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PE808199

AMBERJACK 1

ANALYSIS OF WATER SAMPLES FOR HYDROCARBONS

by

Robyn J. Klepetko

May 1990

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Amberjack 1 - Analysis of Water Samples for Hydrocarbons

R. J. Klepetko

1. INTRODUCTION

Three water samples from depths 1276m, 1480m and 1482m in the Amberjack well were analysed in these Laboratories for the presence of hydrocarbons. The results of analysis are summarised in this Technical Note.

2. EXPERIMENTAL PROCEDURES

Any organic matter present in the water samples was extracted using dichloromethane, and the extract yield determined. The extracted material was then analysed using the technique of gas chromatography. Full details of the experimental procedures used in sample extraction and analysis are outlined in Appendix 1.

3. RESULTS AND DISCUSSION

From the analyses performed, the following information was obtained for the samples and is included in this report:

- * extract yield data (Table 1)
- * whole extract gas chromatograms (Figure 1)
- * raw peak areas for the n-alkanes, pristane and phytane, calculated from the whole extract gas chromatograms (Appendix 2)
- * geochemical parameters calculated from the whole extract raw peak areas (Table 2).

The following observations can be made from the accompanying Tables and Figure:

- * the yields of organic matter extracted from the three water samples are quite low, ranging from 94 to 264ppm.

* for each sample, the extract material displays a compound distribution typical of mature oil (Figure 1). The n-alkanes predominate, and pristane and phytane levels are low relative to nC17 and nC18 respectively.

* the extracts all have similar compound distributions, although the 1482m sample appears to contain more low molecular weight compounds. Possibly this material has been lost from the other two samples during sample handling and preparation for analysis.

* the samples display similar values for the calculated geochemical parameters (Table 3), except for the $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratio. The different values for this parameter may be due to the weak nature of the GC runs, leading to difficulties in accurately integrating peaks. The moderate pristane/phytane ratios suggest slightly oxidising conditions during deposition of the sediments sourcing the extract material. The low pristane/nC17 and phytane/nC18 ratios and the CPI values of around 1 probably reflect the maturity of the extracts.

* the levels of pristane in the extracts, whilst lower than the levels of nC17, are quite high. This is typical of Gippsland Basin oils.

The geochemical parameters calculated from saturate fraction GC analysis of a number of Gippsland Basin oils are provided in Table 3 for comparison with the Amberjack extracts. The oils and extracts display similar values for most of the calculated geochemical parameters. Ignoring the $(C_{21}+C_{22})/(C_{28}+C_{29})$ ratios, the extracts appear most similar to the Luderick 1 oil. This is largely because of the similar pristane/phytane ratios. The Tarwine 1 oil in particular differs from the extracts in that it has a considerably higher value for this parameter.

4. SUMMARY

The three water samples analysed from Amberjack 1 were found to contain low levels of hydrocarbons. Analysis by gas chromatography showed the hydrocarbon distributions in the samples to be broadly similar, resembling mature oil. A comparison of the geochemical parameters calculated from the GC data with those obtained from saturate GC analysis of

several Gippsland Basin oils showed the hydrocarbons from the water samples to be most similar to oil from the Luderick 1 well.

5. ACKNOWLEDGEMENTS

Thankyou to Miss Josephine Brennan for acquiring the GC data and to Dr. Evan Evans for reviewing this Technical Note.

TABLE 1 Yields of Organic Matter Extracted from Amberjack 1 Water Samples.

WELL:		AMBERJACK 1	
DEPTH 1 :	1276	1480	1482.1
DEPTH 2 :	1276	1480	1482.1
AV. DEPTH :	1276	1480	1482.1
SAMPLE TYPE :	WATER	WATER	WATER
RUN NUMBER :	3	4	2
DATA BASE NUMBER :	902207	902209	902208
EXTRACT WEIGHTS			
WEIGHT OF LIQUID (g)	500	500	500
WEIGHT OF EXTRACT (g)	0.0472	0.0826	0.132
CALCULATED YIELDS			
% EXTRACT YIELD	0.009	0.017	0.026
ppm EXTRACT	94	165	264

TABLE 2 Geochemical Parameters Calculated from Whole Extract GC Traces.

WELL: AMBERJACK 1			
DEPTH 1:	1276	1480	1482
DEPTH 2:	1276	1480	1482
AV DEPTH:	1276	1480	1482
LOCATION :	GIPPS BASIN	GIPPS BASIN	GIPPS BASIN
TYPE:	WATER	WATER	WATER
TEST:	RUN#3	RUN#4	RUN#2
DATA BASE NUMBER:	902207	902209	902208
RAW FILE:	RC0359	RC0357	RC0356
PRISTANE/PHYTANE:	2.47	2.00	2.93
PRISTANE/NC17 :	0.79	0.58	0.92
PHYTANE/NC18 :	0.34	0.27	0.32
(C21+C22)/(C28+C29):	6.06	4.05	2.27
CPI(1) :	1.00	1.05	1.11
CPI(2) :	1.20	1.06	1.07
CPI(3) :	1.01	0.81	1.45
CPI(4) :	1.01	1.06	1.13

NOTE:

$$CPI(1) = \frac{[(nC23+nC25+nC27+nC29)+(nC25+nC27+nC29+nC31)]}{2(nC24+nC26+nC28+nC30)}$$

$$CPI(2) = \frac{[(nC23+nC25+nC27)+(nC25+nC27+nC29)]}{2(nC24+nC26+nC28)}$$

$$CPI(3) = \frac{2(nC27)}{(nC26+nC28)}$$

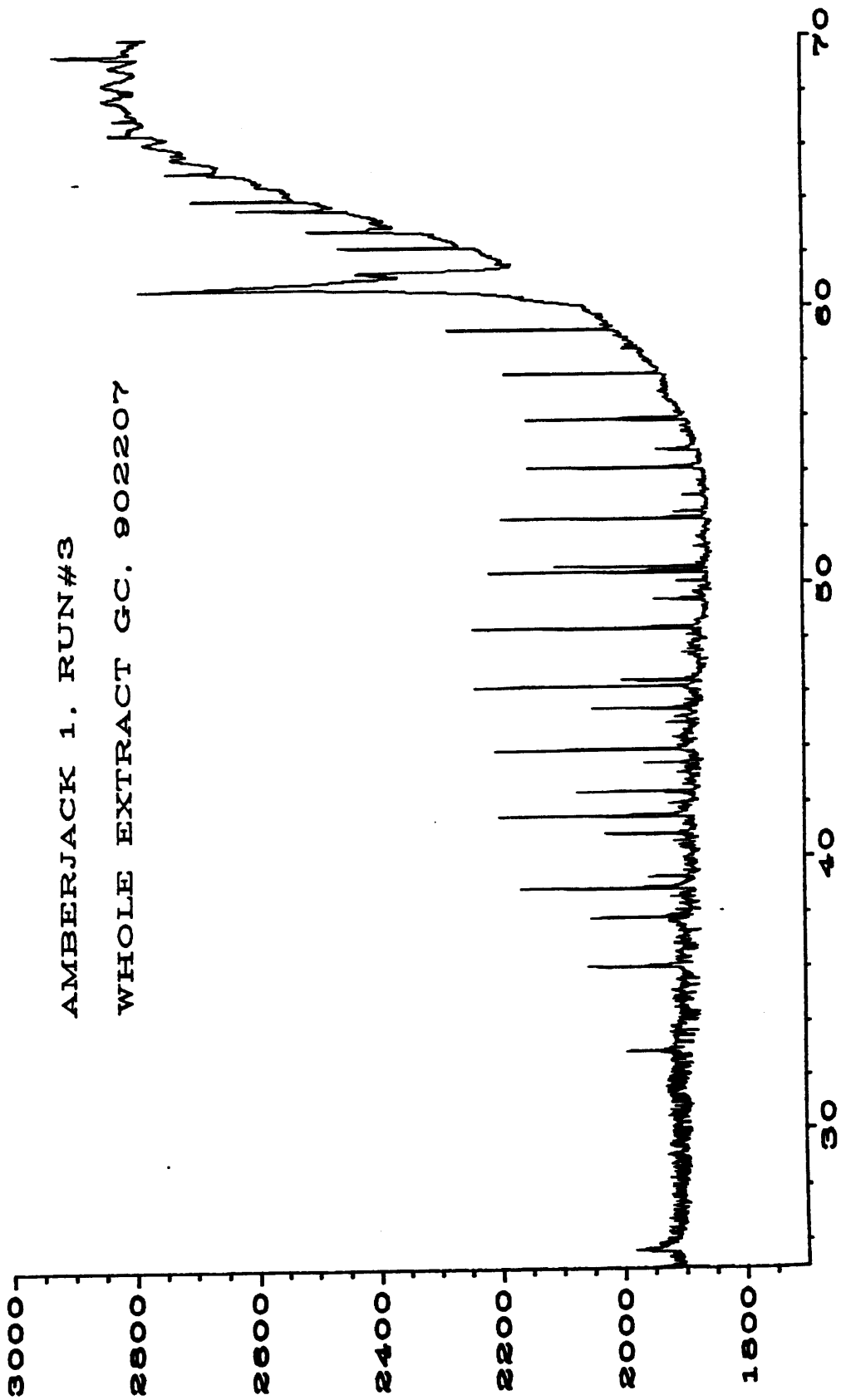
$$CPI(4) = \frac{[2(nC25+nC27+nC29)]}{[nC24+2(nC26+nC28)+nC30]}$$

TABLE 3⁻ Geochemical Parameters Calculated from the Saturate Fraction GC Traces for some Gippsland Oils.

WELL :	BREAM 5	LUDERICK 1	TARWHINE 1
DEPTH 1 :	1940.0	1843.0	1398.0
DEPTH 2 :	1940.0	1843.0	1400.5
AV. DEPTH :	1940.0	1843.0	1399.3
LOCATION :	GIPPS BASIN	GIPPS BASIN	GIPPS BASIN
TYPE :	OIL	OIL	OIL
TEST :	RFT#3	RFT#6/41	PT#2
DATA BASE NUMBER :	860015	860076	860124
PRISTANE/PHYTANE:	3.42	2.88	5.78
PRISTANE/NC17 :	0.65	0.64	0.76
PHYTANE/NC18 :	0.20	0.24	0.16
(C21+C22)/(C28+C29):	6.37	4.94	-
CPI(1) :	1.04	1.02	-
CPI(2) :	1.05	1.00	-
CPI(3) :	1.13	1.15	-
CPI(4) :	-	-	-

FIGURE 1

WHOLE EXTRACT GAS CHROMATOGRAMS FOR
AMBERJACK 1 SAMPLES ANALYSED.



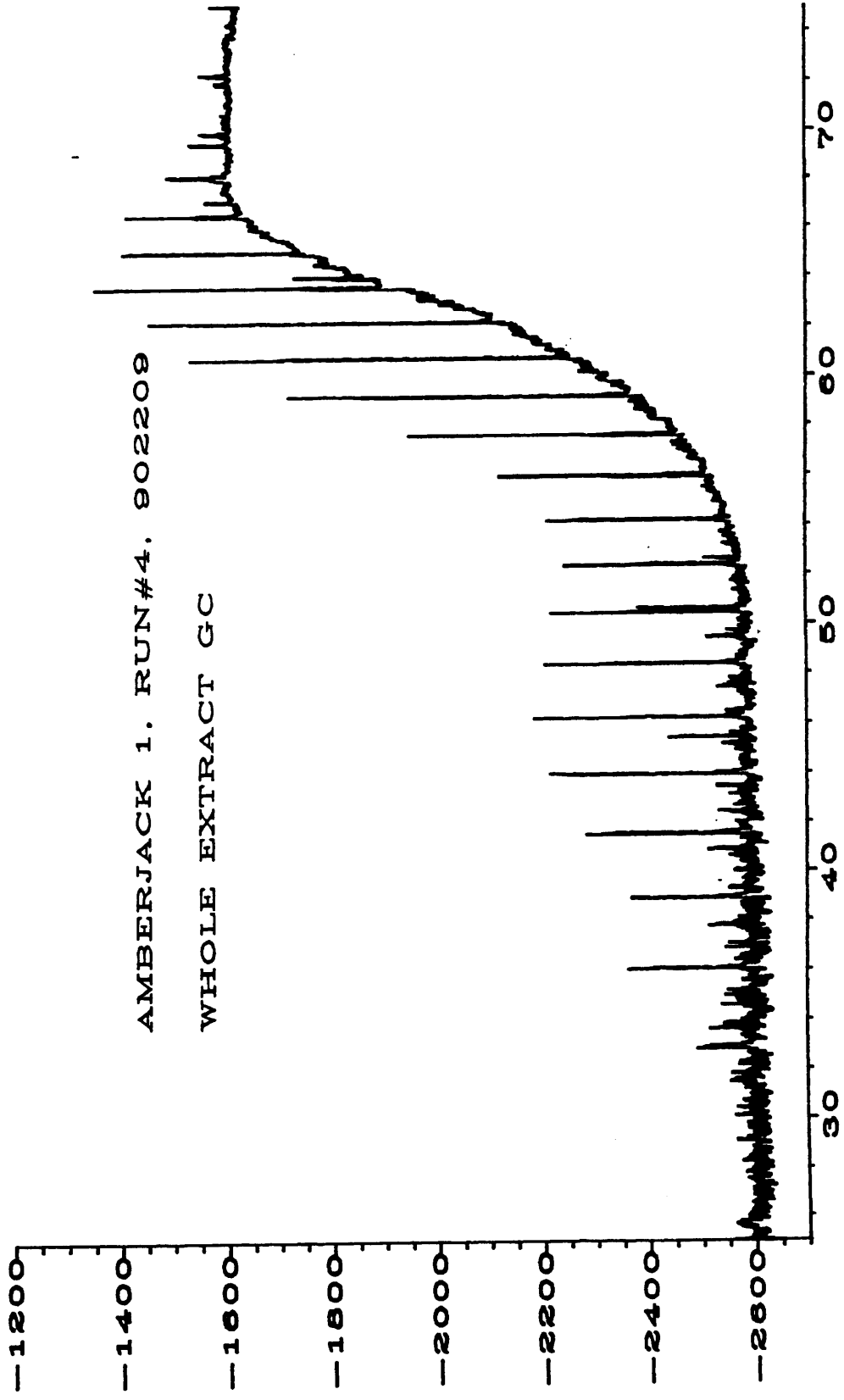
SIG. 1 IN A:\RC0369.D

FIGURE 1A Whole extract gas chromatogram for Amberjack 1, Run#3, 1276.0m.

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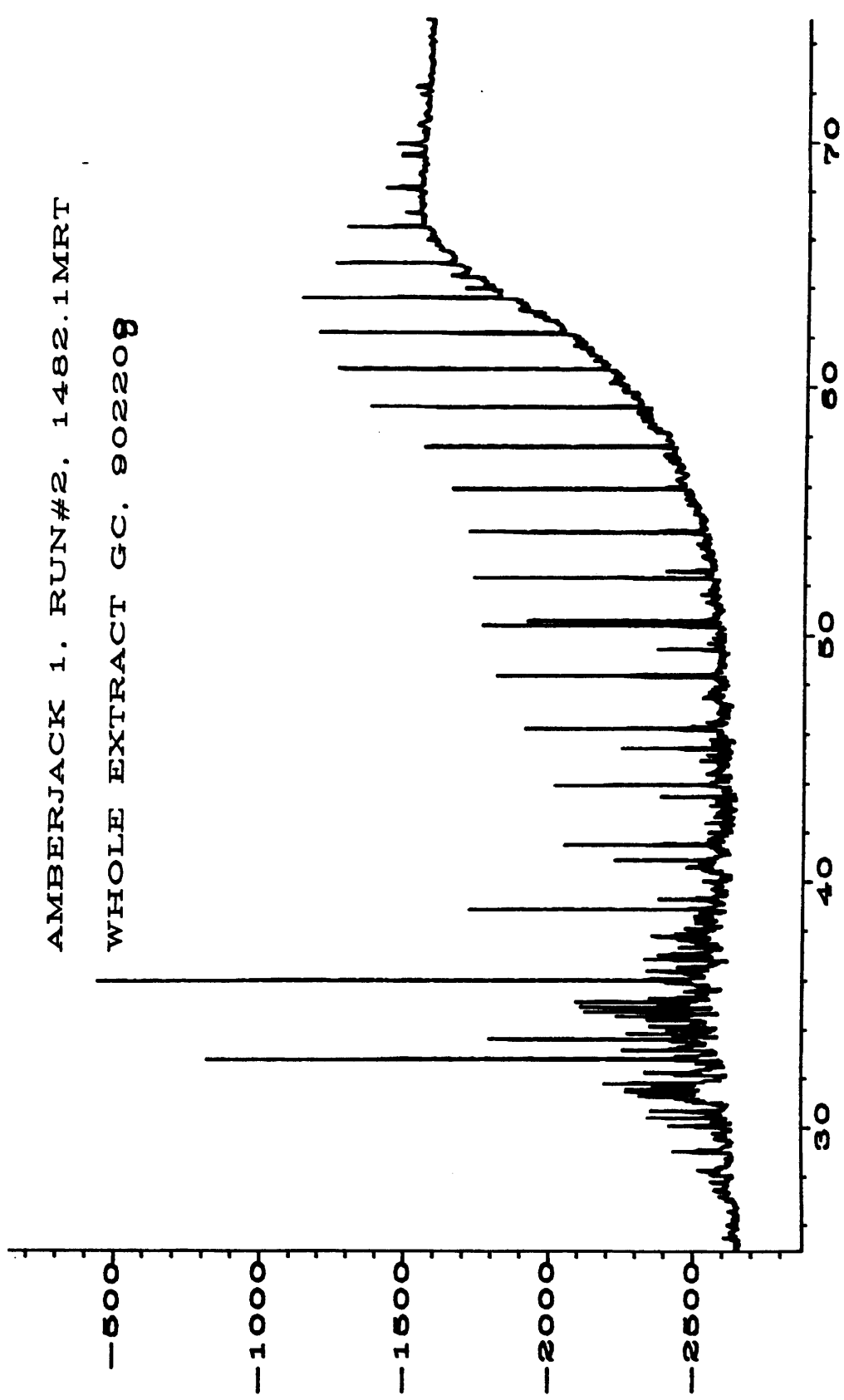
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* j 11 33333 55555
* 1 3 5
* jj 1 3 5555
* j 1 3 5
* j 1 3 5
* j 1 3 3 5 5
* j 111 333 555
* j j
* jjj

*
* L SSS TTTT
* L S S T
* L S T ::
* L SSS T ::
* L S T
* L S S T ::
* LLLL SSS T ::



SIZ. 1 IN A:\RC0367.D

FIGURE 1B Whole extract gas chromatogram for Amberjack 1, Run#4, 1480.0m.



S1E. 1 1F A:\RC0356.D

FIGURE 1C Whole extract gas chromatogram for Amberjack 1, Run#2, 1482.1m.

APPENDIX 1

EXPERIMENTAL PROCEDURES

Solvent Extraction

In each case, the water sample (approximately 500ml) was extracted with dichloromethane (3x100ml) in a 2L separating funnel. The extract was collected in a round bottomed flask and the solvent removed using a rotary evaporator, until only a small volume of liquid remained in the flask (2-3ml). The sample was then diluted with dichloromethane (40ml), and anhydrous magnesium sulfate added to remove any traces of water. The mixture was filtered and the filtrate volume reduced using the rotary evaporator before transferring into a weighed vial and taking to dryness.

Sulfur Removal

One sample (Run#3, 1276m) contained sulfur. This was removed by dissolving the sample in dichloromethane (1ml) and filtering through a pasteur pipette packed with copper turnings (the copper was freshly activated by treatment with dilute hydrochloric acid).

Whole Extract Gas Chromatography

Whole extract gas chromatograms were recorded on a HP5890 GC fitted with an SGE Uninjector at 280° and a 50m 0.22mm ID SGE BP1 Capillary Column. A split flow of 20:1 was used for the injection. The GC oven was programmed such that the temperature was held at -10°C for 1 minute, then increased at 3°C from -10 to 50°C, at 6°C from 50 to 300°C and then held at 300°C for 20 minutes. The data was collected and integrated on a HP PC based Chem-Station.

APPENDIX 2 Raw Peak Areas Calculated from the Whole
Extract Gas Chromatograms.

WELL: AMBERJACK 1

DEPTH 1:	1276	1480	1482
DEPTH 2:	1276	1480	1482
AV DEPTH:	1276	1480	1482
LOCATION :	GIPPS BASIN	GIPPS BASIN	GIPPS BASIN
TYPE:	WATER	WATER	WATER
TEST:	RUN#3	RUN#4	RUN#2
DATA BASE NUMBER:	902207	902209	902208
RAW FILE:	RC0359	RC0357	RC0356
NC9 :			
NC10 :	484	721	5186
NC11 :	3304	1282	6586
NC12 :	4046	1470	3264
NC13 :	4010	1103	2165
NC14 :	3726	1472	1804
NC15 :	4563	1427	2638
NC16 :	3611	1215	2344
NC17 :	3108	1048	2260
PRISTANE :	2449	611	2068
NC18 :	2894	1118	2238
PHYTANE :	990	306	705
NC19 :	2883	1094	2346
NC20 :	2553	1161	2409
NC21 :	2058	1410	2270
NC22 :	3245	1778	2546
NC23 :	2369	1933	2623
NC24 :	1494	1838	2777
NC25 :	1903	2271	3575
NC26 :	1769	1697	5313
NC27 :	1102	885	4816
NC28 :	421	491	1313
NC29 :	454	296	804
NC30 :	971	310	187
NC31 :	0	234	341
NC32 :	0	0	0
NC33 :	0	0	0

APPENDIX 3

Geochemical Parameters Calculated from the GC Results and the Major Factors Which Influence Them

Saturate GC Parameter	Indicator Type	Typical Range of Values	General Boundaries	Effect of Maturity
Pristane/Phytane	depositional environment/ source	0.3-15	<1 1-3 >2 for oils,	anoxic, marine sediments/oils oxic, marine sediments/oils oxidising, terrestrial (eg.coals)
Pristane/nC17	maturity/ source	0-10	<0.5 0.5-1.0 >1.0 for sediments,	marine source mixed source terrestrial source
Phytane/nC18	maturity/ source	0-2	<1 1.0-1.5 >1.5	marine source mixed source terrestrial source
(nC21+nC22)/ (nC28+nC29)	source/ maturity	0.3-10	<1.2 >1.5	terrestrial source marine source
CPI(1) CPI(2) CPI(3) CPI(4)	source/ maturity	0.6-6 (can be up to 30)	<1.0 0.9-1.1 >1.1	very reducing environment?? (eg. some carbonates and evaporites) marine source terrestrial source

Results in mg/L(except where stated and pH)

SAMPLE ID	AMBERJACK-1			METHOD:
	#3777	#3778	#3779	
pH	7.3	7.2	7.3	WAT 2F
Resistivity (Ohm m @25°C)	0.699	0.328	0.855	WAT 2G
Total Dissolved salts @ 180°C	9440	21310	7490	WAT 7
Specific Gravity	1.004	1.011	1.003	WAT 26
Bicarbonate	274	368	260	WAT 2C
Carbonate	N.P	N.P	N.P	WAT 2C
Chloride	4592	10747	3606	WAT 2B
Sulphate	131	310	101	WAT 2E
Sodium	1052	2802	793	WAT 2A
Calcium	114	199	84.8	WAT 2A
Magnesium	84.8	133	60.9	WAT 2A
Potassium	3044	7087	2494	WAT 2A
Iron	0.2	0.2	0.1	WAT 3B
Strontium	2.6	10.2	1.8	WAT 3B
Barium	1.4	1.1	1.1	WAT 3B

COMMENTS:

N.P = NOT PRESENT AT THIS pH

SAMPLE ID:

#3777= RUN #2 1482.1 M RT
#3778= RUN #3 1276.0 MRT(CONTAINS H2S)
#3779= RFT RUN #4 1480.0

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* 2 2 8 8
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* a p p 2 888
* aaaa p p 2 8 8
* a a p p 2 8 8
* aaaa pppp 2222 888
* p
* p

* L SSS TTTT
* L S S T
* L S T ::
* L SSS T ::
* L S S T
* L S S T ::
* LLLL SSS T ::
* *
* *
* *
* *
* *
* *
* *
* *
* *

NOTE ACCOMPANYING DATA



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To: **GARRY WOODHOUSE,**
BHP Petroleum,
Collins Towers,
Collins St.

From **J.B.BRENNAN,**
Extension: 7358

DATE: 11 October, 1990

No. OF PAGES:

MESSAGE: Garry,

untreated core plugs

Please find attached the data for the Amberjack 1 samples. The samples contained oil which was found to be severely biodegraded. Three of the sediments were extracted for saturate GC analysis which confirmed this. The thermal desorption yields are unreliable because of the nature of the oil and no calculations could be made from the saturate GC analyses. If you have any queries please contact Evan or myself.

Regards,

J.B.BRENNAN

Thermal Desorption Yield Data

WELL: AMBERJACK 1

 DEPTH 1: 1272 1272.9 1274.1 1275 1275.9 1277.1 1278 1278.9 1278.9 1278.9 1279.8
 DEPTH 2: 1272 1272.9 1274.1 1275 1275.9 1277.1 1278 1278.9 1278.9 1278.9 1279.8
 AV. DEPTH: 1272 1272.9 1274.1 1275 1275.9 1277.1 1278 1278.9 1278.9 1278.9 1279.8
 DATABASE NUMBER: 902210 902211 902212 902213 902214 902215 902216 902217 902217 902217 902218
 SAMPLE TYPE: SMC#3 SMC#6 SMC#10 SMC#13 SMC#16 SMC#20 SMC#23 SMC#26 SMC#26 SMC#29
 LABORATORY NUMBER : G01001 G01002 G01003 G01004 G01005 G01006 G01007 G01101 G01103 G01102
 RUN FILE NAME : RA0515 RA0516 RA0517 RA0518 RA0519 RA0520 RA0521 RA0522 RA0524 RA0524

⇒ corrects

MASS OF SAMPLE(g): 0.9862 1.0799 1.0235 1.0989 1.0385 0.9617 1.0727 1.1848 1.0845 1.1432

VOLUME OF STANDARD ADDED(ul.): 100 100 100 100 100 100 100 100 100 100 100
 CONCENTRATION OF STANDARD(mg/ul.): 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102 0.00102
 TOTAL AREA: 320257 130889 526400 68729 101409 569529 485124 1154549 927610 735112
 STANDARD AREA: 32476 30463 38159 28298 22655 39947 52879 53646 48131 50643

AREA FOR SAMPLE: 287781 100426 488241 40431 78754 529582 432245 1100903 879479 684469

 THERMAL DESORPTION YIELD (mg/g): 0.9 0.3 1.3 0.1 0.3 1.4 0.8 1.8 1.7 1.2

SOLVENT EXTRACTION YIELD (mg/g): 4.5 3.7 3.6

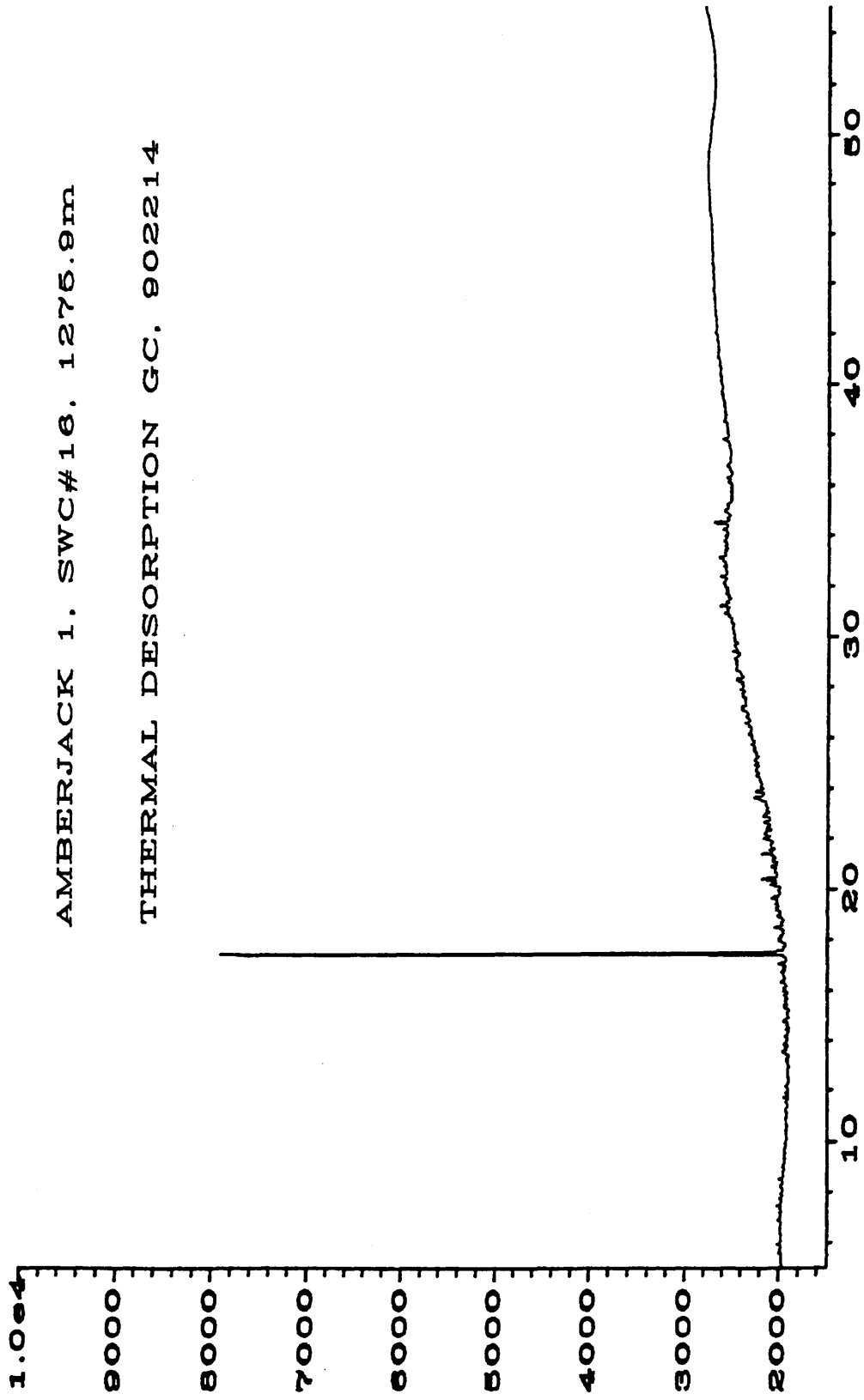
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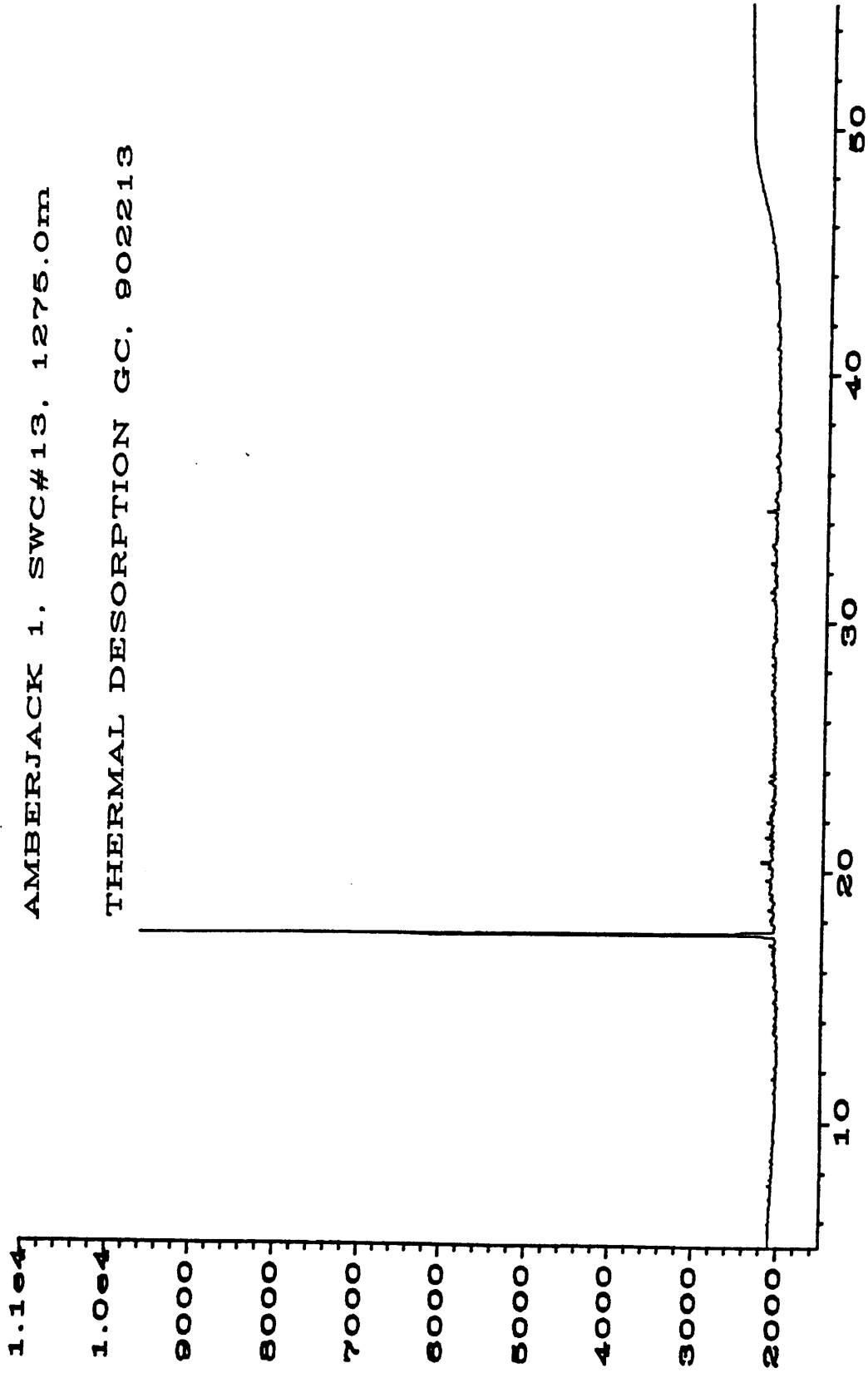
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THERMAL DESORPTION GC. 902214



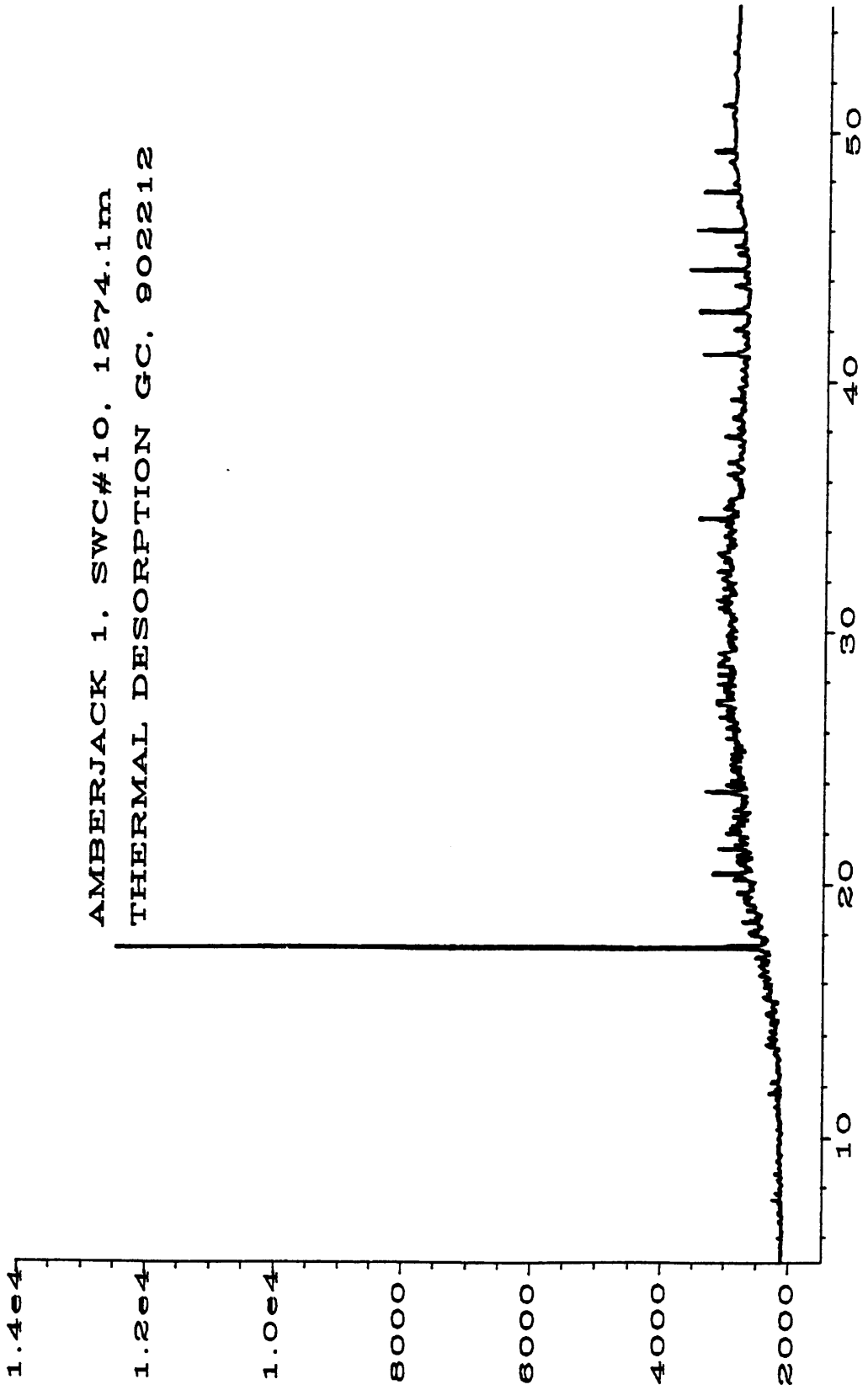
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THERMAL DESORPTION GC. 902213



Sig. 1 in A:\RA0518.D

AMBERJACK 1, SWC#10, 1274.1m
THERMAL DESORPTION GC. 902212



Sig. 1 in A:\RA0517.D

AMBERJACK 1. SWC#6. 1272.9m
THERMAL DESORPTION GC, 902211

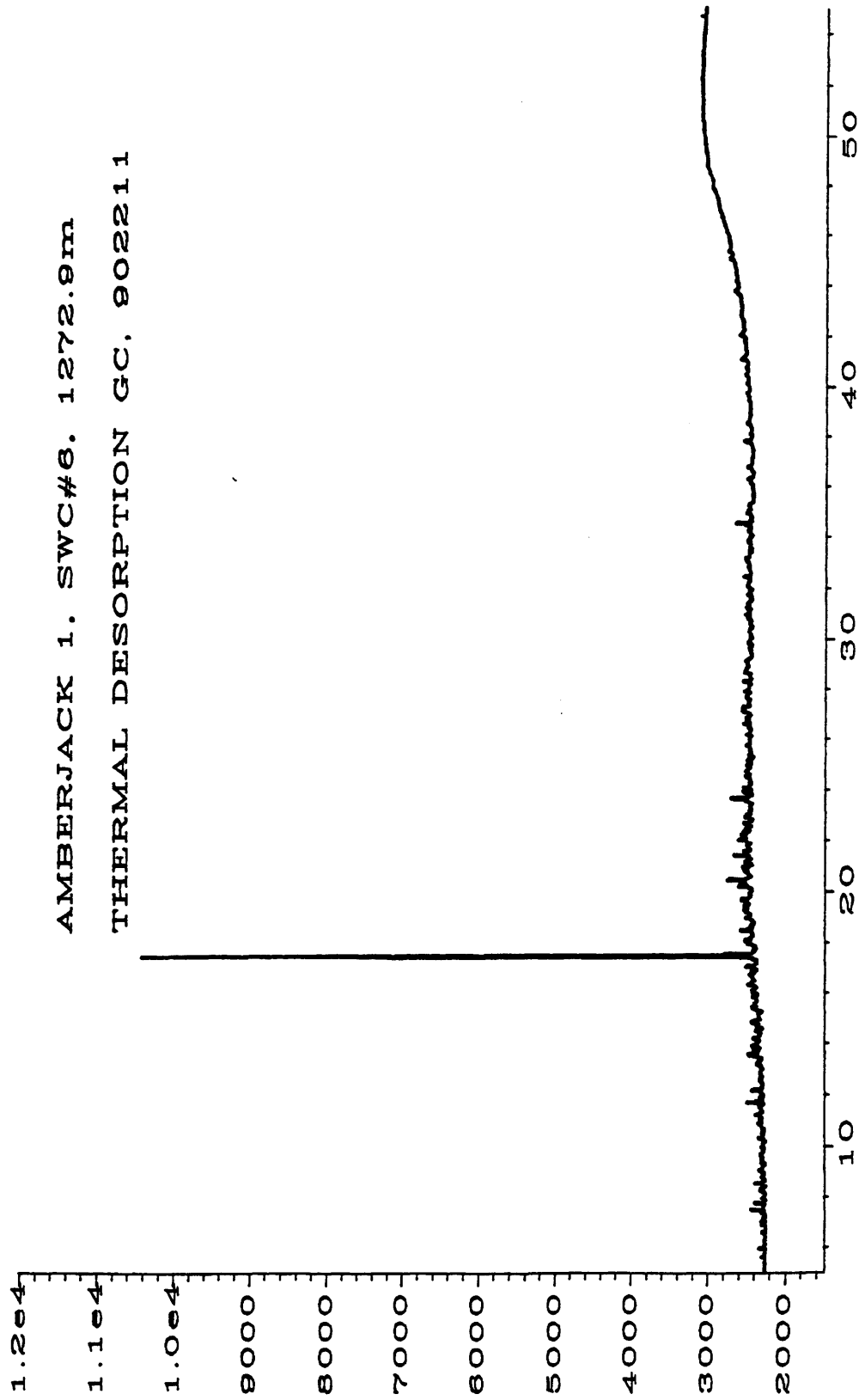
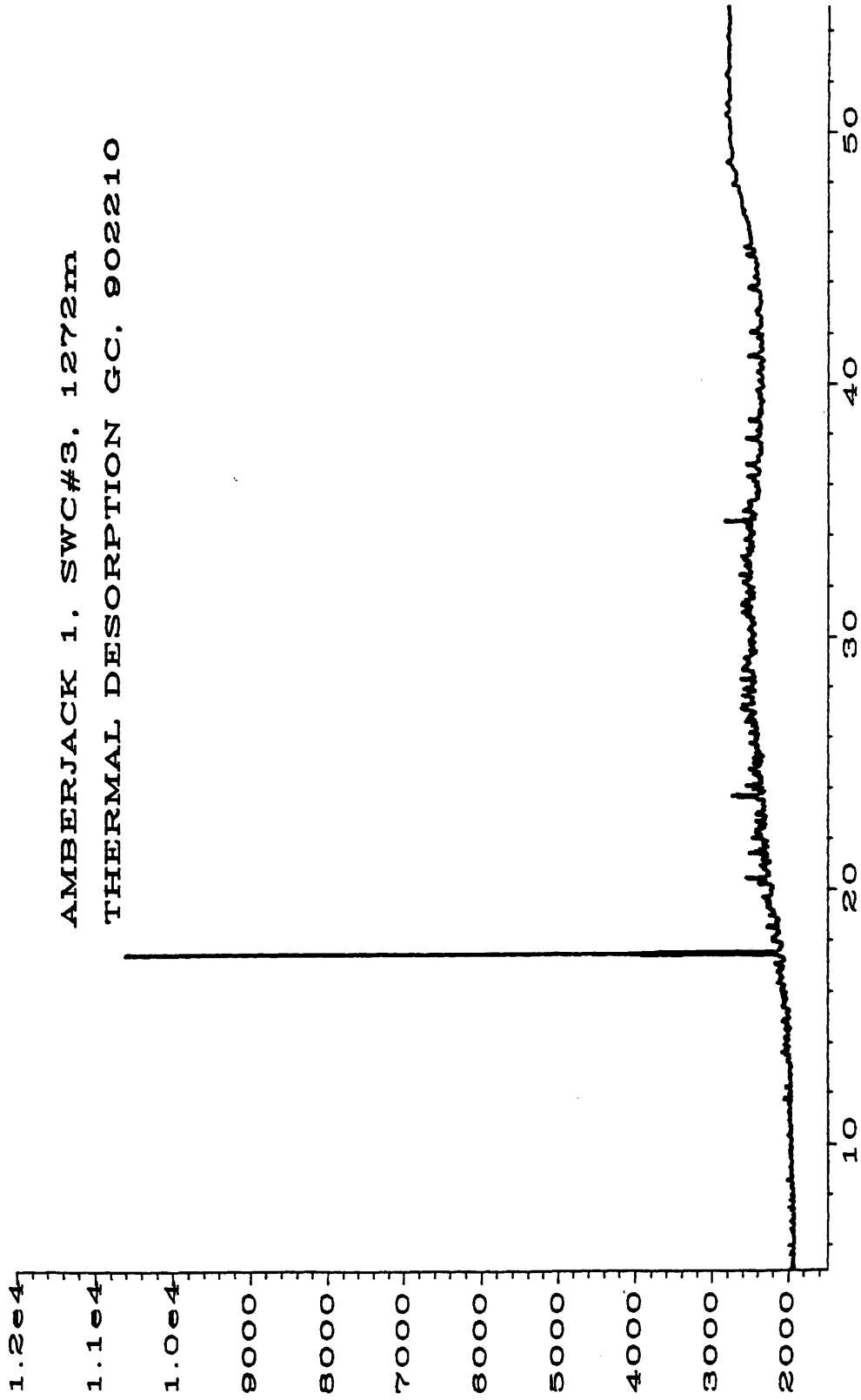


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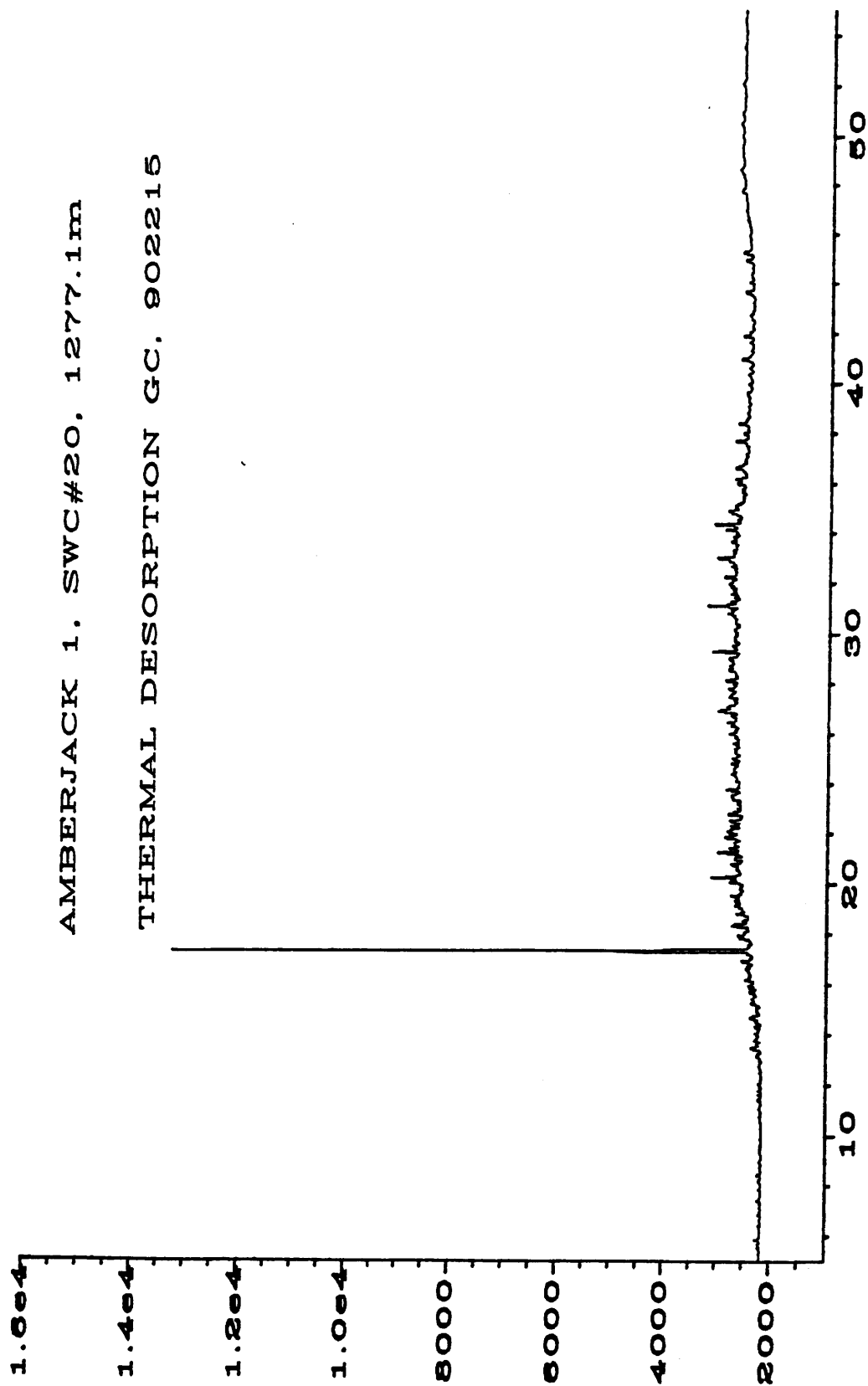
AMBERJACK 1. SWC#3. 1272m
THERMAL DESORPTION GC. 902210



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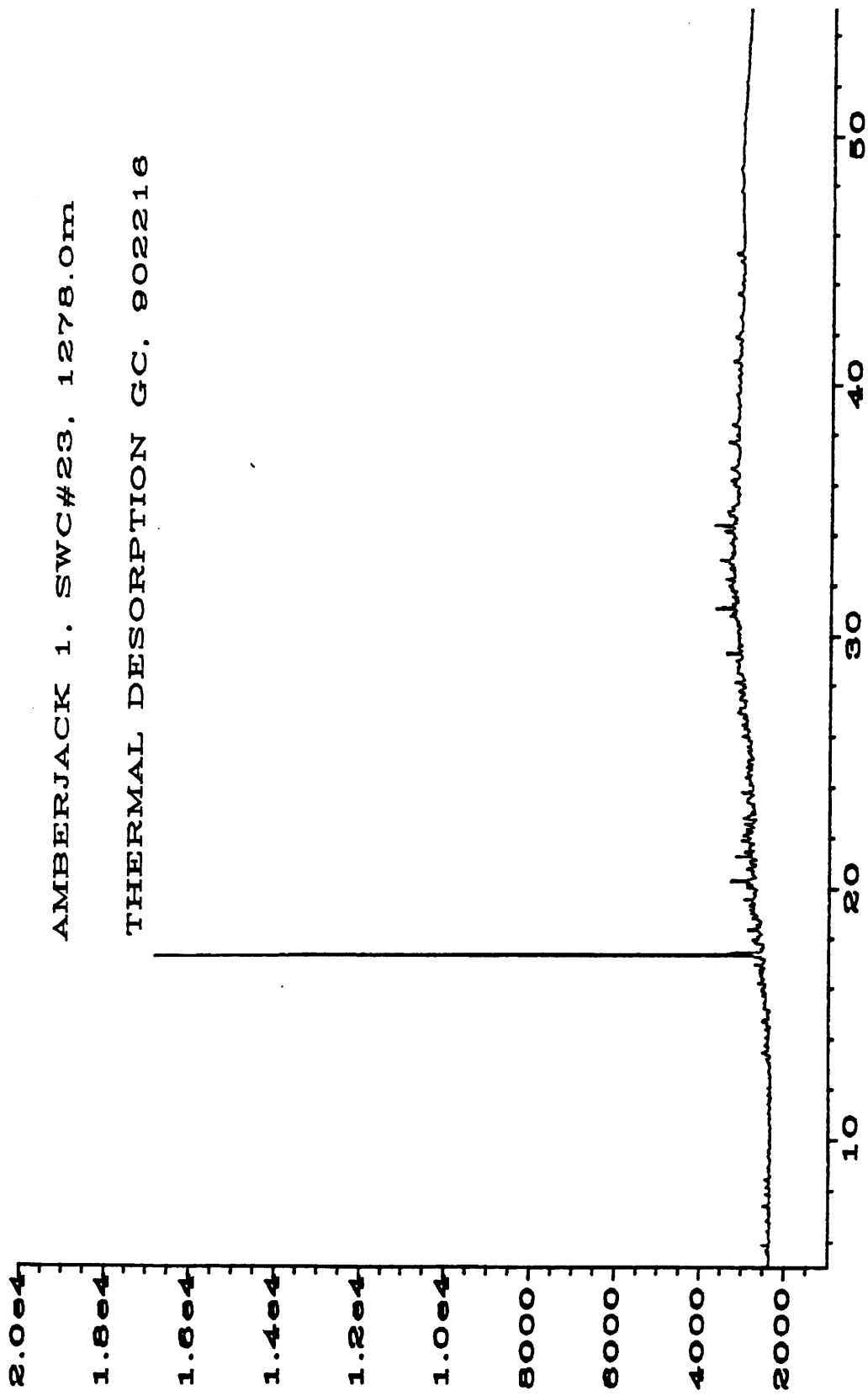
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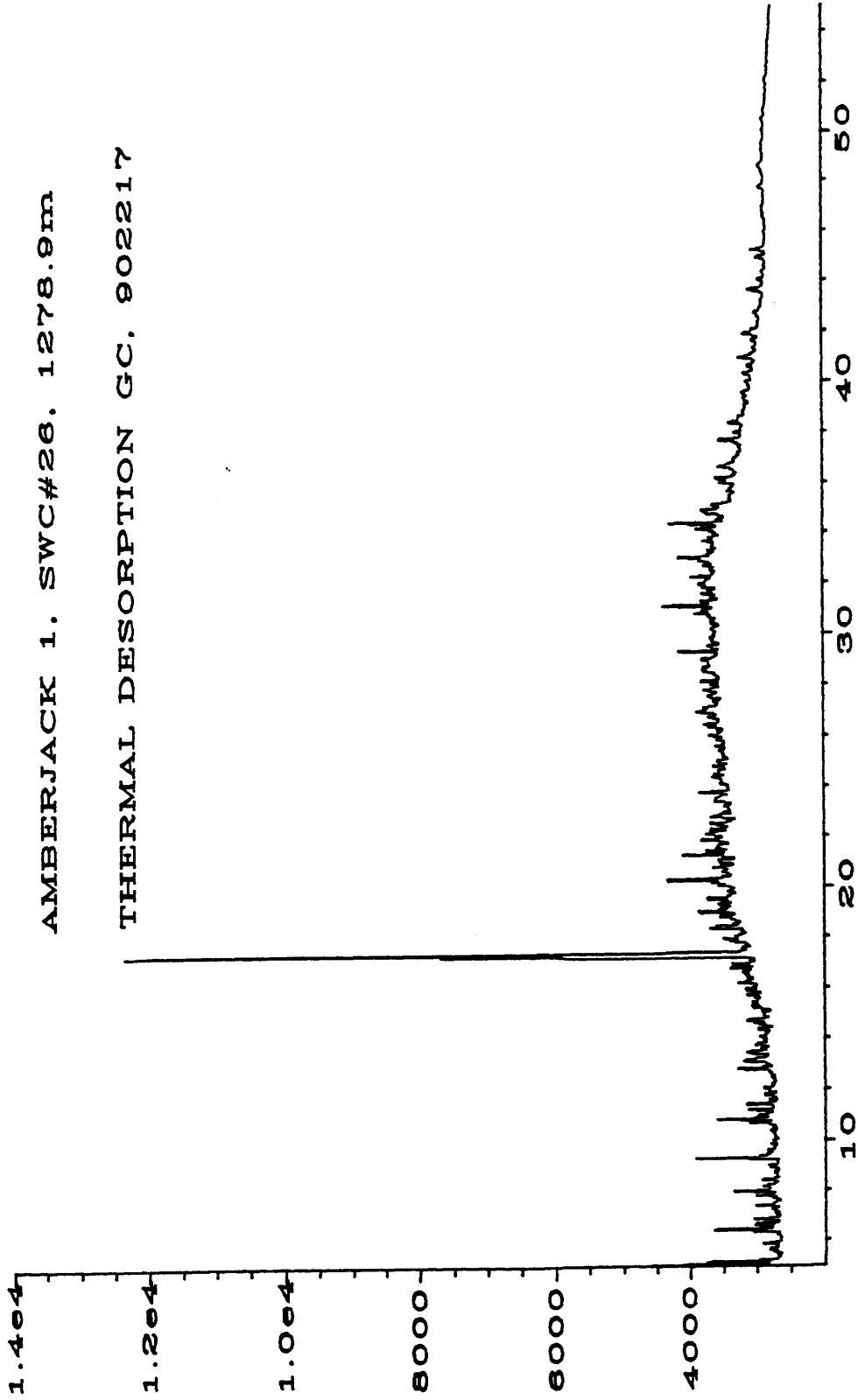
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AMBERJACK 1. SWC#26. 1278.9m

THERMAL DESORPTION GC, 902217

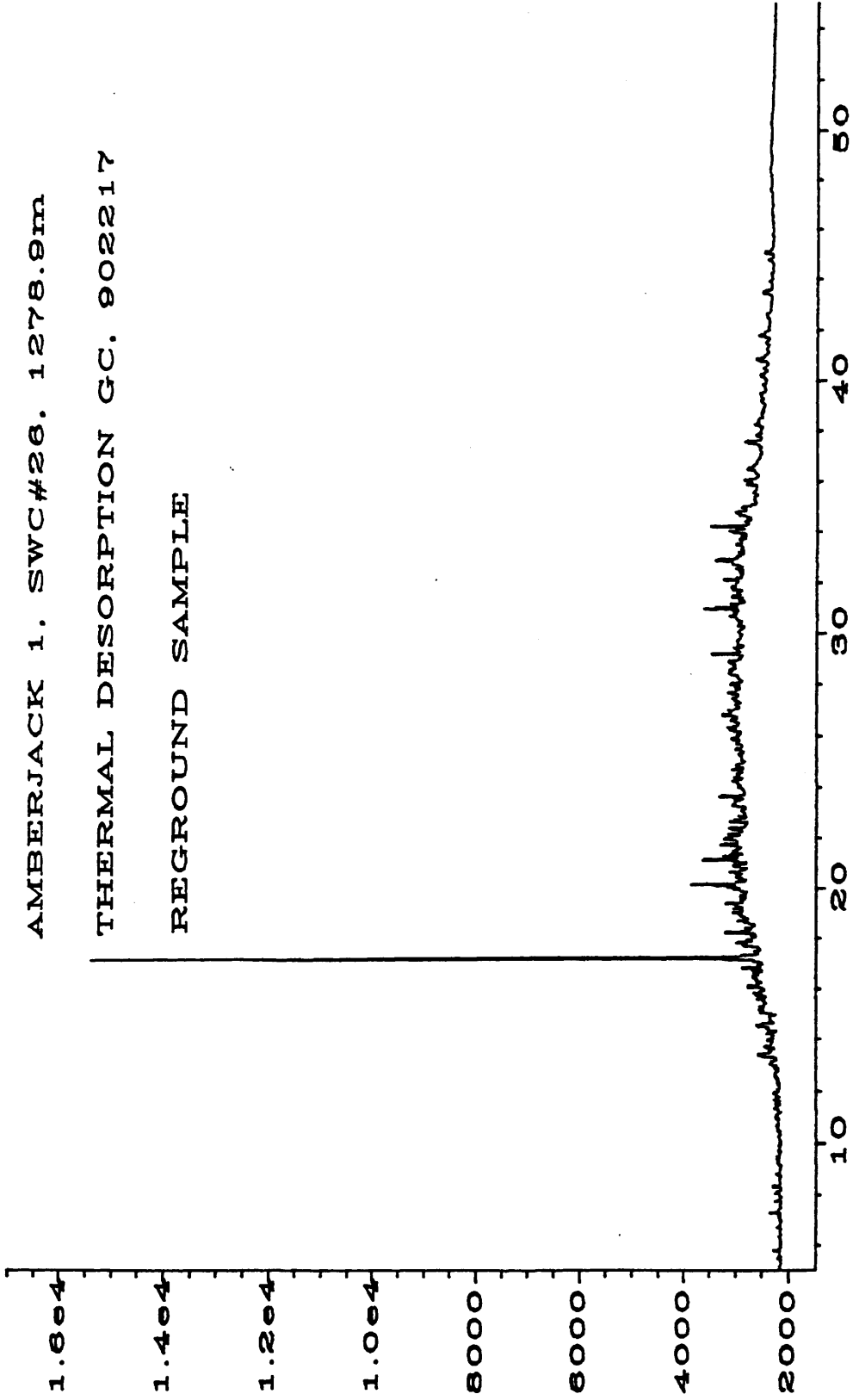


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AMBERJACK 1. SWC#26. 1278.9m

THERMAL DESORPTION GC. 902217

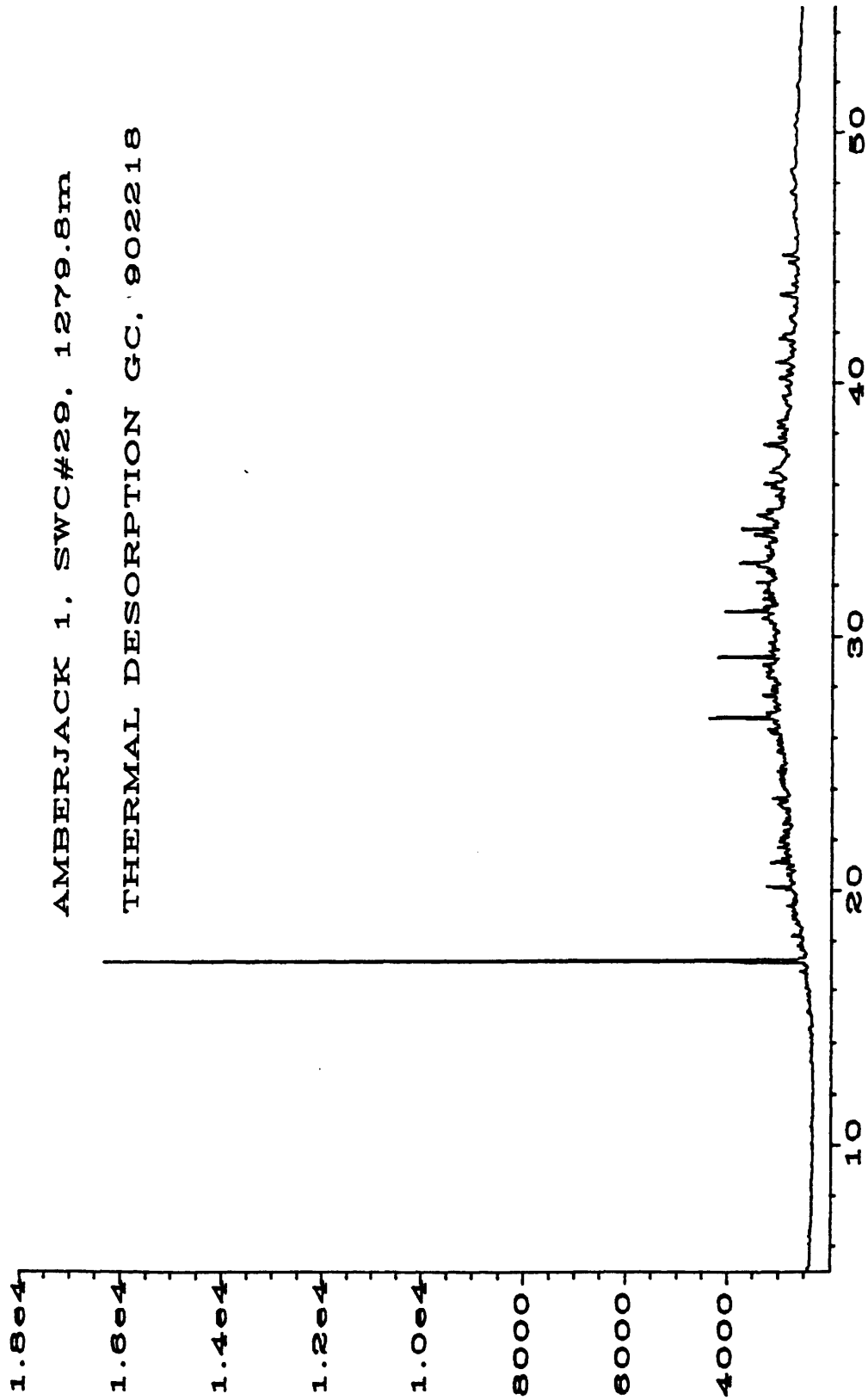
REGROUND SAMPLE



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AMBERJACK 1. SWC#29. 1279.8m

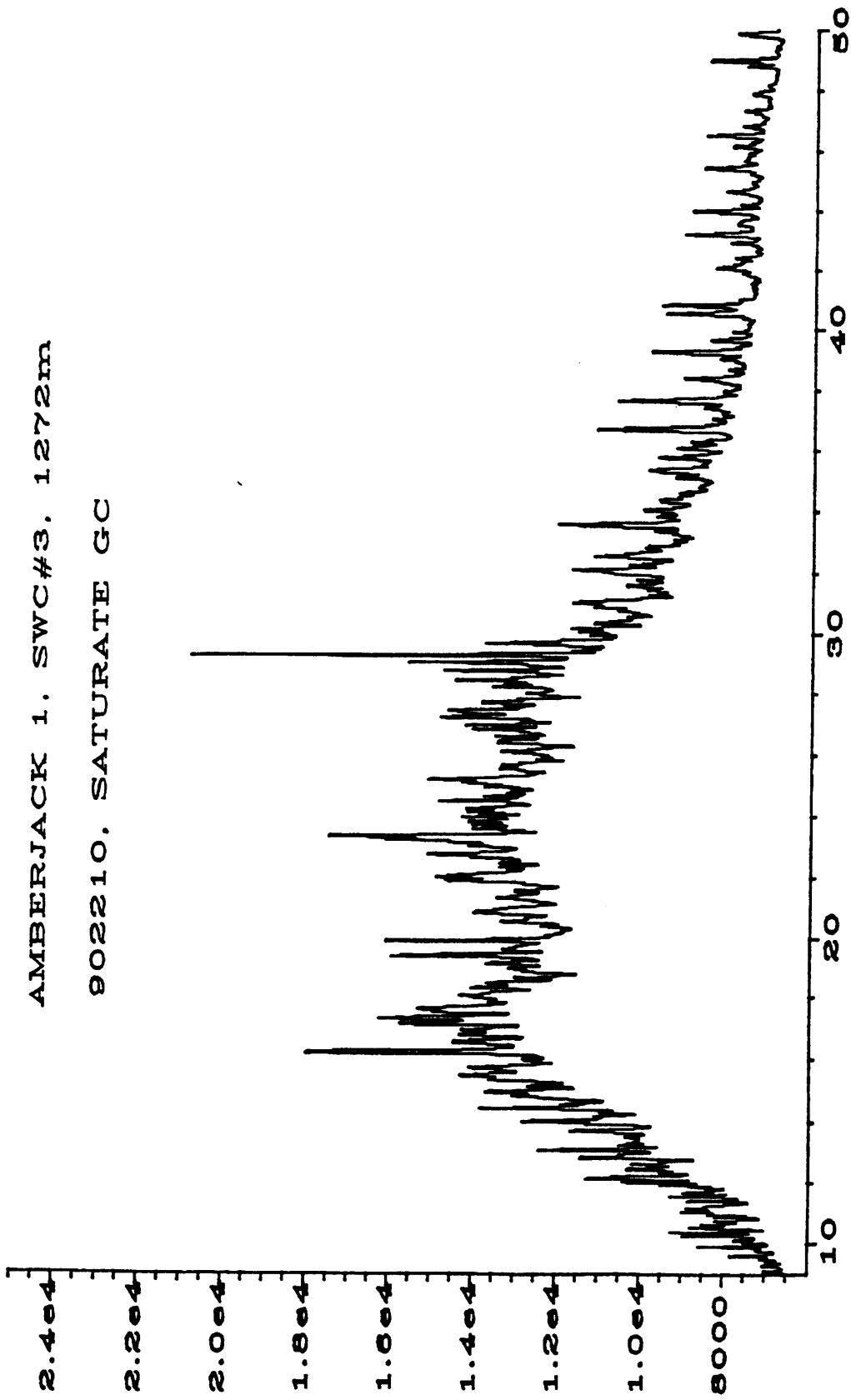
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SIG. 1 IN A:\RA0623.D

AMBERJACK 1. SWC#3. 1272m

902210. SATURATE GC



SIE. 1 IN A:\GC#\AJUN08-90\RA0529.D



AMBERJACK 1. SWC#20. 1277.1m
902215. SATURATE GC

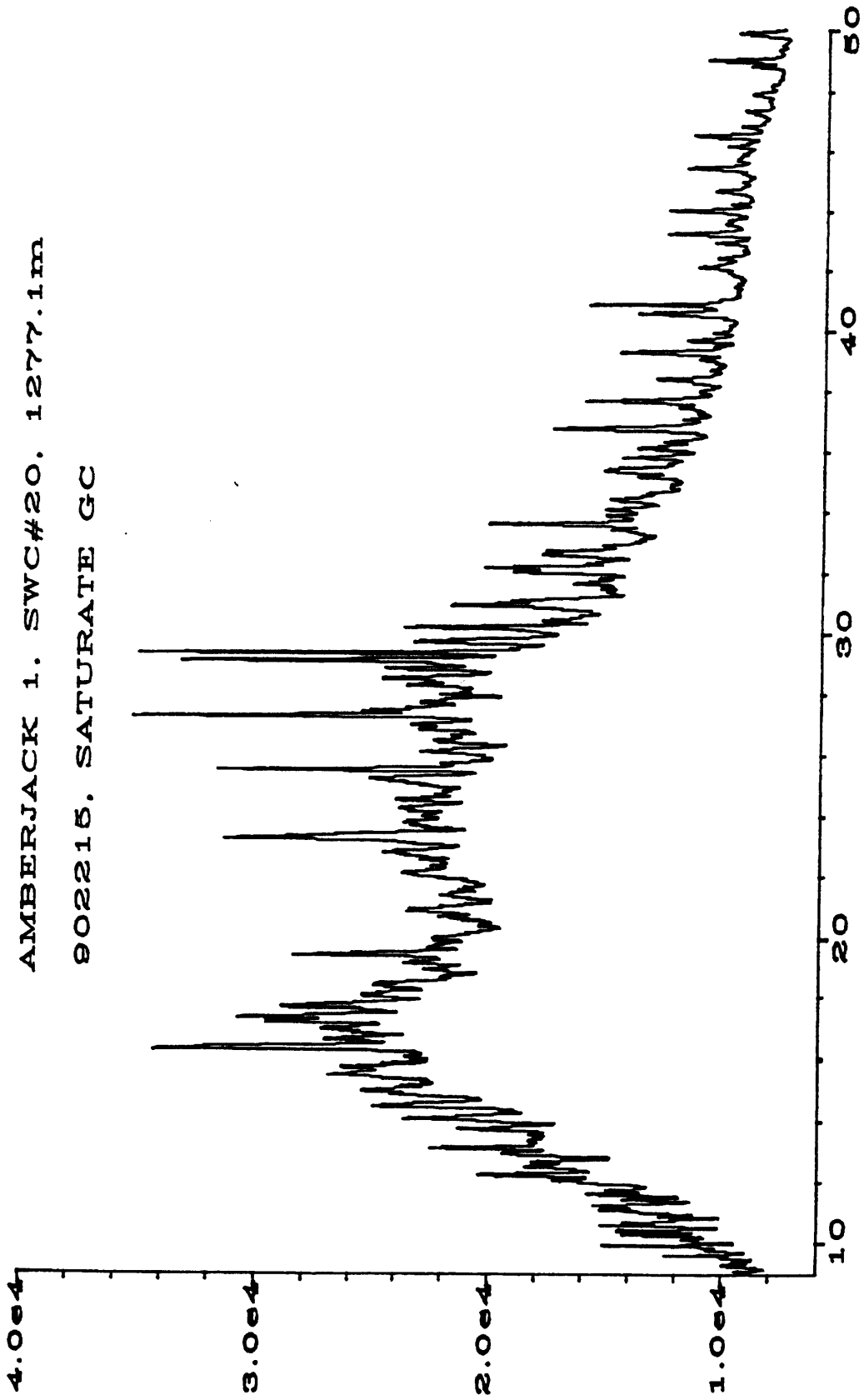
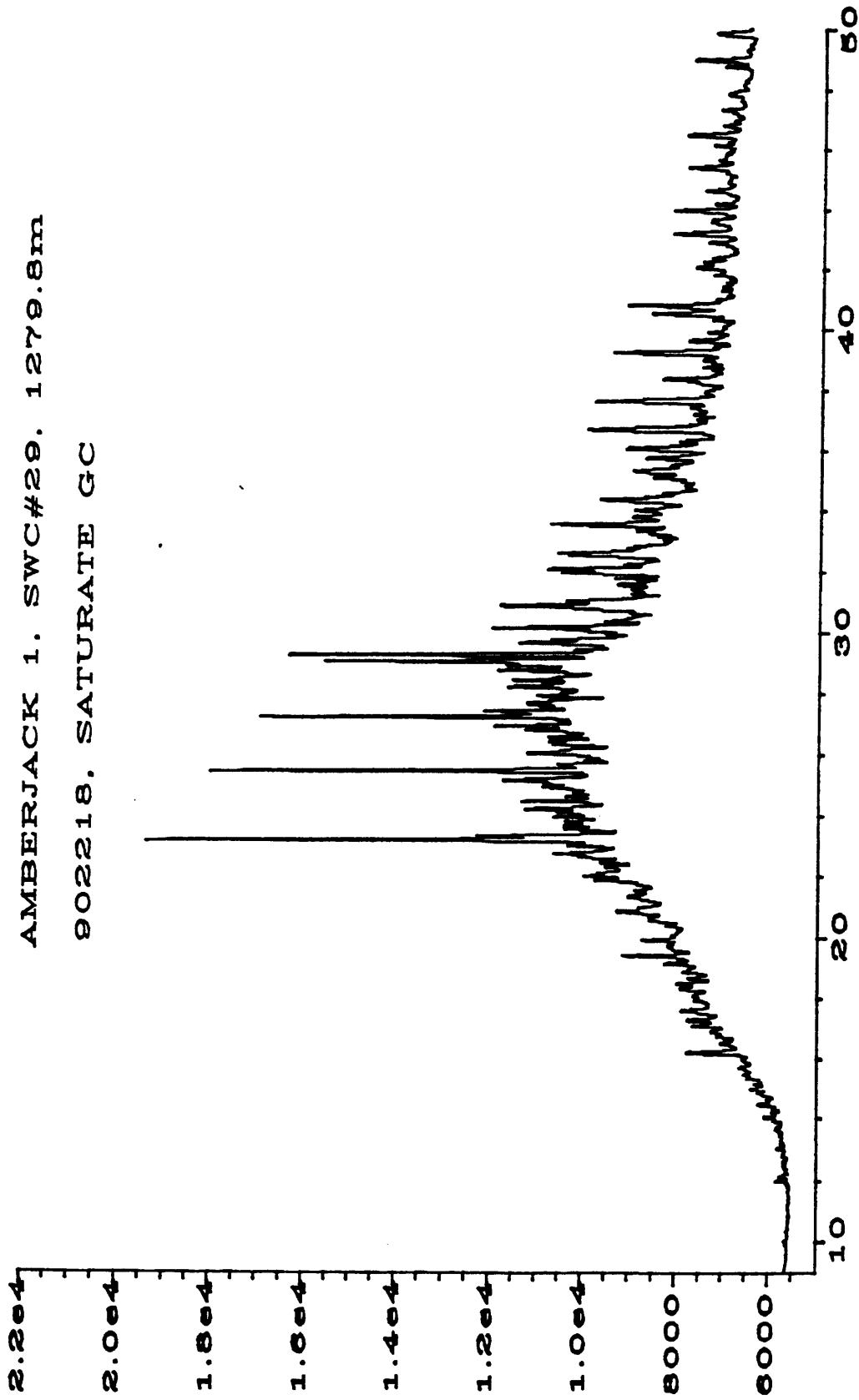


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AMBERJACK 1. SWC#29. 1279.8m
902218. SATURATE GC



SLE. 1 in A:\GC#A\JUN08-90\RA0530.D



TABLE x Extract and Separation Yields.

WELL : CASUARINA 1 CASUARINA 1		
DEPTH 1 :	1330	1331
DEPTH 2 :	1330	1331
AV. DEPTH :	1330	1331
LOCATION :	TIMOR SEA	TIMOR SEA
TYPE :	SWC#40	SWC#39
AGE :		
DATA BASE NUMBER :	902251	902250
FILE :	G071E1	G072E1

EXTRACT AND SEPARATION WEIGHT		

WEIGHT OF SEDIMENT (g)	15.01	20.02
WEIGHT OF EXTRACT (g)	0.0056	0.017
WEIGHT OF EXTRACT SEPARATED (g)		
WEIGHT OF SATURATES (g)		
WEIGHT OF AROMATICS (g)		
WEIGHT OF POLARS (g)		

CALCULATED YIELDS		

% EXTRACT YIELD	0.037	0.085
ppm EXTRACT	373	849
ppm SATURATES	ERR	ERR
ppm AROMATICS	ERR	ERR
ppm POLARS	ERR	ERR
% RECOVERY	ERR	ERR
