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Report

A COMPILATION OF GEOCHEMICAL DATA: EAST COAST EXPLORATORY WELLS

by

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The geochemical data contained in this report are from those exploratory East Coast wells that have passed the required five-year moratorium (inclusive to January 1, 1975).

ABSTRACT

Geochemical data are compiled for canned sample cuttings from 43 exploratory wells drilled in the Canadian eastern offshore area since 1971. At that time the federal Department of Energy, Mines and Resources initiated the collection of canned well cuttings from 9 m (30 ft) intervals. The geochemical analyses of the canned cuttings were done in the Environmental Marine Geology Subdivision laboratories, of the Atlantic Geoscience Centre. These analyses consisted of measuring the organic carbon content, gaseous hydrocarbons (C_1 to C_4), extractable organic matter (bitumen), and quantitative and qualitative distribution of heavy ($C_{15}+$) hydrocarbons.

The analyses of these samples were used to determine the quality of source rocks, as they define their potential to produce oil and gas. These source rock characteristics have been tabulated and graphically presented in this report.

RESUME

INTRODUCTION

This report is a compilation of the geochemical data from 43 of the 141 hydrocarbon exploratory wells drilled offshore eastern Canada from 1966 to the end of 1974. The purpose of this report is to present a comprehensive compilation of the geochemical analyses in a simple format that may be useful to geoscientists working in the offshore areas.

The area of eastern Canada considered in this report extends from approximately 42°N to 59°N and 48°W to 65°W (Fig. 1). Sixteen offshore wells and one onshore well (Sable Island 1-H-58) have been evaluated on the Scotian Shelf (Fig. 2), representing an Upper Triassic to Pleistocene succession. Twenty-three offshore wells have been analyzed from the Grand Banks and East Newfoundland shelf (Fig. 3); these wells penetrated Devonian-Carboniferous and Upper Triassic to Pleistocene successions. Three offshore wells have been analyzed from the Labrador Shelf (Fig. 4); they penetrate Pre-Mesozoic and Cretaceous to Pleistocene successions.

The wells are listed alphabetically in Tables 1, 2 and 3 and are coded to correspond to the location maps for the three areas described above (Fig. 2-4). The analytical results of the geochemical investigations have been tabulated for each area. Graphic presentations of the organic carbon, methane, total gas content and percent wet gas are also included in this report for each of the wells.

The derivation of the data, tabulated in this report is explained, but no interpretation of data is included. Previous papers relating to the regional hydrocarbon geochemistry of these offshore areas have utilized these data to interpret the maturity of organic facies and evaluate source rock potential for the Scotian Shelf (Purcell et al., 1979), the East Newfoundland and Labrador Shelf (Rashid, et al., 1979), and the Grand Banks and East Newfoundland Shelf (Rashid, in press). Internal reports have also been completed by M.A. Rashid for several offshore East coast wells (see Data Report Series).

Hydrocarbon Shows

Significant hydrocarbon shows encountered in the wells are indicated by well symbols in Tables 1, 2, and 3. Gas and condensate are most abundant although minor oil staining has been encountered in some of the offshore exloratory wells such as Sable Island 1-H-58, Heron H-73, Adolphus 2-K-41, and Cohasset D-42.

Experimental Procedure

The geochemical analyses of the canned cuttings consist of measuring the content of organic carbon, gaseous hydrocarbon (C_1 to C_4), extractable organic matter (bitumen), and quantitative and qualitative distribution of heavy (C_{15+}) hydrocarbons. It should be noted that the C_{15+} data is not included in this report. The analytical methods used for these measurements (after Snowdon and McCrossan, 1973), have been discussed in some detail in previous publications (Rashid and McAlary, 1977; Purcell et al., 1979 and Rashid, in press). The following is an excerpt from Purcell et al. (1979):

"The samples used for geochemical analysis were obtained from well cuttings collected at 9 m (30 ft) intervals. The cuttings were covered with water and sealed in 600 ml cans to maintain a standard head-space volume of approximately 100 ml. The gaseous hydrocarbons (C_1 to C_4) present in the canned sediment samples were quantitatively analyzed by blending 100 ml of sediment with

500 ml of water for 2 minutes in a sealed Waring blender. A measured volume of the gas from the head-space of the blender was obtained with a hypodermic syringe and injected through a gas sampling loop into a gas chromatograph equipped with a 3.2 x 1.5 mm Poropack Q column. The temperature rise was programmed from 80 to 180°C at a rate of 10°C per minute. The resulting peaks of C_1 to C_4 hydrocarbons were measured with a digital integrator." The detection limit for C_1 to C_2^+ is 5 ppm (Table IV).

"Organic carbon was determined with a Leco WR12 Carbon Analyzer. A portion of blended sediment sample retained from the gas analysis was freeze-dried, treated with 6N HCl at 80°C to destroy the carbonates, washed three times with distilled water to remove excess acid, and dried prior to combustion." The detection limit for organic carbon is 0.1% carbon (Table IV).

Some of the light-gas data, on Bluenose G-47 were provided by Geochem Laboratories Inc. of Houston, Texas. The remaining 42 wells were analysed in-house. These analyses were carried out on over 5000 samples of canned cuttings.

Explanation of Tables

The nature and quantity of gaseous hydrocarbons measured in the canned cuttings assists with determining the geochemical state and thermal maturation of organic facies within the sedimentary sequence penetrated. Organic matter is subject to burial and increasing temperatures, resulting in the formation of various types of hydrocarbons. The initial products of diagensis of organic matter are the light gases, i.e. methane, ethane, propane, isobutane, and butane (C_1 to C_4). As these are the first gaseous hydrocarbons to evolve, they are listed in columns two to six respectively in each table, in parts per million by volume of rock; the concentrations are listed against depth (Column 1)

(Appendix 2) for each well. Total concentrations of these gases is expressed in column seven, in parts per million (ppm by volume of rock).

In general, methane is the principal gas of immature and overmature strata. Dry gas concentrations in parts per million are listed in Column 9. The concentration of C_2, C_3, and C_4 (wet gases) in parts per million is shown in Column 10. The total gas concentration in parts per million (summation of Columns 9 and 10) is expressed in Column 11. The computed percent wetness of the gases $[(C_2 \text{ to } C_4/C_1 \text{ to } C_4) \times 100]$ is shown in Column 12.

A high degree of correlation is often seen between the organic carbon-content and the light gases. A good source rock must have an adequate percentage of organic carbon. The distribution of organic carbon within the sedimentary sequence at any given depth is expressed as a percentage of the total rock mass from 0 to 5%, as in Column 8.

Ratios of isobutane to normal butane are expressed in Column 13 (ISO/N). This percentage may be indicative of the onset of maturation.

ACKNOWLEDGEMENTS

The compilers are grateful to Roy Sparkes and to Larry Johnson for technical assistance.

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APPENDICES

The wells are listed alphabetically for each physiographic area (Fig. 2-4). Appendix 1 is the computer programs* utilized in this compilation. Appendix 2 is a computer tabulation of methane, ethane, propane, isobutane, butane, total light gases, organic carbon, total dry gas, total wet gas, total gas, percentage wet and ISO/N butane, with respect to depth. These tables are arranged alphabetically by well name. Appendix 3 is a computer plot of methane, total gas and organic carbon (these are colour coded red, green and blue respectively). Appendix 4 is a computer plot of percent wet (0-100%).

* Original data are curated by Program Support Subdivision, Atlantic Geoscience Centre. These programs were adapted after those of G. Joice and J. Leonard.

LIST OF FIGURES

LIST OF TABLES

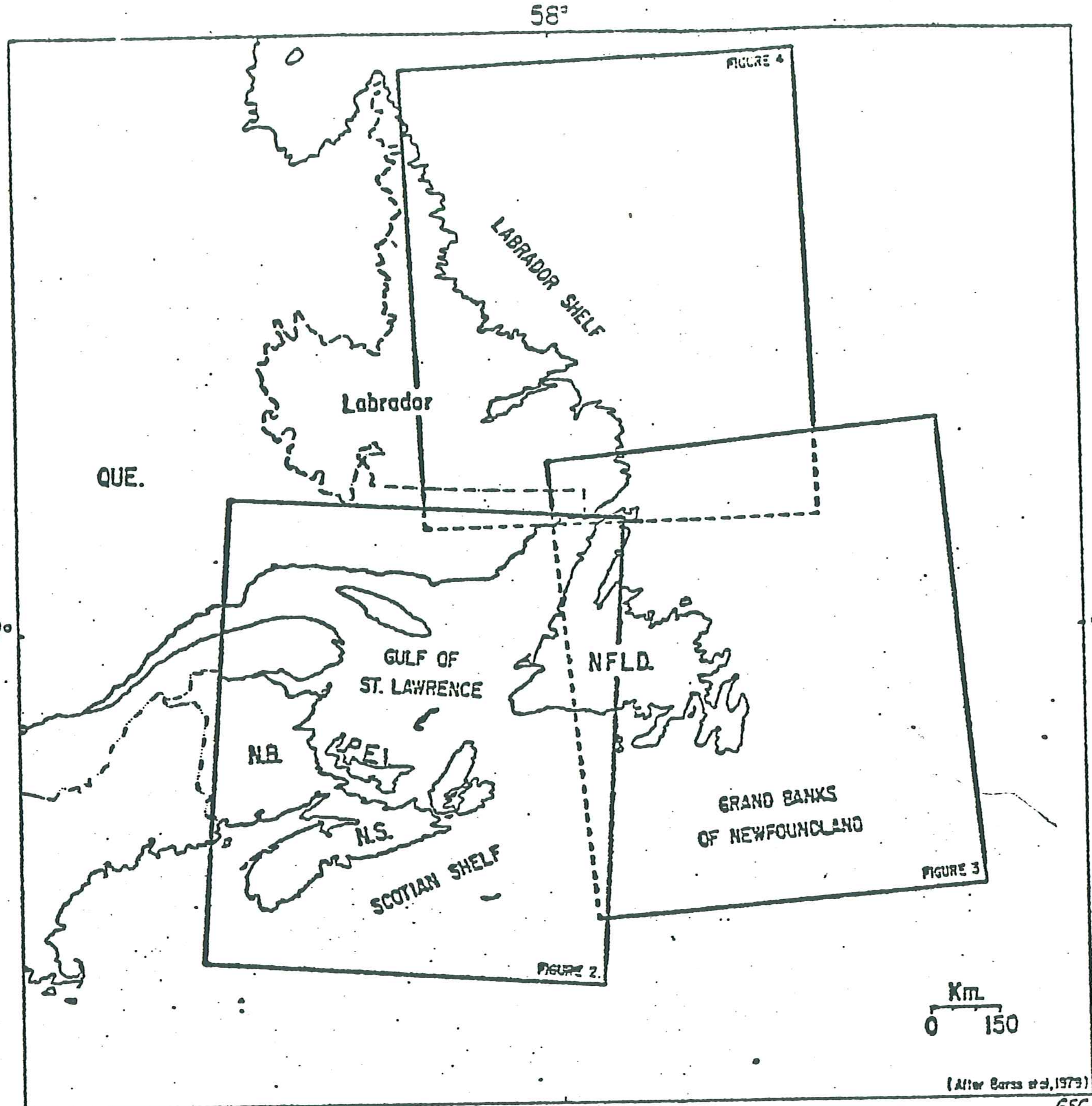


FIGURE 1.

INDEX TO TEXT FIGS. 2,3,4

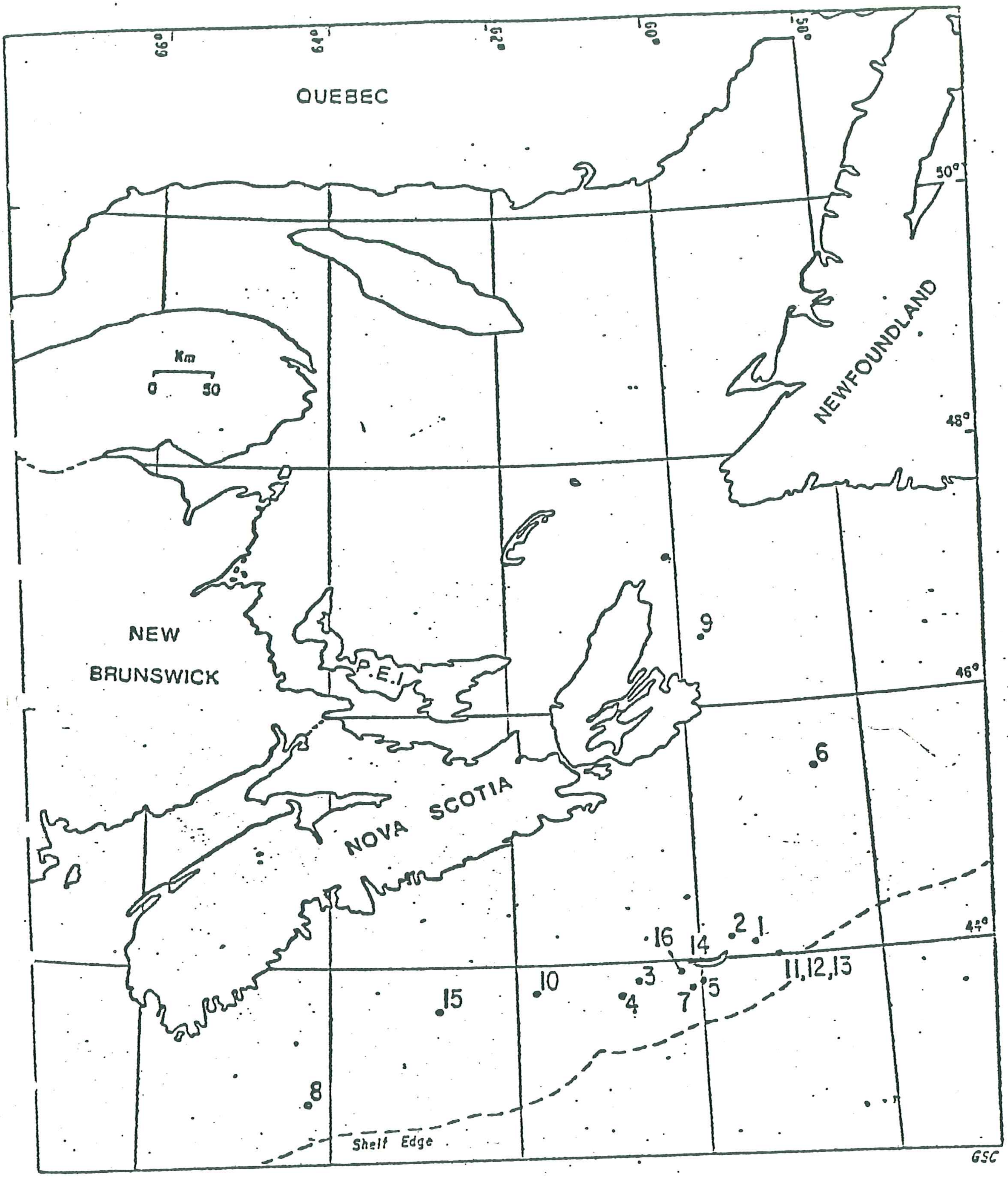


FIGURE 2. INDEX MAP SCOTIAN SHELF

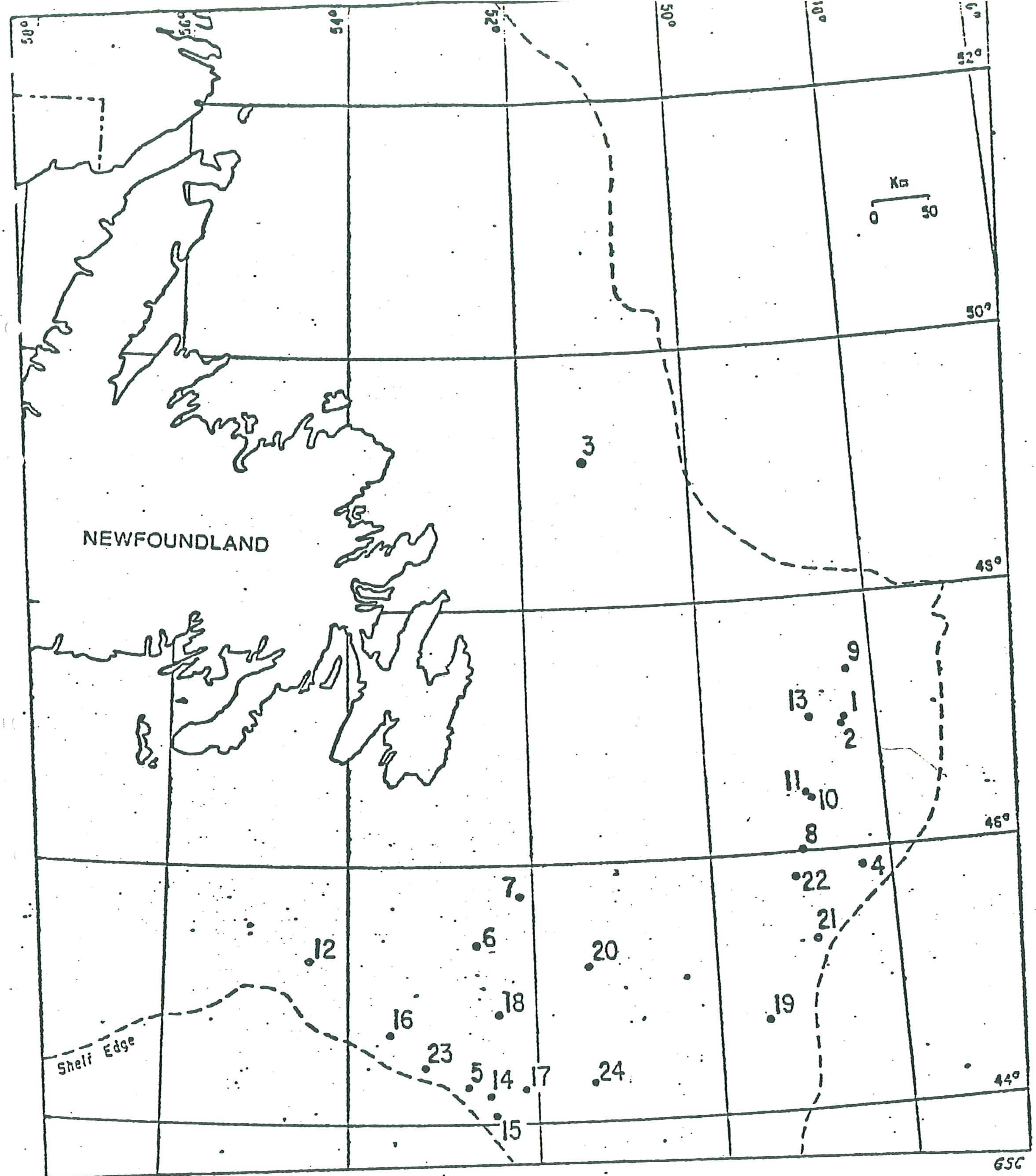


FIGURE 3. INDEX MAP GRAND BANKS, NE NEWFOUNDLAND BASIN

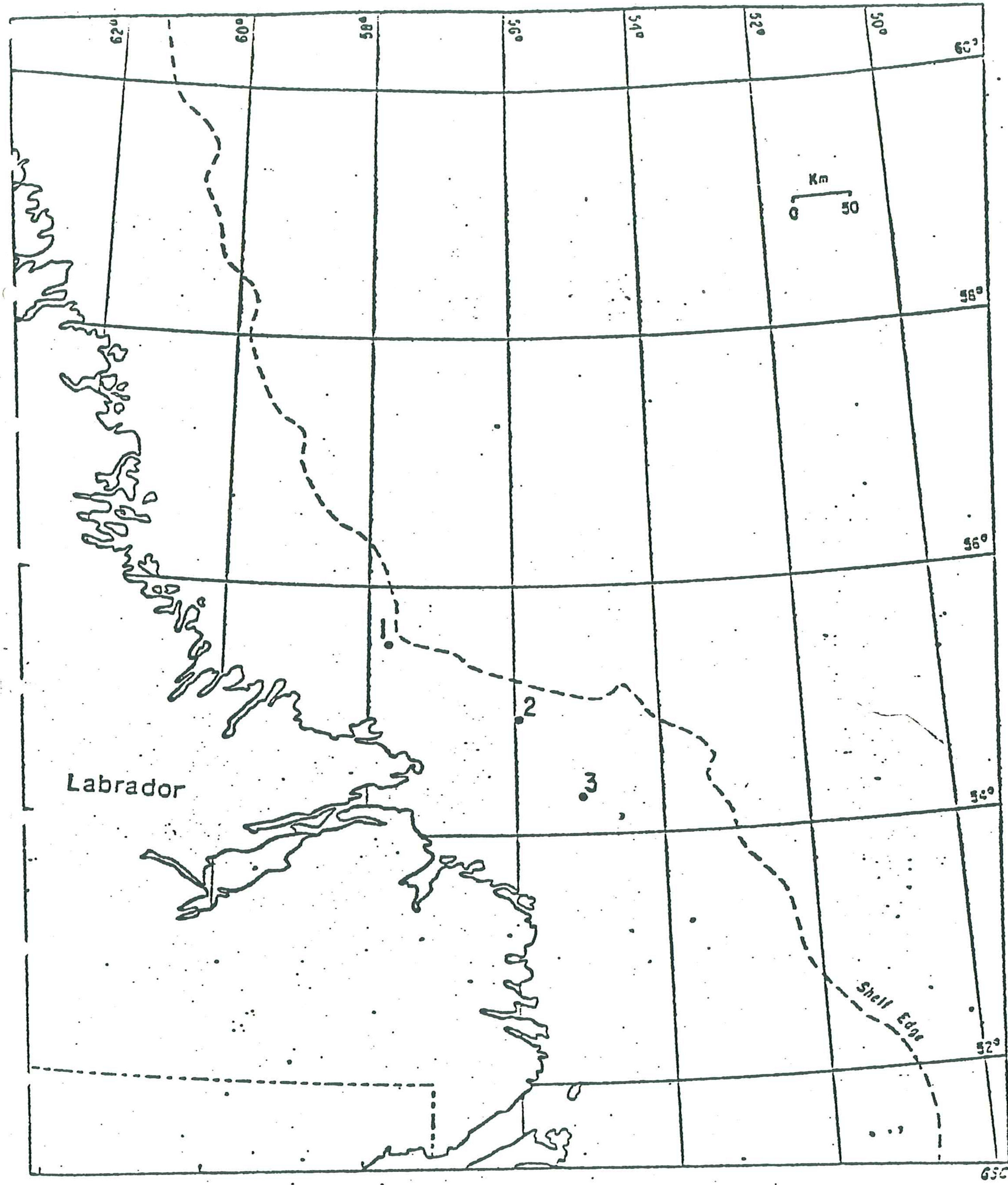


FIGURE 4. INDEX MAP LABRADOR SHELF

Table I

Locations of exploratory wells used for geochemical analyses on Scotian Shelf

Well Symbols:
Plugged and Abandoned; Significant Gas; Gas Show; Oil Show; Significant Oil and Gas; Significant Oil, Suspended

Physiographic Area	Well Name	Latitude, Longitude	GSC D#	Spud Date Rig Release	RT m WD	Depth m Well Status
Scotian Shelf	1. Mobil-Tetco Bluenose G-47	44°06'20.79" 59°21'27.35"	94	73-01-25 73-04-25	29.9 81.4	4 587.2 P & A
	2. Mobil-Tetco-Texaco Citnalta I-59	44°08'42.58" 59°37'32.11"	123	74-02-04 74-04-29	29.9 94.5	4 575 P & S
	3. Mobil-Tetco Cohasset D-42	43°51'06.52" 60°37'13.89"	96	73-04-27 73-07-16	31.4 41.1	4 427.2 P & S
	4. Shell Demascota G-32	43°41'27.2" 60°49'54.00"	125	74-03-01 74-05-20	29.9 54.3	4 672.3 P & A
	5. Texaco-Shell Intrepid L-80	43°49'35.78" 59°56'43.82"	126	74-05-18 74-08-15	31.4 43.6	4 162 P & A
	6. Union *et al.* Jason C-20	45°29'05.45" 58°32'28.27"	131	74-07-03 74-07-22	29.9 112.8	2 482.9 P & A
	7. Shell Marmora P-35	43°44'59.36" 60°04'47.58"	98	73-03-06 73-04-21	29.9 53.3	4 092.9 P & A
	8. Union *et al.* Montagnais I-94	42°53'40.71" 64°13'46.51"	140	74-09-12 74-09-29	29.9 112.8	1 645.9 P & A
	9. Murphy *et al.* North Sydney P-05	46°34'46.24" 59°45'01.65"	135	74-08-10 74-09-07	29.9 62.8	1 660.9 P & A
	10. Union *et al.* Shell Ojibwa E-07	43°46'20.44" 61°46'14.42"	121	74-02-04 74-02-28	29.9 75.6	2 329.6 P & A
	11. Shell Primrose A-41	44°00'05.68" 59°06'18.26"	86	72-10-15 73-01-27	29.9 109.7	3 616.5 P & A
	12. Shell Primrose 1a-A-41	Re-entry (whipstocked)	97			
	13. Shell Primrose F-41	44°00'29.55" 59°07'06.52"	95	73-01-30 73-03-05	29.9 68.6	2 592.3 P & A
	14. Mobil-Tetco Sable Island 1-H-58	43°57'27" 60°07'37"	81	72-06-03 72-08-27	10.7 KB 1.8 GL	3 039.2 P & S
	15. Union *et al.* Sambro I-29	43°38'35.04" 62°48'17.04"	129	74-05-23 74-06-27	29.9 193.5	3 069.6 P & A
	16. Mobil-Tetco-Thebaud P-84	43°53'59.53" 60°12'19.34"	85	72-07-08 72-10-13	28.6 25.9	4 114.8 P & S

Table 2

Locations of exploratory wells used for geochemical analysis on the Grand Banks and Northe
Newfoundland Shelf

Well Symbols:
Plugged and Abandoned — Significant Gas — Gas Show — Oil Show — Significant Oil and Gas — Significant Oil, Suspended

Physiographic Area		Well Name	Latitude, Longitude	GSC D#	Spud Date Rig Release	RT m WD	Depth m Well Status
Grand Banks NE Newfoundland Shelf	1.	Mobil-Gulf Adolphus 2-K-41	47°00'40.56" 48°22'06.47"	92	72-22-17 73-01-08	31.4 114.3	1 239 P & S
		Re-entry (1973)			73-07-27 73-09-26	31.4 114.3	3 657.6 P & A
	2.	Mobil-Gulf Adolphus D-50	46°59'03.06" 48°22'28.86"	141	74-10-23 75-01-05	29.9 114.9	3 685.9 P & A
	3.	BP-Columbia Bonavista C-99	49°08'05.19" 51°14'25.13"	135	74-06-26 74-10-03	12.2 392.2	3 685 P & S
		Re-entry (1975)			75-06-12 75-08-12	12.9 329.2	3 778.9 P & A
	4.	Mobil-Gulf Bonnition H-32	45°51'26.79" 48°19'31.76"	120	73-12-02 74-01-02	29.9 101.8	3 048 P & A
	5.	Amoco-Imp-Skelly Brant P-87	44°16'59.91" 52°42'19.48"	114	73-11-14 73-12-22	29.9 98.8	3 587.8 P & A
	6.	Amoco-Imp-Skelly Carey J-34	45°23'32.42" 52°35'02.67"	124	74-04-17 74-07-06	29.9 100.6	3 689.3 P & A
	7.	Amoco-Imp-Skelly Coot K-56	45°45'41.52" 52°08'32.13"	119	73-12-24 74-03-21	29.9 79.9	3 535.7 P & S
		Re-entry (1974)			74-07-10 74-07-12	29.9 79.8	3 535.7 P & A
	8.	Amoco-Imp- Cormorant N-83	46°02'45.43" 48°58'02.07"	83	72-08-30 72-11-21	25.9 65.8	3 160.5 P & A
	9.	Mobil-Gulf Dominion O-23	47°22'49.14" 48°18'27.90"	139	74-08-27 74-10-21	29.9 161.5	3 997.8 P & A
	10.	Amoco-Imp-Skelly Egret K-36	46°25'37.88" 48°50'22.38"	108	73-07-12 73-09-10	29.9 67.9	3 352.8 P & A
	11.	Amoco-Imp-Skelly Egret N-46	46°25'56.14" 48°51'47.35"	127	74-07-27 74-08-29	29.9 67.7	2 743.2 P & A
	12.	Elf et al. Emerillon C-56	45°15'04.79" 54°23'16.85"	115	73-12-07 74-01-25	29.9 119.8	3 276.6 P & A

Table 2 continued:

Physiographic Area	Well Name	Latitude, Longitude	GSC D#	Spud Date Rig Release	RT m WD	Depth m Well Status
	13. Mobil-Gulf Flying Foam I-13	47°02'41.96" 48°46'30.98"	117	73-09-26 73-11-28	29.9 90.8	3 683.2 P & A
	14. Amoco-Imp Gull F-72	44°11'25.18" 52°26'32.30"	36	72-12-01 73-01-12	29.9 93.6	2 500.8 P & A
	15. Amoco-Imp-Heron H-73	44°02'26.65" 52°25'40.58"	82	72-08-06 72-12-05	25.9 105.5	3 657.6 P & A
	16. Amoco-Imp Kittiwake P-11	44°40'49.43" 53°31'45.65"	79	72-06-20 72-08-03	25.9 95.7	3 550 P & A
	17. Amoco-Imp-Skelly Mallard M-45	44°14'46.16" 52°07'22.39"	89	73-02-26 73-05-02	25.9 84.7	3 521.9 P & A
	18. Amoco-Imp Merganser I-60	44°49'36.11" 52°22'48.66"	90	72-12-07 73-01-17	25.9 78.6	1 903.5 P & A
	19. Amoco-Imp-Skelly Osprey H-84	44°43'28.79" 49°27'22.92"	105	73-07-09 73-08-16	25.9 60.9	3 474 P & A
	20. Amoco-Imp-Skelly Phalarope P-62	45°11'49.25" 51°21'14.40"	136	74-10-24 75-01-05	29.9 73.2	3 161.7 P & A
	21. Amoco-Imp-Skelly Skua E-41	45°20'23.23" 48°52'26.26"	132	74-08-31 74-10-21	29.9 82.9	3 238.8 P & A
	22. Amoco-Imp-Skelly Spoonbill D-30	45°49'06.47" 49°04'06.18"	111	73-09-12 73-10-14	29.9 65.2	2 757.2 P & A
	23. Amoco-Imp-Skelly Tern A-68	44°27'13.41" 53°09'00.84"	102	73-01-17 73-04-16	29.9 114.6	4 188.9 P & A
	24. Amoco-Imp-Skelly Twillick G-49	44°18'25.60" 51°21'32.10"	122	74-03-31 74-04-14	29.9 74.4	1 301.5 P & A

Table 3

Locations of exploratory wells used for geochemical analyses on the Labrador Shelf

Well Symbols:

Plugged and Abandoned — Significant Gas — Gas Show — Oil Show — Significant Oil and Gas — Significant Oil, Suspended

Physiographic Area	Well Name	Latitude, Longitude	GSC D#	Spud Date Rig Release	RT m WD	Depth m Well Statu
Labrador Shelf	1. Eastcan *et al.* Bjarni H-81	55°30'29.35" 57°42'05.52"	116	73-08-29 73-10-14	12.2 138.9	2 514.9 P & S
	Re-entry (1974)			74-10-03 74-10-25	12.2 138.9	2 514.9 P & A
	2. Eastcan *et al.* Gudrid H-55	54°54'30" 55°52'32"	133	74-07-14 74-10-04	12.2 299.3	2 837.9 P & S
	3. Tenneco *et al.* Leif E-38	54°17'29.87" 55°05'52.17"	107	71-08-13 71-10-08	12.2 169.5	1 084.2 P & S
	Re-entry (1973)			73-07-25 73-08-01	12.2 167.6	1 084.2 P & A

Table 4

Precision and detection limits of the analytical parameters for the offshore geochemical data contained in this report.

Parameter	Standard	Units	Precision	Detection Limit
Organic Carbon	Iron Ring	percent	.1%C	0.1
$C_1(CH_4)$	CH_4	ppm	10%	5
C_2^+	C_2H_6	ppm	10%	5
C_3	C_3H_8	ppm	10%	5
C_4	C_4H_{10}	ppm	10%	5
iso-C_4	C_4H_{10}	ppm	10%	5
normal-C_4	C_4H_{10}	ppm	10%	5

Appendix - Plot Program

```
      PROGRAM COPLOT(INPUT,OUTPUT,TAPE5,TAPE6,TAPE7,TAPE51)
      DIMENSION TTITLE(2),DP(500),TC(500),DRG(500),PCW(500)
      DIMENSION IPAK(50),AMET(500)
C
C
C
      N=0
      I=0
C
C
C
C
      START=0.
      END=8000.
      CALL CALCMP(51)
1     CONTINUE
      READ(5,100)JDNO,START,END,YSCAL
      IF(JDNO.EQ.99999) GO TO 90
      GO TO 20
100   FORMAT(I5,3F10.0)
11    YSCAL=(END-START)/9.0
      TDEP=(END-START)/YSCAL
      YGR=TDEP
      YSIZ=YGR+3.5
      IF(YSIZ.GT.30.) GO TO 92
      XSIZ=5.0
C
C
      N=N+1
C
      CALL BGNPL(N)
      CALL FLATPD
      CALL PAGE(17.0,22.0)
      CALL PHYSOR(2.25,0.10)
      CALL HEIGHT(0.10)
      CALL SCMPLX
12    CALL TITLE(" ",0," ",0,"DEPTH (METERS)",14,4.0,9.0)
      CALL HEIGHT(0.10)
      CALL GRAF(0.,1.,4.,END,YSCAL,START)
      CALL FRAME
      CALL NOCHEK
      IF(N.GT.1) GO TO 41
      CALL STRTPT(6.25,0.0)
      CALL CONNPT(6.25,22.0)
      CALL STRTPT(-2.25,10.90)
      CALL CONNPT(14.75,10.90)
      GO TO 41
C
C
C
20    READ(6,200)IDNO,TTITLE
200   FORMAT(I5,1X,2A10)
      IF(EOF(6).NE.0) GO TO 90
      PRINT 201,IDNO,TTITLE
201   FORMAT(1X,I5,5X,2A10)
      IF(IDNO.EQ.JDNO) GO TO 30
      CALL NEWELL(6)
      GO TO 20
C
C
C
C  WELL LOCATED
30      READ(6,300)DP(1),AMET(1),DRG(1),TC(1),PCW(1)
300   FORMAT(F5.0,F8.0,4X,F8.2,17X,F8.0,F8.1)
```

```
      IF(EOF(6).NE.0) GO TO 91
      IF(AMET(1).LT.10.)AMET(1)=10.
      IF(ORG(1).GT.5.)ORG(1)=5.
      IF(TG(1).LT.10.)TG(1)=10.
      DP(1)=DP(1)/3.28
      ISTART=DP(1)/100
      START=ISTART*100.
      PRINT 300,START
      IF(DP(1).LT.START) GO TO 30


      DO 33 I=2,500
      READ(6,300)DP(I),AMET(I),ORG(I),TG(I),PCW(I)
      IF(EOF(6).NE.0) GO TO 40
      IF(AMET(I).LT.10.)AMET(I)=10.
      IF(ORG(I).GT.5.)ORG(I)=5.
      IF(TG(I).LT.10.)TG(I)=10.
      DP(I)=DP(I)/3.28
      IF(DP(I).GT.END) GO TO 40
3     CONTINUE
      I=501


 DATA IN FOR INTERVAL***PLOT
0     I=I-1
      PRINT 200,I
      END=DP(I)
      END1=END/100
      IEN=END1
      IEN=IEN+1
      END=IEN*100.
      PRINT 300,END
      GO TO 11
1     CONTINUE
      IF(I.LT.2) GO TO 91
      CALL GRACE(0.1)
      YPOS=TDEP+0.35
      CALL HEIGHT(0.08)
      CALL SCMPLY
      CALL PEN(2)
      CALL XLGAXS(10.,1.,4.0,"TOTAL GAS (PPM)",15,0.,YPOS)
      CALL CURVE(TG,DP,I,0)


      YPOS=YPOS+0.35
      CALL PEN(3)
      CALL XLGAXS(10.,1.,4.,"METHANE (PPM)",13,0.,YPOS)
      CALL CURVE(AMET,DP,I,0)


      YPOS=YPOS+0.35
      CALL PEN(4)
      CALL XGRAXS(0.,1.,5.,4.0,"TOTAL ORG CARBON (%)",20,0.,YPOS)
      CALL CURVE(ORG,DP,I,0)
      CALL PEN(1)
      IF(I.EQ.500) GO TO 30
'76   CALL HEIGHT(0.20)
      YPOS=YGR+1.3
      CALL DUPLY
      CALL MESSAG(ITITLE,20,0.0,YPOS)
      CALL SCMPLY
      CALL ENDPR(N)
      ...  ...  CALL RSHIFT(..(.11..))
```

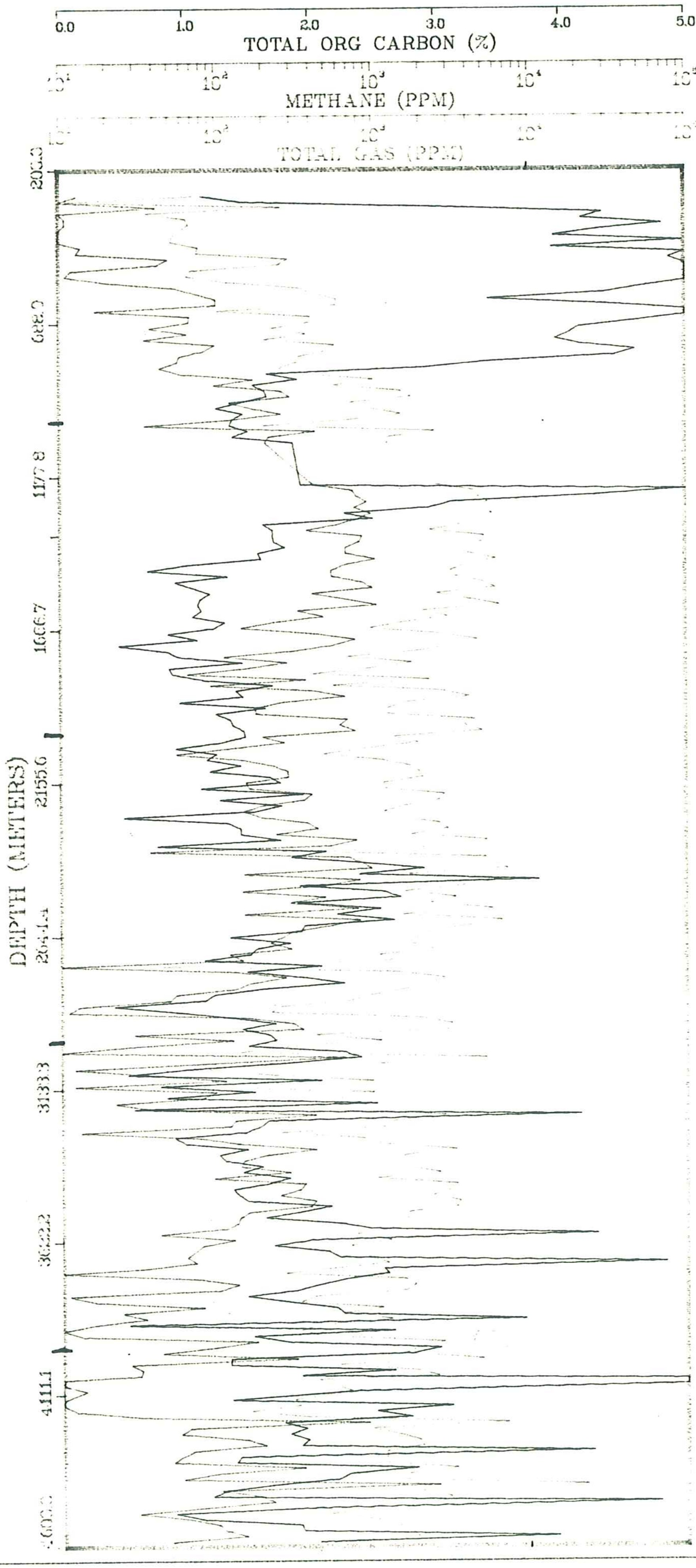
```
      IF(N.EQ.3) CALL RSHIFT(8.5,11.0)
      IF(N.EQ.4) GO TO 81
      N=N+1
      GO TO 12
81    CALL ENDPL(0)
      N=0
      GO TO 1
90    PRINT 900,IDNO
900   FORMAT(1X,"NO WELL FOUND TO MATCH D=",I7)
      GO TO 99
91    PRINT 910,JDNO,START,END
910   FORMAT(1X,"NO VALID DATA FOR D",I5,"DEPTH R=",2F10.2)
      GO TO 1
92    PRINT 921
      PRINT 920,YSCAL,START,END
921   FORMAT(1X,"Y DIMENSION TOO LARGE")
920   FORMAT(1X,"VERT SCAL",F10.2,"START",F10.2,"END",F10.2)
      GO TO 1
99    CALL DONEPL
      END
      SUBROUTINE NEWELL(K)
1     READ(K,100)JJ
100   FORMAT(A1)
      IF(EOF(K).NE.0) RETURN
      GO TO 1
      END
```

Appendix I - Processor Program

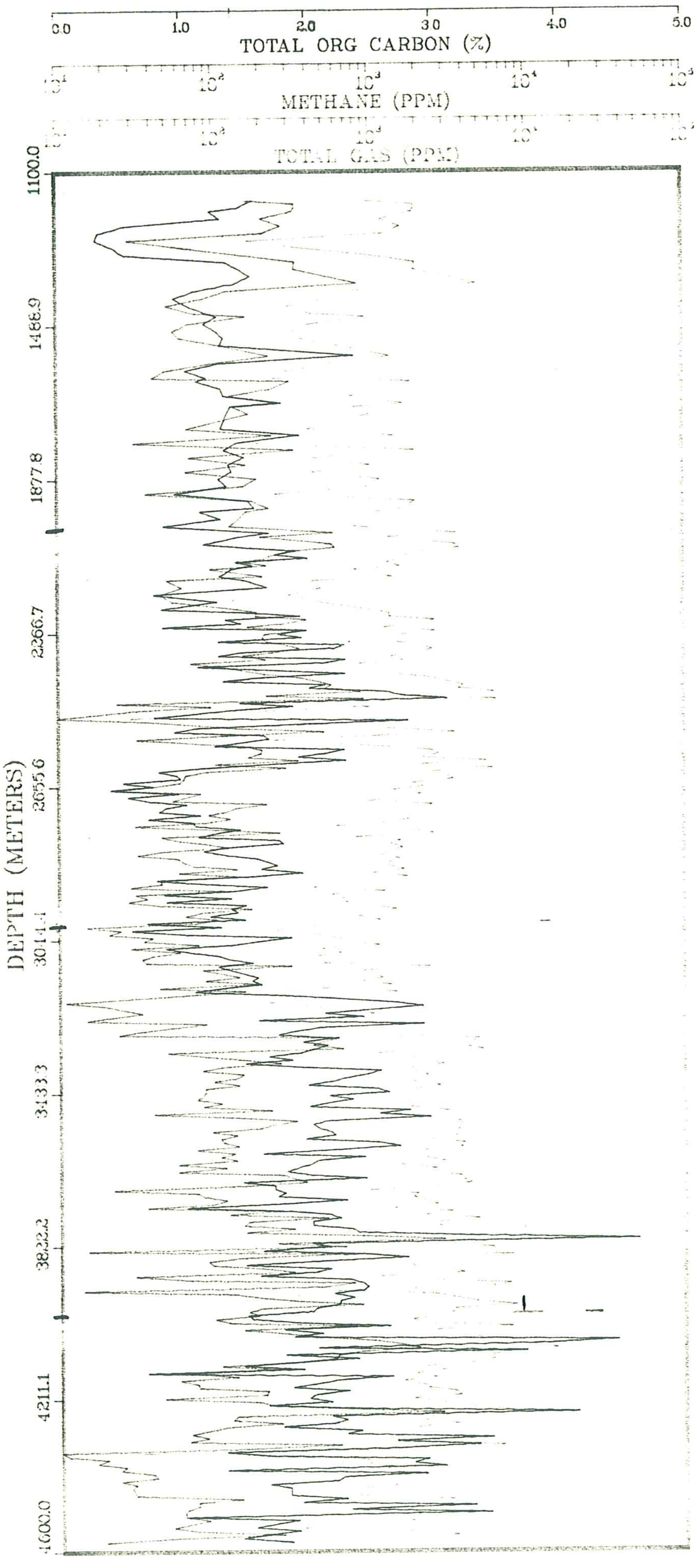

```
      PROGRAM GASS(INPUT,OUTPUT,TAPE6=OUTPUT,TAPE5=INPUT,TAPE7)
      INTEGER PRNT
      INTEGER TITLE(8)
  271 FORMAT(1H ,8A10)
  303 FORMAT (1H1)
  117 FORMAT (F5.0,4F10.0,F9.2,F8.0,2F9.0,F8.1,F9.1)
  114 FORMAT(F5.0,F10.1,7X,F6.3,3X,I1)
  302 FORMAT (1H0,2X,5HDEPTH,2X,7HMETHANE,3X,6HETHANE,3X,7HPROPANE,2X,6H
     1ISOBUT,3X,6HBUTANE,3X,5HTOTAL,2X,5HORG C,4X,7HPPM DRY,2X,7HPPM WET
     2,2X,7HTOT PPM,2X,4HOC WET,3X,5HISO/N)
      M=0
    1 CONTINUE
  113 FORMAT(3I2)
      IN=5
      PRNT=1
      LUN=7
      IND = LUN*LUN + PRNT*PRNT
  116 READ(IN,372) TITLE
  372 FORMAT(8A10)
      IF(EOF(IN).NE.0) GO TO 7777
      IF(LUN.NE.0) WRITE(LUN,372) TITLE
      IF(PRNT.EQ.0) GO TO 4
      WRITE (6,303)
      WRITE(6,271) TITLE
      WRITE(6,302)
    4 CONTINUE
      READ(IN,2) T,P1,P2,P3,PI,P4
    2 FORMAT (I5,5F10.0,F5.3)
      I=0
  203 I=I+1
      N=I-1
  202 READ(IN,114)DPT,X1,X2,X3,XI4,X4,PER,LDEF
      IF (LDEF.EQ.0.) GO TO 201
      IF (LDEF.EQ.2.) GO TO 777
      P1=P1/(X1)
      P2=P2/X2
      P3=P3/X3
      PI4=PI/XI4
      P4=P4/X4
      PPER=PER
      GO TO 202
  201 CONTINUE
      X1=X1*P1
      X2=X2*P2
      X3=X3*P3
      X4=X4*P4
      XI4=XI4*PI4
      PER=PER*PPER
      TGAS  =X1+X2+X3+X4+XI4
      PPMW  = 5.7*(X2+X3+X4+XI4)
      PPMD  = 5.7*X1
      TPPM=TGAS*5.7
      IF (TGAS .NE.0.AND.X1.NE.0) GO TO 164
      TGAS =TGAS +1.
      X1=X1+1.
      TPPM=0.
      RAT=0.
```

```
      GO TO 800
  144 CONTINUE
      PCW=100.*PPMW/TPPM
      RAT=XI4/X4
  800 IF(IND.EQ.0) GO TO 203
      IF(LUN.EQ.0) GO TO 999
      IF(X4.NE.0.) GO TO 304
      WRITE(LUN,117) OPT,X1,X2,X3,XI4,X4,TGAS,PER,PPMD,PPMW,
     1TPPM,PCW
      GO TO 999
  304 CONTINUE
      WRITE(LUN,117) OPT,X1,X2,X3,XI4,X4,TGAS,PER,PPMD,PPMW,
     1TPPM,PCW,RAT
  999 CONTINUE
      IF(PRNT.EQ.0) GO TO 1000
      IF(X4.NE.0.) GO TO 3041
      WRITE(6,117) OPT,X1,X2,X3,XI4,X4,TGAS,PER,PPMD,PPMW,TP
     1PM,PCW
      GO TO 1000
 3041 CONTINUE
      WRITE(6,117) OPT,X1,X2,X3,XI4,X4,TGAS,PER,PPMD,PPMW,TP
     1PM,PCW,RAT
 1000 CONTINUE
      GO TO 203
  777 ENDFILE 7
      GO TO 1
 7777 END
```

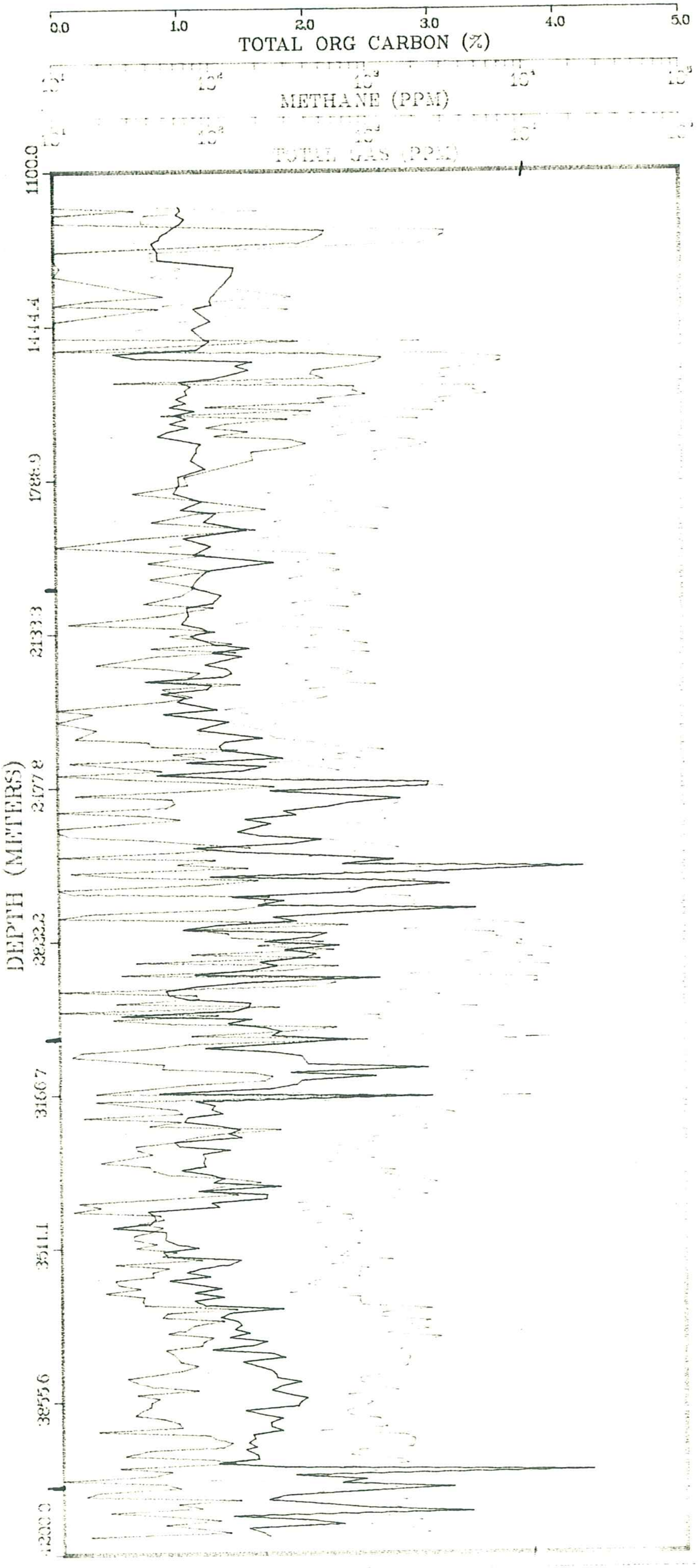
BLUENOSE G-47



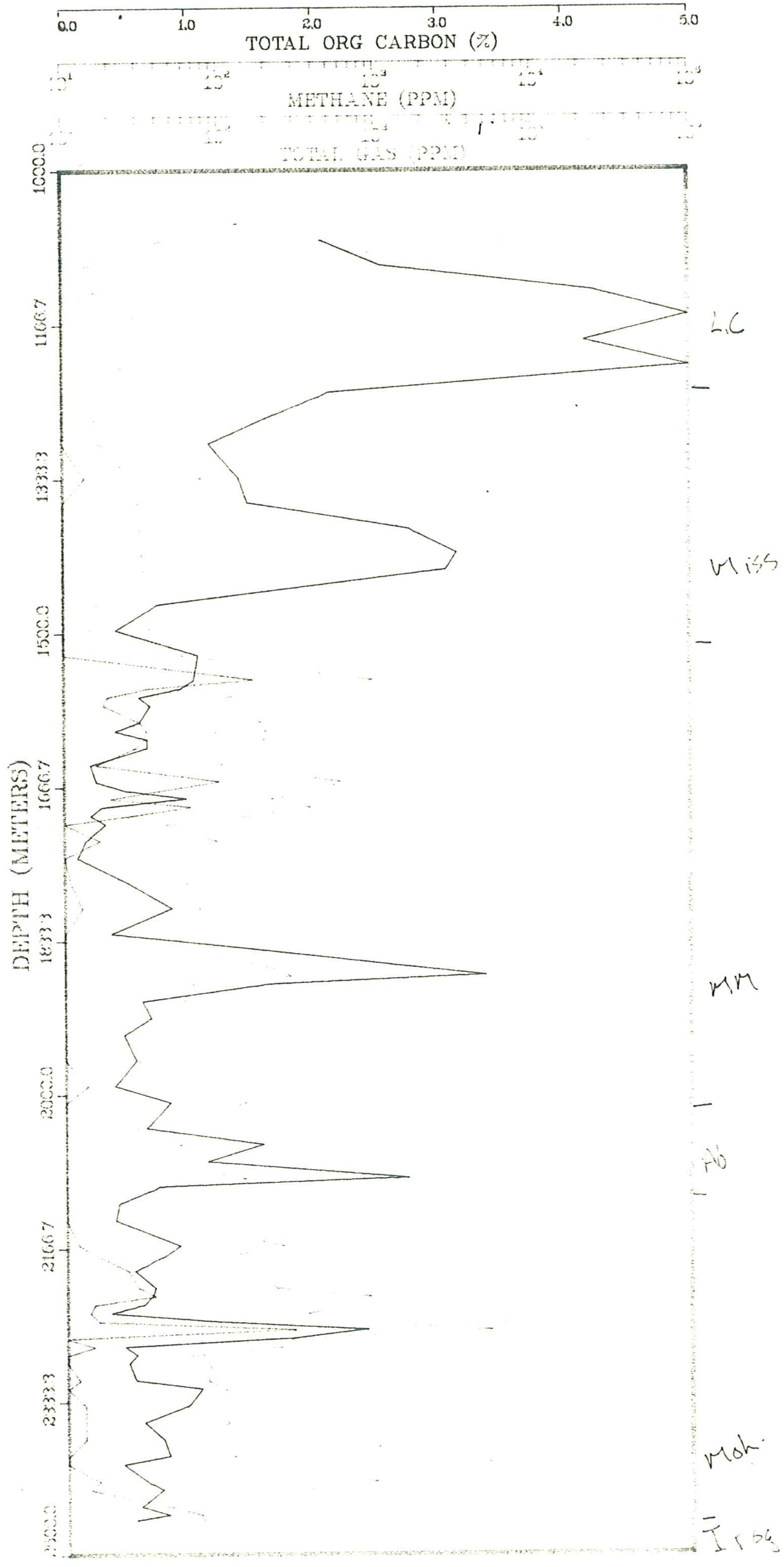
CITNALTA I-59



INTREPID L-80

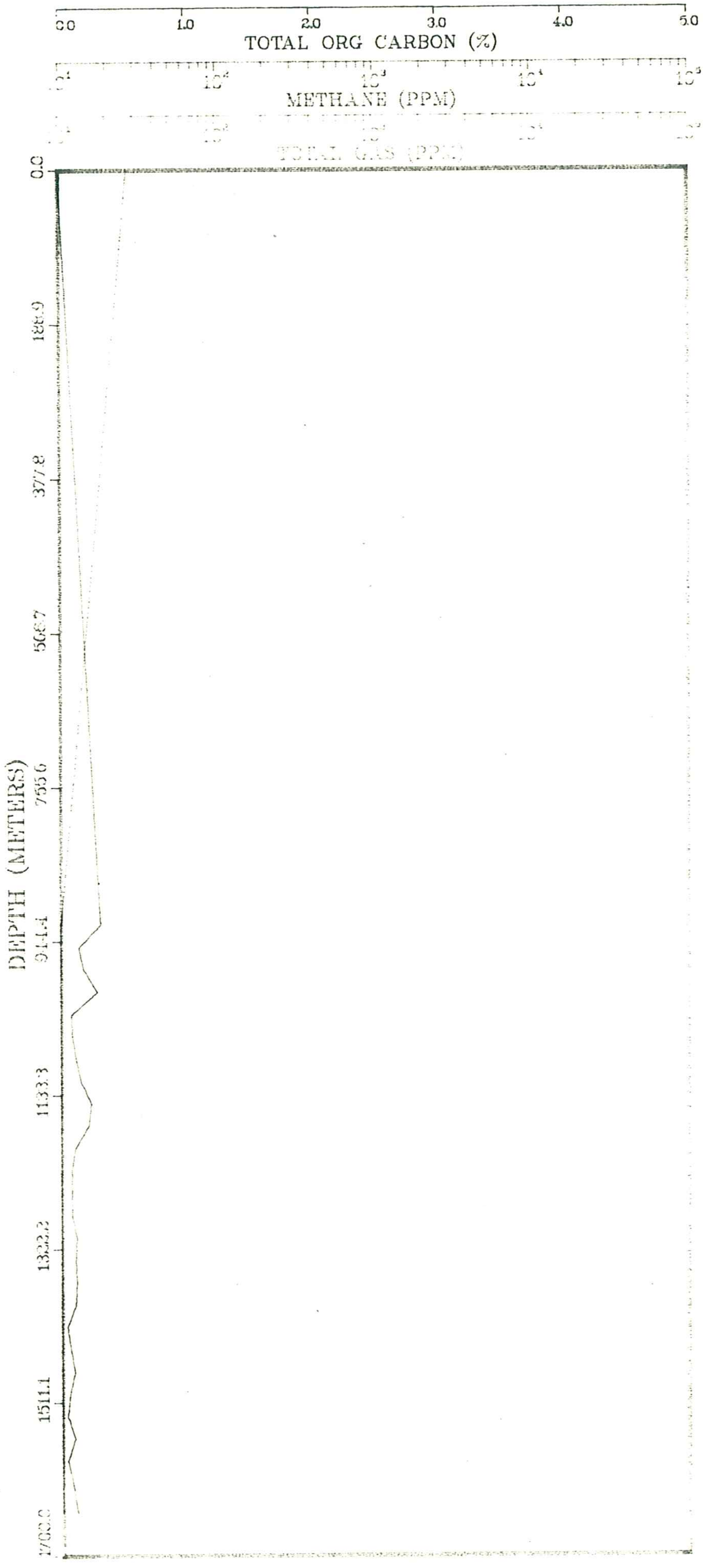


JASON C-20

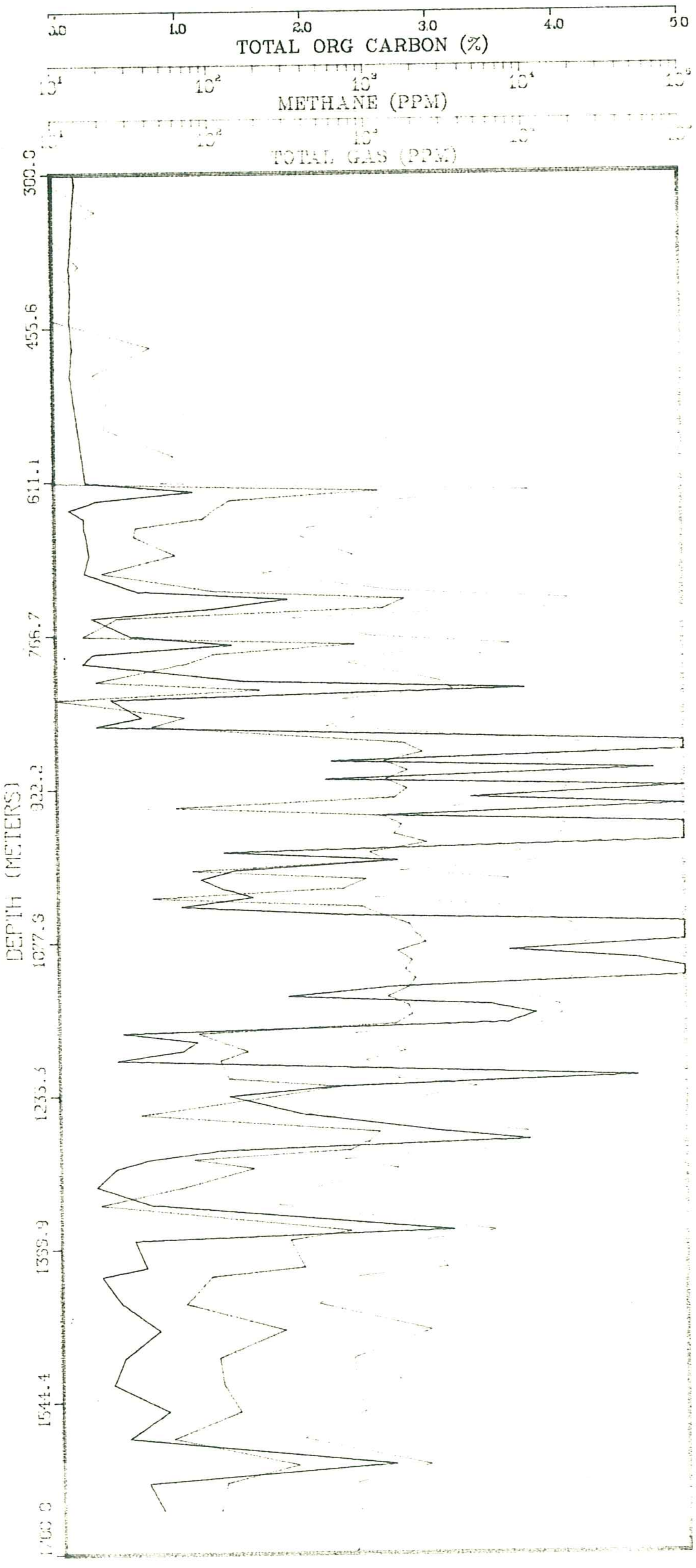


TOTAL ORG CARBON (%)
0.0
1.0
2.0
3.0
4.0
5.0
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1166.7
1333.3
1500.0
1666.7
1833.3
2000.0
2166.7
2333.3
L.C
Miss
MM
Ab
Moh.

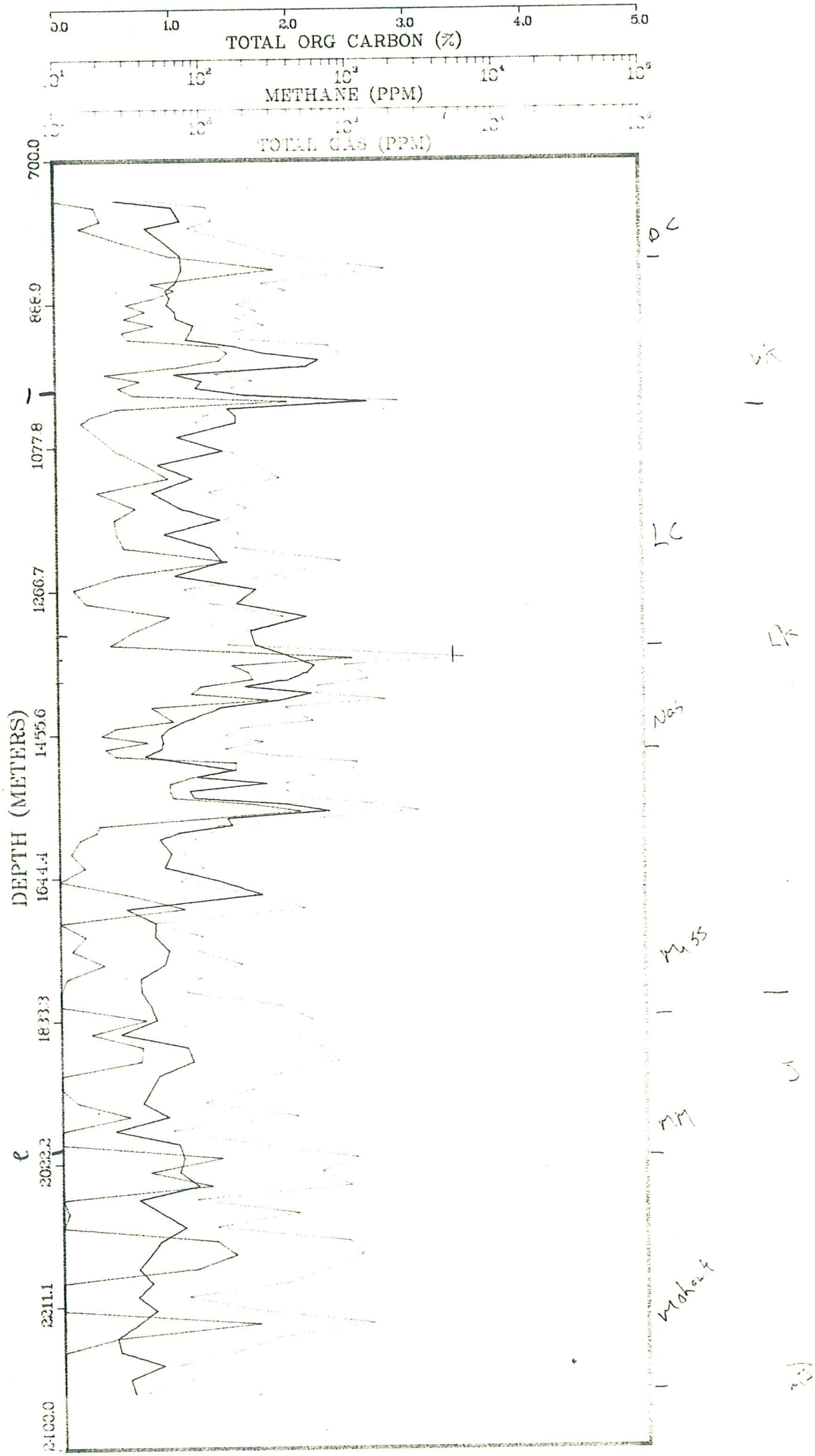
MONTAGNAIS I-94



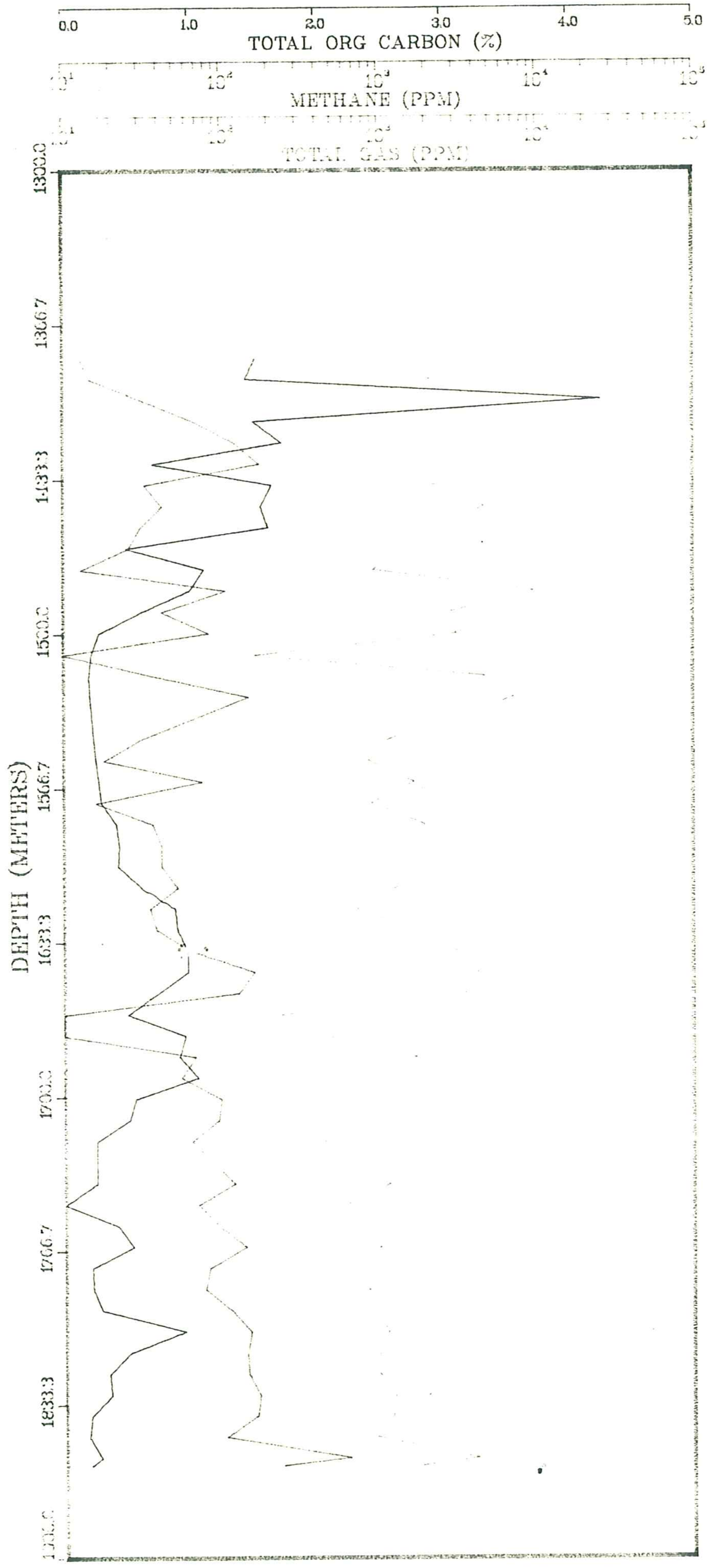
N. SYDNEY P-05


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
300.0
455.6
611.1
766.7
922.2
1077.8
1233.3
1388.9
1544.4
DEPTH (METERS)

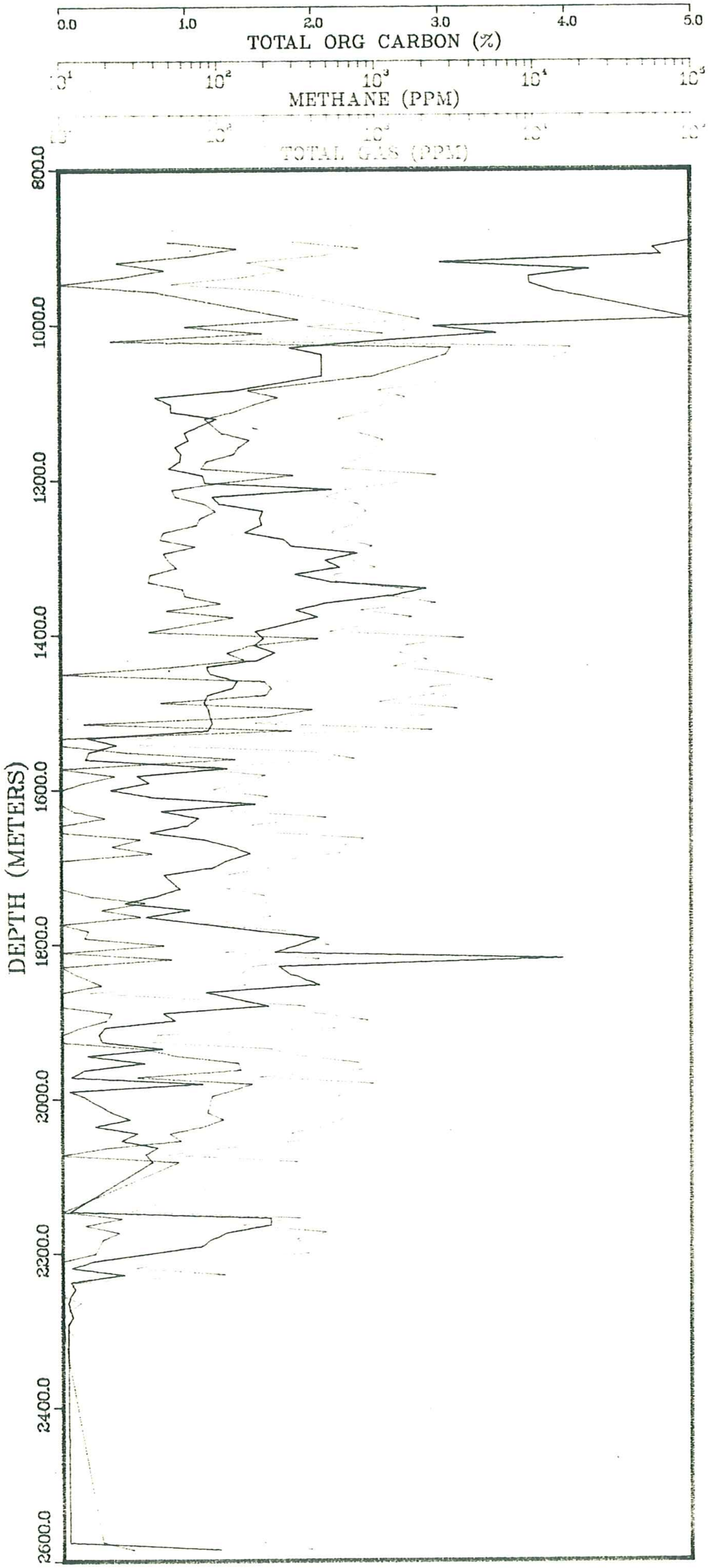
OJIBWA E-07


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
700.0
888.9
1077.8
1266.7
1455.6
1644.4
1833.3
2022.2
2211.1
2400.0
DC
LC
LK
MM
Mohawk

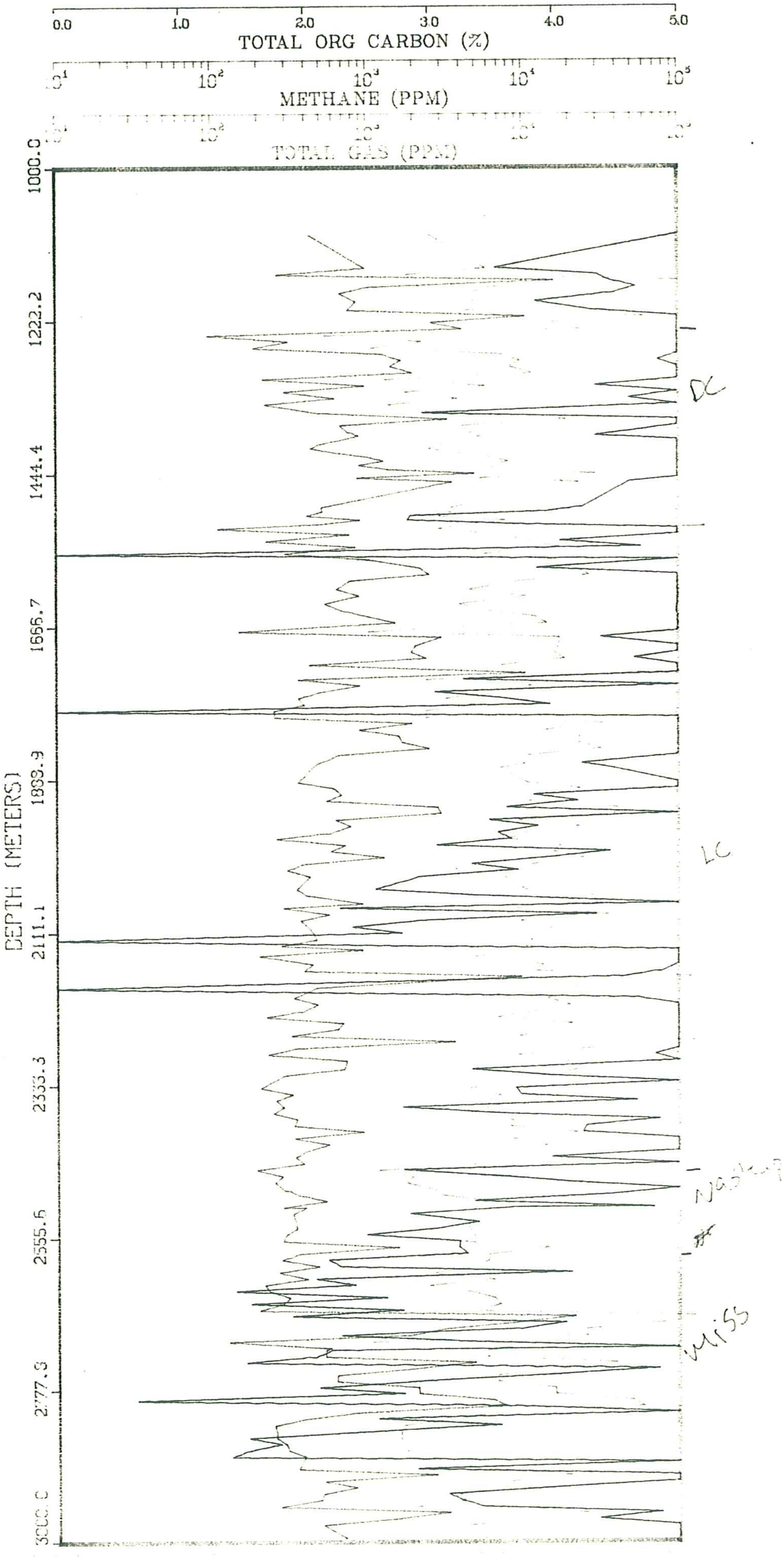
PRIMROSE A-41



PRIMROSE F-41

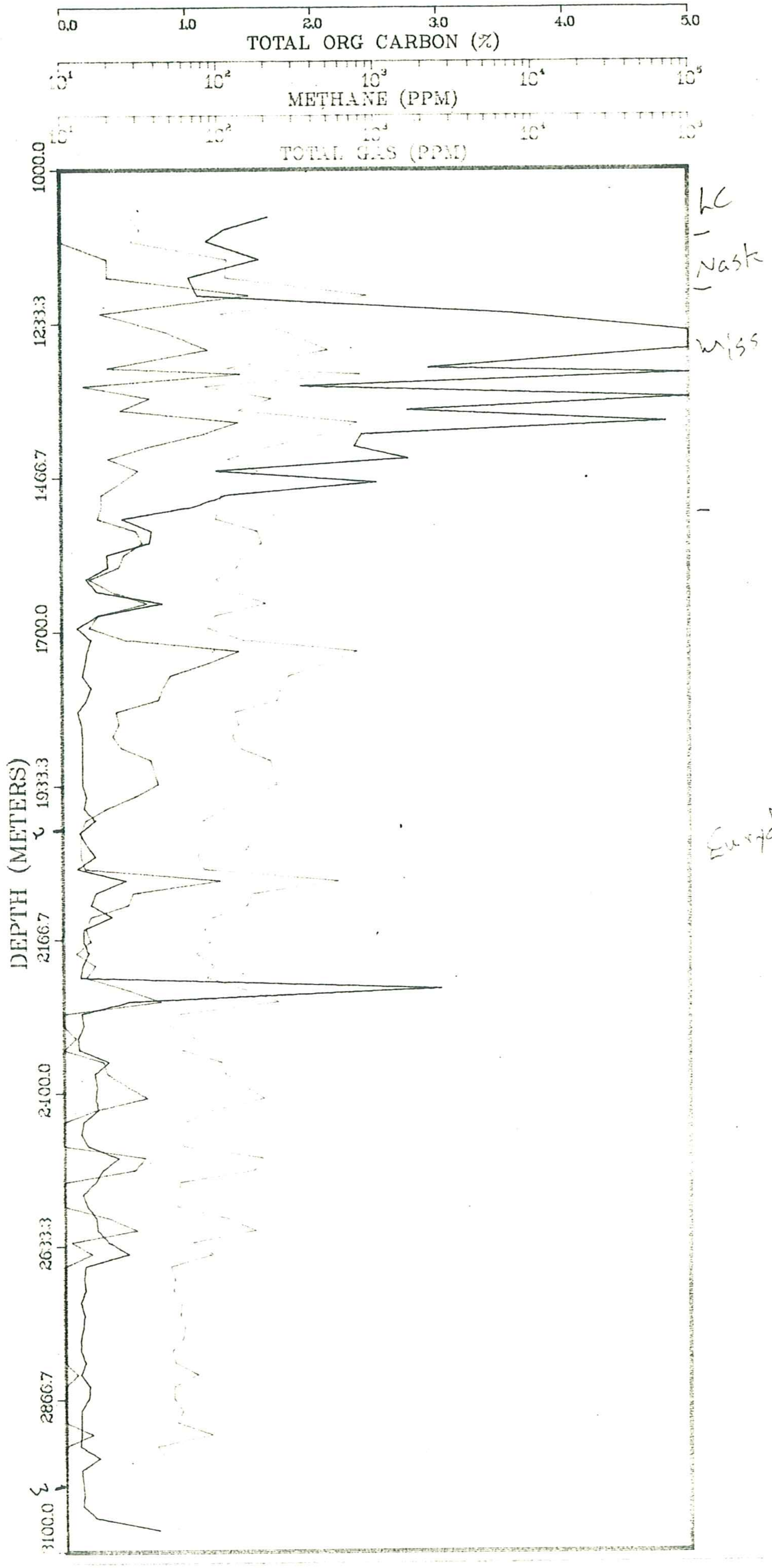


SABLE 1H-58

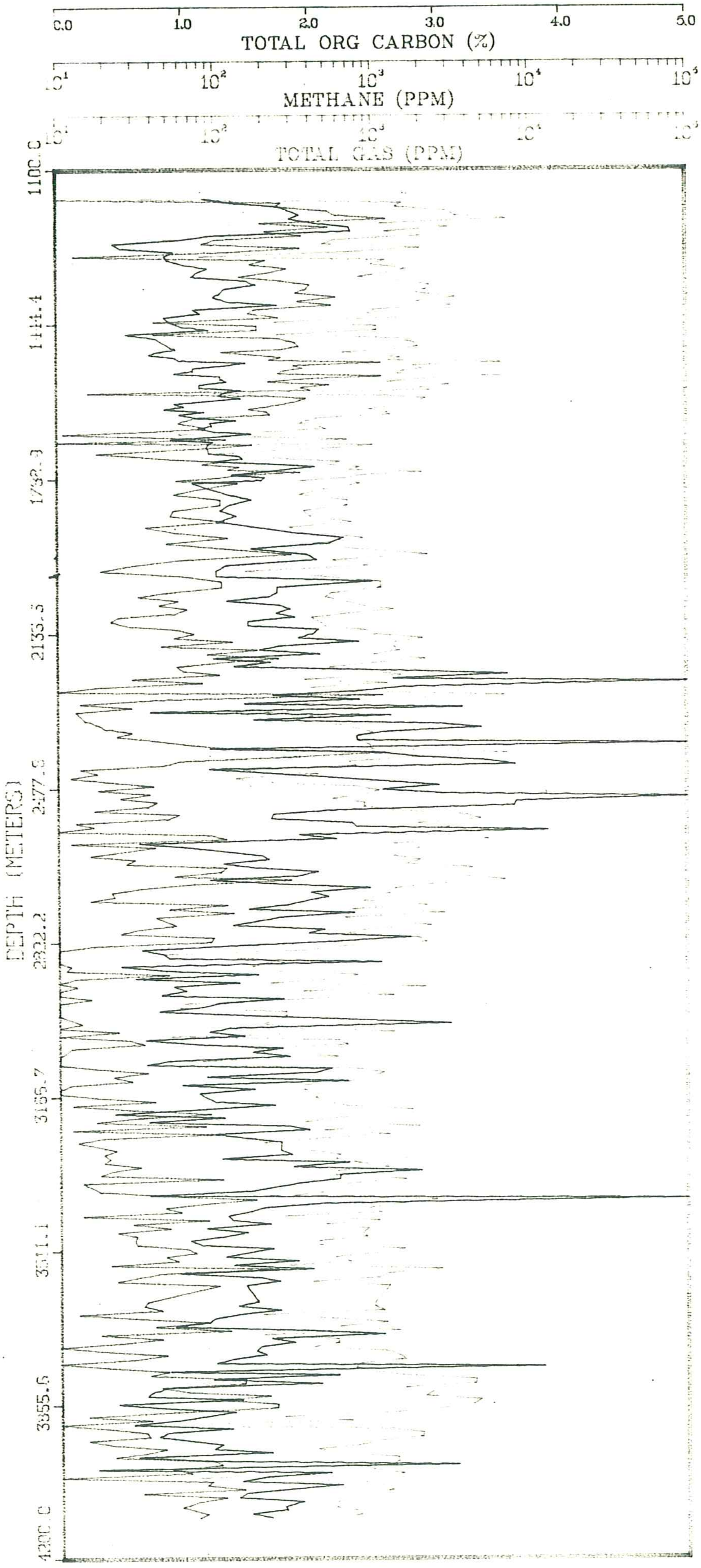


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
10²
10³
10⁴
10⁵
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1222.2
1444.4
1666.7
1888.9
2111.1
2333.3
2555.6
2777.8
3000.0
DC
LC
Naskap
Miss

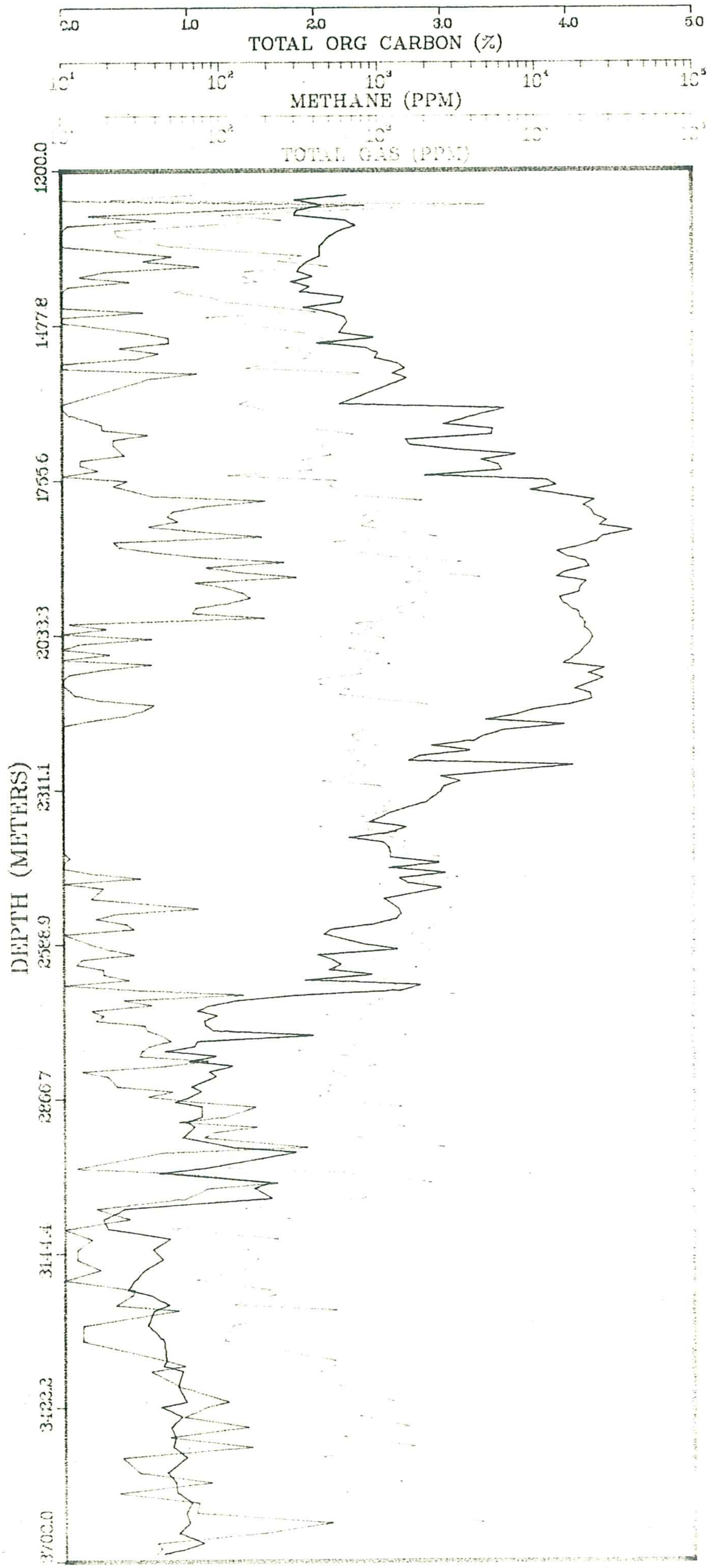
SAMBRO I-29


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1233.3
1466.7
1700.0
1933.3
2166.7
2400.0
2633.3
2866.7
3100.0
LC
Nask
Miss
Euryd

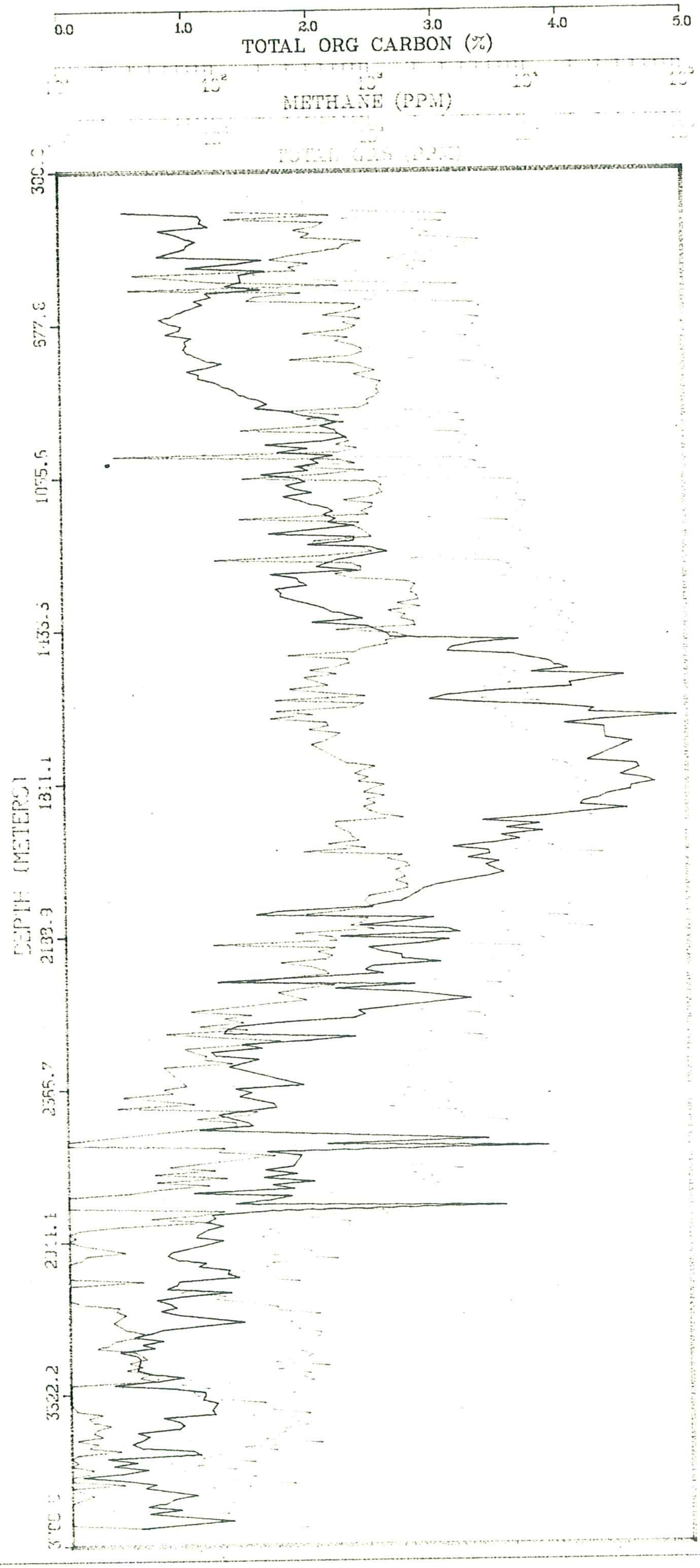
THEBAUD P-84


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
1100.0
1444.4
1788.9
2133.3
2477.8
2822.2
3166.7
3511.1
3855.6
4200.0
DEPTH (METERS)

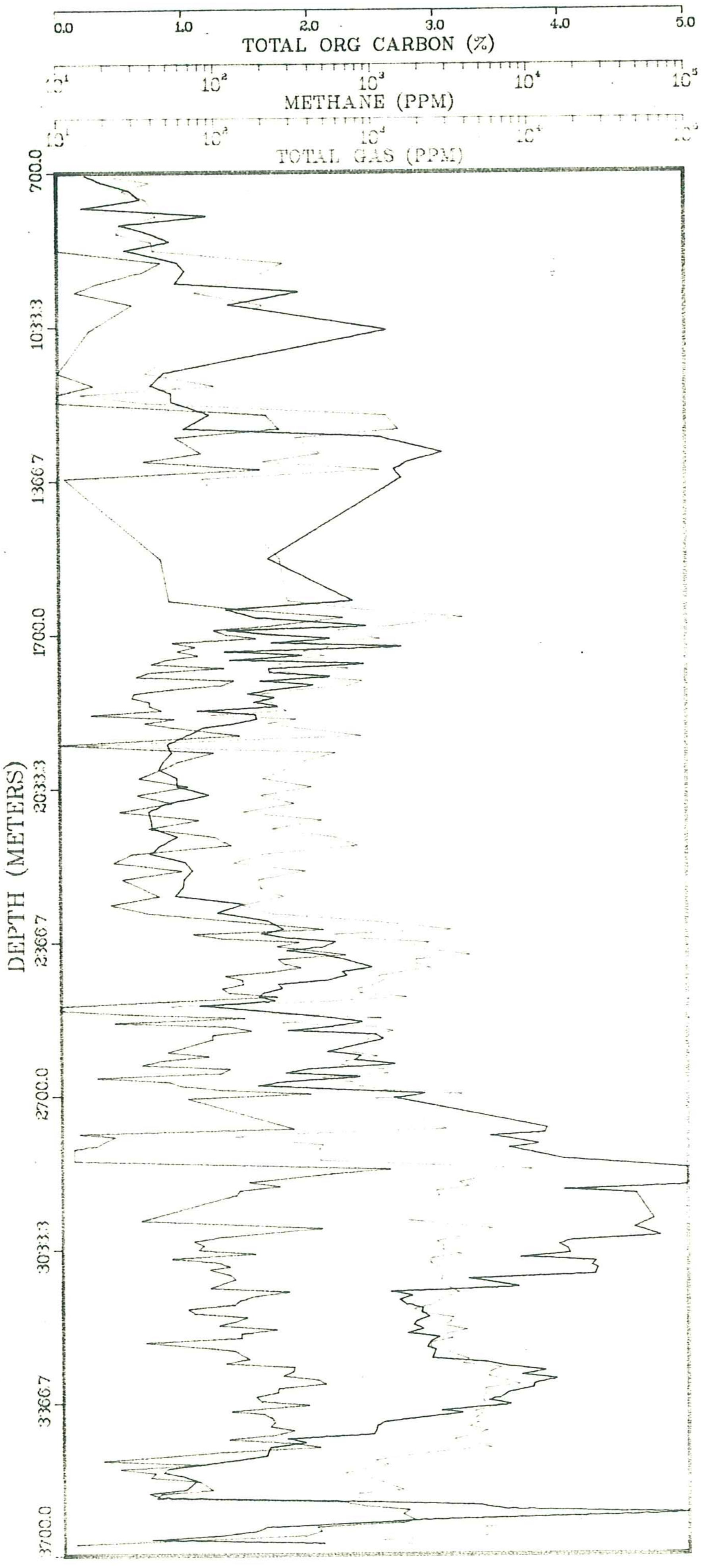
ADOLPHUS D-50



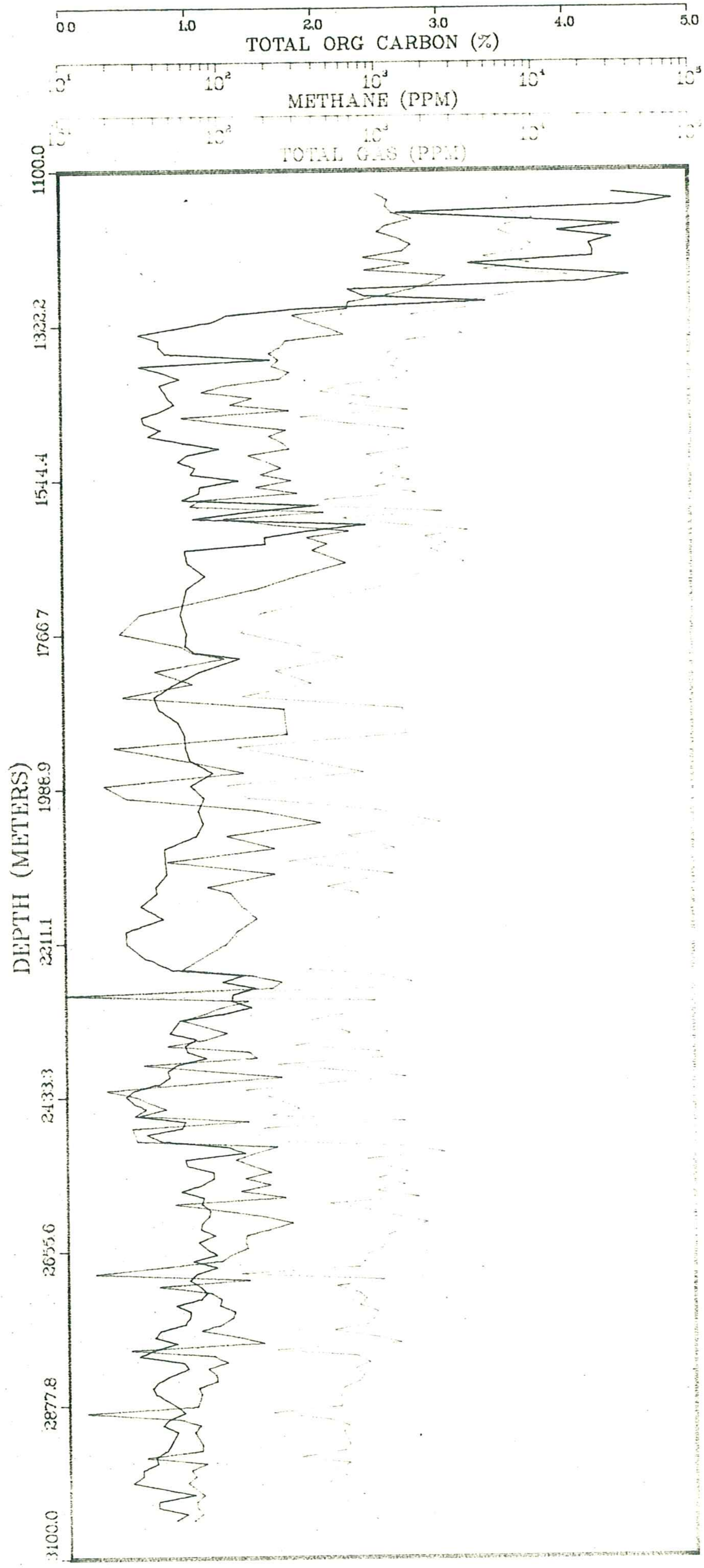
ADOLPHUS 2K-41



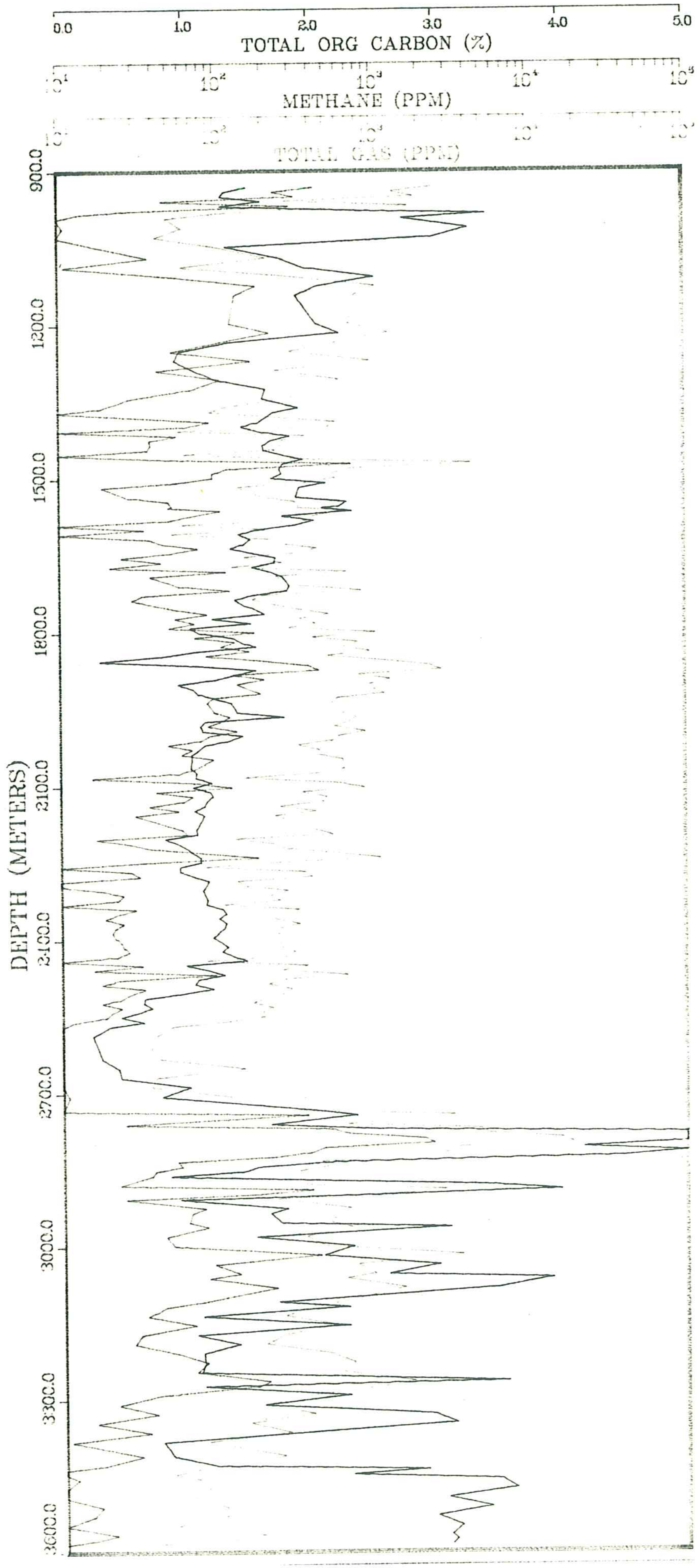
BONAVISTA C-99



BONNITION H-32

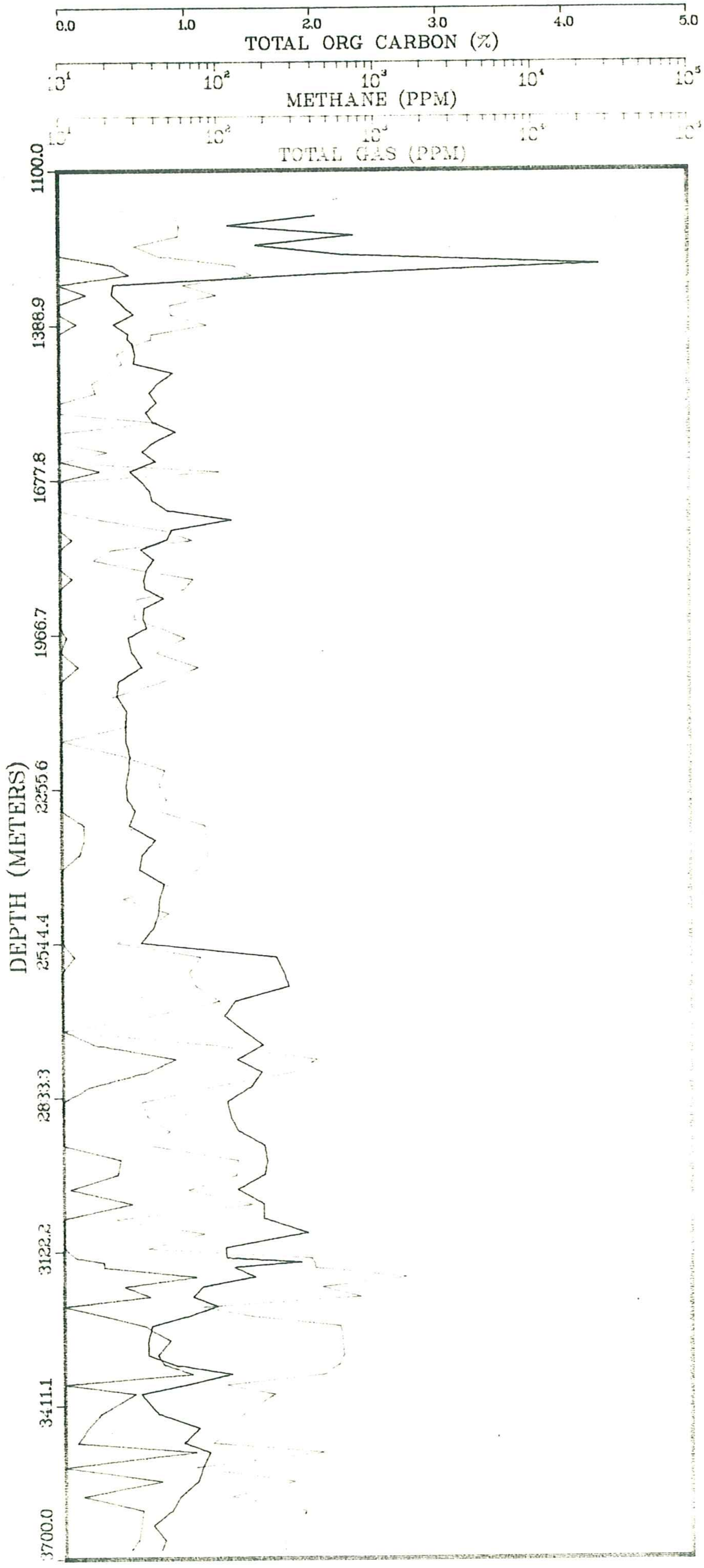


BRANT P-87



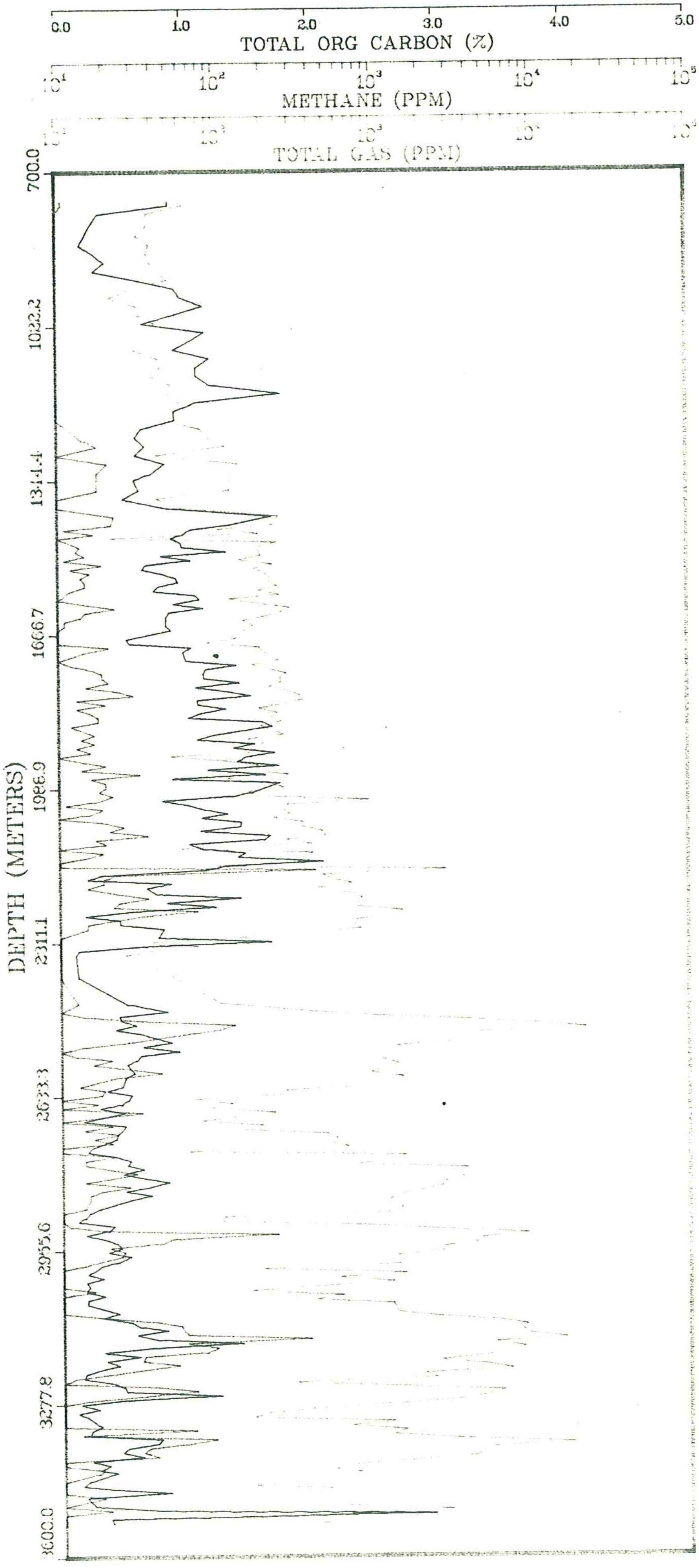
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
900.0
1200.0
1500.0
1800.0
2100.0
2400.0
2700.0
3000.0
3300.0
3600.0

CAREY J-34

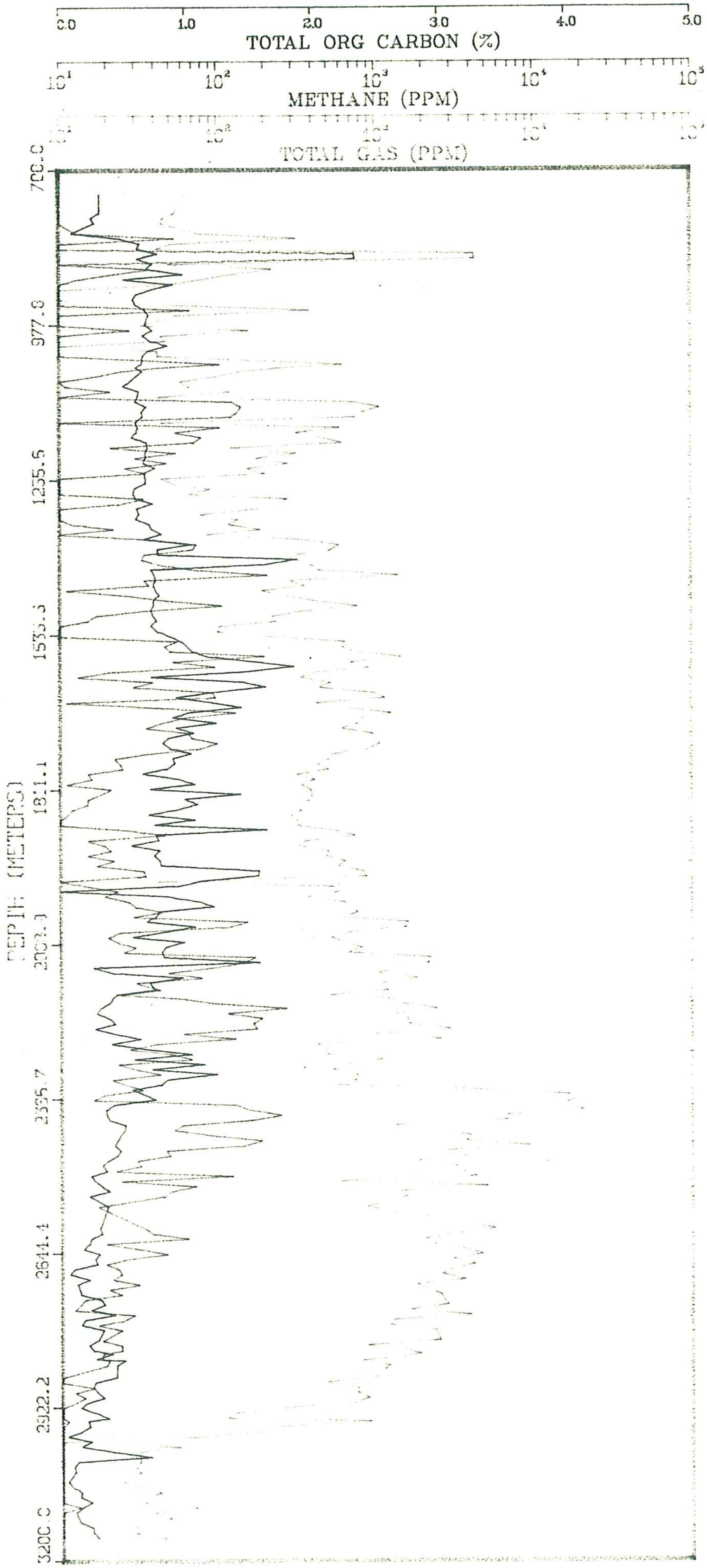


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
1100.0
1388.9
1677.8
1966.7
2255.6
2544.4
2833.3
3122.2
3411.1
3700.0
DEPTH (METERS)

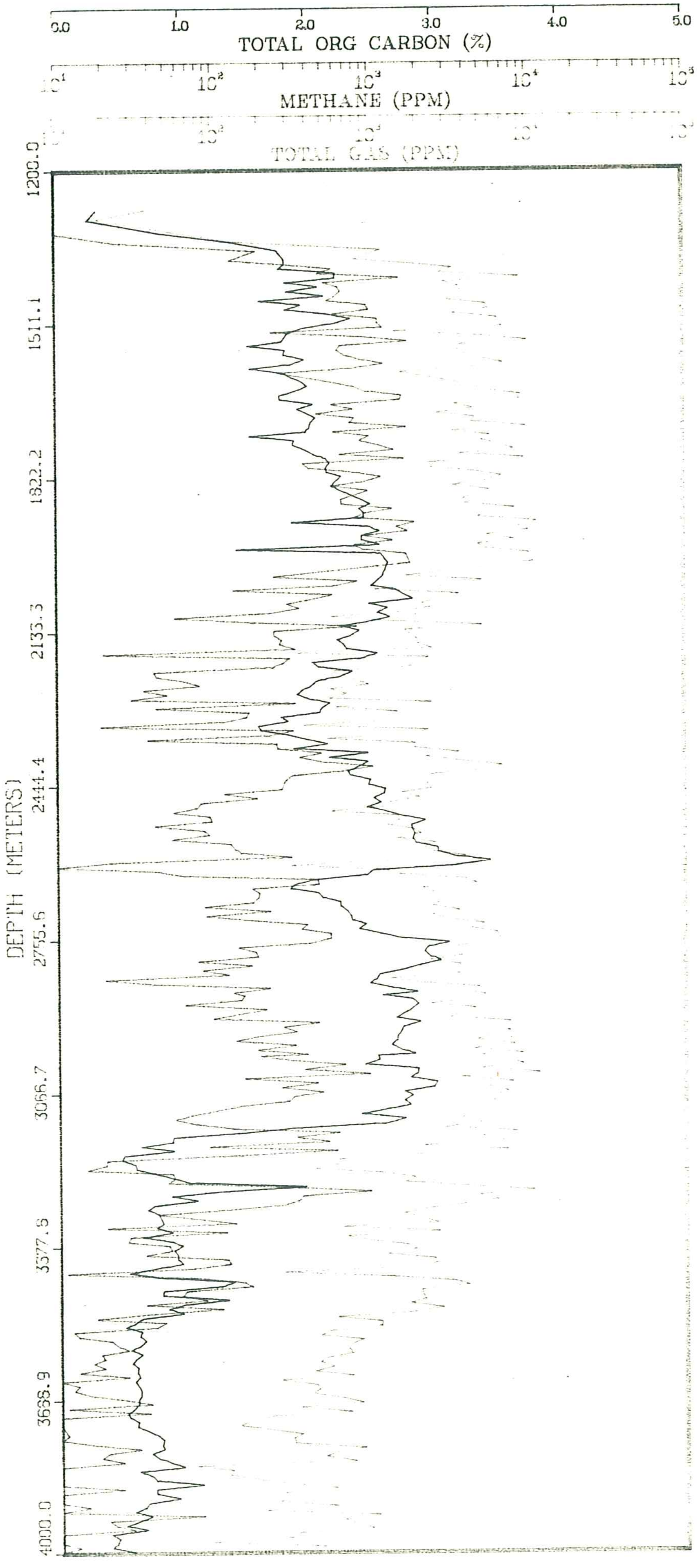
COOT K-56


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
700.0
1022.2
1344.4
1666.7
1988.9
2311.1
2955.6
3277.8
3600.0

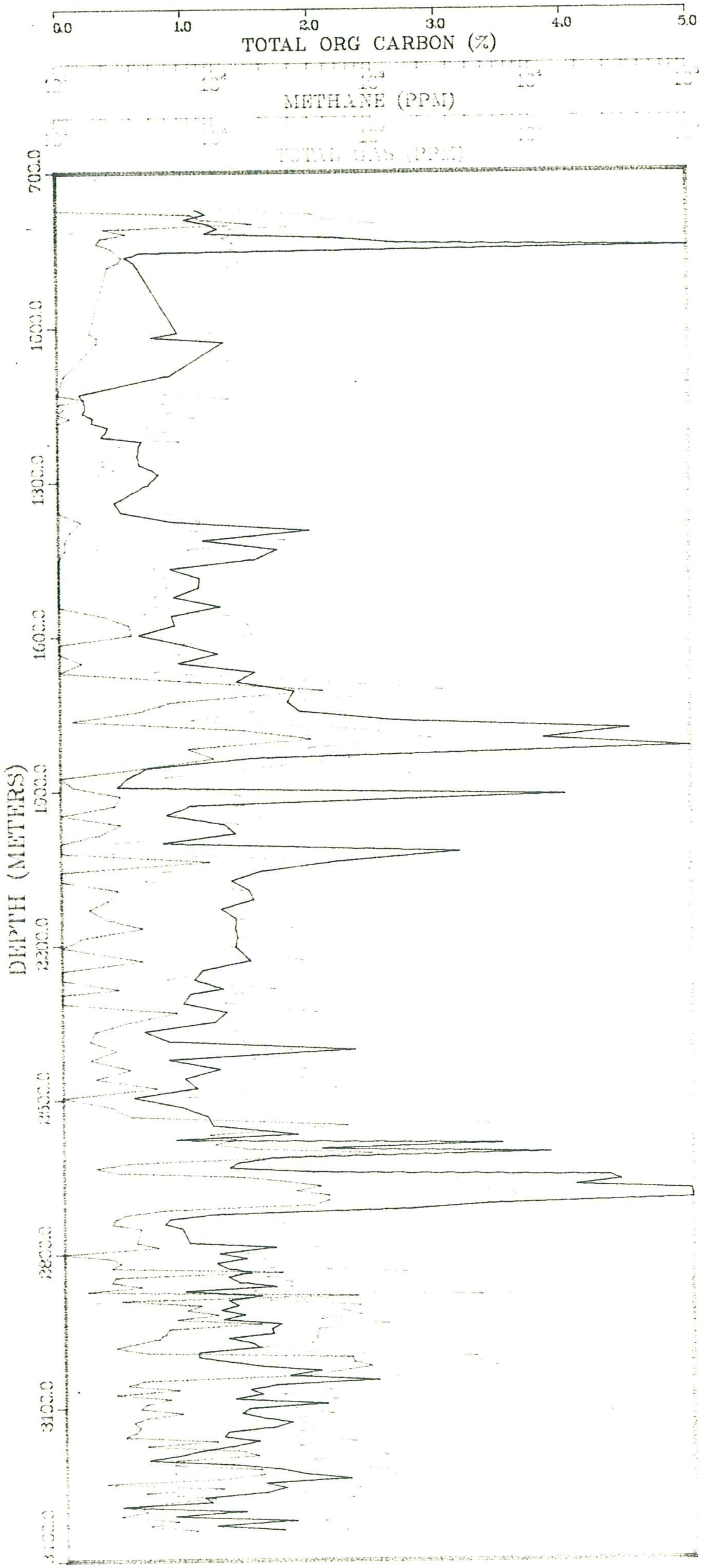
CORMORANT N-83



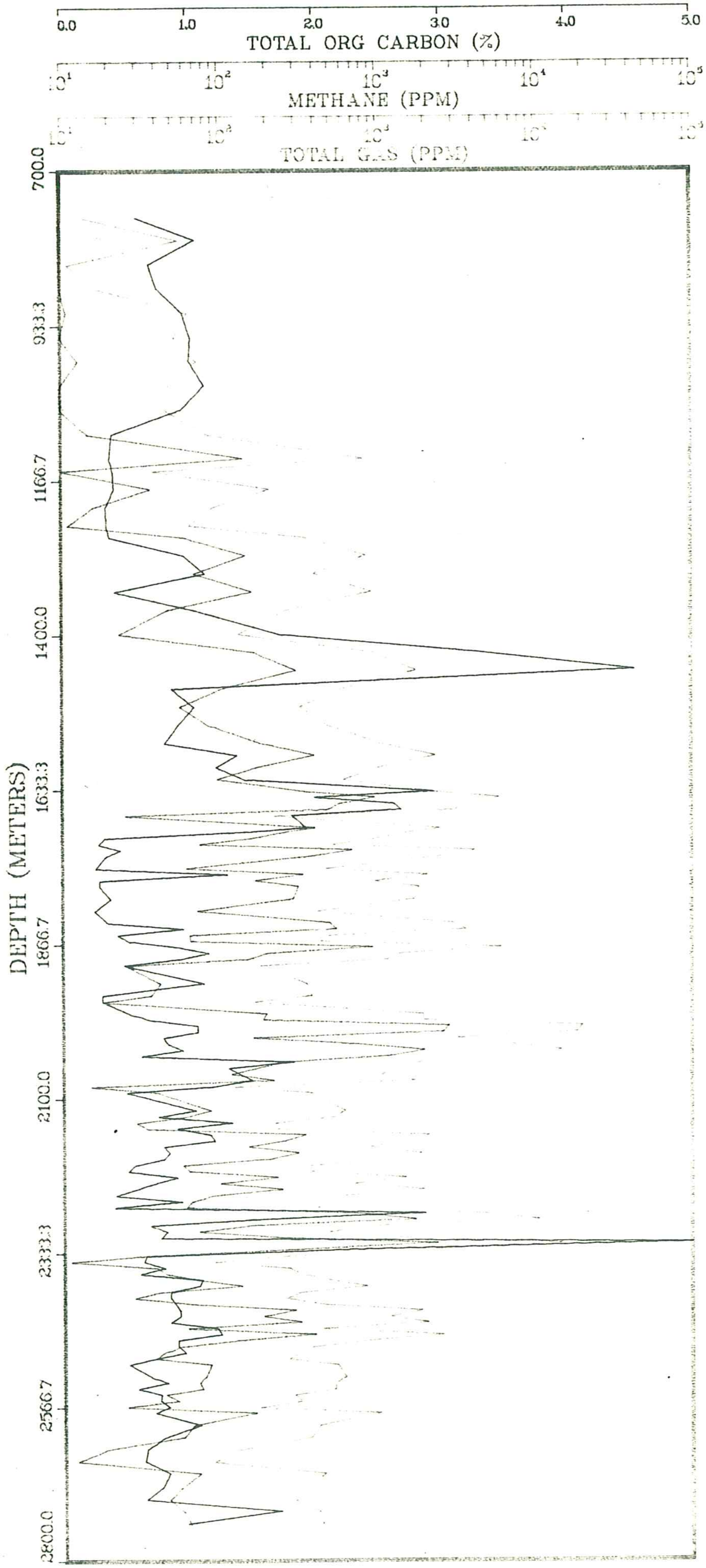
DOMINION O-23



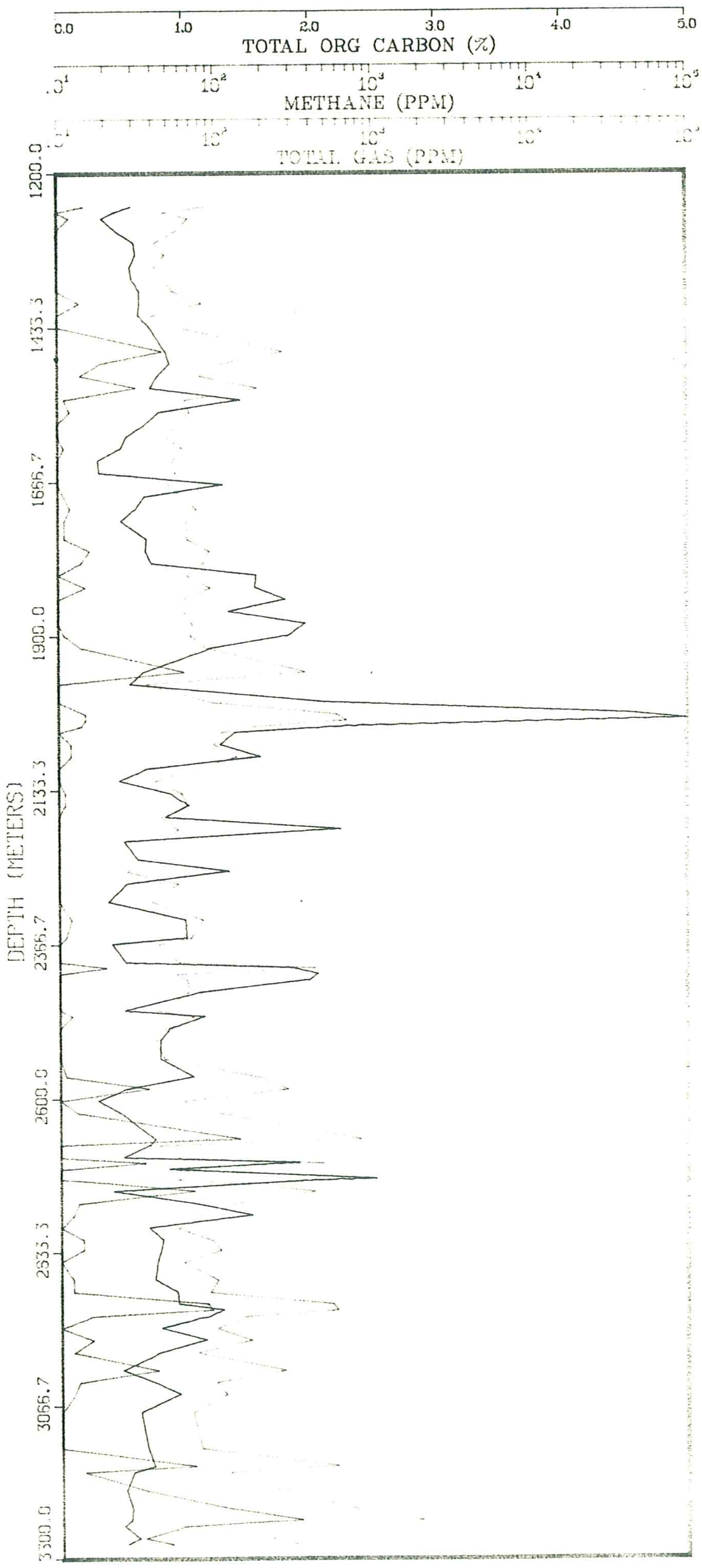
EGRET K-36


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
700.0
1000.0
1300.0
1600.0
1900.0
2200.0
2500.0
2800.0
3100.0

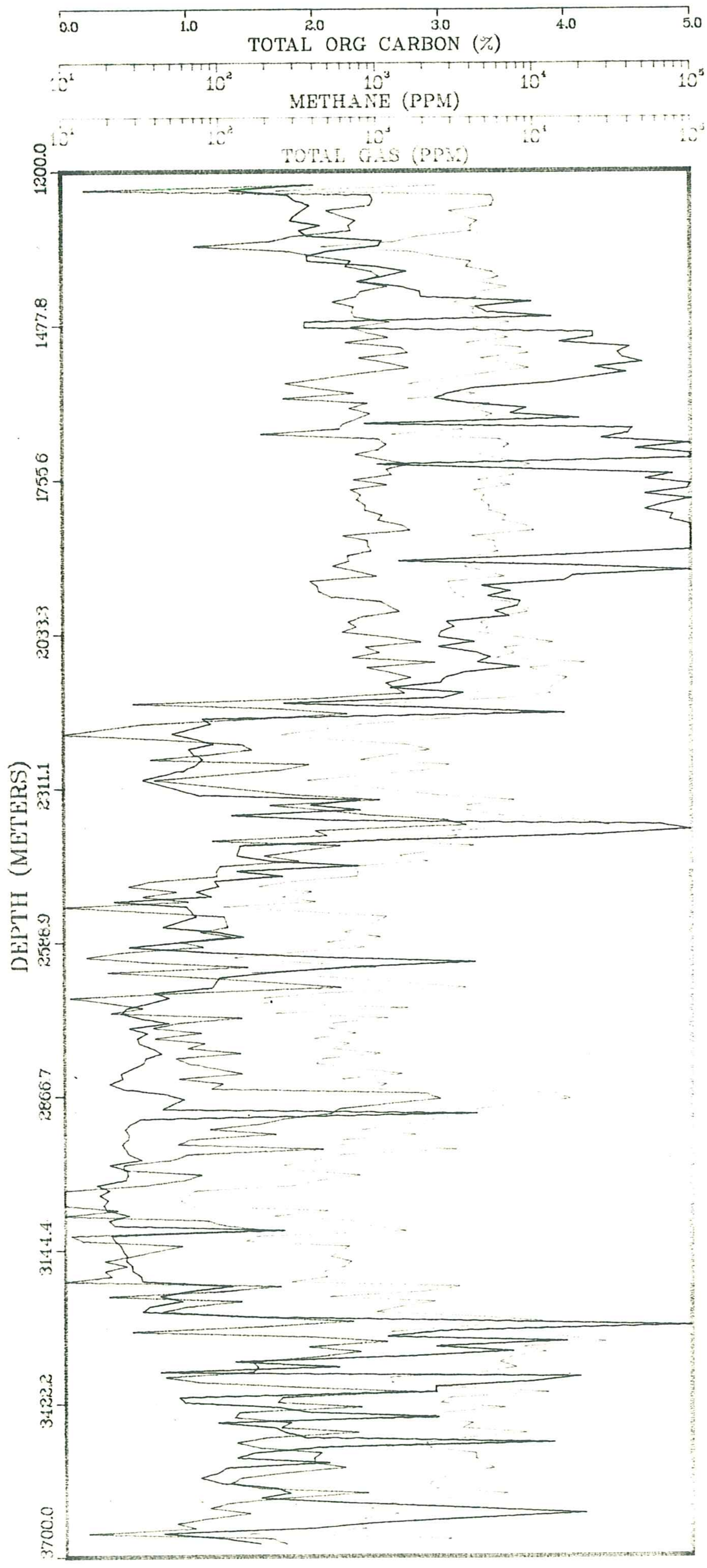
EGRET O-46


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
700.0
933.3
1166.7
1400.0
1633.3
1866.7
2100.0
2333.3
2566.7
2800.0
DEPTH (METERS)

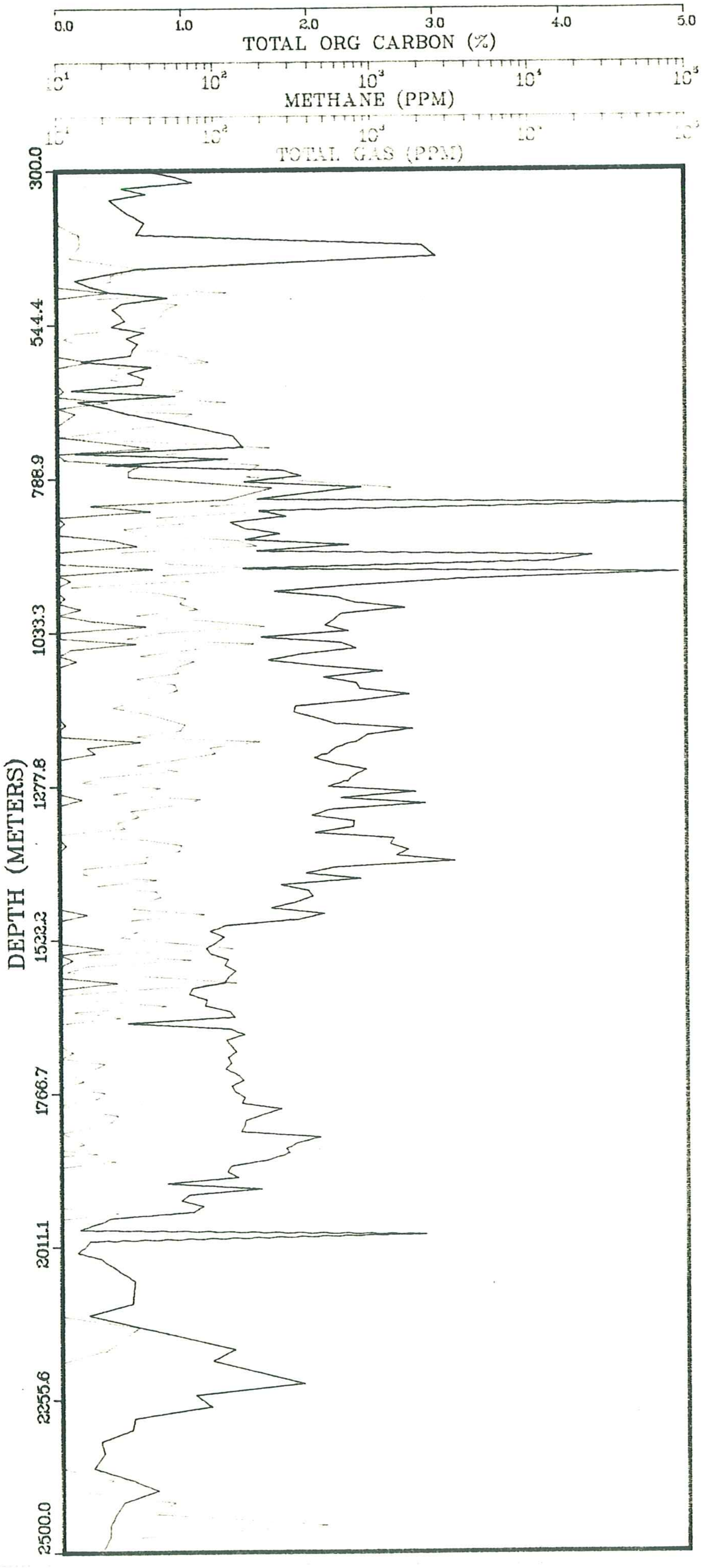
EMERILLION B-56



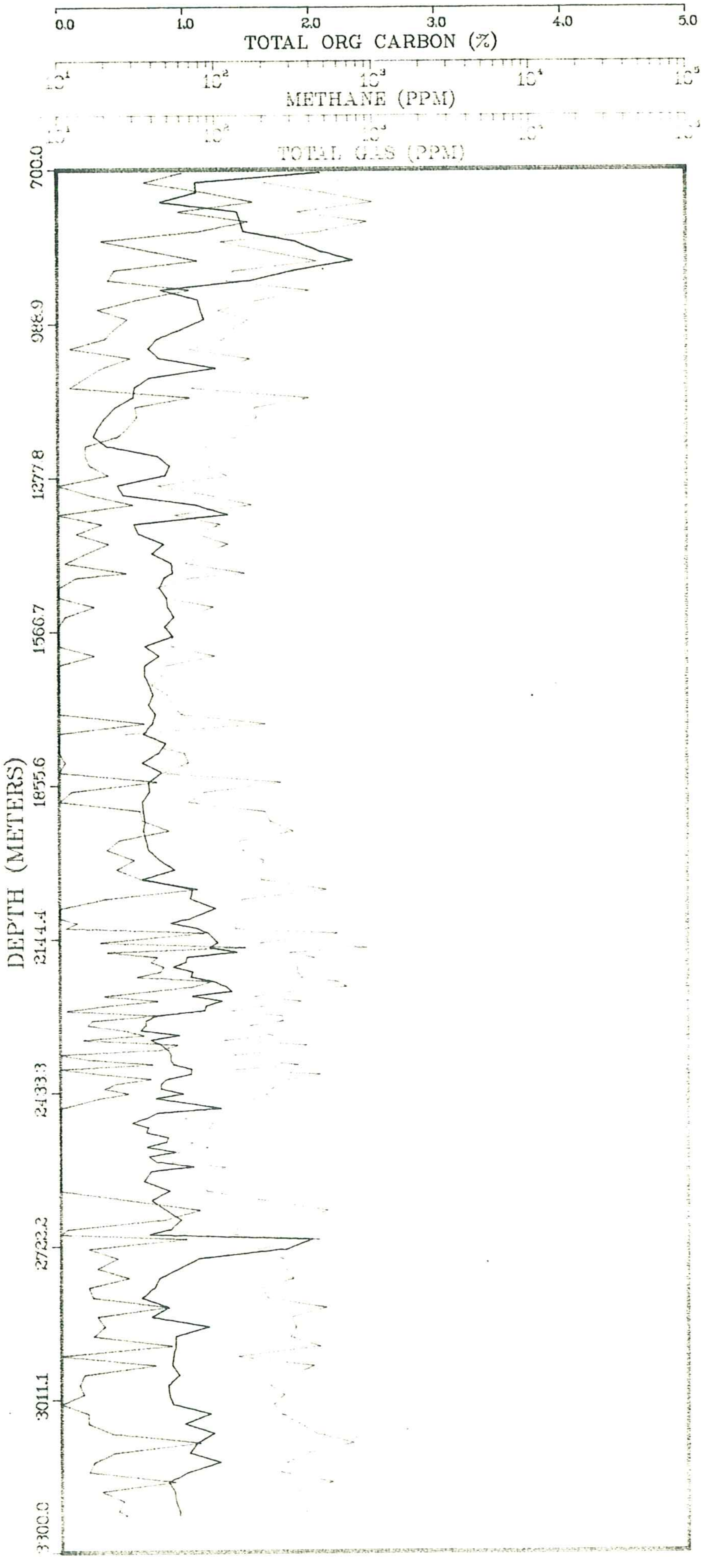
FLYING FOAM 1-13



GULL F-72

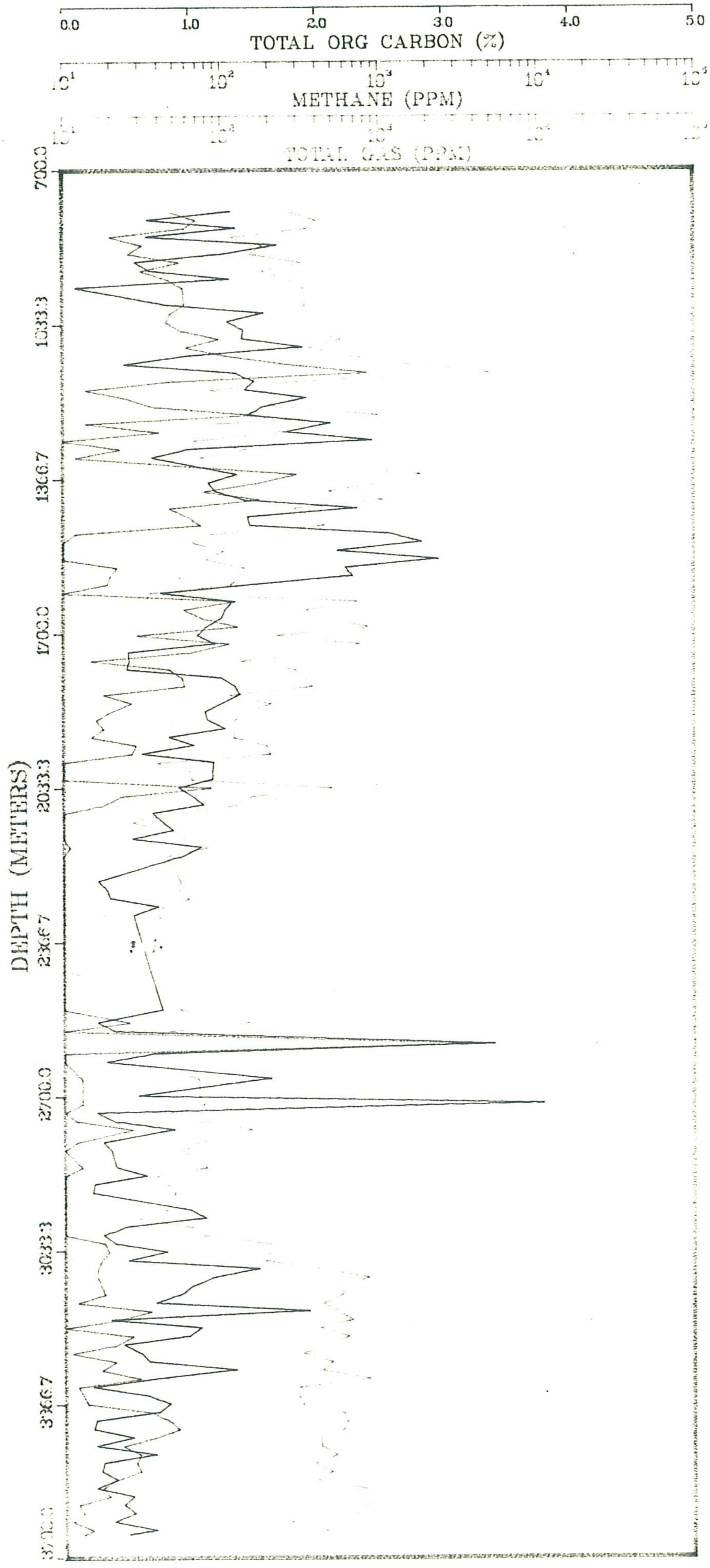

0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
300.0
544.4
788.9
1033.3
1277.8
1522.2
1766.7
2011.1
2255.6
2500.0

SKUA E-41



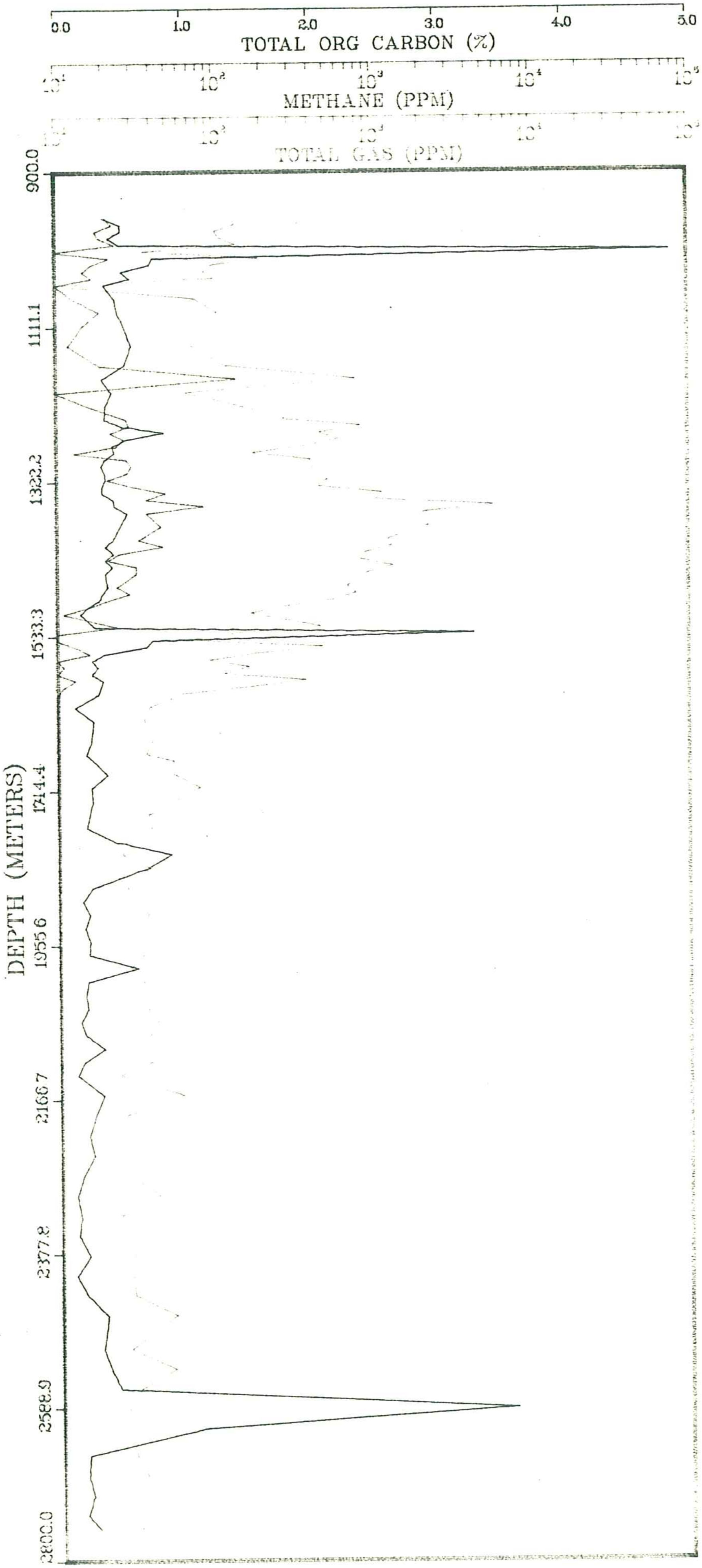
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
700.0
988.9
1277.8
1566.7
1855.6
2144.4
2433.3
2722.2
3011.1
3300.0

HERON H-73

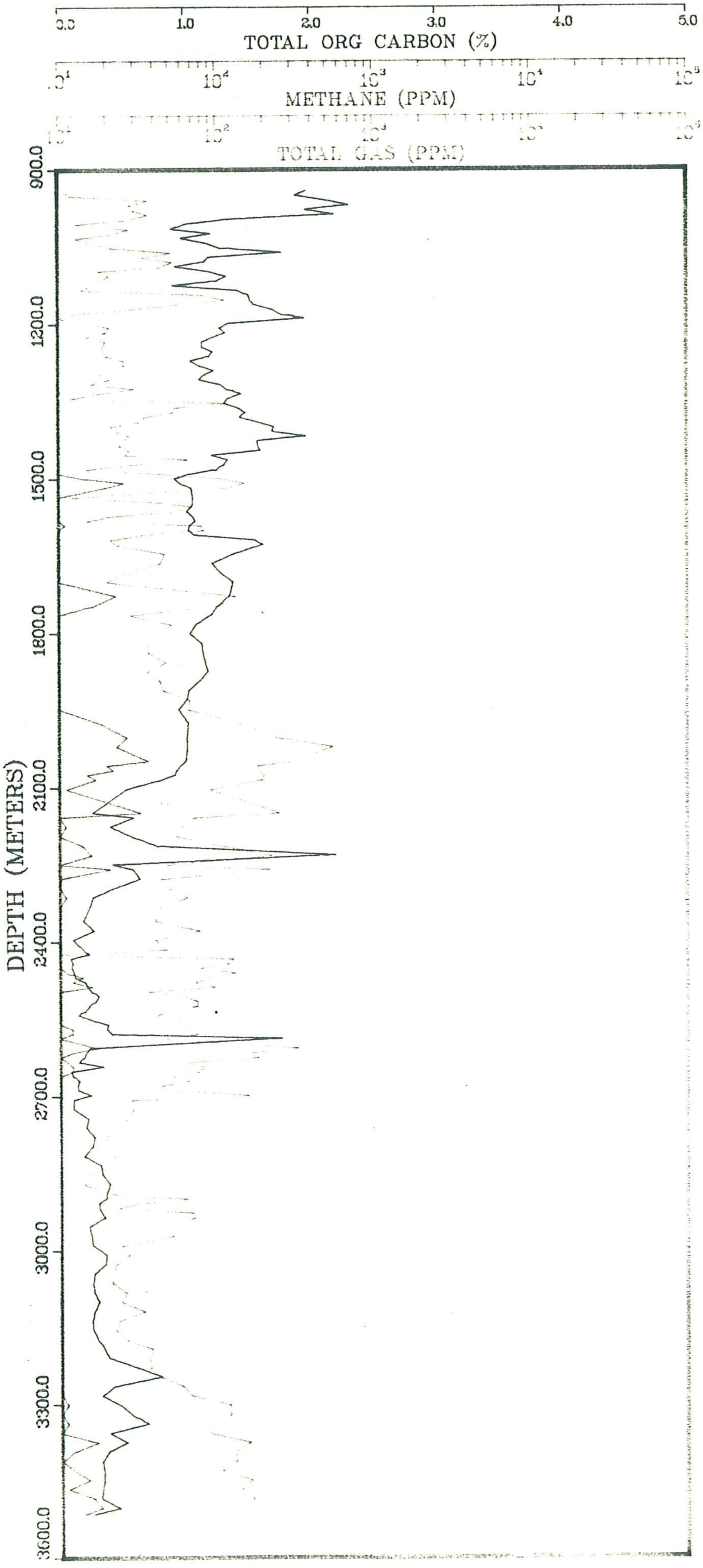


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
700.0
1033.3
1366.7
1700.0
2033.3
DEPTH (METERS)
2700.0
3033.3
3366.7

SPOONBILL C-30

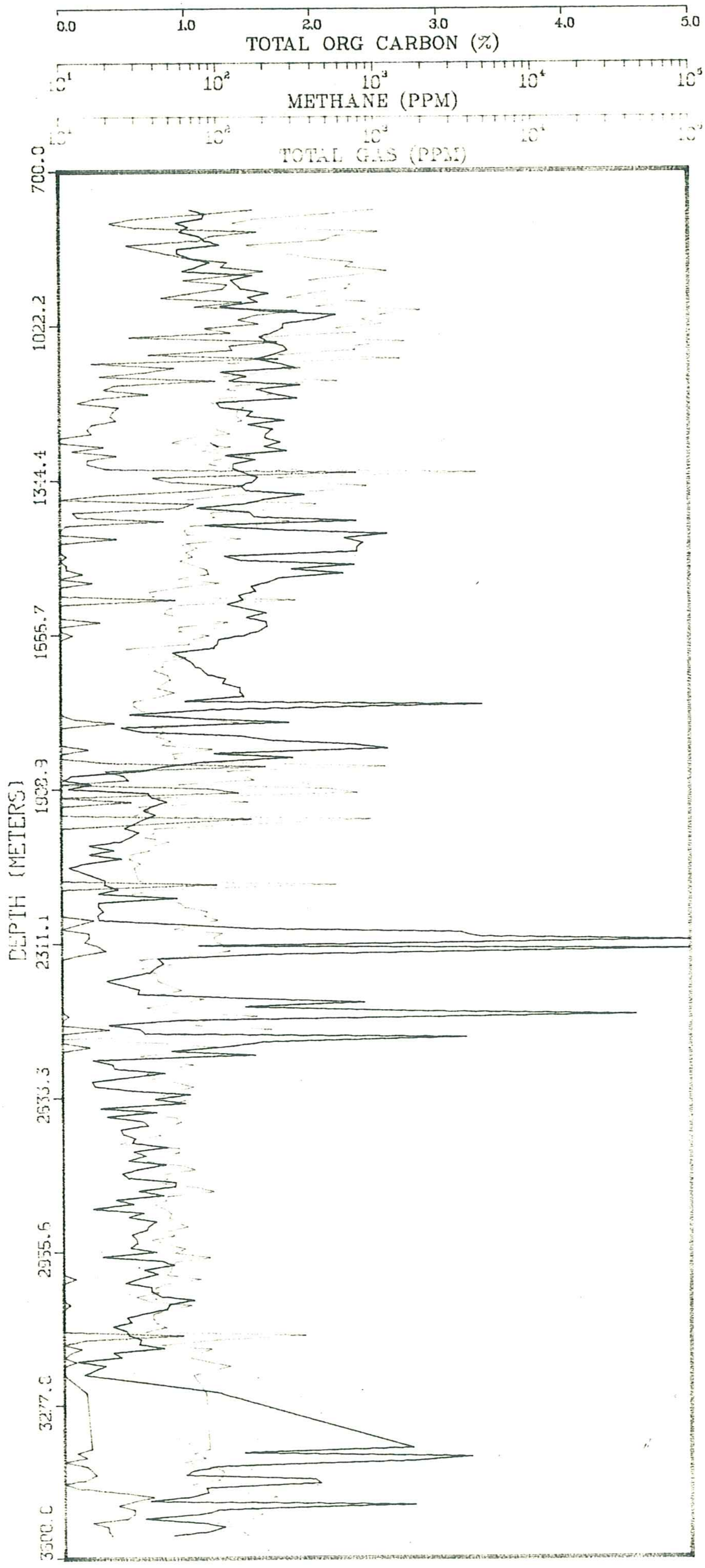


MALLARD M-45

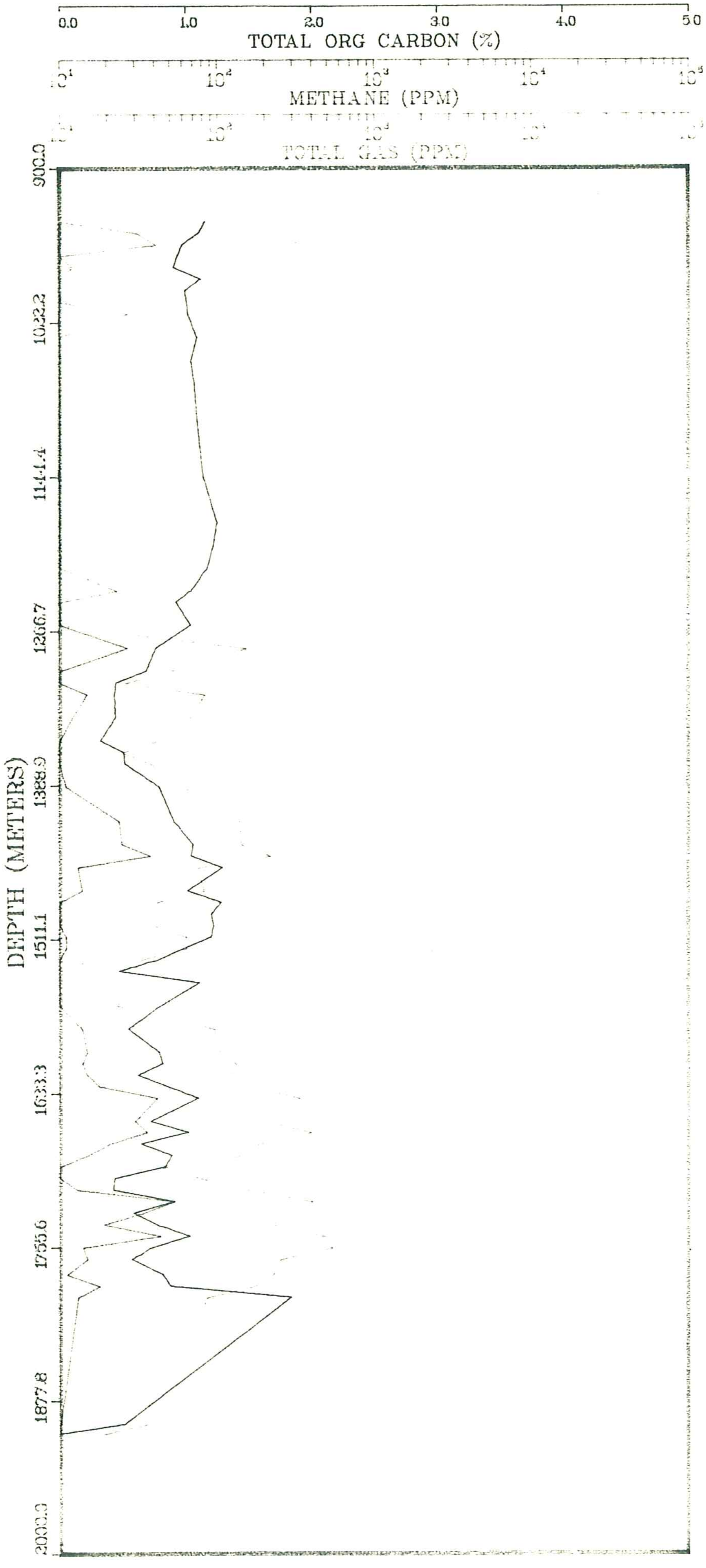


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
900.0
1200.0
1500.0
1800.0
2100.0
2400.0
2700.0
3000.0
3300.0
3600.0

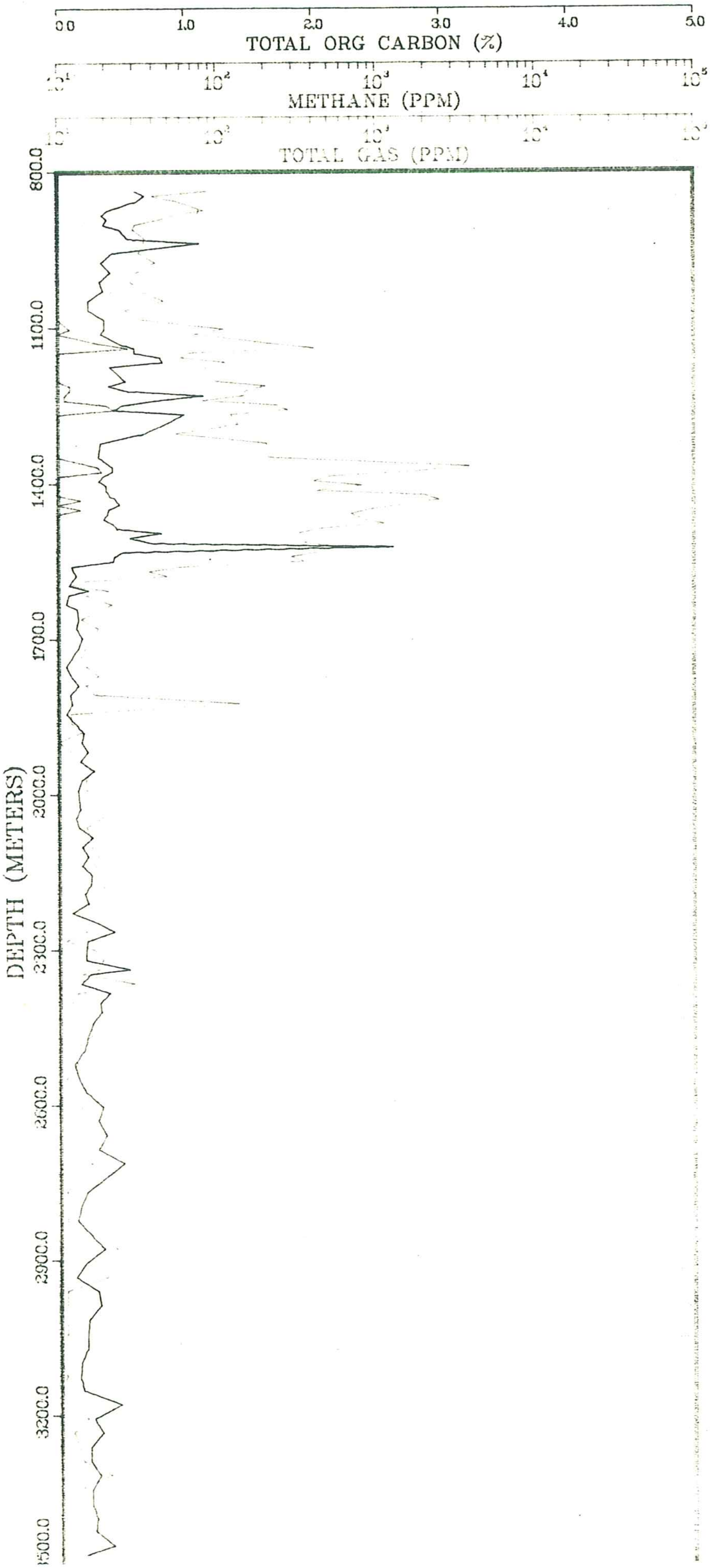
KITTWAKE P-11



MERGANSER I-60

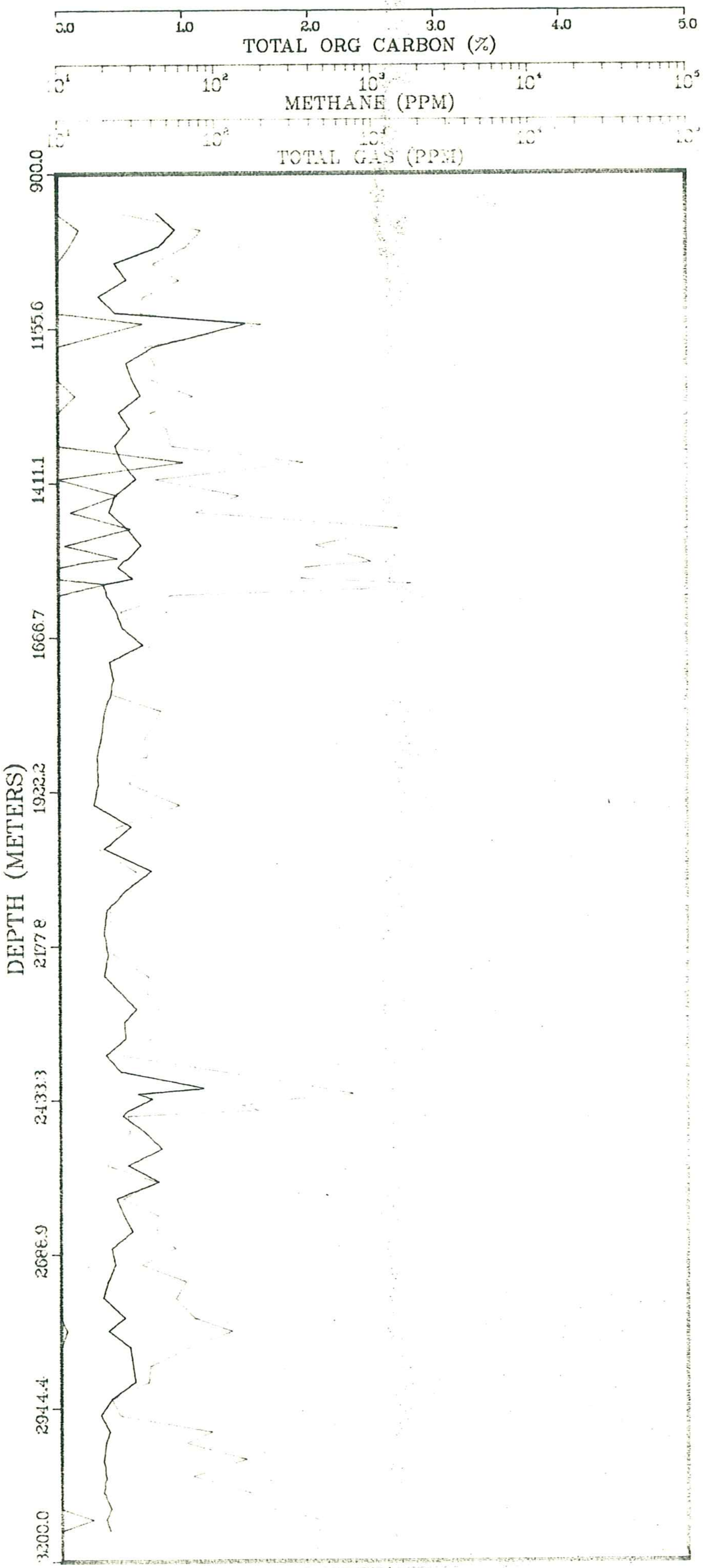


OSPREY H-84

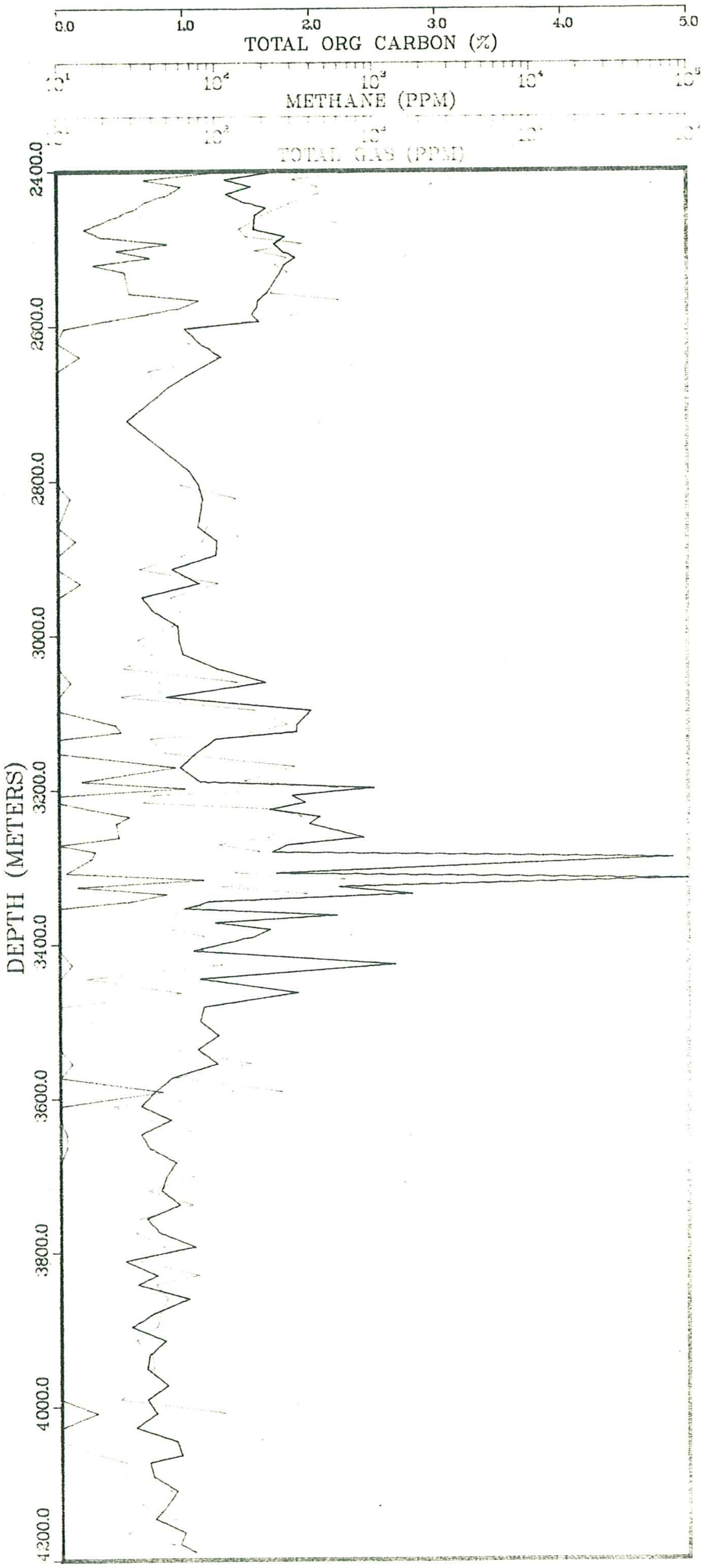


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
800.0
1100.0
1400.0
1700.0
2000.0
2300.0
2600.0
2900.0
3200.0
3500.0
DEPTH (METERS)

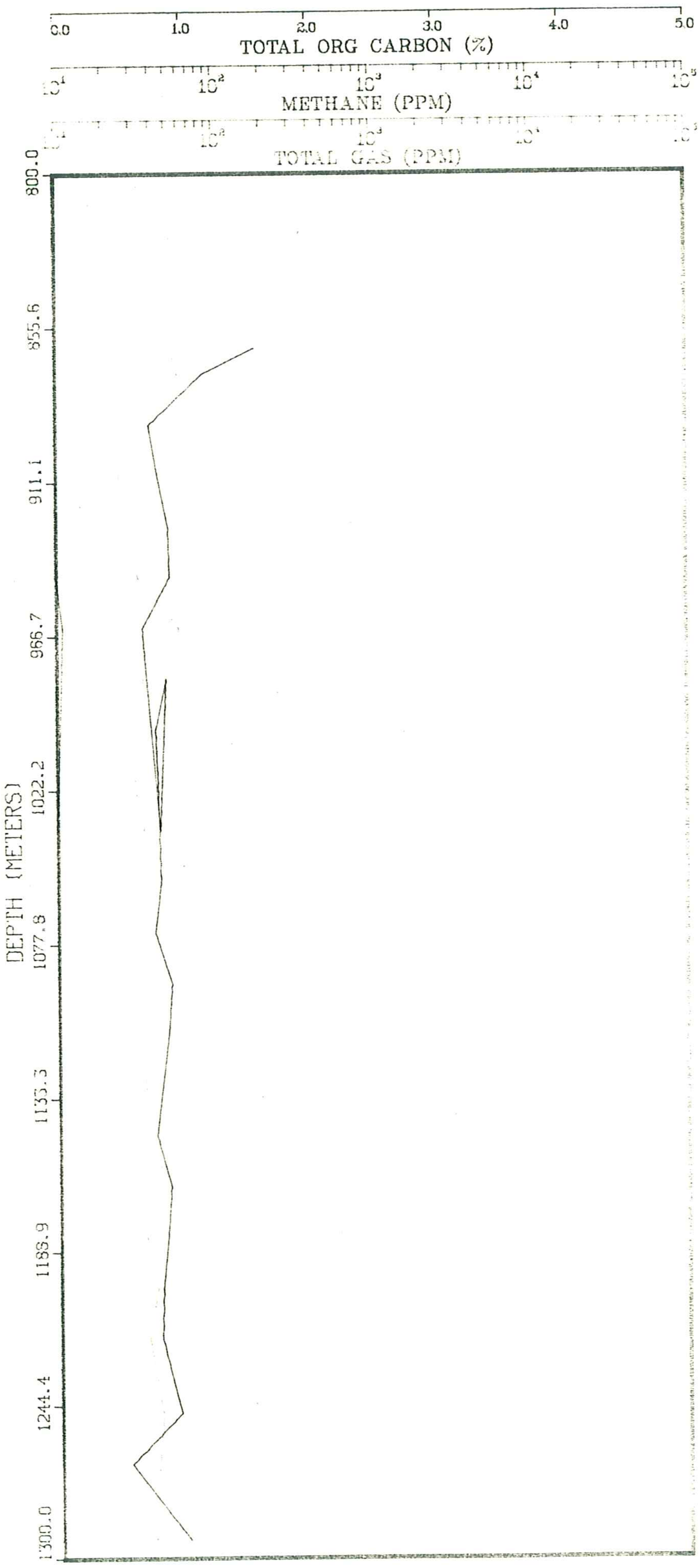
PHALAROPE P-62



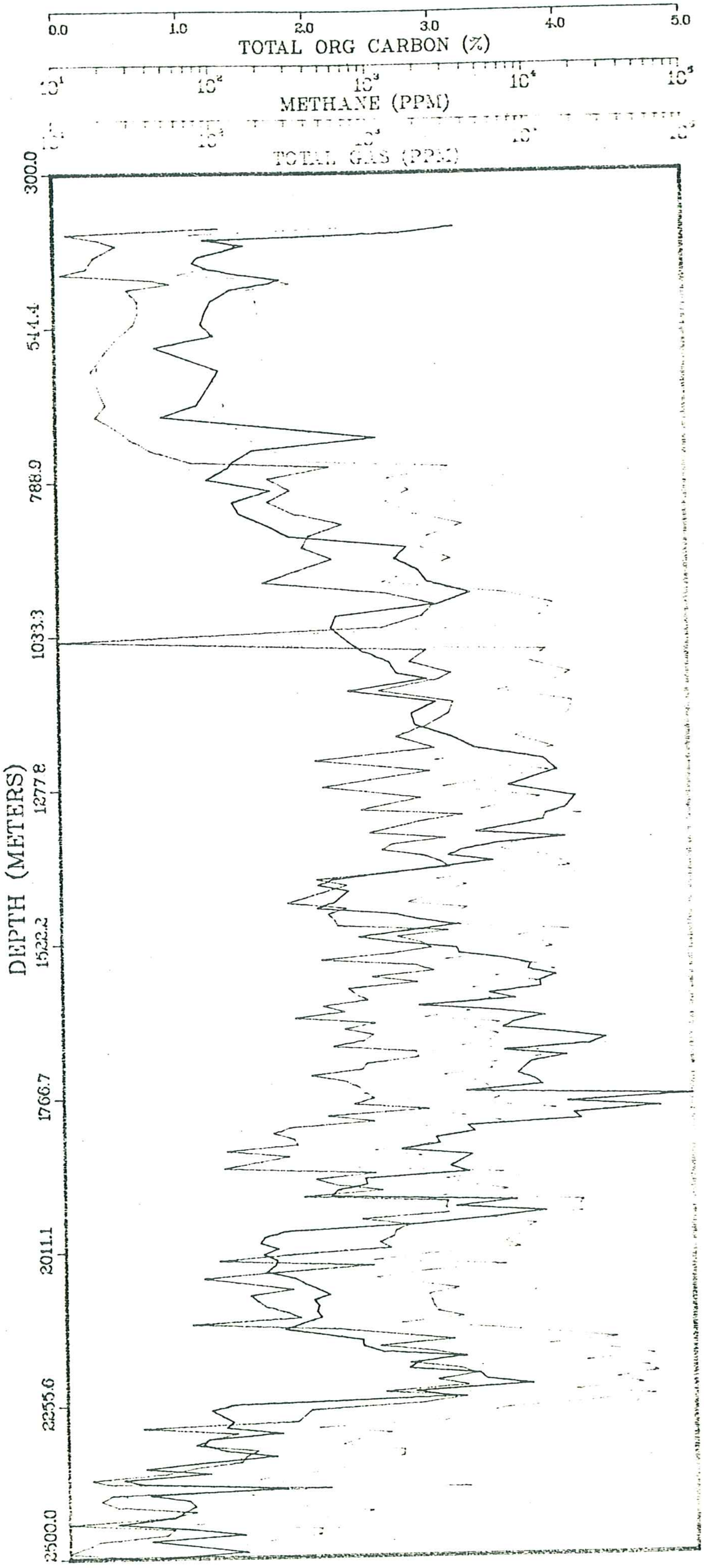
TERN A-68


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
4000.0
4200.0

TWILLICK G-49

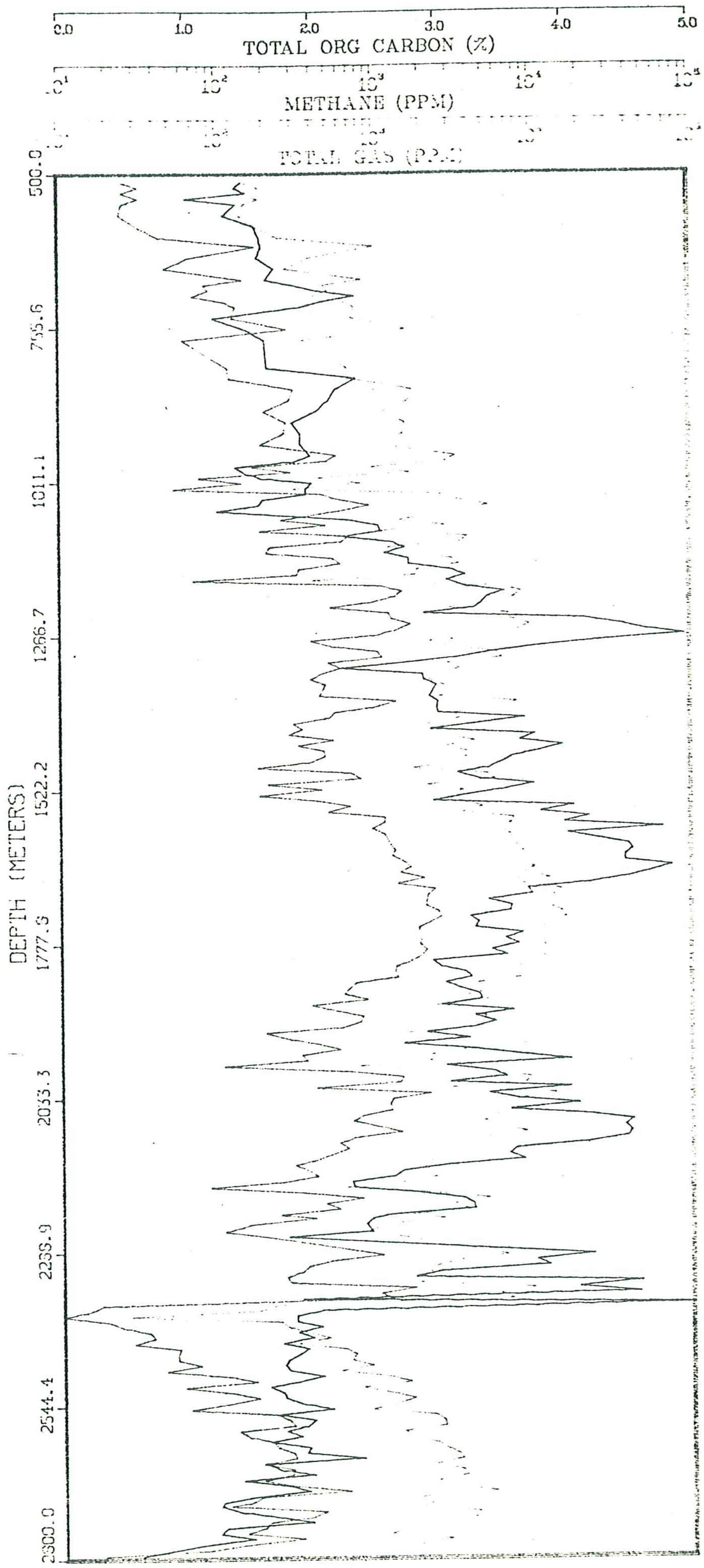


BJARNI H-81



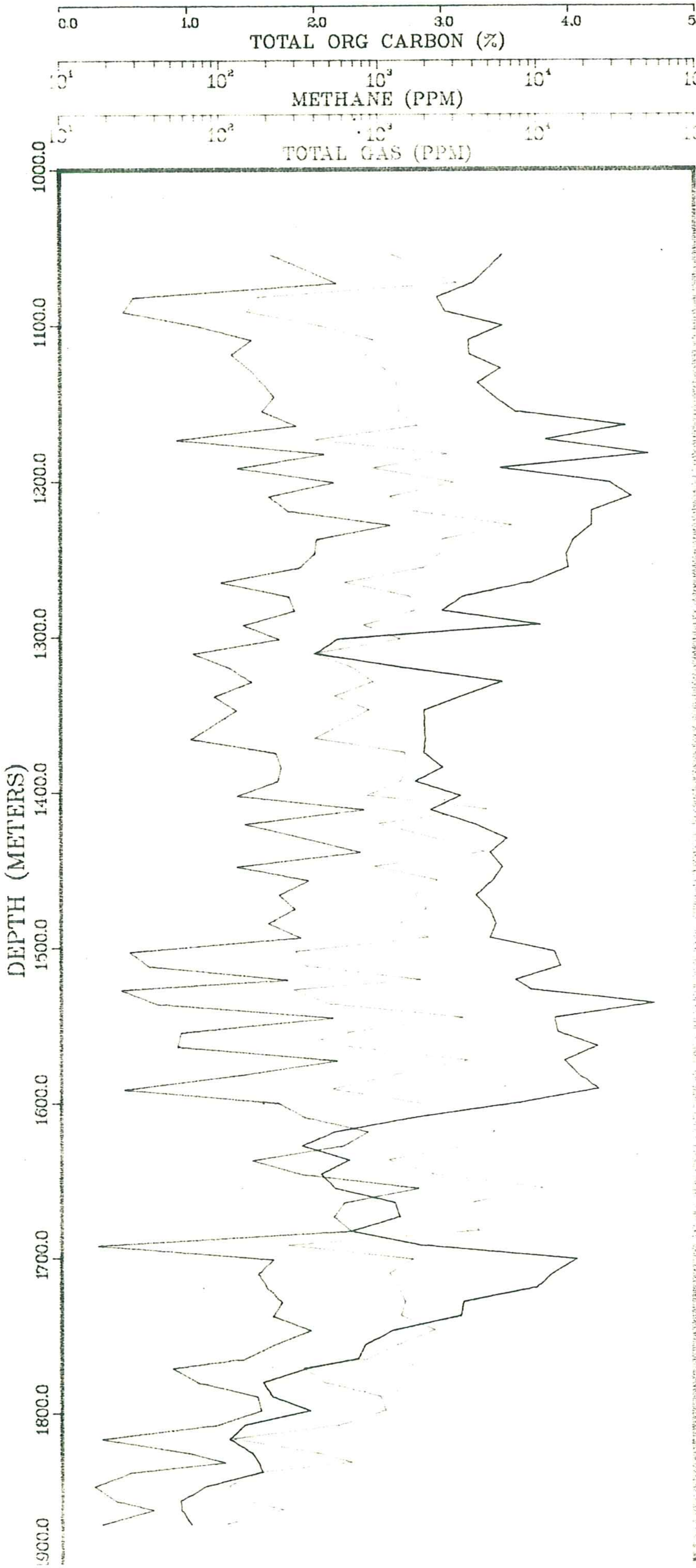
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
300.0
544.4
788.9
1033.3
1277.8
1522.2
1766.7
2011.1
2255.6
2500.0

GUDRID H-55



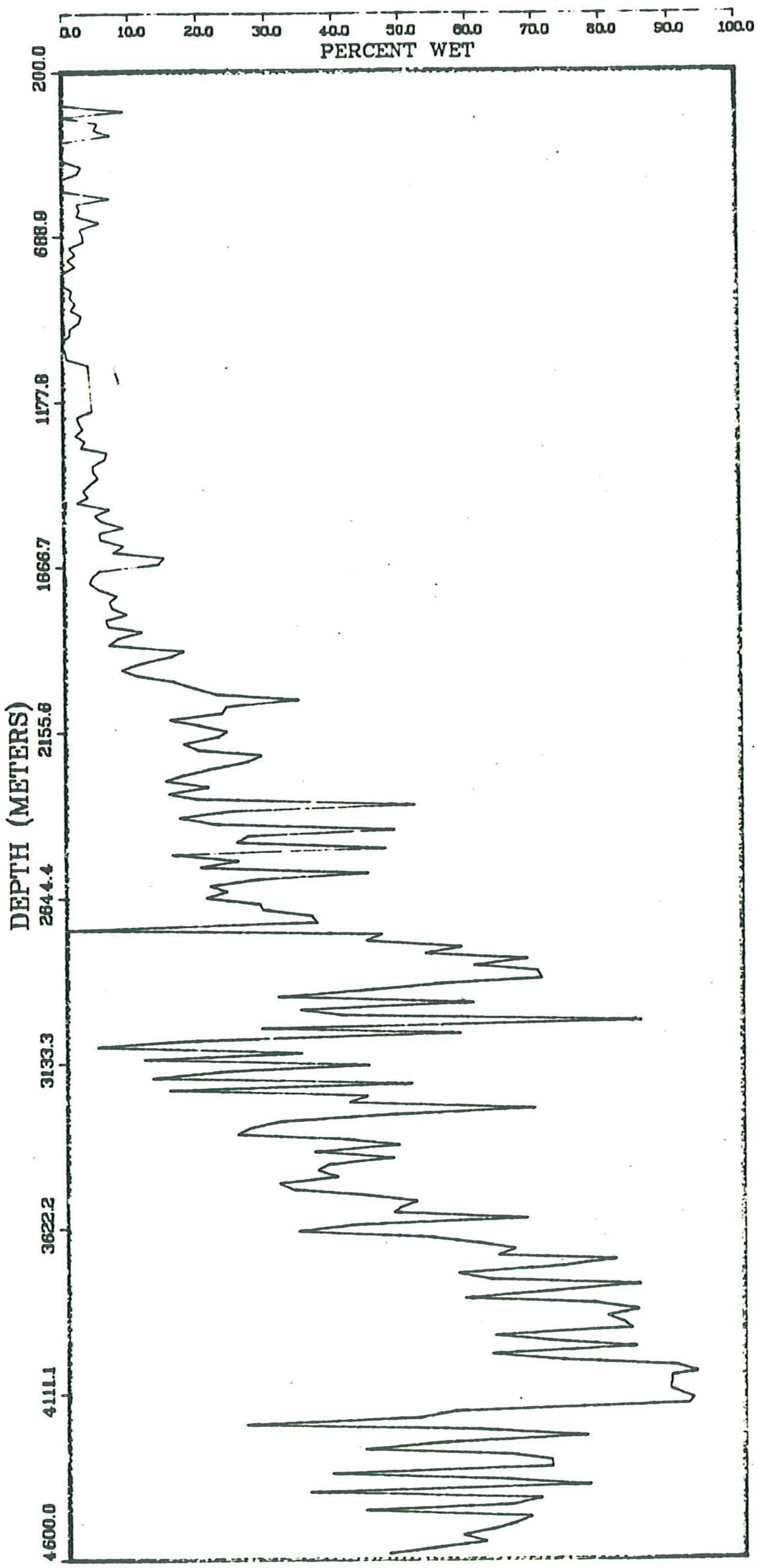
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
DEPTH (METERS)
500.0
755.6
1011.1
1266.7
1522.2
1777.8
2033.3
2288.9
2544.4
2800.0

LEIF E-38

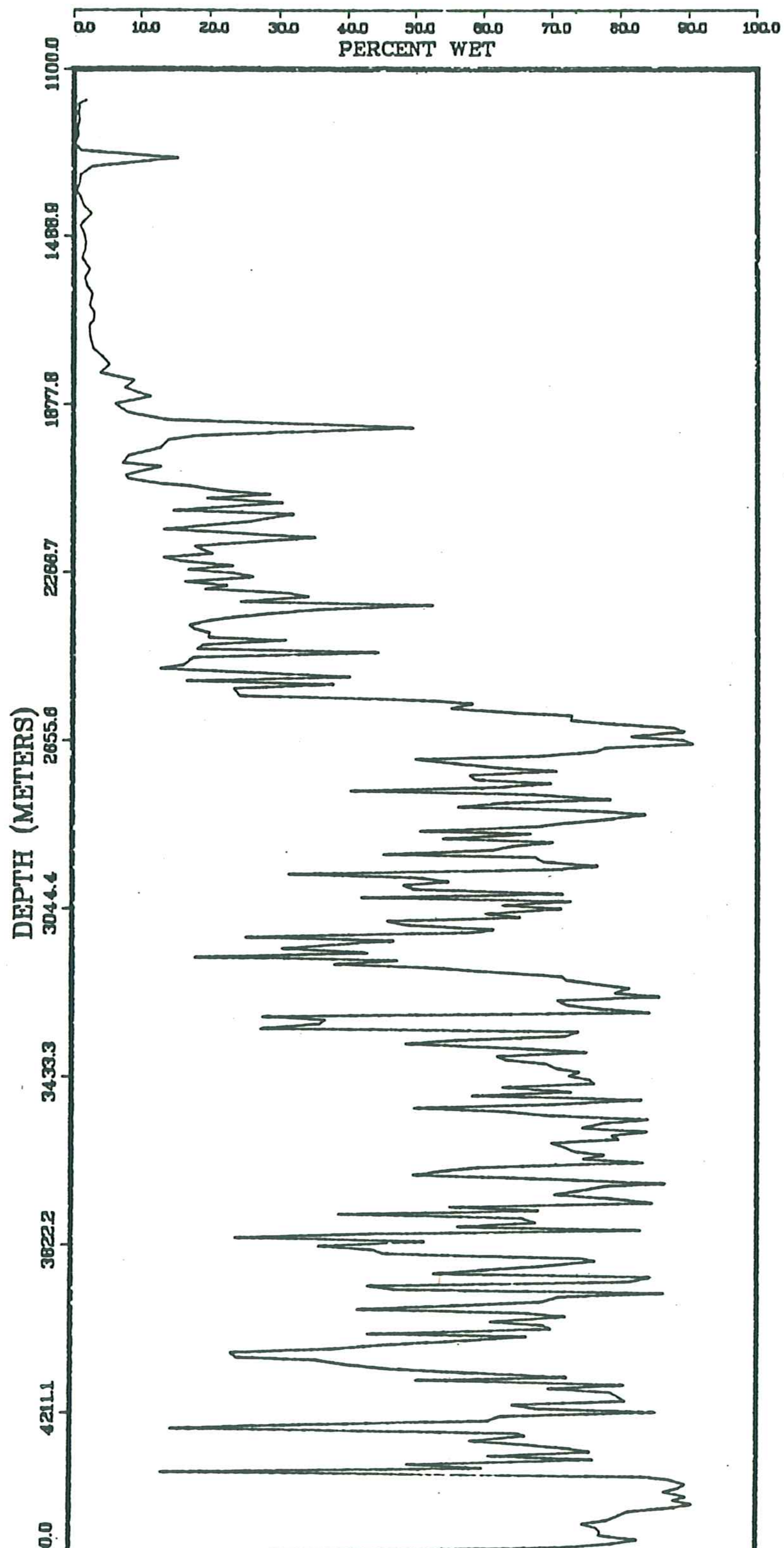


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0

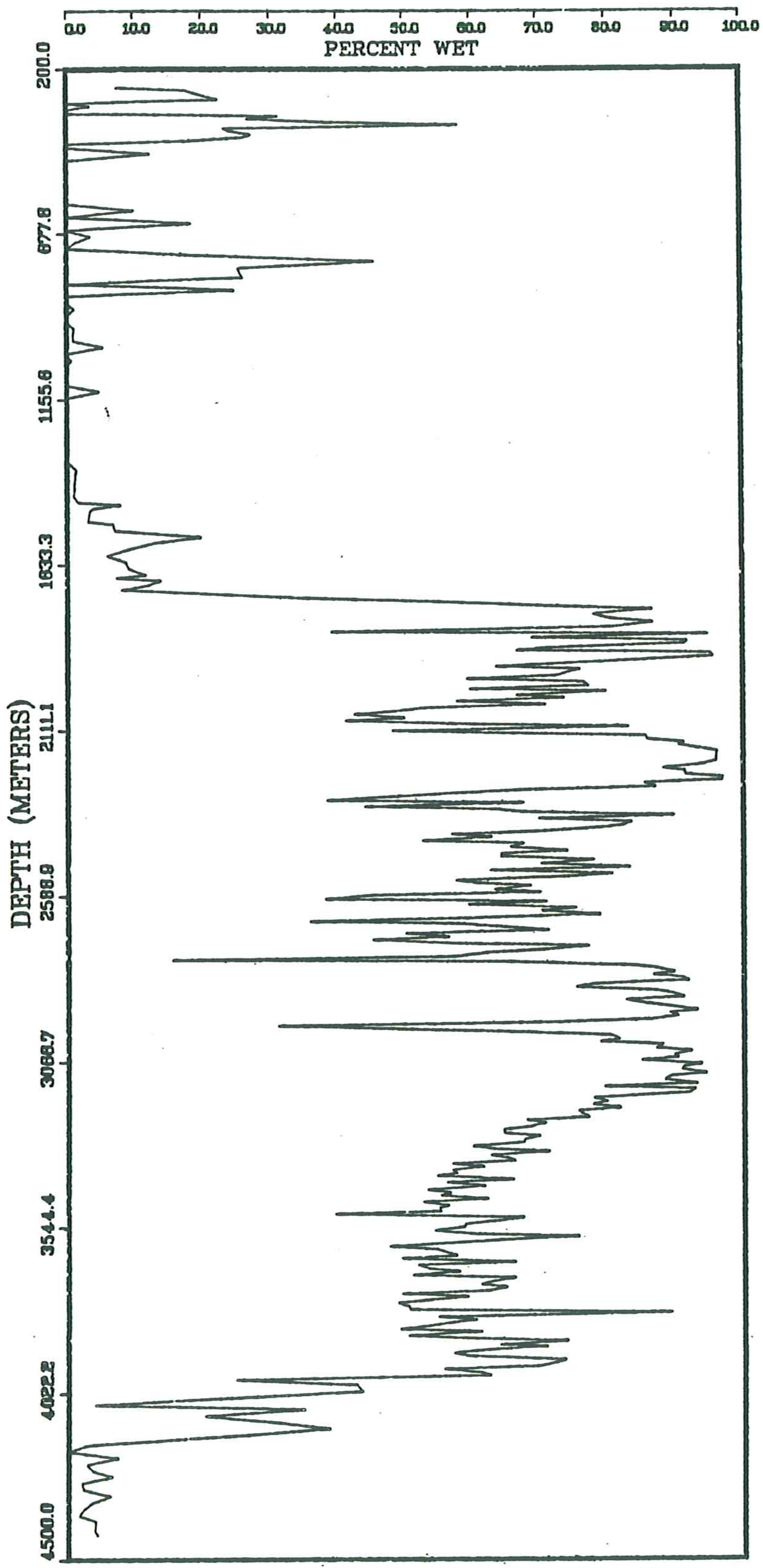
BLUENOSE G-47



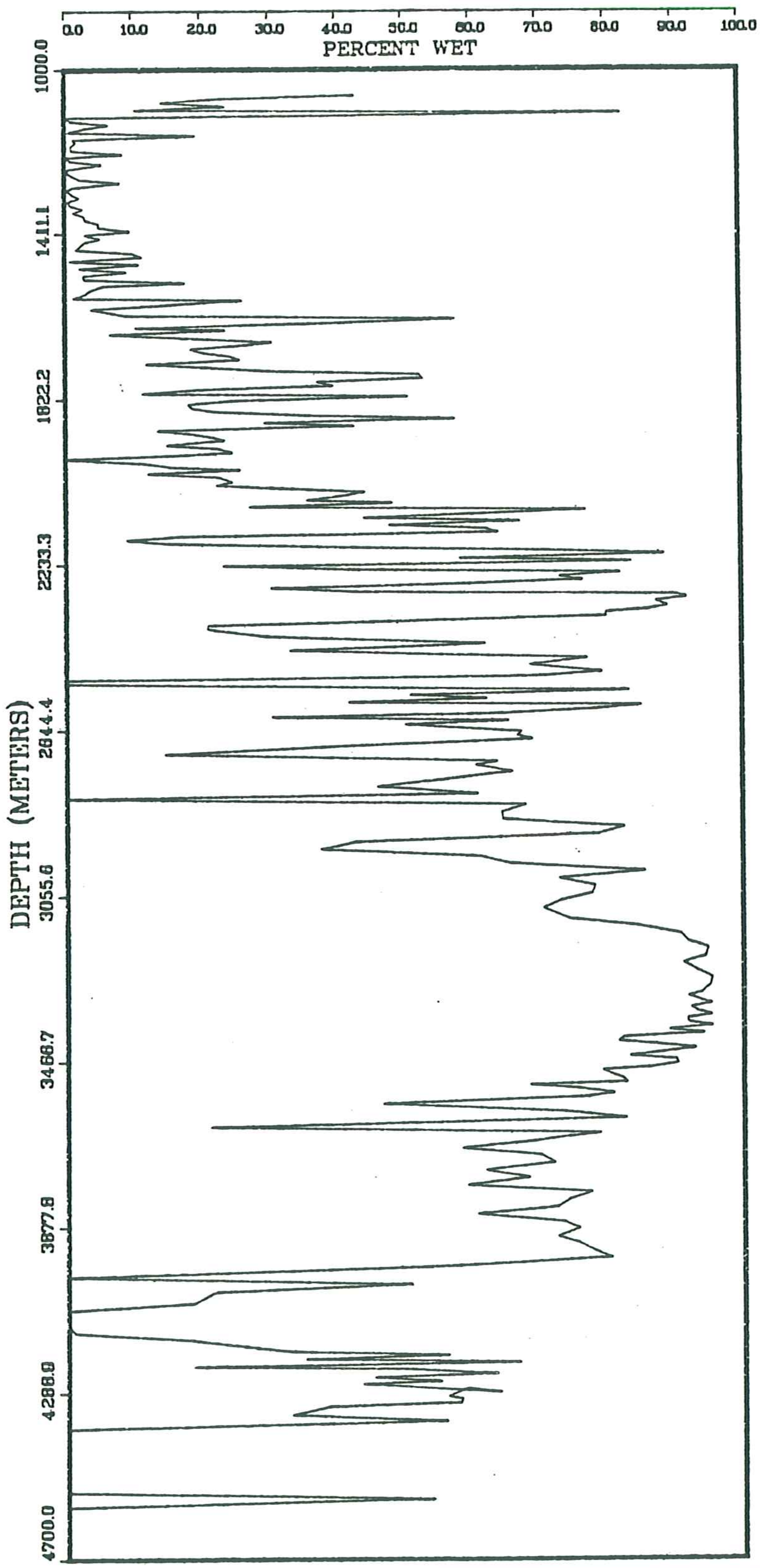
CITNALTA I-59



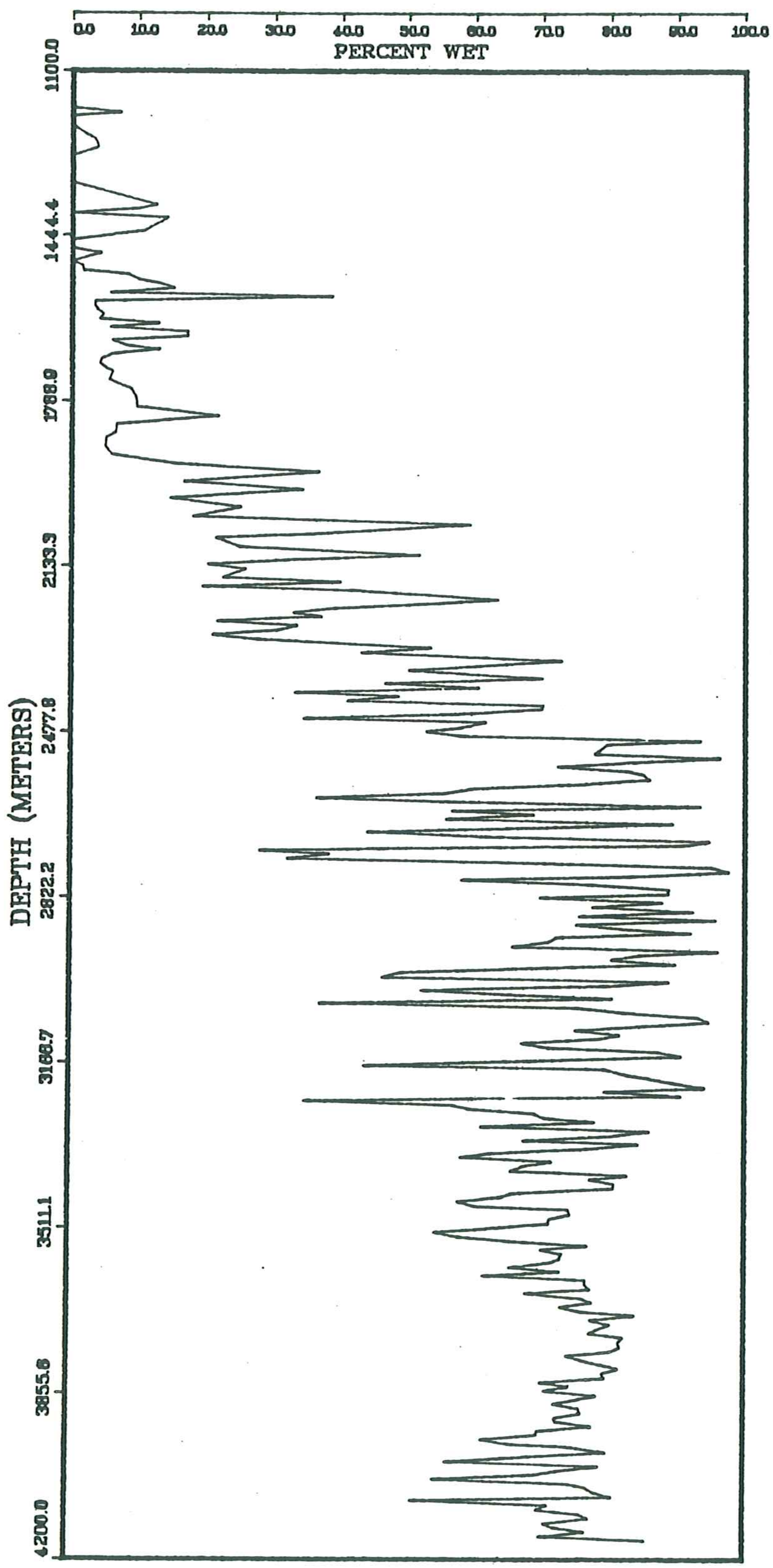
COHASSET D-42



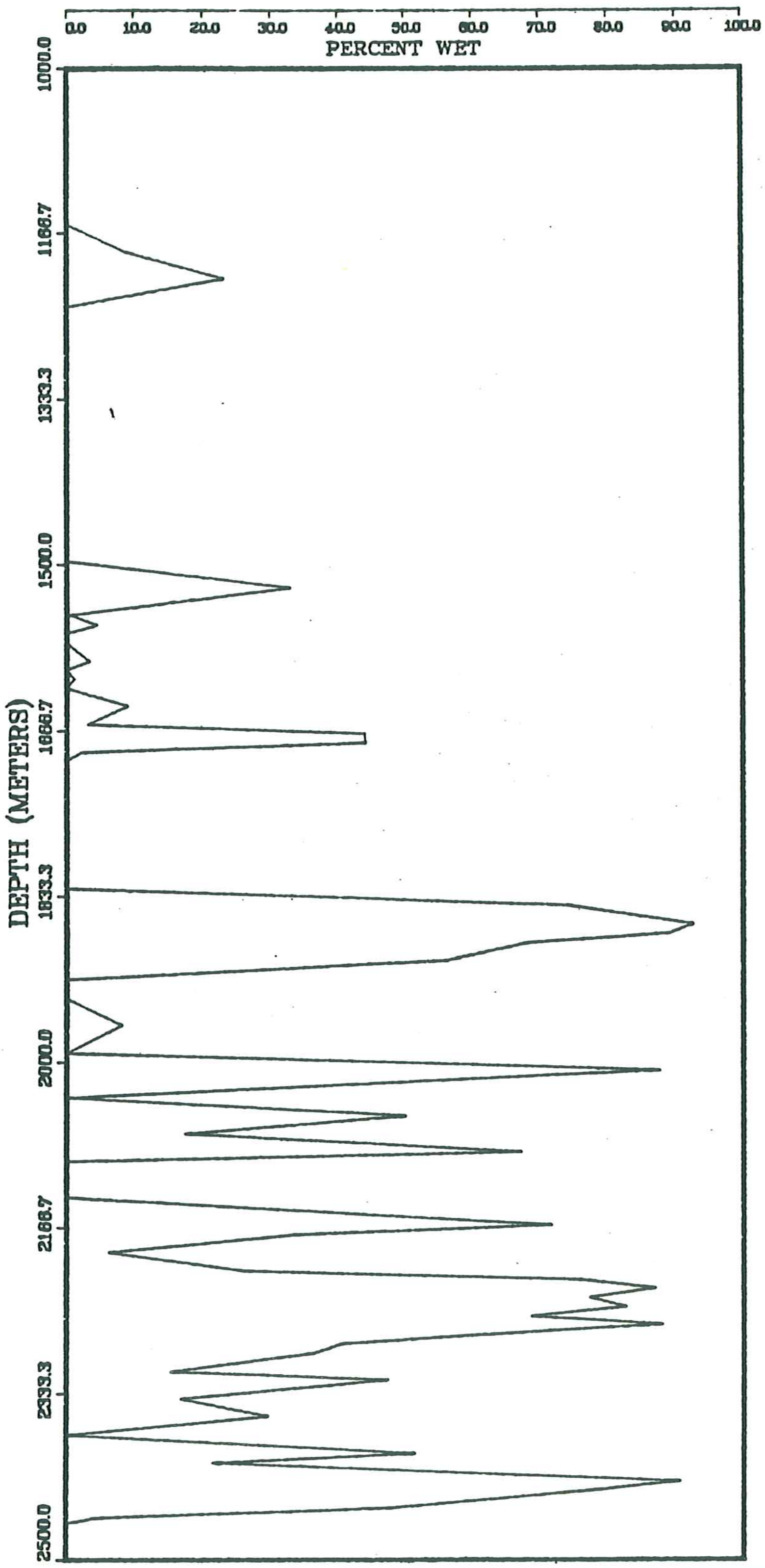
DEMASCOTA G-32



INTREPID L-80

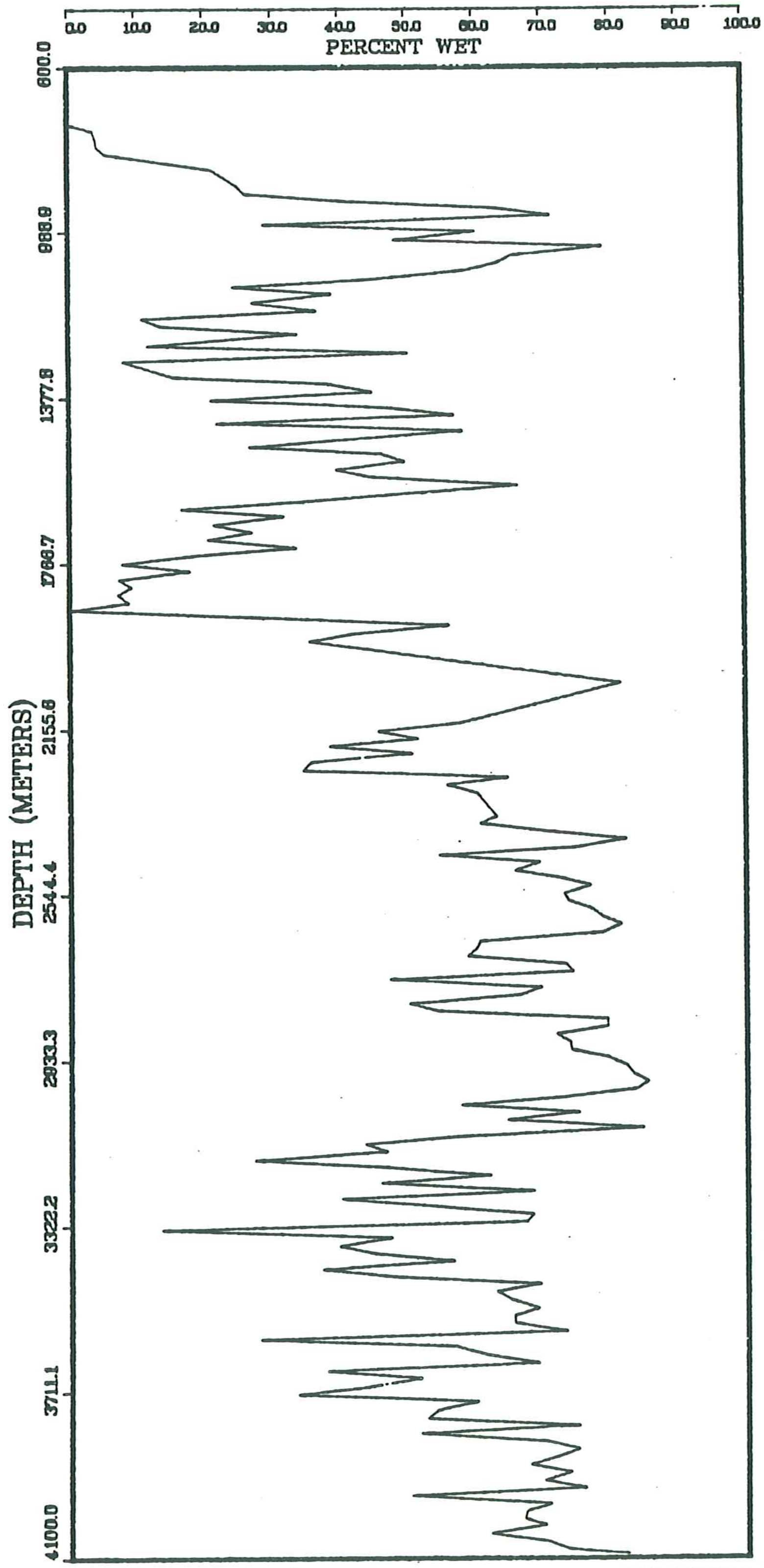


JASON C-20



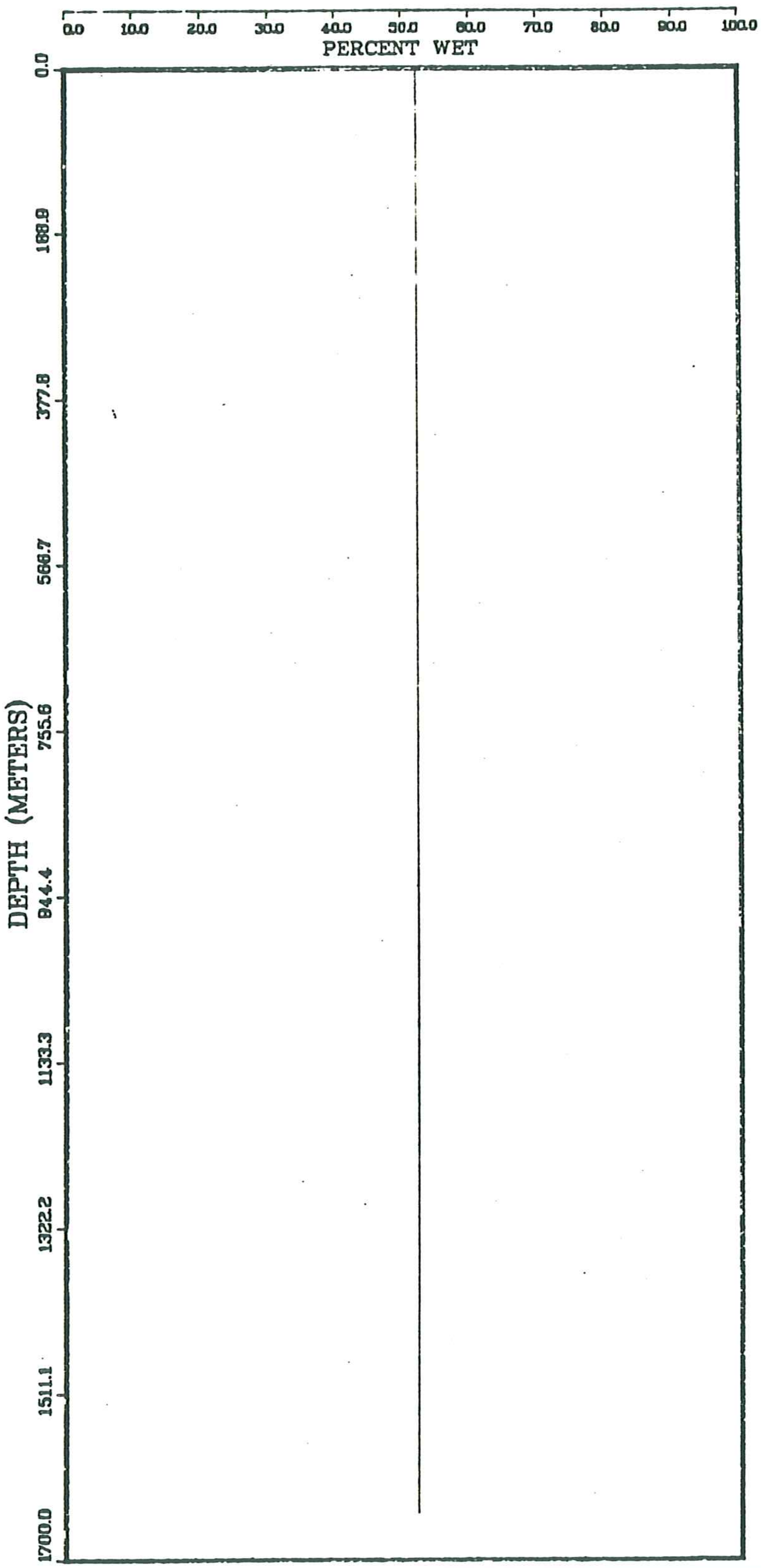
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
1000.0
1166.7
1333.3
1500.0
1666.7
1833.3
2000.0
2166.7
2333.3
2500.0

MARMORA P-35

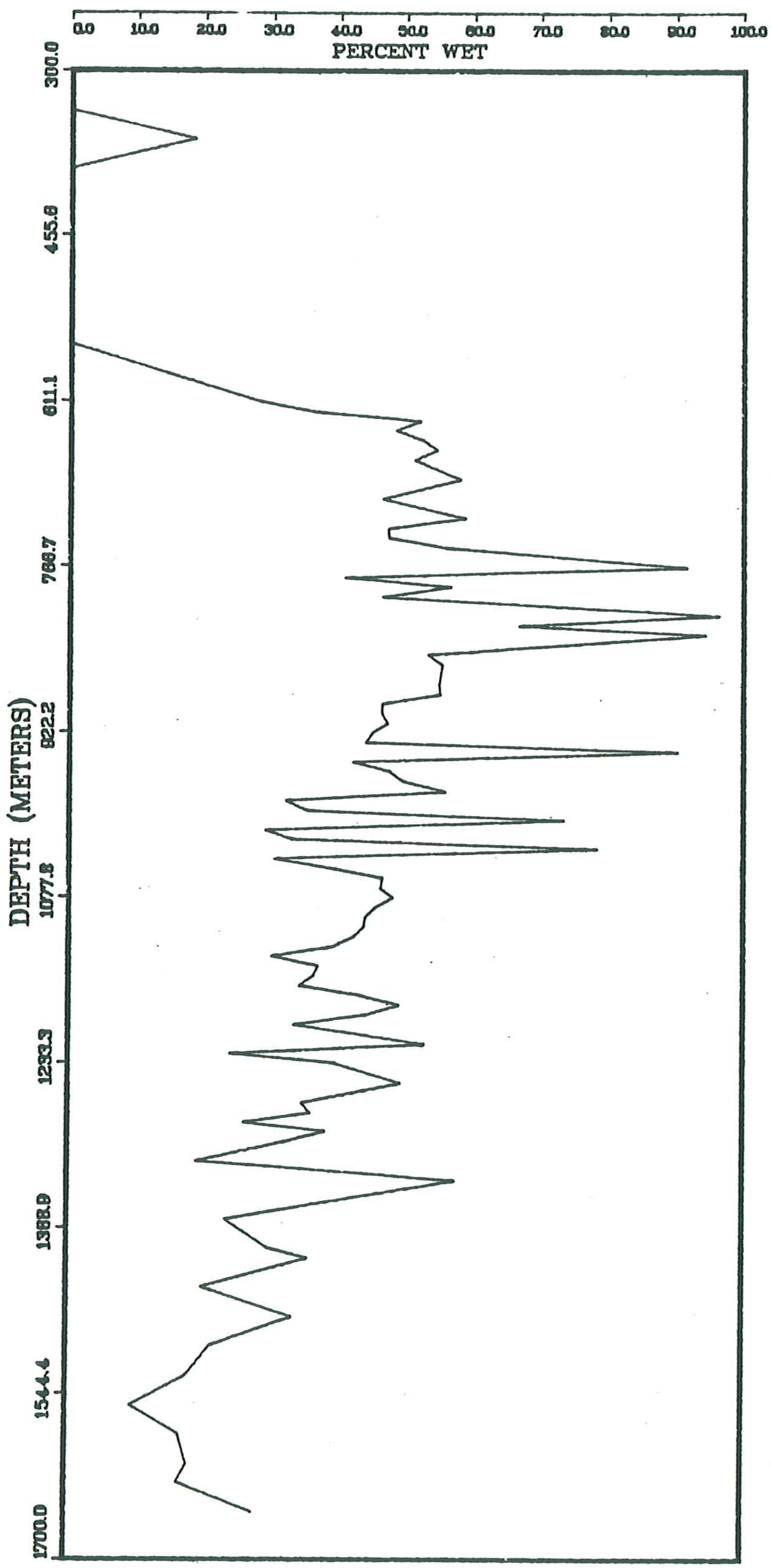


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
600.0
988.9
1377.8
1766.7
2155.6
2544.4
2933.3
3322.2
3711.1
4100.0

MONTAGNAIS I-94

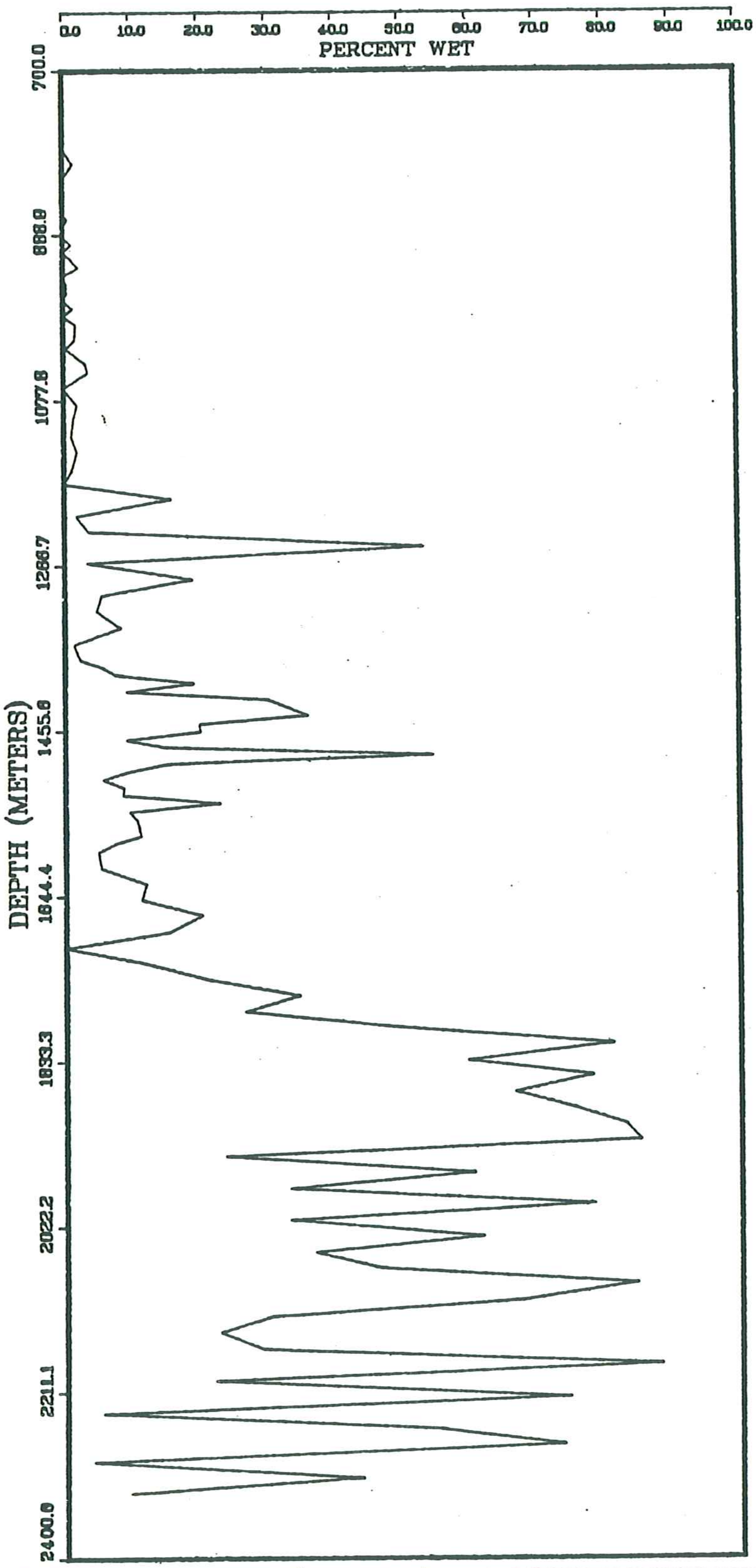


N. SYDNEY P-05



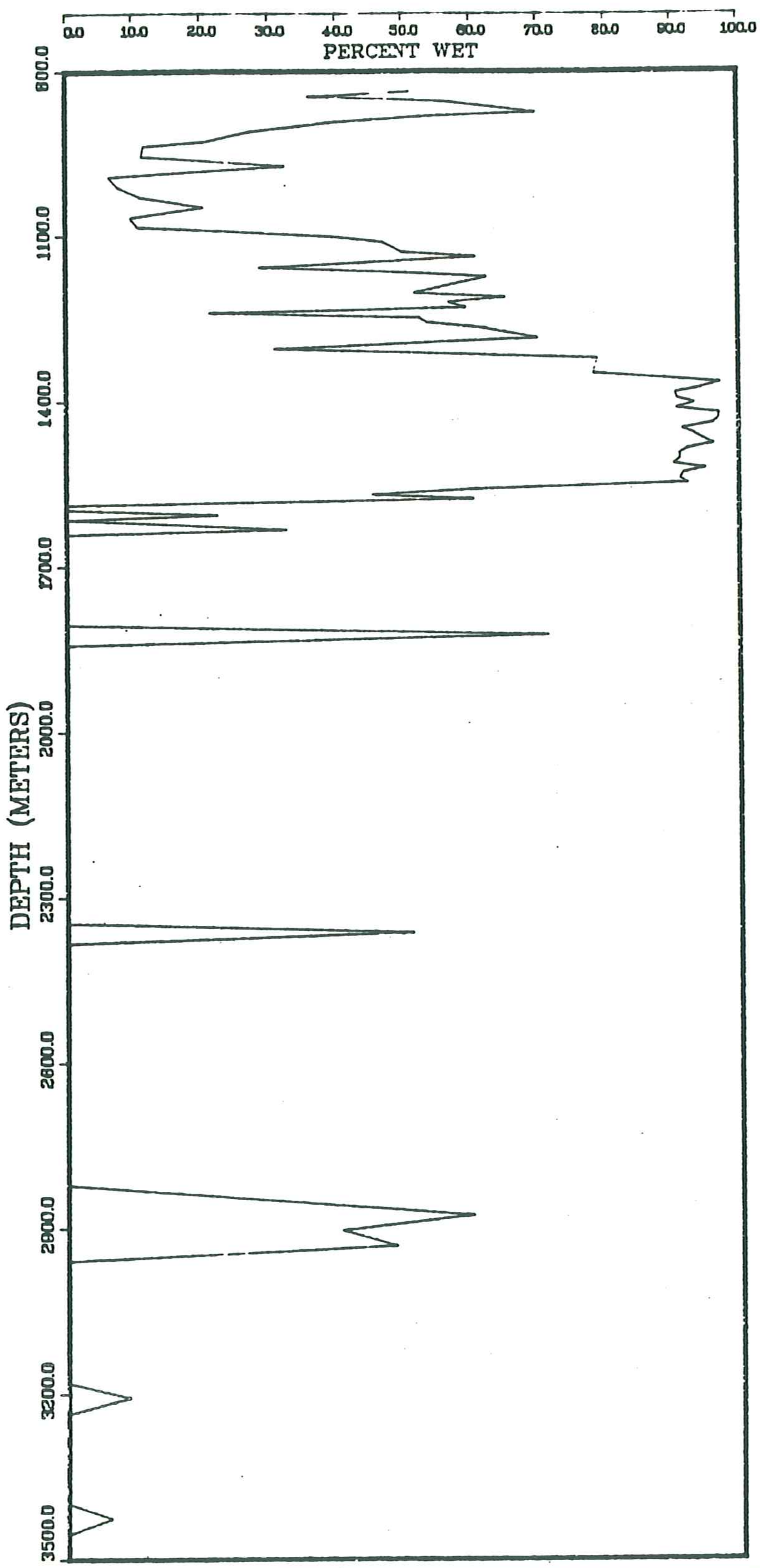
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
300.0
455.6
611.1
766.7
922.2
1077.8
1233.3
1388.9
1544.4
1700.0

OJIBWA E-07



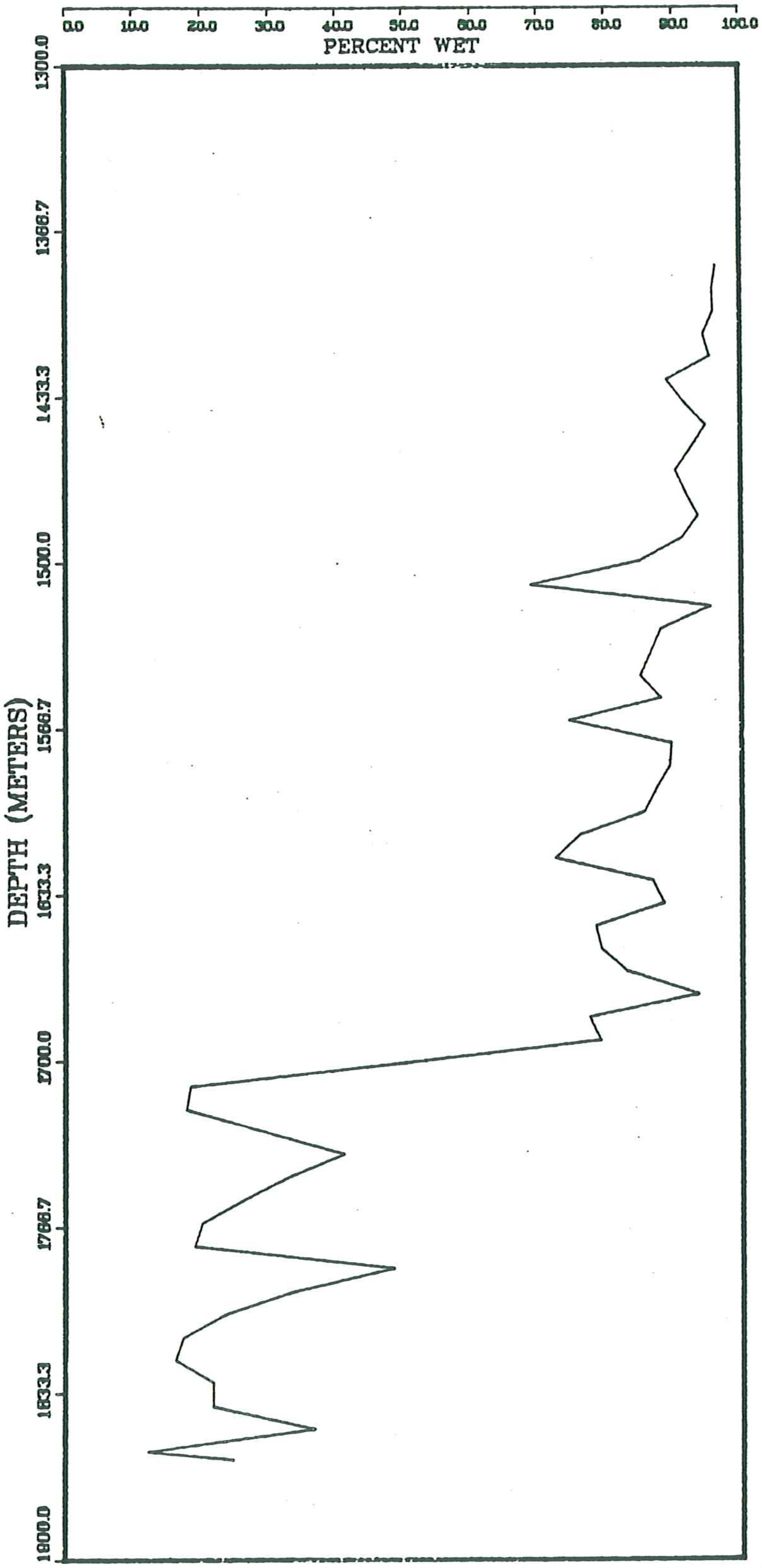
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
700.0
888.9
1077.8
1266.7
1455.6
1644.4
1833.3
2022.2
2211.1
2400.0

OSPREY H-84

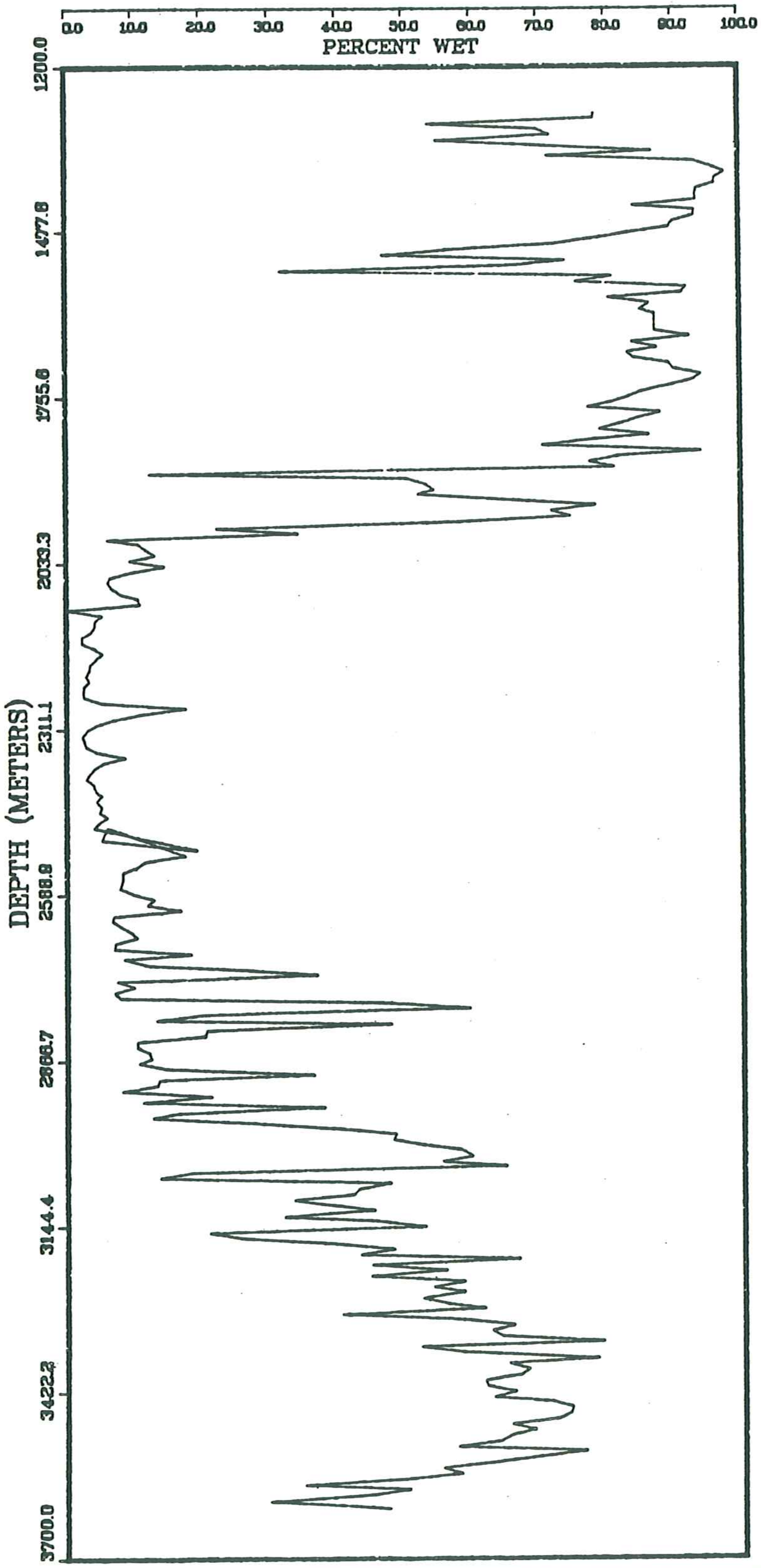


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
800.0
1100.0
1400.0
1700.0
2000.0
2300.0
2600.0
2900.0
3200.0
3500.0

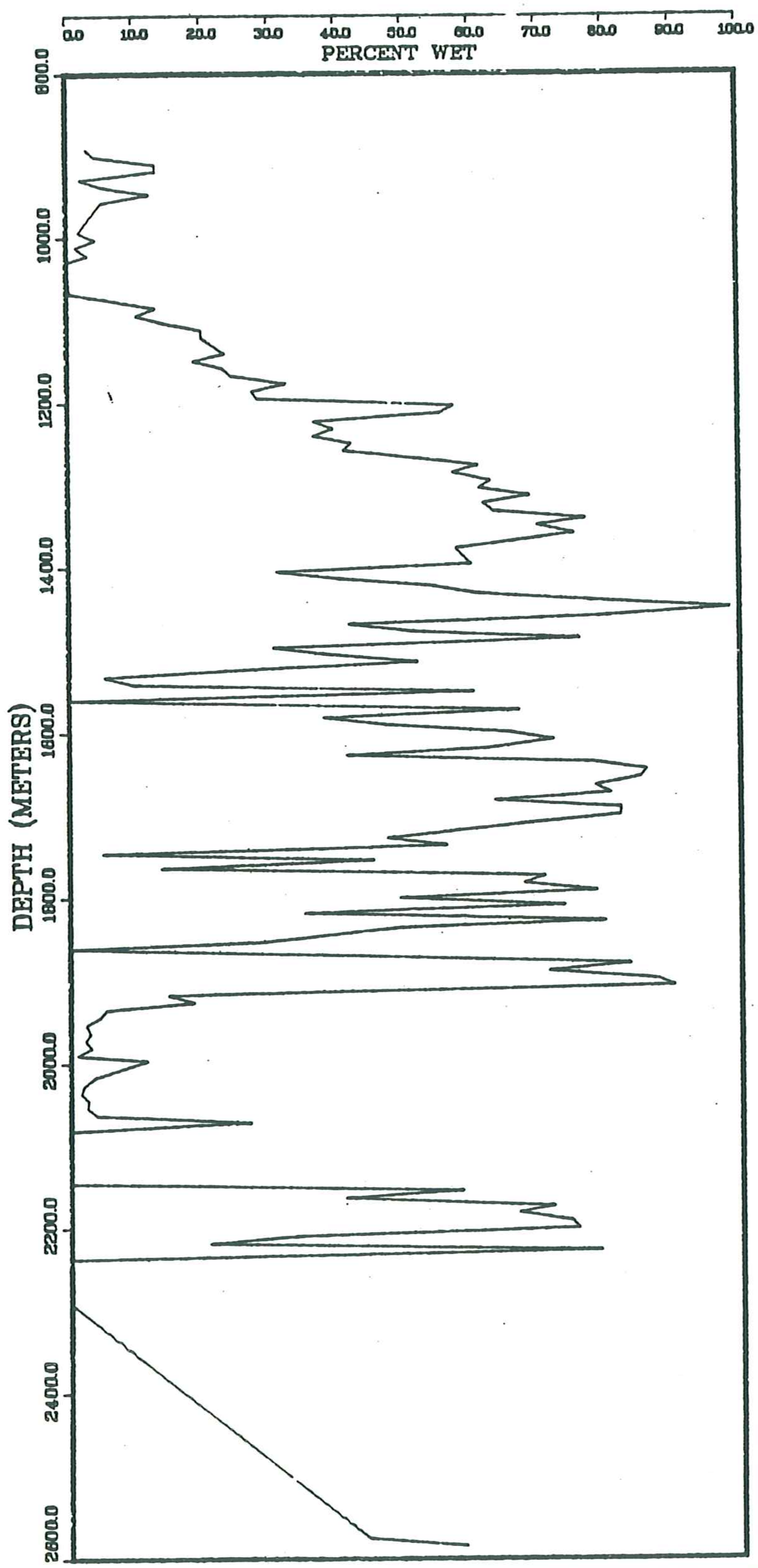
PRIMROSE A-41



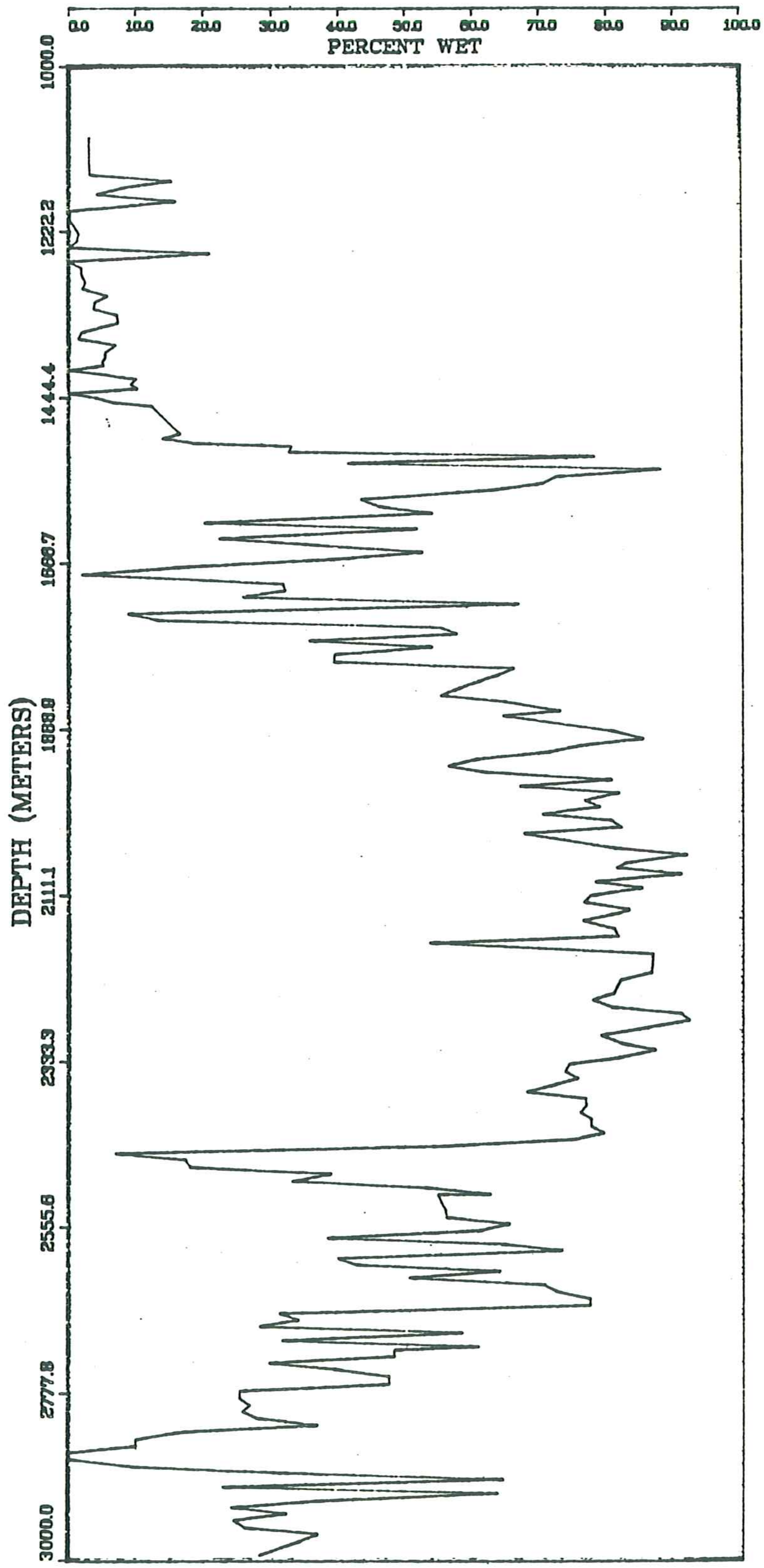
PRIMROSE 1A-A-41



PRIMROSE F-41

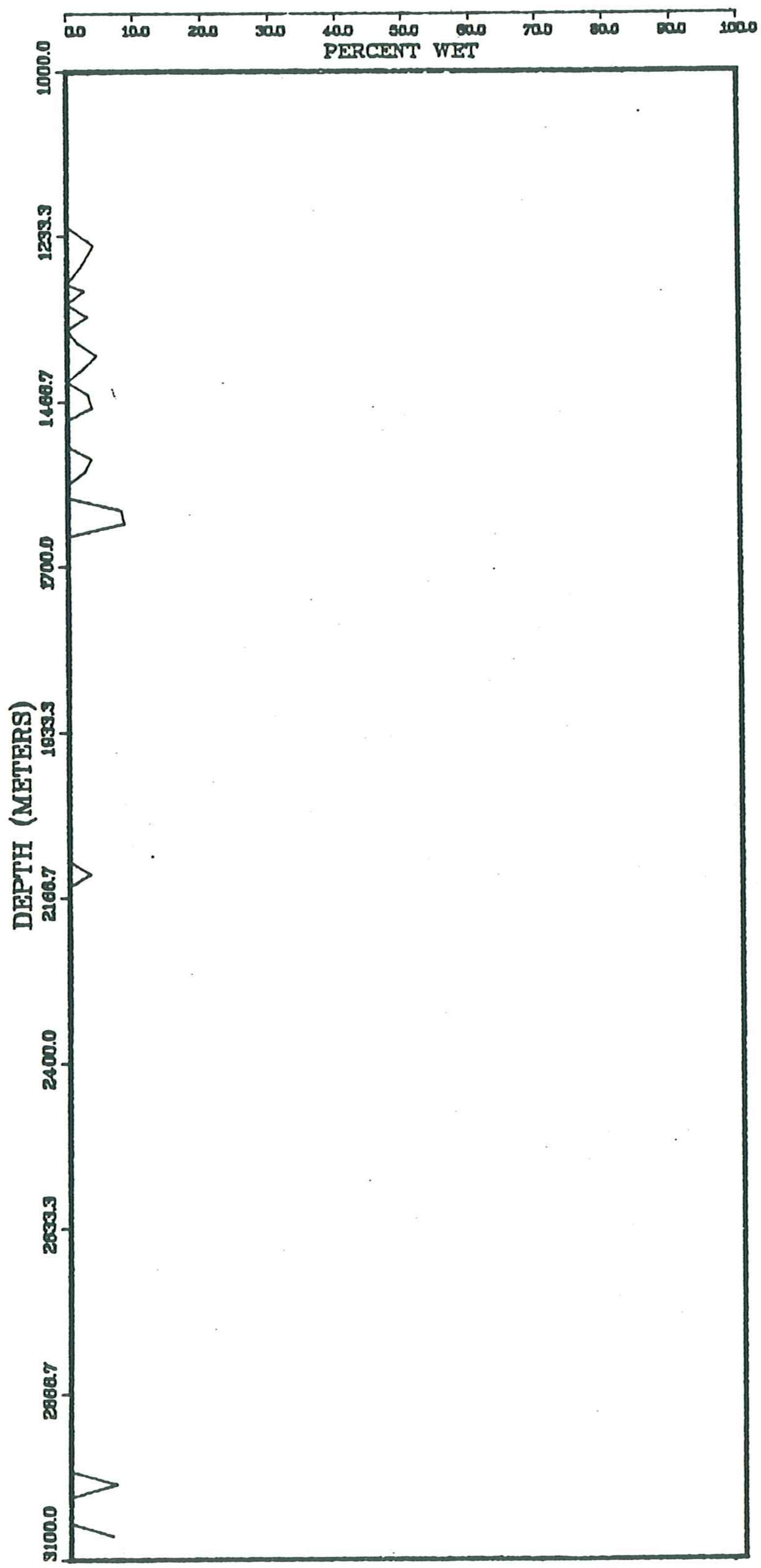


SABLE 1H-58



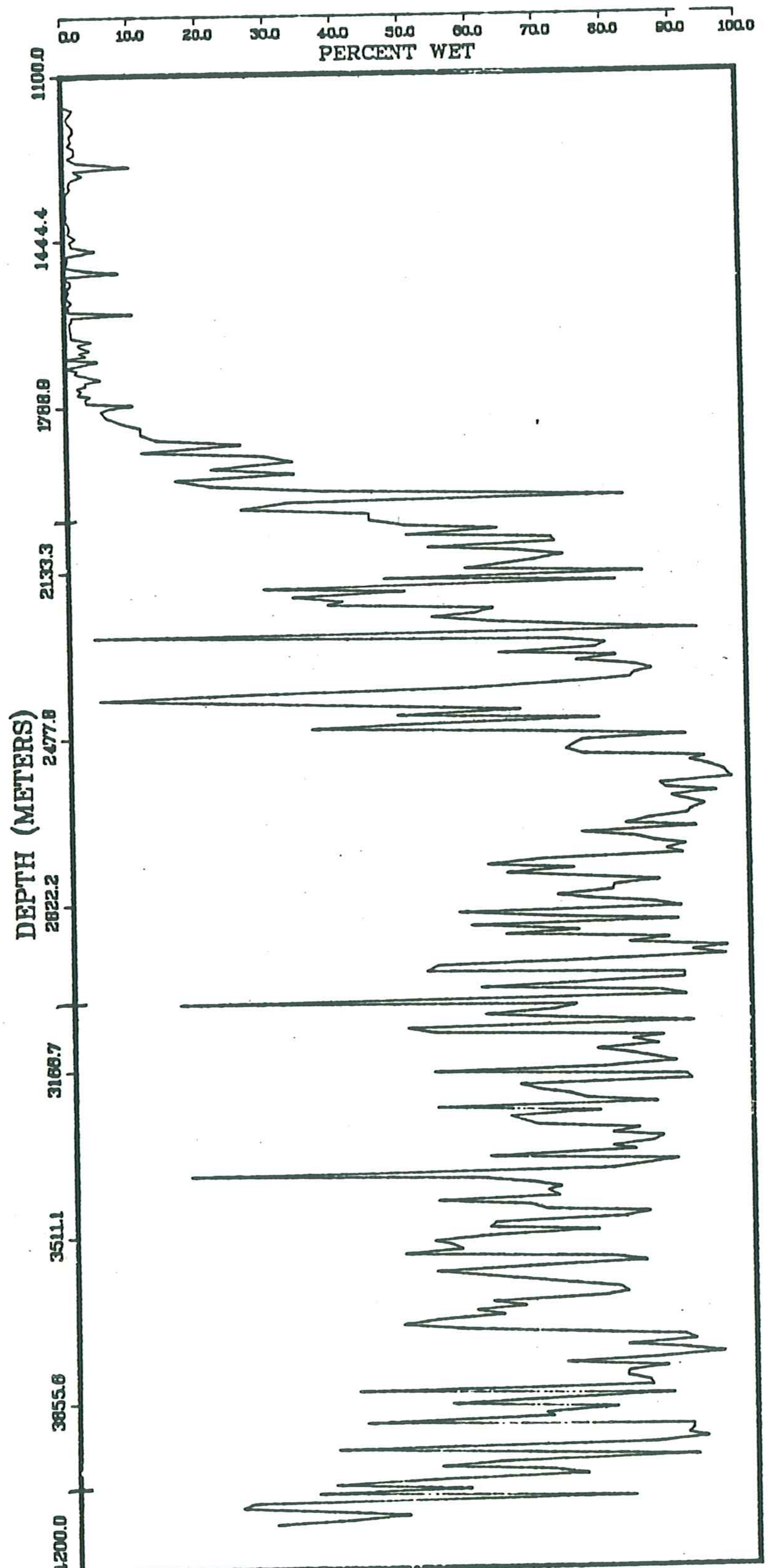
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
1000.0
1222.2
1444.4
1666.7
1888.9
2111.1
2333.3
2555.6
2777.8
3000.0

SAMBRO I-29



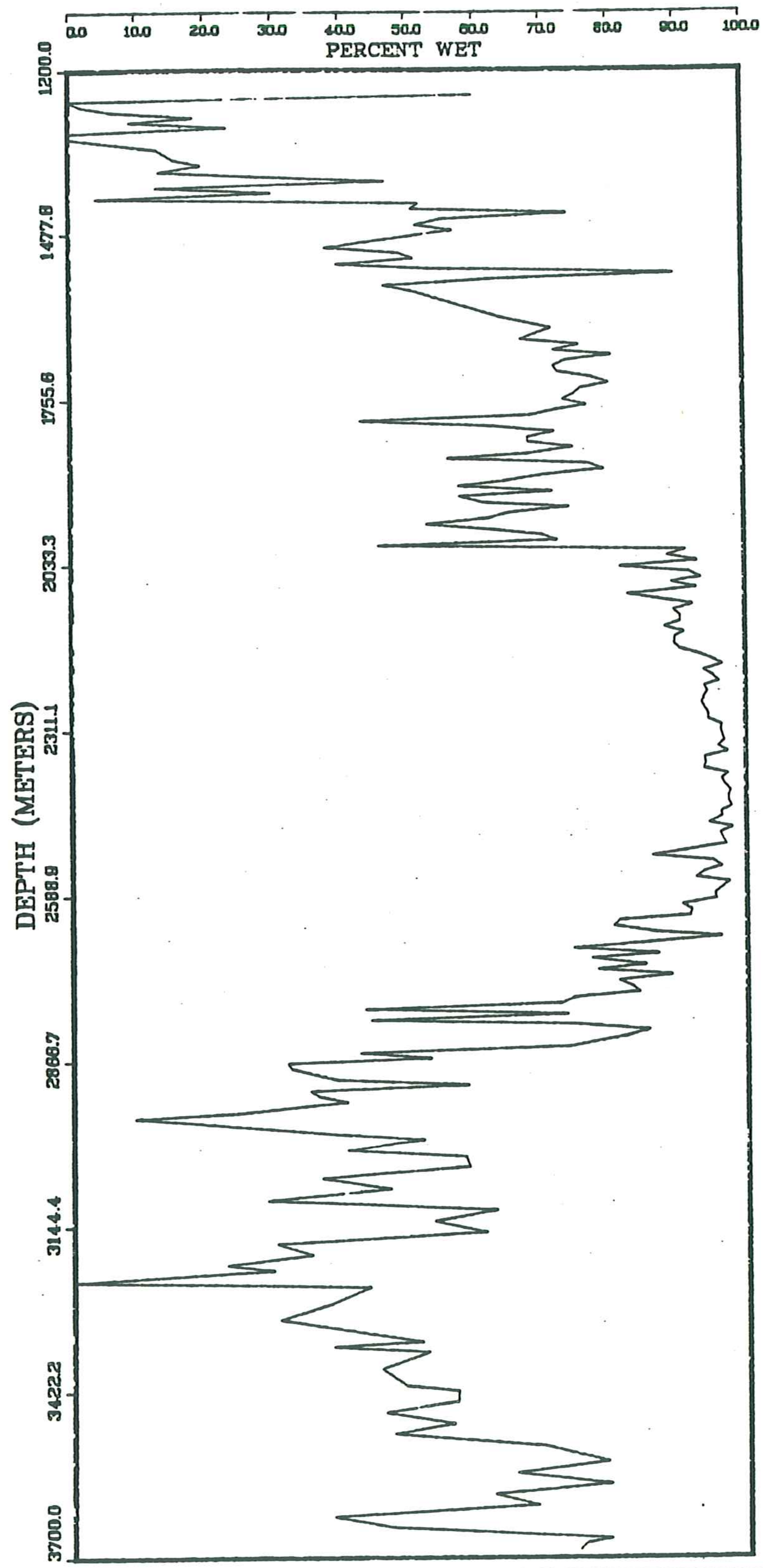
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
1000.0
1233.3
1466.7
1700.0
1933.3
2166.7
2400.0
2633.3
2866.7
3100.0

THEBAUD P-84

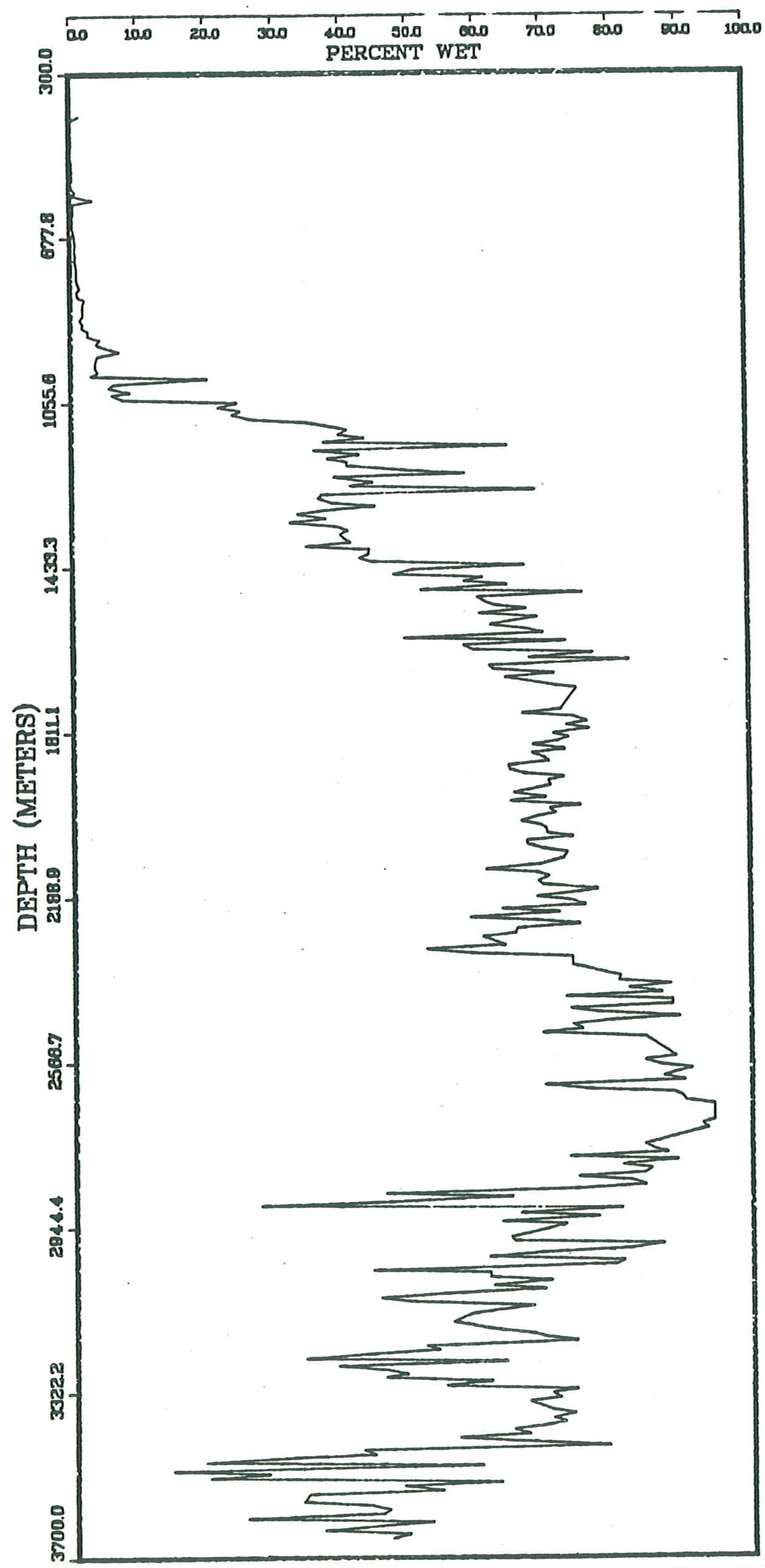


0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
PERCENT WET
DEPTH (METERS)
1100.0
1444.4
1788.9
2133.3
2477.8
2822.2
3166.7
3511.1
3855.6
4200.0

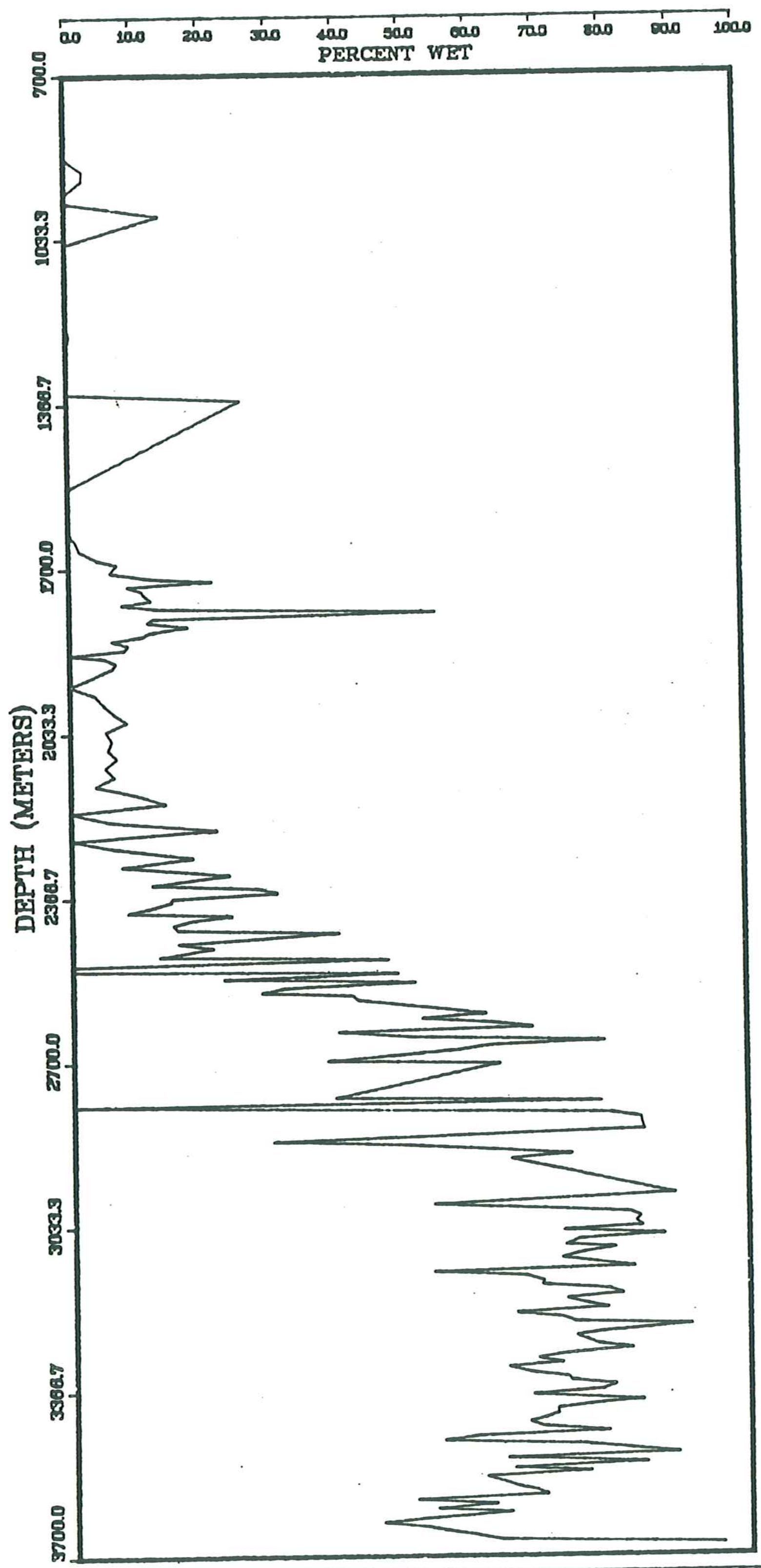
ADOLPHUS D-50



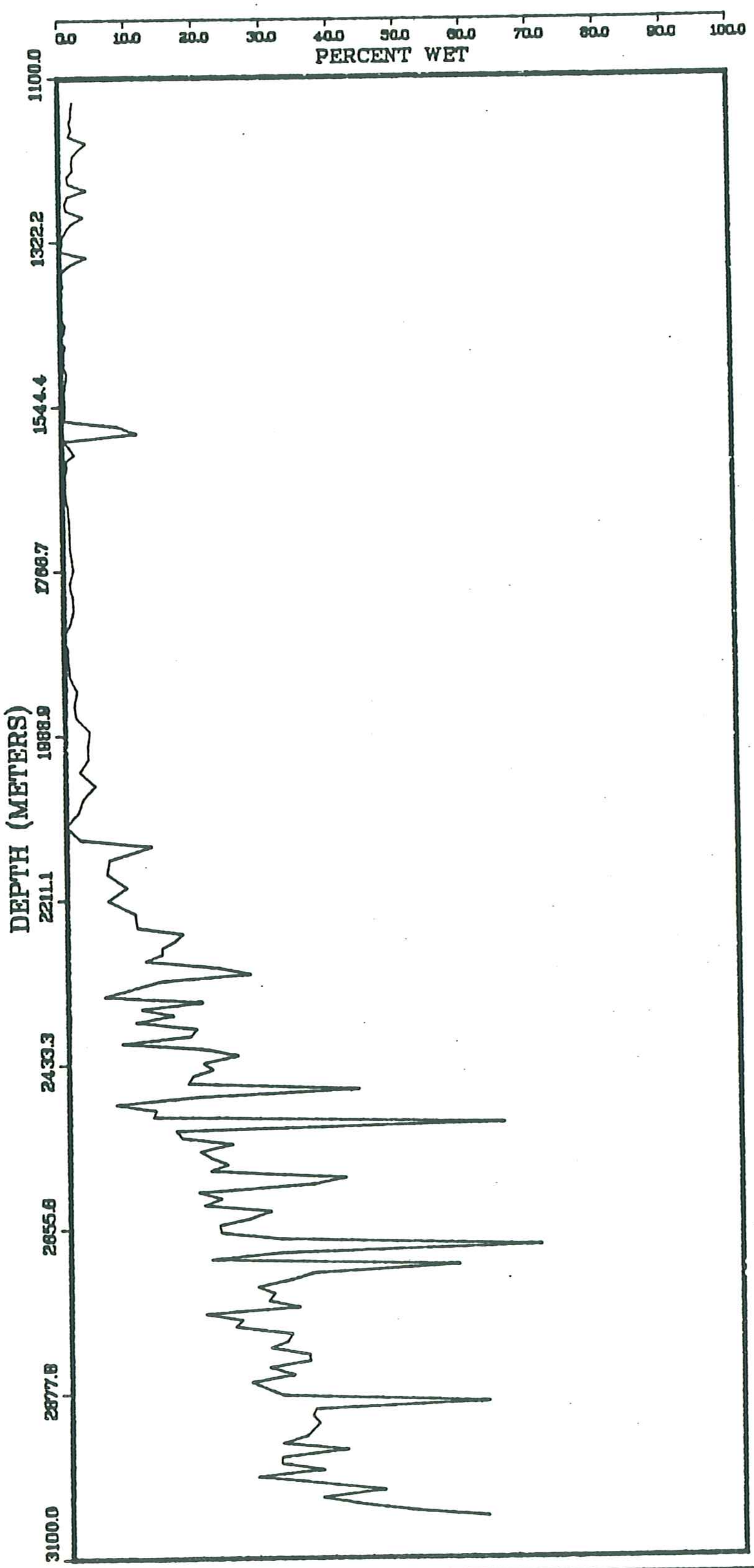
ADOLPHUS 2K-41



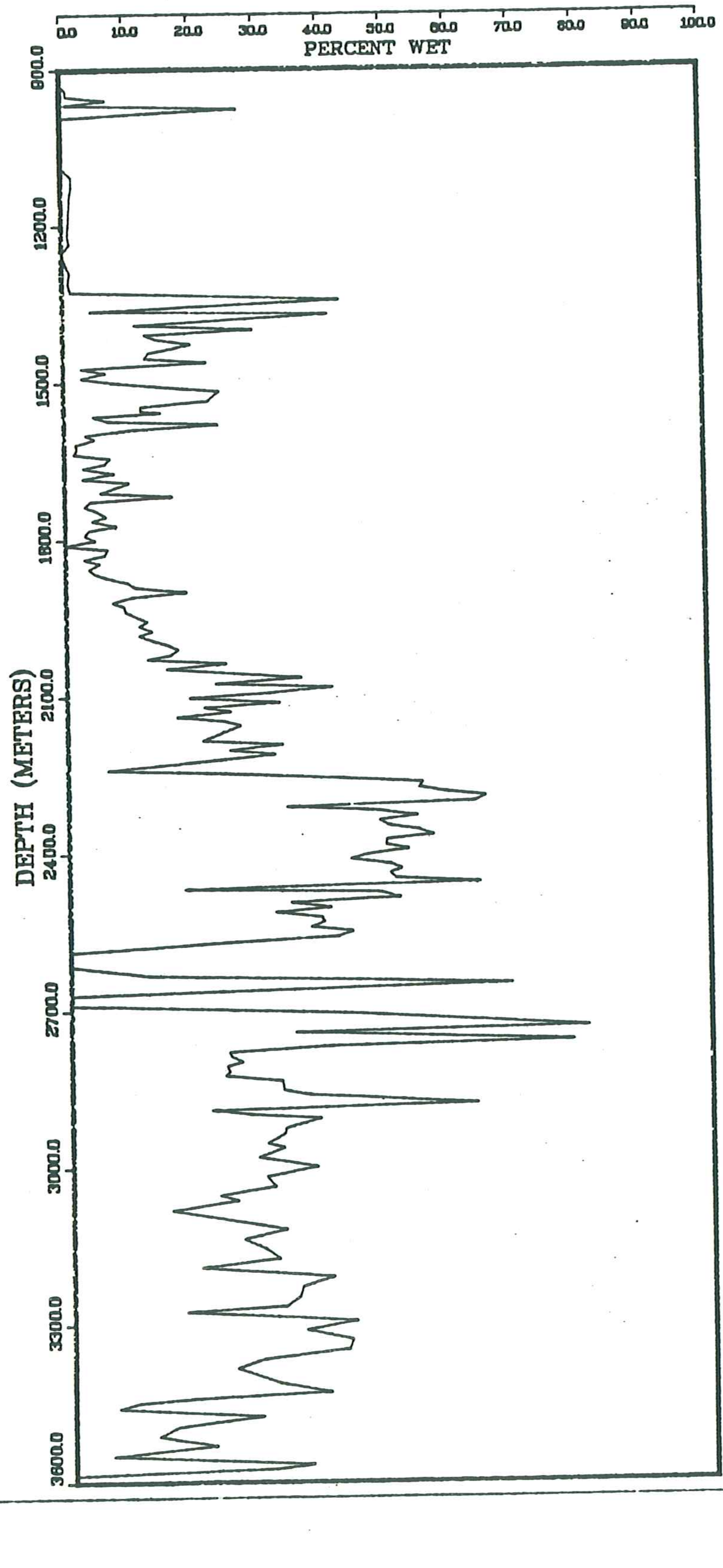
BONAVISTA C-99



BONNITION H-32

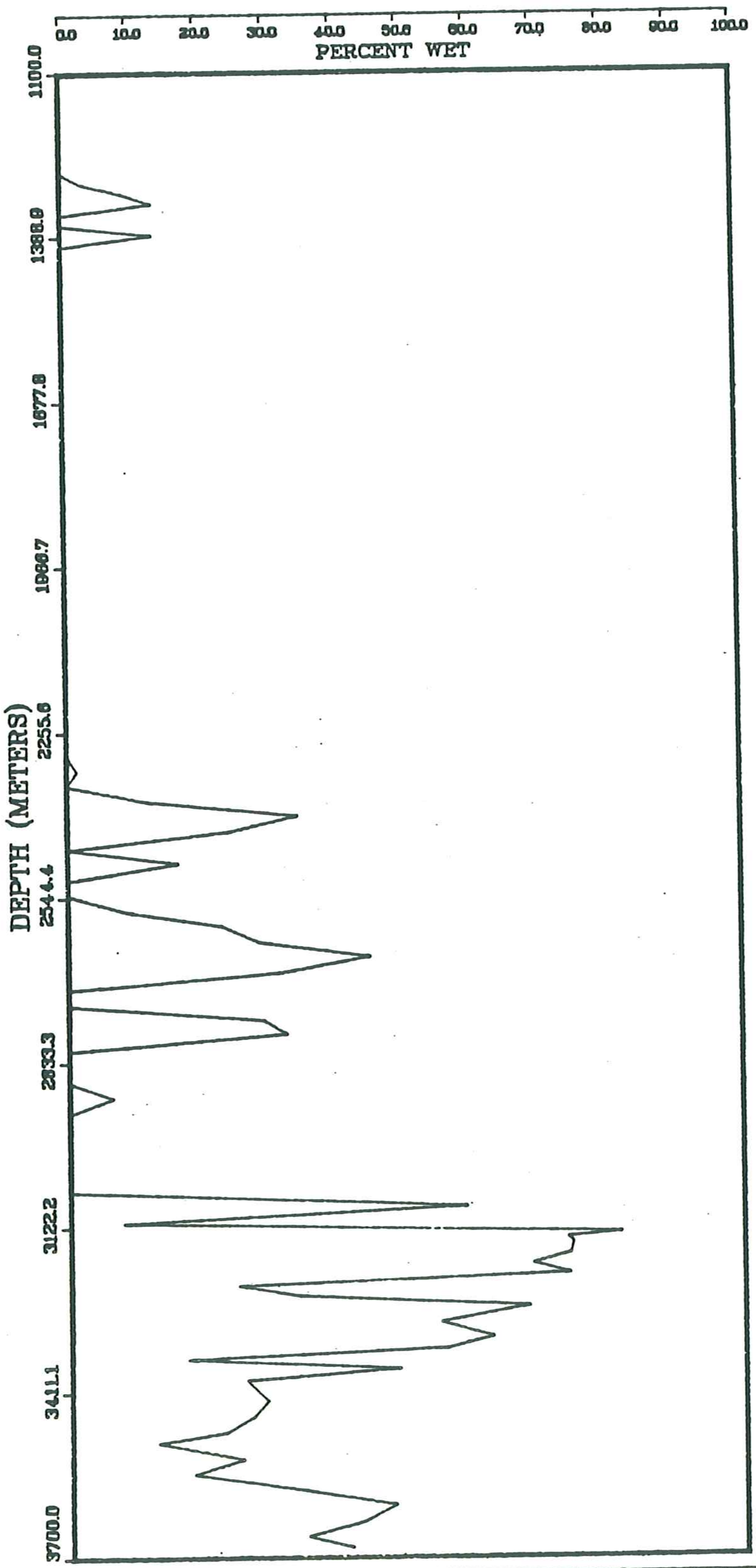


BRANT P-87



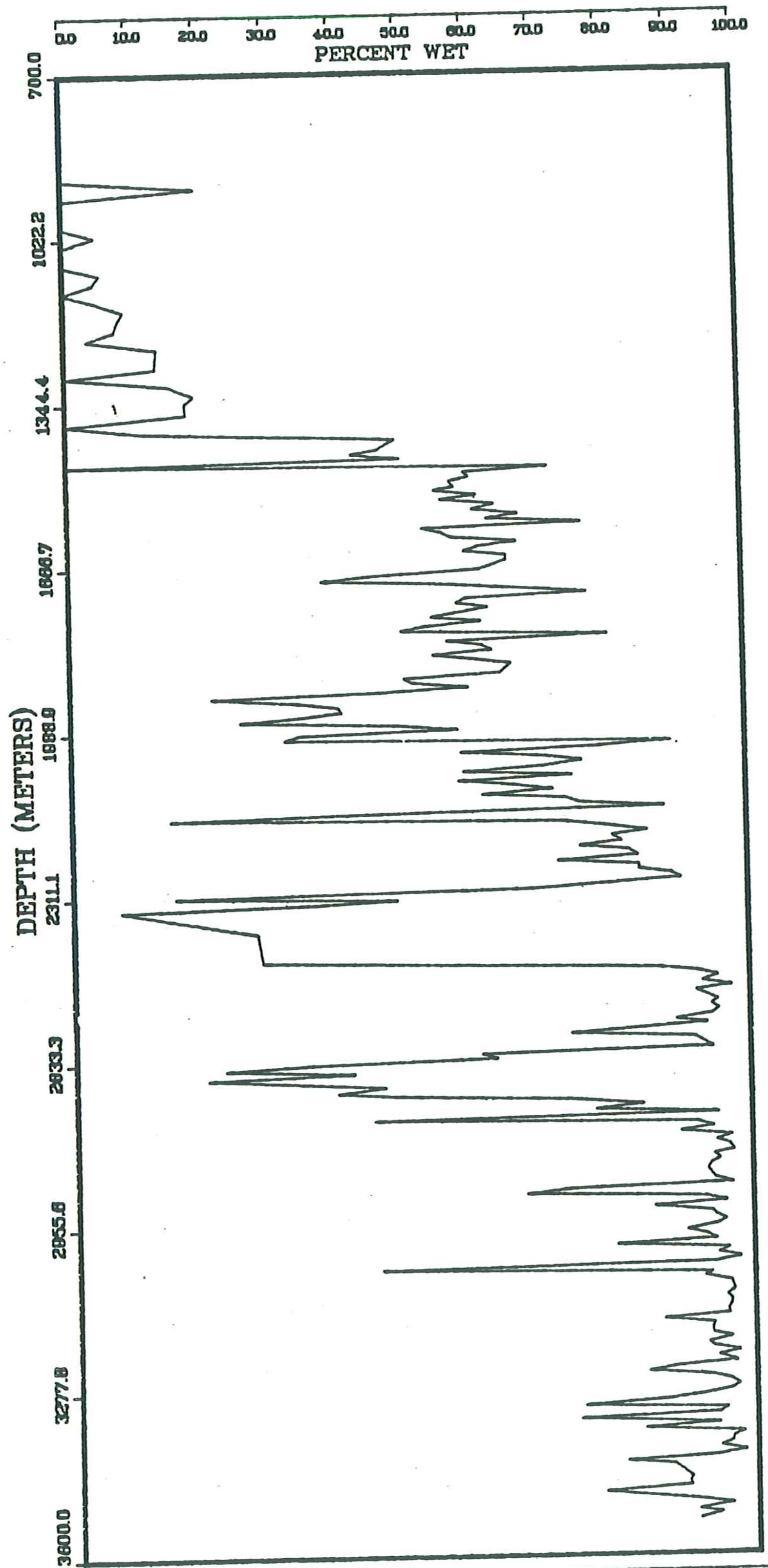
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
900.0
1200.0
1500.0
1800.0
2100.0
2400.0
2700.0
3000.0
3300.0
3600.0

CAREY J-34



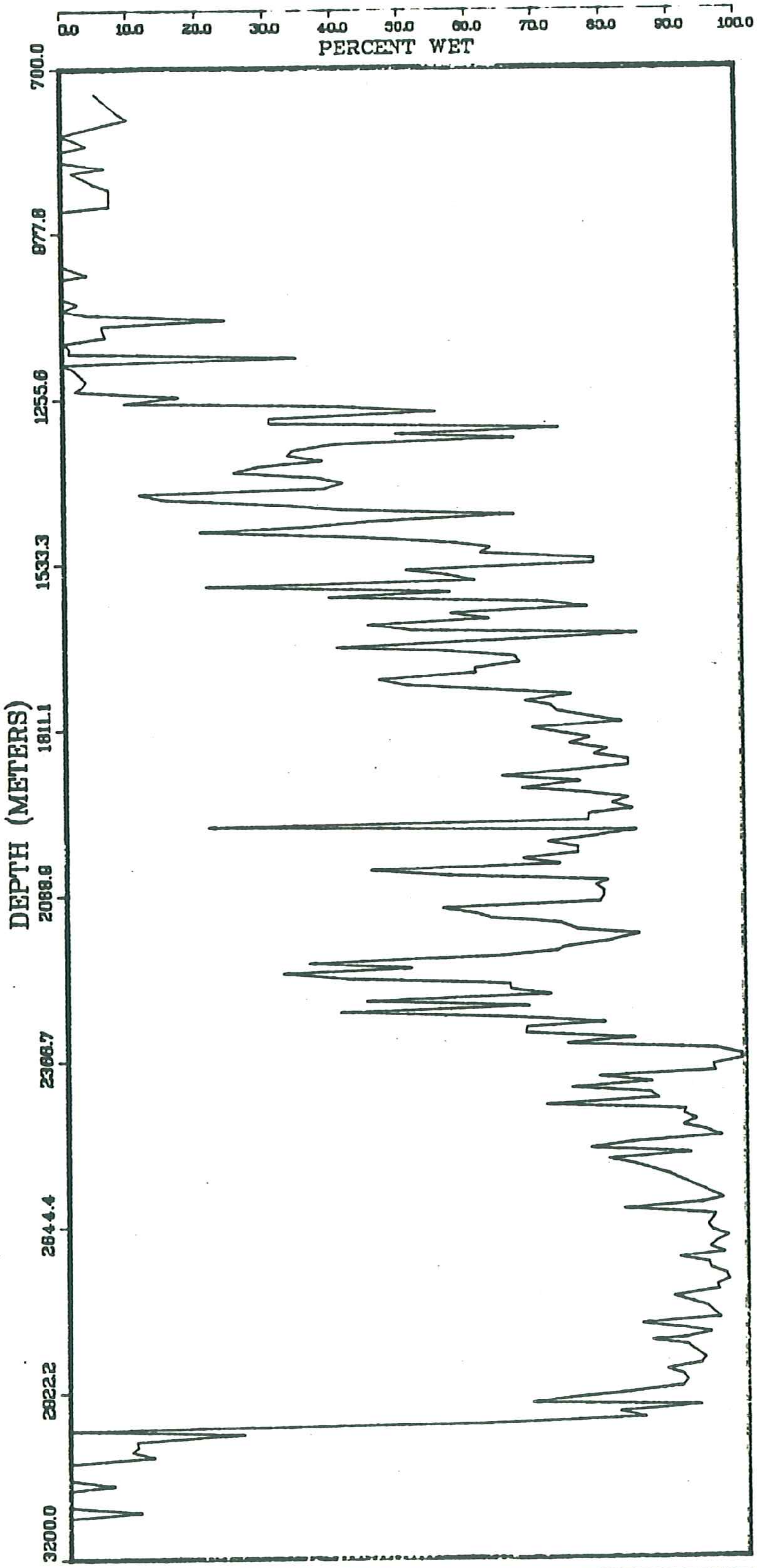
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
1100.0
1388.9
1677.8
1966.7
2255.6
2544.4
2833.3
3122.2
3411.1
3700.0
DEPTH (METERS)

COOT K-56

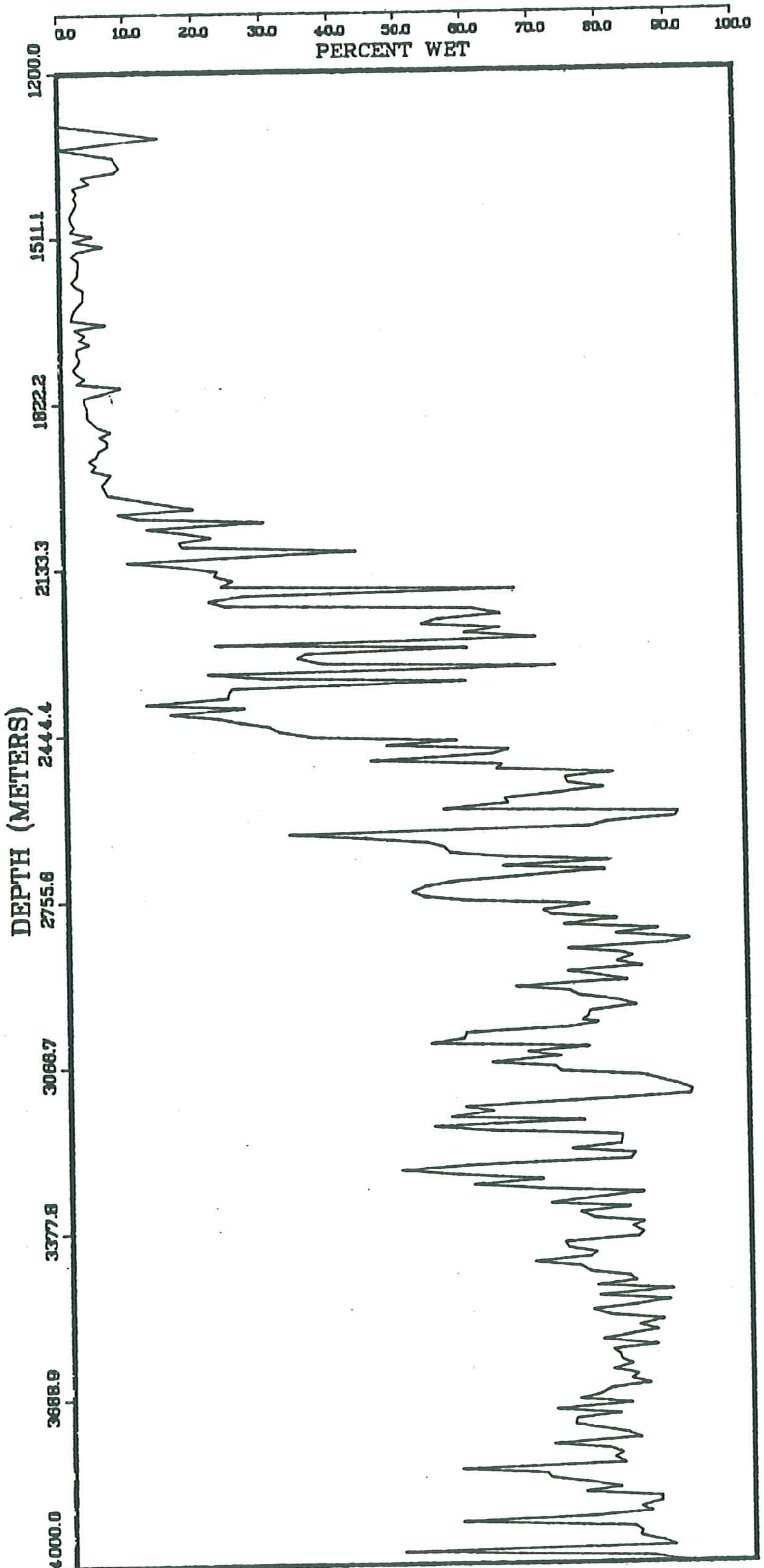


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
700.0
1022.2
1344.4
1666.7
1988.9
2311.1
2633.3
2955.6
3277.8
3600.0

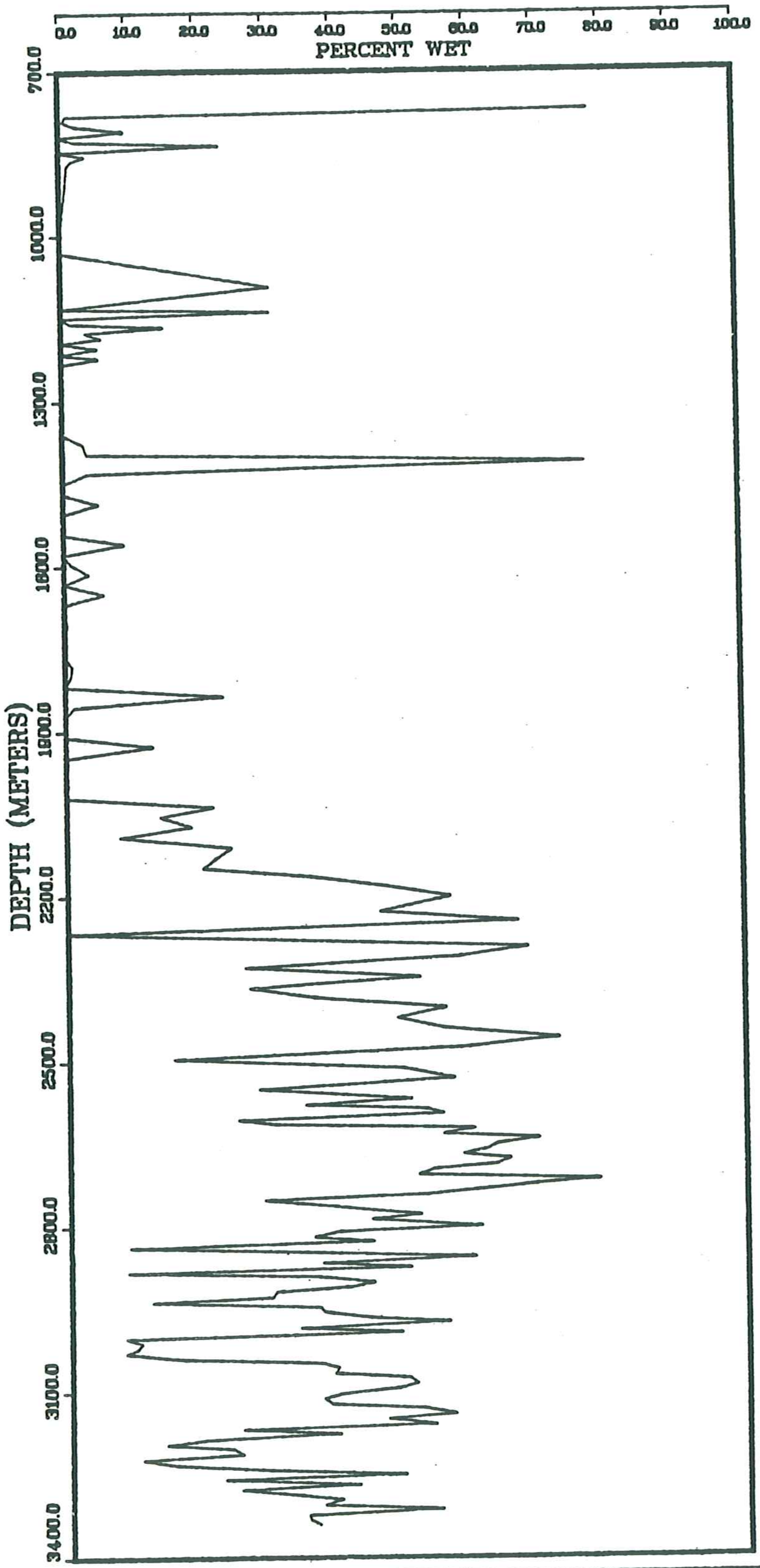
CORMORANT N-83



DOMINION O-23

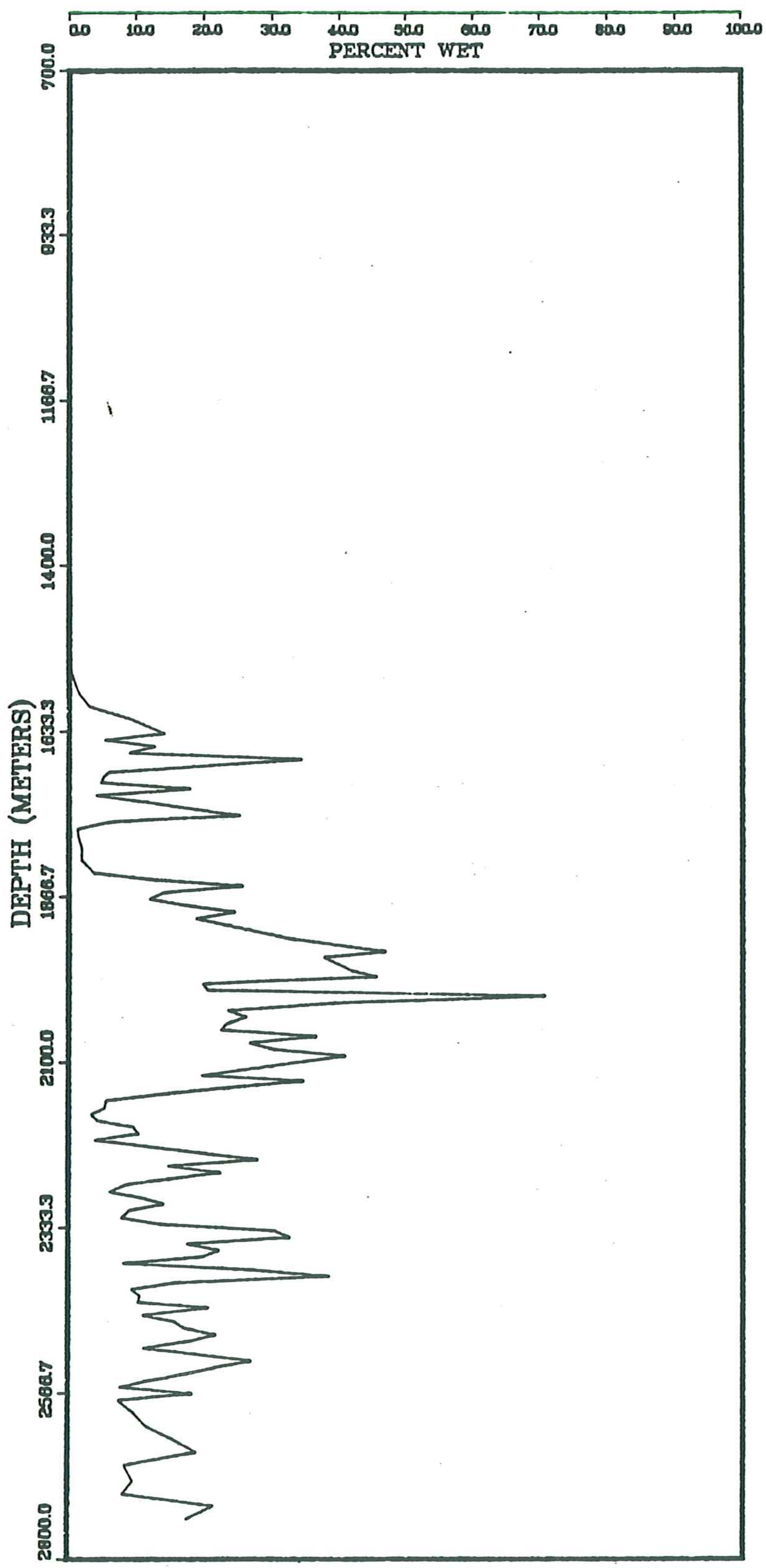


EGRET K-36



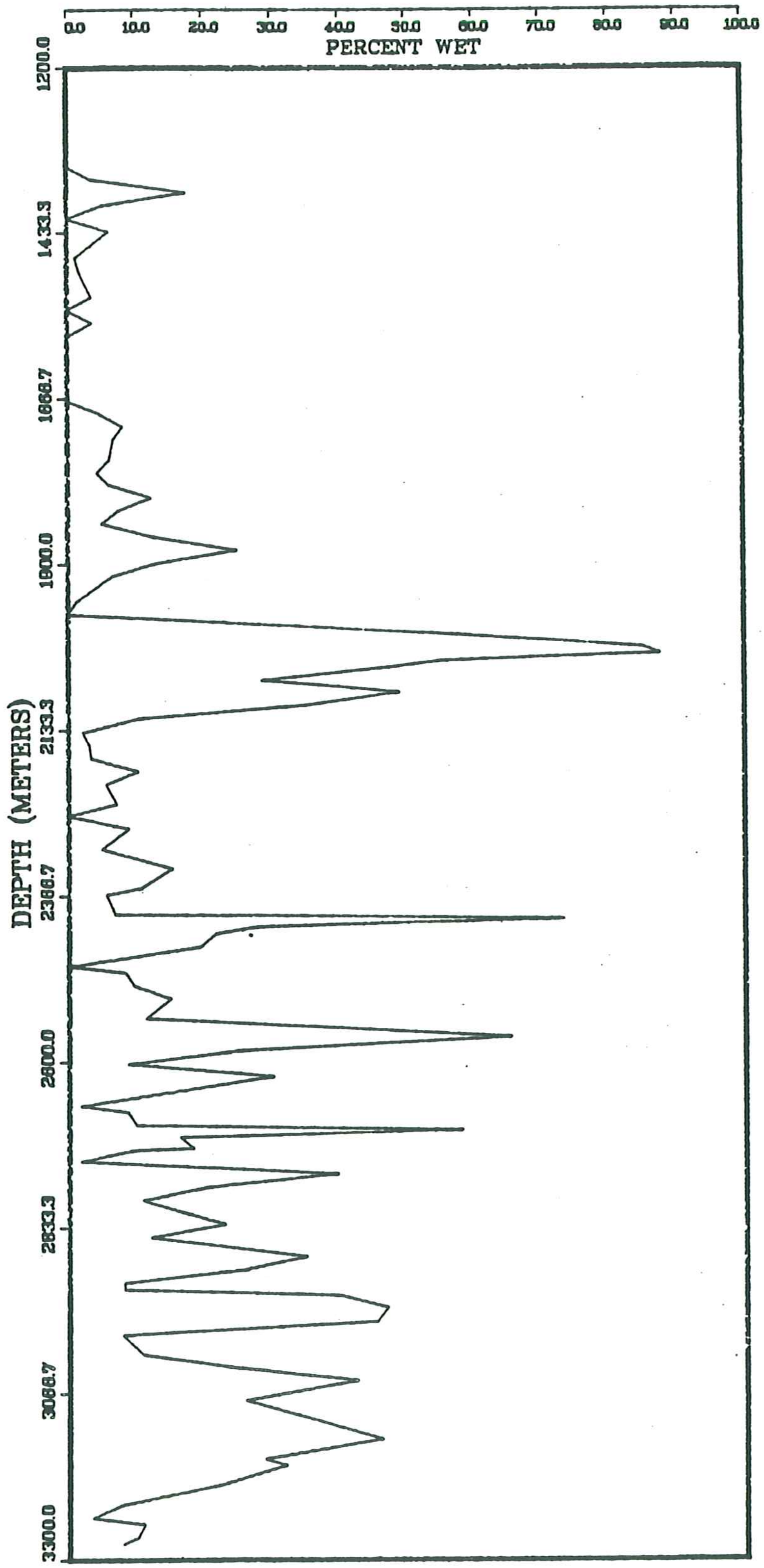
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
700.0
1000.0
1300.0
1600.0
1900.0
2200.0
2500.0
2800.0
3100.0
3400.0

EGRET O-46

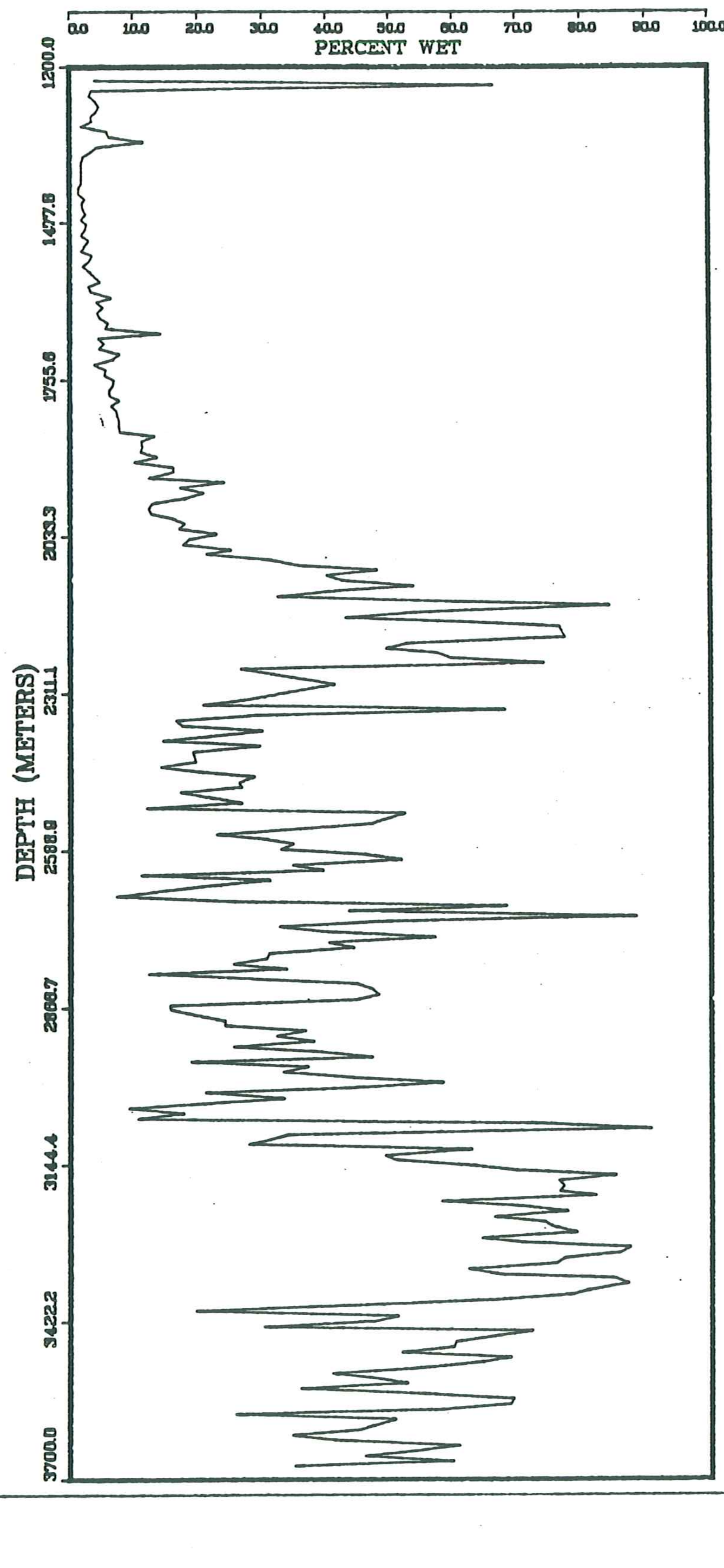


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
700.0
933.3
1166.7
1400.0
1633.3
1866.7
2100.0
2333.3
2566.7
2800.0

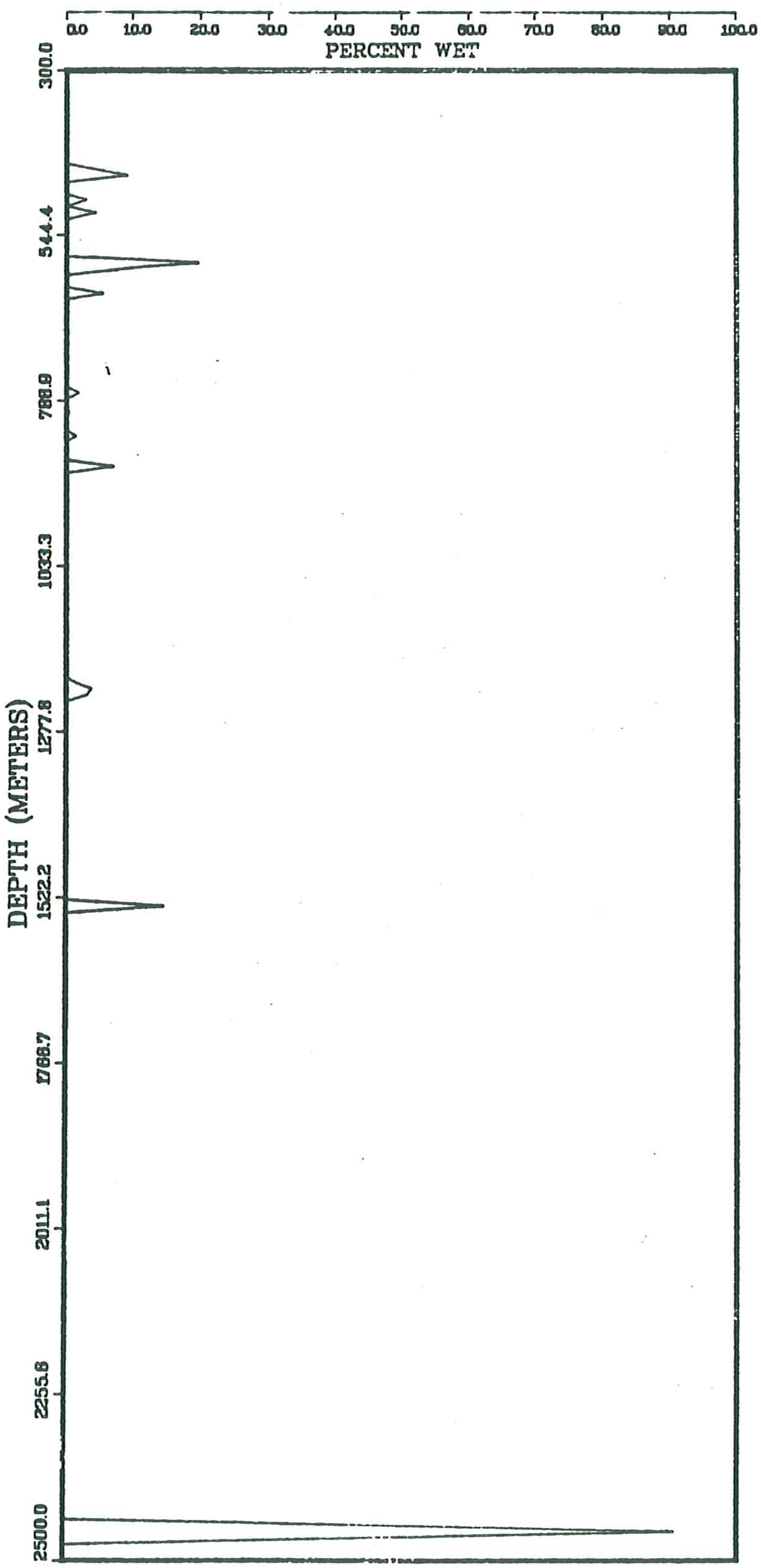
EMERILLION B-56



FLYING FOAM I-13

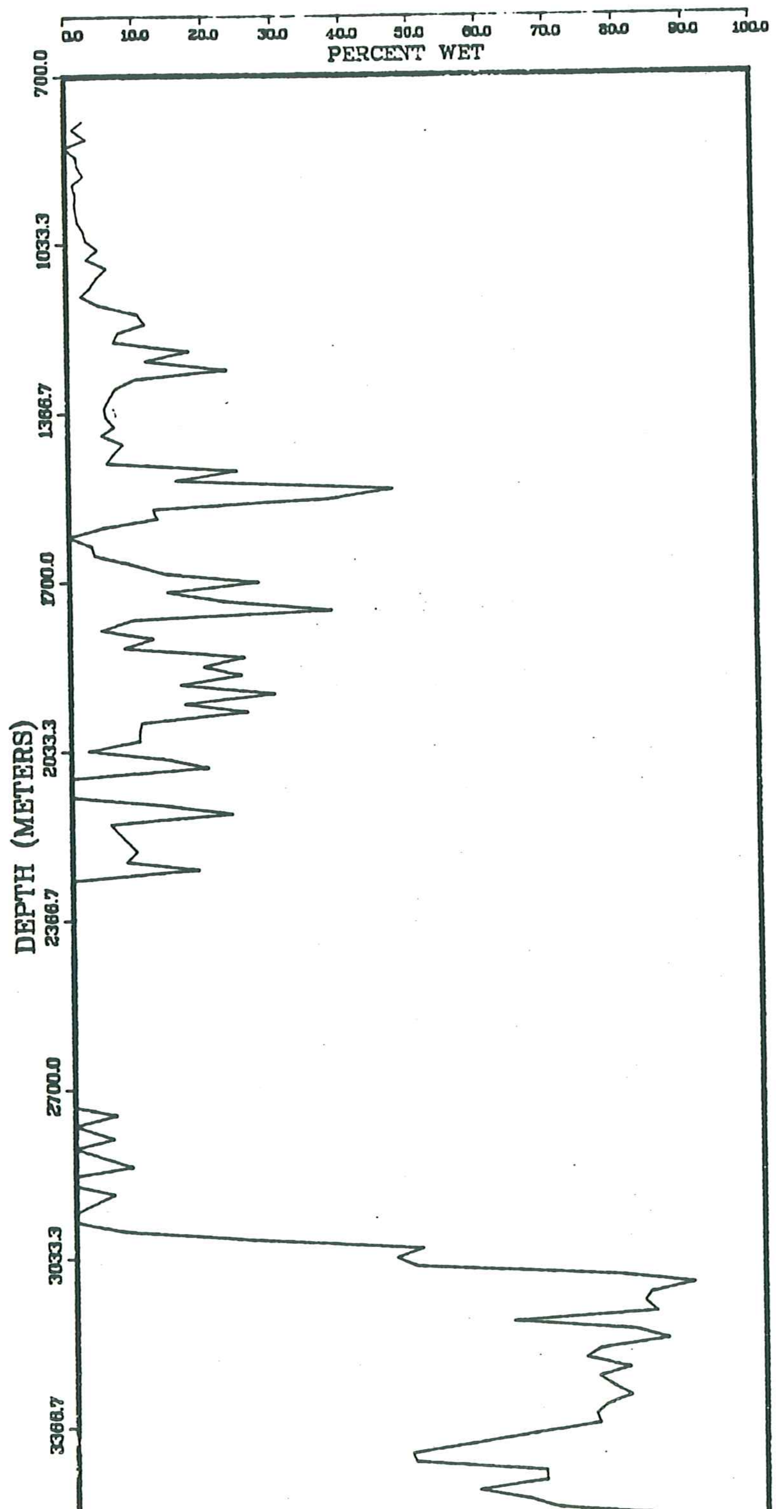


GULL F-72



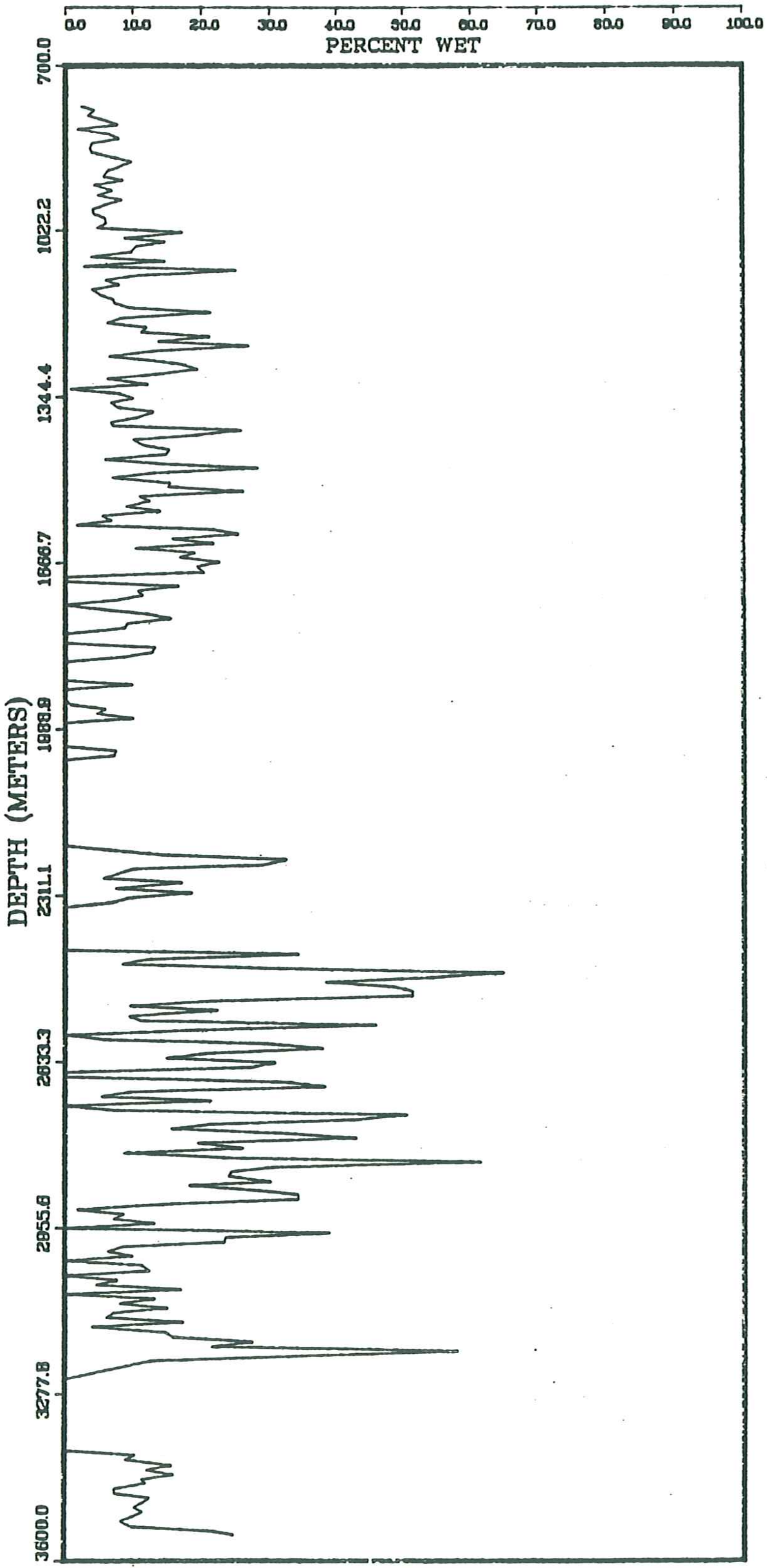
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
300.0
544.4
788.9
1033.3
1277.8
1522.2
1766.7
2011.1
2255.6
2500.0

HERON H-73

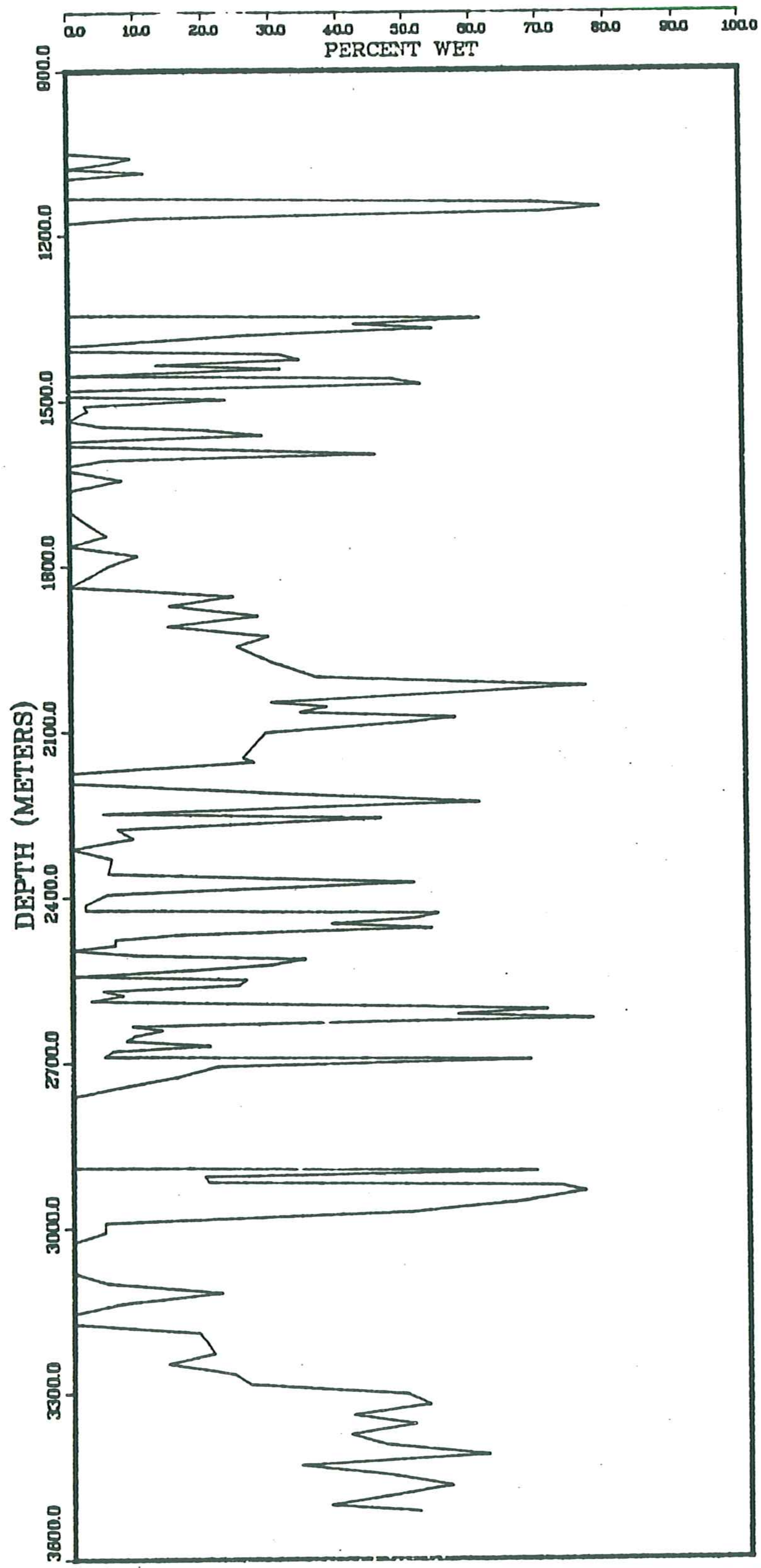


0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
PERCENT WET
DEPTH (METERS)
700.0
1033.3
1366.7
1700.0
2033.3
2366.7
2700.0
3033.3
3366.7
3700.0

KITTWAKE P-11

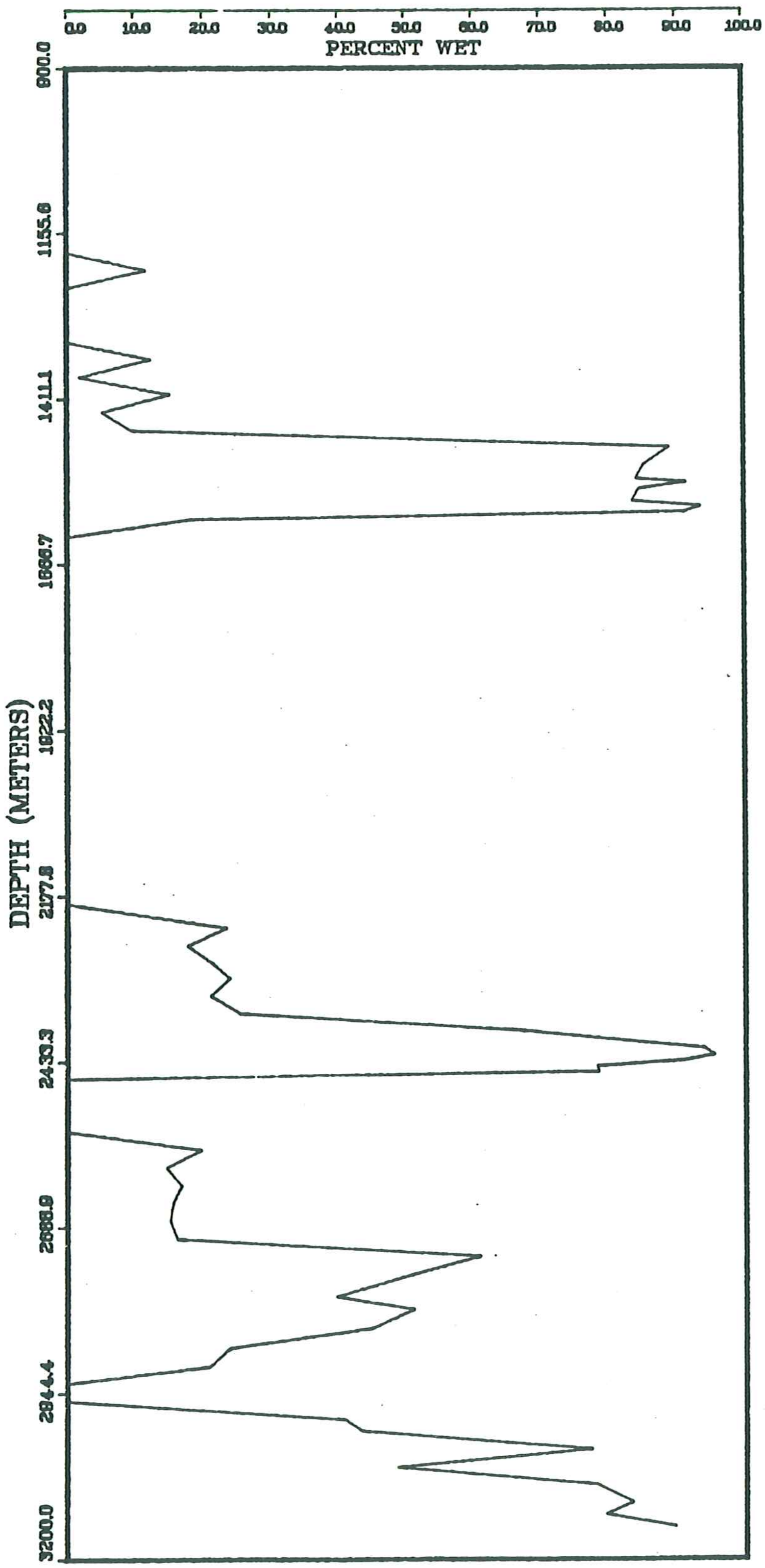


MALLARD M-45

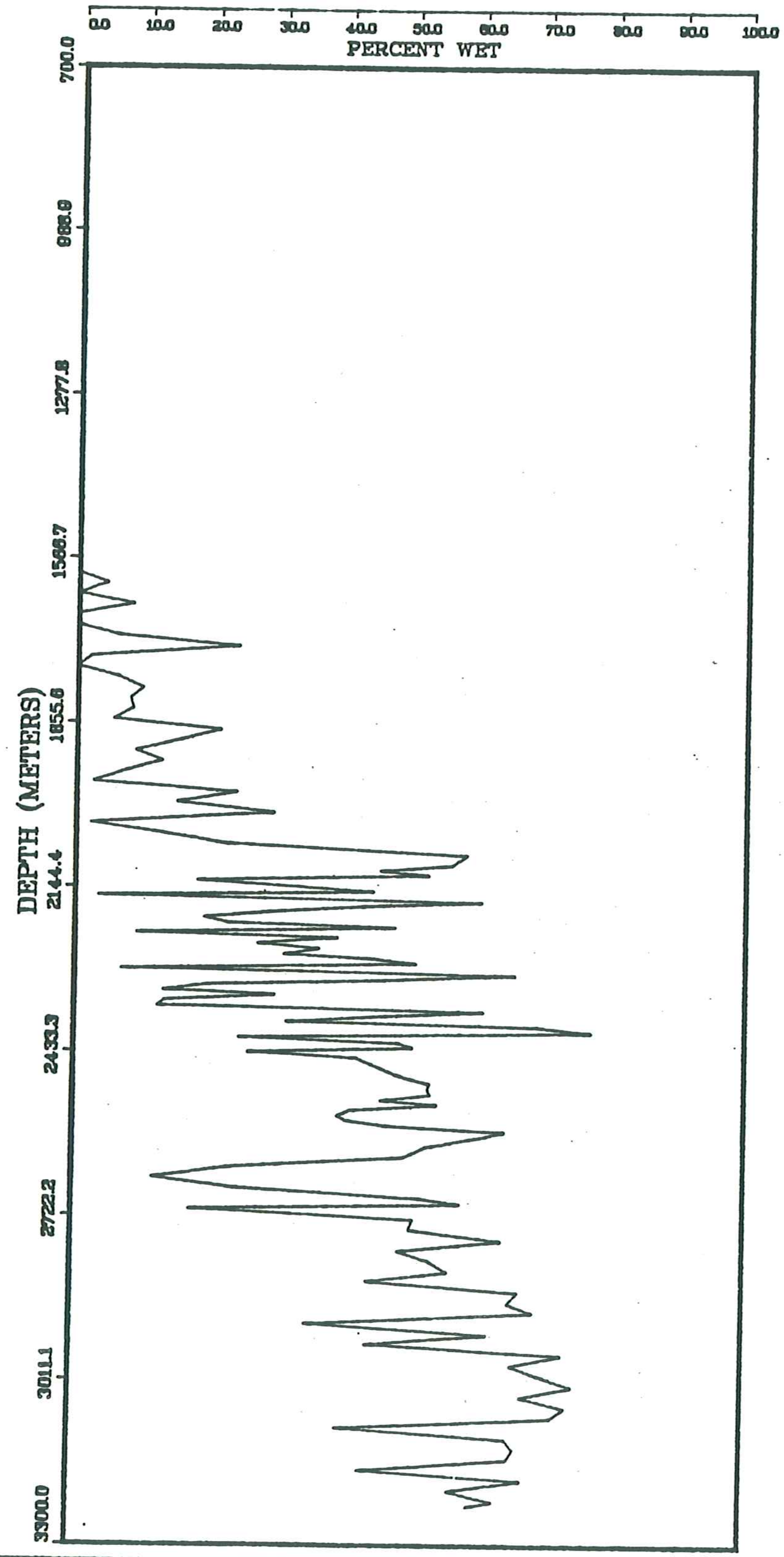


0.0 10.0 20.0 30.0 40.0 50.0 60.0 70.0 80.0 90.0 100.0
PERCENT WET
DEPTH (METERS)
900.0
1200.0
1500.0
1800.0
2100.0
2400.0
2700.0
3000.0
3300.0
3600.0

PHALAROPE P-62

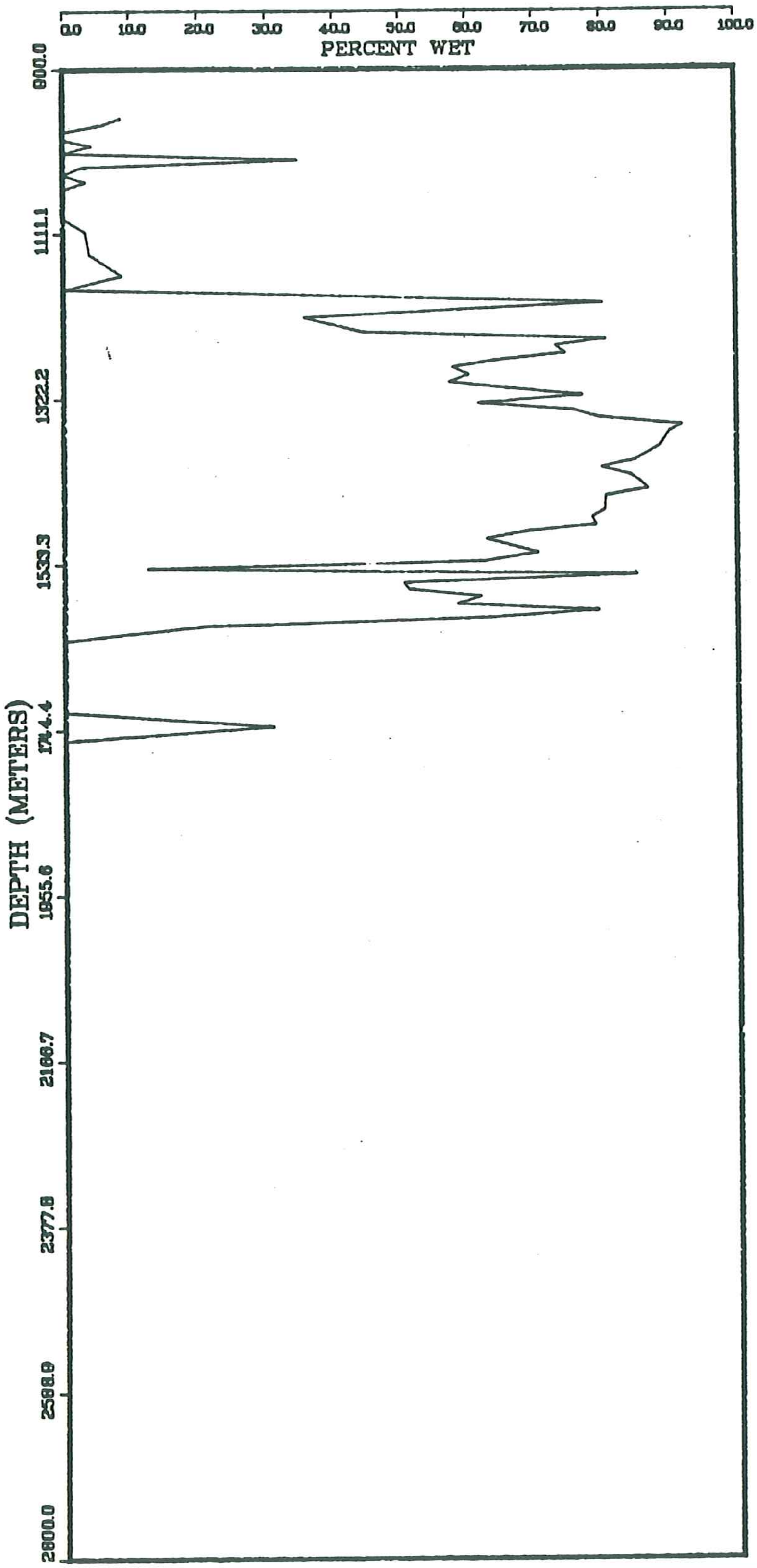


SKUA E-41

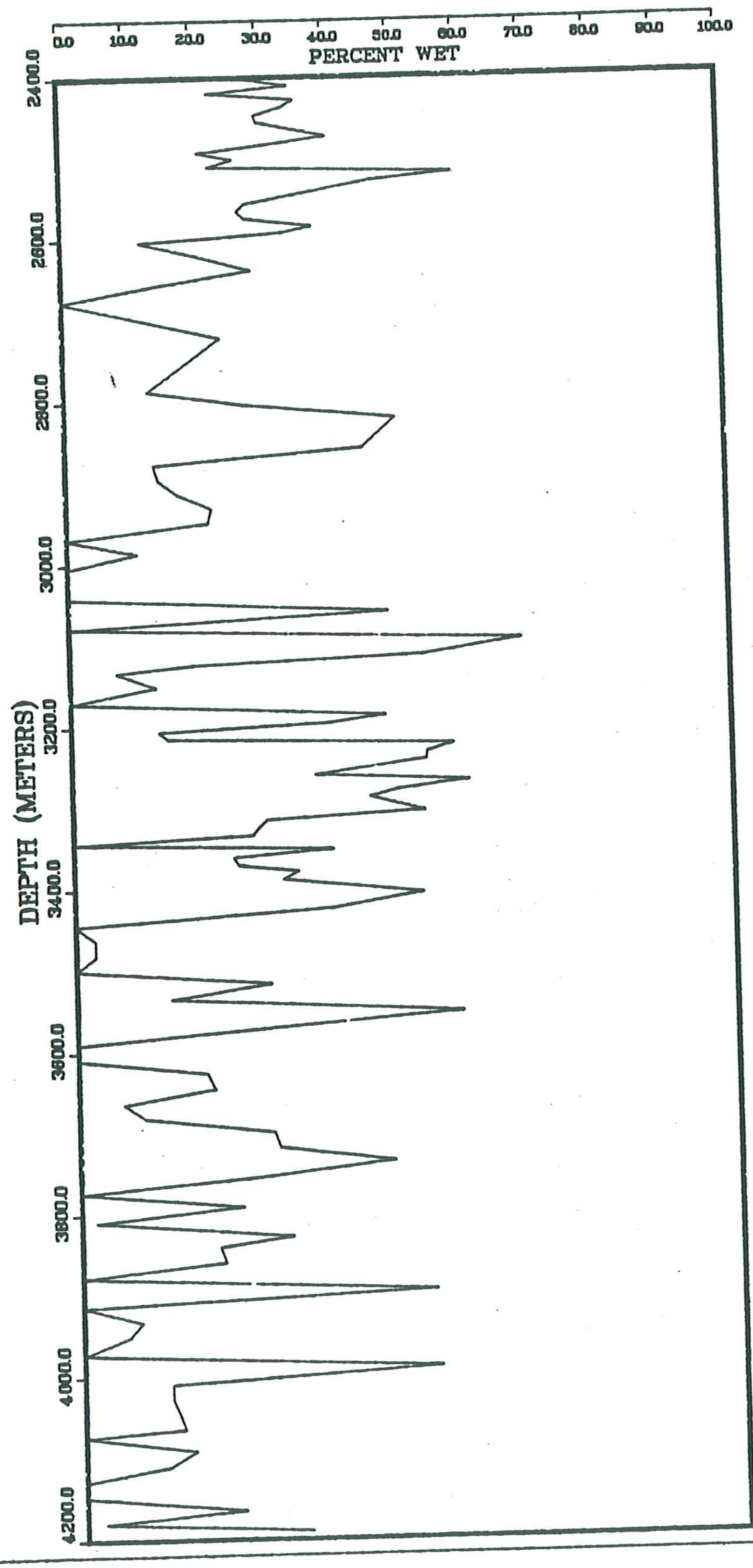


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
700.0
988.9
1277.8
1566.7
1855.6
2144.4
2433.3
2722.2
3011.1
3300.0

SPOONBILL C-30

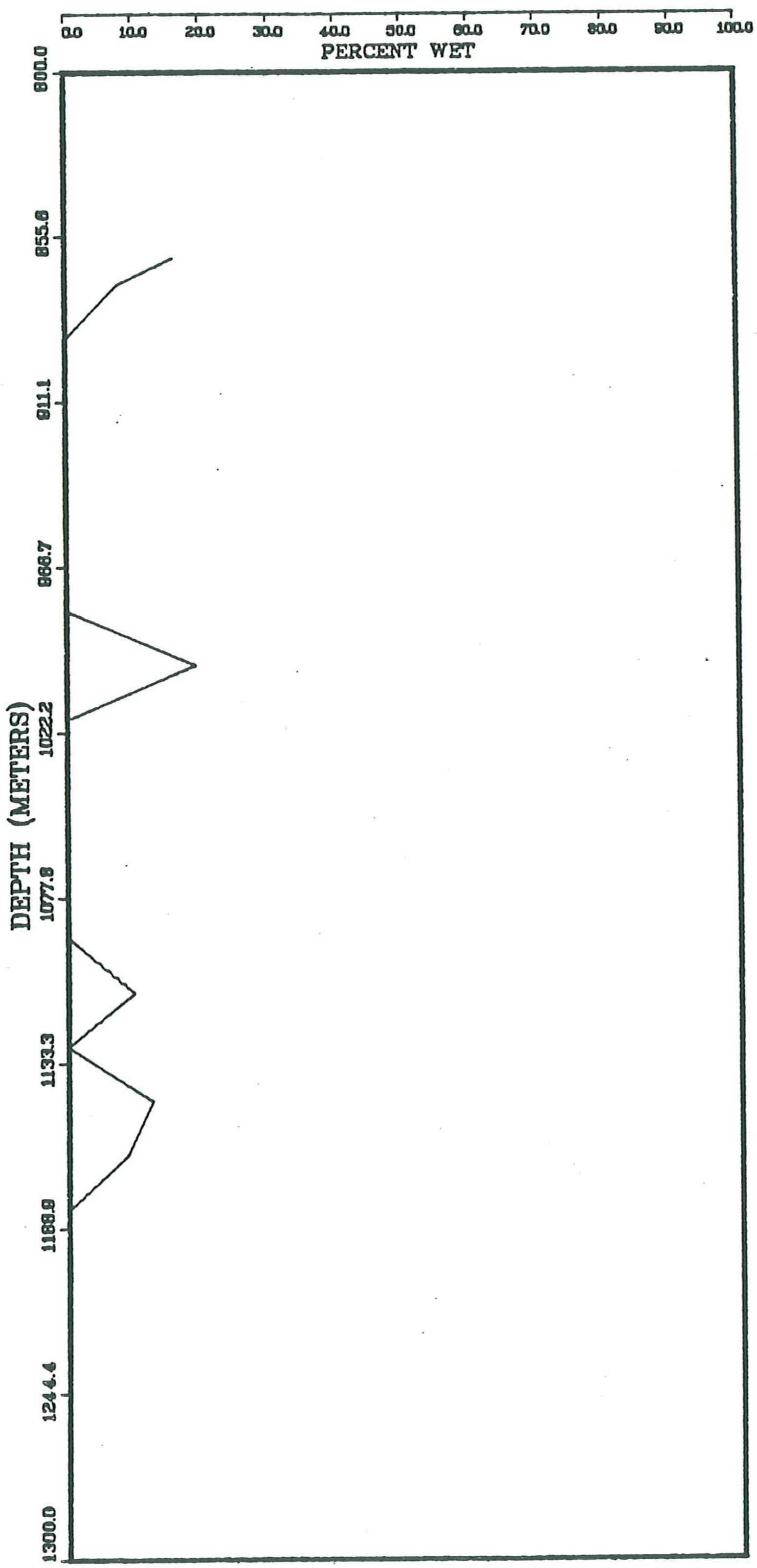


TERN A-68

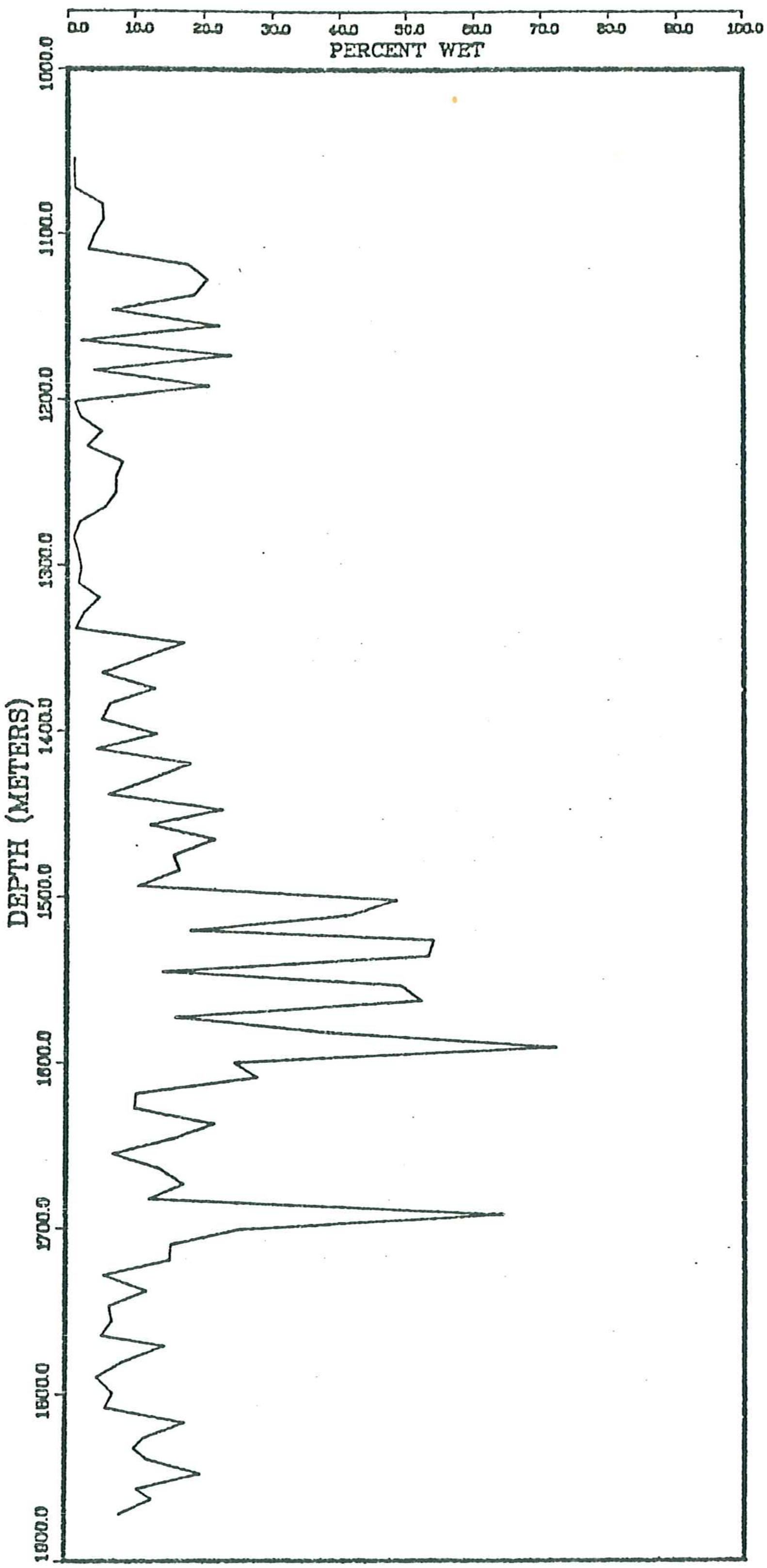


0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
4000.0
4200.0

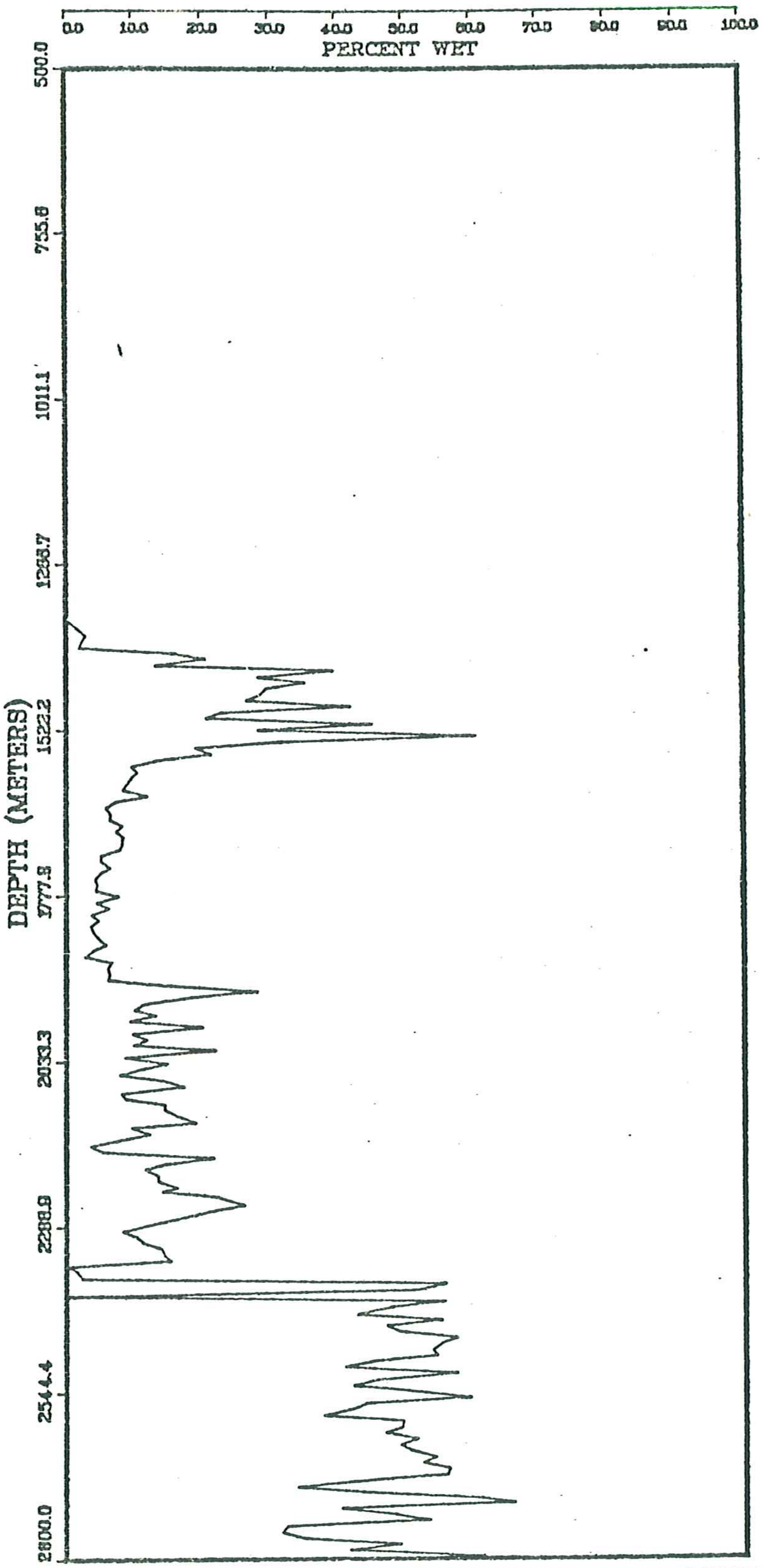
TWILLICK G-49



LEIF E-38

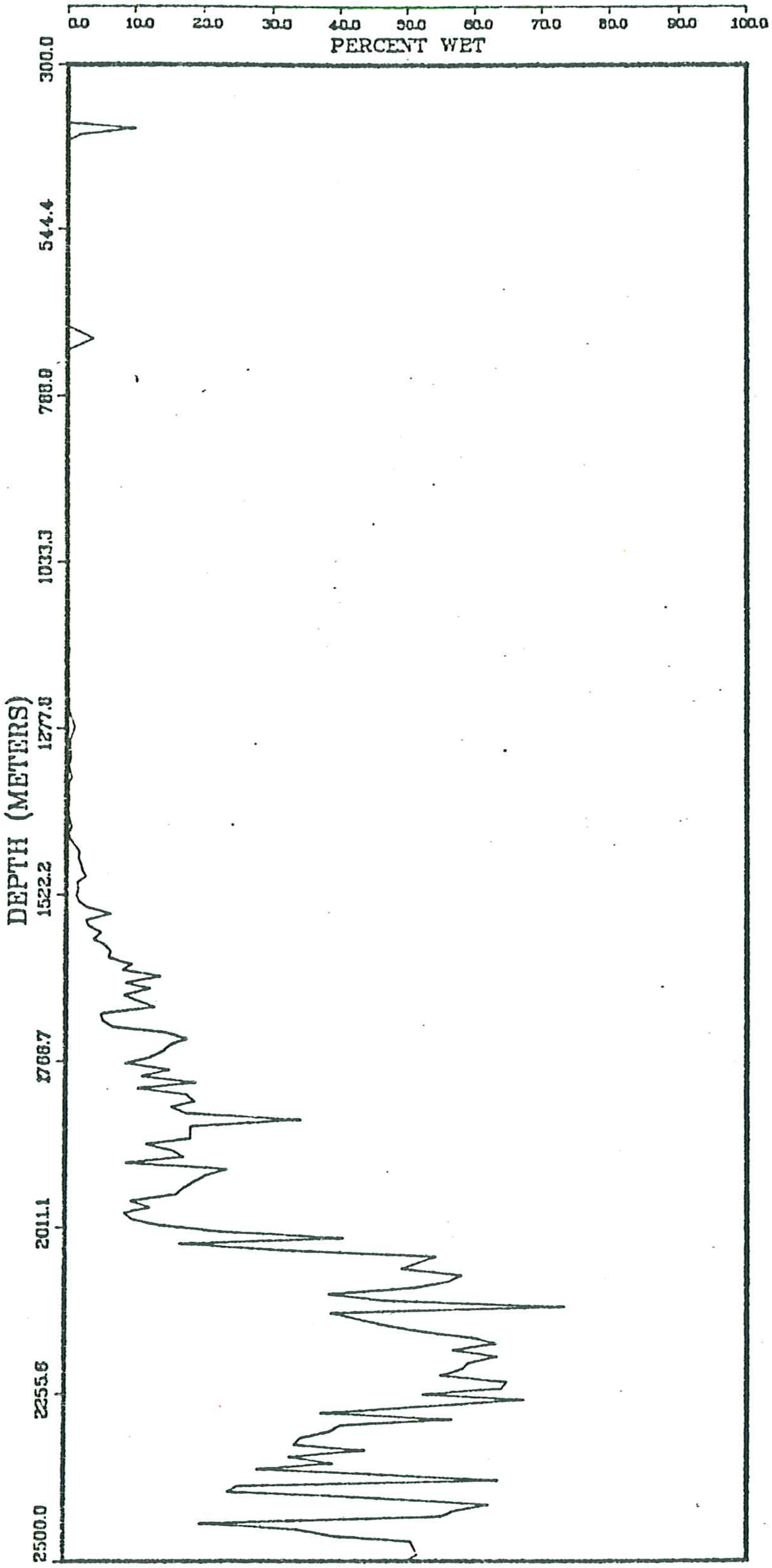

PERCENT WET
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
DEPTH (METERS)
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0

GUDRID H-55



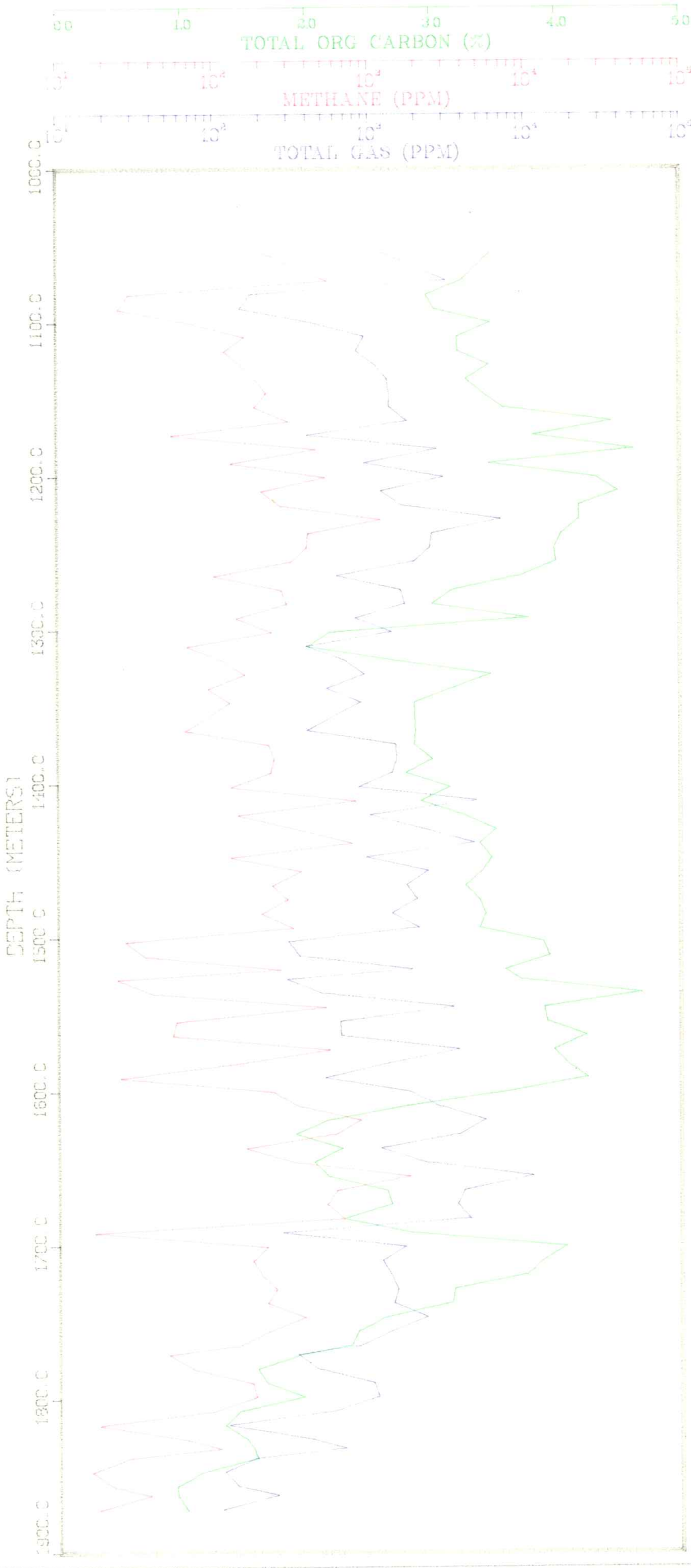
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
500.0
755.6
1011.1
1266.7
1522.2
1777.8
2033.3
2288.9
2544.4
2800.0

BJARNI H-81



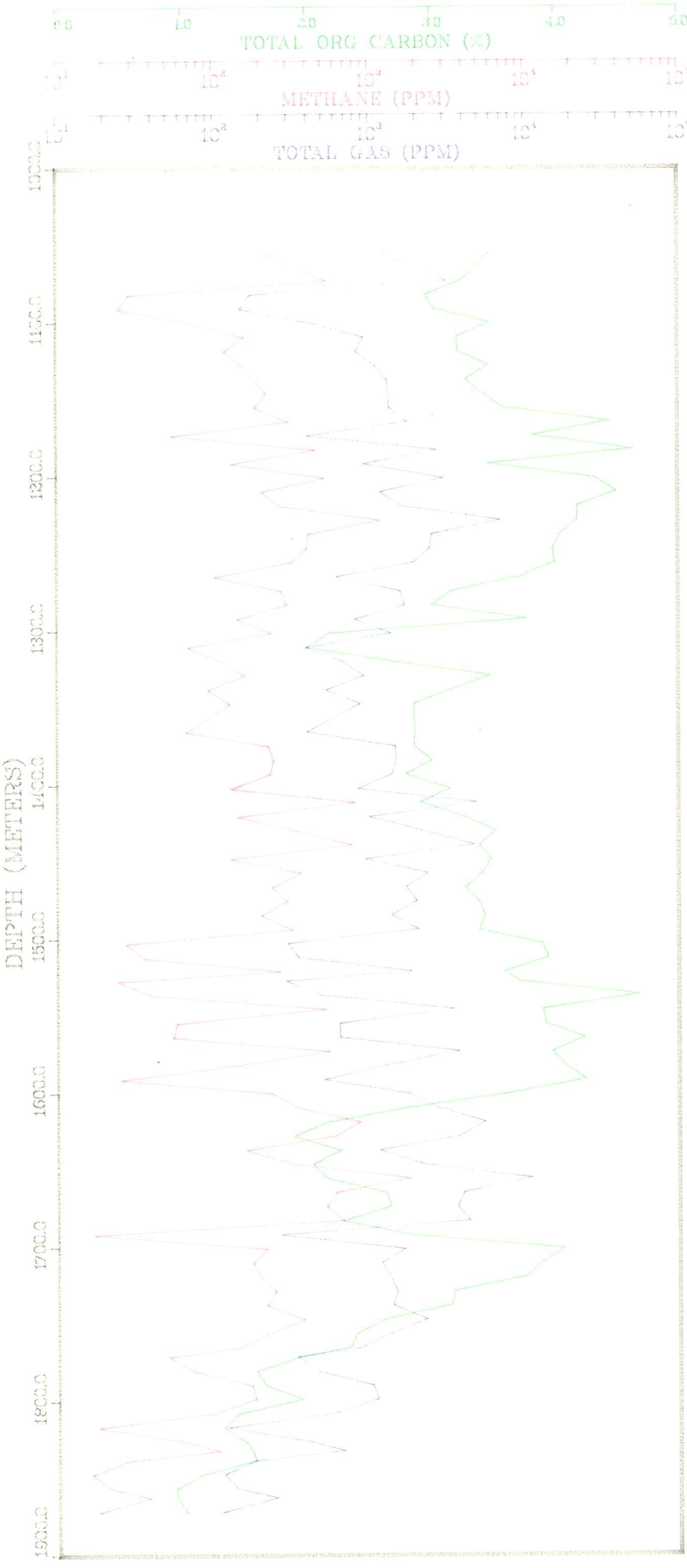
0.0
10.0
20.0
30.0
40.0
50.0
60.0
70.0
80.0
90.0
100.0
PERCENT WET
DEPTH (METERS)
300.0
544.4
788.9
1033.3
1277.8
1522.2
1766.7
2011.1
2255.6
2500.0

LEIF E-38

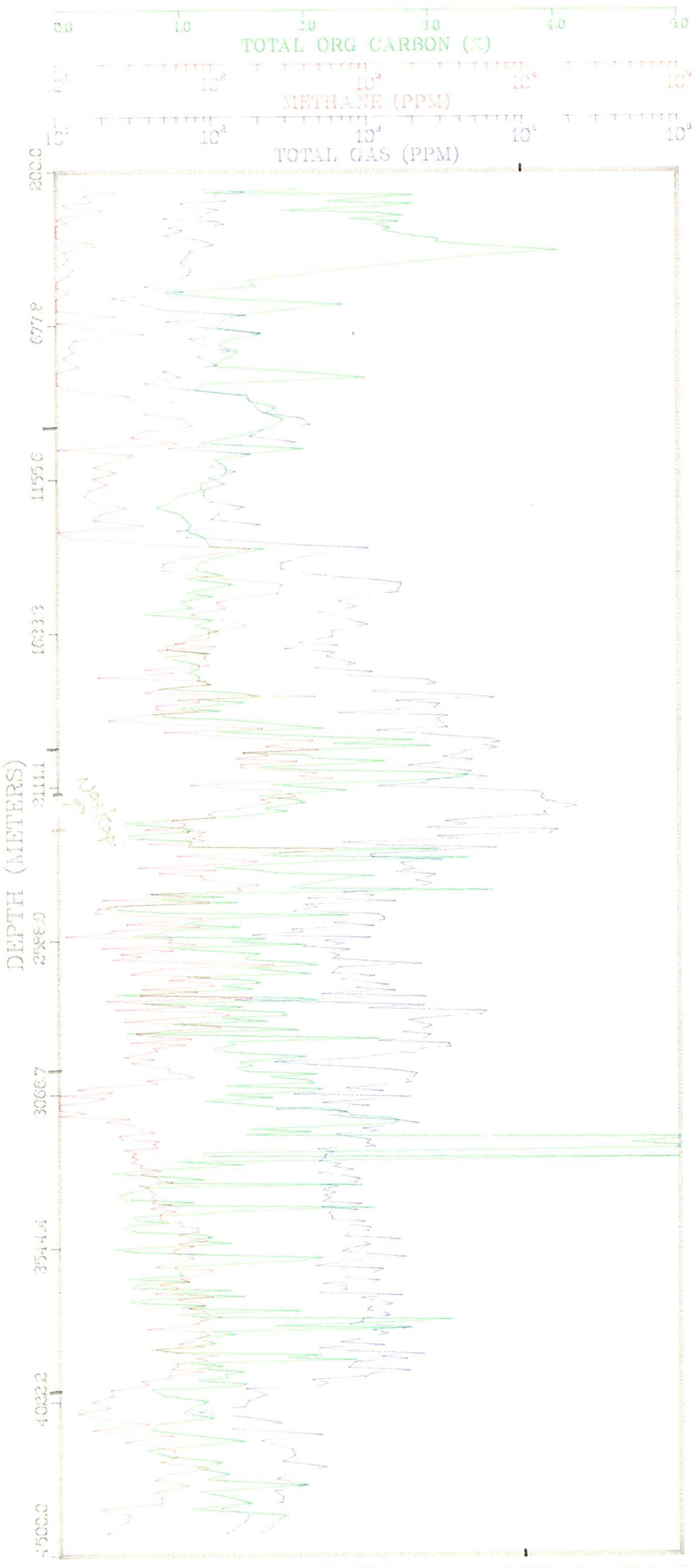


0.0 1.0 2.0 3.0 4.0 5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0

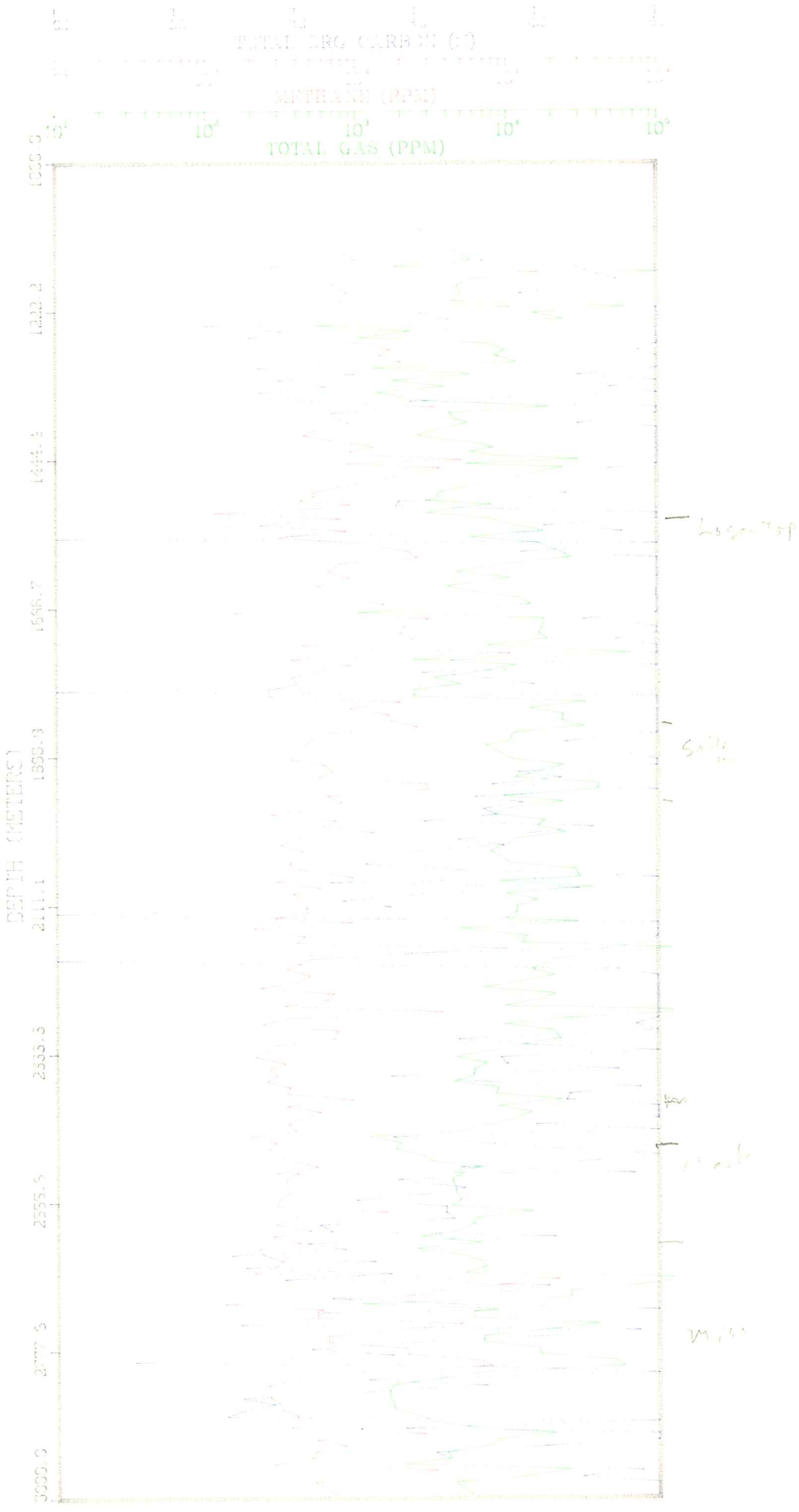
LEIF E-38


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
1000.0
1100.0
1200.0
1300.0
1400.0
1500.0
1600.0
1700.0
1800.0
1900.0

COHASSET D-42

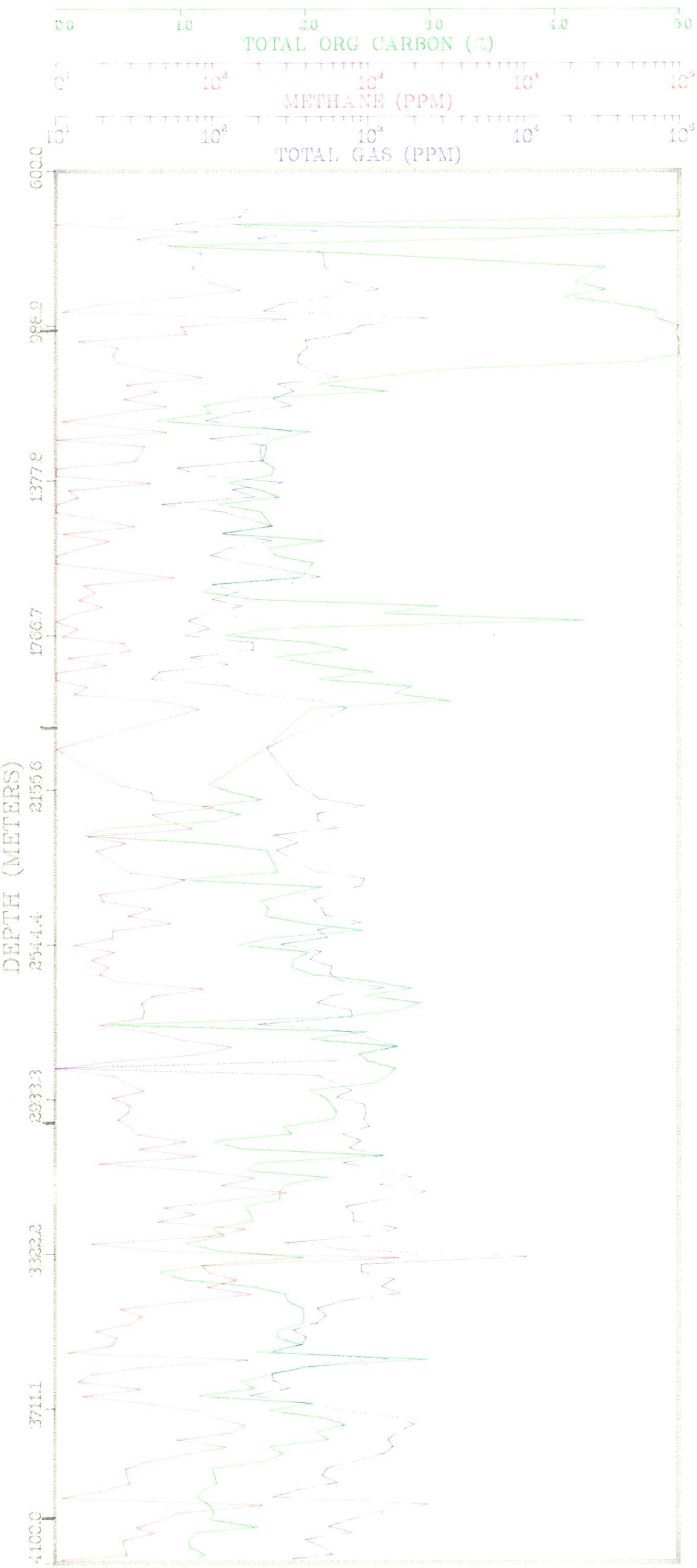


SABLE 1H-58

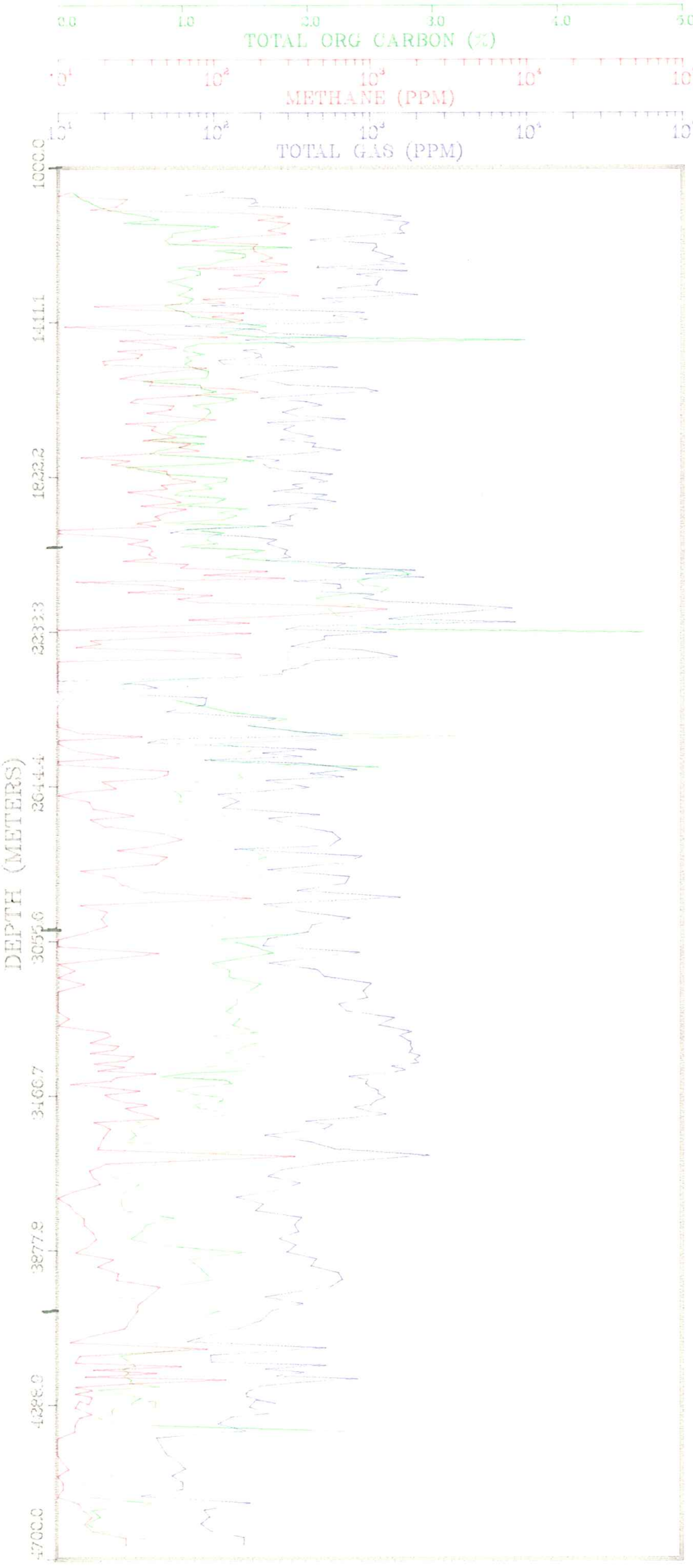


PLOT 3 12.01.32 FRI 11 JAN. 1990 JOB- , BEDFORD INSTITUTE DISSPLA VER 9.0

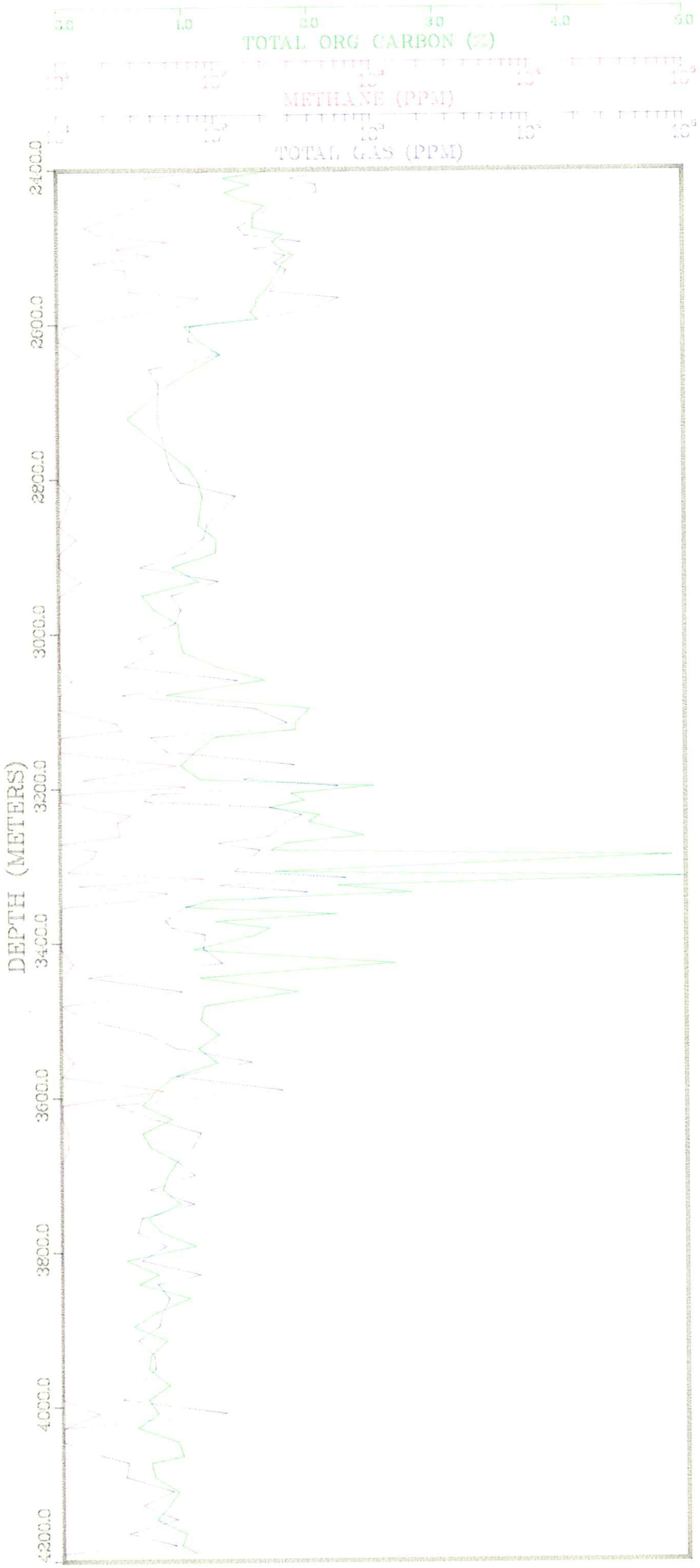
MARMORA P-35


0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
10¹
10²
10³
10⁴
10⁵
METHANE (PPM)
10¹
10²
10³
10⁴
10⁵
TOTAL GAS (PPM)
DEPTH (METERS)
600.0
988.9
1377.8
1766.7
2155.6
2544.4
2933.3
3322.2
3711.1
4100.0

DEMASCOTA G-32

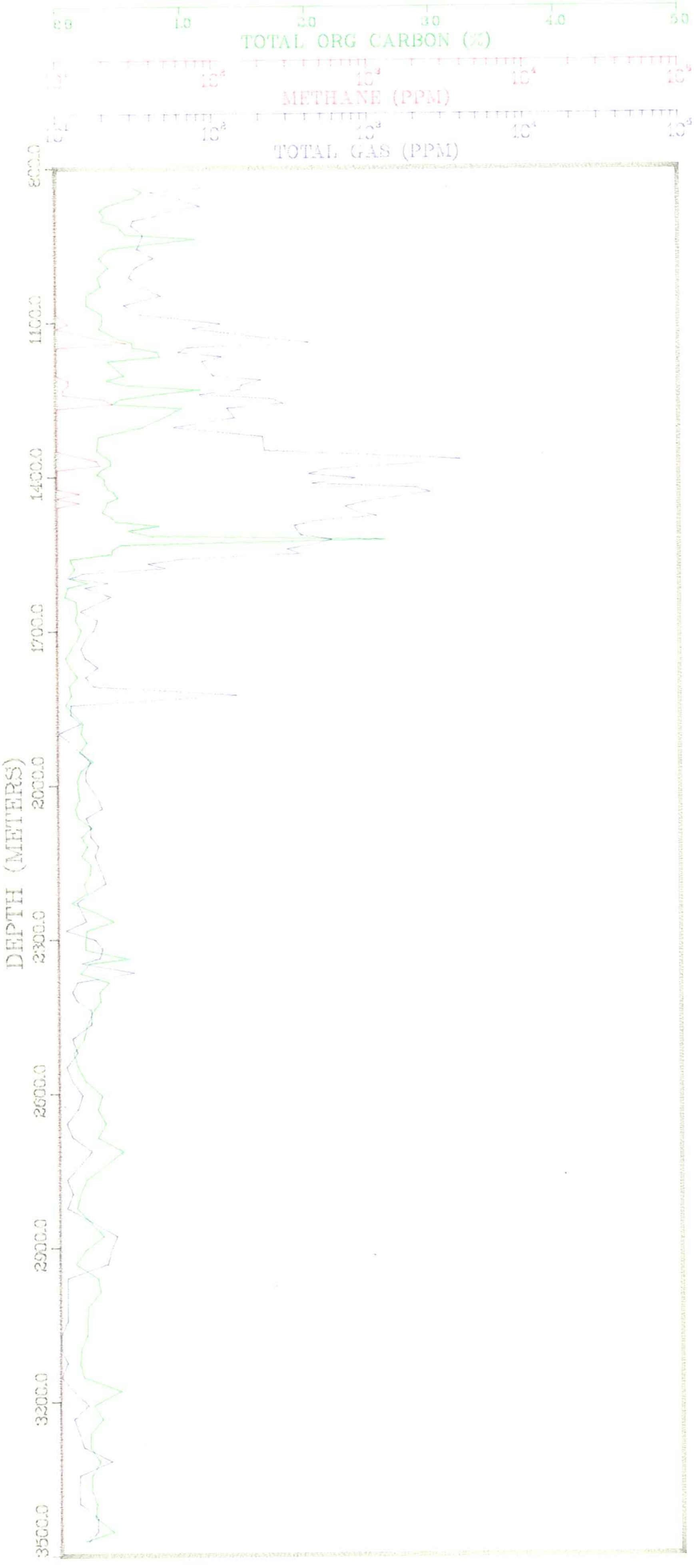


TERN A-68



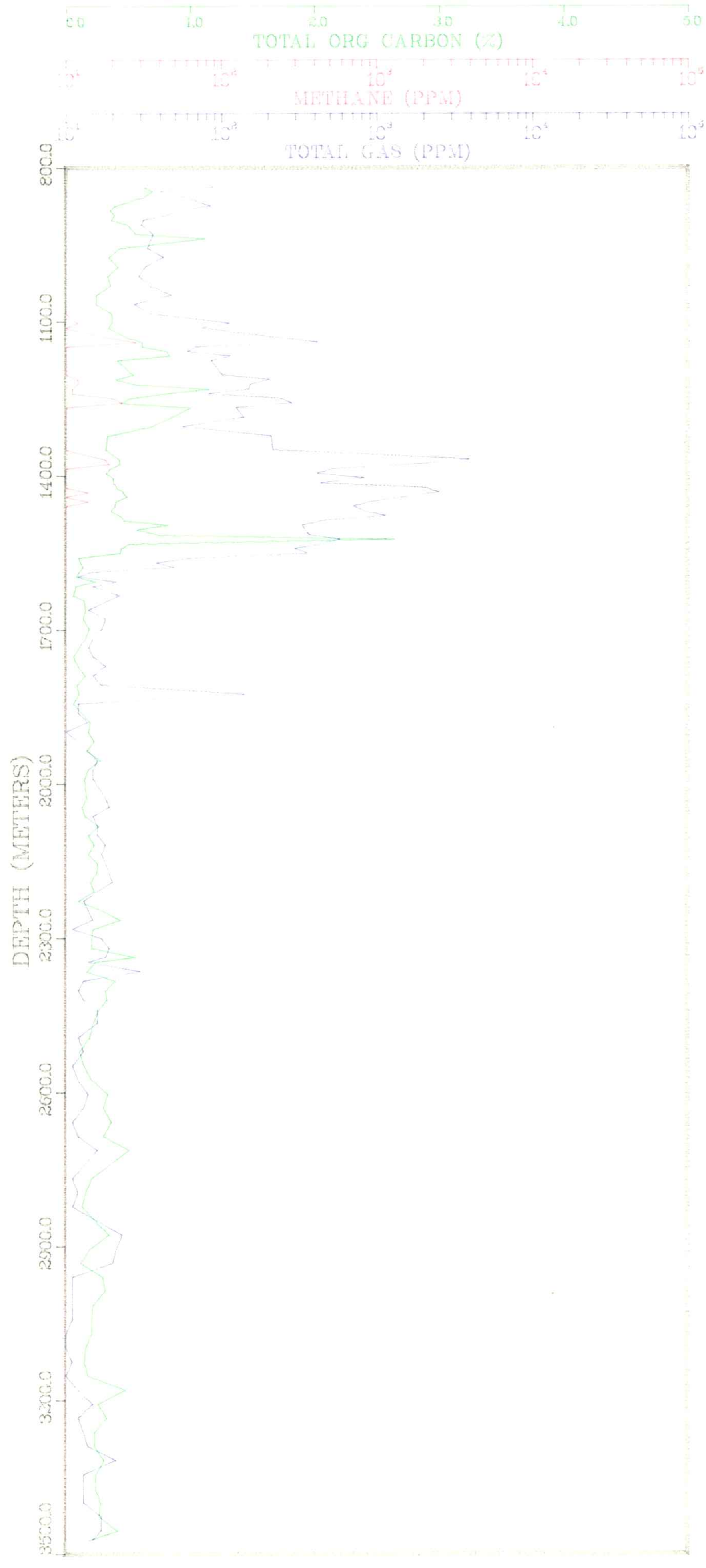
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
4000.0
4200.0
DEPTH (METERS)

OSPREY H-84

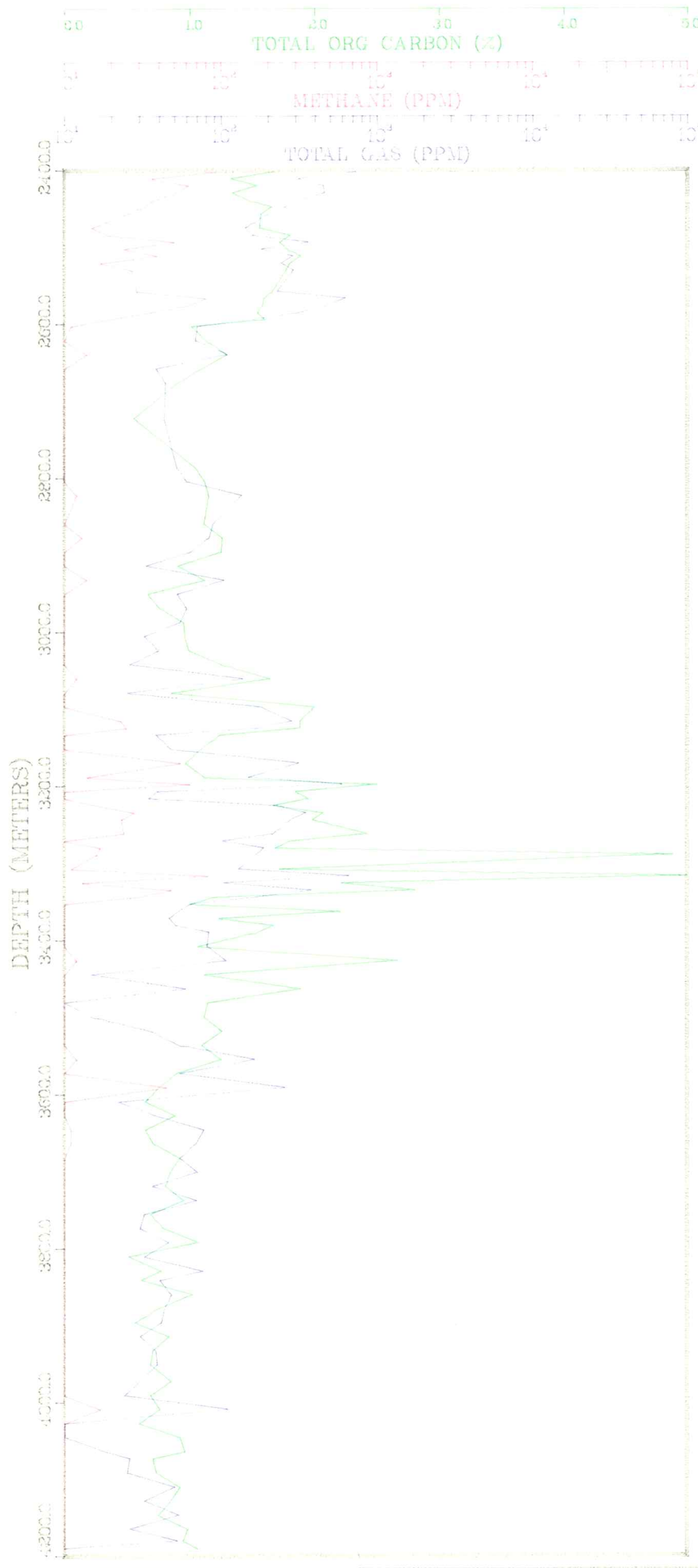


0.0 1.0 2.0 3.0 4.0 5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
800.0
1100.0
1400.0
1700.0
2000.0
2300.0
2600.0
2900.0
3200.0
3500.0
DEPTH (METERS)

OSPREY H-84

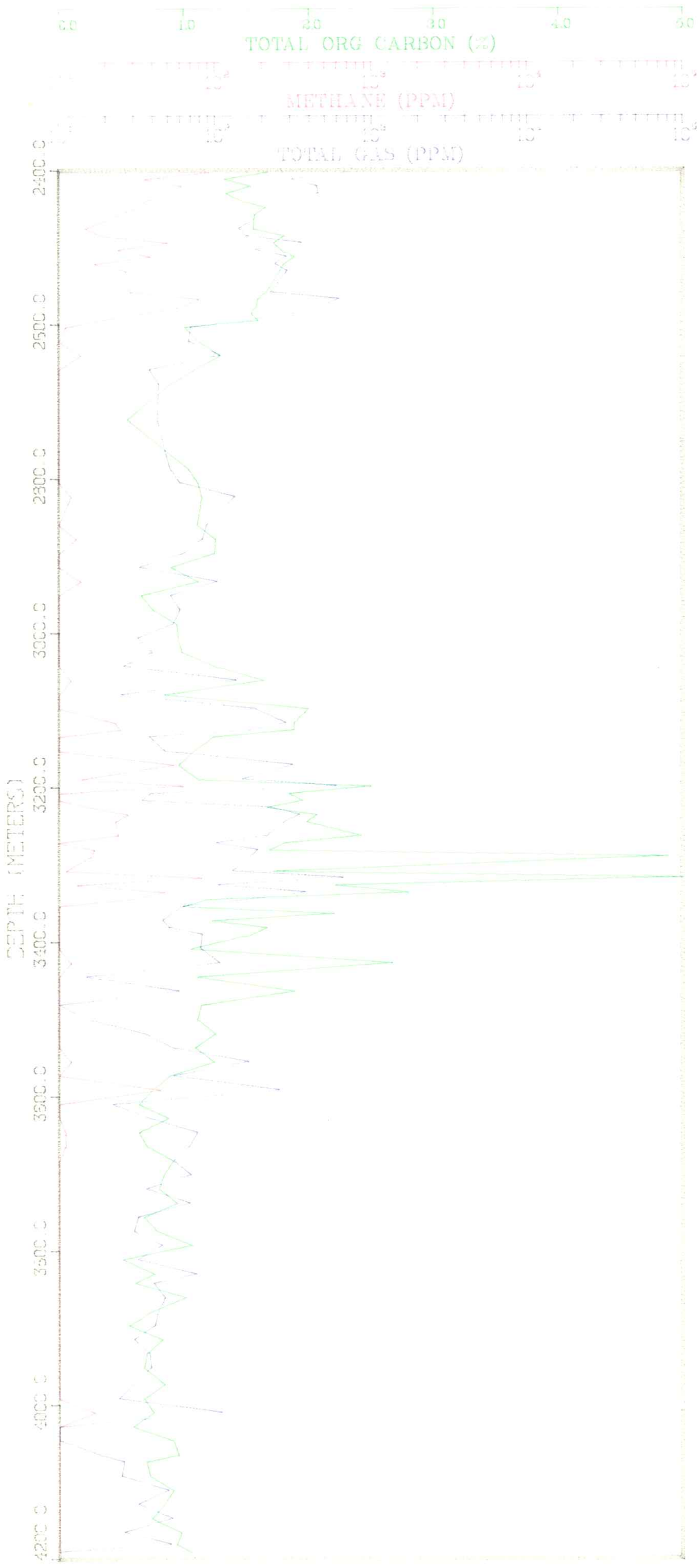

0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
800.0
1100.0
1400.0
1700.0
2000.0
2300.0
2600.0
2900.0
3200.0
3500.0
DEPTH (METERS)

TERN A-68

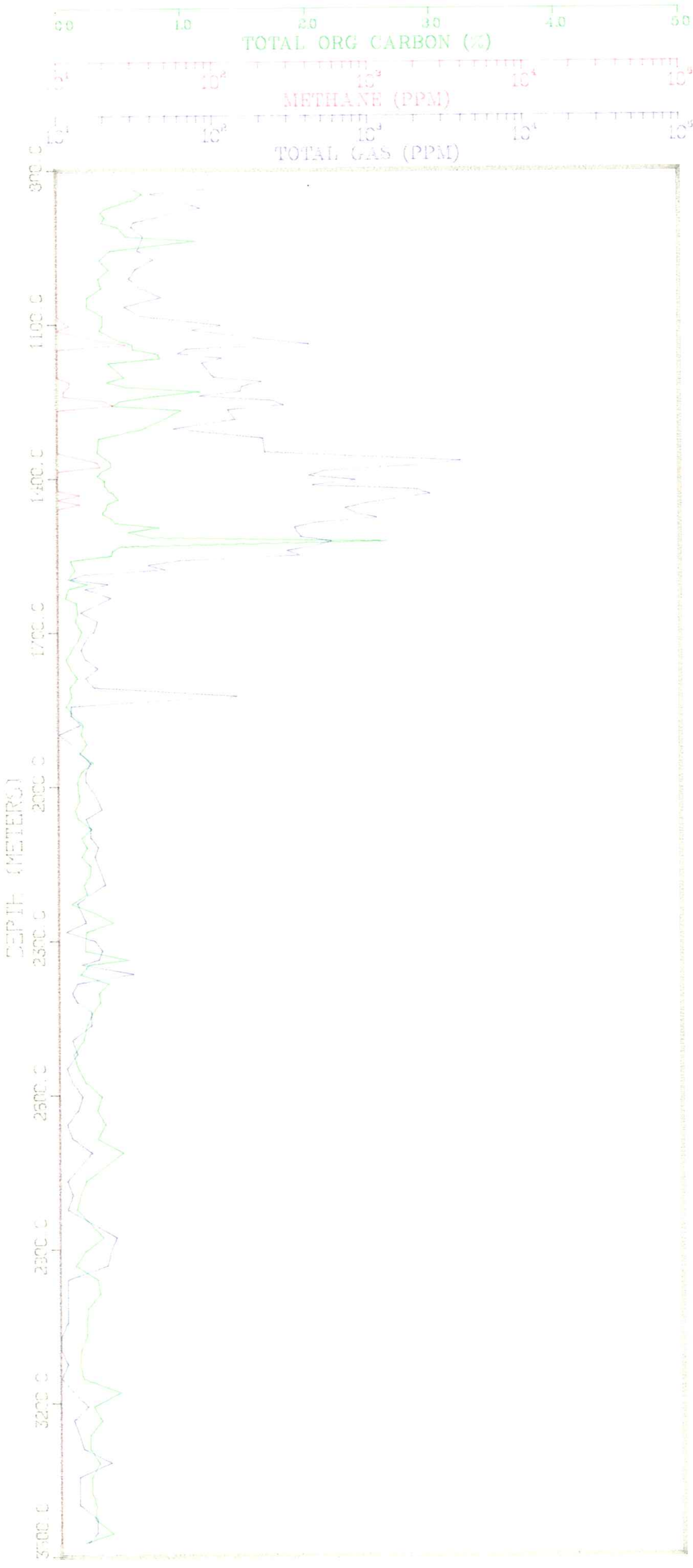


0.0 1.0 2.0 3.0 4.0 5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
4000.0
4200.0
DEPTH (METERS)

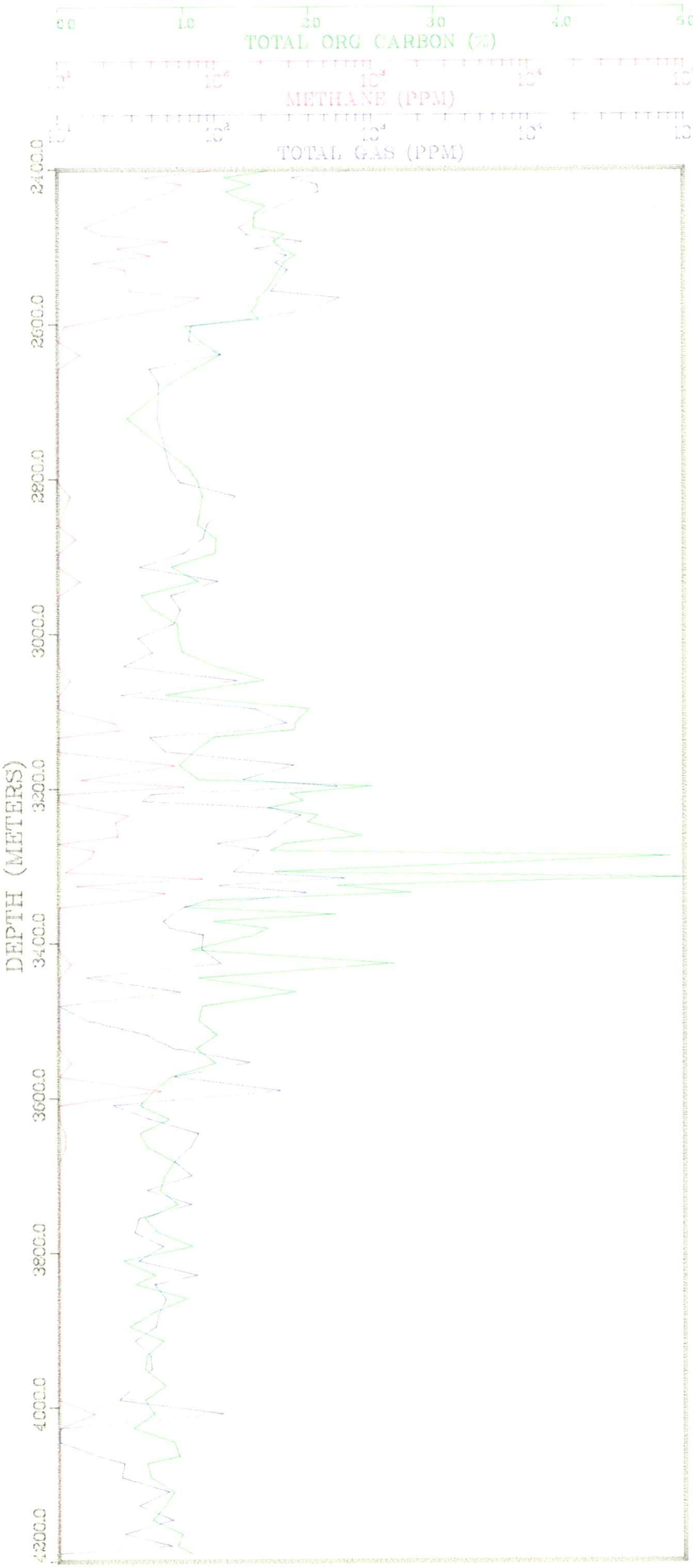
TERN A-68



OSPREY H-84

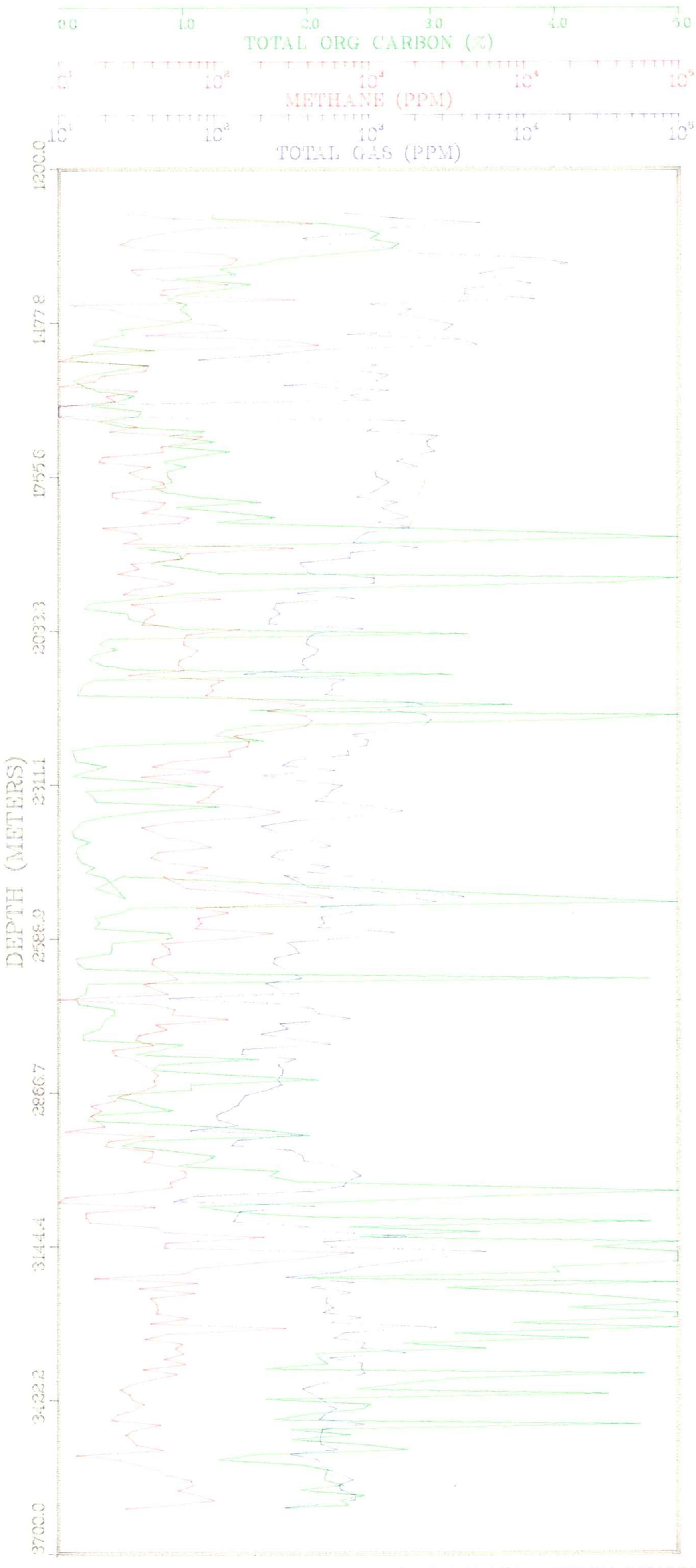

0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)

TERN A-68



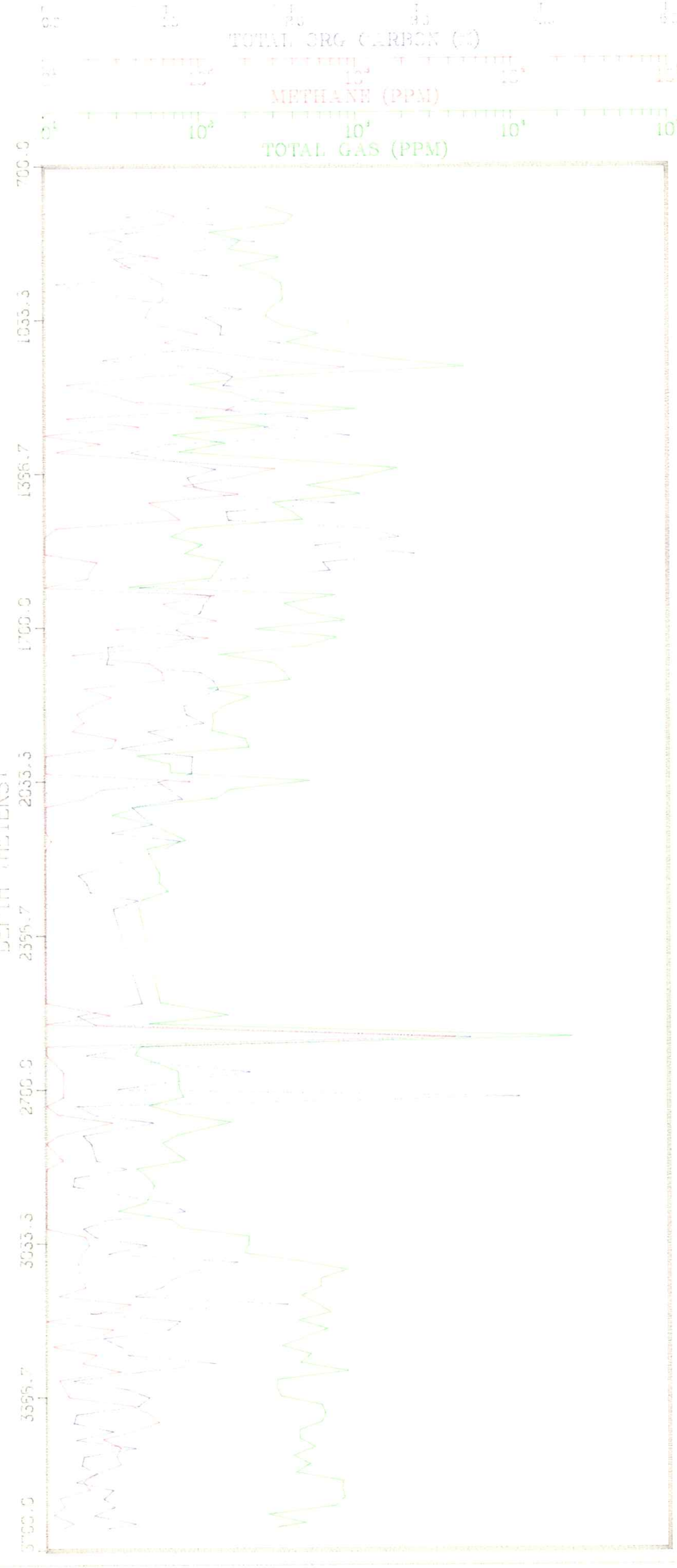
0.0
1.0
2.0
3.0
4.0
5.0
TOTAL ORG CARBON (%)
METHANE (PPM)
TOTAL GAS (PPM)
DEPTH (METERS)
2400.0
2600.0
2800.0
3000.0
3200.0
3400.0
3600.0
3800.0
4000.0
4200.0

PRIMROSE 1A-A-41



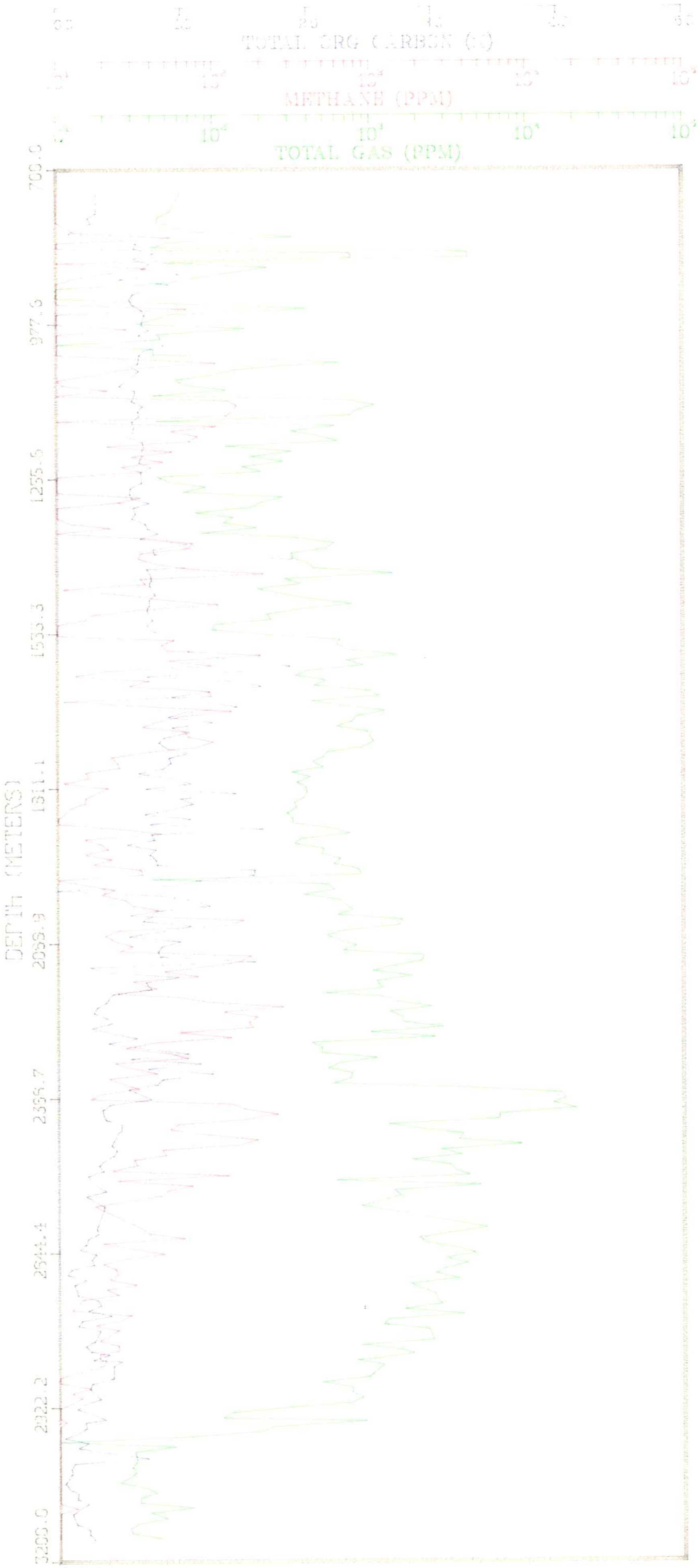
GULL F-72

HERON H-73



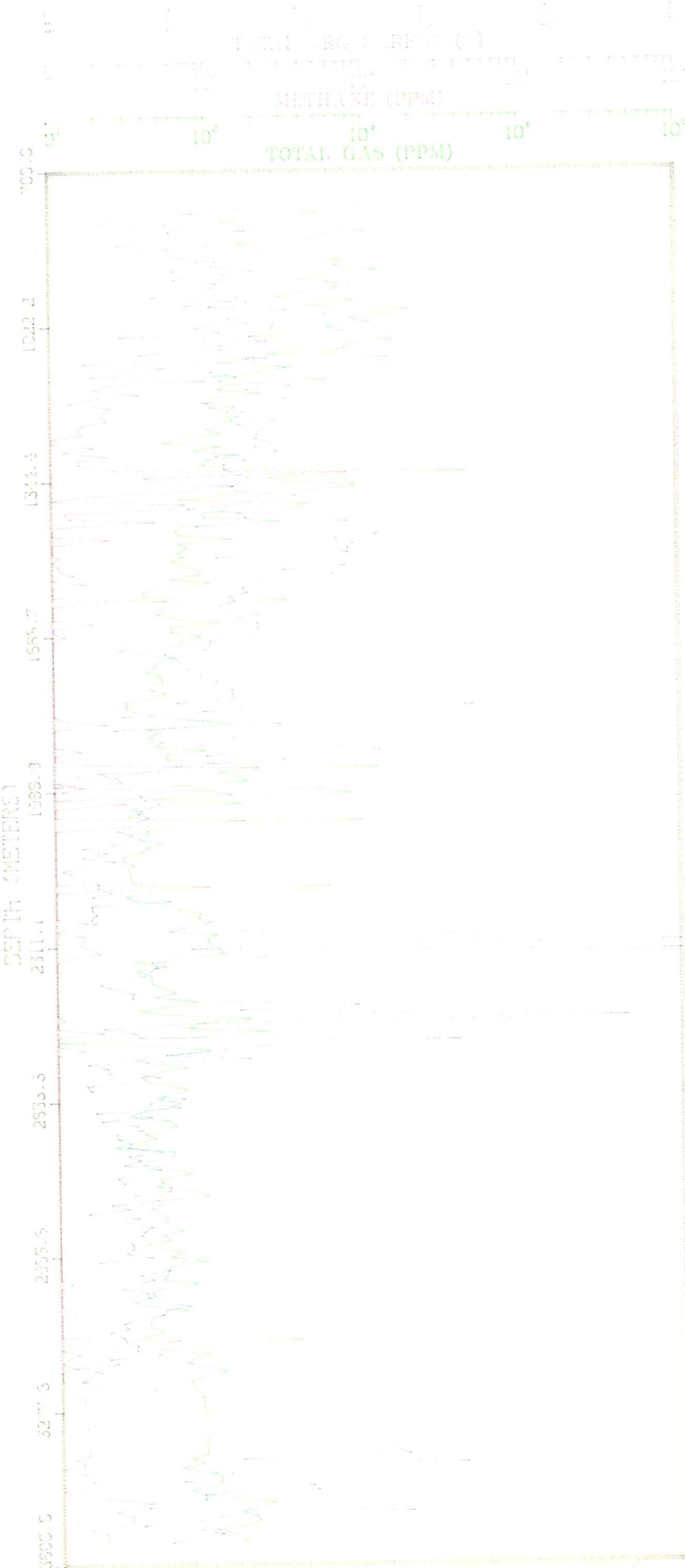
PLOT 4 12 51.17 FRI 11 JAN. 1980 JOB- , BEDFORD INSTITUTE DISSPLA VER 3.0

CORMORANT N-83



LDI 5 12.01.37 FRI 11 JAN, 1030 JOB- . BEDFORD INSTITUTE DISSPLA VER 9.0

KITTWAKE P-11



PLOT 3 12.55.45 FRI 11 JAN 1980 JOB- , BEDFORD INSTITUTE DISSPLA VER 8.0