

Monsanto

11393 COPY 1

MONSANTO RESEARCH CORPORATION / DAYTON LABORATORY / DAYTON, OHIO 45407

ESC-Dayton

(DEPT / SECTION)

Analytical

TYPE OF REPORT

REPORT

REPORT NO.: MDA-359

JOB/PROJECT NO.: 483.4060

DATE: 15 April 1983

TITLE: ANALYSIS OF WATER SAMPLES
FROM DELAWARE RIVER PLANT

AUTHORS: B. Mason Hughes and Robert F. Ivory

ABSTRACT: Water samples from the Delaware River Plant were analyzed for specified organic compounds, metals and chloride concentrations. The results of these analyses are shown in this report.

Technical Approval:

Joseph U. Brooks
Joseph U. Brooks
Research Group Leader

Approved by:

Robert F. Ivory
Robert F. Ivory
Environmental Sciences Center
Service Project Manager

Approval date:

15 April 1983

RECEIVED

APR 21 1983

MONSANTO-LAYTON
CENTRAL FILES

RESTRICTED DISTRIBUTION (see over)

FILE COPY

DO NOT REMOVE FROM FILE

COMPANY CONFIDENTIAL

This document is the property of Monsanto Research Corporation and the recipient is responsible for its safeguarding and disposition. It contains CONFIDENTIAL INFORMATION which must not be reproduced, retransmitted or otherwise disclosed to third parties without Monsanto Research Corporation and Monsanto Company written prior authorization.

MONS 022527

REPORT NO.: MDA-359
AUTHORS: B. M. Hughes and R. F. Ivory
TITLE: ANALYSIS OF WATER SAMPLES FROM DELAWARE RIVER PLANT

REPORT NO.: MDA-359

COPY NO.: 3

CONFIDENTIAL

COPY NUMBER

1	E. Jamro	Delaware River
2	R. F. Ivory	1250
3	Central Files	1250
4	Technical Reports Libry.	R2C

ABSTRACT ONLY

R. W. Scott/1250
H. L. Williams, O2B
J. D. Wilson, G3WC
W. B. Witmer/1250
H. A. Woltermann/1250

NOTE: Distribution of this report is restricted. Requests for additional copies should be made through the principal contact at the Monsanto location involved or the Manager, Environmental Sciences Center, Dayton Laboratory, Dayton, Ohio.

ACKNOWLEDGEMENT

Contributions of the following Dayton Laboratory personnel to this project are gratefully acknowledged:

Analyses: A. Ford
B. M. Hughes
G. Thomas

CONFIDENTIAL

01071/D

When no longer needed, or upon request, return this report to Central Files, Dayton.

01071/D

MONS 022528

1: INTRODUCTION **11393 COPY 1**

Groundwater monitoring samples collected at the Delaware River Plant by Geraghty & Miller, Inc., were analyzed and tested for specified compounds and parameters. The analyses and testing were conducted in accordance with EPA approved or accepted procedures [1,2].

2. SUMMARY

Table 1 shows the analytical results for the specified metal analyses and Table 2 shows the applicable quality control data. Table 3 shows the analytical results for the requested chloride analyses while Table 3 shows the applicable quality control data. Tables 5-34 shows the analytical results for the specified organic analyses. Figures 1-17 shows the applicable chromatograms for the GC/MS analysis for the specified organic analyses.

3. SAMPLING

The samples were collected at the Delaware River plant sites by Geraghty & Miller, Inc. personnel. The samples received by ESC/MRC for analysis arrived in U.S. EPA approved containers.

4. ANALYSES

4.1 METALS ANALYSES

The analyses of the samples for the specified metals were performed in accordance to U.S. EPA approved or accepted procedures [1].

1

FILE COPY
DO NOT REMOVE FROM FILE

MONS 022529

CHLORIDE ANALYSES

The analyses of the samples for their chloride content were performed in accordance to U.S. EPA approved or accepted procedures [1].

4.3 ORGANIC ANALYSES

Samples from the Delaware River Plant were analyzed for benzaldehyde, benzyl chloride, benzyl alcohol, benzal chloride and Aroclor 1248. One liter and 0.01 liter samples were extracted using methylene chloride and hexane, respectively and the resulting 1-mL extracts analyzed using capillary GC/EC and capillary GC/MS analysis techniques. Table 5 summarizes the physical properties and identifications of samples included in this study. Thirty-five samples were extracted and analyzed with and without centrifugation in order to determine if the analytes listed above (and in particular Aroclor 1248) are associated with the pure water phase or with the particulate/organic component of these samples. Tables 6-14 summarize the capillary GC/EC analytical results for centrifuged samples, Tables 15-23 summarize capillary GC/EC analytical results for uncentrifuged samples, Tables 24-32 summarize the capillary GC/MS analytical results for centrifuged samples and Tables 33-34 summarize capillary GC/MS analytical results for selected uncentrifuged samples. Appendix A Figures 1-17, shows all GC/MS total ion and selected ion chromatograms from the analysis reported in Tables 24-34.

All high values of benzyl chloride and Aroclor 1248 appear to be associated with the particulate/organic component of the corresponding sample and the benzaldehyde and benzyl alcohol appear to be primarily associated with the water portion of each sample. No benzal chloride was detected in any sample analyzed.

10/20/77

.5. REFERENCES

1. Methods for Chemical Analysis of Water and Waters, U.S. EPA 600/4-29-020, EHSL, Cincinnati, Ohio, March 1979.
2. Draft Final Report: Sampling and Analysis Procedures for Screening of Industrial Effluents for Priority Pollutants U.S. Environmental Protection Agency, Cincinnati, Ohio, April 1977, 145 pp.

TABLE 1. ANALYTICAL RESULTS FOR METALS ANALYSES OF DELAWARE RIVER PLANT SAMPLES, $\mu\text{g/ml}$

Sample ID	Analyte			Sample ID	Analyte		
	Calcium	Iron	Sodium		Calcium	Iron	Sodium
2-8	549	170	259	48-3	13.8	144	1.7
4-8	120	2,120	88.3	49-1	617	125	304
23-8	962	832	351	49-2	150	115	160
41-8	74.8	1.26	52.3	50-1	589	161	390
42-1	42.1	52.3	29.4	50-2	68.3	37.8	131
42-2	61.1	94.5	67.2	51-1	63.6	236	86.4
42-2 duplicate	63.4	88.4	91.8	51-2	73.0	72.1	100
42-3	65.7	149	177	51-3	72.9	70.3	376
43-1	31.2	36.1	45.8	52-1	13.8	57.1	33.8
43-2	37.2	57.9	69.2	52-2	85.3	37.1	129
44-1	273	527	236	53	231	2,660	99.9
44-2	83.7	75.2	136	53-1	126	356	97.3
45-1	43.8	64.1	5.0	53-2	82.2	51.0	114
45-2	72.0	45.8	114	53-2 duplicate	84.7	53.1	112
46-1	15.0	10.0	32.1	54-1	197	3.2×10^3	124
46-2	73.7	25.7	143	54-2	105	102	135
47-1	7.6	9.8	27.8	55-1	12.5	27.0	56.2
47-2	196	872	138	55-2	73.2	264	138
48-1	1.2×10^3	357	680	55-2 duplicate	64.6	240	136
48-2	43.5	102	61.7	Blank	1.11	0.17	381

TABLE 2. QUALITY CONTROL DATA FOR METALS ANALYSIS
OF DELAWARE RIVER SAMPLES, $\mu\text{g/mL}$

Analyte	Reference standards		
	Observed value	True value	Percent recovery
Calcium	88.6	100	89
Iron	71.4	68.0	105
Sodium	912	1,000	91

TABLE 3. ANALYTICAL RESULTS FOR CHLORIDE ANALYSIS
OF DELAWARE RIVER SAMPLES, ppm

Sample ID	Chloride concentration
2S	1.2×10^3
4S	4.0×10^3
5S	5.3×10^3
23S	3.6×10^3
41S	75
42-1	26.6
42-2	119
42-2 duplicate	135
42-3	297
43-1	34.0
43-2	61.5
44-1	2.6×10^3
44-2	342
45-1	245
45-2	146
46-1	41.2
46-2	242
47-1	24.4
47-2	2.6×10^3

(continued)

TABLE 3 (continued)

Sample ID	Chloride concentration
48-1	6.8×10^3
48-2	273
48-3	146
49-1	2.6×10^3
49-2	515
50-1	2.3×10^3
50-2	320
51-1	586
51-2	797
51-3	760
52-1	41.0
52-2	207
53-1	4.3×10^3
53-2	221
53-2 duplicate	318
54-1	6.1×10^3
54-2	715
55-1	88.8
55-2	874
55-2 duplicate	988
Blank	<7

TABLE 4. QUALITY CONTROL DATA FOR CHLORIDE ANALYSIS OF DELAWARE RIVER SAMPLES, ppm

Reference standard	Observed value	True value	Percent recovery
KRA 8501	248	210	118
KRA 8501	234	218	107
KRA 9401	198	210	94
KRA 3253	294	277	106

TABLE 5. QUALITATIVE DESCRIPTION OF SAMPLES RECEIVED FROM THE DELAWARE RIVER PLANT

483.40618

March 7, 1983

Sample ID	HSC II		pH	Sediment	Organic Layer	Color	Odor	Visual Appearance
	Centrifuged	Uncentrifuged						
62-1	2057	2120	7	0	None	Brown	None	Cloudy
62-2	2055	2120	7	Trace	None	Brown	None	Cloudy
62-2, Dup.	2090	2127	7	Trace	None	Brown	None	Cloudy
62-3	2054	2129	7	^b	None	Gray	None	Cloudy
63-1	2046	2109	6.5	— 1 .5 μ filter paper /L—		Brown	no ^o	no
63-2	2047	2110	6.5	— 1 .5 μ filter paper of 3/L—		Brown	no	no
64-1	2069	2120	7	Trace	None	Yellow	None	Cloudy
64-2	2070	2121	6	Trace	None	Yellow	Foul	Cloudy
65-1	2065	2116	6	+++ ^d	None	Brown	None	Cloudy
65-2	2066	2117	7	++ ^c	None	Brown	None	Cloudy
66-1	2073	2124	6	+	None	Yellow	None	Clear
66-2	2076	2125	7	Trace	None	Yellow	None	Clear
67-1	2061	2107	6	Trace	None	Yellow	None	Clear
67-2	2062	2100	7	+++	None	Brown	None	Cloudy
68-1	2067	2110	7	+	None	Brown	None	Cloudy
68-2	2068	2119	7	++	None	Brown	None	Cloudy
68-3	2080	2130	6	+++	None	Brown	None	Cloudy

MONS 022535

TABLE 5 (continued)

403.40618

March 7, 1983

Sample ID	NO. 6		pH	Sediment	Organic Layer	Color	Odor	Visual appearance
	Centrifuged	Uncentrifuged						
09-1	2063	2111	8	**	None	Brown	None	Cloudy
09-2	2064	2112	8	**	None	Brown	None	Cloudy
09-1	2073	2122	7	0	None	Brown	None	Cloudy
09-2	2074	2123	7	0	None	Yellow	None	Clear
01-1	2087	2099	5	0	None	Yellow	None	Clear
01-2 water*	2089	2103	6	0	Trace	Colorless	None	Clear
01-3	2085	2104	7	0	Trace	Brown	Foul	Cloudy
03-1	2053	2114	6	+++	None	Brown	None	Cloudy
03-2	2064	2115	8	**	None	Yellow	None	Cloudy
03-1	2050	2070	6	-1 Whatman filter of 4/L-		Brown	NB	NB
03-2	2051	2113	8	-1 Whatman filter /L-		Yellow	NB	NB
03-3 Dup.	2099	2133	6	Trace	None	Yellow	None	Cloudy
04-1	2040	2096	5	-1 Whatman filter of 4/L-		Yellow	NB	NB
04-2	2049	2093	6	-1 Whatman filter of 3/L-		Green	NB	NB

TABLE 5 (continued)

483.40618

March 7, 1983

Sample ID	HNC 8		pH	Sediment	Organic Layer	Color	Odor	Visual Appearance
	Centrifuged	Uncentrifuged						
55-1	2006	2141	5	++	None	Yellow	None	Clear
55-2	2003	2135	6	0	None	Yellow	Foul	Clear
55-2 Dup.	2002	2134	6	0	None	Yellow	Foul	Clear
28	2050	2131	6	0	None	Brown	None	Cloudy
08	2000	2105	6	+	Trace	White	Foul	Cloudy
50	2040	2137	5	0	None	Brown	Foul	Cloudy
230	2077	2130	6	++	None	Black	None	Cloudy
035	2079	2132	5	Trace	None	Colorless	None	Clear
Drum sample	2001	2106	5	++	Trace	Colorless	None	Clear
Field blank	2097	2136	5	0	None	Colorless	None	Clear

^aRepresents characteristics of water layer of sample 51-2; 2090 is HNC 8 for the organic phase which is 50% of 51-2 1-liter sample.

^b.5 cm of sediment in 1-liter bottle.

^c.7 cm of sediment in 1-liter bottle.

^d1.0 cm of sediment in 1-liter bottle.

^eun = not analyzed.

MONS 022537

TABLE 6. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			42-1	42-2	42-2 Duplicate	42-3	43-1	43-2
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	ND ^b	ND	ND	ND	ND	ND
Benzal chloride	GC/EC	5	ND	ND	ND	ND	ND	ND
Brocelor 1240	GC/EC	5	ND	ND	ND	ND	<0.5	<0.5
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₄ -benzene-d ₄	GC/EC	10 ⁴ , 100	61	69	64	62	86	206
Sample volume (liter)	-		0.01	0.01	0.01	0.01	1	1
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		1	1	1	1	10	20
HKC extraction Method	-		2057	2055	2090	2054	2046	2067
Comments	-		Clean	Clean	Clean	Clean	Clean	Clean

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 7. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			44-1	44-2	45-1	45-2	46-1	46-2
			Concentration (pp/L)					
Benzyl chloride	GC/EC	5	<500	<500	ND ^b	ND	ND	ND
Benzal chloride	GC/EC	5	<500	<500	ND	ND	ND	ND
Aroclor 1248	GC/EC	5	17.0	6.5	ND	ND	ND	ND
Surrogate Bulkion Compound	Analysis Method	Amount added (pp/L)	Recovery (%)					
Cl ₂ -benzene-d ₆	GC/EC	10 ⁴	66	42	60	67	86	79
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	0.01
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		1	1	1	1	1	1
GC/EC extraction Method	-		2049	2070	2045	2044	2075	2076
Comments	-		Dirty	Dirty	Clean	Clean	Clean	Clean

^aL.O.D. = limit of detection in pp/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 8. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED
OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			47-1	47-2	48-1	48-2	48-3	
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	ND ^b	ND	ND	ND	ND	
Benzal chloride	GC/EC	5	ND	ND	ND	ND	ND	
Breco 1240	GC/EC	5	ND	ND	ND	ND	ND	
Extractable Substances Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	69	63	59	66	61	
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	
Extract volume (mL)	-		1	1	1	1	1	
Extract dil factor	-		1	1	1	1	1	
GC extraction Method	-		2061	2062	2067	2068	2069	
Comments	-		Clean	Clean	Clean	Clean	Clean	

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 9. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40616

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			49-1	49-2	50-1	50-2		
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	ND ^b	ND	ND	ND		
Benzal chloride	GC/EC	5	ND	ND	ND	ND		
Breco 1248	GC/EC	5	ND	ND	ND	ND		
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Ch ₂ -benzene-d ₄	GC/EC	10 ⁴	65	53	85	94		
Sample volume (liter)	-		0.01	0.01	0.01	0.01		
Extract volume (mL)	-		1	1	1	1		
Extract dil factor	-		1	1	1	1		
HNE extraction Method	-		2063	2064	2073	2074		
Comments	-		Clean	Clean	Clean	Clean		

^a L.O.D. = limit of detection in µg/L.

^b ND = none detected with a detection limit given by the L.O.D. value for each compound.

MONS 022541

TABLE 10. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			SI-1	SI-2 Water	SI-3			SI-2 GMS
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	540	6.7x10 ³	10.5x10 ³			33.6x10 ³
Benzyl chloride	GC/EC	5	ND ^b	ND	ND			<500
Aroclor 1248	GC/EC	5	30	44	176			9.3x10 ³
Paraffinic Solking Compound			Recovery (%)					
Cl ₄ -benzene-d ₄	GC/EC	10 ⁴	26	24	24			-
Sample volume (liter)	-		0.01	0.01	0.01			-
Extract volume (mL)	-		1	1	1			-
Extract dil factor	-		1	10	10			10 ³
GC extraction Method	-		2007	2009	2005			2000
Comments	-		Dirty	Dirty	Dirty			Dirty

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 11. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			52-1	52-2	53-1	53-2	53-2 Duplicate	
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	ND ^b	ND	<50	ND	ND	
Benzal chloride	GC/EC	5	ND	ND	<50	ND	ND	
Brecher 1200	GC/EC	5	ND	ND	<50	ND	ND	
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴ , 100	57	60	93	99	66	
Sample volume (liter)	-		0.01	0.01	1	1	0.01	
Extract volume (mL)	-		1	1	1	1	1	
Extract dil factor	-		1	1	10 ³	10	1	
SEC extraction Method	-		2053	2054	2059	2051	2050	
Comments	-		Clean	Clean	Dirty	Clean to Dirty	Clean	

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 12. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			54-1	54-2	55-1	55-2	55-2 Duplicate	Drum Sample
			Concentration (pp/L)					
Benzyl chloride	GC/EC	5	NA ^c	ND ^b	ND	ND	ND	7.4×10^{-2}
Benzal chloride	GC/EC	5	NA	ND	ND	ND	ND	<500
Brecker 1200	GC/EC	5	ND	282	ND	ND	ND	610
Benzene Soluble Compound	Analysis Method	Amount added (pp/L)	Recovery (%)					
			NA	50	34	64	50	52
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴ , 100						
Sample volume (liter)	-		1	1	0.02	0.02	0.02	0.02
Extract volume (mL)	-		5	1	1	1	1	1
Extract dil factor	-		10	10	1	1	1	1
SEC extraction Method	-		2040	2049	2086	2083	2082	2081
Comments	-		Clean	Dirty	Clean	Clean	Clean	Dirty

^aL.O.D. = limit of detection in pp/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 13. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			25	45	55	235	415	Field Blank
			Concentration (pp/L)					
Deonyl chloride	GC/EC	5	ND ^b	2.5×10^3	<500	ND	ND	ND
Deonal chloride	GC/EC	5	ND	<500	<500	ND	ND	ND
Aroclor 1248	GC/EC	5	ND	5.3	ND	ND	ND	ND
Surrogate Spiking Compound	Analysis Method	Amount added (pp/L)	Recovery (%)					
C1 ₈ -Decone-d ₄	GC/EC	10 ⁴	45	48	24	72	50	60
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	0.01
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		1	1	1	1	1	1
HNE extraction Method	-		2050	2000	2060	2077	2099	2097
Comments	-		Clean	Dirty	Dirty	Clean	Clean	Clean

^aL.O.D. = limit of detection in pp/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 14. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			Method Blank	Method Blank	Method Blank	Method Blank		
			Concentration (pp/L)					
Benzyl chloride	GC/EC	5	ND ^b	ND	ND	ND		
Benzal chloride	GC/EC	5	ND	ND	ND	ND		
Aroclor 1248	GC/EC	5	ND	ND	ND	ND		
Surrogate Spiking Compound	Analysis Method	Amount added (pp/L)	Recovery (%)					
Cl ₃ -benzene-d ₄	GC/EC	1x10 ⁴	62	68	83	51		
Sample volume (liter)	-		0.01	0.01	0.01	0.01		
Extract volume (ml)	-		1	1	1	1		
Extract oil factor	-		1	1	1	1		
SEC extraction Method	-		2052	2071	2072	2006		
Comments	-		Clean	Clean	Clean	Clean		

^aL.O.D. = limit of detection in pp/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

TABLE 15. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			42-1	42-2	42-2 Duplicate	42-3	43-1 Sediment	43-2 Sediment
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA	NA	NA
Benzal chloride	GC/EC	5	NA	NA	NA	NA	NA	NA
Brecher 1248	GC/EC	5	ND ^b	NA	ND	ND	ND	ND
Reference Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₃ -benzene-d ₆	GC/EC	10 ⁴	-	-	-	-	-	-
Sample volume (liter)	-		0.01	0.01	0.01	0.01	-	-
Extrant volume (ml)	-		1	1	1	1	1	1
Extrant dil factor	-		-	-	-	-	-	-
SEC extraction Method	-		2128	2126	2127	2129	2109	2110
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022547

TABLE 16. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			44-1	44-2	45-1	45-2	46-1	46-2
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA	NA	NA
Benzal chloride	GC/EC	5	NA	NA	NA	NA	ND	ND
Aroclor 1248	GC/EC	5	42.9 ± 0.6 × 10 ³	ND ^b	ND	ND	ND	ND
Pyrethroid Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₂	GC/EC	10 ⁴	-	-	-	-	-	-
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	0.01
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		-	10	-	-	-	-
HPLC extraction Method	-		2120	2121	2116	2117	2124	2125
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 17. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			47-1	47-2	48-1	48-2	48-3	
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA	NA	
Benzal chloride	GC/EC	5	NA	NA	NA	NA	NA	
Breclor 1248	GC/EC	5	ND ^b	ND	ND	ND	29.9	
Surfactant Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	-	-	-	-	-	
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	
Extract volume (mL)	-		1	1	1	1	1	
Extract dil factor	-		-	-	-	-	-	
SEC extraction Method	-		2107	2108	2110	2119	2130	
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 10. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			49-1	49-2	50-1	50-2		
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA		
Benzal chloride	GC/EC	5	NA	NA	NA	NA		
Aroclor 1248	GC/EC	5	ND ^b	ND	ND	ND		
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₃ -benzene-d ₄	GC/EC	10 ⁴	-	-	-	-		
Sample volume (liter)	-		0.01	0.01	0.01	0.01		
Extract volume (mL)	-		1	1	1	1		
Extract dil factor	-		-	-	-	-		
AHC extraction Method	-		2111	2112	2122	2123		
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 19. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			SI-1	SI-2 Water	SI-3			
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^b	NA	NA			
Benzal chloride	GC/EC	5	NA	NA	NA			
Aroclor 1248	GC/EC	5	0.31x10 ⁴	0.54x10 ⁴	4.02x10 ⁴			
			Recovery (%)					
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)						
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	-	-	-			
Sample volume (liter)	-		0.010	0.010	0.010			
Extract volume (ml)	-		1	1	1			
Extract dil factor	-		100	100	1000			
GC extraction Method	-		2099	2103	2104			
Comments	-		Dirty		Interference			

^aL.O.D. = limit of detection in µg/L.

^bNA = not analyzed.

TABLE 20. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			52-1	52-2	53-1 Sediment	53-2 Sediment	53-2 Duplicate	
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA	NA	
Benzal chloride	GC/EC	5	NA	NA	NA	NA	NA	
Aroclor 1248	GC/EC	5	ND ^b	ND	ND	ND	ND	
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	-	-	-	-	-	
Sample volume (liter)	-		0.01	0.01	-	-	0.01	
Extract volume (ml)	-		1	1	1	1	1	
Extract dil factor	-		-	-	-	-	-	
HRC extraction Method	-		2114	2115	2070	2113	2130	
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 21. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			54-1 Sediment	54-2 Sediment	55-1	55-2	55-2 Duplicate	Run Sample
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^b	NA	NA	NA	NA	NA
Benzal chloride	GC/EC	5	NA	NA	NA	NA	NA	NA
Aroclor 1248	GC/EC	5	174	269	32.3	1.2	20.5	1.7 n 80 ⁰
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₂	GC/EC	10 ⁴	-	-	-	-	-	-
Sample volume (liter)	-		-	-	0.01	0.01	0.06	0.06
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		1	1	-	-	-	1000
SEC extraction Method	-		2096	2093	2141	2135	2136	2106
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bNA = not analysed.

TABLE 22. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			25	45	55	235	415	Field Blank
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA	NA	NA	NA	NA
Benzal chloride	GC/EC	5	NA	NA	NA	NA	NA	NA
Aroclor 1248	GC/EC	5	ND ^b	0.16x10 ⁴	<50	ND	ND	Trace
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	-	-	-	-	-	-
Sample volume (liter)	-		0.01	0.01	0.01	0.01	0.01	0.01
Extract volume (mL)	-		1	1	1	1	1	1
Extract dil factor	-		-	100	-	-	-	-
HSC extraction Method	-		2131	2195	2137	2130	2132	2136
Comments	-							

^a L.O.D. = limit of detection in µg/L, except where noted.

^b ND = none detected with a detection limit given by the L.O.D. value for each compound.

^c NA = not analyzed.

MONS 022554

TABLE 23. RESULTS OF CAPILLARY GC/EC SCREENING ANALYSES OF DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			Method Blank	Method Blank				
			Concentration (µg/L)					
Benzyl chloride	GC/EC	5	NA ^c	NA				
Benzal chloride	GC/EC	5	NA	NA				
Aroclor 1248	GC/EC	5	ND ^b	ND				
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Cl ₂ -benzene-d ₄	GC/EC	10 ⁴	-	-				
Sample volume (liter)	-		0.010	0.010				
Extract volume (ml.)	-		1	1				
Extract dil factor	-		-	-				
WEC extraction Method	-		2139	2100				
Comments	-							

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022555

TABLE 24. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			42-1	42-2	42-2 Duplicate	42-3	43-1	43-2
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	ND	ND	ND	<0.2	1.0
Benzyl chloride	GC/MS	8	ND	ND	ND	ND	<0.05	<0.05
Benzyl alcohol	GC/MS	22	ND	ND	ND	ND	<0.2	41
Benzal chloride	GC/MS	6	ND	ND	ND	ND	<0.05	<0.05
Aroclor 1248	GC/MS	-	NA ^c	NA	NA	NA	NA	NA
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₅	GC/MS	10 ⁴ , 100	24	14	26	13	60	46
2-Cl-phenol-d ₄	GC/MS	10 ⁴ , 100	52	67	62	62	97	125
1,2-Cl ₂ -benzene-d ₄	GC/MS	10 ⁴ , 100	50	71	64	65	76	101
Pyrene-d ₁₀	GC/MS	10 ⁴ , 100	99	100	74	87	80	96
Chrysene-d ₁₂	GC/MS	10 ⁴ , 100	37	89	26	67	33	103
HBC Extraction Method	-	-	2057	2055	2090	2056	2046	2047
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01	1	1

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 25. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED
OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			44-1	44-2	45-1	45-2	46-1	46-2
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	1.0×10^4	ND	ND ^b	ND	<0.2	<0.2
Benzyl chloride	GC/MS	8	ND	ND	ND	ND	<0.00	<0.00
Benzyl alcohol	GC/MS	22	3.1×10^4	6.9×10^3	ND	ND	<0.2	<0.2
Benzal chloride	GC/MS	6	ND	ND	ND	ND	<0.00	<0.00
Isroclor 1248	GC/MS	-	NA ^c	NA	NA	ND	NA	ND
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol- d_5	GC/MS	10^4	17	31	12	17	12	17
2-Cl-phenol- d_4	GC/MS	10^4	64	59	60	85	66	86
1,2-Cl ₂ -benzene- d_4	GC/MS	10^4	72	66	61	112	93	112
Pyrene- d_{10}	GC/MS	10^4	69	76	86	115	130	115
Chrysene- d_{12}	GC/MS	10^4	25	27	31	141	130	122
HBC Extraction Method	-	-	2069	2070	2065	2066	2075	2076
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01	0.01	0.01

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022557

TABLE 26. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			47-1	47-2	48-1	48-2	48-3	
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	ND	ND	642	<0.2	
Benzyl chloride	GC/MS	8	ND	ND	ND	<0.8	<0.00	
Benzyl alcohol	GC/MS	22	ND	ND	ND	5.2 ± 10 ⁴	2.0	
Benzal chloride	GC/MS	6	ND	ND	ND	<0.6	<0.06	
Aroclor 1248	GC/MS	-	NA ^c	NA	ND	ND	ND	
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₉	GC/MS	10 ⁴	13	24	19	36	99	
2-Cl-phenol-d ₉	GC/MS	10 ⁴	65	69	53	80	99	
1,2-Cl ₂ -benzene-d ₁₀	GC/MS	10 ⁴	72	67	50	99	84	
Pyrene-d ₁₀	GC/MS	10 ⁴	121	103	80	87	88	
Chrysene-d ₁₂	GC/MS	10 ⁴	116	30	20	86	34	
WBC Extraction Method	-	-	2061	2062	2067	2068	2008	
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01	0.01	

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022558

TABLE 27. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			49-1	49-2	50-1	50-2		
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	ND	ND	ND		
Benzyl chloride	GC/MS	8	ND	ND	ND	ND		
Benzyl alcohol	GC/MS	22	ND	ND	ND	ND		
Benzal chloride	GC/MS	6	ND	ND	ND	ND		
Aroclor 1248	GC/MS	-	NA ^c	NA	NA	NA		
Polynuclear Aromatic Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS	10 ⁴	29	10	32	14		
2-Cl-phenol-d ₆	GC/MS	10 ⁴	61	64	94	71		
1,2-Cl ₂ -benzene-d ₆	GC/MS	10 ⁴	75	52	123	110		
Pyrene-d ₁₀	GC/MS	10 ⁴	98	88	124	129		
Chrysene-d ₁₂	GC/MS	10 ⁴	51	14	147	122		
HSE Extraction Method	-	-	2063	2064	2073	2074		
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01		

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022559

TABLE 28. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED
OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			SI-1	SI-2 Water	SI-3			SI-2 OMS
			Concentration (µg/L)					
			µg/mL					
Benzaldehyde	GC/MS	16	5.6×10^4	6.0×10^5	5.6×10^5			1.1×10^5
Benzyl chloride	GC/MS	8	962	4.5×10^4	2.5×10^4			1.2×10^5
Benzyl alcohol	GC/MS	22	1.2×10^5	5.0×10^4	3.6×10^5			1.5×10^5
Benzyl chloride	GC/MS	6	ND ^b	<60	<60			ND
Broclor 1248	GC/MS	3000	NA ^c	NA	ND			1.0×10^5
Reference Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS		25	115	27			-
2-Cl-phenol-d ₆	GC/MS		59	87	102			-
1,2-Cl ₂ -benzene-d ₄	GC/MS		64	68	90			-
Pyrene-d ₁₀	GC/MS		90	43	48			-
Chrysen-d ₁₂	GC/MS		30	76	11			-
SEC Extraction Method	-	-	2007	2009	2005			2090
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01			-

^aL.O.D. = limit of detection in µg/L (or µg/mL for SI-2-OMS), except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 29. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED
OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			52-1	52-2	53-1	53-2	53-2 Duplicate	
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	ND	9.8	1	ND	
Benzyl chloride	GC/MS	8	ND	ND	0.12	<0.06	ND	
Benzyl alcohol	GC/MS	22	ND	ND	6.7 ± 10 ⁵	61	ND	
Benzal chloride	GC/MS	6	ND	ND	ND	<0.06	ND	
Aroclor 1248	GC/MS	-	NA ^c	NA	NA	ND	ND	
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₉	GC/MS	10 ⁴ , 100	12	13	13	41	16	
2-Cl-phenol-d ₉	GC/MS	10 ⁴ , 100	52	54	32	97	65	
1,2-Cl ₂ -benzene-d ₉	GC/MS	10 ⁴ , 100	59	60	27	70	70	
Pyrene-d ₁₀	GC/MS	10 ⁴ , 100	94	96	10	49	112	
Chrysene-d ₁₂	GC/MS	10 ⁴ , 100	65	29	24	3.7	100	
WGC Extraction Method	-	-	2053	2054	2050	2051	2009	
Sample Vol. Extracted (L)	-	-	0.01	0.01	1	1	0.01	

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 30. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			54-1	54-2	55-1	55-2	55-2 Duplicate	Drum Sample
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	1.2×10^2	13	171	ND ^b	ND	1.2×10^2
Benzyl chloride	GC/MS	8	<400	ND	17	ND	ND	1.6×10^2
Benzyl alcohol	GC/MS	22	4.5×10^4	539	1.2×10^3	ND	ND	4.2×10^3
Benzal chloride	GC/MS	6	<300	ND	ND	ND	ND	<60
Aroclor 1248	GC/MS	300	ND	ND	NA ^c	NA	NA	<3000
Polynuclear Aromatic Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS	10 ⁶ , 100	46	44	18	20	23	30
2-Cl-phenol-d ₆	GC/MS	10 ⁶ , 100	125	104	64	55	74	95
1,2-Cl ₂ -benzene-d ₆	GC/MS	10 ⁶ , 100	102	79	72	50	86	70
Pyrene-d ₁₀	GC/MS	10 ⁶ , 100	94	60	84	69	97	33
Chrysene-d ₁₂	GC/MS	10 ⁶ , 100	103	30	56	13	29	23
SEC Extraction Method	-	-	2046	2049	2086	2083	2082	2081
Sample Vol. Extracted (L)	-	-	1	1	0.01	0.01	0.01	0.01

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022562

TABLE 31. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			25	45	55	235	415	Field Blank
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	5.3×10^4	1.0×10^4	ND	ND	ND
Benzyl chloride	GC/MS	8	ND	1.9×10^3	ND	ND	ND	ND
Benzyl alcohol	GC/MS	22	ND	2.5×10^4	3.1×10^4	ND	ND	ND
Benzal chloride	GC/MS	6	ND	<620	ND	ND	ND	ND
Aroclor 1248	GC/MS	-	NA ^c	NA	NA	NA	NA	NA
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₅	GC/MS	10 ⁴	27.3	28	1	34	28	18
2-Cl-phenol-d ₅	GC/MS	10 ⁴	52.1	83	77	102	79	75
1,2-Cl ₂ -benzene-d ₄	GC/MS	10 ⁴	46.7	72	74	86	85	ND
Pyrene-d ₁₀	GC/MS	10 ⁴	86.6	38	100	72	84	89
Chrysene-d ₁₂	GC/MS	10 ⁴	46.6	38	44	73	68	25
SEC Extraction Method	-	-	2958	2080	2068	2877	2879	2897
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01	0.01	0.01

^aL.O.D. = limit of detection in µg/L, except where noted.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

MONS 022563

TABLE 32. RESULTS OF CAPILLARY GC/MS ANALYSES OF CENTRIFUGED OR FILTERED DELAWARE RIVER PLANT WATER SAMPLES

483.40618

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			Method Blank	Method Blank	Method Blank	Method Blank		
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	ND ^b	ND	ND	ND		
Benzyl chloride	GC/MS	8	ND	ND	ND	ND		
Benzyl alcohol	GC/MS	22	ND	ND	ND	ND		
Benzyl chloride	GC/MS	6	ND	ND	ND	ND		
Aroclor 1248	GC/MS	-	NA ^c	NA	NA	NA		
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS	10 ⁴	15	38	34	15		
2-Cl-phenol-d ₆	GC/MS	10 ⁴	69	63	78	56		
1,3-Cl ₂ -benzene-d ₆	GC/MS	10 ⁴	72	88	105	62		
Pyrene-d ₁₀	GC/MS	10 ⁴	99	93	112	72		
Chrysene-d ₁₂	GC/MS	10 ⁴	27	26	111	25		
HBC Extraction Method	-	-	2052	2071	2072	2004		
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01		

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cNA = not analyzed.

TABLE 33. RESULTS OF CAPILLARY GC/MS ANALYSES OF SELECTED DELAWARE RIVER PLANT WATER SAMPLES CONTAINING SEDIMENT

483.40618

March 7, 1983

Analyte	Analysis Method	L O D ^a	Sample Identification					
			SI-1	SI-2 Water	SI-3	45	Drum Sample	
			Concentration (µg/L)					
Benzaldehyde	GC/MS	16	6.9 x 10 ⁴	8.1 x 10 ⁴	6.4 x 10 ⁴	5.9 x 10 ⁴	8.3 x 10 ⁴	
Benzyl chloride	GC/MS	8	1.6 x 10 ³	6.4 x 10 ⁴	1.5 x 10 ⁵	2.7 x 10 ⁵	3.0 x 10 ⁵	
Benzyl alcohol	GC/MS	22	1.6 x 10 ³	8.8 x 10 ⁴	4.9 x 10 ⁴	2.9 x 10 ⁴	2.9 x 10 ⁴	
Benzal chloride	GC/MS	6	ND ^b	ND	ND	ND	8.0 x 10 ³	
Aroclor 1248	GC/MS	3x10 ³	ND	5.6 x 10 ³	4.4 x 10 ³	ND	2.3 x 10 ⁴	
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS	10 ⁴	18	6	31	8	-	
3-Cl-phenol-d ₄	GC/MS	10 ⁴	90	96	53	56	-	
1,2-Cl ₂ -benzene-d ₄	GC/MS	10 ⁴	102	85	38	51	-	
Pyrene-d ₁₀	GC/MS	10 ⁴	89	77	58	83	-	
Chrysene-d ₁₂	GC/MS	10 ⁴	8	68	27	68	-	
IMC Extraction Method	-	-	2099	2103	2104	2105	2106	
Sample Vol. Extracted (L)	-	-	0.01	0.01	0.01	0.01	0.01	

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

MONS 022565

TABLE 34. RESULTS OF CAPILLARY GC/MS ANALYSES OF SELECTED DELAWARE RIVER PLANT SEDIMENT SAMPLES

403.40610

March 7, 1983

Analyte	Analysis Method	L.O.D. ^a	Sample Identification					
			53-1 Sediment	54-1 Sediment				
			Concentration ^c (µg/L)					
Benzaldehyde	GC/MS	16	920	ND ^b				
Benzyl chloride	GC/MS	8	ND	ND				
Benzyl alcohol	GC/MS	22	6.1 x 10 ⁴	ND				
Benzal chloride	GC/MS	6	ND	ND				
Aroclor 1248	GC/MS	300	NA ^d	ND				
Surrogate Spiking Compound	Analysis Method	Amount added (µg/L)	Recovery (%)					
Phenol-d ₆	GC/MS	10 ⁴	33	18				
2-Cl-phenol-d ₆	GC/MS	10 ⁴	66	75				
1,2-Cl ₂ -benzene-d ₆	GC/MS	10 ⁴	73	80				
Pyrene-d ₁₀	GC/MS	10 ⁴	130	89				
Chrysene-d ₁₂	GC/MS	10 ⁴	159	25				
HHC Extraction Method	-	-	2070	2097				
Sample Vol. Extracted (L)	-	-	-	-				

^aL.O.D. = limit of detection in µg/L.

^bND = none detected with a detection limit given by the L.O.D. value for each compound.

^cConcentrations calculated assuming 0.01 L sample volume.

^dNA = not analyzed.

MONS 022566

APPENDIX A

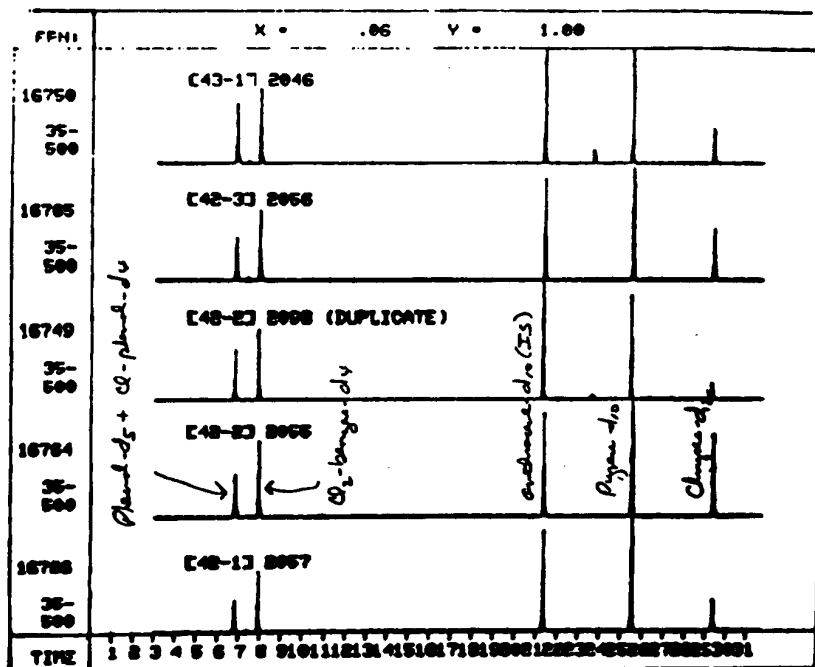


Figure 1

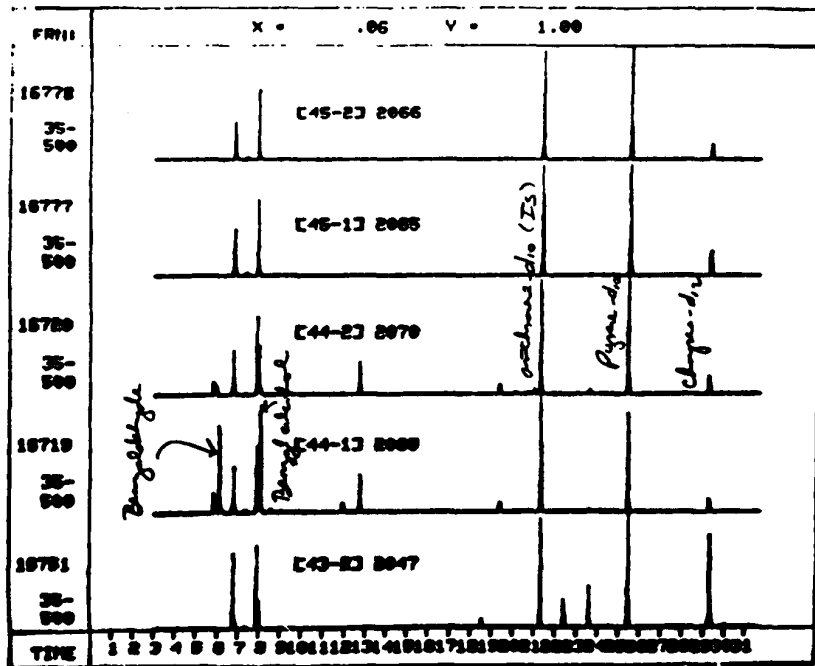


Figure 2

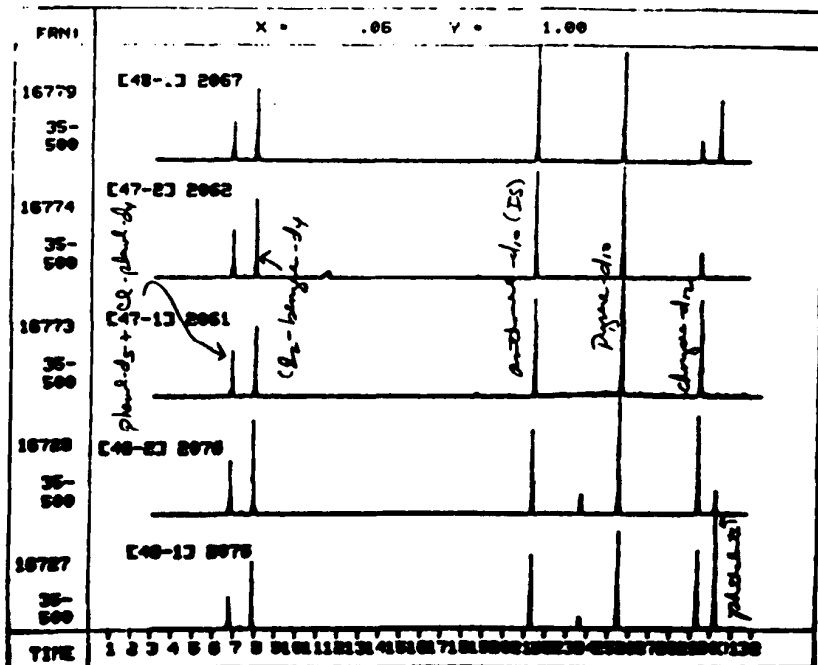


Figure 3

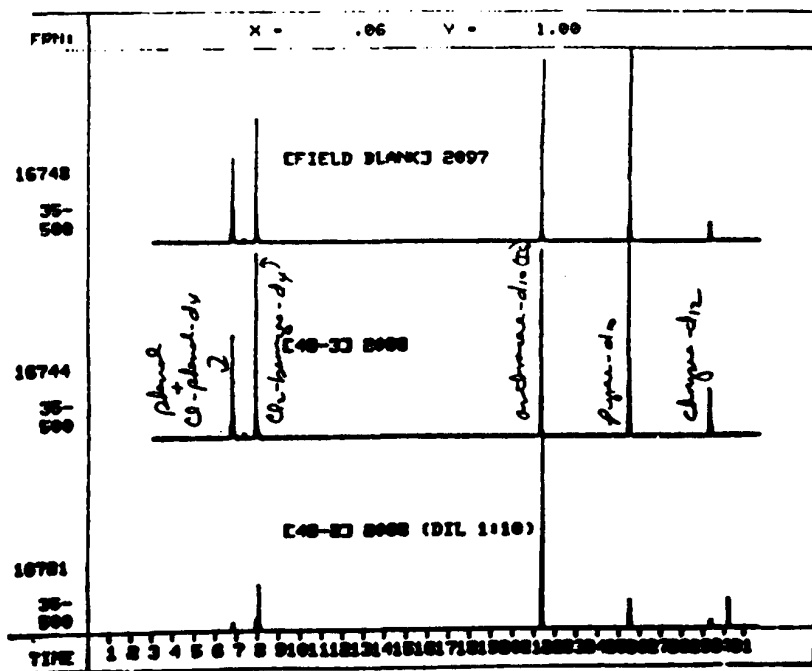


Figure 4

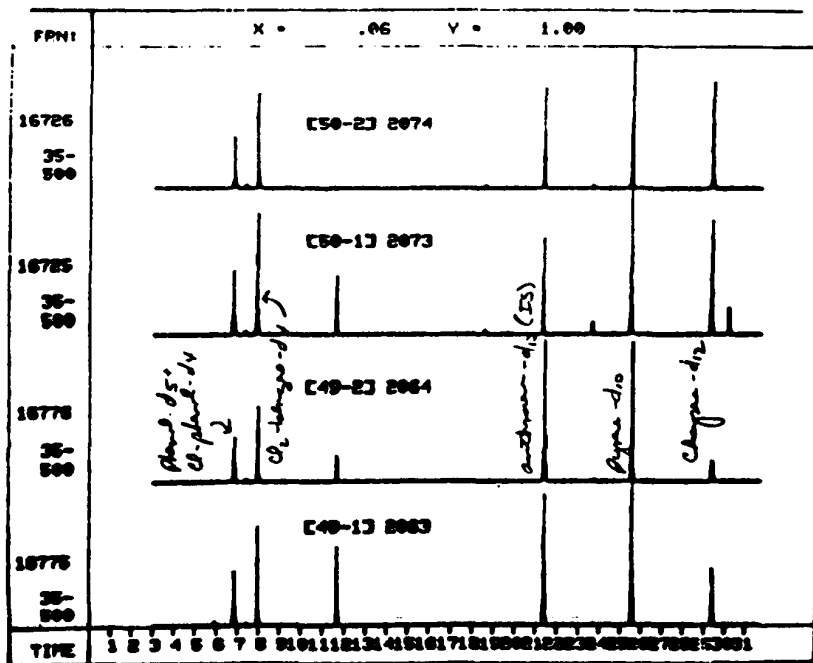


Figure 5

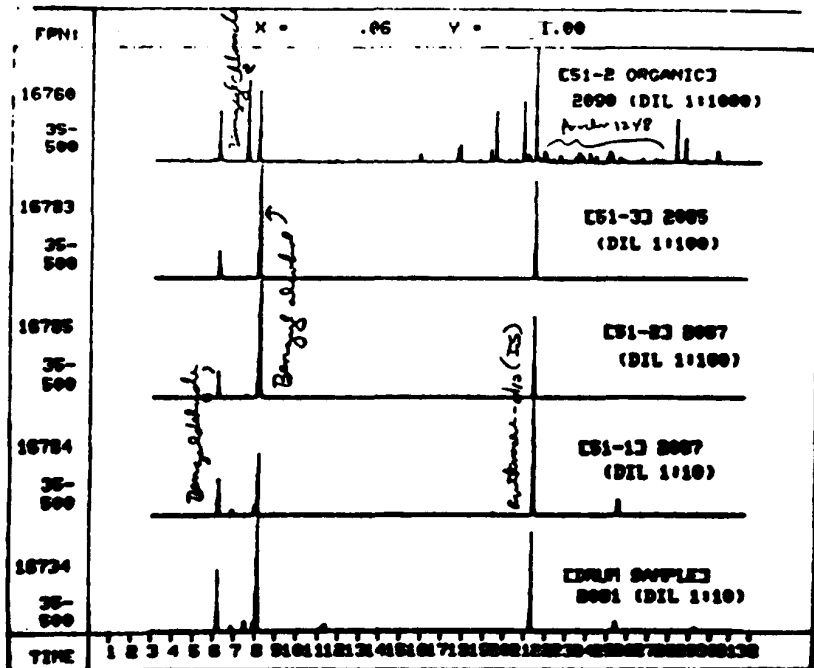


Figure 6

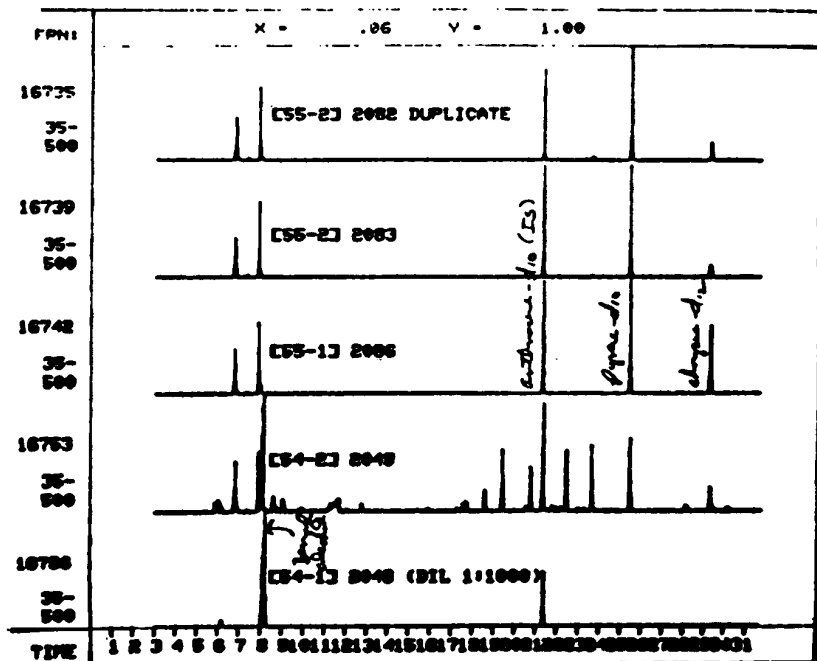


Figure 8

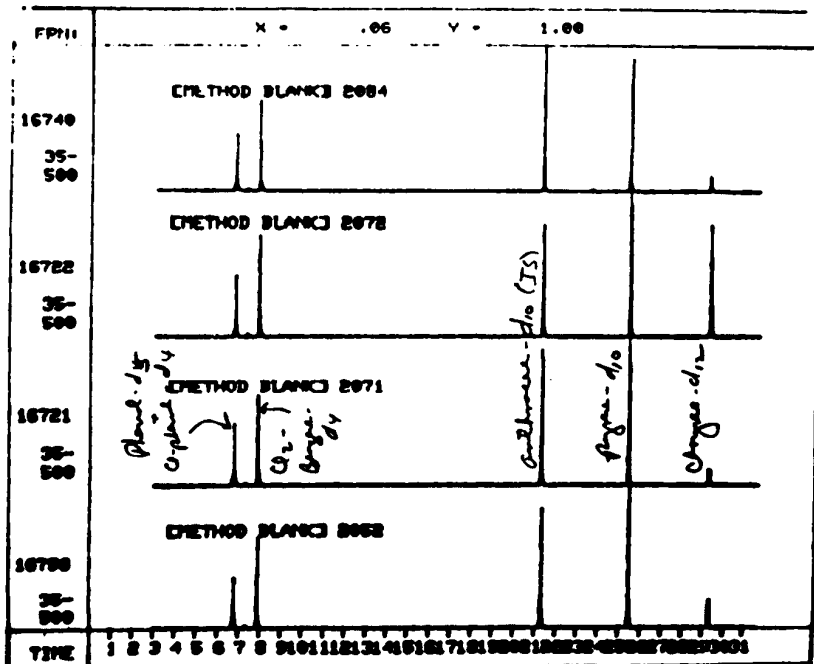


Figure 10

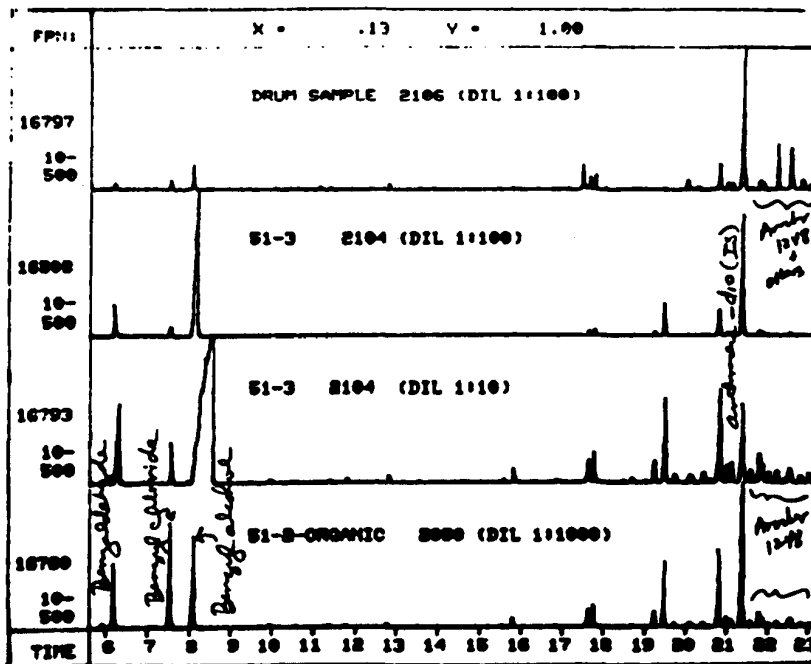


Figure 11

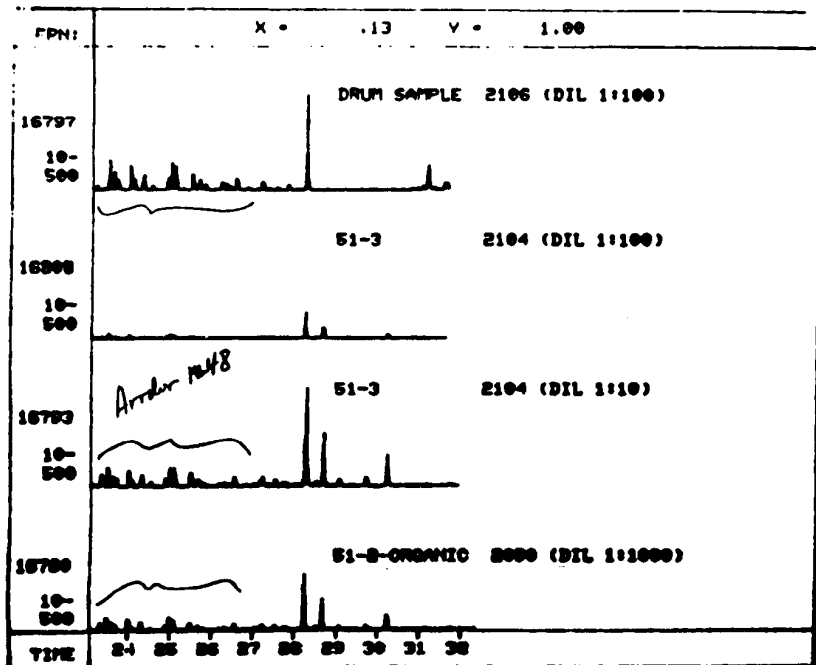


Figure 12

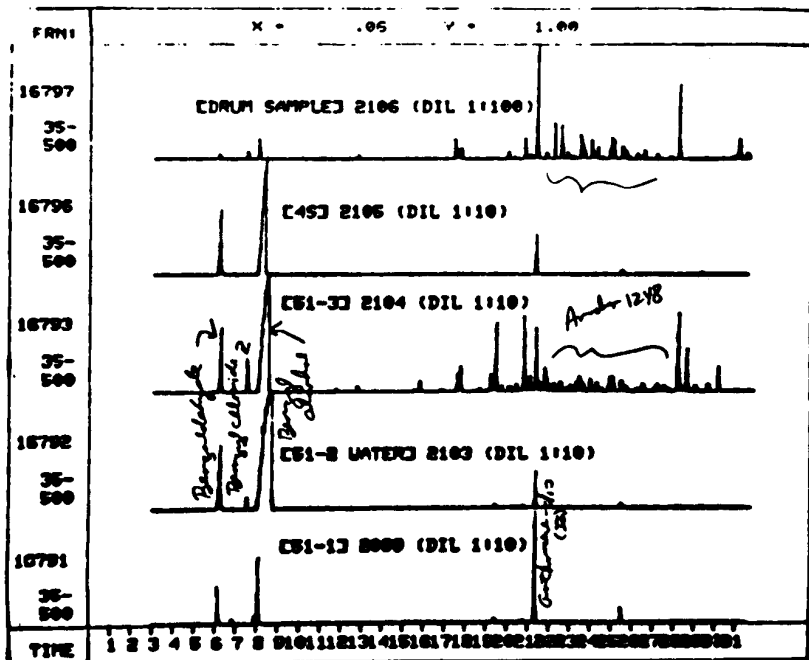


Figure 13

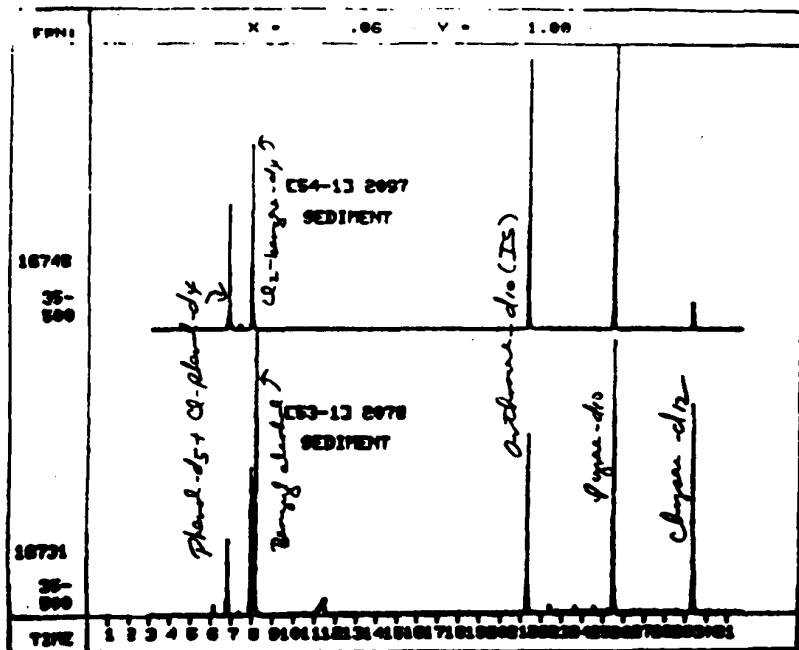


Figure 14

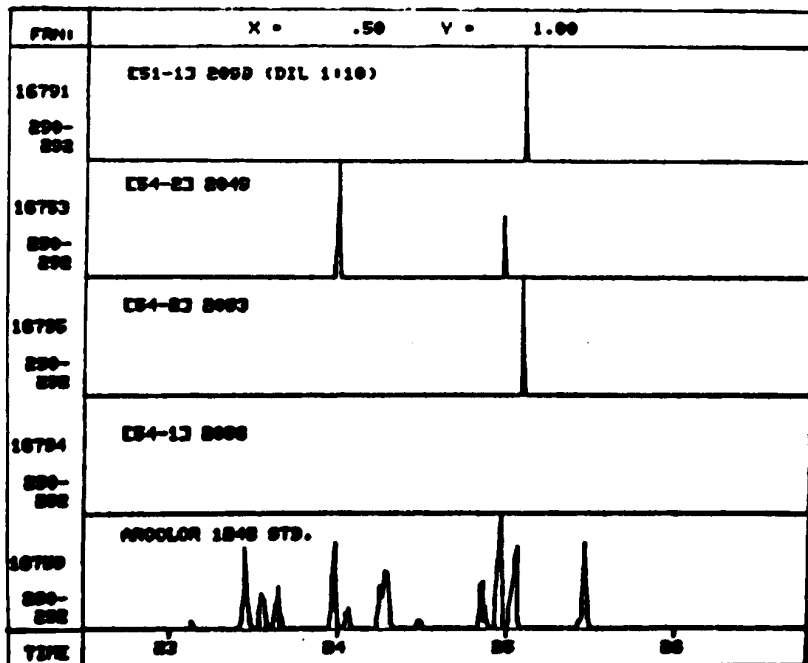


Figure 15

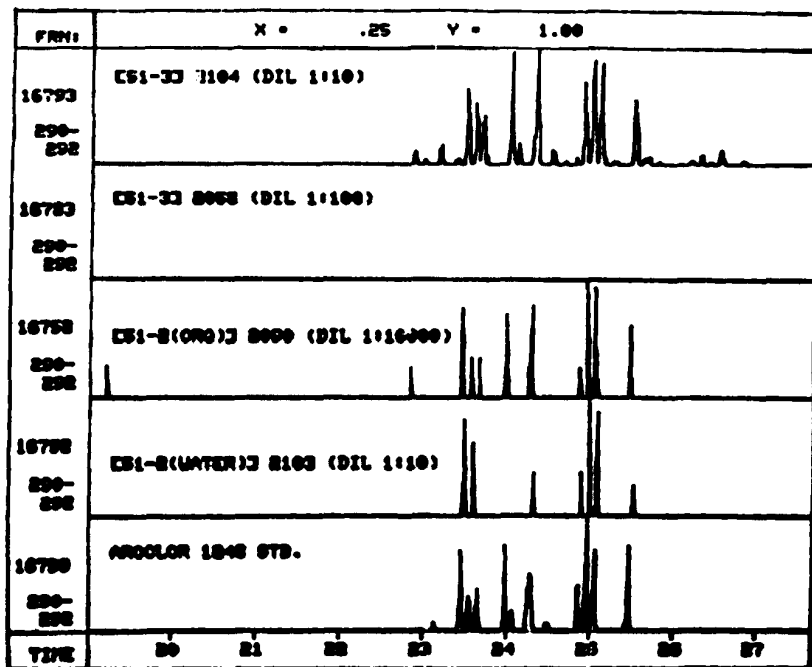


Figure 16

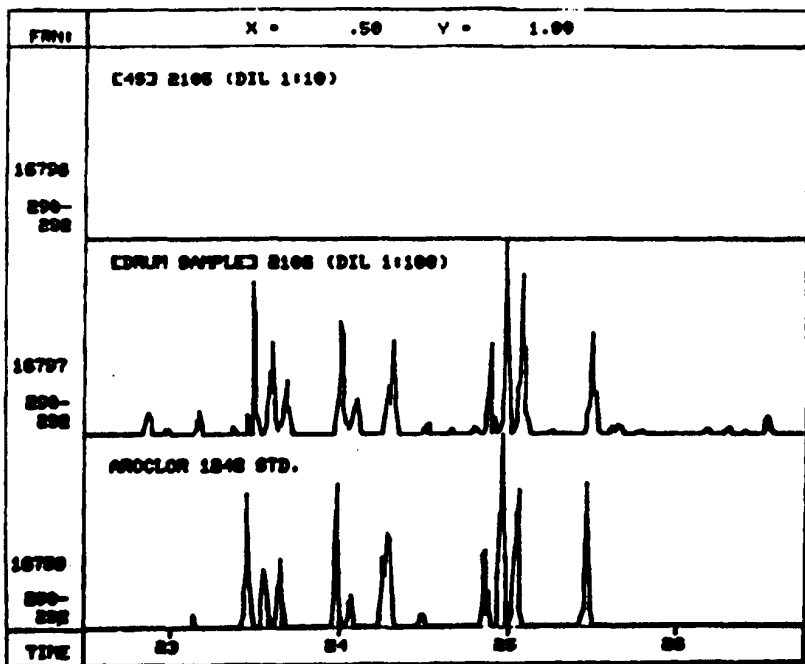


Figure 17

Monsanto

11497 COPY 1

MONSANTO RESEARCH CORPORATION / DAYTON LABORATORY / DAYTON, OHIO 45407

ESC - DAYTON

(DEPT / SECTION)

ANALYTICAL

TYPE OF REPORT

REPORT

REPORT NO: Addendum: MDA - 359

RECEIVED

JOB PROJECT NO: 483.4060

JAN 1

DATE 23 December 1983

PERIOD COVERED

MONSANTO-DAYTON
CENTRAL FILES

TITLE ANALYSIS OF SAMPLES FROM DELAWARE RIVER PLANT

AUTHORS F. D. Hileman

ABSTRACT: A sample previously submitted for analyses by the Delaware River Plant was analyzed for 2,3,7,8-TCDD and 2,3,7,8-TCDF. Results of this analysis is shown in this report.

Technical Approval

J. J. Brooks
J. J. Brooks
Research Group Leader

Approved By:

R. F. Ivory
R. F. Ivory
Environmental Sciences Center
Service Project Manager

Approval Date:

1-20-84

REPT. NO.: MDA - 359
AUTHORS: F. D. Hileman
TITLE: ANALYSIS OF SAMPLES FROM DELAWARE RIVER PLANT

COPY NO.: 4

FILE COPY
DO NOT DESTROY FILE

COMPANY CONFIDENTIAL

This document is the property of Monsanto Research Corporation and the recipient is responsible for its safekeeping and disposition. It contains CONFIDENTIAL INFORMATION which must not be reproduced, loaned to unauthorized persons or sent outside Monsanto Research Corporation and Monsanto Company without proper authorization.

MONS 022585

DISTRIBUTION

COPY NUMBER		ABSTRACT ONLY	
1	E. Jamro 1290	R. M. Scott	02B
2	R. F. Ivory 1250	H. A. Wolterman	1250
3	F. D. Hileman 1250		
4	Central Files 1250		
5	Technical Reports Library 1250		

NOTE: Distribution of this report is restricted. Requests for additional copies should be made through the principal contact at the Monsanto location involved or the Manager, Environmental Sciences Center, Dayton Laboratory, Dayton, Ohio.

ACKNOWLEDGEMENT

Contributions of the following Dayton Laboratory personnel to this project are gratefully acknowledged:

Analyses: F. D. Hileman
B. M. Hughes
D. Kirk

COMPANY CONFIDENTIAL

MONS 022586

A single sample labeled "Sample Point 51-2, 2-3-83" was received for the analysis of 2,3,7,8-tetrachlorodibenzo-p-dioxin (2378-TCDD) and 2,3,7,8-tetrachlorodibenzofuran (2378-TCDF). The sample had been assigned MRC log number 1-83-02-04-04.

The sample that was analyzed consisted of the bottom layer of a two phase sample. This layer was a dark organic layer with a very distinctive odor. The analysis of this layer proved to be quite a challenge. This is due to the significant amount of aromatics which were present. These compounds either eluted the TCDD and TCDF off the clean up column used to retain them in the clean up procedures or were so similar to TCDD and TCDF that they interfered in the final analysis.

The analyses were finally carried out by taking 1 gram of the lower layer organic and dissolving this in 100 mL of petroleum ether. One mL aliquots of this dilution were used for the sample, replicate, low spike (1 ppm) and high spike (10 ppm). All aliquots were spiked with $^{13}\text{C}_{12}$ -2378-TCDD and $^{37}\text{Cl}_2$ -2378-TCDF to serve as surrogates in the quantitative analyses.

These 1 mL aliquots were diluted with 40 mL of petroleum ether and then repeatedly partitioned against 30 mL portions of concentrated sulfuric acid until the sulfuric acid did not change color. After the sulfuric acid washes were completed the petroleum ether was partitioned against 50 mL of organic free water and then dried over anhydrous sodium sulfate. The samples were then passed through a multistage column consisting of (top to bottom) 2 grams of silica, 4 grams of 40% concentrated sulfuric acid on silica, one gram of silica, 2 grams of 36% KOH on silica and finally one gram of silica. This column was then flushed with an additional 50 mL of hexane with the entire effluent passing onto a Woelm B alumina column which retained the 2,3,7,8-TCDD. The Woelm column was eluted with 10 mL of 2% CH_2Cl_2 /hexane to elute PCBs and other

potential interferences and this fraction was discarded. This column was then eluted with 15 mL of 50% CH_2Cl_2 /hexane which was collected and concentrated to 50 mL and submitted for GC/MS analysis.

The GC/MS analyses were carried out on a Hewlett Packard 5985B GC/MS system. The gas chromatographic analyses were performed on a 30 meter DB-5 capillary column with the mass spectrometer operating in the selected ion monitoring mode. Quantitation was achieved by ratioing the observed amount of 2378-TCDD or 2378-TCDF to the isotopically labeled surrogates.

Table 1 shows the results of the analysis for 2378-TCDD. Table 2 shows the results for the analysis of 2378-TCDF. Note that in Table 2 the low and high spike values are comparable to the sample and replicate. This results from the fact that the spike levels were too low to be observed. The total amount of TCDFs present in one of the samples is also shown in Table 2. Figure 2 illustrates the actual ion traces showing that at least twelve TCDFs were present. Note that there are 38 possible tetrachlorodibenzofurans. It is possible that other TCDFs coelute with the 2378-TCDF and therefore the result given in Table 2 should be viewed as the maximum amount of 2378-TCDF which could be present.

TABLE 1. ANALYSIS OF "SAMPLE POINT 51-2"
FOR 2378-TCDD

<u>Sample</u>	<u>ppm 2378-TCDD found</u>	<u>ppm 2378-TCDD added</u>
Sample point 51-2	ND*	-
Sample point 51-2 (Rep)	ND	-
Sample point 51-2 (Spike)	.86	.96
Sample point 51-2 (Spike)	11.7	9.6
Method Blank	ND	
Method Detection limit	0.10	

ND = none detected at the method detection limit

TABLE 2. ANALYSIS OF "SAMPLE POINT 51-2"
FOR 2378-TCDF

<u>Sample</u>	<u>ppm</u> <u>2378-TCDF</u> <u>found</u>	<u>ppm</u> <u>TCDF</u> <u>added</u>
Sample point 51-2	60	-
Sample point 51-2 (Rep)	92	-
Sample point 51-2 (Spike)	69	1.4
Sample point 51-2 (Spike)	58	14
Method Blank	ND*	-
Method Detection Limit	0.10	

*ND = none detected at the method detection limit

<u>Sample</u>	<u>ppm</u> <u>Total TCDFs</u>
Sample point 51-2 (Rep)	382

MONS 022590