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Informal Report

IN-SITU VITRIFICATION (ISV) ORGANIC-SURROGATE VAPOR EMISSIONS DURING A 1-TON PILOT MELT

Draft Report

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Introduction

Pilot tests of a commercial soil vitrification process for entombing Animal/Chemical and Glass Hole area wastes were evaluated by incorporating perfluorocarbon tracers (PFTs) into aqueous and organic "wastes" within bottles of the type buried in typical Brookhaven-type holes. The objective was to add sufficient known PFT quantities of two or more types in the aqueous and organic phases while, at the same time, surrounding the test pit with known emission rate PFT sources, one type in the soil and another type in the air, such that monitoring of the air above ground and below ground would allow computation of the fugitive emission rates from the process as it occurred. Hood off-gas PFT concentrations were also to be monitored in order to verify the fraction present; claims have been made that greater than 99% of pit organics are destroyed during the melt. The output was to be the percentage escape (i.e., not captured by the hood) of pit aqueous and organic phases as the vitrification process proceeded.

The actual melt commenced at 1350 on Monday 24 June 1996 and continued for just short of 48 hours. By the next day it was clear from the real-time PFT analyzer that above-ground fugitive emissions were not assessable because substantial PFT vapors were fumigating the area from the exhaust stack of the ISV hood's soil vapor extraction (SVE) processing system. That sampling component was then switched to the stack to compare hood off-gas concentrations before and after the charcoal filtering.

It will be shown by these data that:

1. Greater than 60 to 80% of pit PFTs were collected by the hood, i.e., destruction efficiencies (DEs) were substantially less than 20 to 40%.

2. Greater than 85% of pit acetone was collected by the hood (DE<15%).

3. From 3 to 26% of PFTs are expelled horizontally into the soil 2 to 3-1/2 feet beyond the hood at an 18-in depth:

   -- it is likely that most of that vapor is collected by the hood.

4. Soil air vapor concentrations below the pit at 52-in. and 72-in. from the surface reach maximum concentrations at 30 to 40 h into the melt:

   -- 10 hours after Region IV PFT is exhausted and 20 hours after Region III is consumed

5. The lower the location of the released organic liquid, the higher is its concentration in the soil air below the melt:

   -- implication is that vapors generated at greater depths may <u>not</u> be recoverable by the surface hood.

6. The off-gas cleanup system used had no apparent capacity for removing PFT vapors.

7. Off-gas monitoring should be continuous integrated sampling:

   -- continuous PFT monitoring clearly showed maxima in hood-extracted air PFT concentrations of short duration (1h or less)

   -- runtime maxima were consistent with melt depth as a function of runtime (Geosafe Fig. 9).

Description of Test Pit with PFT Monitoring

Based on a previous excavation and sizing of contents of a "typical" BNL glass hole, Table 1 was constructed to emulate the glass bottle sizes, void spaces, and aqueous and organic (acetone as surrogate) liquid content. The volume of whole, glass and metal containers (3% of total volume, VT) contained just less than 10% as liquid; debris accounted for 15% and plastic bottles another 3% of VT.

The proposed pit dimensions with zone- and region-identifications are shown schematically in Fig. 1. The four regions of Melt Zone 1 (the inner zone) had 3 PFTs-PDCB in acetone in glass bottles, oPDCH in H_2O/acetone solution in glass bottles, and PMCP in H_2O and H_2O/acetone solution in 4 metal cans in Region III of Zone 1. The 4 regions of the outer zone, Zone 2*, had mPDCH in H_2O and H_2O/acetone solution in glass bottles.

Table 1 provides details of what was found in the typical BNL glass pit and, then, scaling by 1/16, of what was used in the 1-ton demo, that is, number of bottles or cans of each size by region and zone; a total of 236 PFT-containing bottles and 4 cans were used. Table 2 gives the estimated volume of the pit by zone and region and provides total acetone, acetone/water, and PFT quantities used.

Table 3 provides the final allocation of acetone-only (acet) and H_2O/acetone solution (H_2O) by bottle number count. Table 4 gives the amount of acetone (total of 786 mL liquid or 621 g), water (total of 426 mL liquid or 425 g), and PFTs (just 3.3 to 6.1 g of each of 4 types).

To monitor for the emission of PFT vapors that might be evolving into the soil air, eight (8) sampling probes (boreholes) at an 18-in depth were deployed uniformly in a circle of 6-foot radius around the pit centerline. One foot further in, a ring of 16 stakes each with a buried PTCH source at a 2-foot depth as well as a PMCH source at a 1-foot elevation were deployed. The concentration of pit PFT vapors measured in the borehole relative to the buried PFT concentration times the known PTCH source strength gives the effective pit PFT emanation rate into the soil air as measured at that location. Averaging over all eight would give an estimate of the integral pit PFT emanation rate. One can argue that if soil air samples were collected concentrically closer and closer to the pit melt that both pit PFTs and buried reference PFT concentrations would have increased proportionally, so a measure at any one distance away should provide a reliable PFT emanation rate.

The amount of pit PFT as vapor is given in Table 4. If one assumes that all this PFT and acetone as well is uniformly emitted over a 48-hour period, the average maximum pit acetone and PFT emanation rates, S*, are, correcting for composition:

	PDCB in Acetone	ocPDCH in H_2O/Acetone	PMCP in 4 cans	mPDCH in Zone 2	Acetone
S*,µL/min	124	58	83	102	(90 mL/min)
C*,ppb	55	26	37	45	(40 ppm)
V_T,mL liq. [a]	2.64	1.49	1.71	2.63	786
V_T,mL liq. [b]	2.13	2.57	2.06	2.58	--

[a] The total volume of liquid PFT or acetone corrected for composition.

[b] Total liquid PFT volume normalized to an S* of 100 µL/min for each.

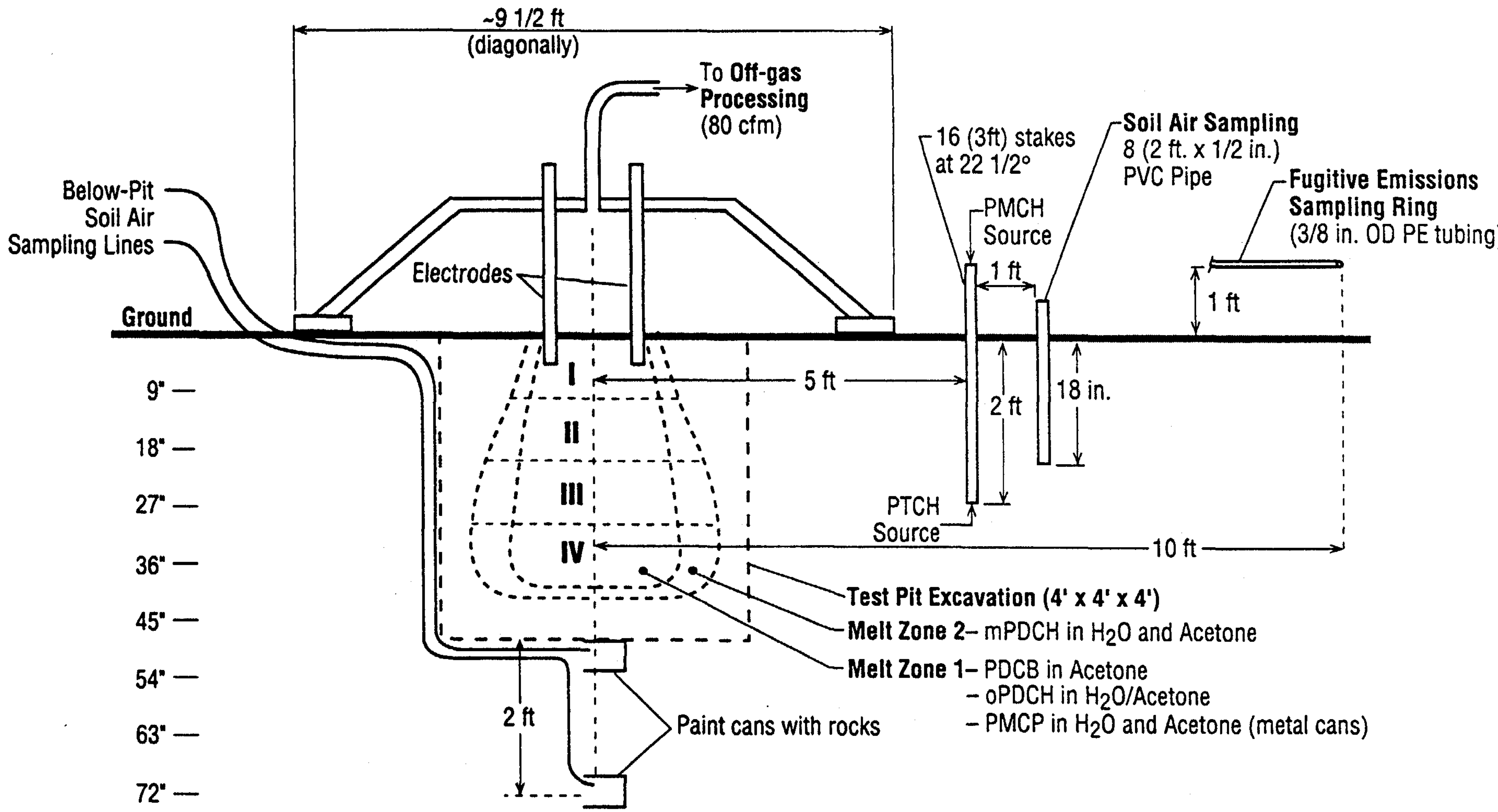


FIGURE 1. **Elevation View of ISV Pilot Test Verification**

Table 1

Using BNL Pit Glass Bottle Data

		Total Void Vol.		Est. Liq. Found, oz.			Scaled 1/16[a]				Total Void Vol.		Quantity of Glass Bottles/Paint Cans by Location: Region I		Region II		Region III		Region IV		
Found Size, oz	No.	oz.	%	oz/cont.	No.	Σ liq.	dr.[c]	oz	mL	No.	mL	Σ mL	Z 1	Z 2*	Z 1	Z 2*	Z 1	Z 2*	Z1	Z 2*	Σ
1	3	3	0.2	0.7	3	2	1		1.85	3	5.55	5.6	3	3	3	3	3	3	3	3	24
2	6	12	0.8	1	6	6	2		3.7	6	22.2	27.8	6	6	6	6	6	6	6	6	42
4	2	8	0.5	3	2	6	3		5.55	3	16.6	44.4	3	3	3	3	3	3	3	3	24
8	2	16	1.1	3	2	6	6		11.1	3	33.3	77.7	3	3	3	3	3	3	3	3	24
16	12	192	12.7	16	1	16		1	29.6	12	355.2		12	--	12	12	--	6	--	--	2
				4	4	16		or 2	59.2	6	355.2	433			10	2	6	3	6	6	33
				3	7	21															
64	8	512	33.9	8	1	8		4	118.3	8	946.4	1379	5	--	3	--	8	6	8	6	36
				3.5	7	24															
96	8	768	50.8	3.5	8	28		8	236.6	8	1892.8	3272	--	--	2	--	4[d]	--	3	--	9
Total	41	1511	100		133[b]						3276										240[e]

[a] Based on 1 ton to 50 ton ratio to 2/3 power
[b] Liquid content found in 41 bottles was about 133/1511 or 8.8%
[c] 1 dram = one-sixteenth (0.0625) oz.
[d] Four 8-oz. paint cans with 48 mL liquid (20%) instead of 24 mL (10%)
[e] Sum of all glass bottles plus 4 cans

Table 2

Pit and Contents Volume (L) by Region and Zone

Region	Z 1	Z 2*	Z 2	3% Z 1	3% Z 2*	15% Z 1	15% Z 2
I	30.5	2.9	24.4	0.92	0.09	4.6	3.7
II	61.7	18.7	60.6	1.85	0.56	9.3	9.1
III	77.2	39.4	87.8	2.32	1.18	11.6	13.2
IV	71.1	38.6	102.3	2.13	1.16	10.7	15.3
Σ	240.5	99.6	275.1	7.22	2.99	36.2	41.3
Liq. (10%)				0.91[a]	0.30		

[a] Four 8-oz paint cans in Zone 1, Region III, with 20% volume as liquid

Sums

Z 1 + Z 2:	515.6 L total pit volume (excludes top 2-in)
10% (3% Z 1 + 3% Z 2*):	1.21 L total liquid in glass and metal containers
15% Z 1 + 15% Z 2:	77.5 L Debris
3% Z 1 + 3% Z 2:	15.5 L Plastic bottles

Liquid	Zone 1 (Glass)	Zone 1 (4 cans)	Zone 2*
Total:	0.72 L	0.19 L	0.30 L
40% Acetone:	288 mL (w/4.4 g PDCB)	96 mL (w/1.65 g PMCP)	120 mL (w/2.1 g mPDCH)
"60% Aqueous":	432 mL Acetone 288 mL H_2O (w/6.1 g oPDCH)	48 mL Acetone 48 mL H_2O (w/1.65 g PMCP)	90 mL Acetone 90 mL H_2O (w/3.2 g mPDCH)

Table 3

Final Allocation of PFT-Tagged Bottles and Cans

Bottle Size	10%[a] as Liq, mL	Region I				Region II				Region III				Region IV			
		Z1		Z2		Z1		Z2		Z1		Z2		Z1		Z2	
		Acet	H_2O	Acet	H_2O	Acet	H_2O	Acet	H_2O	Acet	H_2O	Acet	H_2O	Acet	H_2O	Acet	H_2O
1 dr	0.18	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
2 dr	0.37	2	4	2	4	2	4	2	4	2	4	2	4	2	4	2	4
3 dr	0.55	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
6 dr	1.1	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2
1 oz	3.0	5	7	-	-	5	7	5	7	-	-	2	4	-	-	-	-
2 oz	6.0	-	-	-	-	-	10	-	2	2	4	1	2	2	4	2	4
4 oz	12	2	3	-	-	3	-	-	-	3	5	2	4	3	5	2	4
8 oz	24	-	-	-	-	1	1	-	-	-	-	-	-	1	2	-	-
8 oz (cans)	48[b]	-	-	-	-	-	-	-	-	2	2	-	-	-	-	-	-

[a] All glass bottles: liquid content per bottle at 10% of bottle volume.

[b] Four (4) metal cans: liquid content per can at 20% of can volume.

Table 4

Total of All Liquids and PFTs in Pit

Fluid	Zone 1 (Glass)	Zone 1 (Region 3)	Zone 2*	Totals
Acetone				
-- liq. (mL)	432	144	210	786
-- g	341	114	166	621
H_2O				
-- liq (mL)	288	48	90	426
-- g	287	48	90	425
PDCB				
-- g	4.41	--	--	4.41
-- vapor, v (mL)	357	--	--	357
oPDCH				
-- g	6.14	--	--	6.14
-- v-oc (mL)	168	--	--	168
PMCP				
-- g	--	3.30	--	3.30
-- v (mL)	--	238	--	238
mPDCH				
-- g	--	--	5.26	5.26
-- v-meta (mL)	--	--	294	294
Totals				
-- liq (mL)	720	192	300	1,212

Dividing the calculated emanation rates from the borehole measurements by these maximum uniform rates, S*, gives the normalized emanation rates. If destruction efficiency was 0% and PFTs were emitted uniformly, this normalized value would be 1.0; if DE were 99%, this value would be 0.01; etc. Average uniform concentration, C*, is that expected in the hood off-gas assuming that no vapors are destroyed and that the off-gas flow rate was 80 scfm (2.27 m^3/min). Also shown is the liquid volume of acetone and each PFT used, corrected for composition (V_T) and then the amount of PFT that would have been present if each would have had S* rates of 100 µL/min; for example, only 2.06 mL of PMCP liquid would have given 100 µL vapor per min for 48 hours.

Fugitive emissions escaping into the air from the ground during the melt process were to have been collected by a sampling ring surrounding the pit at a 10-foot radius and staked 1 foot above the ground. The details of the fabrication of the ring are given in Table 5; regardless of direction and magnitude of the prevailing winds, pit PFT vapors escaping from the ground as well as those from the known-rate elevated PMCH sources would have allowed the calculation of the unknown emanation rate of pit PFTs as a function of time. Unfortunately, as indicated earlier, the poor destruction efficiency (DE) of the melt and the lack of any effective off-gas treatment did not allow this measurement to be made; on the second day of the melt, the sampling equipment was switched to the Exhaust Air coming from the air processing treatment stack.

As shown in Fig. 1, soil air was also sampled directly below the melt at 52- and 72-in. depths. Because there was no reference PFT source of known source strength at that depth, only PFT concentrations are reported.

PFT Monitoring. Borehole sampling consisted of purging the sampling probes or lines, filling a plastic bag (ISV Bags) with about 300 mL of air, transferring about a 60-mL aliquot to an adsorbent tube with analysis by an automated GC system [1, 2].

Programmable adsorbent tube samplers [1] were used to collect hourly integrated air samples from the fugitive emissions Ring, the off-gas Hood Air, and the Exhaust Air. About 50 mL/min of ring air was directly sampled. For hood air and exhaust air, sampling air from those systems at about 6 to 8 mL/min was dynamically diluted with particle-filtered ambient air at 6 to 8 L/min; the 1000-fold diluted sampled air was then collected at about 50 mL/min onto the programmable adsorbent tubes.

A real-time PFT analyzer [3] was deployed initially on the ring along with the adsorbent sampler; immediately, the first integrated 3-min sample completely overloaded the instrument. Not realizing that the ISV system was not destroying PFTs as proposed, all samplers and the real-time analyzer were shut down to determine the problem. After adjusting for the observations, sampling commenced about 2-1/2 hours into the melting. Real-time data was only used as a qualitative indicator; results are not reported here.

Results and Discussions

In this section, results are briefly presented and discussed with full, detailed results in appendices for Borehole and Below-Pit Soil Air (Appendix A), Ring Air (Appendix B), Hood Air (Appendix C), and Exhaust Air (Appendix D).

Borehole Air. Of the eight (8) boreholes, only 6 were sampled for the last 4 of 6 sampling periods; boreholes 3 and 4 had very poor permeability. Appendix A gives the sampling dates and times and the 6 figures give the normalized emission rates for each of the 4 pit PFTs versus elapsed time. Boreholes 1 and 2 clearly have the largest normalized emissions, approaching unity for PMCP, the PFT in Region III. Because the initial maxima occurred at runtimes of 2 and 5 hours, long before Region III was effected by the melt, these early

Table 5

ISV Above-Ground Fugitive Emissions
Air Sampling Cable Design

(Polyethylene: 3/8-in. OD by 1/4=in. ID)
Specifications: 10-ft radius, 60 holes
0.155 L/min/hole, Total flow = 9.3 L/min @ΔP=3mmHg

Hole Nos.		Drill Size, in.
30		0.039
28-29	31-32	0.039
26-27	33-34	0.038
25	35	0.037
24	36	0.036
22-23	37-38	0.035
20-21	39-40	0..033
18-19	41-42	0.032
17	43	0.031
14-16	44-46	0.0292
12-13	47-48	0.028
8-11	49-52	0.026
7	53	0.025
4-6	54-56	0.024
1-3	57-59	0.0225
0 or 60	{at pump}	0.0225

concentrations were probably due to PMCP-tagged liquid leaking from the 4 cans over the weekend prior to the melt.

Fig. 2 shows the melt depth versus runtime (from the Geosafe report, their Fig. 9). Based on their depths, the runtime period which was effecting each of the four regions is indicated. The second PMCP maxima in many of the borehole plots seems to be occurring abut 5 to 10 hours after Region III was melted.

The integral under each of the PFT curves was used to provide an estimate of the average over the melt duration of the PFT soil air emission rate versus borehole number as shown in Table 6. Using a linear interpolation for the missing data for boreholes 3 and 4, an average emission rate into the soil is computed. For 3 of the 4 pit PFTs, the rate is just 3 to 4% of that in the pit; for PMCP in Region III, about 26% is emitted into the soil air. The next most-prevalent PFT soil emission rate is that of mPDCH, the PFT in the perimeter zone, Zone 2. All the borehole plots show the same trend for the 25- to 41-h sampling results, i.e., PMCP is highest followed by mPDCH. Clearly, the deeper the liquid source is located (PMCP in Region III) or the closer it is to the periphery of the melt (mPDCH in Zone 2), the higher is the emission rate into the soil. However, of the amount emitted into the soil, most is probably recovered by the hood at the depth of this melt.

Below-Pit Soil Air. There was no PFT source of known emission rate near the below-pit sampling locations, so a calculation of emanation rate is not possible. However, Table 7 gives the PFT concentrations measured in the soil air as a function of runtime for each of the two depths. At the 52-in location each of the four PFTs decrease in concentration over the first 19 hours--the start of the melt of Region III at about the 21-in depth. At 26 hours into the run, the PFT concentrations start to increase with a major jump in PMCP - the Region III PFT. The concentrations still climb at the 31st hour but start to decrease by the 41st hour.

At 5 hours into the run, there are significantly larger PFT concentrations at 72 in. than at 52 in, implying a source from below which is being effected through soil vapor extraction by the hood. This, too, decreases at 19-1/2 hours and then climbs again, albeit, more slowly and to a smaller magnitude than at the 52-in depth. Because soil air concentrations are increasing more slowly with time at greater depths, the question arises as to the magnitude of these emissions and to the effectiveness of the hood as a function of depth.

Figures 3 and 4 show the PFT concentrations (ppt) in the soil air normalized to an identical volume emission rate of 100 μL/min for each. As discussed earlier, the amount of PMCP giving 450 ppt at the 52-in depth and 4-fold lower (110 ppt) at the 72-in. depth is only 2.06 mL of liquid; clearly, 2-L of liquid would give rise to 450 ppb of vapor in soil air and, quite likely, higher amounts with depth if the larger volume of escaping liquid is not immediately volatilized. Below the pit melt as well as peripherally more organic vapor is emitted the deeper the source or the more it is on the perimeter. Also, consistently, the ocPDCH from aqueous solutions is always higher than the PDCB from acetone-only solutions; it appears there is a steam-distillation enhancement.

Ring Air. Although the ring air concentrations measured were determined to be due to fumigation from the exhaust air, Fig. 5 is informative as it shows the impact of the melting reaching each of the first three regions as defined from the melt curve of Fig 2. The melting is occurring under the word "Region; the PFT emanation is occurring in advance of the melting. The first two regions are dominated by the PFT in acetone only, PDCB, and then the PFT in acetone/water, ocPDCH. The outer zone PFT, mPDCH in Zone 2, is not of the same magnitude, and the Region III PFT is not yet prevalent, consistent with the melting occurring from the center outward and the small volume for Zone 2 at Regions I and II.

By the time the melt hits Region III, the dominance of PMCP is clearly shown. The lack of a Region IV-signal was due to the wind shift carrying the stack emissions away from the ring. In the forefront of Region III, PMCP is rising just ahead of the Zone 2 tracer, in PDCH, as it does

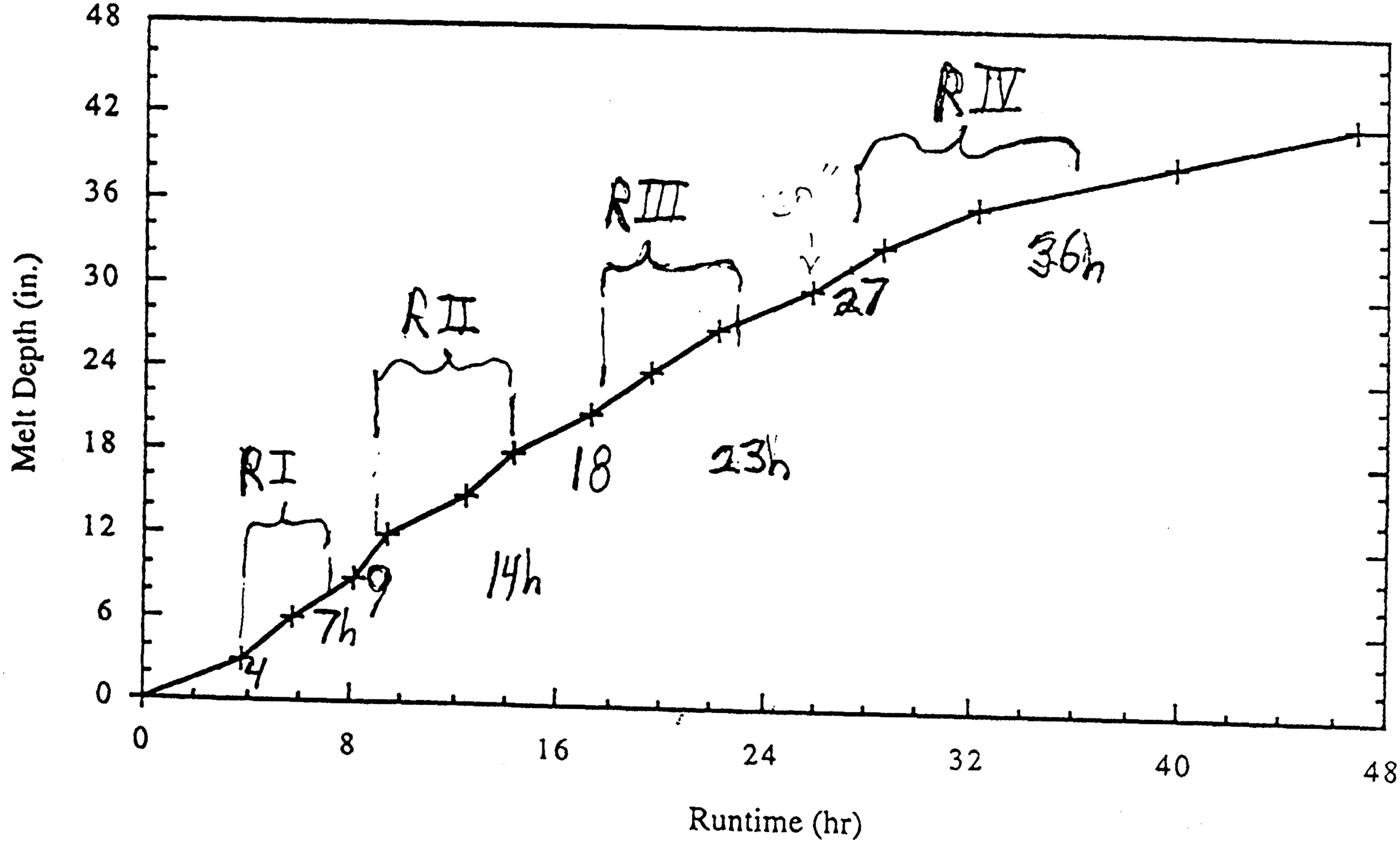


FIGURE 2. Vertical Melt Rate

Table 6

Average Normalized Soil Air Emissions

Barhole No.[a]	PDCB in Acetone	ocPDCH in H_2O/Acetone	PMCP in 4 cans	mPDCH in Zone 2
1	0.05	0.06	0.32	0.10
2	0.10	0.05	0.70	0.06
5	0.03	0.02	0.17	0.04
6	0.013	0.007	0.05	0.01
7	0.017	0.011	0.045	0.02
8	0.01	0.01	0.04	0.015
Avg. at 18-in. depth[b]	3.2%	2.8%	26.5%	4.3%

[a] Barhole Nos. 3 and 4 were too wet (no soil air extractable).

[b] 2 to 3-1/2 feet from edge of hood; uncertainty of +10% and -100%

Table 7

PFT Soil Air Vapor Concentrations (pL/L or pptv) Below Melt

Depth from Surface, in.	Run Time, h	PDCB in Acetone	ocPDCH in H_2O/Acetone	PMCP in 4 cans	mPDCH in Zone 2
52	2	2.9	3.4	16.3	4.0
	5	1.5	0.8	9.1	2.2
	19 1/2	0.3	0.1	0.4	0.4
	26	20.8	2.2	114.7	4.4
	31	118.1	164.1	398.0	192.7
	41 1/2	94.1	62.4	309.0	213.4
72	2	0.5	1.2	3.1	1.4
	5	34.4	4.0	128.7	9.0
	19 1/2	0.8	0.2	2.4	0.9
	26	6.4	1.4	34.7	5.9
	31	19.5	26.6	87.6	40.9
	41 1/2	22.5	11.8	97.5	49.7

FIGURE 3. **Copper 52 inch Depth**

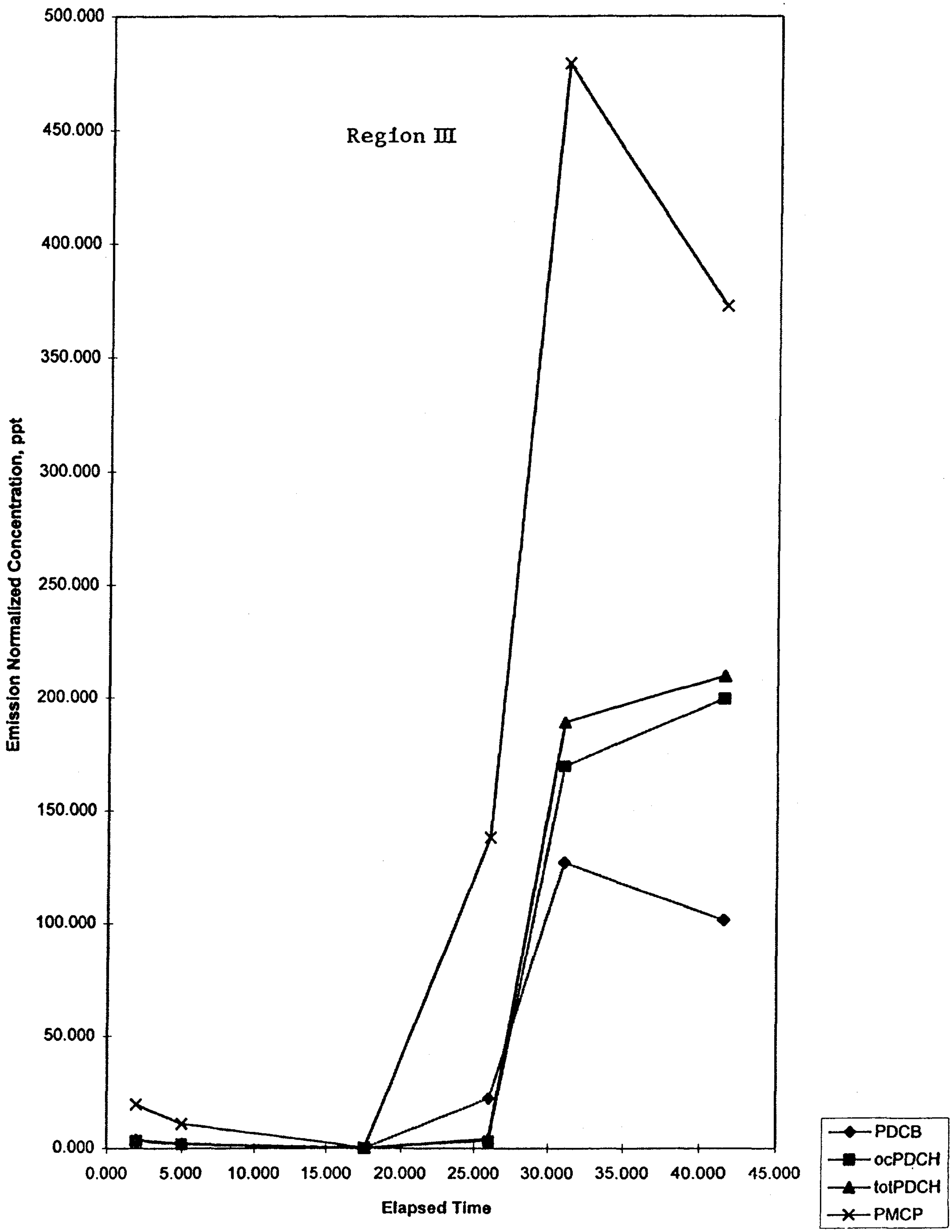


FIGURE 4. **Copper, 72-inch Depth**

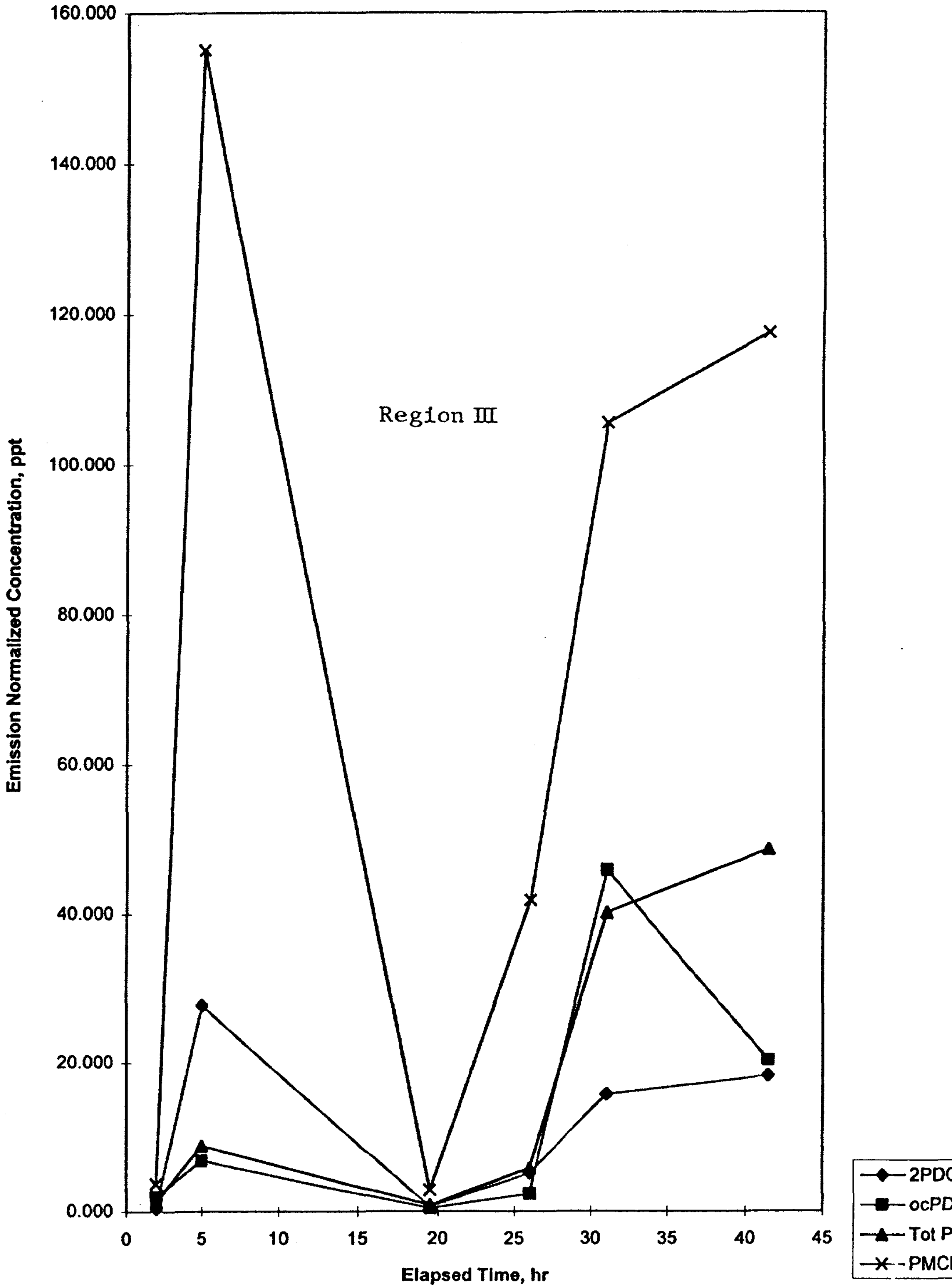
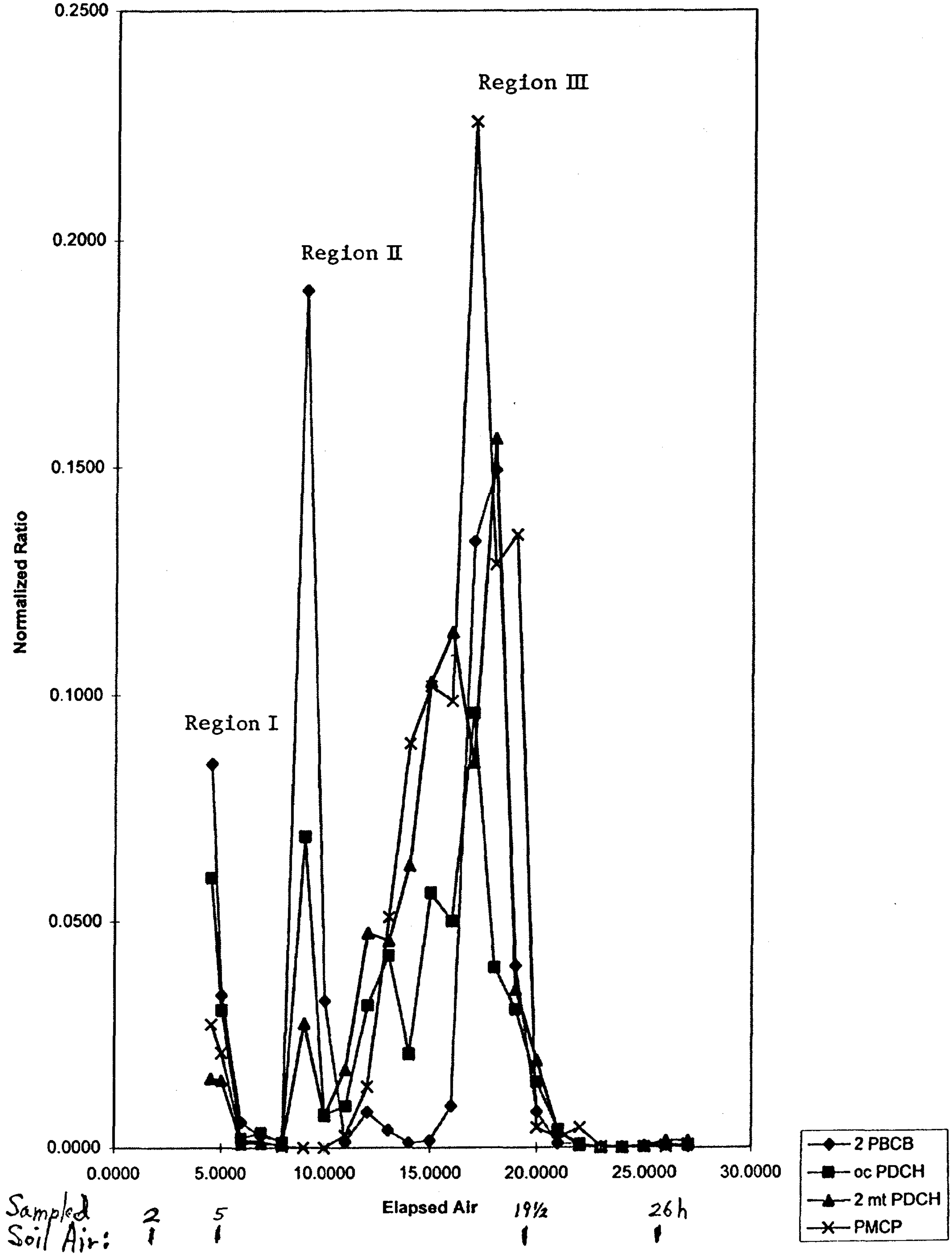


FIGURE 5. **Ring Air**



in the soil air results. Similarly, the aqueous tracer, ocPDCH, is rising before the acetone-dissolved tracer, PDCB.

Hood Air. Fig. 6 gives the hood-air normalized emission rates versus runtime. The high levels before the start of the melt confirm the presence of PFT vapors in the soil air from bottle leakage over the weekend. That PMCP dropped to negligible levels (about 0.01 ± a factor of 2 as shown in Appendix C) implies that the other PFTs showing at the beginning of the Region I melt are, indeed, from that region, dominated again early by the Zone 1 PFTs and not until later by the outer Zone 2 PFT (mPDCH).

Again the dominance of PMCP in the Region III melting is evident. The PFT data at the 26th hour and beyond was lost because of a GC valve leak that occurred after the first tube was analyzed. This lid of samples was analyzed 12 days after the earlier results which were run prior to the occurrence of the leak as confirmed by standards.

Also shown are the normalized acetone concentrations, i.e., concentrations received from Geosafe divided by the nominal maximum uniform concentration of 40 ppm (assuming no destruction). The sum of the acetone normalized hourly average concentrations divided by the sum of the sampling hours gives 85.0% presence in the hood. Because the three measurements do not coincide with the PFT maxima, it can be assumed that much more than 85% is emitted into the hood air.

Date	6/24/96	6/25/96	6/25/96
Clock	2345-0045	1346-1436	2254-2354
Runtime, h	~10-11	~24-25	~33-34
Duration, h	1	0.83	1
Conc., ppm.	33	18	45
Norm. Conc. a	0.825	0.45	1.13

Norm. C = C/40 ppm

Exhaust Air. When the ring air sampling was recognized as being ineffective, the sampler was diverted to the Exhaust Air but now with 1000-fold dilution as well. The detailed data are in Appendix D and Fig. 7 shows the normalized emission rates versus runtime. Here it can be seen that, indeed, there was a Region IV emanation which was not seen in the hood air analyses after the 25th hour because of the sampler problem.

The results show that the PMCP from Region III is now gone during the presence of the Region IV PFTs. Again, the aqueous PFT (ocPDCH) rises before the acetone-only PFT (PDCB), both in Zone 1, but the Zone 2 PFT, in PDCH is more widely distributed probably because the Region III-Zone 2 liquids are still being evolved.

Integrated Organic Emissions. Summing the normalized emission numbers for the hood air (Appendix C) up through the 25th-hour integrated sample together with that for the exhaust air from 1600 on 6/25/96 (the 26th hour) and on, the integrated PFT vapor emanation rates into the hood air as a percentage of that initially present are:

PDCB in Acetone	ocPDCH in H_2O/Acetone	PMCP in 4 cans	mPDCH in Zone 2	All Acetone
>80%	>61%	>63%	>66%	>85%

The greater-than sign is being used for the PFTs because during the field monitoring of the hood and the exhaust air, the dilution air flow was constant but the actual hood and exhaust air sampling rates (nominally 7 and 6 mL/min, respectively) would occasionally drift down to 2/3 or 1/2 those values before we would adjust them up again (an automated flow control is

FIGURE 6. **Hood Air**

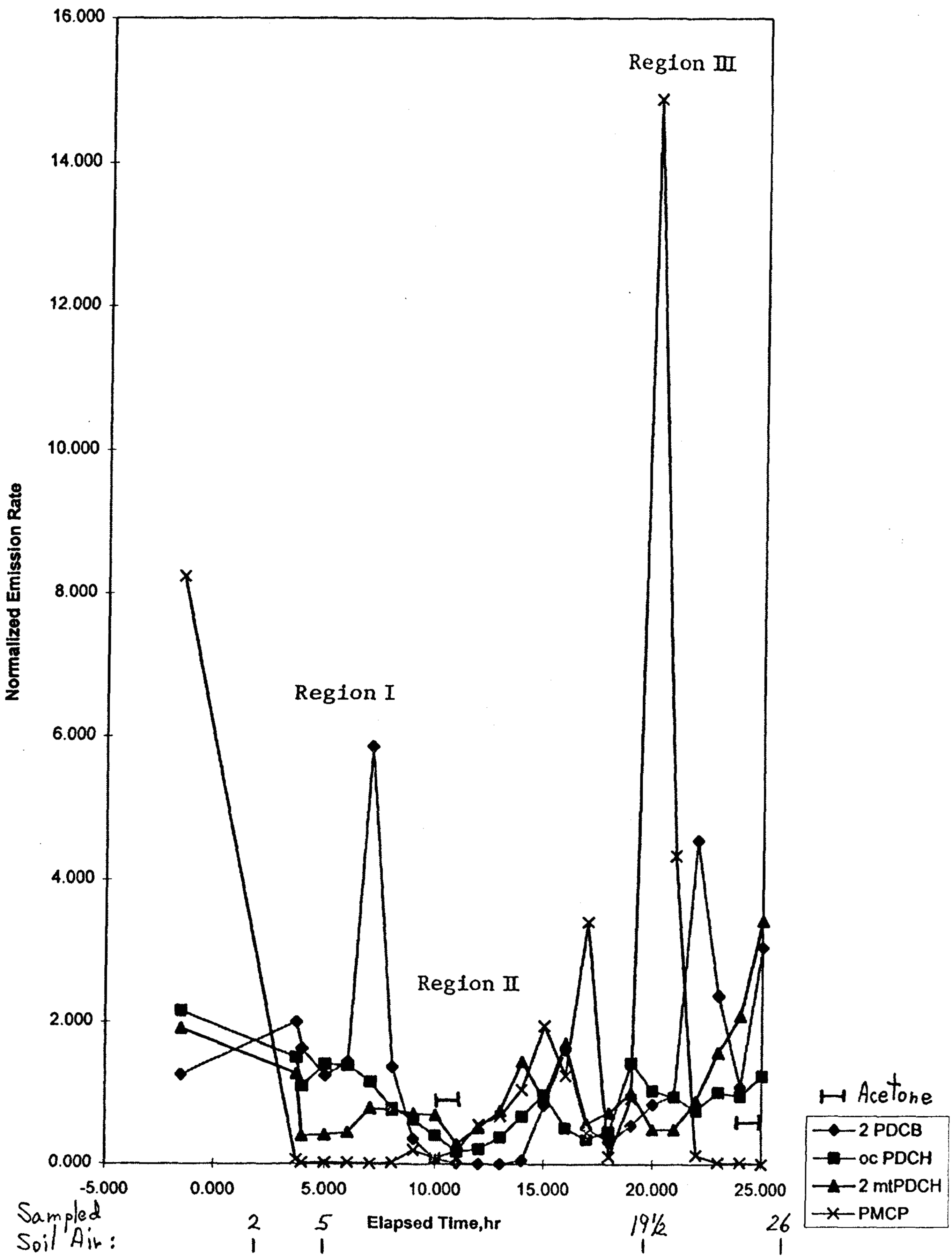
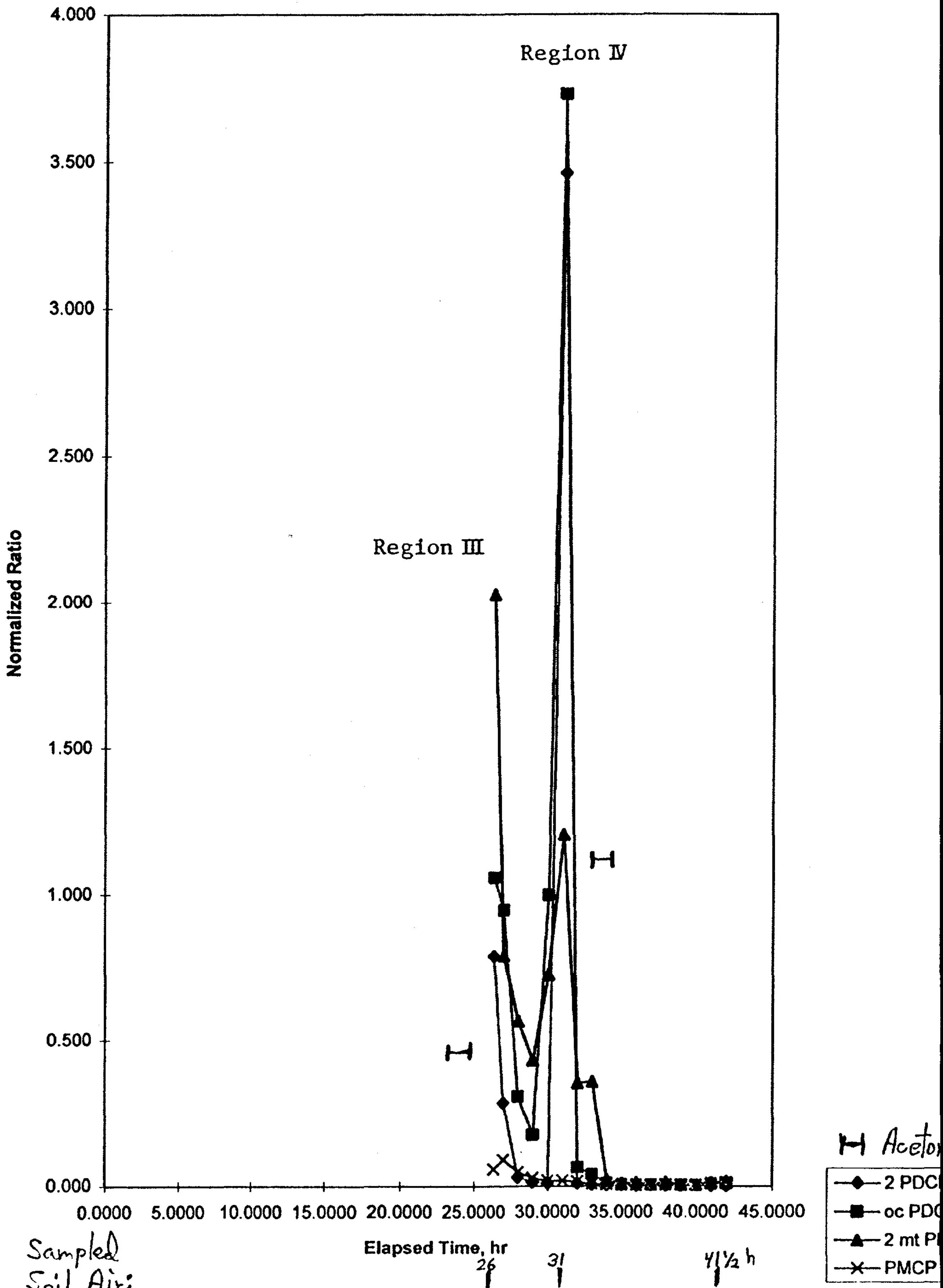


FIGURE 7. **Exhaust Air**



needed). The acetone emissions are greater than 85% because of the lack of measurements during periods of peak PFT emanation.

The agreement between the acetone results (>85%) and the PDCB in acetone-only (>80%) emanation rates into the hood air is remarkably good. It would appear that when water is present, the amount of organic vapor (ocPDCH) recovered in the hood air (61%) is significantly lower; whether water vapor assists the destruction of this PFT-organic surrogate as a potential oxygen donor (possible, since ocPDCH is the least-stabile PFT, followed by PMCP, and then mPDCH--the order shown above) or water assists in the escape of organic vapors into the soil with delayed recovery is not discernible. Considering the large recovery of acetone, much of which was present with water, and its chemical instability compared to PFTs, the numbers may also reflect the uncertainty of the results. On the other hand, the borehole analyses did account for 26% of the PMCP entering the soil air up to 6-feet from the pit centerline!

Recommendations

Pilot Test

1. Provide acetone data from soil samples taken after the melt as a function of location.

Future Full-Scale Melts

1. Tests can be designed to examine hood-effectiveness as a function of depth before a melt (before commitment to power availability)
   --time constant versus depth
   --steady-state effectiveness versus depth
   --addresses concern for liquid organic release at depth.

2. PFTs can be added during a full-scale melt at the time flux is added.

3. The on-line, continuous monitoring of PFTs in the real pits and buried PFT sources at different depths external to the pits can provide documentation of performance.

References

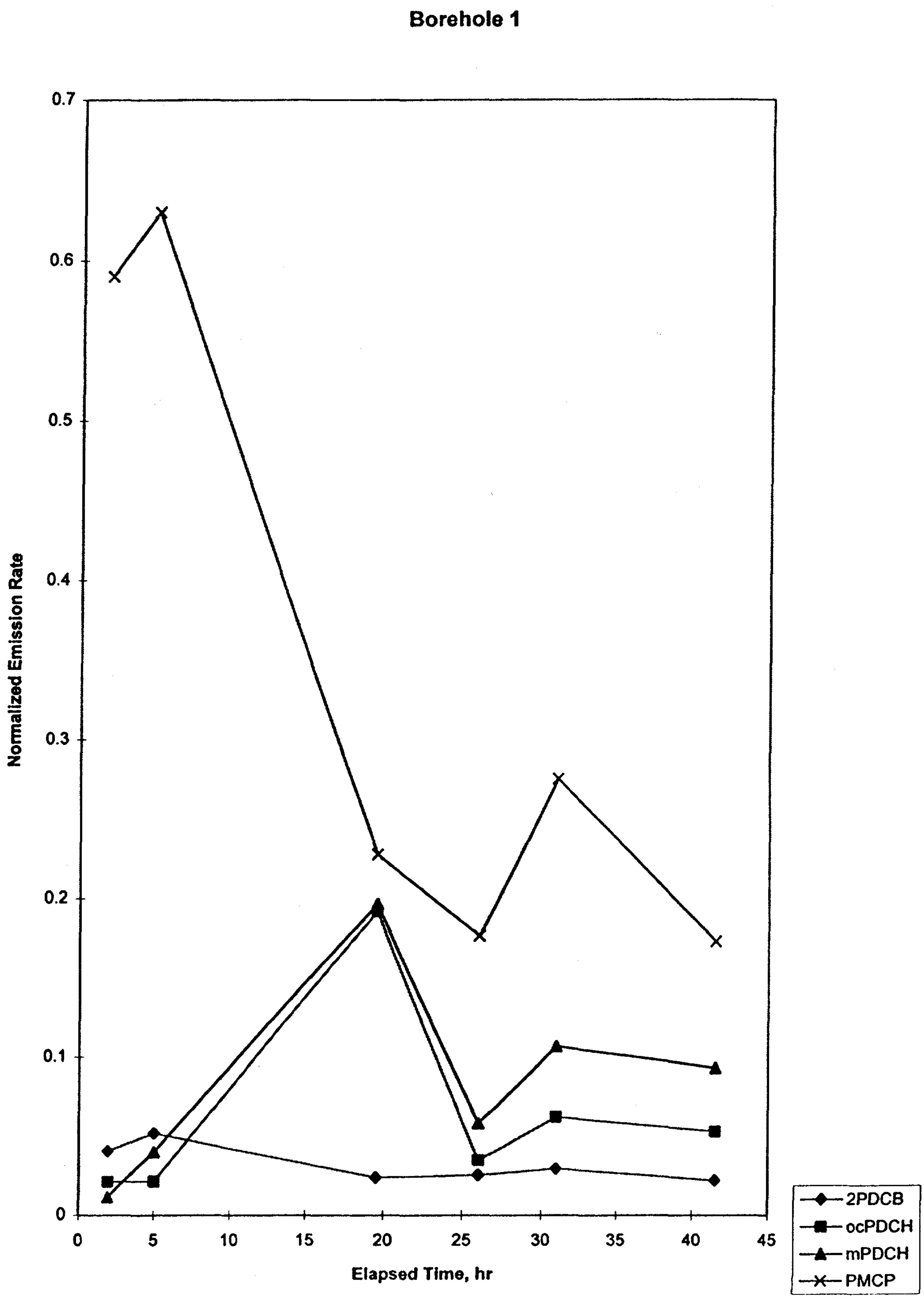
1. Perfluorocarbon tracer technology. Dietz, R. N. In Regional and Long-Range Transport of Air Pollution, Sandroni, S., Ed., pp. 215-247, Elsevier Science Publishers B.V., Amsterdam, the Netherlands, 1987.

2. Across North America Tracer Experiment (ANATEX): Sampling and analysis. Draxler, R. R., Dietz, R. N., Lagomarsino, R. J., and Start, G. Atmos. Environ. 25A, 2815-2836 (1991).

3. Perfluorocarbon measurment using an automated dual trap analyzer. D'Ottavio, T. W., Goodrich, R. W., and Dietz, R.N. Environ. Sci. Technol. 20 (1), 100-104 (1986).

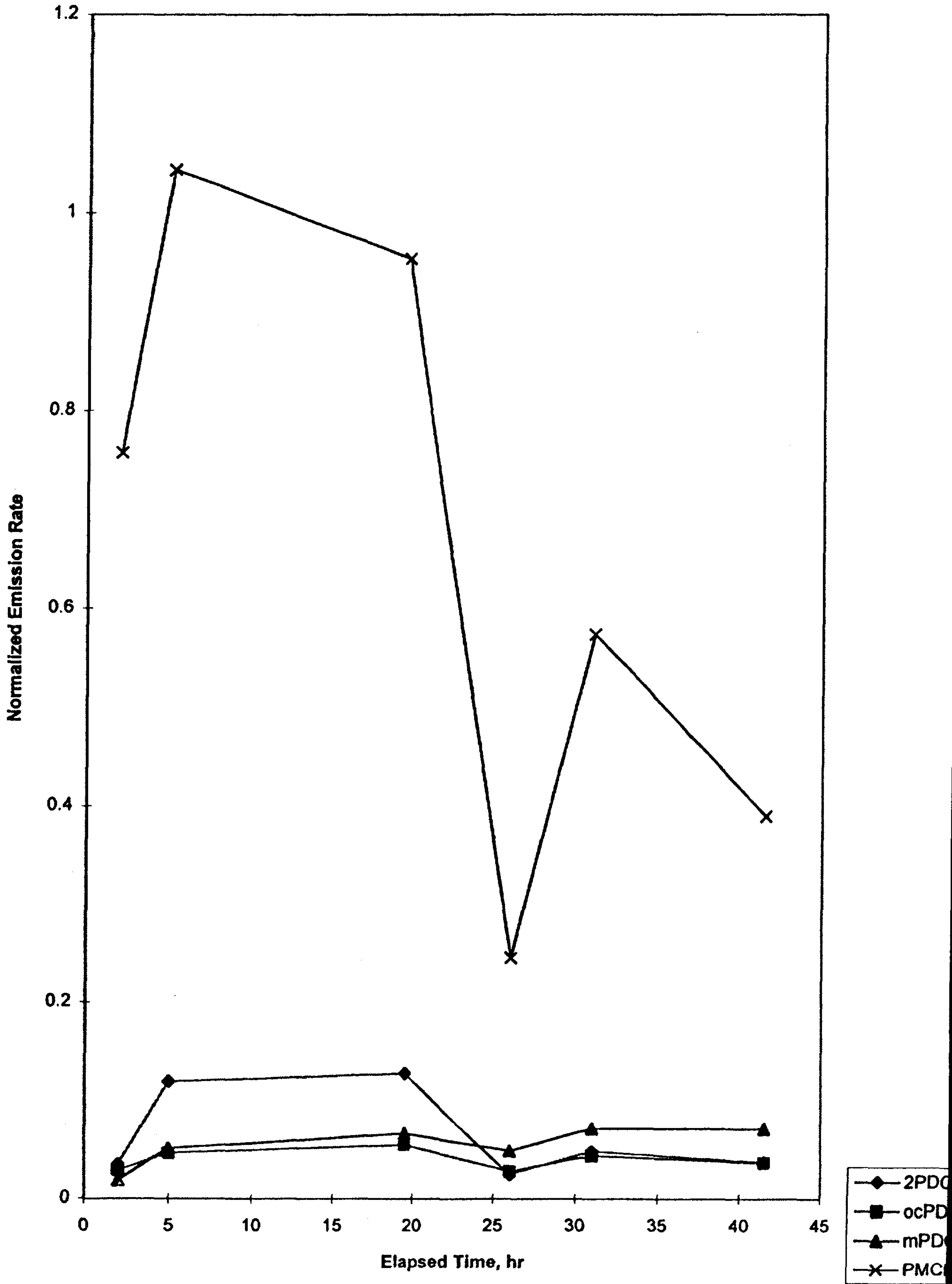
Appendix A

Borehole and Below-Pit Soil Air

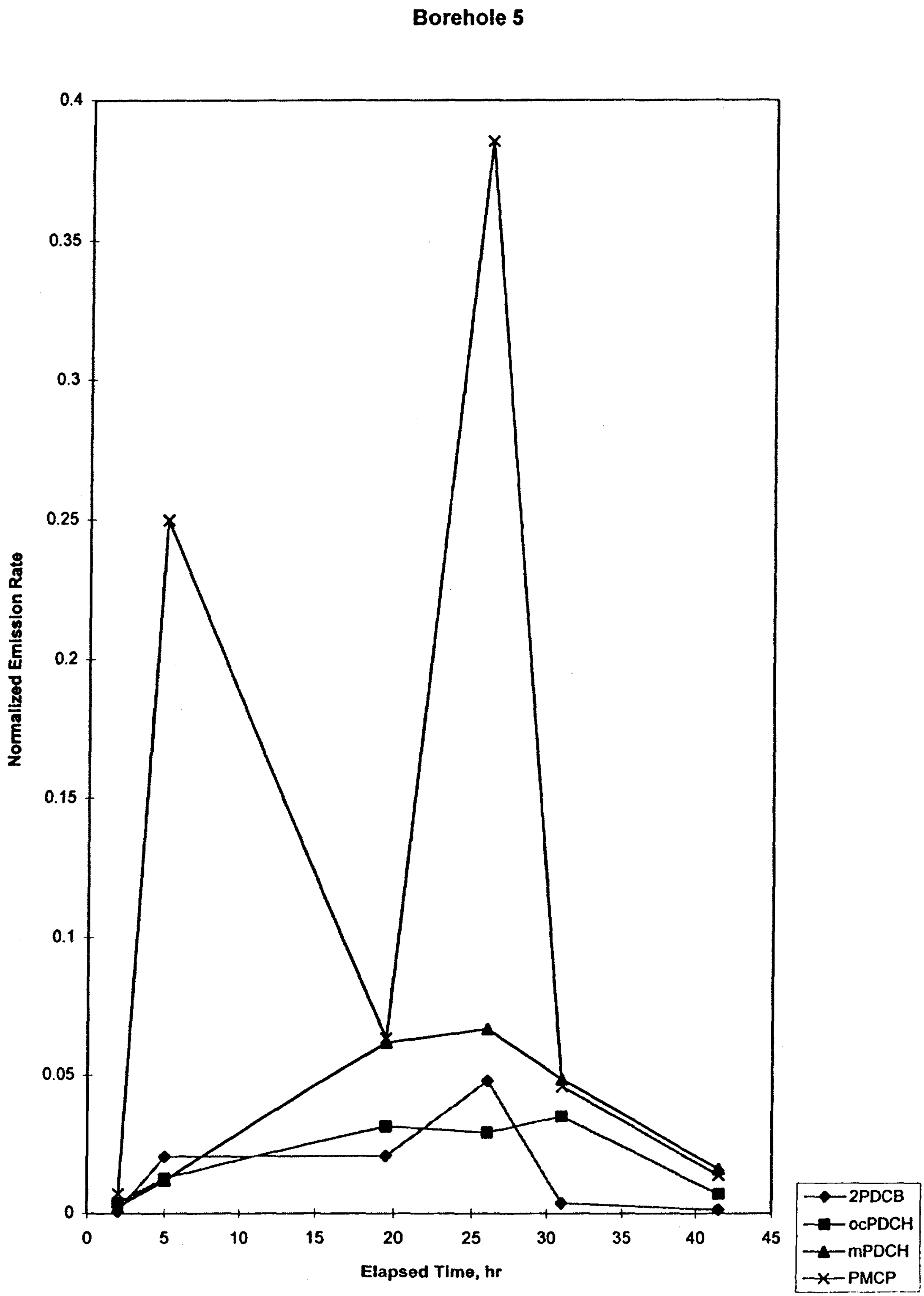


Borehole 1
Normalized Emission Rate
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
0
5
10
15
20
25
30
35
40
45
Elapsed Time, hr
2PDCB
ocPDCH
mPDCH
PMCP

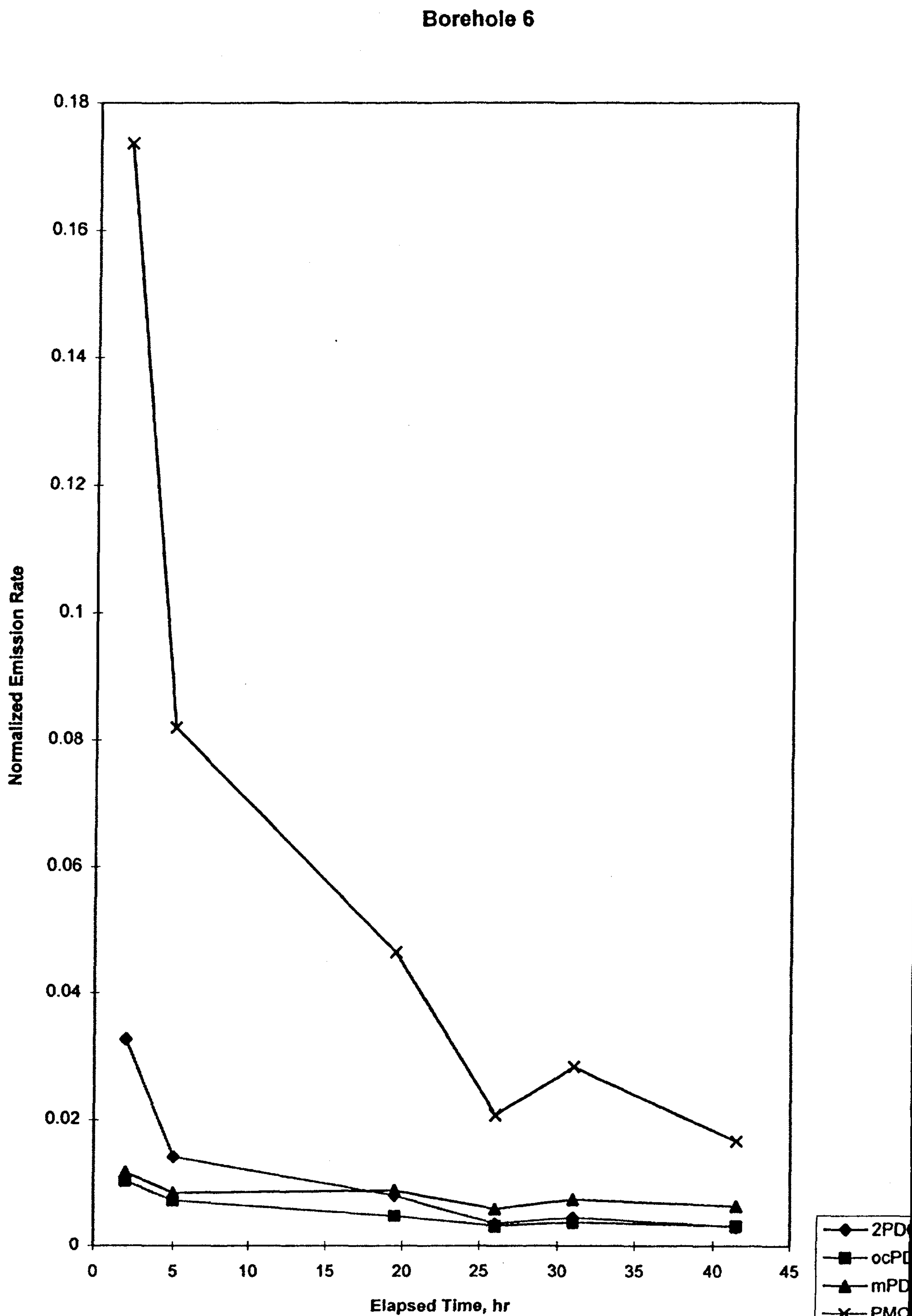
Borehole 2



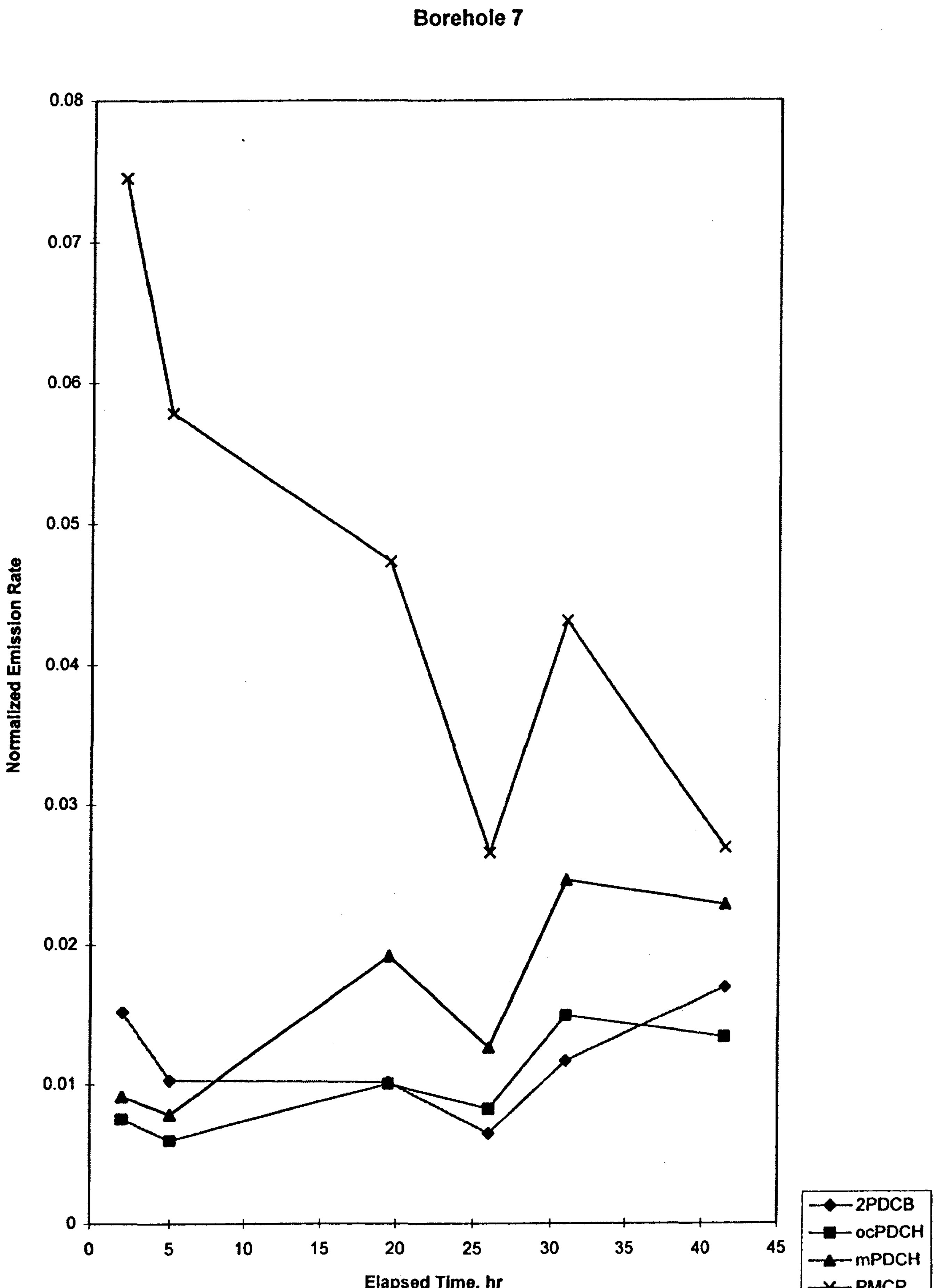
Normalized Emission Rate
1.2
1
0.8
0.6
0.4
0.2
0
0
5
10
15
20
25
30
35
40
45
Elapsed Time, hr
2PDC
ocPD
mPD
PMC

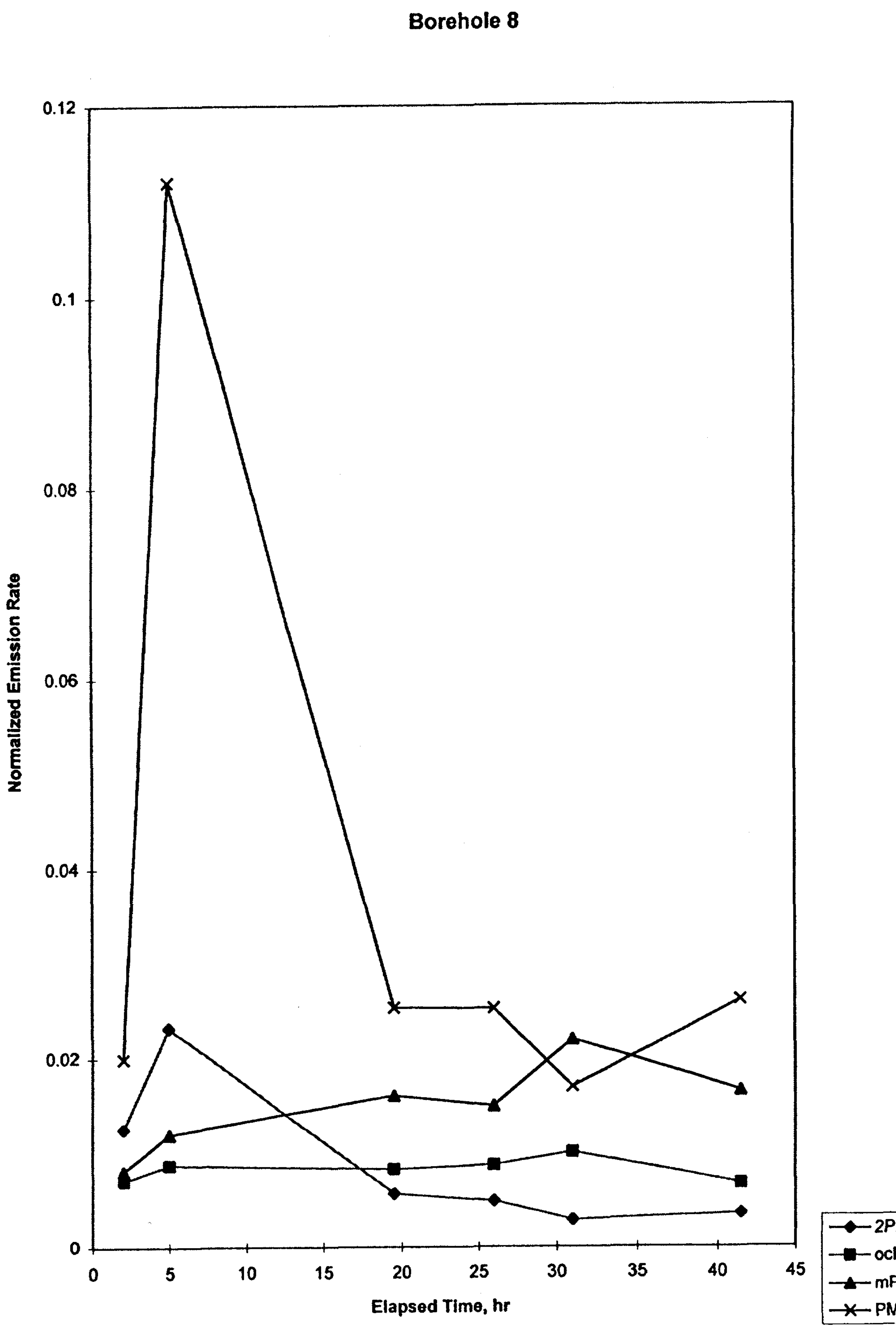


Borehole 5
Normalized Emission Rate
Elapsed Time, hr
0
0.05
0.1
0.15
0.2
0.25
0.3
0.35
0.4
0
5
10
15
20
25
30
35
40
45
2PDCB
ocPDCH
mPDCH
PMCP



Borehole 6
Normalized Emission Rate
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
0
5
10
15
20
25
30
35
40
45
Elapsed Time, hr
2PD
ocPD
mPD
PMC


Borehole 7
Normalized Emission Rate
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
0
5
10
15
20
25
30
35
40
45
Elapsed Time, hr
2PDCB
ocPDCH
mPDCH
PMCP



Borehole 8
Normalized Emission Rate
0.12
0.1
0.08
0.06
0.04
0.02
0
0
5
10
15
20
25
30
35
40
45
Elapsed Time, hr
2P
oc
mP
PM

ISV BAGS

File #	CATS#	Sampling Date	Sampling Time	Site	SAMPLING VOL, mL	PDCB	2 PDCB	PMCH	ocPDCH	ptPDCH	mcPDCH	mtPDCH	mPDCH, TOT
						PICOLITERS							
8498c1	11259	6/24/96	1600	CU GREY	60	0.0191	0.0382	0	0.0702	0.0058	0.039	0.0422	0.0843
8498c2	3946	6/24/96	1600	CU RED	60	0.1168	0.2336	0.0038	0.2023	0.0137	0.1186	0.108	0.2423
8498c3	8423	6/24/96	1600	BH 1	60	3.4191	6.8382	0.0502	1.2496	0.1186	0.4968	0.8427	1.1961
8498c4	7890	6/24/96	1600	BH 2	60	4.8071	9.6142	0.2397	2.7553	0.2261	1.5188	1.4914	3.1643
8498c5	3326	6/24/96	1600	BH3	60	6.7254	13.451	0.1149	1.8092	0.1402	0.642	0.7397	1.4891
8498c6	7922	6/24/96	1600	BH 4	60	1.8002	3.6004	0.0448	1.2838	0.0806	0.4426	0.4903	1.0126
8498c7	2215	6/24/96	1600	BH 5	60	0.042	0.084	0.0452	0.1513	0.0149	0.0721	0.0733	0.155
8498C8	6448	6/24/96	1600	BH 6	60	0.6229	1.2458	0.015	0.1378	0.0067	0.1266	0.1508	0.2747
8498C9	5767	6/24/96	1600	BH 7	60	0.5673	1.1346	0.0416	0.1971	0.0091	0.1993	0.2242	0.4201
8498C10	8386	6/24/96	1600	BH 8	60	0.1505	0.301	0.0253	0.0596	0.0025	0.057	0.0645	0.12
8498C11	21555	6/24/96	1900	CU GREY	60	1.3769	2.7538	0.0116	0.2383	0.0182	0.2634	0.2798	0.54
8498C12	5955	6/24/96	1900	CU RED	60	0.0613	0.1226	0.0062	0.0492	0.0046	0.065	0.0691	0.1335
8498C13	8354	6/24/96	1900	BH 1	60	0.0818	0.1636	0.012	0.0238	0.0021	0.0405	0.0431	0.0784
8498C14	2552	6/24/96	1900	BH 2	45	0.7803	1.5606	0.022	0.2159	0.0113	0.1879	0.2357	0.4186
8498C15	7200	6/24/96	1900	BH 3	60	0.8743	1.7486	0.0109	0.1379	0.0109	0.1081	0.1447	0.2493
8498C16	21449	6/24/96	1900	BH 4	20	0.5164	1.0328	0.0066	0.0848	0.0057	0.0518	0.0764	0.1247
8498C17	2856	6/24/96	1900	BH 5	60	0.051	0.102	0.029	0.0223	0.0014	0.0165	0.0237	0.0367
8498C18	9812	6/24/96	1900	BH 6	60	0.4007	0.8014	0.0164	0.1448	0.007	0.1369	0.1616	0.2957
8498C19	1449	6/24/96	1900	BH 7	60	0.326	0.652	0.0456	0.1331	0.0071	0.1464	0.1618	0.306
8498C20	2001	6/24/96	1900	BH 8	60	0.4334	0.8668	0.1009	0.114	0.0061	0.1261	0.1515	0.2748
8498C21	21491	6/24/96	1900	OFF GAS	60	2.8787	5.7574	0.018	0.9477	0.0136	0.3819	0.3742	0.7544
8501C1	21309	6/25/96	935	CU RED	60	0.0125	0.025	0.02	0.0066	0	0.0104	0.0127	0.0212
8501C2	4398	6/25/96	935	CU GREY	60	0.0327	0.0654	0.0276	0.0149	0.001	0.0267	0.0316	0.0537
8501C3	10573	6/25/96	935	OFF GAS	60	2.2362	4.4724	0.0261	5.2185	0.1117	2.9181	2.773	5.6973
8501C4	21563	6/25/96	935	BH 1	60	0.0872	0.1744	0.0044	0.4889	0.0176	0.4744	0.4017	0.88
8501C5	5043	6/25/96	935	BH 2	60	1.6493	3.2986	0.0662	0.5047	0.0321	0.4873	0.5977	1.0725
8501C6	180	6/25/96	935	BH 3	10	0.4022	0.8044	0.0208	0.1668	0.0135	0.1805	0.2229	0.399
8501C7	5685	6/25/96	935	BH 4	20	0	0	0	0.0227	0.0006	0.0242	0.0299	0.0497
8501C8	21259	6/25/96	935	BH 5	60	0.024	0.048	0.0198	0.0256	0	0.0451	0.0502	0.0886
8501C9	10141	6/25/96	935	BH 6	60	0.1392	0.2784	0.0168	0.0577	0.0019	0.0922	0.0976	0.1889
8501C10	11501	6/25/96	935	BH 7	60	0.1334	0.2668	0.0058	0.0925	0.0043	0.1486	0.1648	0.3111
8501C11	10803	6/25/96	935	BH 8	60	0.0294	0.0588	0.0061	0.0299	0.0012	0.0502	0.0577	0.1017
8501C12	22176	6/25/96	1600	CU RED	60	0.8326	1.6652	0.0369	0.1335	0.0091	0.1139	0.155	0.265

ISV BAGS

File #	CATS#	Sampling	Sampling	Site	SAMPLING	PDCB	2 PDCB	PMCH	ocPDCH	ptPDCH	mcPDCH	mtPDCH	mPDCH, TOT
		Date	Time		VOL, mL	PICOLITERS							
8501C13	5578	6/25/96	1600	CU GREY	60	0.2545	0.509	0.0339	0.0834	0.02	0.1634	0.195	0.3548
8501C14	20737	6/25/96	1600	BH 1	60	1.2021	2.4042	0.0239	1.1515	0.0847	1.658	1.7438	3.3896
8501C15	2894	6/25/96	1600	BH 2	60	0.4296	0.8592	0.0195	0.3424	0.0267	0.5134	0.5433	1.051
8501C16	16012	6/25/96	1600	BH 5	60	0.0641	0.1282	0.0293	0.0274	0.0067	0.0515	0.0647	0.1101
8501C17	1586	6/25/96	1600	BH 6	60	0.2407	0.4814	0.0142	0.1508	0.0086	0.2513	0.2542	0.5035
8501C18	8201	6/25/96	1600	BH 7	60	0.7953	1.5906	0.0114	0.7077	0.0369	0.922	1.0013	1.9124
8501C19	10974	6/25/96	1600	BH 8	60	0.2425	0.485	0.0046	0.3006	0.0189	0.4357	0.4767	0.906
8501C20	7917	6/25/96	1600	CONTROL	60	0.0124	0.0248	0	0.02	0	0.0314	0.0352	0.0614
8503C1	10326	6/25/96	2100	OFF GAS	60	0.0118	0.0236	0.0216	0.2214	0.0078	0.2228	0.2197	0.4412
8503C2	21298	6/25/96	2100	CU RED	60	4.7231	9.4462	0.0703	9.8437	0.2445	5.8993	5.6725	11.5635
8503C3	6780	6/25/96	2100	CU GREY	60	0.7795	1.559	0.0275	1.5963	0.0941	1.2401	1.2182	2.4569
8503C4	20653	6/25/96	2100	BH 1	60	0.3832	0.7664	0.0121	0.5673	0.0453	0.8434	0.879	1.7155
8503C5	3947	6/25/96	2100	BH 2	60	0.2633	0.5266	0.0284	0.1669	0.0119	0.2257	0.2564	0.4782
8503C6	11567	6/25/96	2100	BH 5	60	0.0036	0.0072	0.027	0.0242	0.0007	0.0301	0.0341	0.0591
8503C7	11074	6/25/96	2100	BH 6	60	0.1904	0.3808	0.0142	0.1088	0.0066	0.1946	0.1959	0.3892
8503C8	1877	6/25/96	2100	BH 7	60	1.3747	2.7494	0.0226	1.236	0.0762	1.7319	1.8643	3.5789
8503C9	4909	6/25/96	2100	BH 8	60	0.0596	0.1192	0.0106	0.1472	0.012	0.2822	0.2839	0.5639
8503C10	556	6/26/95	730	CONTROL	60	0.0044	0.0088	0	0.0149	0	0.0291	0.0275	0.0526
8503C11	5922	6/26/95	730	CU RED	60	3.7658	7.5316	0.0382	3.7459	0.263	6.9344	5.8026	12.8068
8503C12	1532	6/26/95	730	CU GREY	60	0.9019	1.8038	0.0213	0.7066	0.0961	1.6726	1.2758	2.9805
8503C13	7735	6/26/95	730	BH 1	60	0.8339	1.6678	0.0234	1.4016	0.1036	2.1378	2.2068	4.333
8503C14	8	6/26/95	730	BH 2	60	0.4797	0.9594	0.0408	0.3282	0.0271	0.5631	0.5716	1.1307
8503C15	8566	6/26/95	730	BH 5	60	0.0033	0.0066	0.05	0.0128	0	0.0308	0.0238	0.0512
8503C16	9165	6/26/95	730	BH 6	60	0.5065	1.013	0.0278	0.3693	0.0217	0.68	0.6482	1.3277
8503C17	1825	6/26/95	730	BH 7	60	1.698	3.396	0.0299	0.9429	0.0638	1.3675	1.4764	2.8295
8503C18	2206	6/26/95	730	BH 8	60	0.0688	0.1376	0.0066	0.0924	0.0099	0.203	0.1977	0.3998
8503C19	21220	6/26/95	730	OFF GAS	60	0.0055	0.011	0.0067	0.0087	0	0.0254	0.0257	0.0474

File #	CATS#	Sampling	Sampling	Site	PMCP	PTCH1	tot PTCH	PDCB	2PDCB	PMCH	ocPDCH	ptPDCH
		Date	Time									Pi
8498c1	11259	6/24/96	1600	CU GREY	0.1869	0	0.0015	0.318	0.637	0.000	1.170	0.097
8498c2	3946	6/24/96	1600	CU RED	0.9803	0	0.0044	1.947	3.893	0.063	3.372	0.228
8498c3	8423	6/24/96	1600	BH 1	49.7346	0	0.067	56.985	113.970	0.837	20.827	1.977
8498c4	7890	6/24/96	1600	BH 2	103.037	0	0.1082	80.118	160.237	3.995	45.922	3.768
8498c5	3326	6/24/96	1600	BH3	153.84	0	0.0849	112.090	224.180	1.915	30.153	2.337
8498c6	7922	6/24/96	1600	BH 4	10.7128	0	0.2133	30.003	60.007	0.747	21.397	1.343
8498c7	2215	6/24/96	1600	BH 5	0.4066	0	0.046	0.700	1.400	0.753	2.522	0.248
8498C8	6448	6/24/96	1600	BH 6	3.3192	0.018	0.0152	10.382	20.763	0.250	2.297	0.112
8498C9	5767	6/24/96	1600	BH 7	2.7924	0.0366	0.0298	9.455	18.910	0.693	3.285	0.152
8498C10	8386	6/24/96	1600	BH 8	0.2406	0.0114	0.0096	2.508	5.017	0.422	0.993	0.042
8498C11	21555	6/24/96	1900	CU GREY	7.7214	0.0037	0.0031	22.948	45.897	0.193	3.972	0.303
8498C12	5955	6/24/96	1900	CU RED	0.5463	0	0.00063	1.022	2.043	0.103	0.820	0.077
8498C13	8354	6/24/96	1900	BH 1	0.9984	0	0.00126	1.363	2.727	0.200	0.397	0.035
8498C14	2552	6/24/96	1900	BH 2	6.8208	0.0062	0.0052	17.340	34.680	0.489	4.798	0.251
8498C15	7200	6/24/96	1900	BH 3	7.1998	0.0072	0.0061	14.572	29.143	0.182	2.298	0.182
8498C16	21449	6/24/96	1900	BH 4	4.68	0.0074	0.0062	25.820	51.640	0.330	4.240	0.285
8498C17	2856	6/24/96	1900	BH 5	0.6283	0	0.002	0.850	1.700	0.483	0.372	0.023
8498C18	9812	6/24/96	1900	BH 6	2.3308	0.027	0.0226	6.678	13.357	0.273	2.413	0.117
8498C19	1449	6/24/96	1900	BH 7	1.8392	0.0306	0.0253	5.433	10.867	0.760	2.218	0.118
8498C20	2001	6/24/96	1900	BH 8	2.0992	0.0177	0.0149	7.223	14.447	1.682	1.900	0.102
8498C21	21491	6/24/96	1900	OFF GAS	0.083	0.0046	0.0039	47.978	95.957	0.300	15.795	0.227
8501C1	21309	6/25/96	935	CU RED	0.0264	0	0.00063	0.208	0.417	0.333	0.110	0.000
8501C2	4398	6/25/96	935	CU GREY	0.143	0	0.0009	0.545	1.090	0.460	0.248	0.017
8501C3	10573	6/25/96	935	OFF GAS	3.6857	0.0184	0.0154	37.270	74.540	0.435	86.975	1.862
8501C4	21563	6/25/96	935	BH 1	0.8294	0.0035	0.0029	1.453	2.907	0.073	8.148	0.293
8501C5	5043	6/25/96	935	BH 2	12.3464	0.0122	0.0103	27.488	54.977	1.103	8.412	0.535
8501C6	180	6/25/96	935	BH 3	3.8487	0.0081	0.0068	40.220	80.440	2.080	16.680	1.350
8501C7	5685	6/25/96	935	BH 4	0.6175	0.0027	0.0023	0.000	0.000	0.000	1.135	0.030
8501C8	21259	6/25/96	935	BH 5	0.0739	0	0.00093	0.400	0.800	0.330	0.427	0.000
8501C9	10141	6/25/96	935	BH 6	0.8107	0.0166	0.0139	2.320	4.640	0.280	0.962	0.032
8501C10	11501	6/25/96	935	BH 7	0.6251	0.0125	0.0105	2.223	4.447	0.097	1.542	0.072
8501C11	10803	6/25/96	935	BH 8	0.1306	0.0048	0.0041	0.490	0.980	0.102	0.498	0.020
8501C12	22176	6/25/96	1600	CU RED	6.8791	0.0075	0.0063	13.877	27.753	0.615	2.225	0.152

ISV BAGS

File #	CATS#	Sampling	Sampling	Site	PMCP	PTCH1	tot PTCH	PDCB	2PDCB	PMCH	ocPDCH	ptPDCH
		Date	Time									Pi
8501C13	5578	6/25/96	1600	CU GREY	2.0837	0.003	0.0025	4.242	8.483	0.565	1.390	0.333
8501C14	20737	6/25/96	1600	BH 1	8.3664	0.0468	0.0377	20.035	40.070	0.398	19.192	1.412
8501C15	2894	6/25/96	1600	BH 2	4.2524	0.0164	0.0138	7.160	14.320	0.325	5.707	0.445
8501C16	16012	6/25/96	1600	BH 5	0.5185	0	0.00107	1.068	2.137	0.488	0.457	0.112
8501C17	1586	6/25/96	1600	BH 6	1.4461	0.0688	0.0555	4.012	8.023	0.237	2.513	0.143
8501C18	8201	6/25/96	1600	BH 7	3.2703	0.1191	0.0981	13.255	26.510	0.190	11.795	0.615
8501C19	10974	6/25/96	1600	BH 8	1.2455	0.0487	0.0392	4.042	8.083	0.077	5.010	0.315
8501C20	7917	6/25/96	1600	CONTROL	0.0249	0	0	0.207	0.413	0.000	0.333	0.000
8503C1	10326	6/25/96	2100	OFF GAS	0.0105	0	0.0065	0.197	0.393	0.360	3.690	0.130
8503C2	21298	6/25/96	2100	CU RED	23.88	0.0318	0.0262	78.718	157.437	1.172	164.062	4.075
8503C3	6780	6/25/96	2100	CU GREY	5.2541	0.0083	0.007	12.992	25.983	0.458	26.605	1.568
8503C4	20653	6/25/96	2100	BH 1	3.591	0.0123	0.0104	6.387	12.773	0.202	9.455	0.755
8503C5	3947	6/25/96	2100	BH 2	3.1013	0.0052	0.0043	4.388	8.777	0.473	2.782	0.198
8503C6	11567	6/25/96	2100	BH 5	0.0454	0	0.00079	0.060	0.120	0.450	0.403	0.012
8503C7	11074	6/25/96	2100	BH 6	1.2099	0.042	0.034	3.173	6.347	0.237	1.813	0.110
8503C8	1877	6/25/96	2100	BH 7	5.1089	0.1148	0.0943	22.912	45.823	0.377	20.600	1.270
8503C9	4909	6/25/96	2100	BH 8	0.3545	0.0198	0.0166	0.993	1.987	0.177	2.453	0.200
8503C10	556	6/26/95	730	CONTROL	0.0353	0.003	0.0025	0.073	0.147	0.000	0.248	0.000
8503C11	5922	6/26/95	730	CU RED	18.5412	0.0808	0.0654	62.763	125.527	0.637	62.432	4.383
8503C12	1532	6/26/95	730	CU GREY	5.8483	0.0193	0.0162	15.032	30.063	0.355	11.777	1.602
8503C13	7735	6/26/95	730	BH 1	6.5664	0.0371	0.0302	13.898	27.797	0.390	23.360	1.727
8503C14	8	6/26/95	730	BH 2	5.0012	0.0122	0.0102	7.995	15.990	0.680	5.470	0.452
8503C15	8566	6/26/95	730	BH 5	0.0359	0	0.00208	0.055	0.110	0.833	0.213	0.000
8503C16	9165	6/26/95	730	BH 6	2.8346	0.1622	0.1359	8.442	16.883	0.463	6.155	0.362
8503C17	1825	6/26/95	730	BH 7	2.71	0.0985	0.0803	28.300	56.600	0.498	15.715	1.063
8503C18	2206	6/26/95	730	BH 8	0.5119	0.0185	0.0156	1.147	2.293	0.110	1.540	0.165
8503C19	21220	6/26/95	730	OFF GAS	0.0139	0.003	0.0025	0.092	0.183	0.112	0.145	0.000

File #	CATS#	Sampling	Sampling	Site	mcPDCH	mtPDCH	mPDCH, Tot	PMCP	PTCH-1	tot PTCH	PDCB	2PDCB
		Date	Time		oliters per Liter							Emis
8498c1	11259	6/24/96	1600	CU GREY	0.650	0.703	1.405	3.115	0.000	0.025	0.840	1.681
8498c2	3946	6/24/96	1600	CU RED	1.977	1.800	4.038	16.338	0.000	0.073	1.752	3.504
8498c3	8423	6/24/96	1600	BH 1	8.280	14.045	19.935	828.910	0.000	1.117	3.368	6.736
8498c4	7890	6/24/96	1600	BH 2	25.313	24.857	52.738	1717.280	0.000	1.803	2.932	5.864
8498c5	3326	6/24/96	1600	BH3	10.700	12.328	24.818	2563.992	0.000	1.415	5.228	10.456
8498c6	7922	6/24/96	1600	BH 4	7.377	8.172	16.877	178.547	0.000	3.555	0.557	1.114
8498c7	2215	6/24/96	1600	BH 5	1.202	1.222	2.583	6.777	0.000	0.767	0.060	0.121
8498C8	6448	6/24/96	1600	BH 6	2.110	2.513	4.578	55.320	0.300	0.253	2.705	5.409
8498C9	5767	6/24/96	1600	BH 7	3.322	3.737	7.002	46.540	0.610	0.497	1.256	2.513
8498C10	8386	6/24/96	1600	BH 8	0.950	1.075	2.000	4.010	0.190	0.160	1.035	2.069
8498C11	21555	6/24/96	1900	CU GREY	4.390	4.663	9.000	128.690	0.062	0.052	29.315	58.629
8498C12	5955	6/24/96	1900	CU RED	1.083	1.152	2.225	9.105	0.000	0.011	6.422	12.844
8498C13	8354	6/24/96	1900	BH 1	0.675	0.718	1.307	16.640	0.000	0.021	4.285	8.570
8498C14	2552	6/24/96	1900	BH 2	4.176	5.238	9.302	151.573	0.138	0.116	9.904	19.808
8498C15	7200	6/24/96	1900	BH 3	1.802	2.412	4.155	119.997	0.120	0.102	9.460	18.919
8498C16	21449	6/24/96	1900	BH 4	2.590	3.820	6.235	234.000	0.370	0.310	5.497	10.994
8498C17	2856	6/24/96	1900	BH 5	0.275	0.395	0.612	10.472	0.000	0.033	1.683	3.366
8498C18	9812	6/24/96	1900	BH 6	2.282	2.693	4.928	38.847	0.450	0.377	1.170	2.340
8498C19	1449	6/24/96	1900	BH 7	2.440	2.697	5.100	30.653	0.510	0.422	0.850	1.701
8498C20	2001	6/24/96	1900	BH 8	2.102	2.525	4.580	34.987	0.295	0.248	1.920	3.840
8498C21	21491	6/24/96	1900	OFF GAS	6.365	6.237	12.573	1.383	0.077	0.065	48.716	97.433
8501C1	21309	6/25/96	935	CU RED	0.173	0.212	0.353	0.440	0.000	0.011	1.310	2.619
8501C2	4398	6/25/96	935	CU GREY	0.445	0.527	0.895	2.383	0.000	0.015	2.398	4.796
8501C3	10573	6/25/96	935	OFF GAS	48.635	46.217	94.955	61.428	0.307	0.257	9.584	19.167
8501C4	21563	6/25/96	935	BH 1	7.907	6.695	14.667	13.823	0.058	0.048	1.985	3.969
8501C5	5043	6/25/96	935	BH 2	8.122	9.962	17.875	205.773	0.203	0.172	10.568	21.137
8501C6	180	6/25/96	935	BH 3	18.050	22.290	39.900	384.870	0.810	0.680	3.904	7.807
8501C7	5685	6/25/96	935	BH 4	1.210	1.495	2.485	30.875	0.135	0.115	0.000	0.000
8501C8	21259	6/25/96	935	BH 5	0.752	0.837	1.477	1.232	0.000	0.016	1.703	3.406
8501C9	10141	6/25/96	935	BH 6	1.537	1.627	3.148	13.512	0.277	0.232	0.661	1.322
8501C10	11501	6/25/96	935	BH 7	2.477	2.747	5.185	10.418	0.208	0.175	0.839	1.677
8501C11	10803	6/25/96	935	BH 8	0.837	0.962	1.695	2.177	0.080	0.068	0.473	0.947
8501C12	22176	6/25/96	1600	CU RED	1.898	2.583	4.417	114.652	0.125	0.105	8.722	17.445

ISV BAGS

File #	CATS#	Sampling Date	Sampling Time	Site	mcPDCH	mtPDCH	mPDCH, Tot	PMCP	PTCH-1	tot PTCH	PDCB	2PDCB
					oliters per Liter							Emis
8501C13	5578	6/25/96	1600	CU GREY	2.723	3.250	5.913	34.728	0.050	0.042	6.719	13.438
8501C14	20737	6/25/96	1600	BH 1	27.633	29.063	56.493	139.440	0.780	0.628	2.104	4.209
8501C15	2894	6/25/96	1600	BH 2	8.557	9.055	17.517	70.873	0.273	0.230	2.055	4.109
8501C16	16012	6/25/96	1600	BH 5	0.858	1.078	1.835	8.642	0.000	0.018	3.954	7.908
8501C17	1586	6/25/96	1600	BH 6	4.188	4.237	8.392	24.102	1.147	0.925	0.286	0.572
8501C18	8201	6/25/96	1600	BH 7	15.367	16.688	31.873	54.505	1.985	1.635	0.535	1.070
8501C19	10974	6/25/96	1600	BH 8	7.262	7.945	15.100	20.758	0.812	0.653	0.408	0.817
8501C20	7917	6/25/96	1600	CONTROL	0.523	0.587	1.023	0.415	0.000	0.000	#DIV/0!	#DIV/0!
8503C1	10326	6/25/96	2100	OFF GAS	3.713	3.662	7.353	0.175	0.000	0.108	0.120	0.240
8503C2	21298	6/25/96	2100	CU RED	98.322	94.542	192.725	398.000	0.530	0.437	11.898	23.796
8503C3	6780	6/25/96	2100	CU GREY	20.668	20.303	40.948	87.568	0.138	0.117	7.350	14.699
8503C4	20653	6/25/96	2100	BH 1	14.057	14.650	28.592	59.850	0.205	0.173	2.432	4.864
8503C5	3947	6/25/96	2100	BH 2	3.762	4.273	7.970	51.688	0.087	0.072	4.041	8.083
8503C6	11567	6/25/96	2100	BH 5	0.502	0.568	0.985	0.757	0.000	0.013	0.301	0.602
8503C7	11074	6/25/96	2100	BH 6	3.243	3.265	6.487	20.165	0.700	0.567	0.370	0.739
8503C8	1877	6/25/96	2100	BH 7	28.865	31.072	59.648	85.148	1.913	1.572	0.962	1.924
8503C9	4909	6/25/96	2100	BH 8	4.703	4.732	9.398	5.908	0.330	0.277	0.237	0.474
8503C10	556	6/26/95	730	CONTROL	0.485	0.458	0.877	0.588	0.050	0.042	0.116	0.232
8503C11	5922	6/26/95	730	CU RED	115.573	96.710	213.447	309.020	1.347	1.090	3.800	7.601
8503C12	1532	6/26/95	730	CU GREY	27.877	21.263	49.675	97.472	0.322	0.270	3.674	7.349
8503C13	7735	6/26/95	730	BH 1	35.630	36.780	72.217	109.440	0.618	0.503	1.822	3.645
8503C14	8	6/26/95	730	BH 2	9.385	9.527	18.845	83.353	0.203	0.170	3.104	6.208
8503C15	8566	6/26/95	730	BH 5	0.513	0.397	0.853	0.598	0.000	0.035	0.105	0.209
8503C16	9165	6/26/95	730	BH 6	11.333	10.803	22.128	47.243	2.703	2.265	0.246	0.492
8503C17	1825	6/26/95	730	BH 7	22.792	24.607	47.158	45.167	1.642	1.338	1.396	2.791
8503C18	2206	6/26/95	730	BH 8	3.383	3.295	6.663	8.532	0.308	0.260	0.291	0.582
8503C19	21220	6/26/95	730	OFF GAS	0.423	0.428	0.790	0.232	0.050	0.042	0.145	0.290

File #	CATS#	Sampling	Sampling	Site	ocPDCH	mPDCH	PMCP	PDCB	2PDCB	ocPDCH	mPDCH	PMCP
		Date	Time		ion Rate, uL/min			Normalized Emission Rate				
8498c1	11259	6/24/96	1600	CU GREY	3.089	3.709	8.224	0.006777	0.013555	0.053255	0.036365	0.09908
8498c2	3946	6/24/96	1600	CU RED	3.035	3.635	14.705	0.014129	0.028258	0.052319	0.035632	0.177163
8498c3	8423	6/24/96	1600	BH 1	1.231	1.178	48.992	0.027162	0.054324	0.021223	0.011551	0.590269
8498c4	7890	6/24/96	1600	BH 2	1.681	1.930	62.851	0.023647	0.047294	0.028977	0.018923	0.757235
8498c5	3326	6/24/96	1600	BH3	1.406	1.158	119.593	0.042163	0.084326	0.024249	0.011349	1.440874
8498c6	7922	6/24/96	1600	BH 4	0.397	0.313	3.315	0.004492	0.008984	0.006849	0.003072	0.039937
8498c7	2215	6/24/96	1600	BH 5	0.217	0.222	0.583	0.000486	0.000972	0.003743	0.00218	0.007029
8498C8	6448	6/24/96	1600	BH 6	0.598	1.193	14.412	0.021812	0.043624	0.010316	0.011694	0.173642
8498C9	5767	6/24/96	1600	BH 7	0.437	0.930	6.185	0.010133	0.020265	0.007526	0.009122	0.074512
8498C10	8386	6/24/96	1600	BH 8	0.410	0.825	1.654	0.008344	0.016689	0.007065	0.008088	0.019929
8498C11	21555	6/24/96	1900	CU GREY	5.073	11.497	164.391	0.236408	0.472817	0.087474	0.112713	1.980616
8498C12	5955	6/24/96	1900	CU RED	5.154	13.986	57.231	0.05179	0.103579	0.088867	0.137115	0.689535
8498C13	8354	6/24/96	1900	BH 1	1.247	4.107	52.297	0.034555	0.069109	0.021494	0.040261	0.630086
8498C14	2552	6/24/96	1900	BH 2	2.740	5.313	86.572	0.079869	0.159739	0.047246	0.052088	1.043032
8498C15	7200	6/24/96	1900	BH 3	1.492	2.697	77.899	0.076287	0.152575	0.025725	0.026445	0.938548
8498C16	21449	6/24/96	1900	BH 4	0.903	1.327	49.819	0.044332	0.088664	0.015564	0.013014	0.600233
8498C17	2856	6/24/96	1900	BH 5	0.736	1.211	20.734	0.013573	0.027145	0.012688	0.011874	0.249806
8498C18	9812	6/24/96	1900	BH 6	0.423	0.864	6.807	0.009437	0.018874	0.007291	0.008466	0.082009
8498C19	1449	6/24/96	1900	BH 7	0.347	0.798	4.798	0.006858	0.013717	0.005987	0.007826	0.057806
8498C20	2001	6/24/96	1900	BH 8	0.505	1.217	9.298	0.015482	0.030964	0.008706	0.011934	0.11203
8498C21	21491	6/24/96	1900	OFF GAS	16.038	12.767	1.405	0.392875	0.785749	0.276517	0.125164	0.016923
8501C1	21309	6/25/96	935	CU RED	0.691	2.221	2.766	0.010561	0.021121	0.011921	0.021774	0.033322
8501C2	4398	6/25/96	935	CU GREY	1.093	3.938	10.487	0.019339	0.038677	0.018839	0.038608	0.126345
8501C3	10573	6/25/96	935	OFF GAS	22.365	24.417	15.796	0.077288	0.154576	0.385603	0.239382	0.190312
8501C4	21563	6/25/96	935	BH 1	11.127	20.028	18.876	0.016004	0.032009	0.191839	0.196349	0.227422
8501C5	5043	6/25/96	935	BH 2	3.234	6.872	79.113	0.085228	0.170457	0.055759	0.067376	0.953167
8501C6	180	6/25/96	935	BH 3	1.619	3.873	37.355	0.031481	0.062963	0.027913	0.037967	0.450061
8501C7	5685	6/25/96	935	BH 4	0.651	1.426	17.720	0	0	0.011231	0.013982	0.213489
8501C8	21259	6/25/96	935	BH 5	1.817	6.288	5.245	0.013736	0.027471	0.031324	0.061645	0.063187
8501C9	10141	6/25/96	935	BH 6	0.274	0.897	3.849	0.00533	0.01066	0.004724	0.008793	0.046378
8501C10	11501	6/25/96	935	BH 7	0.581	1.955	3.929	0.006762	0.013524	0.010025	0.019171	0.04734
8501C11	10803	6/25/96	935	BH 8	0.481	1.637	2.102	0.003817	0.007633	0.008299	0.01605	0.025329
8501C12	22176	6/25/96	1600	CU RED	1.399	2.776	72.067	0.070343	0.140685	0.024113	0.027218	0.868274

ISV BAGS

File #	CATS#	Sampling	Sampling	Site	ocPDCH	mPDCH	PMCP	PDCB	2PDCB	ocPDCH	mPDCH	PMCP
		Date	Time		ion Rate, uL/min			Normalized Emission Rate				
8501C13	5578	6/25/96	1600	CU GREY	2.202	9.367	55.010	0.054184	0.108368	0.037961	0.091831	0.662767
8501C14	20737	6/25/96	1600	BH 1	2.016	5.934	14.647	0.016972	0.033943	0.034757	0.058177	0.176467
8501C15	2894	6/25/96	1600	BH 2	1.638	5.027	20.338	0.016569	0.033139	0.028234	0.04928	0.245031
8501C16	16012	6/25/96	1600	BH 5	1.690	6.791	31.982	0.031886	0.063771	0.02914	0.066581	0.385328
8501C17	1586	6/25/96	1600	BH 6	0.179	0.599	1.720	0.002308	0.004617	0.003092	0.00587	0.020719
8501C18	8201	6/25/96	1600	BH 7	0.476	1.287	2.200	0.004315	0.00863	0.008209	0.012614	0.026508
8501C19	10974	6/25/96	1600	BH 8	0.506	1.525	2.097	0.003293	0.006585	0.008726	0.014955	0.025265
8501C20	7917	6/25/96	1600	CONTROL	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!	#DIV/0!
8503C1	10326	6/25/96	2100	OFF GAS	2.248	4.480	0.107	0.000966	0.001933	0.03876	0.04392	0.001285
8503C2	21298	6/25/96	2100	CU RED	24.797	29.129	60.156	0.095951	0.191901	0.427536	0.285583	0.724768
8503C3	6780	6/25/96	2100	CU GREY	15.051	23.165	49.539	0.059271	0.118541	0.259497	0.227108	0.596851
8503C4	20653	6/25/96	2100	BH 1	3.600	10.887	22.789	0.019612	0.039223	0.062072	0.106734	0.274567
8503C5	3947	6/25/96	2100	BH 2	2.562	7.340	47.601	0.032592	0.065183	0.044168	0.071959	0.57351
8503C6	11567	6/25/96	2100	BH 5	2.022	4.937	3.793	0.002425	0.004851	0.034858	0.048407	0.045698
8503C7	11074	6/25/96	2100	BH 6	0.211	0.756	2.349	0.002981	0.005961	0.003641	0.007407	0.028297
8503C8	1877	6/25/96	2100	BH 7	0.865	2.505	3.576	0.007759	0.015518	0.014915	0.024557	0.043081
8503C9	4909	6/25/96	2100	BH 8	0.585	2.242	1.409	0.001911	0.003822	0.010091	0.021981	0.016981
8503C10	556	6/26/95	730	CONTROL	0.393	1.389	0.932	0.000937	0.001874	0.006782	0.013614	0.011228
8503C11	5922	6/26/95	730	CU RED	3.780	12.924	18.711	0.030648	0.061296	0.065177	0.126709	0.225437
8503C12	1532	6/26/95	730	CU GREY	2.879	12.143	23.826	0.029632	0.059265	0.049633	0.119047	0.287065
8503C13	7735	6/26/95	730	BH 1	3.063	9.469	14.350	0.014697	0.029394	0.052812	0.092838	0.172897
8503C14	8	6/26/95	730	BH 2	2.124	7.316	32.361	0.025032	0.050064	0.036615	0.071728	0.389888
8503C15	8566	6/26/95	730	BH 5	0.406	1.625	1.139	0.000844	0.001689	0.007003	0.015928	0.013725
8503C16	9165	6/26/95	730	BH 6	0.179	0.645	1.377	0.001984	0.003967	0.003092	0.006322	0.016586
8503C17	1825	6/26/95	730	BH 7	0.775	2.326	2.227	0.011255	0.02251	0.013362	0.0228	0.026836
8503C18	2206	6/26/95	730	BH 8	0.391	1.691	2.166	0.002347	0.004695	0.00674	0.016583	0.026093
8503C19	21220	6/26/95	730	OFF GAS	0.230	1.251	0.367	0.001171	0.002342	0.00396	0.012268	0.004421

Appendix B

Ring Air

Ring Air

File #	Type	Start		Sample	PDCB	2PDCB	PMCH	ocPDCH	ptPDCH	mcPDCH	mtPDCH	2 mtPDCH
		Date	Time	Vol, L	Picoliters							
8499B5	Ring Air	6/24/96	1630	1.68	10.6209	16.144	0.5218	5.3177	0.113	3.4449	1.1945	2.389
8499B6	Ring Air	6/24/96	1700	3.36	9.3516	14.214	1.16	6.0034	0.2859	2.6398	2.5867	5.1734
8499B7	Ring Air	6/24/96	1800	3.36	1.6447	2.500	1.2235	0.4364	0.0349	0.4169	0.1797	0.3594
8499B8	Ring Air	6/24/96	1900	3.36	0.9052	1.376	1.4779	0.8419	0.0377	0.6624	0.2303	0.4606
8499B9	Ring Air	6/24/96	2000	3.36	0.3917	0.595	1.1145	0.2186	0.0291	0.1115	0.1156	0.2312
8499B10	Ring Air	6/24/96	2100	3.36	38.977	59.245	0.8603	10.1035	0.3916	3.628	3.5368	7.0736
8499B11	Ring Air	6/24/96	2200	3.36	4.6152	7.015	0.5947	0.745	0.0818	1.0237	0.639	1.278
8499B12	Ring Air	6/24/96	2300	3.36	0.5399	0.5399	1.2055	1.8975	0.3937	5.0605	3.1146	6.2292
8499B13	Ring Air	6/25/96	0	3.36	5.4767	5.4767	1.9155	10.2488	1.6323	23.6011	13.6239	27.2478
8499B14	Ring Air	6/25/96	100	3.36	2.6898	2.6898	1.9165	13.8446	1.6369	27.1956	13.1257	26.2514
8499B15	Ring Air	6/25/96	200	3.36	0.9434	0.9434	2.3477	8.2698	2.755	32.2816	22.0037	44.0074
8499B16	Ring Air	6/25/96	300	3.36	1.4949	1.4949	2.6305	25.3088	5.4031	66.3629	40.5868	81.1736
8499B17	Ring Air	6/25/96	400	3.36	9.7763	9.7763	2.9273	25.0117	6.3194	72.4039	49.9621	99.9242
8499B18	Ring Air	6/25/96	500	3.36	149.7283	149.7283	3.07	50.2382	5.0159	81.091	39.174	78.348
8499B19	Ring Air	6/25/96	600	3.36	150.6644	150.6644	2.7666	18.7545	8.6505	84.512	64.8313	129.6626
8499B20	Ring Air	6/25/96	700	3.36	35.8434	35.8434	2.4519	12.7251	1.5048	23.5672	12.8132	25.6264
8499B21	Ring Air	6/25/96	800	3.36	5.5614	5.5614	1.9324	4.7766	0.6823	10.0548	5.5861	11.1722
8499B22	Ring Air	6/25/96	900	3.36	0.5708	0.5708	1.8335	1.2193	0.1327	2.062	0.9504	1.9008
8502B1	Ring Air	6/25/96	1001	3.36	0.5208	0.5208	1.6823	0.2105	0.0317	0.1711	0.1372	0.2744
8502B2	Ring Air	6/25/96	1100	3.36	0.049	0.049	1.7683	0	0.0214	0.0593	0.0805	0.161
8502B3	Ring Air	6/25/96	1200	3.36	0.0334	0.0334	1.9799	0	0.0177	0.0491	0.0643	0.1286
8502B4	Ring Air	6/25/96	1300	3.36	0.1575	0.1575	1.8256	0.0446	0.0259	0.1367	0.1088	0.2176
8502B5	Ring Air	6/25/96	1400	3.36	0.568	0.568	1.5921	0.1145	0.058	0.4579	0.3425	0.685
8502B6	Ring Air	6/25/96	1500	3.36	0.0843	0.0843	0.7361	0.0555	0.0336	0.2093	0.167	0.334

File #	Type	Start		Sample	Tot mPDCH	PMCP	PTCH	2PDCB	ocPDCH	2 mtPDCH	PMCP	PMCH
		Date	Time	Vol, L				Picoliter/Liter				
8499B5	Ring Air	6/24/96	1630	1.68	4.81	3.4709	0.0158	9.609	3.1653	1.4220	2.066	0.3106
8499B6	Ring Air	6/24/96	1700	3.36	5.2038	5.9265	0.0337	4.230	1.7867	1.5397	1.764	0.3452
8499B7	Ring Air	6/24/96	1800	3.36	0.6106	0.5131	0.0113	0.744	0.1299	0.1070	0.153	0.3641
8499B8	Ring Air	6/24/96	1900	3.36	0.9221	0.5276	0	0.409	0.2506	0.1371	0.157	0.4399
8499B9	Ring Air	6/24/96	2000	3.36	0.2174	0.0781	0.0053	0.177	0.0651	0.0688	0.023	0.3317
8499B10	Ring Air	6/24/96	2100	3.36	7.1313	0	0.0264	17.632	3.0070	2.1052	0.000	0.2560
8499B11	Ring Air	6/24/96	2200	3.36	1.6925	0	0.0044	2.088	0.2217	0.3804	0.000	0.1770
8499B12	Ring Air	6/24/96	2300	3.36	8.8393	0.8	0	0.161	0.5647	1.8539	0.238	0.3588
8499B13	Ring Air	6/25/96	0	3.36	39.0552	6.2853	0.027	1.630	3.0502	8.1095	1.871	0.5701
8499B14	Ring Air	6/25/96	100	3.36	42.1009	23.8431	0.0494	0.801	4.1204	7.8129	7.096	0.5704
8499B15	Ring Air	6/25/96	200	3.36	55.8266	51.1585	0.0838	0.281	2.4613	13.0974	15.226	0.6987
8499B16	Ring Air	6/25/96	300	3.36	106.5728	65.4094	0.2219	0.445	7.5324	24.1588	19.467	0.7829
8499B17	Ring Air	6/25/96	400	3.36	121.5249	70.4209	0.2021	2.910	7.4440	29.7393	20.959	0.8712
8499B18	Ring Air	6/25/96	500	3.36	119.8162	169.3124	0.5214	44.562	14.9518	23.3179	50.391	0.9137
8499B19	Ring Air	6/25/96	600	3.36	148.3841	86.851	0.4412	44.841	5.5817	38.5901	25.849	0.8234
8499B20	Ring Air	6/25/96	700	3.36	38.1995	80.9233	0.3523	10.668	3.7872	7.6269	24.084	0.7297
8499B21	Ring Air	6/25/96	800	3.36	16.8829	2.0675	0	1.655	1.4216	3.3251	0.615	0.5751
8499B22	Ring Air	6/25/96	900	3.36	3.1436	1.0003	0	0.170	0.3629	0.5657	0.298	0.5457
8502B1	Ring Air	6/25/96	1001	3.36	0.3087	1.7958	0	0.155	0.0626	0.0817	0.534	0.5007
8502B2	Ring Air	6/25/96	1100	3.36	0.1426	0.0895	0	0.015	0.0000	0.0479	0.027	0.5263
8502B3	Ring Air	6/25/96	1200	3.36	0.1161	0.0341	0	0.010	0.0000	0.0383	0.010	0.5893
8502B4	Ring Air	6/25/96	1300	3.36	0.2473	0.0325	0	0.047	0.0133	0.0648	0.010	0.5433
8502B5	Ring Air	6/25/96	1400	3.36	0.7991	0.0253	0	0.169	0.0341	0.2039	0.008	0.4738
8502B6	Ring Air	6/25/96	1500	3.36	0.3754	0.1375	0	0.025	0.0165	0.0994	0.041	0.2191

File #	Type	Start		Sample	Elapsed	2 PBCB	oc PDCH	2 mt PDCH	PMCP
		Date	Time	Vol, L					
8499B5	Ring Air	6/24/96	1630	1.68	4.5000	0.0848	0.059741	0.01526	0.027248
8499B6	Ring Air	6/24/96	1700	3.36	5.0000	0.0336	0.030338	0.01487	0.020929
8499B7	Ring Air	6/24/96	1800	3.36	6.0000	0.0056	0.002091	0.00098	0.001718
8499B8	Ring Air	6/24/96	1900	3.36	7.0000	0.0026	0.003339	0.00104	0.001462
8499B9	Ring Air	6/24/96	2000	3.36	8.0000	0.0015	0.00115	0.00069	0.000287
8499B10	Ring Air	6/24/96	2100	3.36	9.0000	0.1888	0.068845	0.02741	0
8499B11	Ring Air	6/24/96	2200	3.36	10.0000	0.0323	0.007344	0.00716	0
8499B12	Ring Air	6/24/96	2300	3.36	11.0000	0.0012	0.009227	0.01722	0.002718
8499B13	Ring Air	6/25/96	0	3.36	12.0000	0.0078	0.031365	0.04742	0.013441
8499B14	Ring Air	6/25/96	100	3.36	13.0000	0.0038	0.042347	0.04566	0.050963
8499B15	Ring Air	6/25/96	200	3.36	14.0000	0.0011	0.020649	0.06248	0.089264
8499B16	Ring Air	6/25/96	300	3.36	15.0000	0.0016	0.056401	0.10286	0.10186
8499B17	Ring Air	6/25/96	400	3.36	16.0000	0.0092	0.050087	0.11378	0.098545
8499B18	Ring Air	6/25/96	500	3.36	17.0000	0.1337	0.095928	0.08507	0.225918
8499B19	Ring Air	6/25/96	600	3.36	18.0000	0.1493	0.039738	0.15622	0.128597
8499B20	Ring Air	6/25/96	700	3.36	19.0000	0.0401	0.030424	0.03484	0.135198
8499B21	Ring Air	6/25/96	800	3.36	20.0000	0.0079	0.01449	0.01927	0.004383
8499B22	Ring Air	6/25/96	900	3.36	21.0000	0.0009	0.003898	0.00346	0.002235
8502B1	Ring Air	6/25/96	1001	3.36	22.0000	0.0008	0.000733	0.00054	0.004373
8502B2	Ring Air	6/25/96	1100	3.36	23.0000	0.0001	0	0.00030	0.000207
8502B3	Ring Air	6/25/96	1200	3.36	24.0000	0.0000	0	0.00022	7.06E-05
8502B4	Ring Air	6/25/96	1300	3.36	25.0000	0.0002	0.000143	0.00040	7.29E-05
8502B5	Ring Air	6/25/96	1400	3.36	26.0000	0.0010	0.000422	0.00143	6.51E-05
8502B6	Ring Air	6/25/96	1500	3.36	27.0000	0.0003	0.000442	0.00151	0.000765

Appendix C

Hood Air

Hood Air

File #	Type	Start		Sample	PDCB	2PDCB	PMCH	ocPDCH	ptPDCH	mcPDCH	mtPDCH	2 mtPDCH
		Date	Time	Vol, L	Picoliters							
8500B1	Hood Air	6/24/96	1220-1237	0.74	50.7742	50.7742	0.6062	40.7058	4.1088	60.7248	31.7248	63.4496
8500B2	Hood Air	6/24/96	1726-1800	1.48	161.4226	161.4226	0.5424	56.6213	5.233	86.6122	42.2531	84.5062
8500B3	Hood Air	6/24/96	1800	2.61	231.127	231.127	0.5608	73.3407	2.3353	75.205	23.3617	46.7234
8500B4	Hood Air	6/24/96	1900	2.61	176.8712	176.8712	0.6109	93.4976	2.1768	88.7964	24.1351	48.2702
8500B5	Hood Air	6/24/96	2000	2.61	204.5479	204.5479	0.6165	92.4513	2.5884	88.8606	26.1052	52.2104
8500B6	Hood Air	6/24/96	2100	2.61	833.6653	833.6653	0.6238	76.8458	5.3931	61.8794	46.1122	92.2244
8500B7	Hood Air	6/24/96	2200	2.61	193.8146	193.8146	0.5102	52.0265	5.3793	85.0439	44.7284	89.4568
8500B8	Hood Air	6/24/96	2300	2.61	50.393	50.393	0.74	41.53	4.232	73.377	41.716	83.432
8500B9	Hood Air	6/25/96	0	2.61	10.2514	10.2514	0.3875	26.9372	5.0219	64.3933	40.4111	80.8222
8500B10	Hood Air	6/25/96	100	2.61	2.3636	2.3636	0.2838	11.8425	1.9866	27.7895	16.8215	33.643
8500B11	Hood Air	6/25/96	200	2.61	0.3579	0.3579	0.4699	14.0738	3.7985	46.3958	29.7077	59.4154
8500B12	Hood Air	6/25/96	300	2.61	0.6749	0.6749	0.6686	25.1039	6.0828	69.8571	44.0722	88.1444
8500B13	Hood Air	6/25/96	400	2.61	7.4422	7.4422	0.9047	44.5509	11.7798	128.8729	84.2947	168.5894
8500B14	Hood Air	6/25/96	500	2.61	117.439	117.439	1.1241	64.8047	6.7003	105.6938	53.5904	107.1808
8500B15	Hood Air	6/25/96	600	2.61	228.0381	228.0381	1.1748	33.5876	13.9391	135.9076	99.4922	198.9844
8500B16	Hood Air	6/25/96	700	2.61	73.1536	73.1536	0.8015	22.9868	4.1525	53.4163	33.1824	66.3648
8500B17	Hood Air	6/25/96	800	2.61	43.5575	43.5575	0.4159	30.5221	5.2802	69.3826	42.3427	84.6854
8500B18	Hood Air	6/25/96	900	2.61	77.0468	77.0468	0.8838	94.6739	7.3987	134.2387	58.3824	116.7648
8500B19	Hood Air	6/25/96	1000	2.61	119.6297	119.6297	1.6467	68.8229	3.2951	38.7558	28.7007	57.4014
8500B20	Hood Air	6/25/96	1100	2.61	137.0148	137.0148	1.0642	62.7021	3.2976	76.2759	28.5457	57.0914
8500B21	Hood Air	6/25/96	1200	2.61	645.47	645.47	0	49.75	5.4	88.1	51.95	103.9
8500B22	Hood Air	6/25/96	1300	2.61	336.9716	336.9716	0.982	66.9385	13.1255	156.9991	91.6739	183.3478
8500B23	Hood Air	6/25/96	1400	2.61	154.3171	154.3171	1.0632	63.3185	17.1628	183.7298	122.2138	244.4276
8507B1	Hood Air	6/25/96	1500	2.61	217.0734	434.1468	1.3284	82.497	31.797	460.2073	200.17	400.34

Hood Air

File #	Type	Start		Sample	Tot mPDCH	PMCP	PTCH	2 PDCB	PMCH	ocPDCH	2 mtPDCH	PMCP
		Date	Time	Vol, L				Hood Emission Rate				
8500B1	Hood Air	6/24/96	1220-1237	0.74	92.7222	222.8657	0.4058	155.75	1.86	124.87	194.64	683.656
8500B2	Hood Air	6/24/96	1726-1800	1.48	128.3069	3.3381	0.0878	247.59	0.83	86.84	129.61	5.120
8500B3	Hood Air	6/24/96	1800	2.61	99.0967	2.2412	0.1077	201.02	0.49	63.79	40.64	1.949
8500B4	Hood Air	6/24/96	1900	2.61	113.3314	1.8373	0.0923	153.83	0.53	81.32	41.98	1.598
8500B5	Hood Air	6/24/96	2000	2.61	115.2477	2.2277	0.086	177.90	0.54	80.41	45.41	1.938
8500B6	Hood Air	6/24/96	2100	2.61	107.4947	0.5602	0.115	725.07	0.54	66.84	80.21	0.487
8500B7	Hood Air	6/24/96	2200	2.61	129.1116	2.136	0.0405	168.57	0.44	45.25	77.80	1.858
8500B8	Hood Air	6/24/96	2300	2.61	124.571	18.774	0	43.83	0.64	36.12	72.56	16.328
8500B9	Hood Air	6/25/96	0	2.61	104.5181	8.1982	0.0822	8.92	0.34	23.43	70.29	7.130
8500B10	Hood Air	6/25/96	100	2.61	46.4132	17.577	0.077	2.06	0.25	10.30	29.26	15.287
8500B11	Hood Air	6/25/96	200	2.61	76.9051	52.481	0.141	0.31	0.41	12.24	51.68	45.644
8500B12	Hood Air	6/25/96	300	2.61	113.3712	64.3954	0.152	0.59	0.58	21.83	76.66	56.007
8500B13	Hood Air	6/25/96	400	2.61	216.2861	99.3412	0.227	6.47	0.79	38.75	146.63	86.400
8500B14	Hood Air	6/25/96	500	2.61	158.8673	184.9221	0.518	102.14	0.98	56.36	93.22	160.833
8500B15	Hood Air	6/25/96	600	2.61	241.7511	118.3451	0.8105	198.33	1.02	29.21	173.06	102.928
8500B16	Hood Air	6/25/96	700	2.61	86.9883	323.8535	1.549	63.62	0.70	19.99	57.72	281.666
8500B17	Hood Air	6/25/96	800	2.61	111.2536	10.0832	0.119	37.88	0.36	26.55	73.65	8.770
8500B18	Hood Air	6/25/96	900	2.61	193.9228	87.2499	0.4111	67.01	0.77	82.34	101.55	75.884
8500B19	Hood Air	6/25/96	1000	2.61	68.5748	1419.512	3.703	104.05	1.43	59.86	49.92	1234.595
8500B20	Hood Air	6/25/96	1100	2.61	105.0224	412.1526	3.205	119.17	0.93	54.53	49.65	358.462
8500B21	Hood Air	6/25/96	1200	2.61	142.01	11.71	0	561.39	0.00	43.27	90.37	10.185
8500B22	Hood Air	6/25/96	1300	2.61	257.0086	2.1935	0.084	293.07	0.85	58.22	159.46	1.908
8500B23	Hood Air	6/25/96	1400	2.61	328.9733	2.087	0.0615	134.21	0.92	55.07	212.59	1.815
8507B1	Hood Air	6/25/96	1500	2.61	979.1261	0	0.1332	377.59	1.16	71.75	348.19	0.000

Hood Air

Nxh: (1350-1800) 4.726 3.543 3.008 0.146 4.829 5.775

File #	Type	Start		Sample	PTCH	Elapsed	2 PDCB	oc PDCH	2 mtPDCH	PMCP	PTCH	PMCH
		Date	Time	Vol, L		Time	Normalized Emmission Rate					
8500B1	Hood Air	6/24/96	1220-1237	0.74	1.245	-1.500	1.256	2.153	1.908	8.2368	18.8609	5.453
8500B2	Hood Air	6/24/96	1726-1800	1.48	0.135	3.750	1.997	1.497	1.271	0.0617	2.0404	2.440
8500B3	Hood Air	6/24/96	1800	2.61	0.094	4.000	1.621	1.100	0.398	0.0235	1.4192	1.430
8500B4	Hood Air	6/24/96	1900	2.61	0.080	5.000	1.241	1.402	0.412	0.0193	1.2163	1.558
8500B5	Hood Air	6/24/96	2000	2.61	0.075	6.000	1.435	1.386	0.445	0.0233	1.1333	1.572
8500B6	Hood Air	6/24/96	2100	2.61	0.100	7.000	5.847	1.152	0.786	0.0059	1.5154	1.591
8500B7	Hood Air	6/24/96	2200	2.61	0.035	8.000	1.359	0.780	0.763	0.0224	0.5337	1.301
8500B8	Hood Air	6/24/96	2300	2.61	0.000	9.000	0.353	0.623	0.711	0.1967	0.0000	1.887
8500B9	Hood Air	6/25/96	0	2.61	0.071	10.000	0.072	0.404	0.689	0.0859	1.0832	0.988
8500B10	Hood Air	6/25/96	100	2.61	0.067	11.000	0.017	0.178	0.287	0.1842	1.0147	0.724
8500B11	Hood Air	6/25/96	200	2.61	0.123	12.000	0.003	0.211	0.507	0.5499	1.8581	1.198
8500B12	Hood Air	6/25/96	300	2.61	0.132	13.000	0.005	0.376	0.752	0.6748	2.0030	1.705
8500B13	Hood Air	6/25/96	400	2.61	0.197	14.000	0.052	0.668	1.438	1.0410	2.9914	2.307
8500B14	Hood Air	6/25/96	500	2.61	0.451	15.000	0.824	0.972	0.914	1.9377	6.8261	2.867
8500B15	Hood Air	6/25/96	600	2.61	0.705	16.000	1.599	0.504	1.697	1.2401	10.6806	2.996
8500B16	Hood Air	6/25/96	700	2.61	1.347	17.000	0.513	0.345	0.566	3.3936	20.4123	2.044
8500B17	Hood Air	6/25/96	800	2.61	0.103	18.000	0.306	0.458	0.722	0.1057	1.5682	1.061
8500B18	Hood Air	6/25/96	900	2.61	0.358	19.000	0.540	1.420	0.996	0.9143	5.4174	2.254
8500B19	Hood Air	6/25/96	1000	2.61	3.221	20.000	0.839	1.032	0.489	14.8746	48.7972	4.200
8500B20	Hood Air	6/25/96	1100	2.61	2.787	21.000	0.961	0.940	0.487	4.3188	42.2347	2.714
8500B21	Hood Air	6/25/96	1200	2.61	0.000	22.000	4.527	0.746	0.886	0.1227	0.0000	0.000
8500B22	Hood Air	6/25/96	1300	2.61	0.073	23.000	2.364	1.004	1.563	0.0230	1.1069	2.505
8500B23	Hood Air	6/25/96	1400	2.61	0.053	24.000	1.082	0.949	2.084	0.0219	0.8104	2.712
8507B1	Hood Air	6/25/96	1500	2.61	0.116	25.000	3.045	1.237	3.414	0.0000	1.7553	3.388

Σ: 33.331 21.430 24.014 29.925

Appendix D

Exhaust Air

Exhasut Air

File #	Type	Start		Sample	PDCB	2PDCB	PMCH	ocPDCH	ptPDCH	mcPDCH	mtPDCH	2 mtPDCH
		Date	Time	Vol, L	Picoliters							
8502B7	Exhaust Air	6/25/96	1620	2.24	96.5103	96.5103	0.8062	60.6582	13.4937	156.0307	102.0623	204.1246
8502B8	Exhaust Air	6/25/96	1700	3.36	52.6759	52.6759	0.7596	81.3012	7.7616	135.4445	59.7	119.4
8502B9	Exhaust Air	6/25/96	1800	3.36	5.4373	5.4373	0.2881	26.4874	5.4151	69.7127	42.7998	85.5996
8502B10	Exhaust Air	6/25/96	1900	3.36	2.5626	2.5626	0.2454	15.2684	4.0289	49.4549	32.6957	65.3914
8502B11	Exhaust Air	6/25/96	2000	3.36	1.791	1.791	0.6929	85.7976	6.5737	76.5814	54.839	109.678
8502B12	Exhaust Air	6/25/96	2100	3.36	635.308	635.308	1.0859	320.3163	10.15	283.8249	91.1128	182.2256
8502B13	Exhaust Air	6/25/96	2200	3.36	1.7451	1.7451	0.1644	5.4758	3.3877	35.6555	26.7958	53.5916
8502B14	Exhaust Air	6/25/96	2300	3.36	1.0835	1.0835	0.1633	3.4847	3.5432	35.9403	27.1408	54.2816
8502B15	Exhaust Air	6/26/96	0	3.36	0.8266	0.8266	0	0.8753	0.2221	3.0307	1.6449	3.2898
8502B16	Exhaust Air	6/26/96	100	3.36	0.5994	0.5994	0	0.5816	0.1097	1.5543	0.7692	1.5384
8502B17	Exhaust Air	6/26/96	200	3.36	0.4192	0.4192	0	0.4666	0.1274	1.6431	0.9221	1.8442
8502B18	Exhaust Air	6/26/96	300	3.36	0.2617	0.2617	0	0.3615	0.0772	0.9984	0.5073	1.0146
8502B19	Exhaust Air	6/26/96	400	3.36	0.2046	0.2046	0.2161	0.354	0.1249	1.4496	0.9321	1.8642
8502B20	Exhaust Air	6/26/96	500	3.36	0.1688	0.1688	0.192	0.2787	0.062	0.7744	0.3934	0.7868
8502B21	Exhaust Air	6/26/96	600	3.36	0.1538	0.1538	0.2172	0.2579	0.062	0.7456	0.3843	0.7686
8502B22	Exhaust Air	6/26/96	700	3.36	0	0	0	0.6527	0.1097	1.6777	0.8325	1.665
8502B23	Exhaust Air	6/26/96	800-836	2.02	0	0	0	0.5377	0.0892	1.4072	0.6877	1.3754

Exhasut Air

File #	Type	Start		Sample	Tot mPDCH	PMCP	PTCH	2 PDCB	oc PDCH	2 mtPDCH	PMCP	Elapsed
		Date	Time	Vol, L				Exhaust Emission Rate				Time, hr
8502B7	Exhaust Air	6/25/96	1620	2.24	268.5377	4.6914	0.1461	97.803	61.471	206.858	4.7542	26.3300
8502B8	Exhaust Air	6/25/96	1700	3.36	196.6162	11.1402	0.1559	35.588	54.927	80.666	7.5263	27.0000
8502B9	Exhaust Air	6/25/96	1800	3.36	112.0145	5.8201	0.129	3.673	17.895	57.831	3.9320	28.0000
8502B10	Exhaust Air	6/25/96	1900	3.36	82.6934	3.3475	0.1138	1.731	10.315	44.178	2.2616	29.0000
8502B11	Exhaust Air	6/25/96	2000	3.36	130.4402	2.2581	0.0837	1.210	57.964	74.098	1.5256	30.0000
8502B12	Exhaust Air	6/25/96	2100	3.36	410.0956	2.2827	0.4307	429.211	216.404	123.111	1.5422	31.0000
8502B13	Exhaust Air	6/25/96	2200	3.36	63.7607	1.8743	0.124	1.179	3.699	36.206	1.2663	32.0000
8502B14	Exhaust Air	6/25/96	2300	3.36	64.3665	1.0533	0.096	0.732	2.354	36.672	0.7116	33.0000
8502B15	Exhaust Air	6/26/96	0	3.36	4.9733	0.7734	0.0794	0.558	0.591	2.223	0.5225	34.0000
8502B16	Exhaust Air	6/26/96	100	3.36	2.4002	0.6189	0.0722	0.405	0.393	1.039	0.4181	35.0000
8502B17	Exhaust Air	6/26/96	200	3.36	2.6657	0.4994	0.0618	0.283	0.315	1.246	0.3374	36.0000
8502B18	Exhaust Air	6/26/96	300	3.36	1.5293	0.459	0.0635	0.177	0.244	0.685	0.3101	37.0000
8502B19	Exhaust Air	6/26/96	400	3.36	2.4708	0.4075	0.0567	0.138	0.239	1.259	0.2753	38.0000
8502B20	Exhaust Air	6/26/96	500	3.36	1.1761	0.3647	0.0575	0.114	0.188	0.532	0.2464	39.0000
8502B21	Exhaust Air	6/26/96	600	3.36	1.137	0.3389	0.0517	0.104	0.174	0.519	0.2290	40.0000
8502B22	Exhaust Air	6/26/96	700	3.36	2.6016	0.8888	0.1787	0.000	0.441	1.125	0.6005	41.0000
8502B23	Exhaust Air	6/26/96	800-836	2.02	2.1546	0.7143	0.1475	0.000	0.604	1.546	0.8027	42.0000

Exhasut Air

1600-1700 = 1.184 1.590 3.042 0.086

File #	Type	Start		Sample	2 PDCB	oc PDCH	2 mt PDCH	PMCP
		Date	Time	Vol, L	Normalized Emission Rate			
8502B7	Exhaust Air	6/25/96	1620	2.24	~~0.789~~	~~1.060~~	~~2.028~~	~~0.057~~
8502B8	Exhaust Air	6/25/96	1700	3.36	0.287	0.947	0.791	0.091
8502B9	Exhaust Air	6/25/96	1800	3.36	0.030	0.309	0.567	0.047
8502B10	Exhaust Air	6/25/96	1900	3.36	0.014	0.178	0.433	0.027
8502B11	Exhaust Air	6/25/96	2000	3.36	0.010	0.999	0.726	0.018
8502B12	Exhaust Air	6/25/96	2100	3.36	3.461	3.731	1.207	0.019
8502B13	Exhaust Air	6/25/96	2200	3.36	0.010	0.064	0.355	0.015
8502B14	Exhaust Air	6/25/96	2300	3.36	0.006	0.041	0.360	0.009
8502B15	Exhaust Air	6/26/96	0	3.36	0.005	0.010	0.022	0.006
8502B16	Exhaust Air	6/26/96	100	3.36	0.003	0.007	0.010	0.005
8502B17	Exhaust Air	6/26/96	200	3.36	0.002	0.005	0.012	0.004
8502B18	Exhaust Air	6/26/96	300	3.36	0.001	0.004	0.007	0.004
8502B19	Exhaust Air	6/26/96	400	3.36	0.001	0.004	0.012	0.003
8502B20	Exhaust Air	6/26/96	500	3.36	0.001	0.003	0.005	0.003
8502B21	Exhaust Air	6/26/96	600	3.36	0.001	0.003	0.005	0.003
8502B22	Exhaust Air	6/26/96	700	3.36	0.000	0.008	0.011	0.007
8502B23	Exhaust Air	6/26/96	800-836	2.02	0.000	0.010	0.015	0.010

Σ_{Ex} = 5.016 7.916 7.580 0.175

+ Σ_{Hood} = 33.331 21.430 24.014 29.925

Σ_T = 38.347 29.346 31.594 30.100

$\Sigma_T/48$ = 79.9% 61.1% 65.8% 62.7%