN WELL
- GLACIAL OVERBURDEN WITHDRAWAL WELL
- GLACIAL OVERBURDEN/SHALLOW DOLOMITE WELL NEST
- RANNEY TYPE COLLECTOR
- (29,000) TOTAL VOC CONCENTRATION IN ug/L; NS MEANS NOT SAMPLED. ND MEANS NOT DETECTED.
- 100K ISOCONCENTRATION CONTOUR. 100K REPRESENTS 100,000 ug/L TOTAL VOCs. CONTOUR INTERVAL ON LOGARITHMIC SCALE.

NOTES

1. THE BASE MAP WAS DEVELOPED FROM HATCHER-SAYER, INC., 1992.
2. VALUES FOR W-03A AND W-40 REPRESENT MEAN VALUES FOR TWO DUPLICATE ANALYSES.
3. SAMPLES WERE COLLECTED APRIL 13-16, 1992.

ISOCONCENTRATION MAP : SHALLOW DOLOMITE TOTAL VOC DATA, SPRING QUARTER 1992

Drawn By:	DJW
Approved By:	
Date:	FEBRUARY, 1993
Proj. No.:	1832.33

FIGURE 6

RMT COMPUTER AIDED DESIGN & DRAFTING

Plot Data

Design File = /usr2/1832/dolsho.plt
User ID = project
Plot File = dolsho.prf
Pen Table = h:\1832\table\dolomite.tbl
Plotter = VERSA EC
Scale = 1:200.000000
Rotation = 0.000000
Plot Date = Wed Feb 10 10:04:26 1993
Levels On = 8,22,45-50

Reference Files

Ref. File 1 = bmrnt.dgn
Ref. File 2 = bmollent.dgn
Ref. File 3 = borders.dgn
Ref. File 4 = *no ref name*
Ref. File 5 = *no ref name*
Ref. File 6 = *no ref name*
Ref. File 7 = *no ref name*
Ref. File 8 = *no ref name*
Ref. File 9 = *no ref name*
Ref. File 10 = *no ref name*

Logical Names

(1) bmr
(2) bmc
(3) bdr
(4) *no ref logical*
(5) *no ref logical*
(6) *no ref logical*
(7) *no ref logical*
(8) *no ref logical*
(9) *no ref logical*
(10) *no ref logical*

Levels

(1) 8,22,36-40,45-47,49,50
(2) 1-63
(3) 1-63
(4) *no ref levels*
(5) *no ref levels*
(6) *no ref levels*
(7) *no ref levels*
(8) *no ref levels*
(9) *no ref levels*
(10) *no ref levels*

APPENDIX D

TREND ANALYSIS PLOTS

Glacial Wells:

Receptor:	RC-1, RC-2, RC-3
Perimeter:	W-01A, W-03B, W-04A, W-08, W-14B, W-16A, W-18A, W-20, W-27
Remediation Progress:	W-06A, W-19A, W-37, W-41, W-42, W-43, W-44, W-45, W-46, W-47, W-48

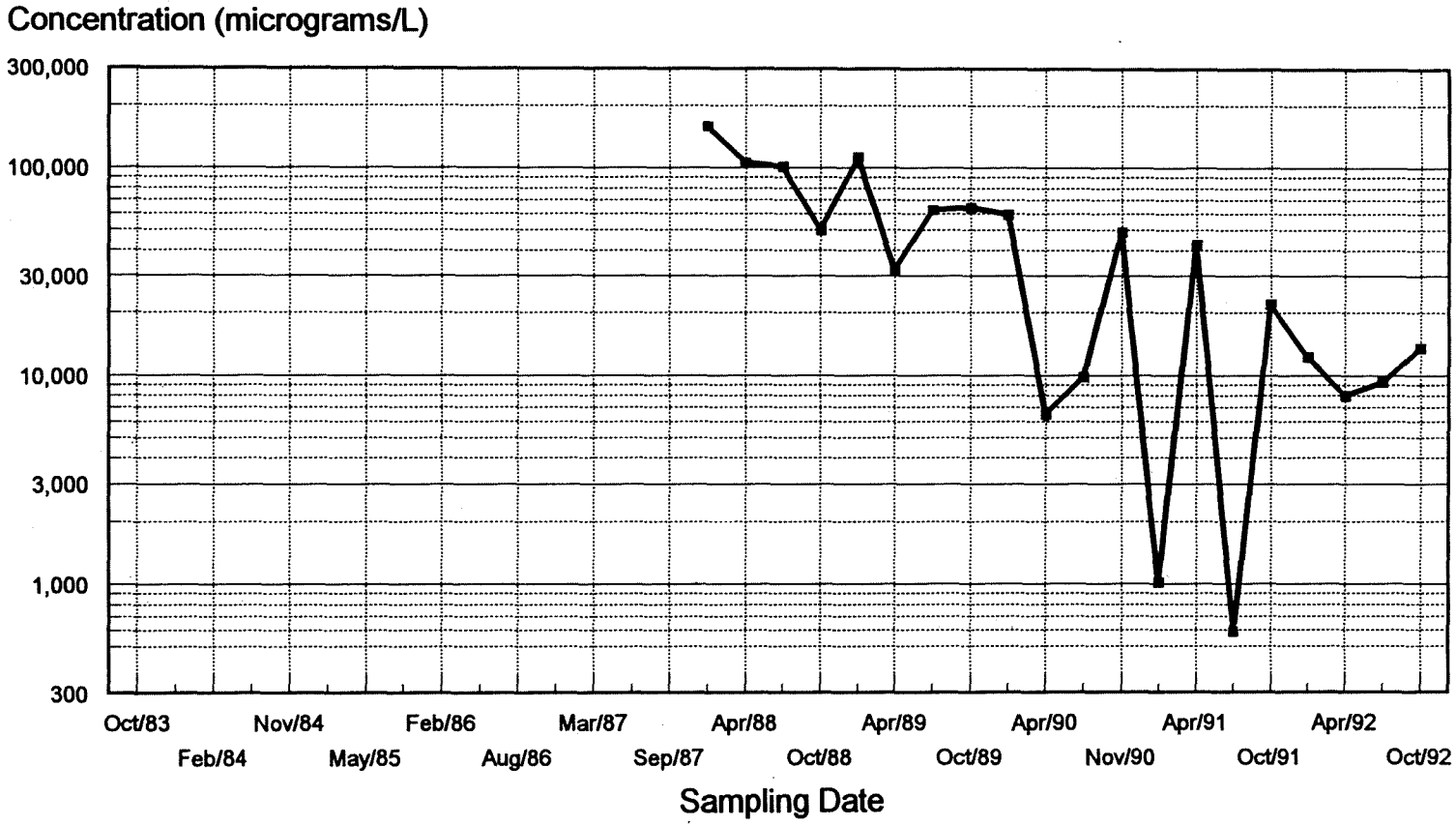
Dolomite Wells:

Receptor:	MW-1, MW-2, MW-3, MW-4
Perimeter:	W-03A, W-07, W-22, W-23, W-25, W-39, W-40, PW-08
Remediation Progress:	W-21A, W-24A, W-28, W-29, W-30, W-38

NOTES: When sample analyses indicate **non-detectable** levels of total VOCs, these events are depicted on the following plots by a symbolic value of **0.01 μg/L**. This value does not represent the detection limit (or the absolute concentration) because of changes in laboratories, methods, and detection limits since 1983.

Trend Analysis: Total VOC Concentrations

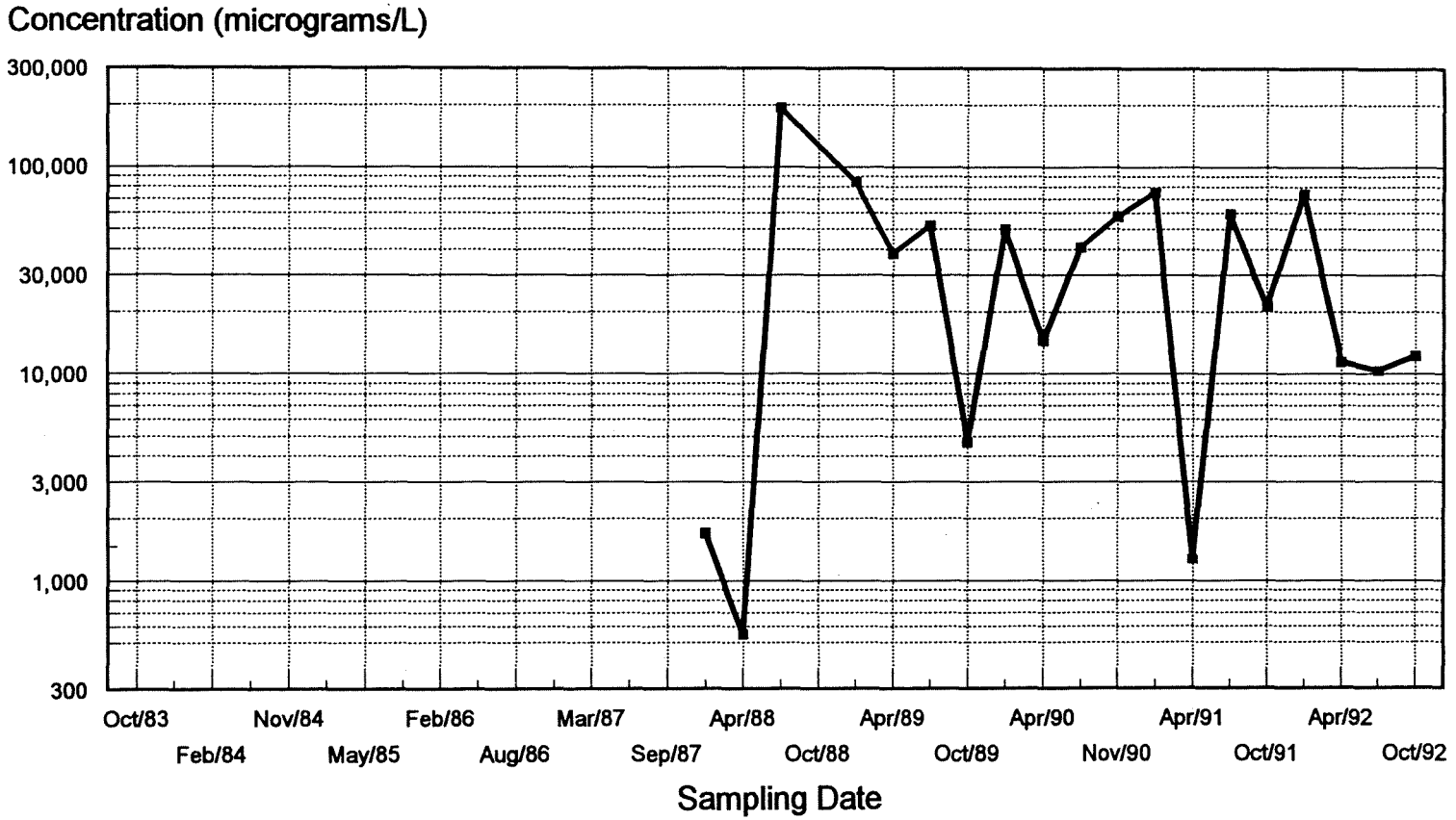
RC-1



1832.33 0000:LOT/FL:cook:rc1

Trend Analysis: Total VOC Concentrations

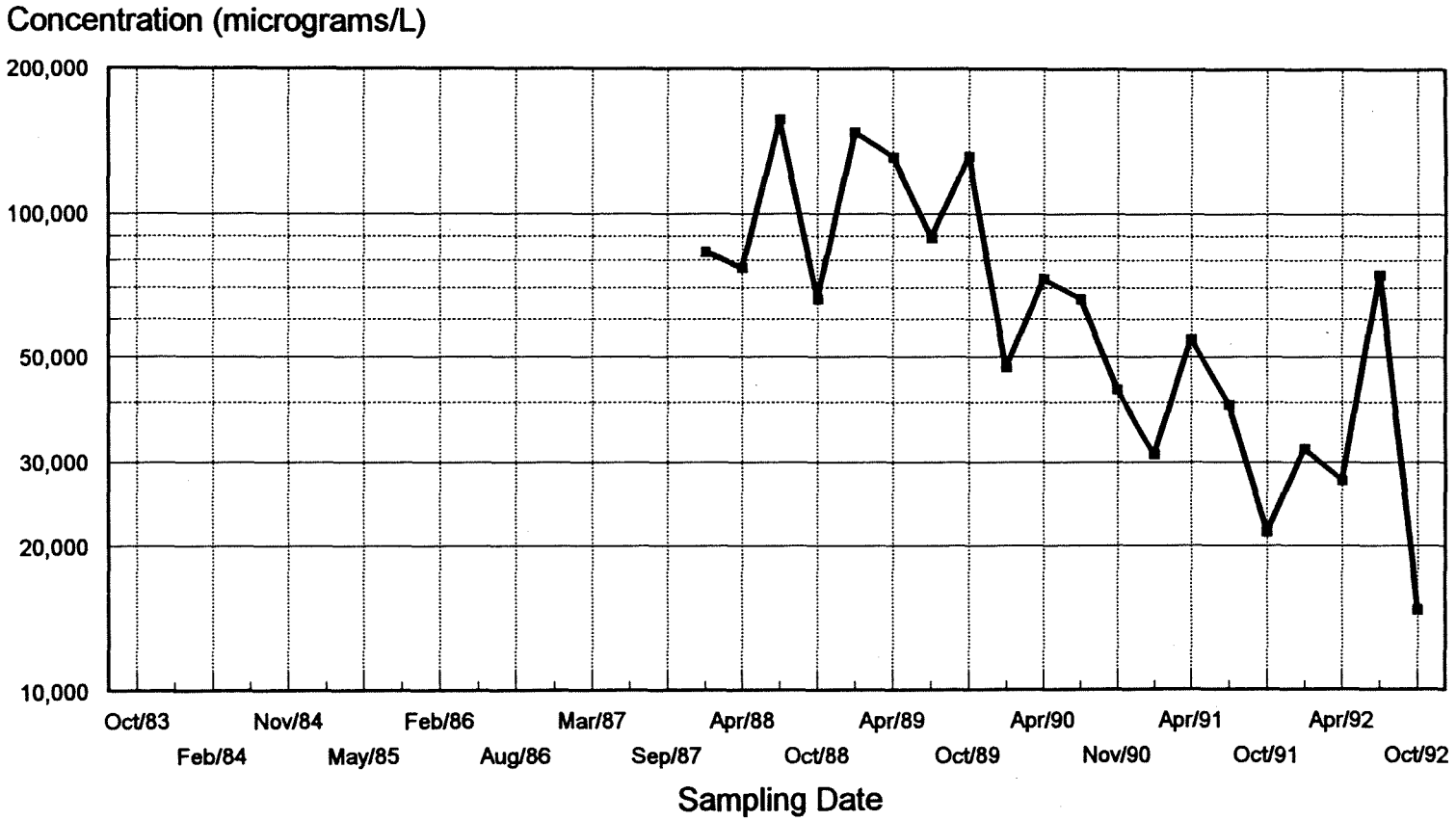
RC-2



1832.33 0000:LOT/FL:cook:rc2

Trend Analysis: Total VOC Concentrations

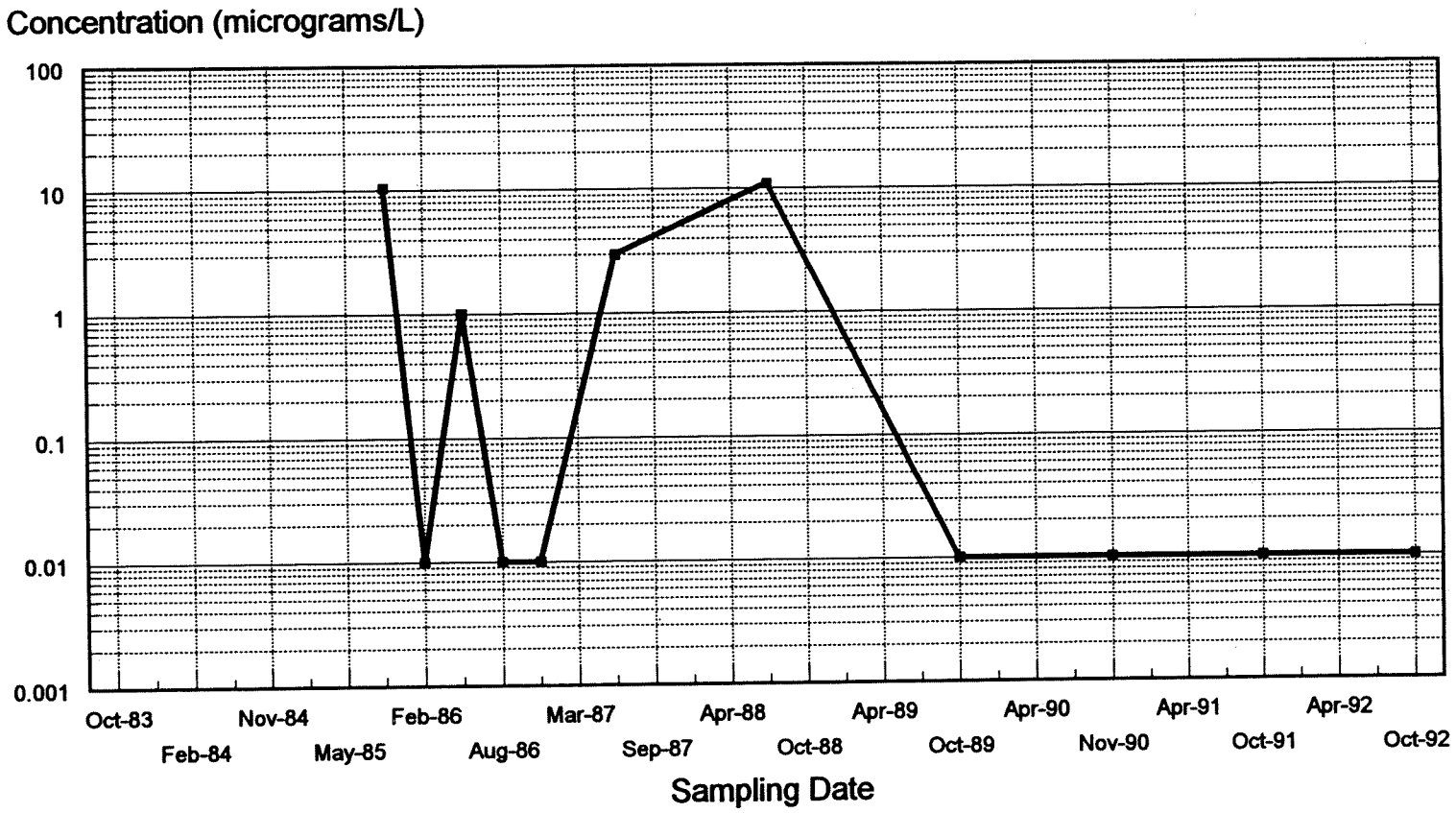
RC-3



1832.33 0000:LOT/FL:cook:rc3

Trend Analysis: Total VOC Concentrations

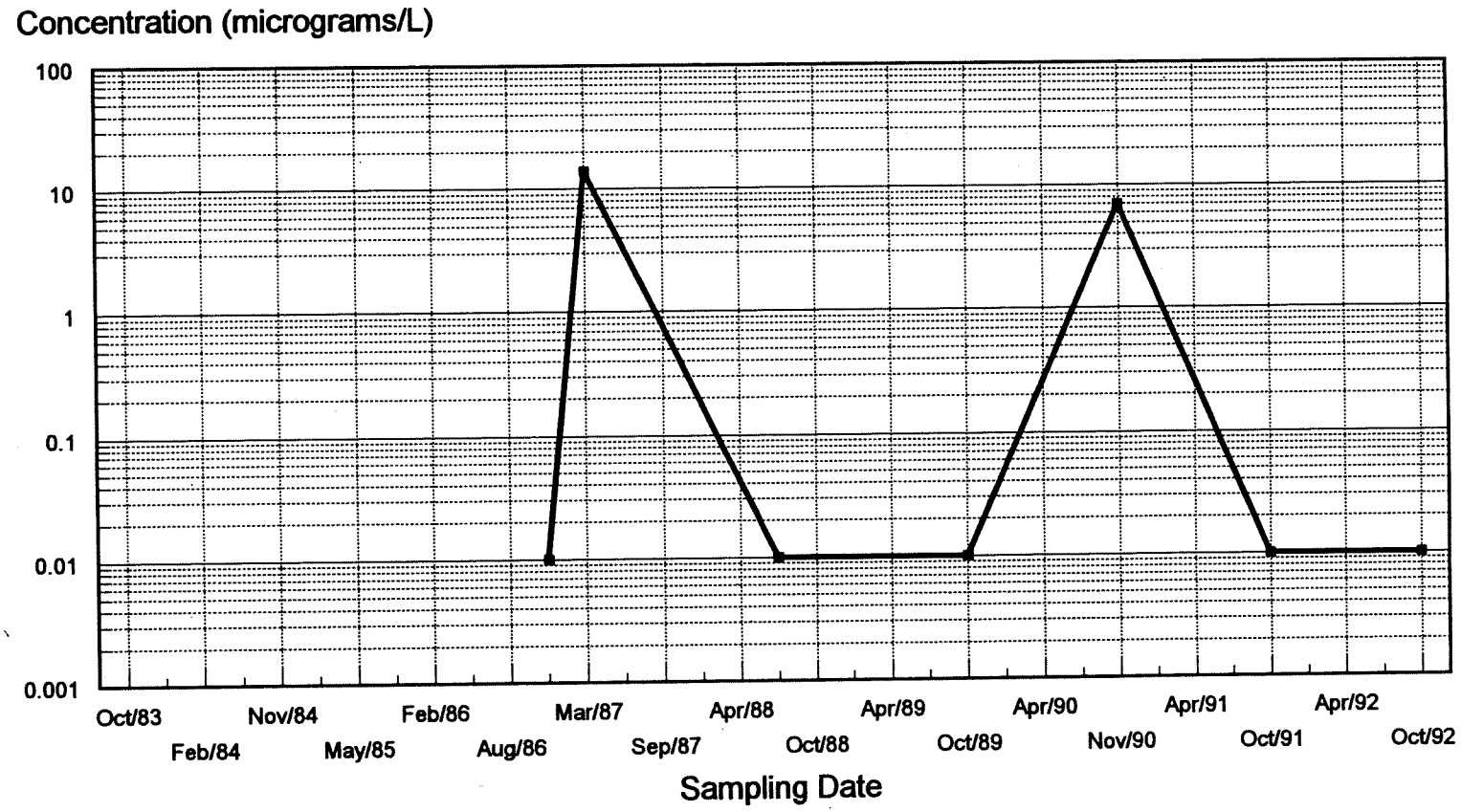
W-01A



1832.33 0000:LOT/FL:cook:w01a

Trend Analysis: Total VOC Concentrations

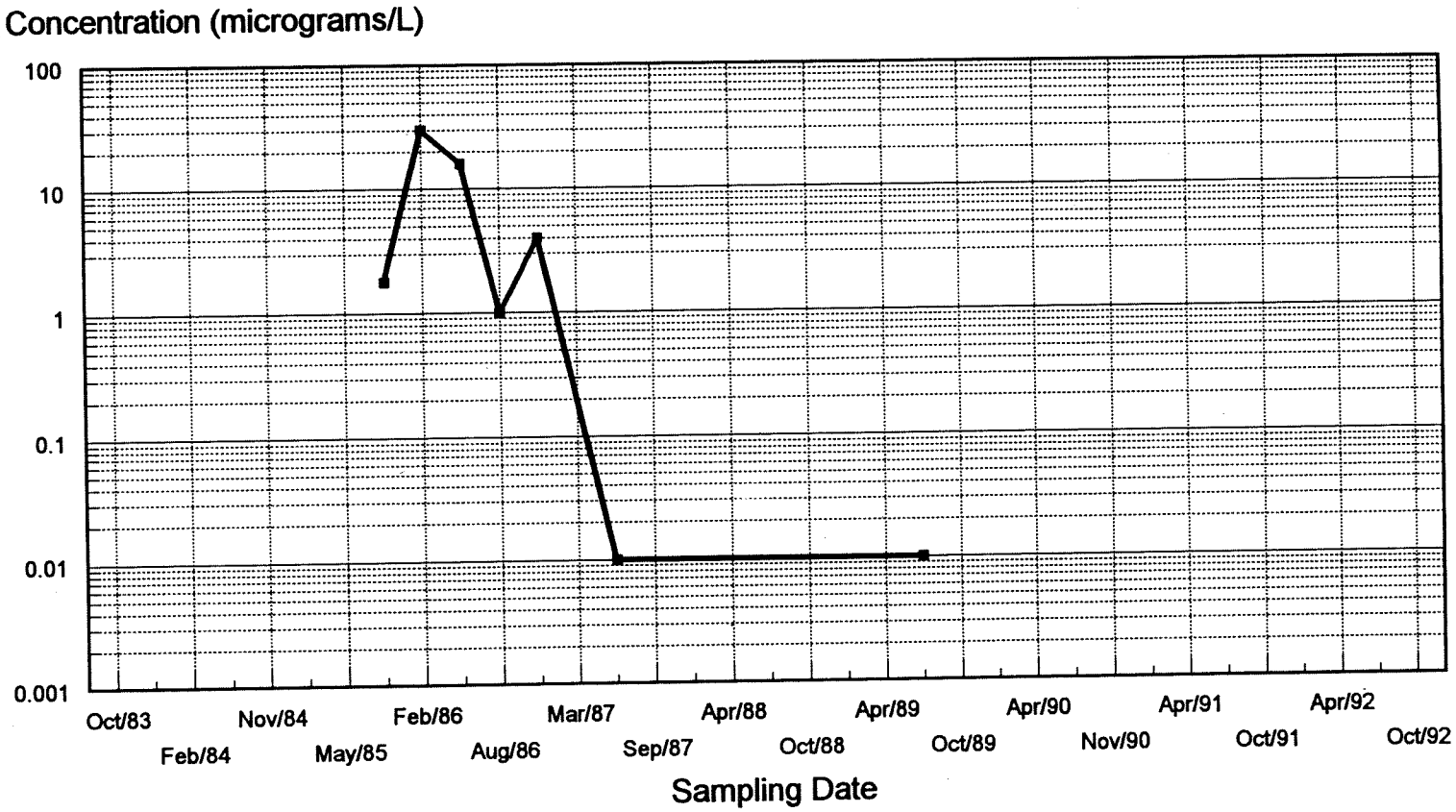
W-03B



1832.33 0000:LOT/FL:cook:w03b

Trend Analysis: Total VOC Concentrations

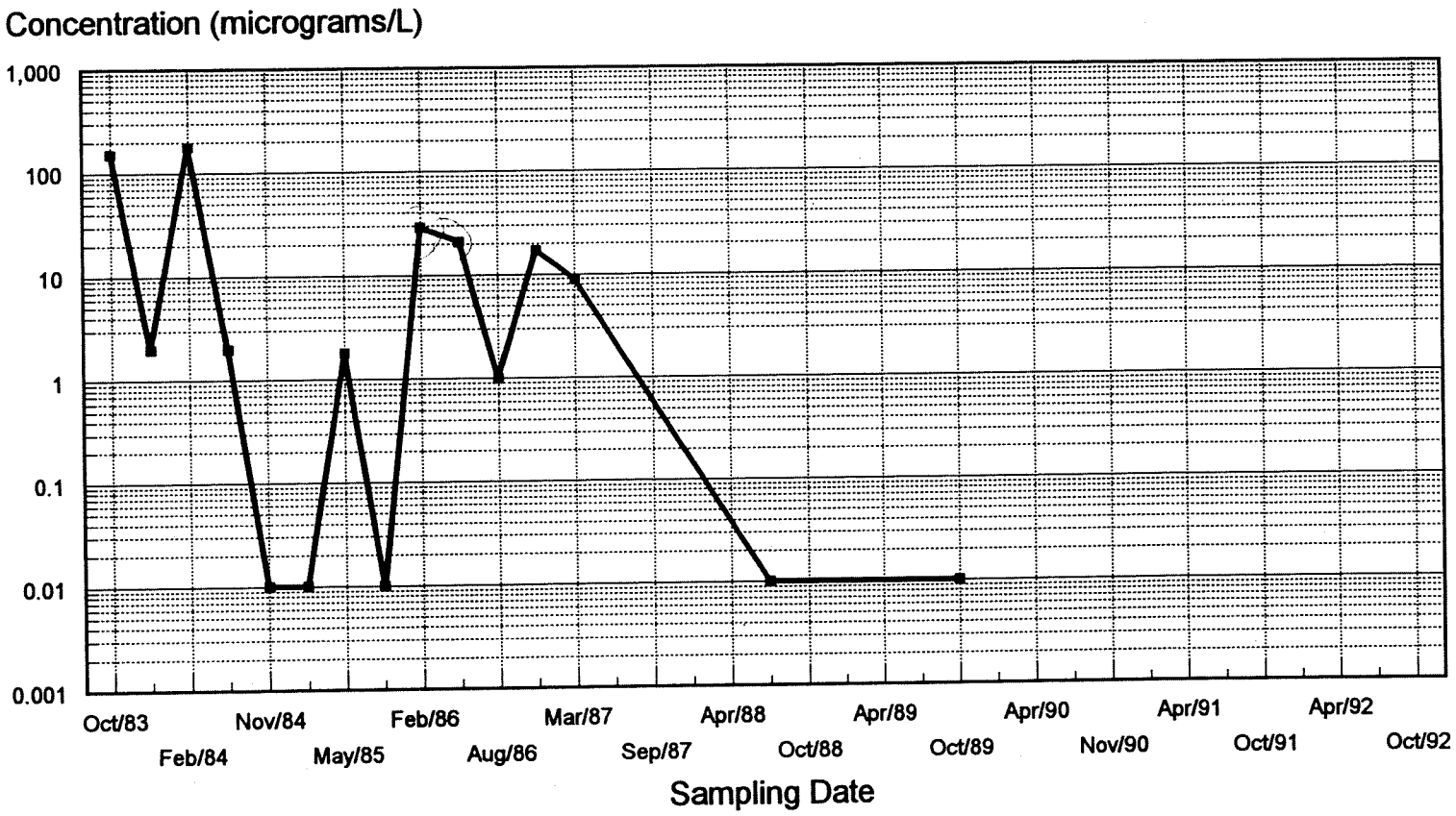
W-04A



1832.33 0000:LOT/FL:cook:w04a

Trend Anslysis: Total VOC Concentrations

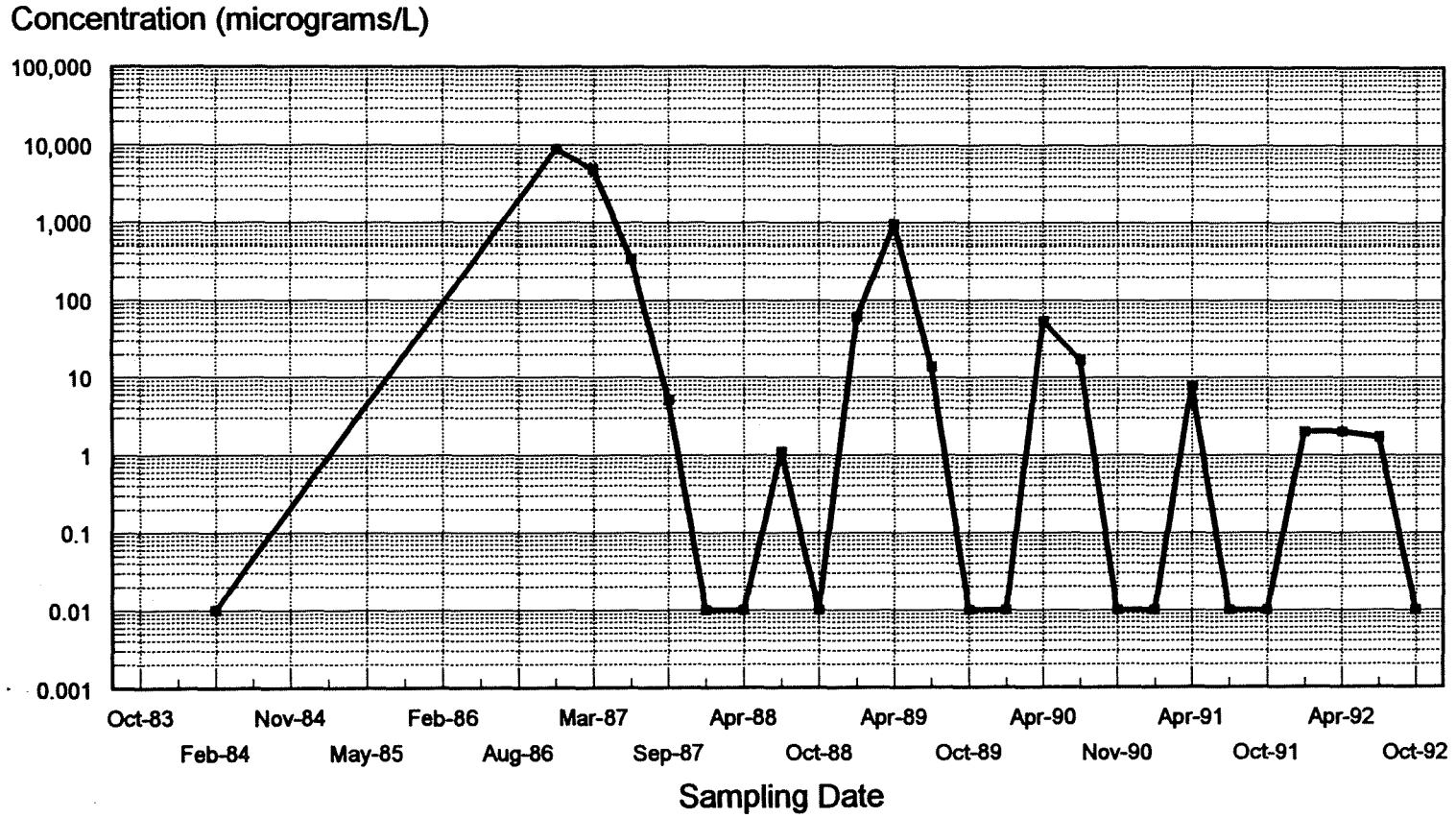
W-08



1832.33 0000:LOT/FL:cook:w08

Trend Analysis: Total VOC Concentrations

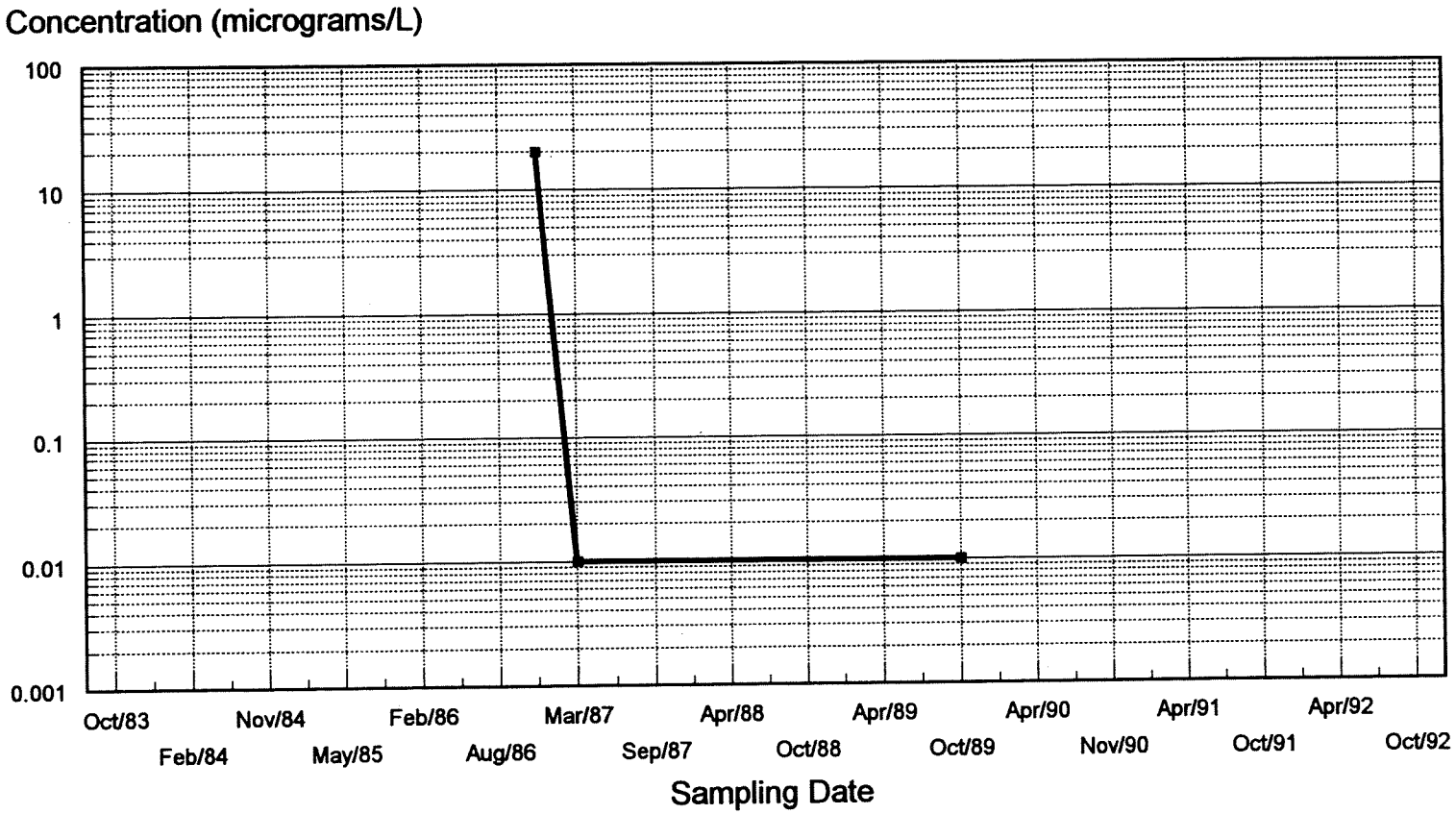
W-14B



1832.33 0000:LOT/FL:cook:w14b

Trend Analysis: Total VOC Concentrations

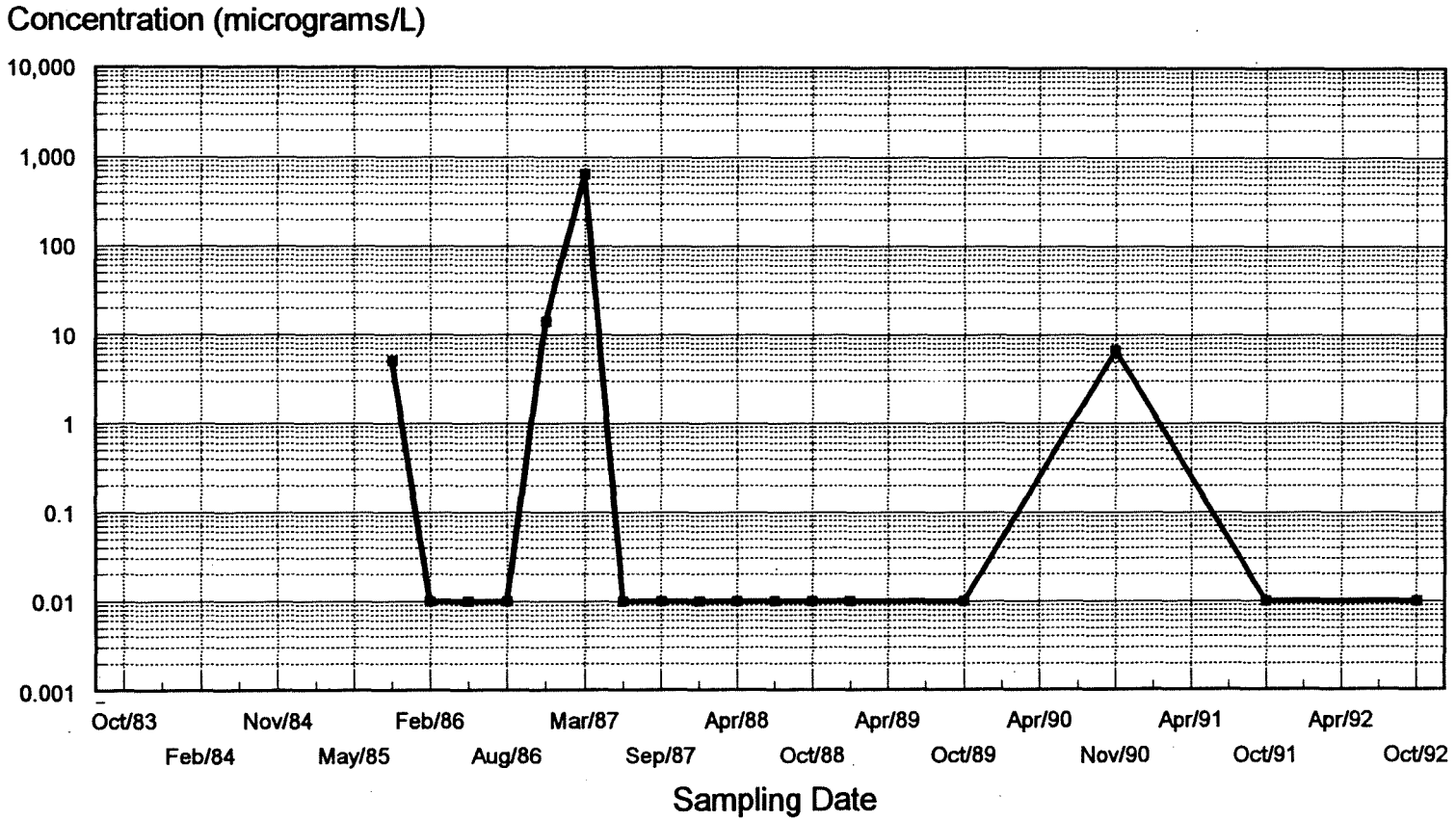
W-16A



1832.33 0000:LOT/FL:cook:w16a

Trend Analysis: Total VOC Concentrations

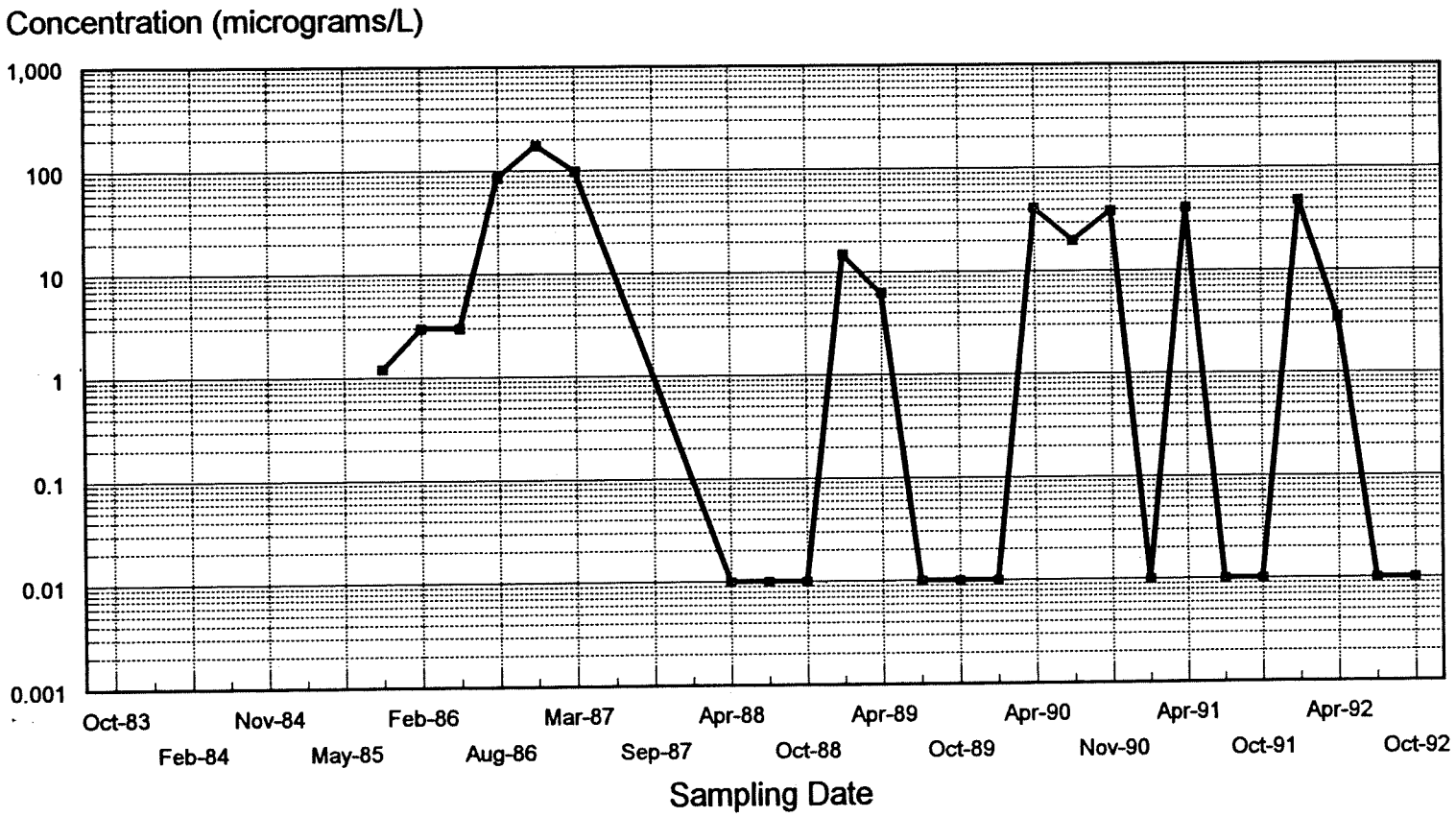
W-18A



1832.33 0000:LOT/FL:cook:w18a

Trend Analysis: Total VOC Concentration

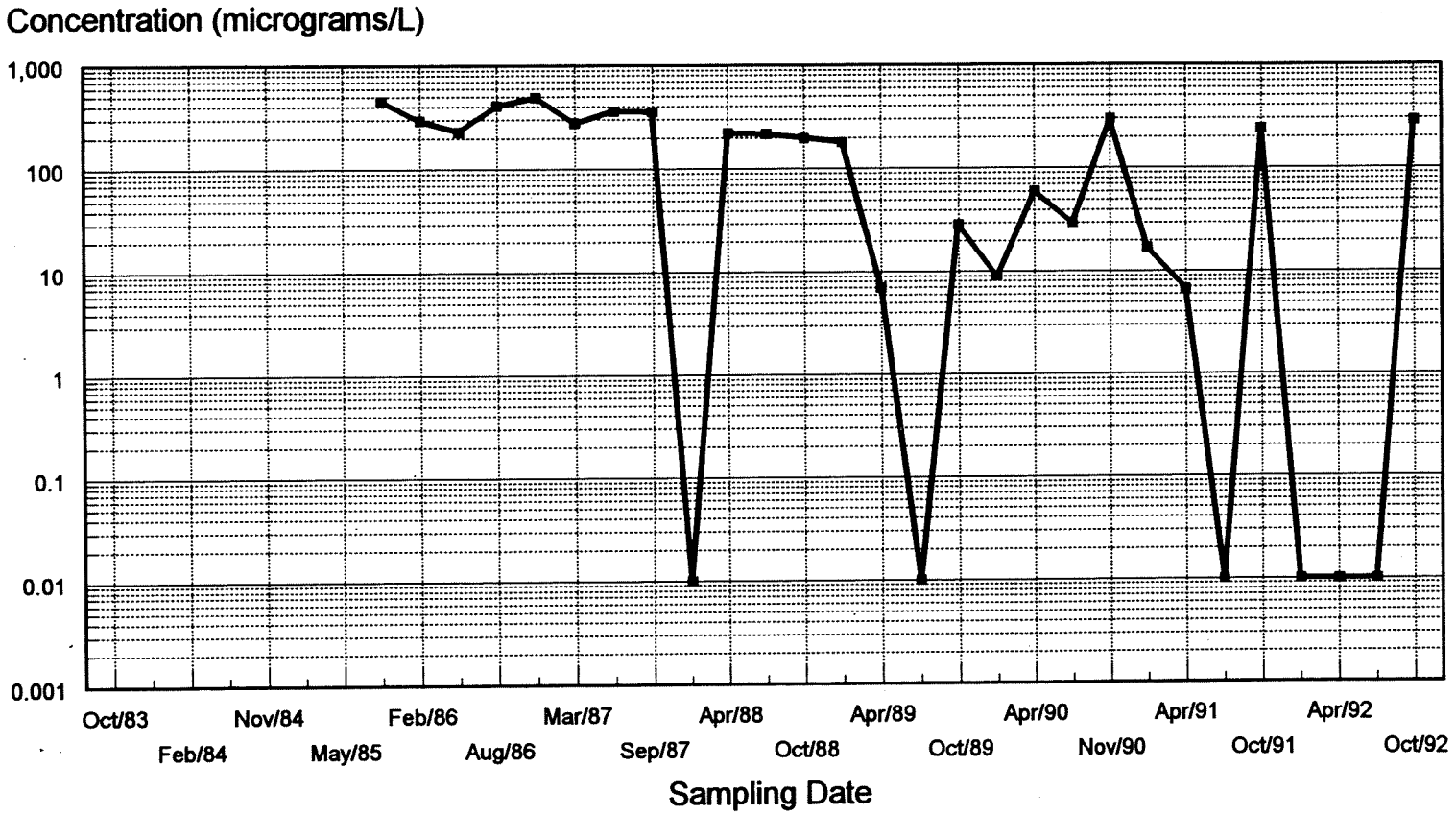
W-20



1832.33 0000:LOT/FL:cook:w20

Trend Analysis: Total VOC Concentrations

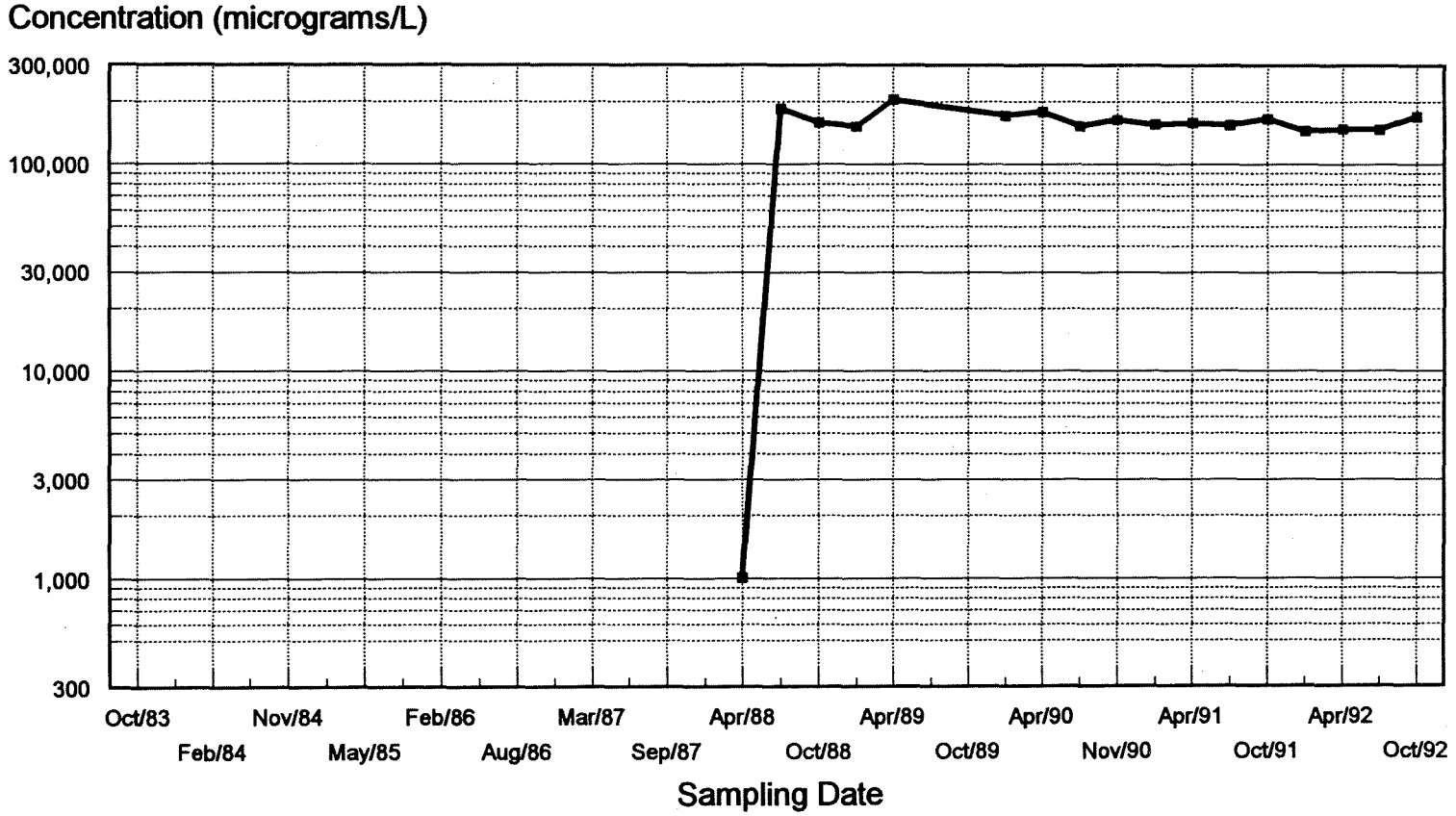
W-27



1832.33 0000:LOT/FL:cook:w27

Trend Analysis: Total VOC Concentrations

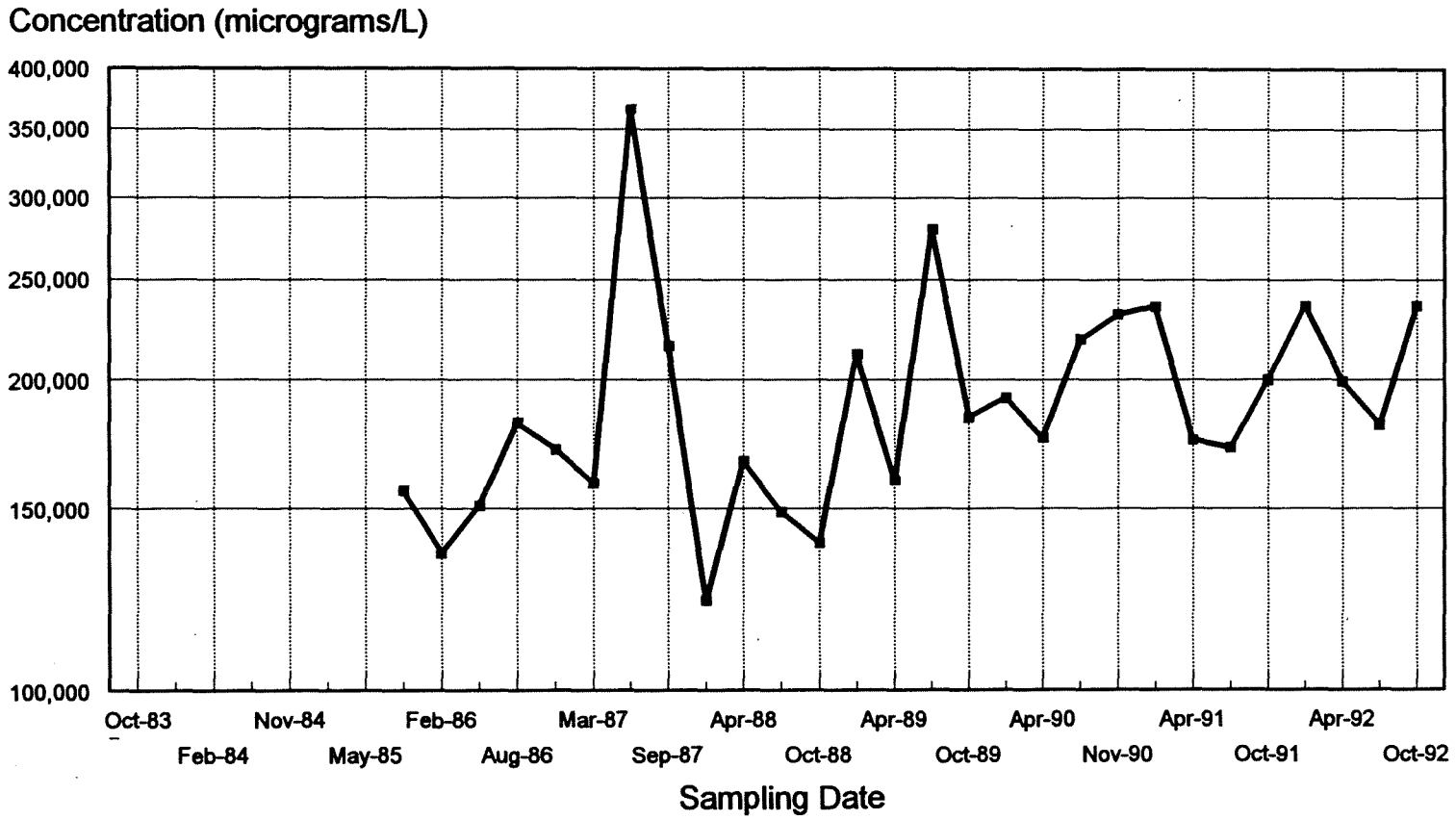
W-37



1832.33 0000:LOT/FL:cook:w37

Trend Analysis: Total VOC Concentrations

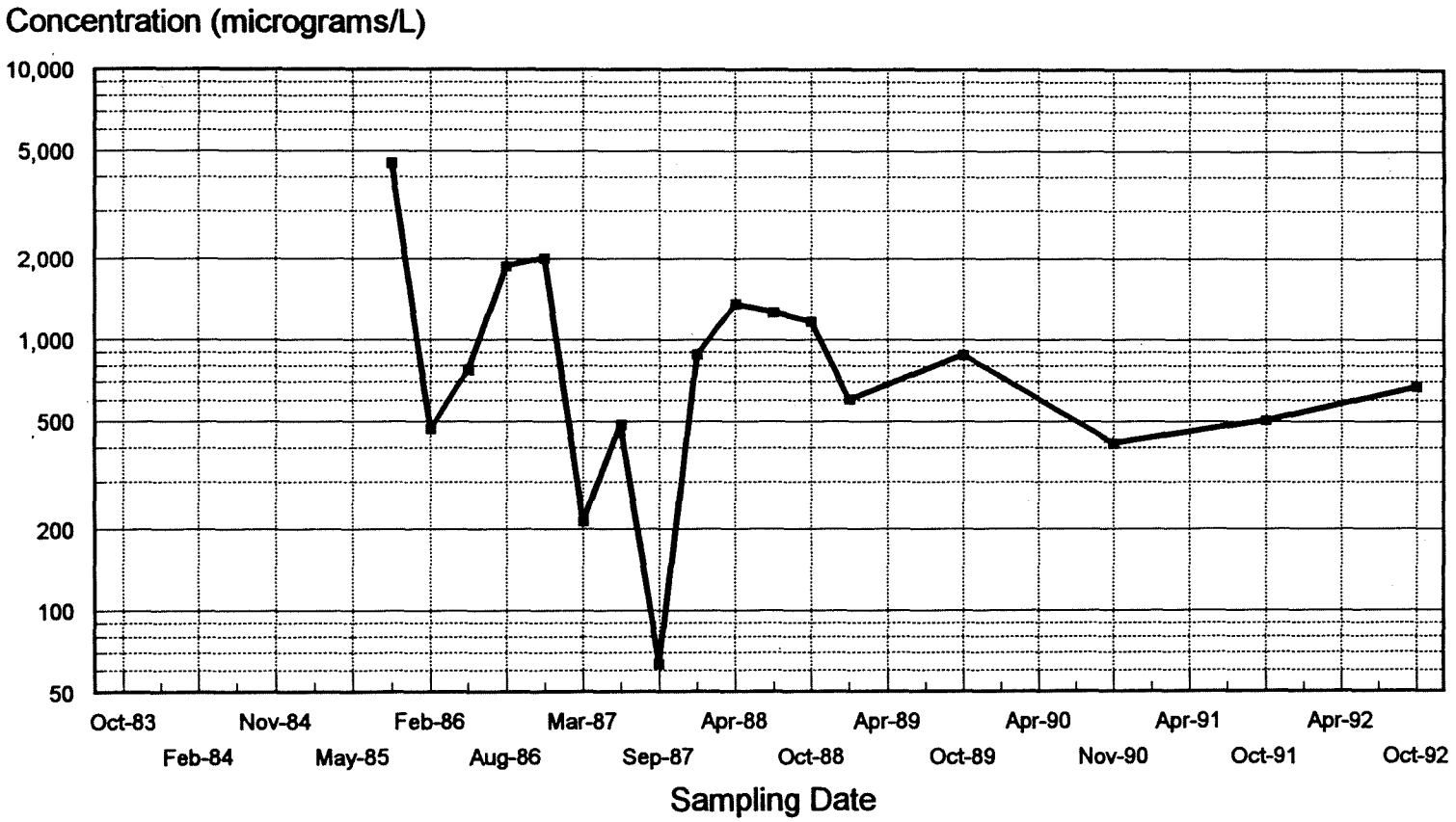
W-06A



1832.33 0000:LOT/FL:cook:w06a

Trend Analysis: Total VOC Concentration

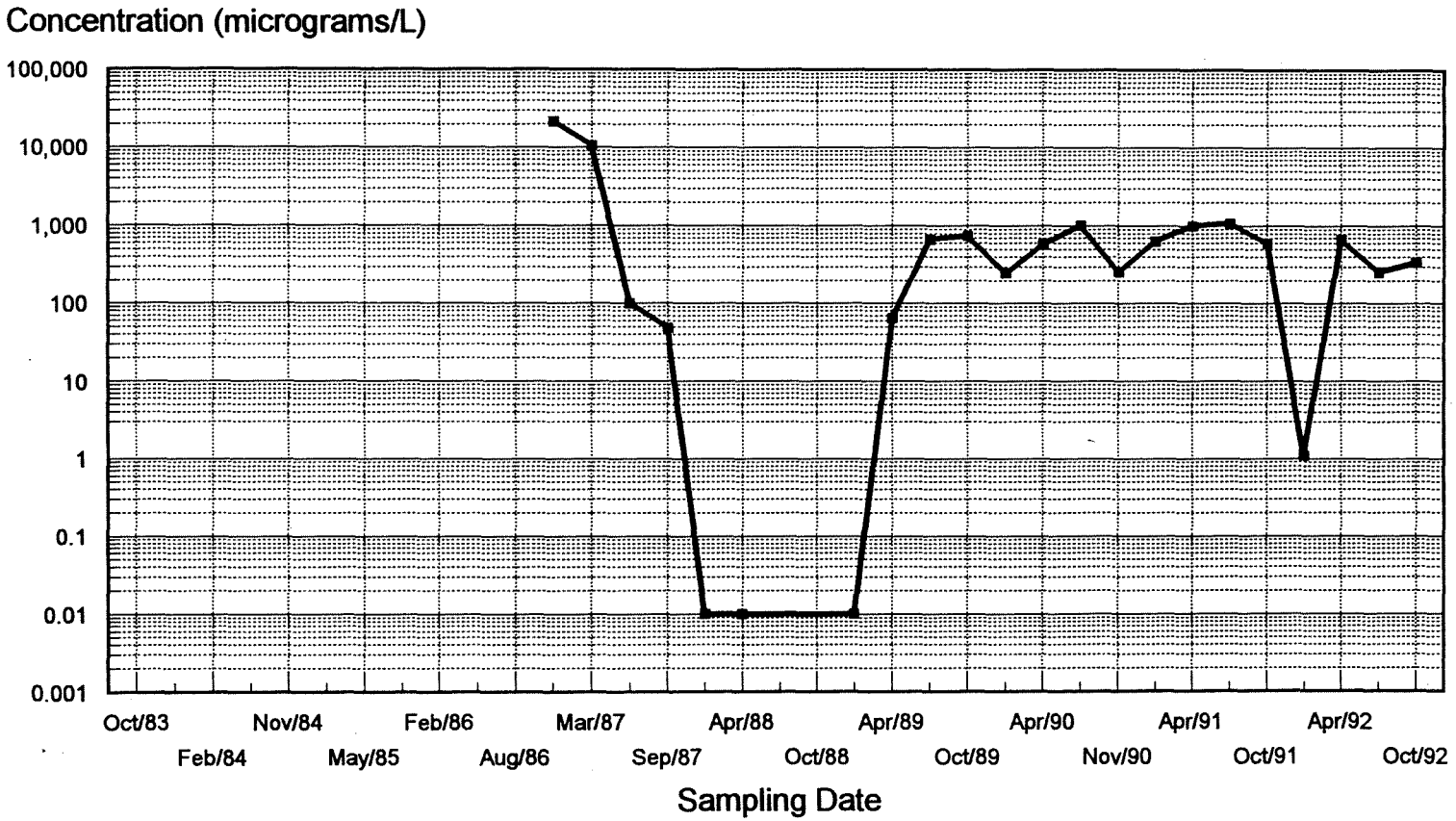
W-19A



1832.33 0000:LOT/FL:cook:w19a

Trend Analysis: Total VOC Concentrations

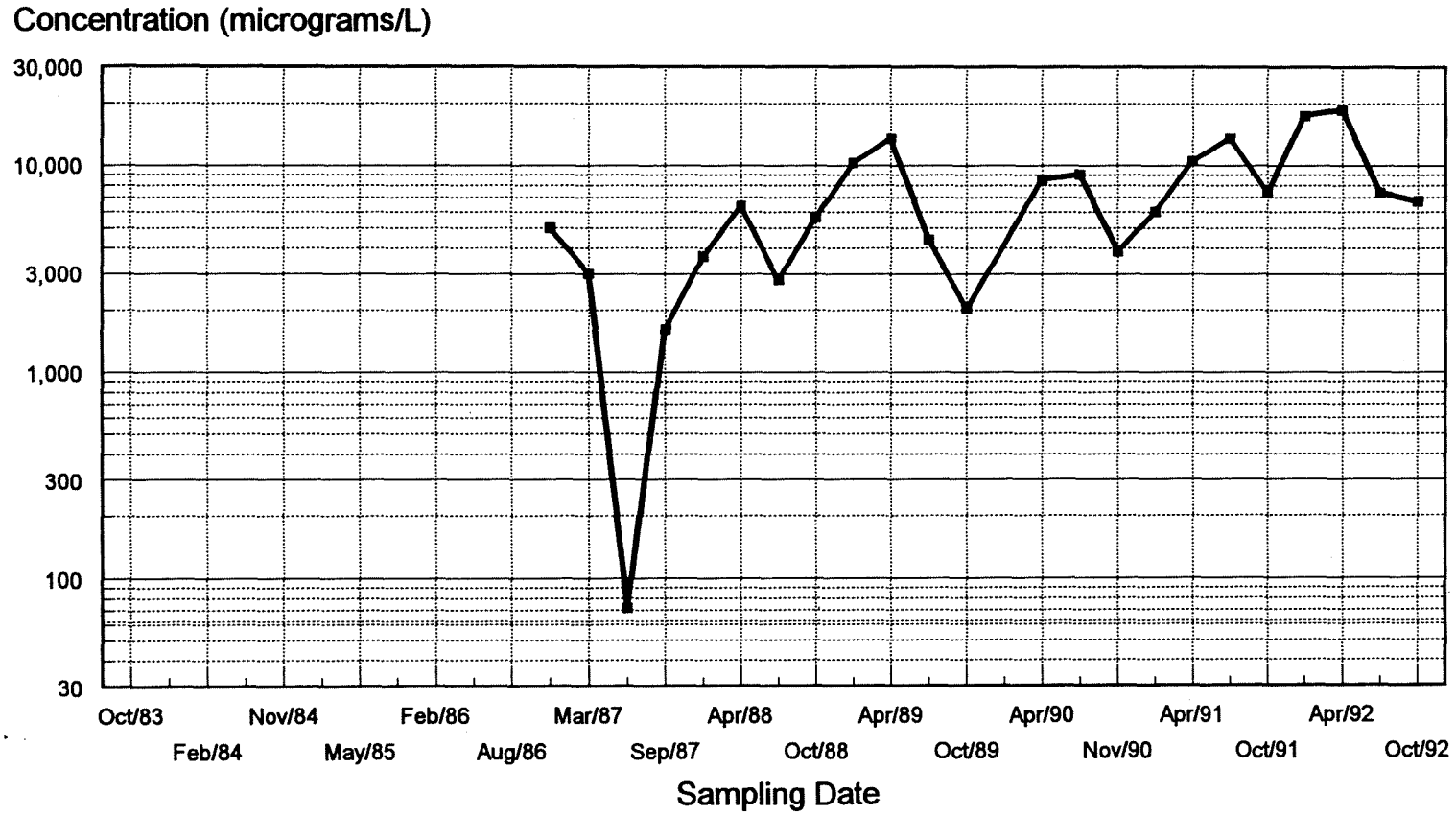
W-41



1832.33 0000:LOT/FL:cook:w41

Trend Analysis: Total VOC Concentrations

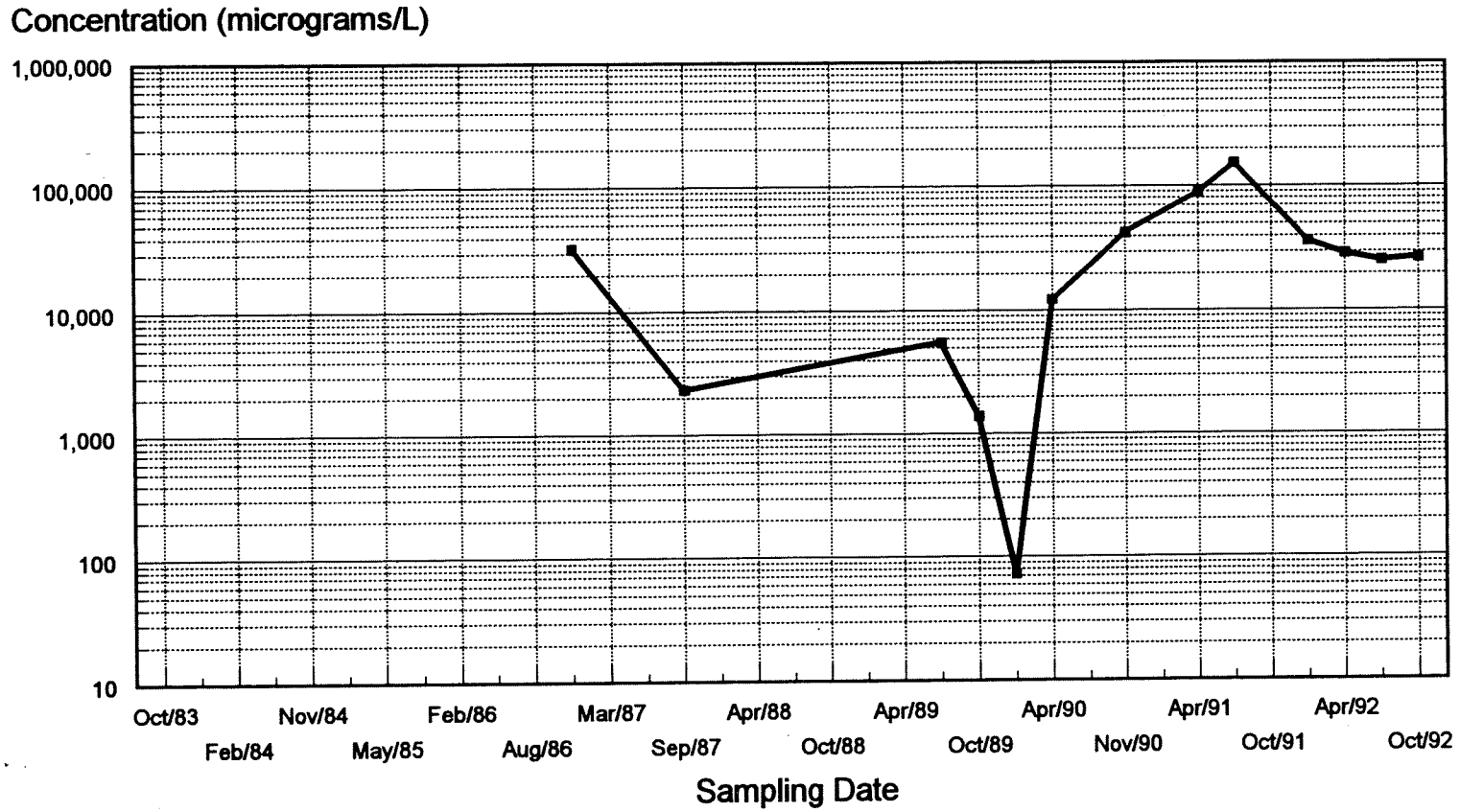
W-42



1832.33 0000:LOT/FL:cook:w42

Trend Analysis: Total VOC Concentrations

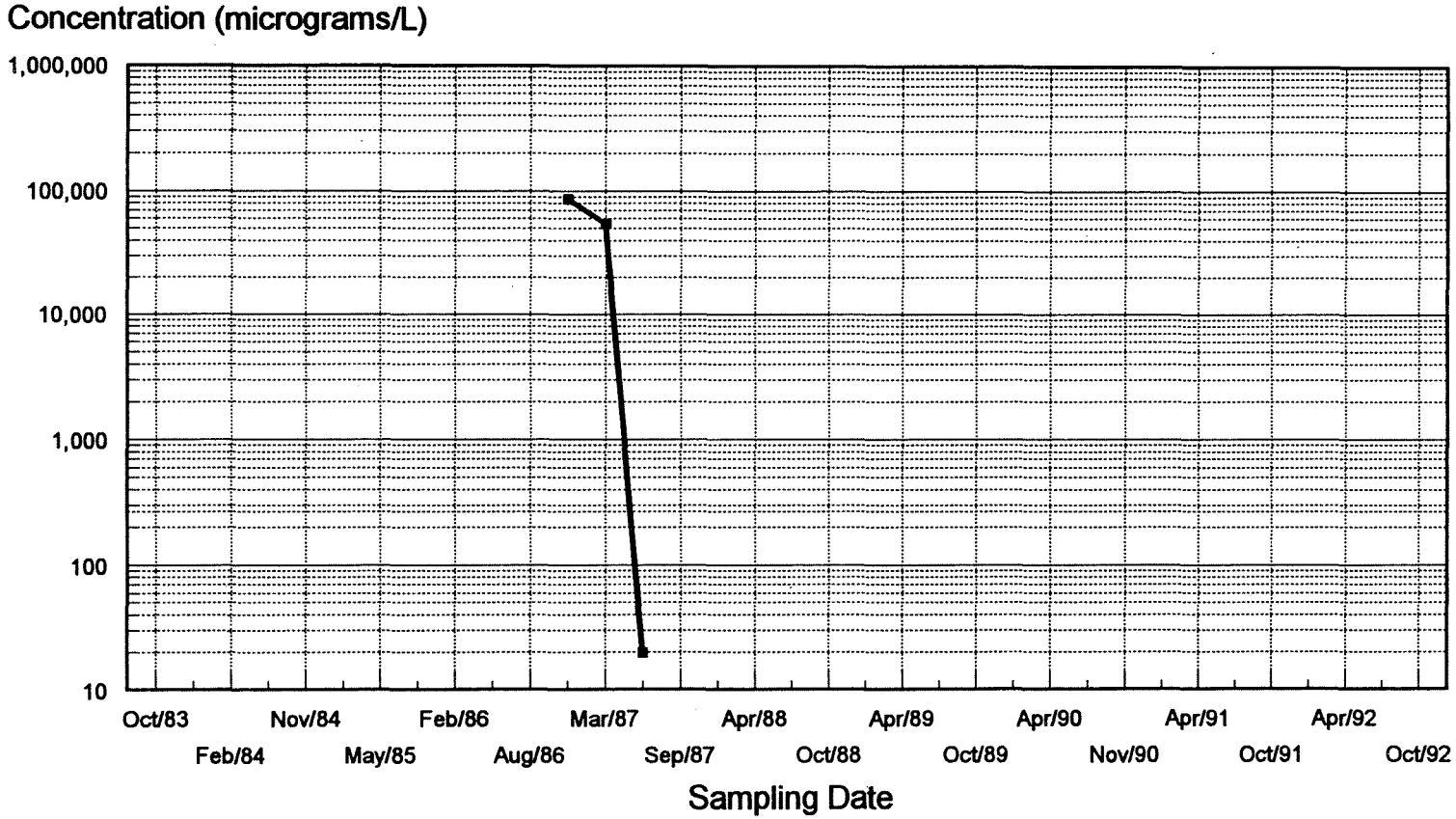
W-43



1832.33 0000:LOT/FL:cook:w43

Trend Analysis: Total VOC Concentrations

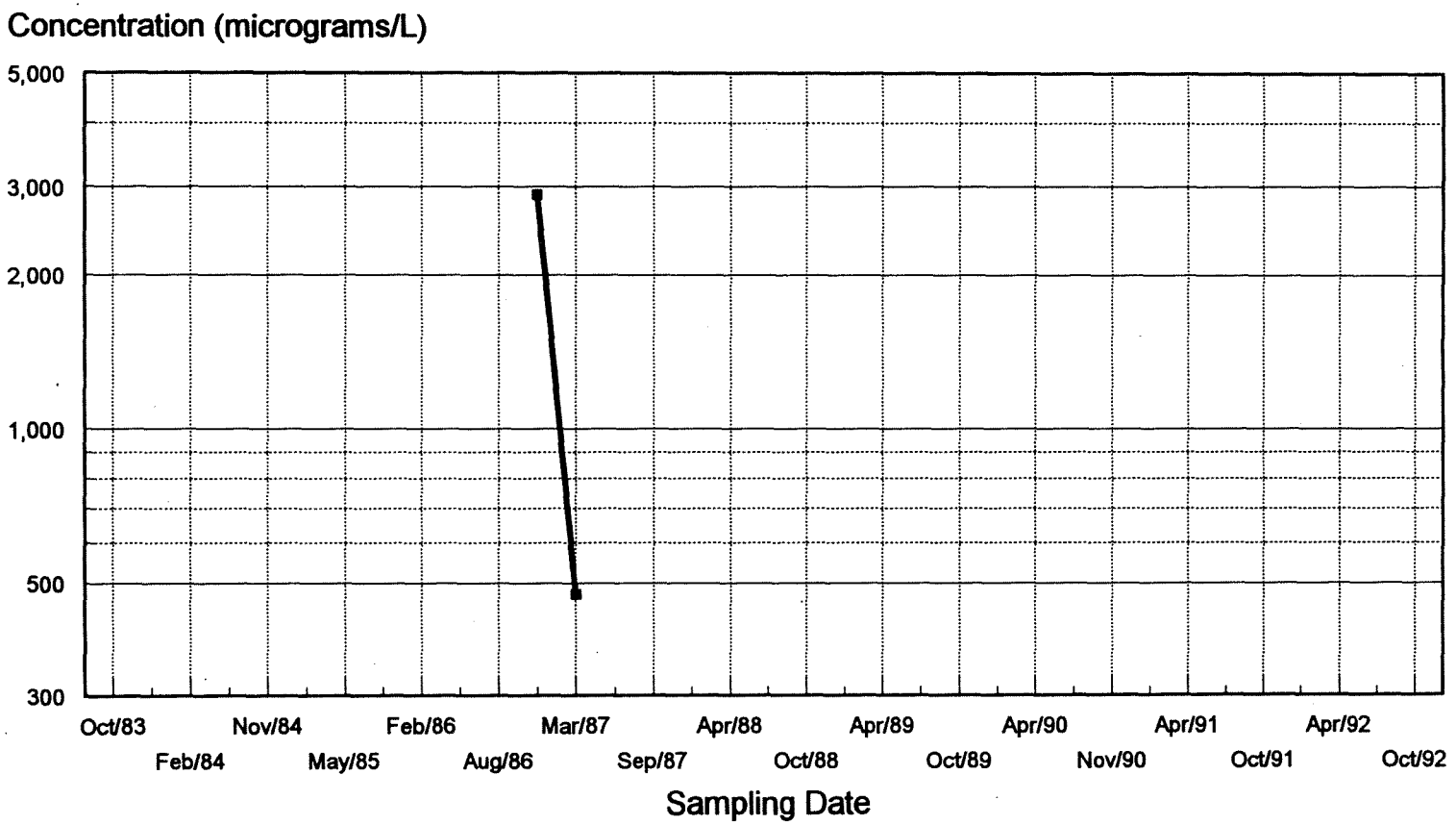
W-44



1832.33 0000:LOT/FL:cook:w44

Trend Analysis: Total VOC Concentrations

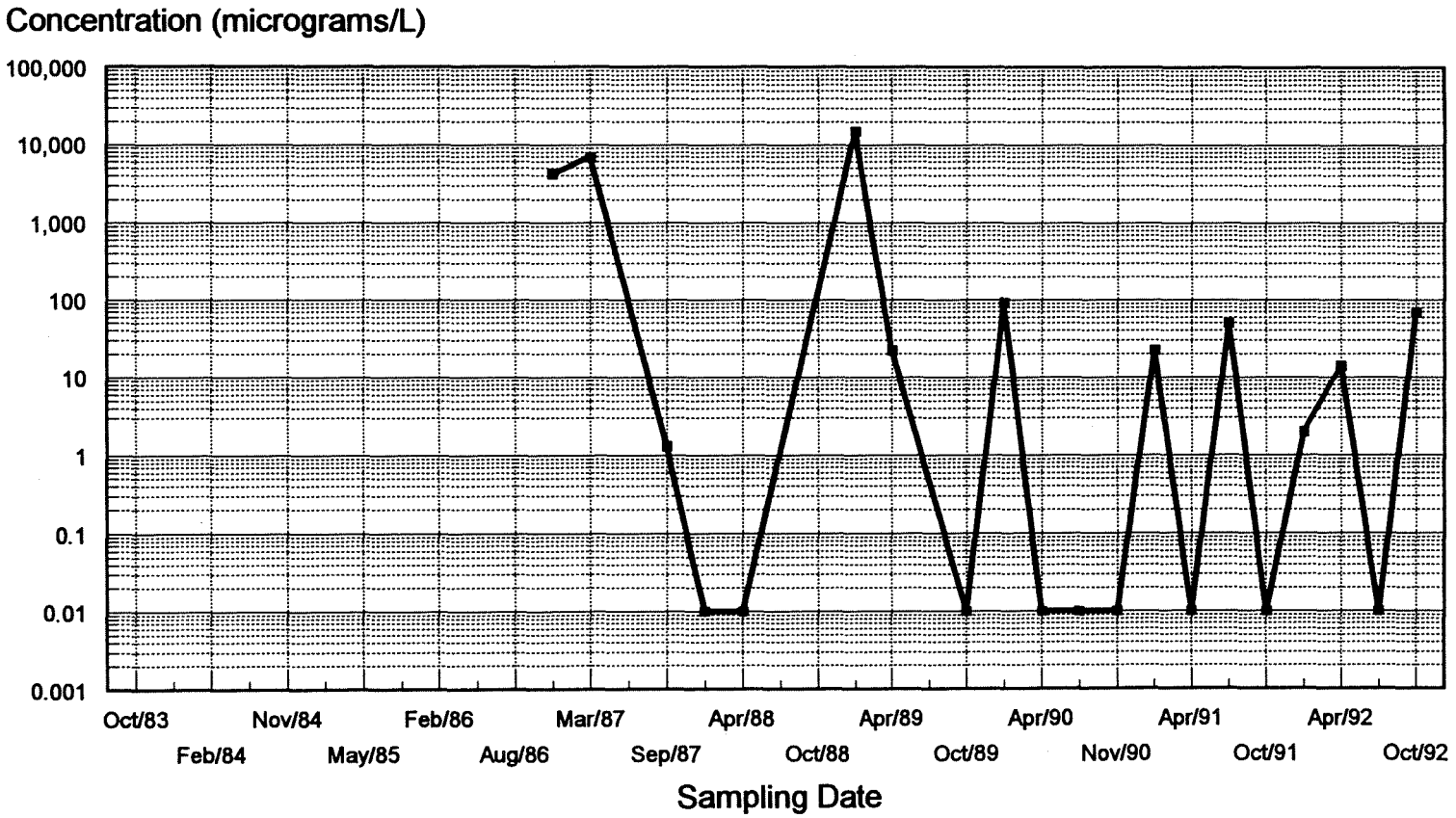
W-45



1832.33 0000:LOT/FL:cook:w45

Trend Analysis: Total VOC Concentrations

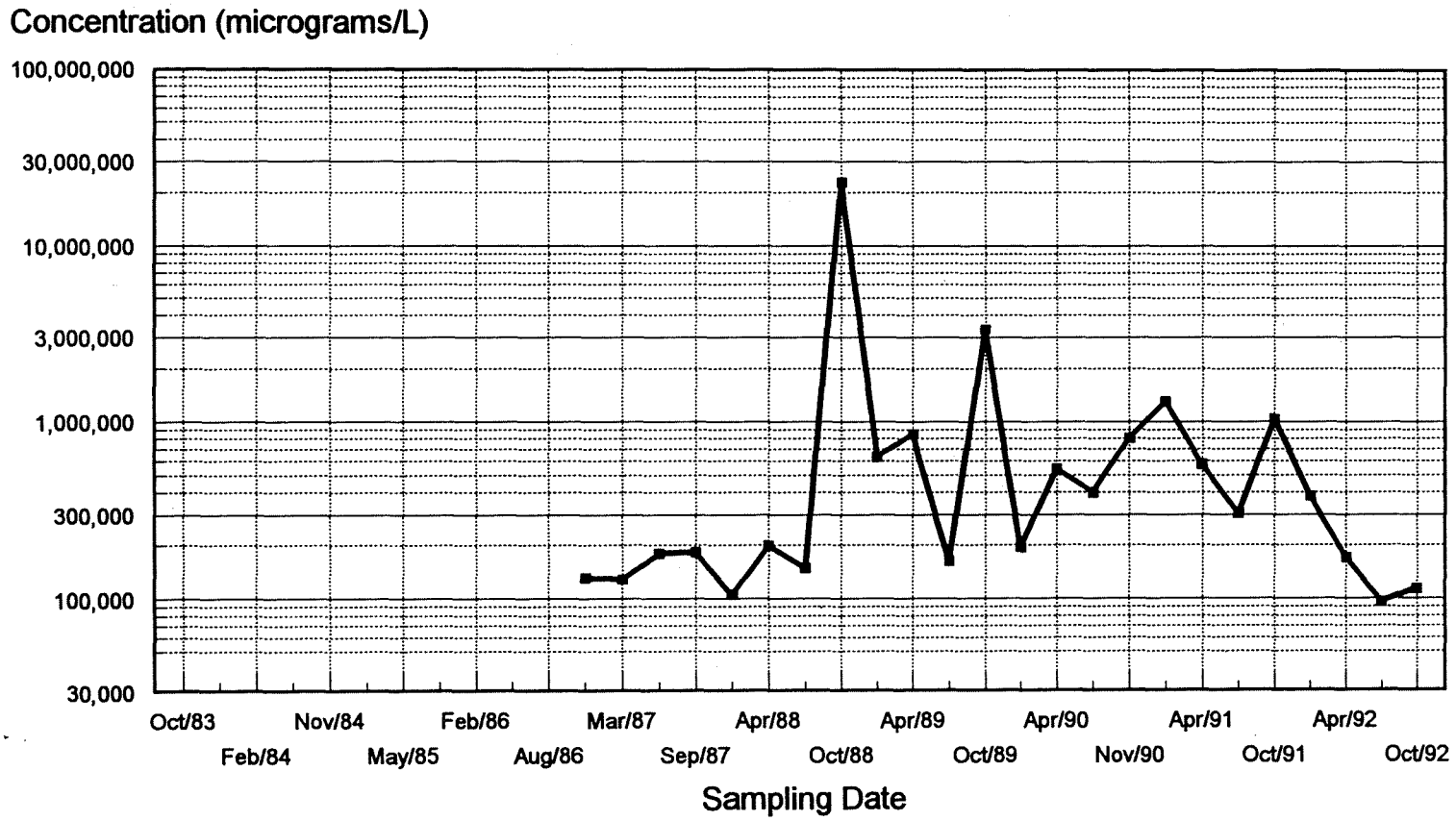
W-46



1832.33 0000:LOT/FL:cook:w46

Trend Analysis: Total VOC Concentrations

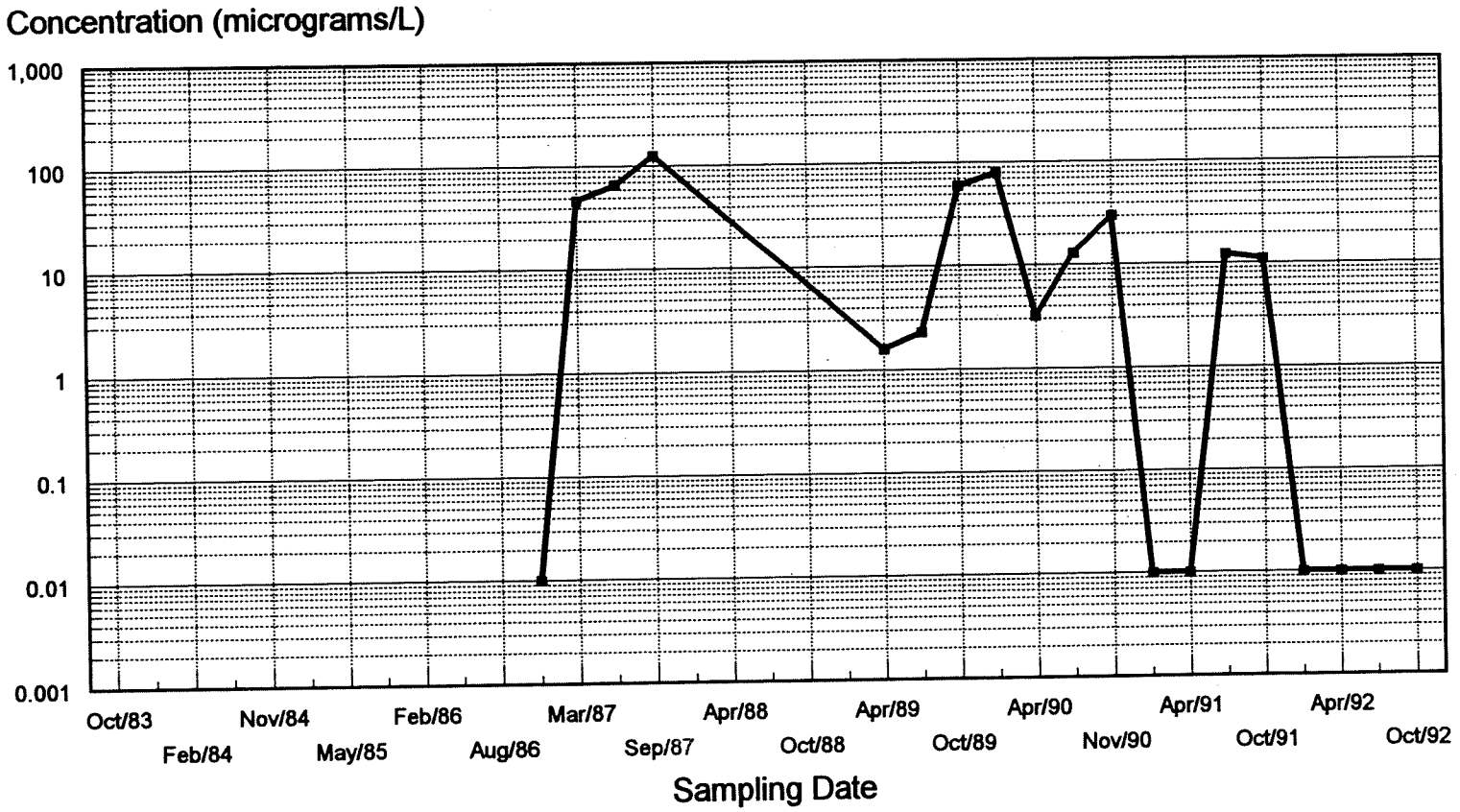
W-47



1832.33 0000:LOT/FL:cook:w47

Trend Analysis: Total VOC Concentrations

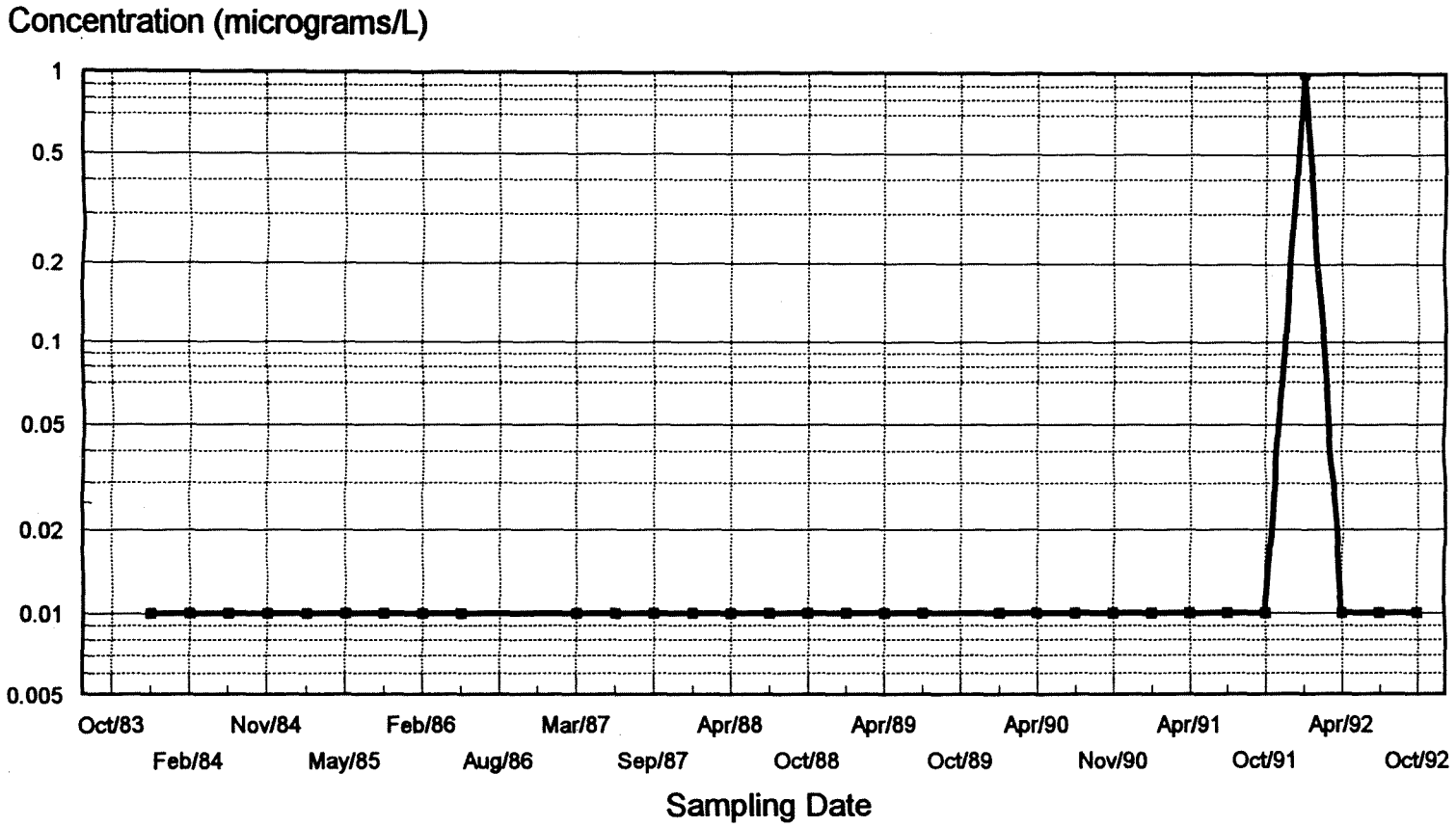
W-48



1832.33 0000:LOT/FL:cook:w48

Trend Analysis: Total VOC Concentrations

MW-01



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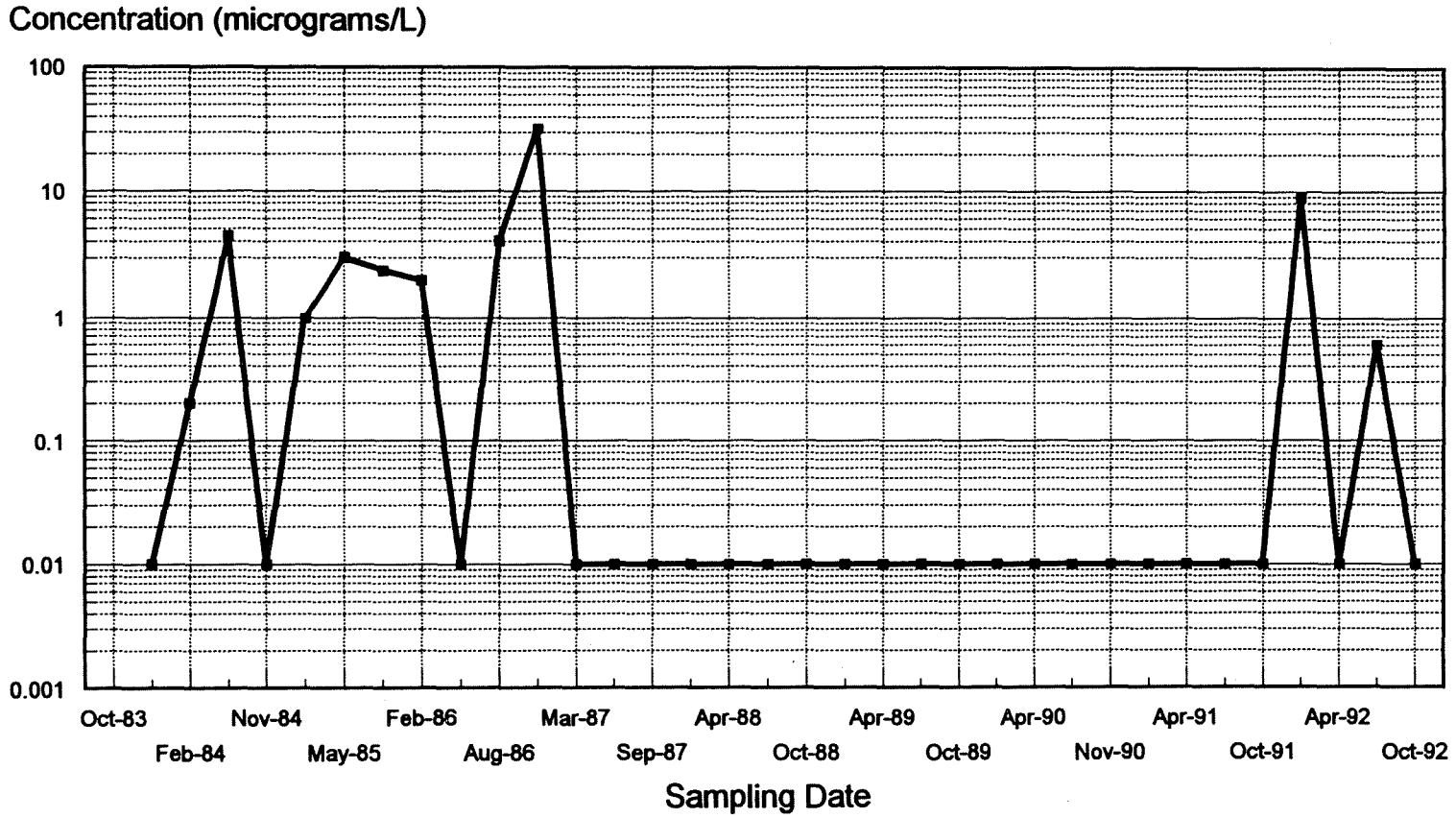
Trend Analysis: Total VOC Concentrations

MW-02



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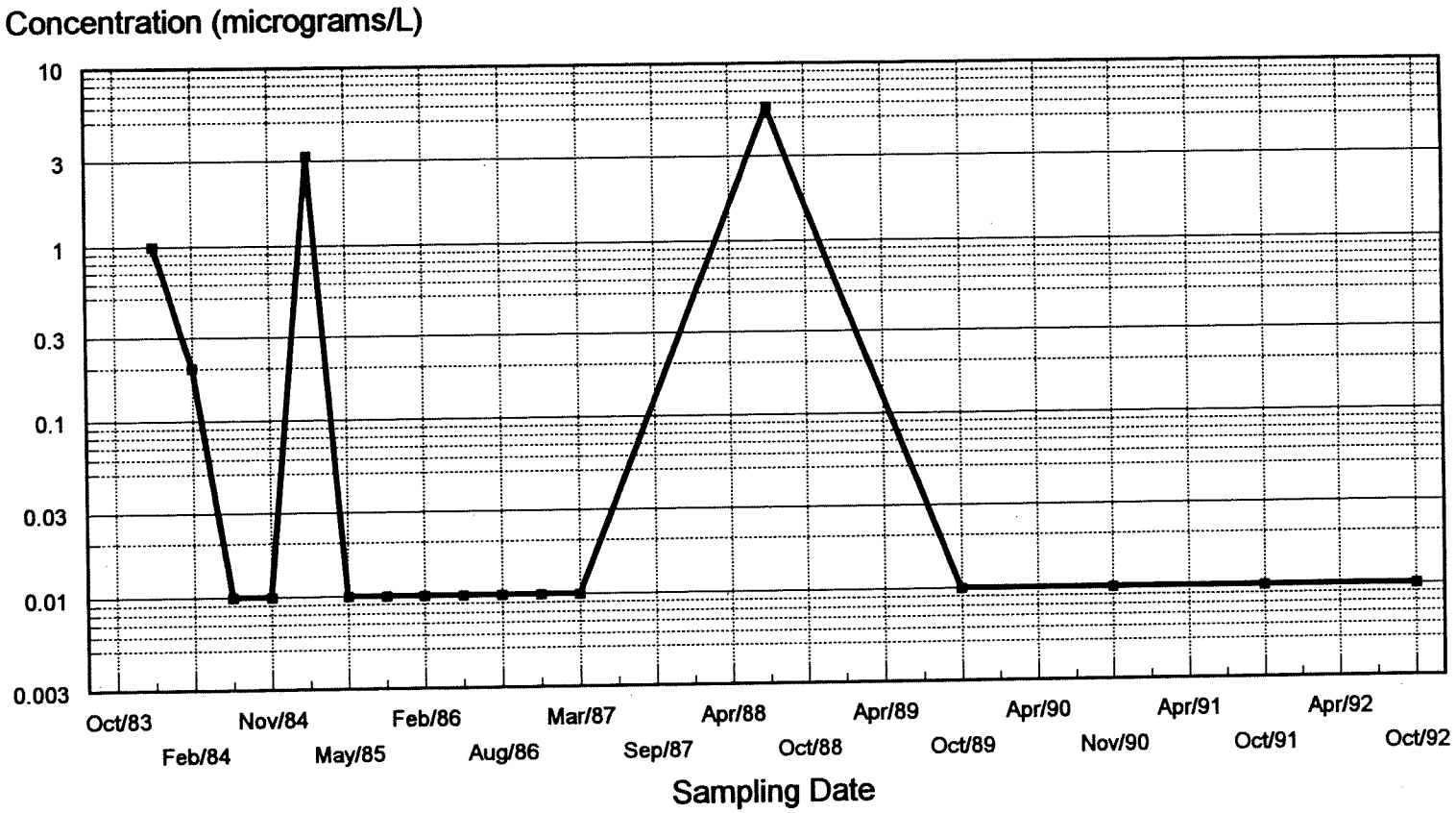
Trend Analysis: Total VOC Concentrations

MW-04



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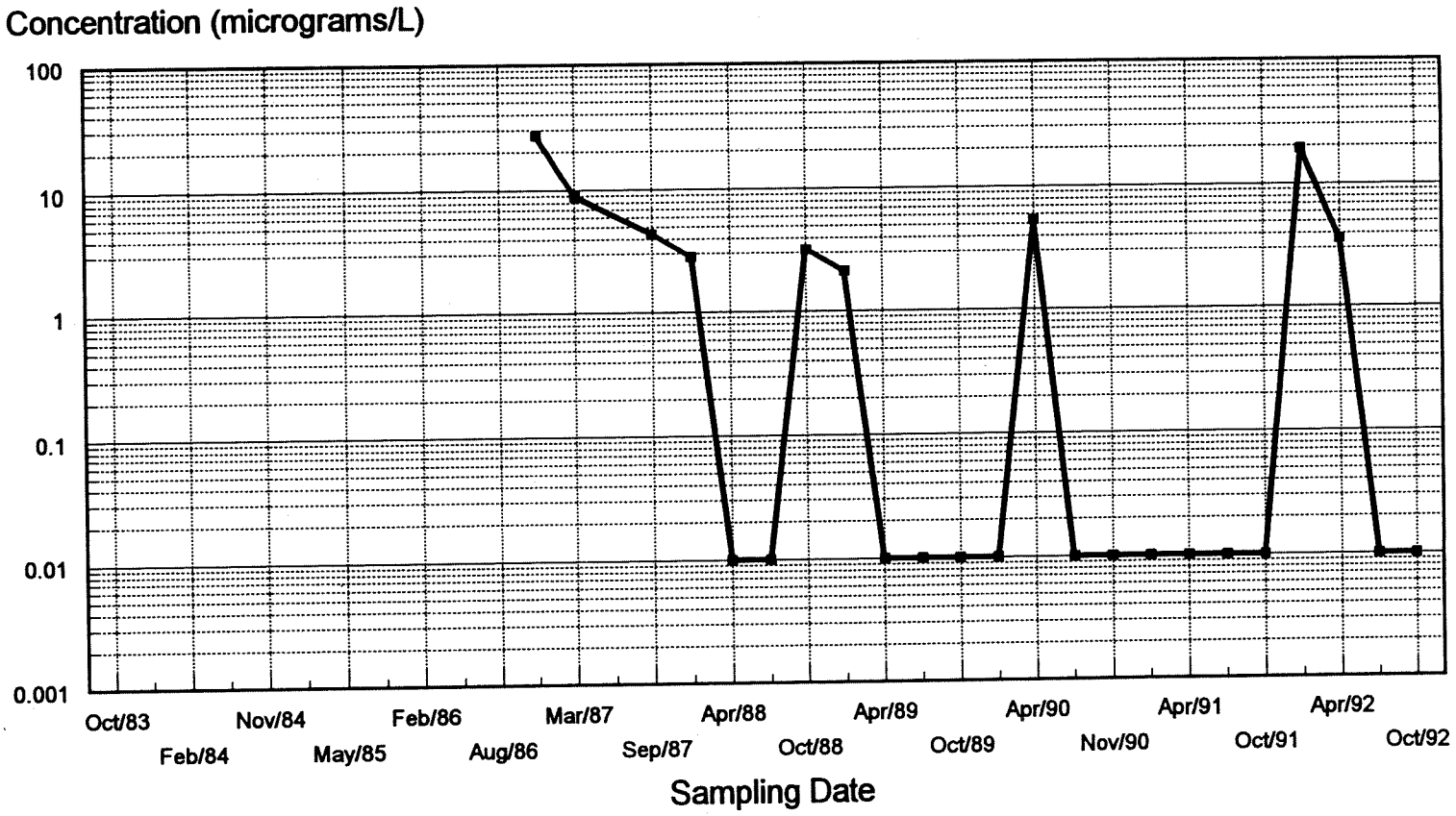
Trend Analysis: Total VOC Concentrations

W-03A



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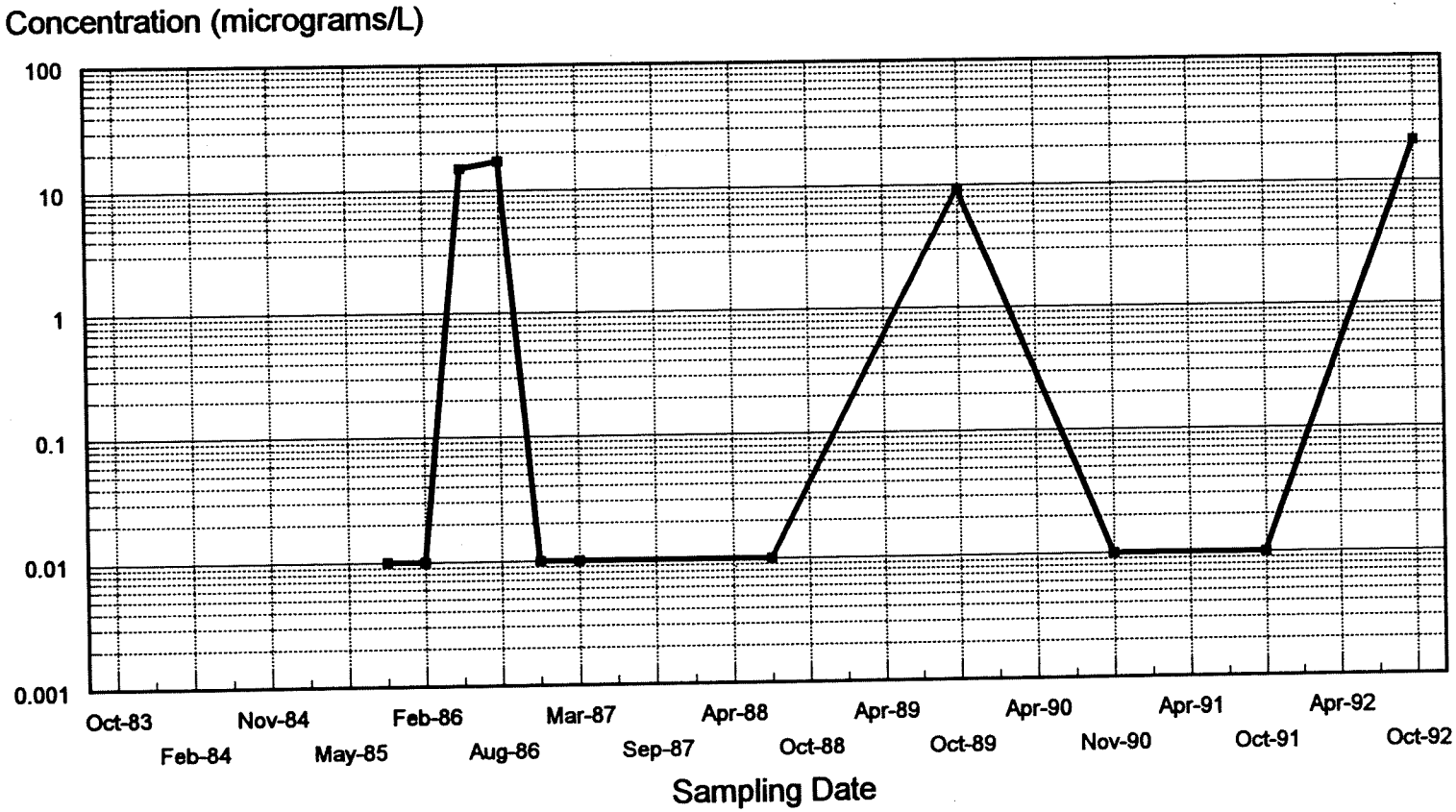
Trend Analysis: Total VOC Concentrations

W-22



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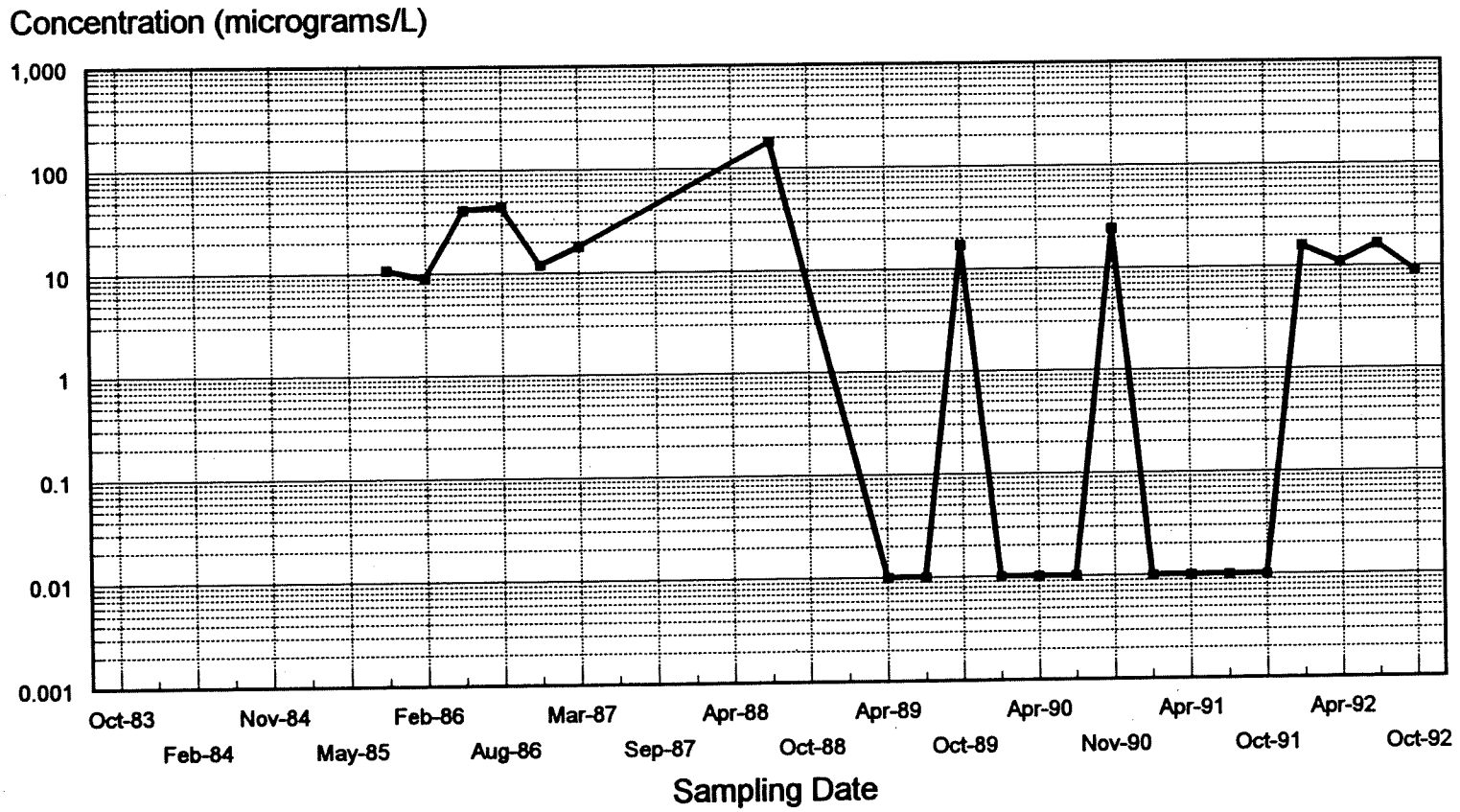
Trend Analysis: Total VOC Concentrations

W-23



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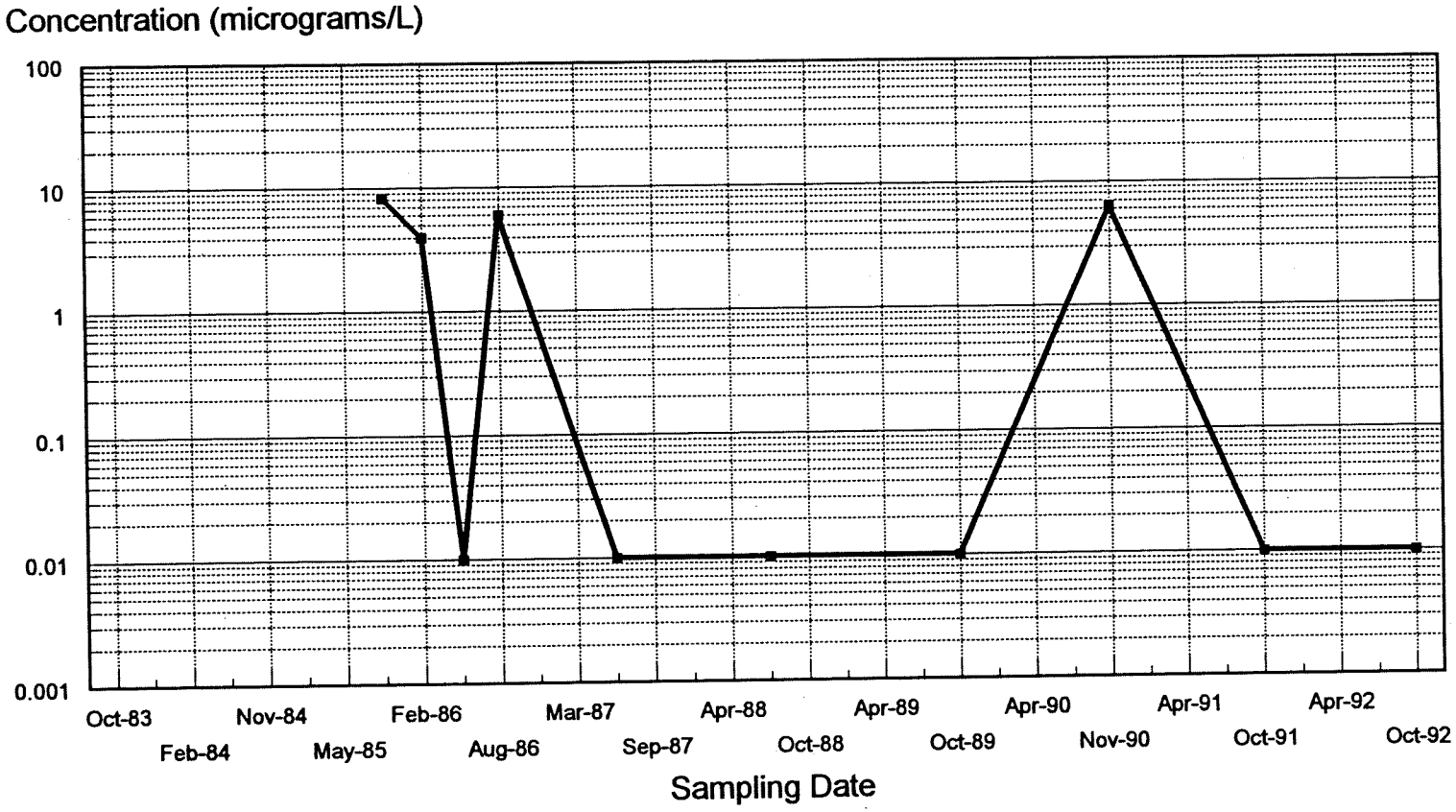
Trend Analysis: Total VOC Concentrations

W-25



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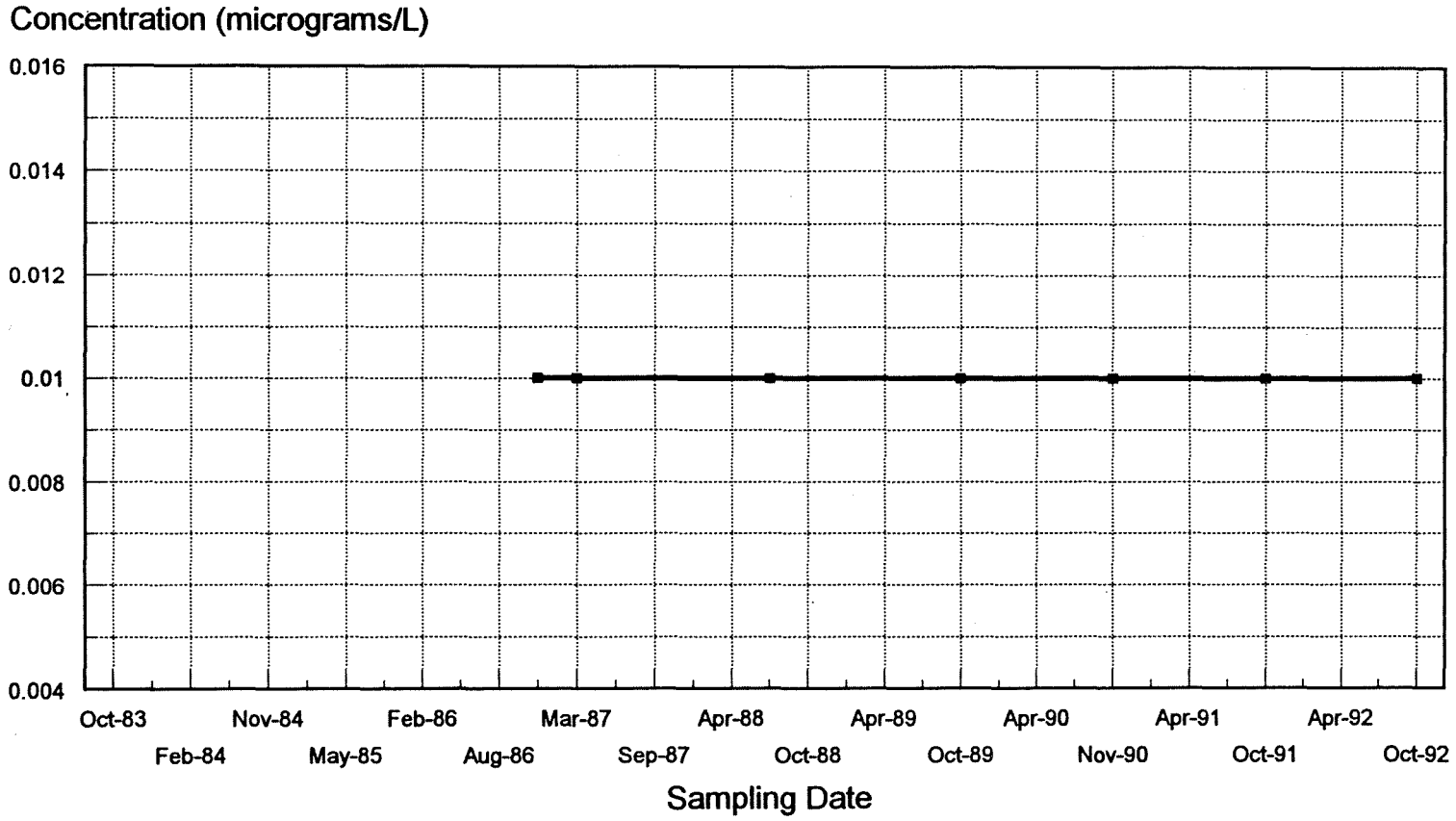
Trend Analysis: Total VOC Concentrations

W-39



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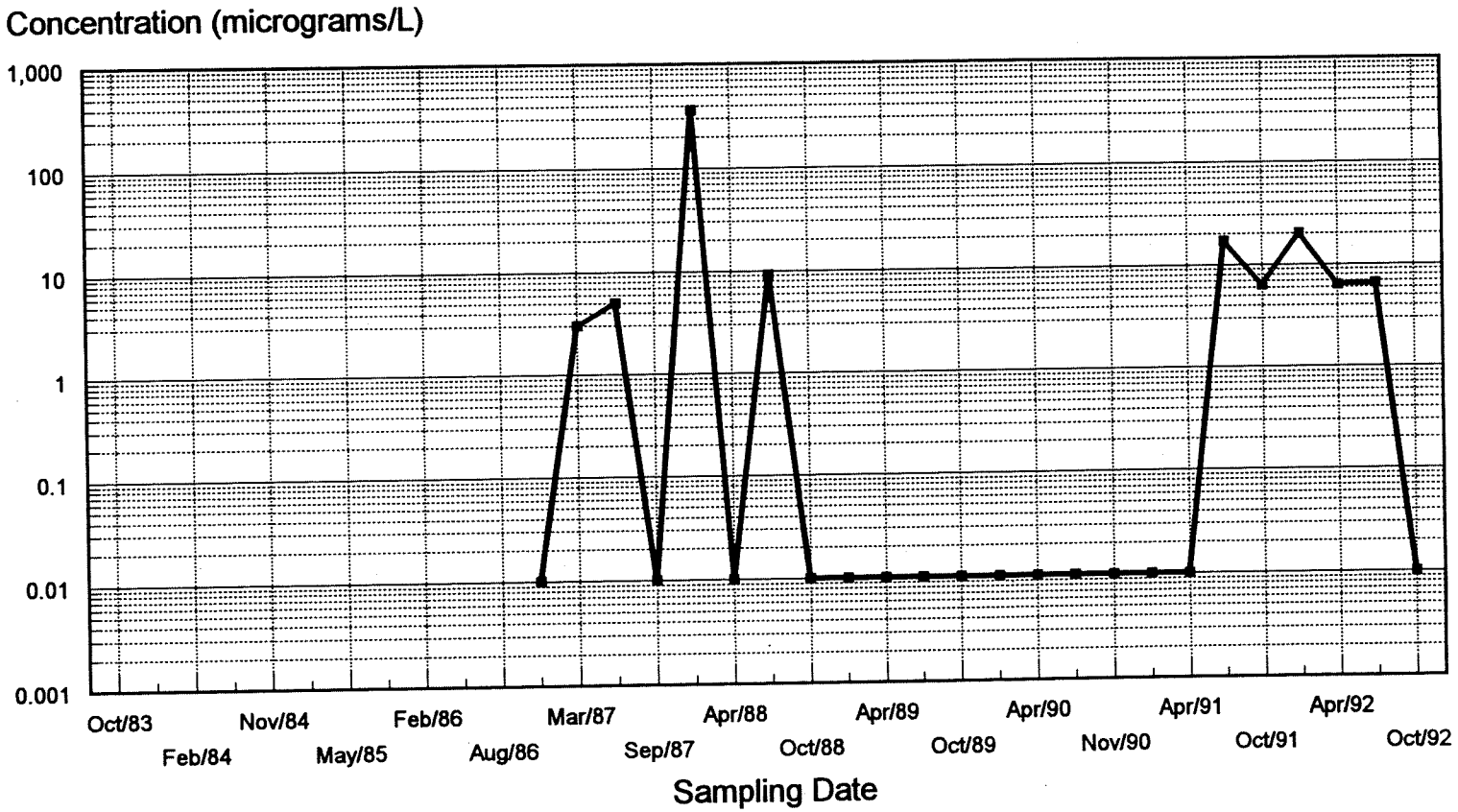
Trend Analysis: Total VOC Concentrations

W-40



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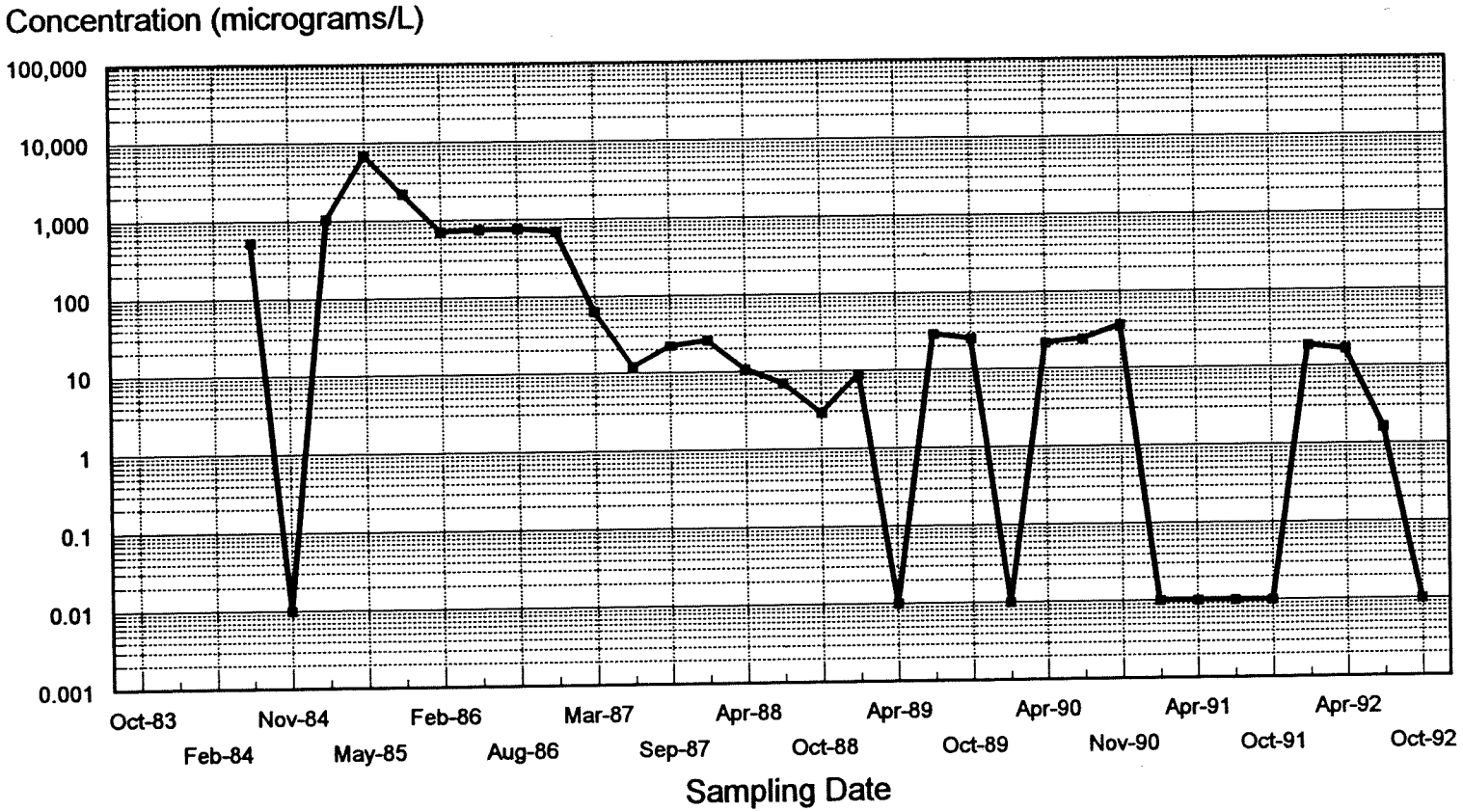
Trend Analysis: Total VOC Concentrations

PW-08



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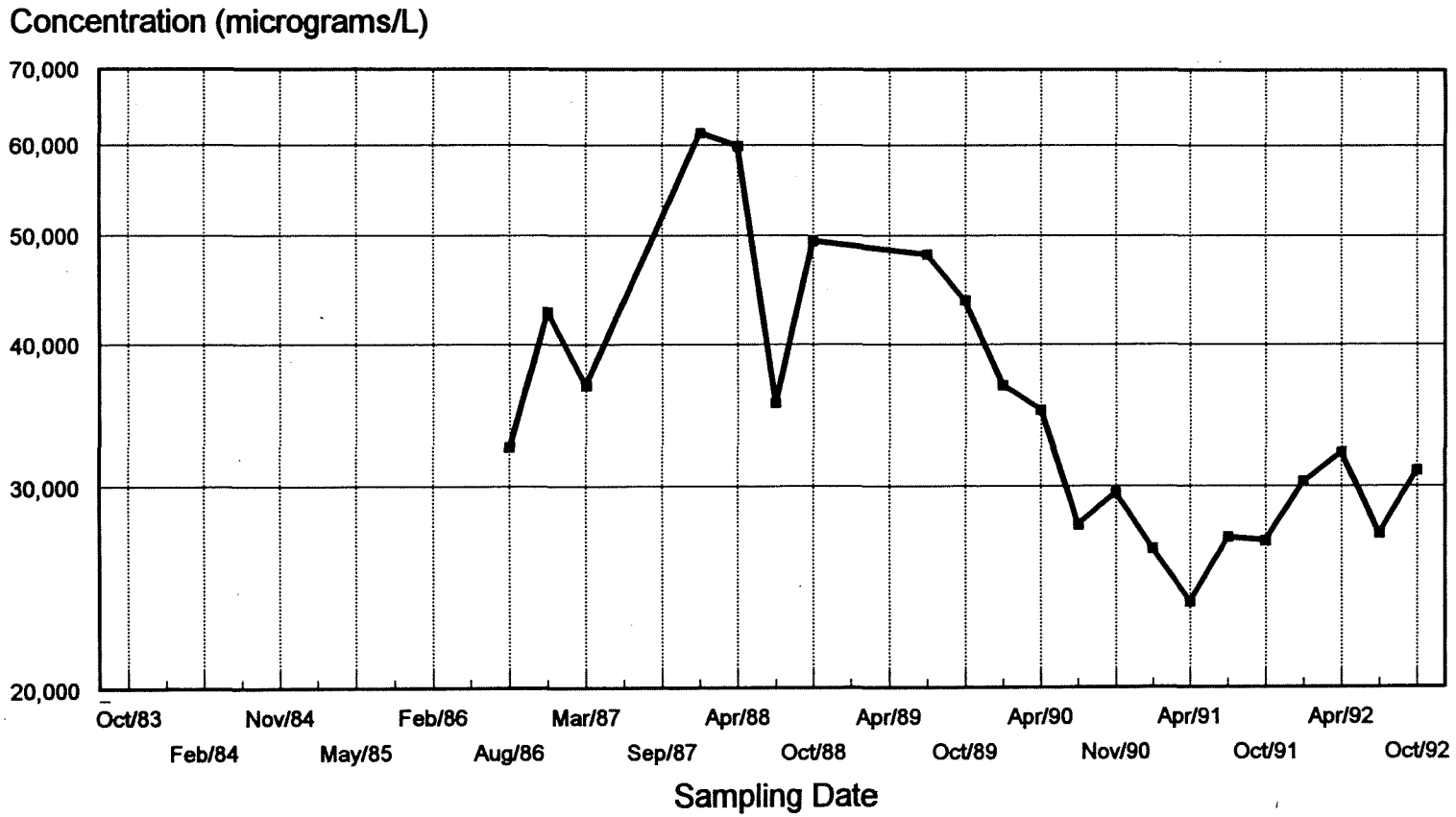
Trend Analysis: Total VOC Concentrations

W-21A



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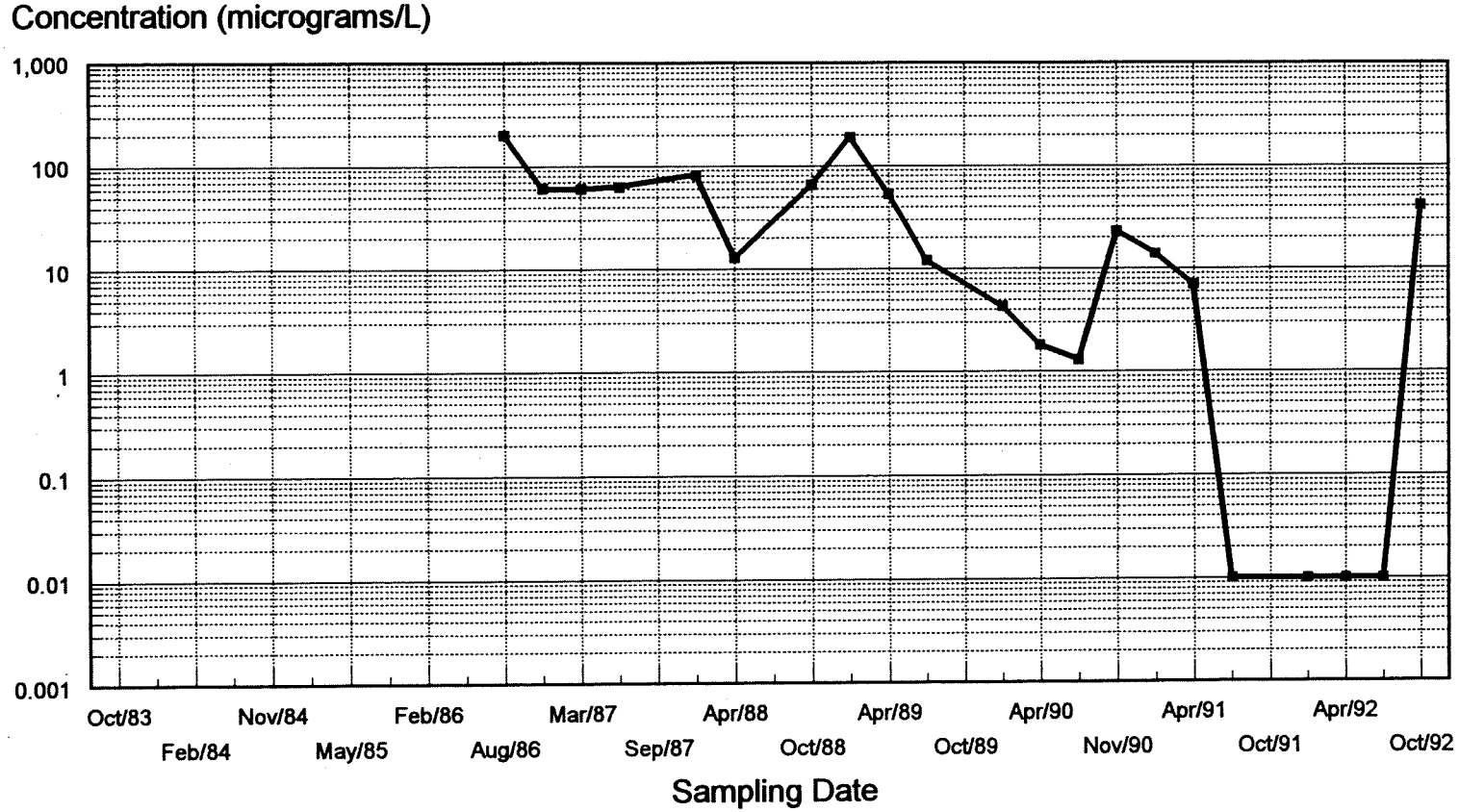
Trend Analysis: Total VOC Concentrations

W-24A



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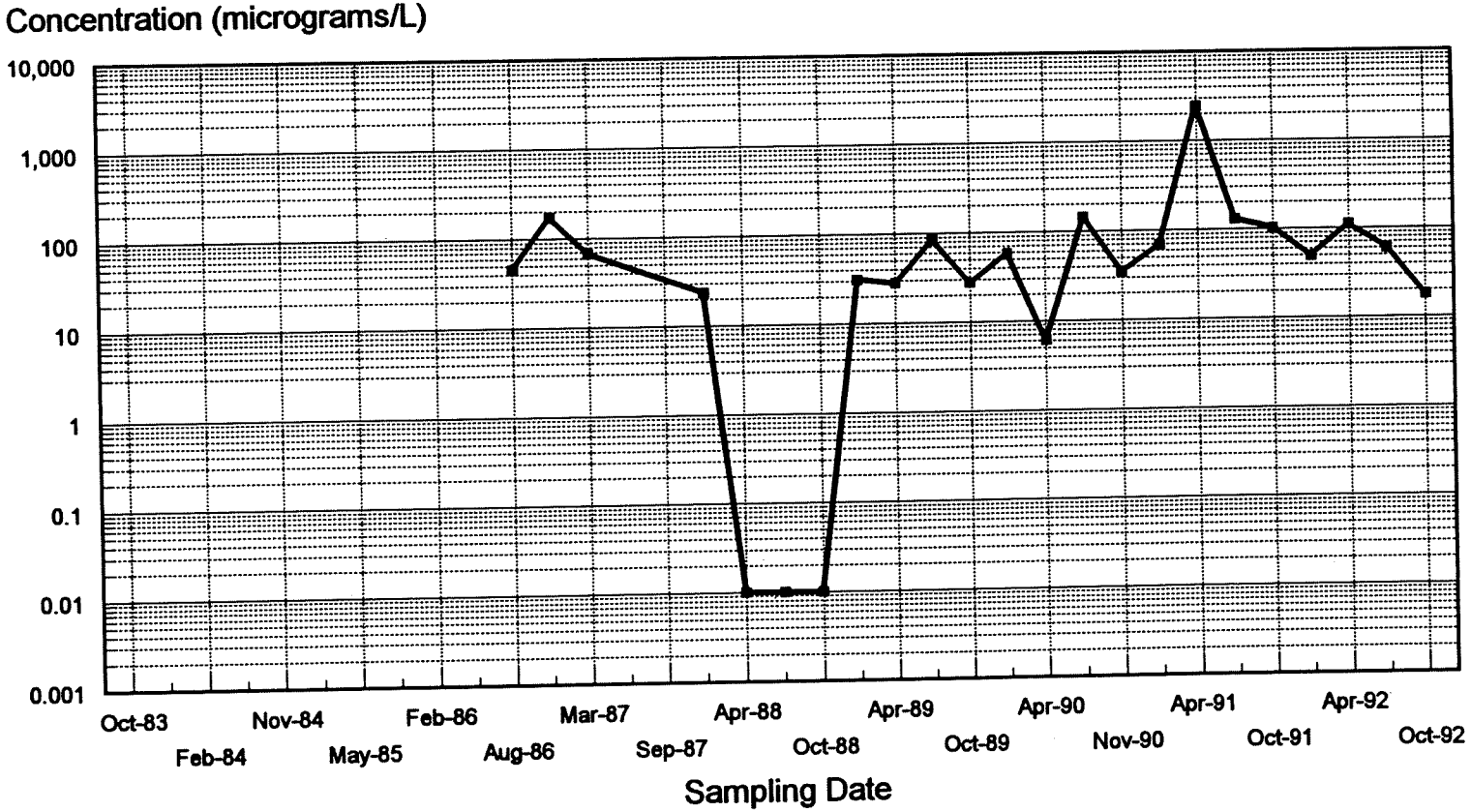
Trend Analysis: Total VOC Concentrations

W-28



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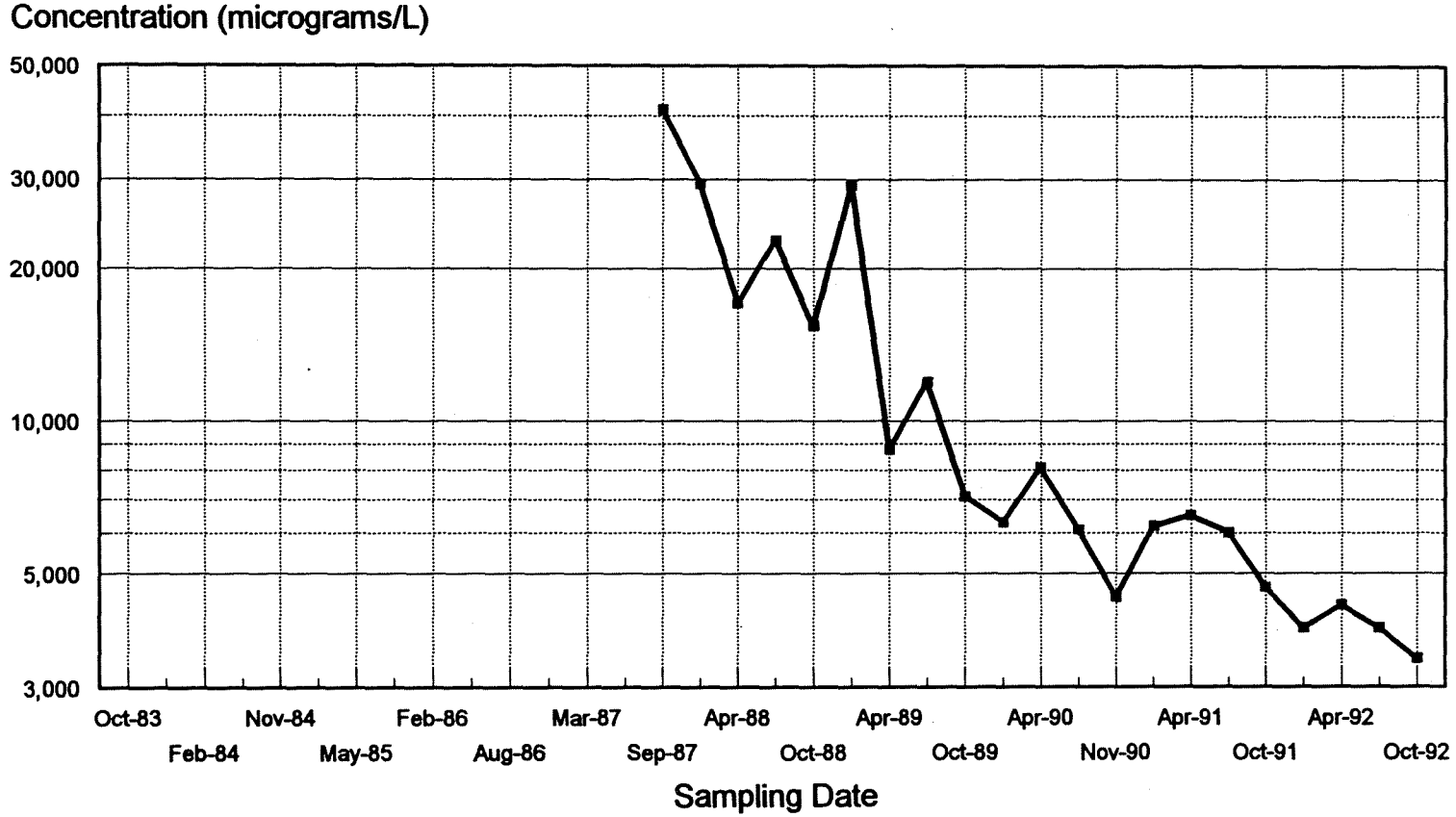
Trend Analysis: Total VOC Concentrations

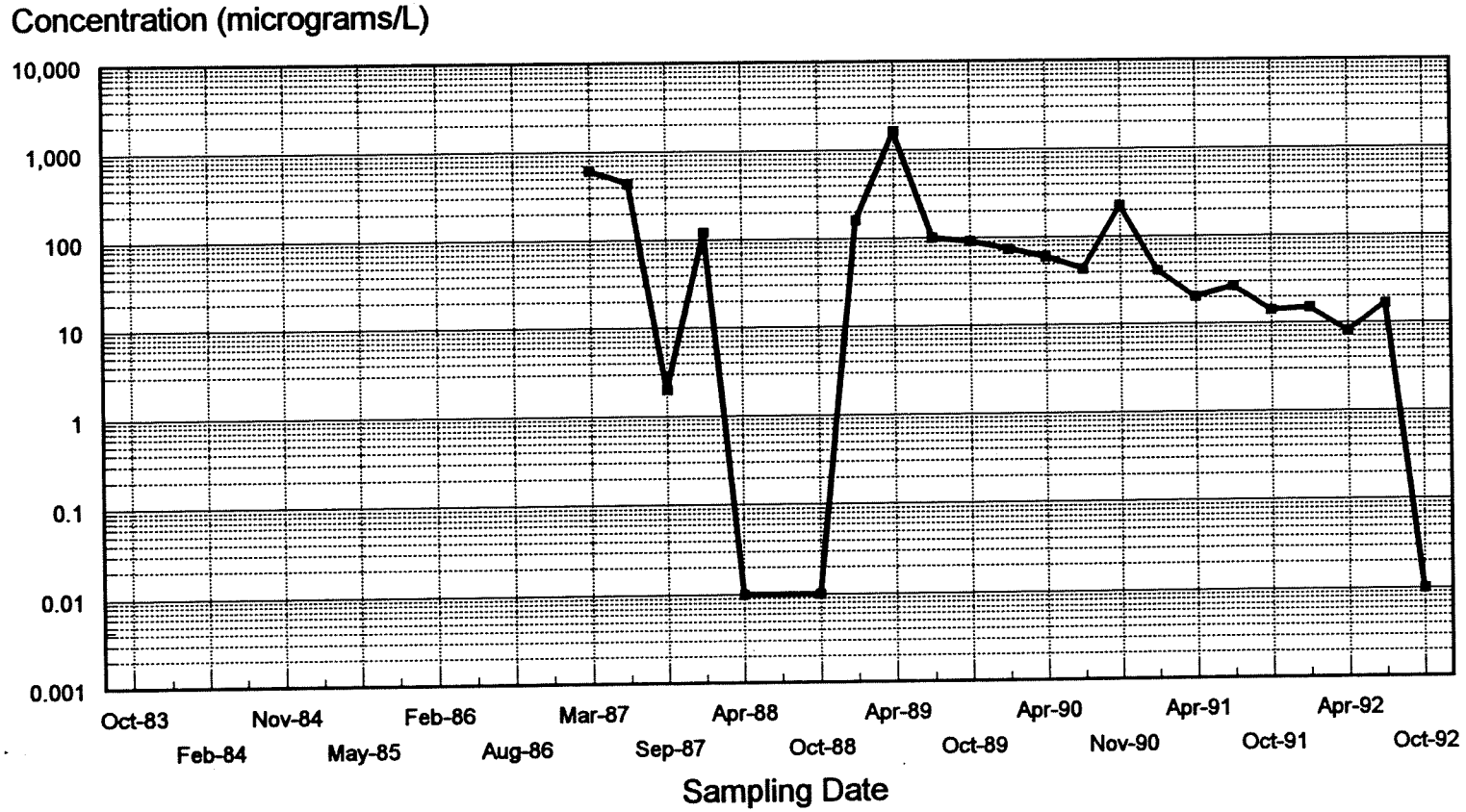
W-29



1832.33 0000:LOT/FL:cook:w29

Trend Analysis: Total VOC Concentration

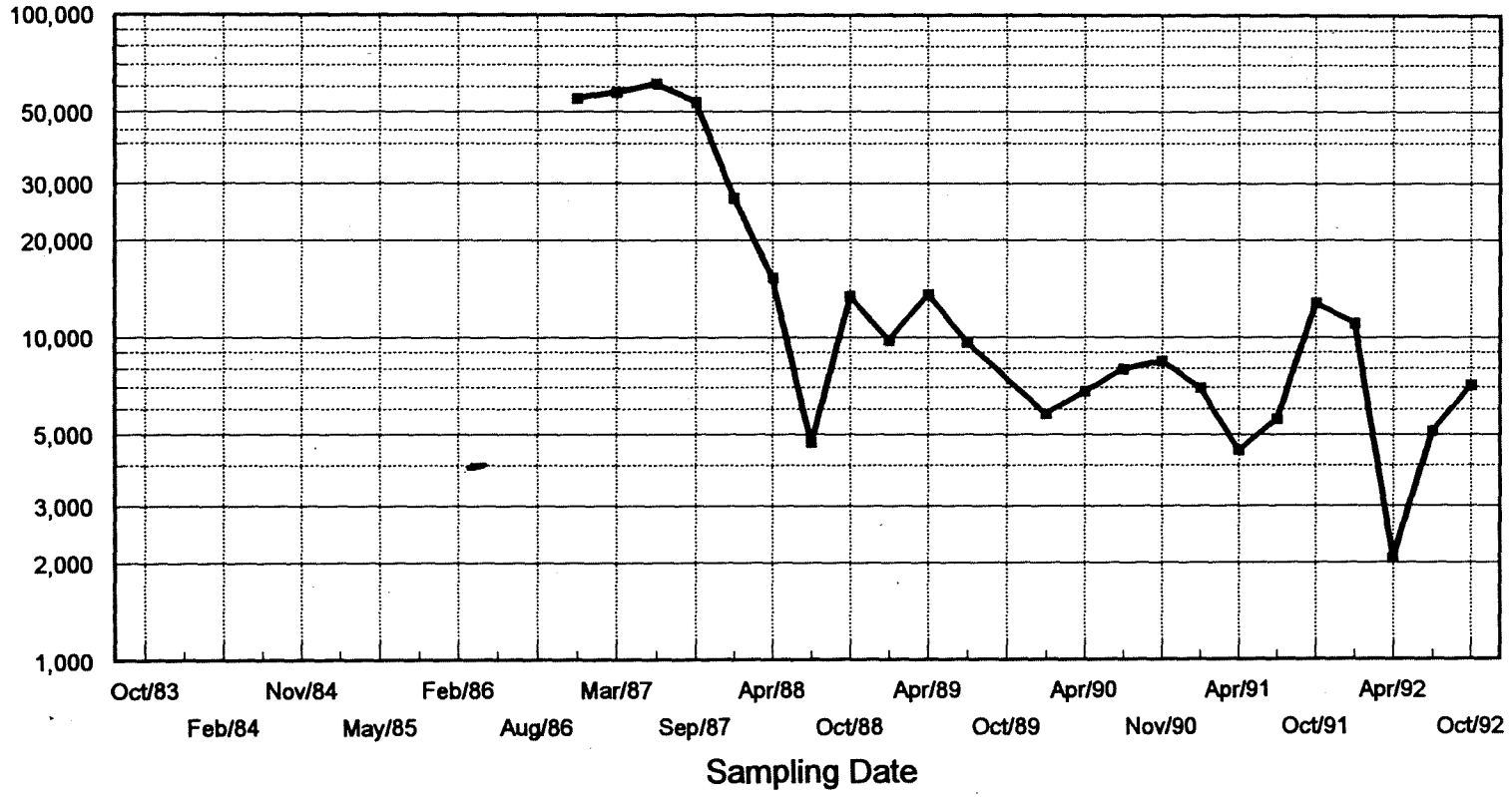
W-30



1832.33 000J:LOT/FL:cook:w30

Trend Analysis: Total VOC Concentrations

W-38



1832.33 0000:LOT/FL:cook:w38

APPENDIX E

HYDROGEOLOGIC CALCULATIONS

COMPUTATION SHEET

RMT INC.

SHEET _____ OF _____

744 Heartland Trail P.O. Box 8923 Madison, WI 53708-8923 (608) 831-4444 FAX: (608) 831-3334

PROJECT / PROPOSAL NAME	PREPARED		CHECKED		PROJECT/PROPOSAL NO.
Cook Composites	By: GNK	Date: 1/15/93	By: GSP	Date: 2/10/93	1832.33

Hydraulic Gradient Calculations

WATER TABLE Spring Quarter (April 1992)

1. Vicinity of W-06A to Vicinity of W-44

$$i = \frac{dh}{dl} = \frac{765 - 755 \text{ ft}}{300 \text{ ft}} = \underline{0.03} \text{ ft/ft} \checkmark$$

Potentiometric surface in Shallow dolomite: Spring Quarter (April 1992)

3 Vicinity of W-19A to W-27A:

$$i = \frac{750 - 730}{300} = \underline{0.07} \text{ ft/ft} \checkmark$$

4. Vicinity of W-38 to vicinity of W-21A

$$i = \frac{750 - 700}{160} = \underline{0.31} \text{ ft/ft} \checkmark$$