Hansen
NBH
3.2
47115

U.S. ENVIRONMENTAL PROTECTION AGENCY

DATE: 22 December 1986

SUBJ: Analysis of New Bedford Harbor Samples for PCBs

FROM: Michael D. Mullin, Ph.D.
Research Chemist, LLRS

TO: Mr. Frank Ciavettiri
Region I

I have enclosed the data summaries for the four (4) sample extracts analyzed at the Large Lakes Research Station for PCBs. The extracts were prepared by Dr. William Steinhauer at the Battelle lab in Duxbury and forwarded to me.

The data must be considered preliminary for several reasons. First, and foremost, there were no field and/or laboratory blanks sent with the sample extracts. This is not a major problem as these samples were intended only to provide the Region I staff with a sample of the detail that can be obtained using the analytical approach developed at Grosse Ile, and available through no other EPA laboratory. In this regard the analyses were successful. Second, the suspended solids concentrations were not available for the samples. This is needed in order to calculate the mass of PCB per mass of solids in the sample. Coupled with the concentration of PCB in the water itself (not done in this case but practicable with our technique), partition coefficients for <u>each</u> congener may be calculated. Third, there were no spiked samples included in this group. While this procedure may provide some insight into extraction efficiency, it is a very difficult procedure to perform with samples of this type. Fourth, there was a strong indication of the presence of sulfur in the sample extracts and, therefore, the extracts were treated with copper filings to remove the sulfur.

The details of the analytical procedure are in one of the attachments. Briefly, the use of two (2) long length, narrow bore, high resolution, thin film fused silica capillary columns with different polarities (to provide different elution times for the same compounds) yields comparable data for the full list of potential compounds of interest. The resultant data has a higher degree of confidence than is possible from each column alone. The use of electron capture detectors (ECD) provides a greater sensitivity than does mass spectrometry (MS), allowing the detection of much lower concentrations of <u>all</u> PCB congeners.

SDMS DocID 47115

The samples locations are unknown to me so I am unable to make any comments on the congener concentrations relative to the individual stations. The concentrations cover a broad range (over three (3) orders of magnitude) with the maximum value of approximately 3000 ng/L being quite high for a water column concentration.

I appreciated the opportunity to provide these specialized, high resolution analyses to you on these samples from New Bedford Harbor. I would be interested in discussing the possibility of additional analytical support to Region I in the future.

cc:
Charles Bering, Region I
William Steinhauer, Battelle
William Richardson, LLRS

NUMBERING OF PCB ISOMERS*

No.	Structure
	Monochlorobiphenyls
1	2
2	3
3	4
	Dichlorobiphenyls
4	2,2'
5	2,3
6	2,3'
7	2,4
8	2,4'
9	2,5
10	2,6
11	3,3'
12	3,4
13	3,4'
14	3,5
15	4,4'
	Trichlorobiphenyls
16	2,2',3
17	2,2',4
18	2,2',5
19	2,2',6
20	2,3,3'
21	2,3,4
22	2,3,4'
23	2,3,5
24	2,3,6
25	2,3',4
26	2,3',5
27	2,3',6
28	2,4,4'
29	2,4,5
30	2,4,6
31	2,4',5
32	2,4',6
33	2',3,4
34	2',3,5
35	3,3',4
36	3,3',5
37	3,4,4'
38	3,4,5
39	3,4',5
	Tetrachlorobiphenyls
40	2,2',3,3'
41	2,2',3,4
42	2,2',3,4'
43	2,2',3,5
44	2,2',3,5'
45	2,2',3,6
46	2,2',3,6'
47	2,2',4,4'
48	2,2',4,5
49	2,2',4,5'
50	2,2',4,6
51	2,2',4,6'
	Tetrachlorobiphenyls
52	2,2',5,5'
53	2,2',5,6'
54	2,2',6,6'
55	2,3,3',4
56	2,3,3',4'
57	2,3,3',5
58	2,3,3',5'
59	2,3,3',6
60	2,3,4,4'
61	2,3,4,5
62	2,3,4,6
63	2,3,4',5
64	2,3,4',6
65	2,3,5,6
66	2,3',4,4'
67	2,3',4,5
68	2,3',4,5'
69	2,3',4,6
70	2,3',4',5
71	2,3',4',6
72	2,3',5,5'
73	2,3',5',6
74	2,4,4',5
75	2,4,4',6
76	2',3,4,5
77	3,3',4,4'
78	3,3',4,5
79	3,3',4,5'
80	3,3',5,5'
81	3,4,4',5
	Pentachlorobiphenyls
82	2,2',3,3',4
83	2,2',3,3',5
84	2,2',3,3',6
85	2,2',3,4,4'
86	2,2',3,4,5
87	2,2',3,4,5'
88	2,2',3,4,6
89	2,2',3,4,6'
90	2,2',3,4',5
91	2,2',3,4',6
92	2,2',3,5,5'
93	2,2',3,5,6
94	2,2',3,5,6'
95	2,2',3,5',6
96	2,2',3,6,6'
97	2,2',3',4,5
98	2,2',3',4,6
99	2,2',4,4',5
100	2,2',4,4',6
101	2,2',4,5,5'
102	2,2',4,5,6'
103	2,2',4,5',6
104	2,2',4,6,6'
	Pentachlorobiphenyls
105	2,3,3',4,4'
106	2,3,3',4,5
107	2,3,3',4',5
108	2,3,3',4,5'
109	2,3,3',4,6
110	2,3,3',4',6
111	2,3,3',5,5'
112	2,3,3',5,6
113	2,2,3',5',6
114	2,3,4,4',5
115	2,3,4,4',6
116	2,3,4,5,6
117	2,3,4',5,6
118	2,3',4,4',5
119	2,3',4,4',6
120	2,3',4,5,5'
121	2,3',4,5',6
122	2',3,3',4,5
123	2',3,4,4',5
124	2',3,4,5,5'
125	2',3,4,5,6'
126	3,3',4,4',5
127	3,3',4,5,5'
	Hexachlorobiphenyls
128	2,2',3,3',4,4'
129	2,2',3,3',4,5
130	2,2',3,3',4,5'
131	2,2',3,3',4,6
132	2,2',3,3',4,6'
133	2,2',3,3',5,5'
134	2,2',3,3',5,6
135	2,2',3,3',5,6'
136	2,2',3,3',6,6'
137	2,2',3,4,4',5
138	2,2',3,4,4',5'
139	2,2',3,4,4',6
140	2,2',3,4,4',6'
141	2,2',3,4,5,5'
142	2,2',3,4,5,6
143	2,2',3,4,5,6'
144	2,2',3,4,5',6
145	2,2',3,4,6,6'
146	2,2',3,4',5,5'
147	2,2',3,4',5,6
148	2,2',3,4',5,6'
149	2,2',3,4',5',6
150	2,2',3,4',6,6'
151	2,2',3,5,5',6
152	2,2',3,5,6,6'
153	2,2',4,4',5,5'
154	2,2',4,4',5,6'
155	2,2',4,4',6,6'
156	2,3,3',4,4',5
157	2,3,3',4,4',5'
158	2,3,3',4,4',6
159	2,3,3',4,5,5'
160	2,3,3',4,5,6
	Hexachlorobiphenyls
161	2,3,3',4,5',6
162	2,3,3',4',5,5'
163	2,3,3',4',5,6
164	2,3,3',4',5',6
165	2,3,3',5,5',6
166	2,3,4,4',5,6
167	2,3',4,4',5,5'
168	2,3',4,4',5',6
169	3,3',4,4',5,5'
	Heptachlorobiphenyls
170	2,2',3,3',4,4',5
171	2,2',3,3',4,4',6
172	2,2',3,3',4,5,5'
173	2,2',3,3',4,5,6
174	2,2',3,3',4,5,6'
175	2,2',3,3',4,5',6
176	2,2',3,3',4,6,6'
177	2,2',3,3',4',5,6
178	2,2',3,3',5,5',6
179	2,2',3,3',5,6,6'
180	2,2',3,4,4',5,5'
181	2,2',3,4,4',5,6
182	2,2',3,4,4',5,6'
183	2,2',3,4,4',5',6
184	2,2',3,4,4',6,6'
185	2,2',3,4,5,5',6
186	2,2',3,4,5,6,6'
187	2,2',3,4',5,5',6
188	2,2',3,4',5,6,6'
189	2,3,3',4,4',5,5'
190	2,3,3',4,4',5,6
191	2,3,3',4,4',5',6
192	2,3,3',4,5,5',6
193	2,3,3',4',5,5',6
	Octachlorobiphenyls
194	2,2',3,3',4,4',5,5'
195	2,2',3,3',4,4',5,6
196	2,2',3,3',4,4',5,6'
197	2,2',3,3',4,4',6,6'
198	2,2',3,3',4,5,5',6
199	2,2',3,3',4,5,6,6'
200	2,2',3,3',4,5',6,6'
201	2,2',3,3',4,5,5',6'
202	2,2',3,3',5,5',6,6'
203	2,2',3,4,4',5,5',6
204	2,2',3,4,4',5,6,6'
205	2,3,3',4,4',5,5',6
	Nonachlorobiphenyls
206	2,2',3,3',4,4',5,5',6
207	2,2',3,3',4,4',5,6,6'
208	2,2',3,3',4,5,5',6,6'
	Decachlorobiphenyl
209	2,2',3,3'4,4',5,5',6,6'

*Adopted from Ballschmiter, K. and Zell, M., Fresenius Z. Anal. Chem., 302, 20-31 (1980).

14-Oct-86

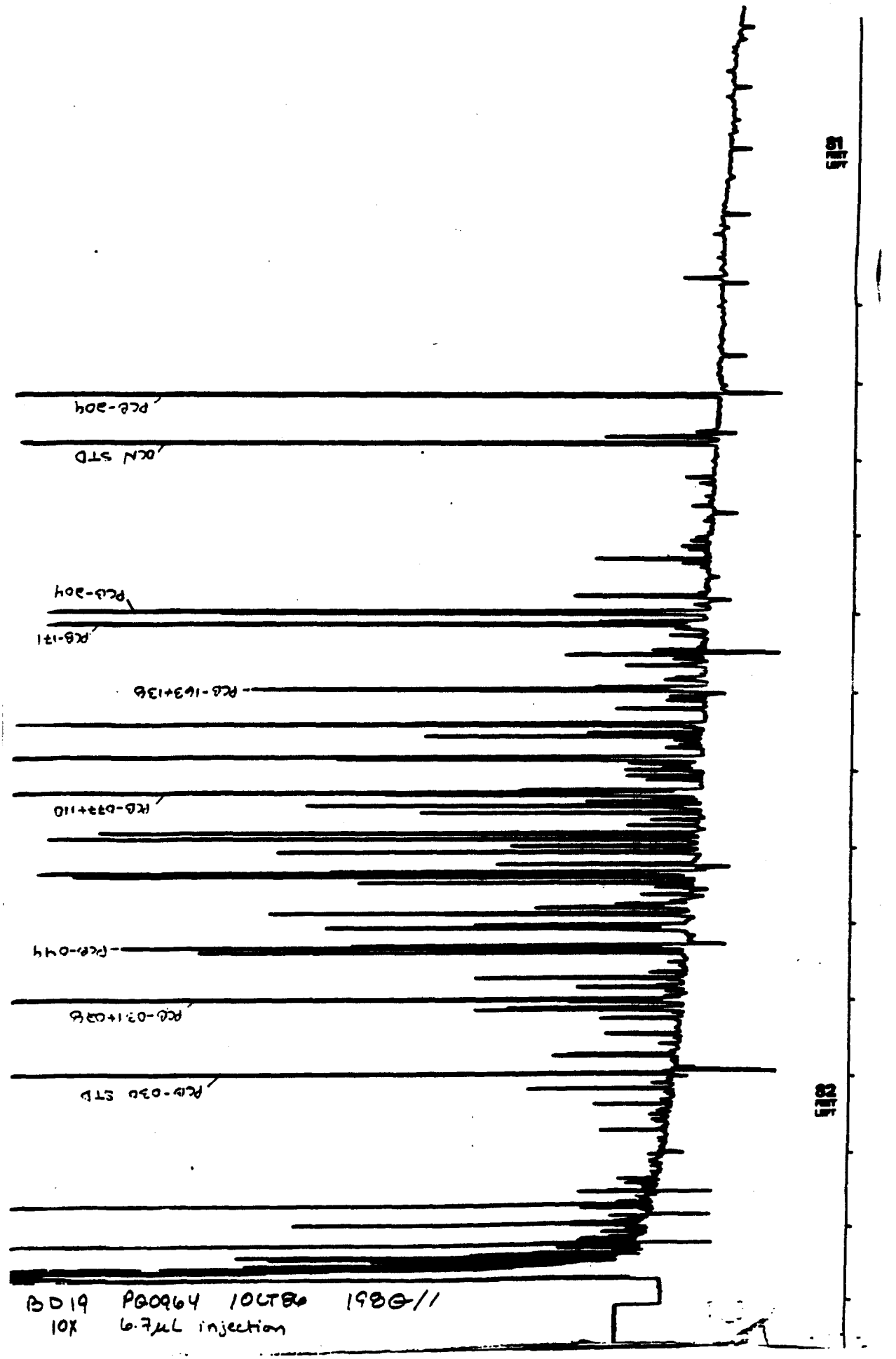
Congener	# Chorlines	BC67 Final Mean Conc'n ng/L	BC81 Final Net Conc'n ng/L	BD19 Final Net Conc'n ng/L	BC71 Final Net Conc'n ng/L
001	1				
003	1				
004	2				
010	2				
004+010(SUM)	2	3.400			
007	2	3.500		0.007	0.039
006	2	19.500	0.012	0.017	0.135
008+005(SUM)	2	87.000	0.031	0.270	0.810
019	3	3.425	0.006	0.011	0.022
012	2	1.750	0.001	0.008	0.016
013	2	5.150	0.003	0.010	0.018
012+013	2				
018	3	59.750	0.030	0.135	0.405
017	3	51.500	0.030	0.120	0.330
024	3				
027	3				
024+027(SUM)	3	6.600		0.014	0.044
016	3	11.000	0.012	0.033	0.110
032	3	42.500	0.026	0.108	0.330
029	3	0.878			0.008
026	3		0.026	0.170	
025	3		0.014		
031	3				
028	3				
031+028(SUM)	3	382.500	0.200	1.200	2.900
021	3	0.595			
033	3	42.500	0.046	0.140	0.425
053	4	15.000	0.006	0.037	0.076
051	4	4.550		0.015	
022	3	57.000	0.058	0.230	0.600
045	4	12.750	0.008	0.035	0.092
046	4	7.125	0.006	0.021	0.053
052	4	137.500	0.073	0.485	0.910
043	4	3.250	0.002	0.017	0.042
049	4	132.500	0.038	0.450	0.840
048	4	51.500	0.042	0.210	0.390
047	4	25.500	0.022	0.100	0.200
047+048(SUM)	4				
044	4	88.000	0.064	0.330	0.770
037	3	30.500		0.125	0.180
037+044	4				
042	4	34.000		0.140	
037+042(SUM)	3				
041+071(AVE)	4	48.500	0.036	0.200	0.390
064	4	50.000	0.033	0.210	0.460
064+(041+071(AVE	4				
040	4	12.000	0.014	0.053	0.120
100	5			0.037	
OCS	0				
100+OCS(SUM)	0				
063	4	4.550	0.008	0.025	0.063
074	4	44.750	0.065	0.225	0.635
070+076(SUM)	4	96.250	0.170	0.650	1.700
066	4	135.000	0.200	0.700	2.300
095	5	81.500	0.076	0.320	0.875
091	5				0.405
056+060(AVE)	4	50.000	0.074	0.370	0.740
092	5				
084	5				
092+084(SUM)	5	69.000	0.074	0.295	0.600
089	5	3.625			0.077
101	5	86.500	0.140	0.485	1.300
099	5			0.385	0.910
119	5				
083	5	6.075		0.035	0.081
097	5	35.250	0.041	0.185	0.420
081	4	7.500		0.033	
087	5	11.250	0.053	0.265	0.635
085	5	6.225	0.028	0.068	0.295

110	5	185.000	0.170	0.800	1.900
077+110(SUM)	5				
082	5	3.350	0.009	0.033	0.160
151	6	12.750	0.018	0.058	0.170
135	6	8.300	0.007	0.043	0.140
144	6	3.600	0.005		0.084
135+144(SUM)	6				
124	5	3.950			
147	6				
107	5	9.750			
149	6	60.000	0.083	0.310	0.910
118	5	92.500		0.570	
149+118(SUM)	6				
134+114(SUM)	6	12.250		0.053	0.180
131	6	0.685	0.002	0.006	0.018
146	6	15.500	0.033	0.093	0.270
132	6	6.900	0.027	0.063	0.340
153	6	110.000	0.213	0.530	2.200
153+132+105(SUM)	6				
153+132(SUM)	6				
105	5	3.500	0.077	0.150	0.940
105+146(SUM)	5				
141	6	4.925	0.012	0.039	0.175
137	6	2.800		0.023	0.130
176 (CALC)	7				
137+176(SUM)	6				
130	6	2.500			
130+176(SUM)	6				
163+138(SUM)	6	44.750	0.210	0.400	2.050
158	6	10.275	0.027	0.077	0.280
129	6	3.950	0.004	0.029	
178	7	2.500	0.017	0.040	0.100
129+178(SUM)	7	2.050			
175	7	0.390	0.001	0.004	0.014
187+182(AVE)	7	9.100	0.017	0.047	0.150
183	7	3.800	0.010	0.026	0.115
128	6	7.350			
187+182(AVE)+128	7				
167	6				
185	7	0.523		0.055	0.016
174	7	3.050	0.010	0.021	0.105
177	7	2.075	0.006	0.014	0.084
171	6	5.000		0.030	0.170
156	6	8.300			
171+156(SUM)	6				
173	7				0.034
157	6	0.200	0.010	0.025	0.120
200	8	0.515	0.002	0.300	0.007
157+200(SUM)	8				
172	7	1.150	0.004		0.046
197	8	0.260			
172+197(SUM)	7				
180	7	11.000	0.034	0.064	0.315
193	7	1.075			0.009
191	7	0.708	0.001		0.006
199	8	0.238	0.001		0.005
169	6	0.240			
170	7	9.400	0.034	0.063	0.330
190	7	1.900	0.004	0.008	0.049
170+190(SUM)	7				
198	8	0.277	0.001	0.003	0.006
201	8	3.025	0.008	0.020	0.074
203	8	2.550	0.005	0.012	
196	8	1.400		0.010	
203+196(SUM)	8				0.067
189	7	0.753		0.006	0.011
195	8	1.125	0.003	0.005	0.025
207	9	0.343		0.004	
194	8	1.900	0.006	0.011	0.042
205	8	0.275			0.005
206	9	2.050	0.005	0.012	0.041
209	10				

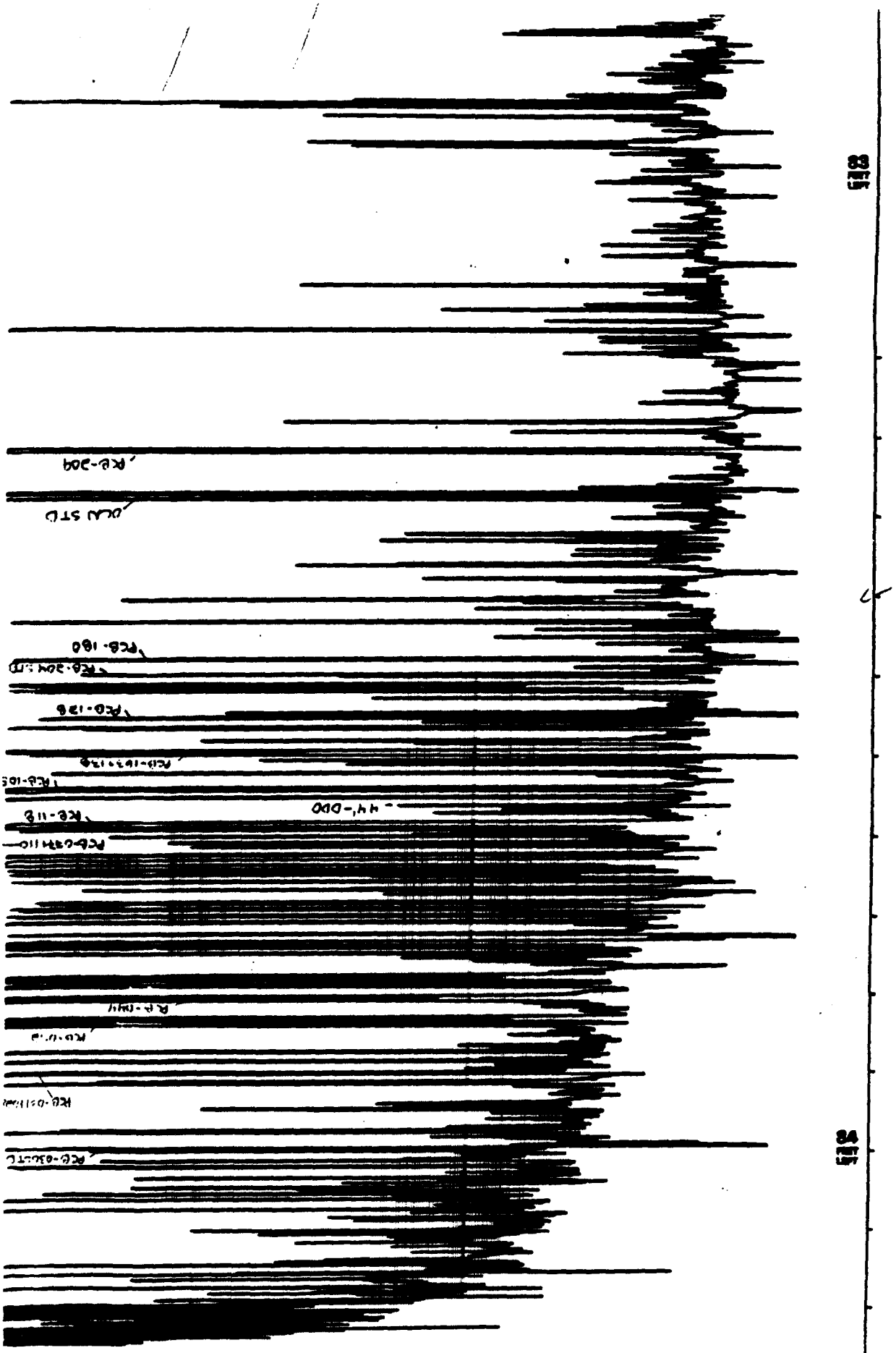
HOMOLOGS		PERCENT		PERCENT		PERCENT		PERCENT
Mono	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000
Di	120.300	4.37	0.047	1.645	0.312	2.368	1.018	2.980
Tri	688.748	25.02	0.447	15.625	2.286	17.375	5.354	15.672
Tetra	977.675	35.52	0.872	30.514	4.393	33.390	10.190	29.828
Penta	577.475	20.98	0.669	23.393	3.628	27.576	8.598	25.168
Hexa	325.125	11.81	0.657	23.006	1.815	13.792	7.347	21.505
Hepta	49.473	1.80	0.136	4.767	0.348	2.641	1.384	4.051
Octa	11.565	0.42	0.026	0.892	0.361	2.740	0.231	0.676
Nona	2.393	0.09	0.005	0.157	0.016	0.118	0.041	0.119
Deca (PES)	0.000	0.00	0.000	0.000	0.000	0.000	0.000	0.000

DATA REPORT: The data are presented as (1) the concentration of the individual PCB congener or other compound observed in the sample. Units are in mass per mass or mass per volume. ppm, ppb, etc., are <u>not</u> used since they can be imprecise and are ambiguous. The sums of the concentrations of isomeric congeners, or homologs (i.e., congeners with the same number of chlorines per biphenyl molecule) are also calculated and the total of all PCB congeners is then determined. No reference is made in the data summary to 'Aroclors' as they have no analytical meaning in environmental samples since these samples normally consist of PCB congeners derived from more than one Aroclor mixture and each of the component congeners will have been subjected to many factors which can affect its relative concentration (e.g., volatility, metabolic degradation, partitioning into biota and/or sedimentary material). The data as presented are more meaningful when used to evaluate the transport and/or fate of these materials within a given study area since they are specifically determined values are not approximations based on 'best fits' or operator estimation. Also, when laboratories attempt to report PCB concentrations as approximating so much Aroclor 12XX, the reference libraries may not contain all of the congeners that are present in the sample and, thereby, bias the analytical determination by the selection of incomplete, or improper, reference standard mixtures.

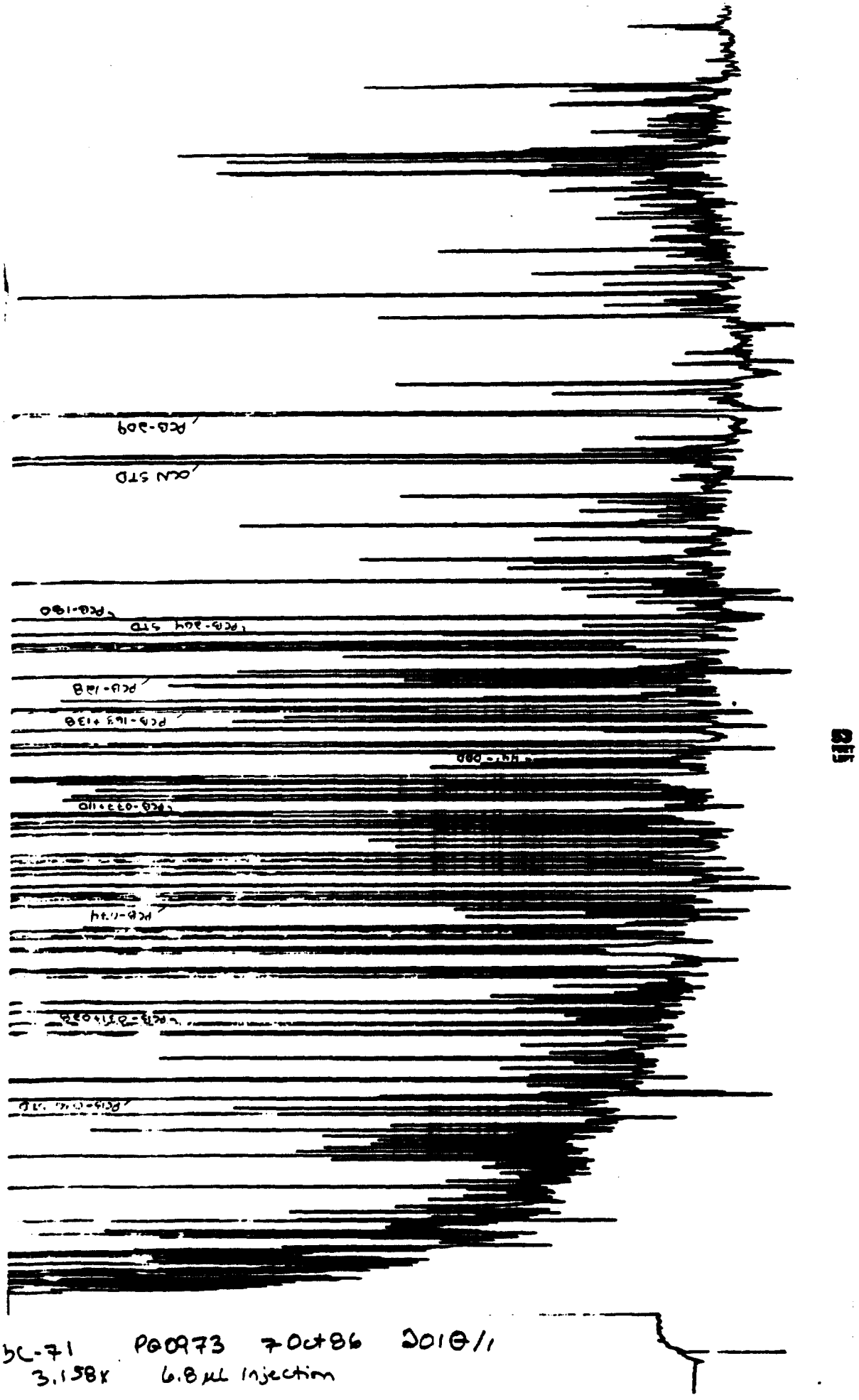
22 December 1986
MDM



BD19 PG0964 10CT86 198G//
10X 6.7μL injection



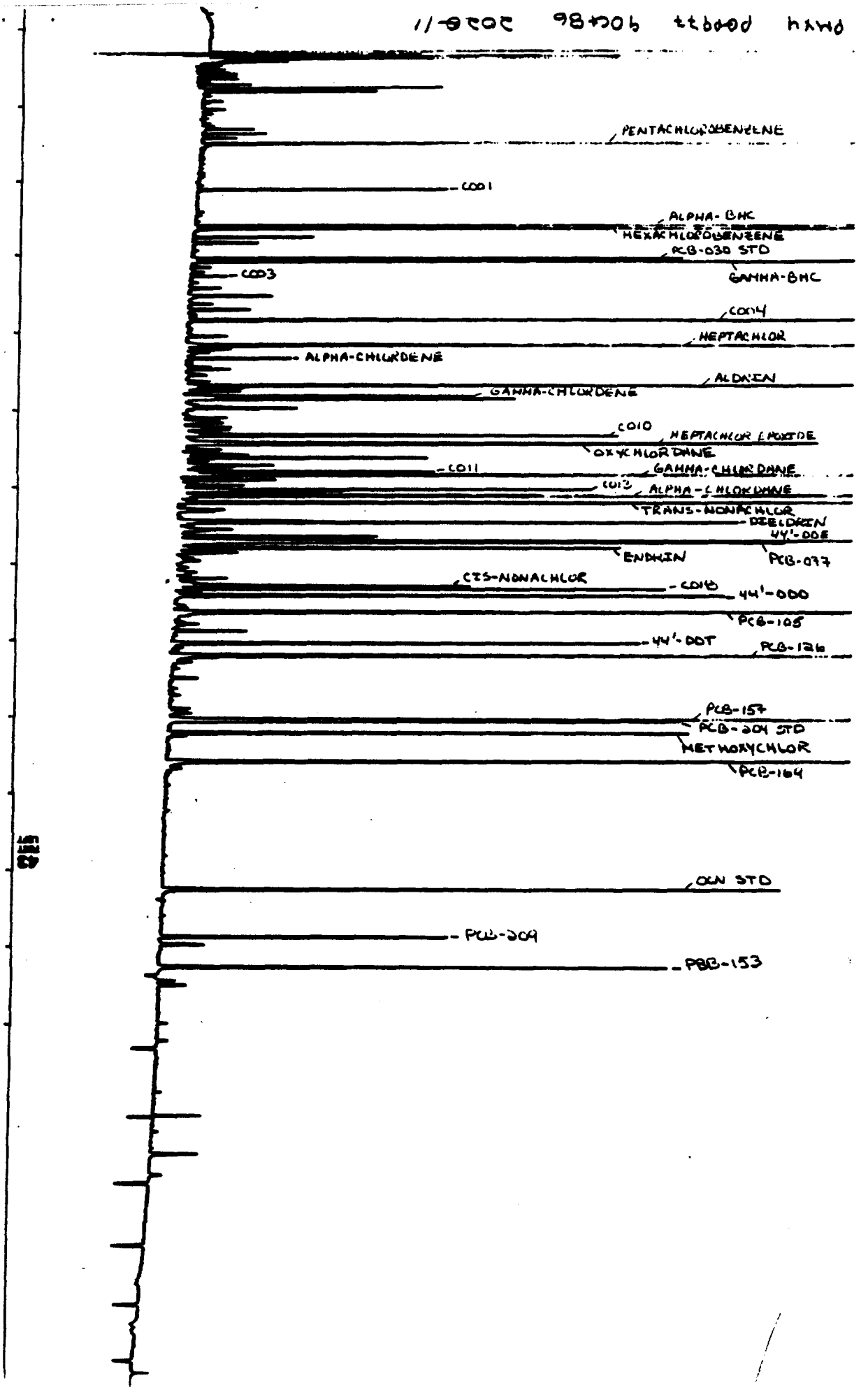
BC81 PG0963 10CT86 1980/1
1X 6.6μL injection



BC-71 PQ0973 7 Oct 86 2018/1
3.158x 6.8 µL Injection

BC-67A PB0956 29SEP86 1970/1
94X RIE05620IPE1 6.6µL injection 1.75G

Mix 20 PG0976 90486 2020.11


PENTACHLOROBENZENE
C001
ALPHA-BHC
HEXACHLOROBENZENE
PCB-030 STD
C003
GAMMA-BHC
C004
HEPTACHLOR
ALPHA-CHLORDENE
ALDRIN
GAMMA-CHLORDENE
C010
HEPTACHLOR EPOXIDE
OXYCHLORDANE
C011
GAMMA-CHLORDANE
C013
ALPHA-CHLORDANE
TRANS-NONACHLOR
DIELDRIN
44'-DDE
ENDRIN
PCB-077
CIS-NONACHLOR
C016
44'-DDD
PCB-105
44'-DDT
PCB-126
PCB-157
PCB-209 STD
METHOXYCHLOR
PCB-169
OCN STD
PCB-209
PCB-153