GEOLOGICAL AND PETROLEUM ENGINEERING COMPLETION REPORT - BP WELL NORMANBY-1

by

14 AUG 1986

G. TEMPLETON and D.K. PEATTIE

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BP PETROLEUM DEVELOPMENT LIMITED

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BP WELL NORMANBY-1

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G. TEMPLETON AND D.K. PEATTIE

APPROVED BY:

EXPLORATION MANAGER

NORMANBY-1/W28/W48
MELBOURNE
AUGUST 1986

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ENCLOSURES

1. SUMMARY

Well Normanby-1 was an exploration well drilled in Licence VIC/P14, offshore Victoria, Australia. The well was located on the Normanby Prospect in the Otway Basin. The primary objective was to investigate the hydrocarbon potential of the Waarre Formation sandstone reservoir.

The well was spudded on 7th March 1986 by the semi-submersible rig Zapata Arctic. A total depth of 3308mBRT (LD) was reached on 15th April 1986 in siltstone of the Waarre Formation. The well was plugged and abandoned as a dry well on 29th April 1986.

The well encountered 224m of Waarre Formation below 3084mBRT (LD). No significant shows were recorded, although minor amounts of gas - probably in solution - were encountered (maximum 1.23% C1 at 3175mBRT (DD)).

Note: All depths are expressed in terms of log depth (LD), rather than drilled depth (DD), except where clearly indicated to the contrary.

2. SUMMARY OF WELL DATA

Well:	Normanby-1, Offshore Victoria
Operator:	BP Petroleum Development Ltd.
R.T.E.:	26.84 amsl
Latitude:	38° 14' 11.55" S
Longitude:	141° 05' 03.26" E
Water Depth:	48.8m
Type of Rig:	Semi-submersible
Name:	Zapata Arctic
Objectives:	To investigate the hydrocarbon potential of the Waarre Formation sandstone reservoir, in the Normanby Prospect. The underlying Eumeralla Formation was a secondary target.
Date Spudded:	7th March 1986
Date Completed:	29nd April 1986
Well Status:	Plugged and abandoned dry.
T.D.:	3281.2mSS (LD), 3308.0mBRT (LD) 3279.2mSS (DD), 3306.0mBRT (DD)

TS 3822

WELL: NORMANBY-1

SUMMARIZED WELL LOG

OFFSHORE VICTORIA
AUSTRALIA

Spudded: 7 March 1986
Completed: 29 April 1986

SCALE 1:10 000 STATUS: Plugged and Abandoned Dry Well

A3 size enclosure

GEOLOGICAL DATA (Fig. 1)

Lithostragigraphy	Thickness	Tops (LD)		Chronostratigraphy
	m	mBRT	mSS	
	1199.4	75.6	48.8	Tertiary
Heytesbury Group	550.4	75.6	48.8	Eocene - Recent
Nirranda Group	91.5	626.0	599.2	Eocene
Wangerrip Group	557.5	717.5	690.7	E. Eocene
Dilwyn Formation	495.5	717.5	690.7	
Pember Mudstone Formation	62.0	1213.0	1186.2	
	+2033.0	1275.0	1248.2	Cretaceous
Sherbrook Group	+2033.0	1275.0	1248.2	Cenomanian - Maastrichtian
Curdies Formation	210.0	1275.0	1248.2	Maastrichtain
Paaratte Formation	915.0	1485.0	1458.2	Coniacian - Maastrichtain
Belfast Formation	684.0	2400.0	2373.2	Cenomanian - Coniacian
Waarre Formation	+224.0	3084.0	3057.2	Cenomanian

CORES

Conventional

None.

Sidewall

Run No.	Depth mBRT (LD)	No. Cores	Recovered	Lost	Empty
2A	1613.9-2684.9	30	23	5	2
3B	2737.0-3293.0	60	44	8	8

SHOWS

No significant shows were encountered. However, minor amounts of gas occur locally within the Waarre Formation. A maximum of 1.23% C1 was recorded from a depth of 3175mBRT(DD) after the well was shut-in and a 'gas bubble' in the annulus circulated out.

No sandstone showed any fluorescence. The coals within the Waarre Formation (Encl. 1) had a slow pale blue-white cut fluorescence.

Gas levels recorded in the Waarre Formation were as follows:

Formation	Depth mBRT (DD)	Gas %	Lithology
Waarre	3084-3100	0.3-0.45 C1 0.02-0.04 C2 0.002-0.007 C3	Sandstone/Siltstone
	3100-3110	0.28 C1 0.015 C2 0.002 C3	Siltstone
	3110-3128	0.65-0.85 C1 0.05-0.24 C2 0.009-0.06 C3	Sandstone
	3128-3174	0.8-0.85 C1 0.06-0.1 C2 0.006-0.02 C3 Trace C4	Sandstone/Siltstone
	3175	1.23 C1 0.51 C2 0.32 C3 0.068 C4 Trace C5	Sandstone
	3175-3306	0.8-1.09 C1 0.15-0.2 C2 0.05-0.1 C3 0.0015 C4	Sandstone/Siltstone/Coal

TESTS

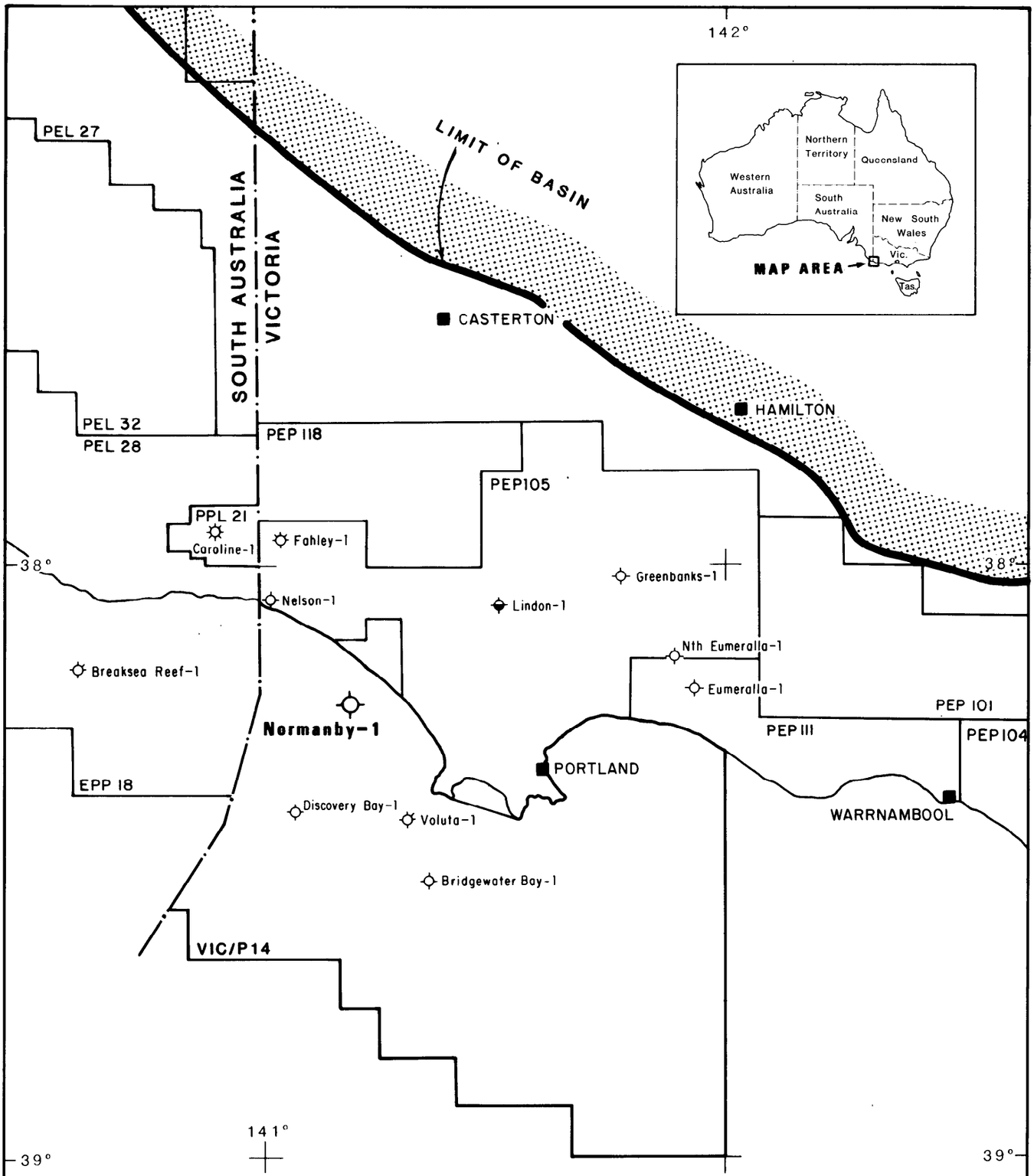
A RFT was run between 3112.5 and 3277.5mBRT. Only one valid pressure test was achieved due to seal failures (hole size between 9½-12") and tight formation. A sample of formation fluid was collected at 3178mBRT which consisted of contaminated gas cut formation water (1scf and 1 litre).

RFT No.	Depth mBRT(LD)	Hydrostatic Pressure Before psig	Hydrostatic Pressure After psig	Formation Pressure/ Remarks psig
1	3112.5	6308	6308	Tight
2	3113.5	6310	6310	Seal Failure
3	3115.5	6314	6314	Seal Failure
4	3116.5	6316	-	Seal Failure
5	3117.5	6317	6317	Tight
6	3121.0	6322	6322	Seal Failure
7	3123.0	6326	6326	Tight
8	3124.5	6328	6328	Seal Failure
9	3177.0	6426	6425	Tight
10	3178.0	6426	6424	6409
11	3178.5	6423	6423	Tight
12	3179.0	6424	6424	Tight
13	3212.0	6489	6490	Tight
14	3219.0	6502	6503	Tight
15	3265.0	6594	6594	Tight
16	3268.0	6599	6604	Tight
17	3277.5	6622	6618	Tight

COMMENTS

All sandstones encountered within the Waarre Formation are water wet. Minor amounts of gas occur locally, but probably in solution.

Author: G. Templeton Date: May 1986.



CO-ORDINATES:-

LATITUDE: 38° 14' 11.55" S
LONGITUDE: 141° 05' 03.26" E
AUSTRALIAN NATIONAL SPHEROID
AUSTRALIAN GEODETIC DATUM (1966)

GRID REFERENCE:- 507 372.1 E
5 767 921.7 N
UTM GRID ZONE 54

BP MELBOURNE	OTWAY BASIN, OFFSHORE VICTORIA NORMANBY-1 LOCATION MAP	Figure 2
Author: G. TEMPLETON		Date: APRIL 1986
Report Ref: W28		Drawing No.: TS 3818

3. LOCATION

The location of the well is illustrated in Fig. 2.

NORMANBY-1
SAMPLES COLLECTED FOR GOVERNMENT AUTHORITIES, PARTNERS AND INTERNAL BP

SAMPLE TYPE	NUMBER OF SETS	MINIMUM SAMPLE WEIGHT (GRAMS)	COLLECTED IN	CONTAINER PROVIDED BY	COLLECTED FOR	SAMPLE INTERVAL (MBRT,DD)
WASHED/DRIED	5	100	PAPER BAG	GEARHART	D.I.T.R.	157m - 750m 10m INTERVALS
		100	POLYTHENE BAG	BMR	BMR	750m - 3306m 5m INTERVALS
		100	PAPER BAG	GEARHART	GAS AND FUEL	
		100	PAPER BAG	GEARHART	BP	
		100	PLASTIC TRAYS	BP	BP	
BULK WET CUTTINGS	3	500	CANVAS BAG	GEARHART	BP SPARE	157m - 750m 10m INTERVALS
		500	CANVAS BAG	GEARHART	BP-BIOSTRATI-GRAPHY	750m - 3306m 5m INTERVALS
		500	SEALED FOIL BAG	BP	BP- GEO-CHEMISTRY	
MUD SAMPLES	1	-	TINS	GEARHART	BP-GEO-CHEMISTRY	EVERY 500m AND WHILST CIRCULATING OUT DRILL BREAKS/ AFTER WELL SHUT IN
APATITE SAMPLES	1	1000	TINS	GEARHART	BP	SANDSTONE/ SILTSTONE LITHOLOGY AT 300m INTERVALS

BP MELBOURNE	OTWAY BASIN, OFFSHORE VICTORIA	Figure 3
Author: G. TEMPLETON	NORMANBY-1 SAMPLING CHART	Date: APRIL 1986
Report Ref: W28		Drawing No.: TS 3814

4. SAMPLING

CUTTING SAMPLES

Sample collection and distribution for Normanby-1 are summarised in Fig. 3.

CORES

Conventional

None.

Sidewall

Run No.	Depth mBRT (LD)	No. Cores	Recovered	Lost	Empty
2A	1613.9-2684.9	30	23	5	2
3B	2737.0-3293.0	60	44	8	8

5. GEOLOGY

Lithostratigraphical nomenclature used in this report is from Wopfner and Douglas (1971).

No cuttings were collected between seabed and 157m. Within the 20" casing section formation tops were picked from the cased-hole gamma ray log and cuttings descriptions. Formation tops below the 20" casing (666m) were defined by lithological and open-hole wireline log characteristics.

5.1 Heytesbury Group (75.6-626.0m) Tertiary (Eocene - Recent)

The top of the Heytesbury Group probably extends to sea bed, although this cannot be confirmed due to the lack of cuttings and unsuitable log coverage, i.e. a suppressed gamma ray log run in casing.

The group predominantly consists of a massive white to light grey, fossiliferous microcrystalline to argillaceous limestone. Notable light grey-brown mudstone interbeds occur towards the base of the sequence.

5.2 Nirranda Group (626.0-717.5m) Tertiary (Eocene)

The top of the Nirranda Group is marked by the presence of medium to coarse, dark brown sand in the cuttings. This is coincident with a downhole increase in gamma ray log response. The lower part of the

group consists of a thinly interbedded sandstone and dark brown-black mudstone/siltstone sequence.

5.3 Wangerrip Group (717.5-1275.0m) Tertiary (E.Eocene)

5.3.1 Dilwyn Formation (717.5-1213.0m)

The top of the Dilwyn Formation is picked on a marked downhole decrease in gamma ray log response together with a decrease in resistivity log response. The formation predominantly consists of a massively bedded light grey quartzose sandstone sequence. Minor medium to dark brown mudstone and siltstone beds with occassional limestone interbeds become increasingly common towards the base of the formation.

5.3.2 Pember Mudstone (1213.0-1275.0m)

The top of the Pember Mudstone is picked on a downhole increase in sonic interval transit time together with an increase in resistivity log response. The formation consists of an interbedded light to medium grey-brown mudstone and siltstone section with occassional minor sandstone and dolomite beds.

The Pebble Point Formation is absent in this well due to non-deposition. The formation is also not developed in nearby well Discovery Bay-1.

5.4 Sherbrook Group (1275.0-3308.0m) Cretaceous (Cenomanian - Maastrichtian)

5.4.1 Curdies Formation (1275.0-1485.0m) Maastrichtian

The top of the Curdies Formation is picked on a marked downhole decrease in sonic interval transit time together with an increase in gamma ray log response. The formation consists of a massively bedded colourless to light grey quartzose sandstone sequence with minor mudstone and siltstone interbeds and occassional limestones.

5.4.2 Paaratte Formation (1485.0-2400.0m) Coniacian - Maastrichtian

The top of the Paaratte Formation is picked on a downhole increase in resistivity log response together with a decrease in sonic interval transit time. The Formation predominantly consists of a massively bedded argillaceous grey quartzose sandstone section. Minor interbeds of grey-brown mudstone and siltstone occur and occassional thin beds of limestone and dolomite.

5.4.3 Belfast Formation (2400.0-3084.0m) Cenomanian - Coniacian

The top of the Belfast Formation is marked by the presence of dark grey mudstone in the cuttings. This is associated with a downhole increase in gamma ray log response together with an

of a massively bedded mudstone/siltstone section with very minor beds of sandstone and dolomite.

5.4.4 Waarre Formation (3084.0-3308.0m) Cenomanian

The top of the Waarre Formation is picked on a marked increase in resistivity log response together with a downhole decrease in gamma ray log response. The formation consists of a massively bedded grey, carbonaceous, fine to medium grained, calcareous and dolomite cemented quartzose sandstone. Mudstone and siltstone interbeds occur in the upper part. This sequence passes downwards into an interbedded sandstone, mudstone and siltstone section with minor coal in the lower part of the formation.

The well was terminated in the Waarre Formation.

6. HYDROCARBON SHOWS

No significant shows were encountered. However, minor amounts of gas occur locally within the Waarre Formation. A maximum of 1.23% C1 was recorded from a depth of 3175mBRT (DD) after the well was shut-in and a 'gas bubble' in the annulus circulated out.

No sandstone showed any fluorescence. The coals within the Waarre Formation (Encl. 1) had a slow pale blue-white cut fluorescence.

Gas levels recorded in the Waarre Formation were as follows:

Formation	Depth mBRT (DD)	Gas %	Lithology
Waarre	3084-3100	0.3-0.45 C1 0.02-0.04 C2 0.002-0.007 C3	Sandstone/Siltstone
	3100-3110	0.28 C1 0.015 C2 0.002 C3	Siltstone
	3110-3128	0.65-0.85 C1 0.05-0.24 C2 0.009-0.06 C3	Sandstone
	3128-3174	0.8-0.85 C1 0.06-0.1 C2 0.006-0.02 C3 Trace C4	Sandstone/Siltstone

Formation	Depth mBRT (DD)	Gas %	Lithology
	3175	1.23 C1	Sandstone
		0.51 C2	
		0.32 C3	
		0.068 C4	
		Trace C5	
	3175-3306	0.8-1.09 C1	Sandstone/Siltstone/Coal
		0.15-0.2 C2	
		0.05-0.1 C3	
		0.0015 C4	

7. SIDEWALL CORE DESCRIPTIONS

No.	Depth mBRT(LD)	Description
1	2684.9	Siltstone: medium to dark grey, moderately hard to hard, locally sandy with very fine quartz grains, predominantly silty, slightly calcareous, trace pyrite, argillaceous in part, slightly swelling.
2	2672.8	Siltstone: medium to dark grey, occassionally grey-black, moderately hard to hard, locally sandy with very fine quartz grains in argillaceous matrix, non calcareous, trace pyrite, argillaceous, slightly swelling.
3	2639.5	Siltstone: locally sandy with well developed thin very fine grained sandstone lenses, siltstone - medium to dark grey, moderately hard to hard, non to slightly calcareous, argillaceous, sandstone - very fine, white to light grey, subangular to subrounded grains, moderately sorted, slightly calcareous/dolomitic cement, argillaceous, poor visible porosity.
4	2601.1	Siltstone: medium to dark grey, moderately hard, non to slightly calcareous, argillaceous, sandy, containing thin sandstone lenses.

5	2580.8	Siltstone: dark grey to grey-black, hard, argillaceous, non to slightly calcareous, micaceous, sandy.
6	2561.4	Siltstone: dark grey, firm, non to slightly calcareous, very argillaceous, grading to mudstone.
7	2524.4	Siltstone: medium to dark grey to grey-black, moderately hard to hard, sandy in part, non to slightly calcareous, argillaceous, trace glauconite.
8	2476.0	Siltstone: dark grey to black, hard, non calcareous, micaceous.
9	2417.5	Siltstone: dark grey-black, very hard, dolomitic with buff-amber coloured crystals of dolomite, very calcareous.
10	2379.0	Siltstone: medium to dark grey, moderately hard, non to slightly calcareous, sandy, carbonaceous, grading to very fine sandstone.
11	2333.0	Siltstone: medium to dark grey, hard, moderately calcareous, slightly dolomitic, locally sandy with very fine quartz grains.

12	2329.0	Siltstone: medium to dark grey, moderately hard, slightly calcareous, sandy with white to light grey, very fine quartz grains in thin lenses.
13	2315.4	Empty.
14	2302.2	Siltstone: medium to dark grey, consolidated, slightly to non calcareous, argillaceous, interlaminated with sandstone lenses; very fine to fine white quartz grains, subangular to subrounded, moderately sorted, moderately to well siliceous cemented, trace calcareous cement, trace glauconite, poor porosity.
15	2280.0	Siltstone: medium to dark grey, hard, slightly to non calcareous, argillaceous, interlaminated with thin sandstone lenses, glauconitic.
16	2251.5	Siltstone: medium to dark grey, consolidated, slightly calcareous, finely interlaminated with very fine grained sandstone, poor porosity.
17	2210.1	Siltstone: medium to dark grey, hard, non to slightly calcareous, argillaceous, occassionally sandy.

18	2147.6	Siltstone: light to dark grey, consolidated, non to slightly calcareous, arenaceous with thin sandstone laminae, very fine to fine, occassionally medium quartz grains, white to light grey, subangular to subrounded, poorly sorted, poor porosity.
19	2087.9	Sandstone: white to light grey quartz grains, very fine to fine, occassionally medium, moderately sorted, friable, weakly calcareous and siliceous cemented, containing thin carbonaceous and argillaceous laminae.
20	2056.2	Lost.
21	2033.0	Siltstone: dark grey-black, firm to hard, non calcareous, micaceous, sandy in part with very fine to fine quartz grains in calcareous/ dolomitic cement.
22	1980.7	Lost.
23	1923.6	Siltstone: dark grey - grey black, consolidated, non to slightly calcareous, micaceous, arenaceous in part, argillaceous, trace pyrite, carbonaceous, grading to very fine grained sandstone.

24	1879.0	Sandstone: white to light grey, translucent to opaque quartz grains, fine to medium, subrounded, occassionally subangular, moderately sorted, friable, weakly siliceous and calcareous cemented, good trace glauconite, poor porosity.
25	1820.8	Lost.
26	1744.5	Lost
27	1720.6	Siltstone: dark grey-black, firm to moderately hard, non calcareous, argillaceous, interlaminated with sandstone, clear to white, very fine to fine quartz grains, weakly siliceous and calcareous cemented, poor visible porosity.
28	1685.1	Sandstone: clear to light grey, medium to coarse, occassionally fine to very coarse, subrounded, occassionally subangular, moderately sorted, friable, trace pyrite, good porosity, interlaminated mudstone, dark grey to black, soft to firm, slightly carbonaceous.
29	1642.1	Lost.
30	1613.9	Empty.
31	3293.0	Empty.

32	3288.0	Siltstone: medium to dark grey, soft to firm, blocky, subfissile, non calcareous, carbonaceous, slightly swelling.
33	3286.0	Lost.
34	3283.0	Empty.
35	3278.0	Sandstone: colourless, medium grey, very fine to fine, occassionally medium quartz grains, subangular to subrounded, moderately sorted, well calcareous and dolomite cemented, carbonaceous, moderate visible porosity.
36	3275.0	Empty.
37	3272.5	Sandstone: clear to light grey very fine to fine quartz grains, subangular to subrounded, well calcareous and siliceous cemented, moderately sorted, containing non scale carbonaceous laminae, argillaceous, moderate visible porosity.
38	3268.0	Sandstone: light to medium grey, fine occassionally medium quartz grains, moderately sorted, well calcareous and siliceous cemented, carbonaceous, argillaceous, fair visible porosity.

39	3266.0	Mudstone: medium grey, soft, sticky, subfissile, carbonaceous, slightly swelling.
40	3264.0	Empty.
41	3255.0	Siltstone: dark grey, soft, subfissile, carbonaceous, non calcareous.
42	3250.0	Sandstone: light grey, very fine quartz grains, subangular to subrounded, moderately sorted, containing carbonaceous laminae, argillaceous, calcareous cemented, moderate visible porosity.
43	3246.5	Mudstone: medium to dark grey-brown, firm, non calcareous, carbonaceous, swelling.
44	3243.5	Lost.
45	3237.0	Sandstone: light to medium grey, very fine quartz grains, subrounded, moderately sorted, argillaceous, moderately siliceous and calcareous cemented, fair visible porosity.
46	3231.0	Siltstone: medium grey-brown, friable, non calcareous, argillaceous, sandy, carbonaceous.

47	3220.0	Sandstone: medium grey, friable, very fine quartz grains, subrounded, moderately sorted, moderately calcareous cemented, packstone texture, argillaceous, carbonaceous, moderate visible porosity.
48	3217.0	Siltstone: light to medium grey, firm, blocky, non calcareous, argillaceous, grading to very fine grained sandstone.
49	3213.0	Lost.
50	3200.0	Sandstone: light grey, firm to friable, very fine to fine quartz grains, subrounded, moderately sorted, moderately calcareous cemented, grainstone, micaceous, moderate visible porosity.
51	3197.0	Sandstone: light grey, friable, very fine to fine quartz grains, subrounded, moderately sorted, moderately well calcareous cemented, carbonaceous, fair visible porosity.
52	3189.0	Sandstone: colourless to light grey, hard, fine to medium quartz grains, moderately sorted, well calcareous cemented, grainstone, carbonaceous, moderate visible porosity.

53	3184.0	Empty.
54	3181.0	Siltstone: medium grey, firm, non calcareous, carbonaceous, sandy, non swelling.
55	3176.5	Sandstone: light grey, moderately hard, fine to medium quartz grains, moderately sorted, well calcareous cemented, grainstone, fair visible porosity.
56	3175.0	Empty.
57	3168.0	Lost.
58	3157.0	Siltstone: dark grey-black, firm, non calcareous, carbonaceous.
59	3145.0	Lost.
60	3142.0	Lost.
61	3139.5	Sandstone: light grey, friable to firm, very fine to fine quartz grains, moderately sorted, moderately calcareous cemented, grainstone, carbonaceous, moderate visible porosity.
62	3138.0	Sandstone: light grey, very fine to fine quartz grains, moderately sorted, moderately calcareous cemented, fair visible porosity.

63	3135.0	Sandstone: white to light grey, friable, fine to medium quartz grains, moderately sorted, moderately siliceous and calcareous cemented, argillaceous, moderate visible porosity.
64	3128.0	Mudstone: light to medium grey, moderately hard, non calcareous, carbonaceous, slightly swelling.
65	3124.0	Sandstone: colourless to light grey, friable, fine to medium quartz grains, moderately sorted, moderately well calcareous cemented, grainstone, moderate visible porosity.
66	3121.5	Sandstone: white to light grey, fine to medium quartz grains, moderately sorted, moderately calcareous cemented, grainstone, carbonaceous, moderate visible porosity.
67	3119.0	Mudstone: light to medium grey, moderately hard, non calcareous, carbonaceous, slightly swelling.
68	3114.0	Sandstone: white to light grey, hard, medium to coarse quartz grains, poorly sorted, moderately well calcareous cemented, carbonaceous, fair visible porosity.

69	3098.5	Sandstone: light grey, friable, fine to medium quartz grains, moderately sorted, moderate calcareous and siliceous cemented, grainstone, moderate visible porosity.
70	3087.0	Siltstone: medium grey, friable to moderately hard, non calcareous, sandy, argillaceous, non swelling.
71	3084.0	Siltstone: medium grey, friable to moderately hard, non calcareous, sandy, argillaceous, non swelling.
72	3075.5	Mudstone: medium to dark grey, hard, non to slightly calcareous, carbonaceous, non swelling.
73	3065.0	Empty.
74	3047.0	Mudstone: medium to dark grey, hard, non to slightly calcareous, carbonaceous, non swelling.
75	3035.0	Siltstone: dark grey to black, hard, slightly calcareous, carbonaceous, non swelling.
76	3025.0	Lost.
77	3006.0	Empty.

78	2989.5	Siltstone: light to dark grey, hard, slightly calcareous, subfissile, carbonaceous.
79	2975.0	Mudstone: medium grey to black, hard, non to slightly calcareous, carbonaceous, non swelling.
80	2952.0	Mudstone: medium grey to black, hard, non to slightly calcareous, carbonaceous, non swelling.
81	2935.0	Siltstone: medium to dark grey, moderately hard, slightly calcareous, slightly swelling.
82	2918.0	Mudstone: dark grey to black, hard, non calcareous, carbonaceous, non swelling.
83	2892.0	Mudstone: dark grey to black, soft, sticky, slightly calcareous, slightly swelling.
84	2874.0	Mudstone: dark grey to black, hard, subfissile, non calcareous, carbonaceous.
85	2847.0	Mudstone: dark grey to black, hard, non calcareous, carbonaceous.
86	2833.0	Siltstone: medium grey, firm to moderately hard, non to slightly calcareous, non swelling.

87	2813.0	Lost
88	2773.0	Mudstone: medium grey, soft, sticky, slightly, calcareous, carbonaceous, non swelling.
89	2756.0	Siltstone: medium grey, firm, subfissile, non to slightly calcareous, carbonaceous.
90	2737.0	Siltstone: medium to dark grey, hard, non calcareous, subfissile, non swelling.

8. LOGGING OPERATIONS SUMMARY

8.1 Logs Run

See Table 1 opposite.

8.2 Summary of Temperatures Recorded

Suite	Run	Log	Depth of Thermometer mBRT	Max. Recorded Temperature °C
1	1	DIL/SLS	1536	46.7
2	2	DIL/BHC	2700	75.6
2	2	CST/GR*	-	-
3	1	LDT/DLL	3279	91.1
3	2	BHC/GR	3299	96.7
3	3	DLL/MSFL	3284	97.2
3	4	FDC/CNL*	-	-
3	5	RFT/GR	3285	104.4
3	6	SHDT/GR	3299	105
3	7	CVL	3300	105.6
3	8	CST/GR*	-	-

* Thermometers were not run with these logging tools

9. LOG EVALUATION

9.1 17½" Hole Section

The logs indicate that fairly thick clean sands exist within the Tertiary Dilwyn Formation (717.5 to 1213m). The logs show that much of the interval from 1275m to 1558m (maximum logged depth) also consists of fairly clean water saturated sandstone.

A quantitative analysis was not carried out due to uncertainties in Rw and the unreliability of porosity measurements derived from a sonic log.

9.2 12¼" Hole Section

From 1558m to 2400m the logs indicate a sandstone/shale sequence. The sandstones are quite thick in places (up to 25m), but tend to be fairly argillaceous. The sandstones are water saturated.

The top of the Belfast Formation can be identified at 2400m on the gamma ray and resistivity logs. From 2400m to the maximum logged depth of 2724m a thick mudstone interval occurs.

TABLE 2 : LOG INTERPRETATION

Zone No.	Interval mBRT	Point Reading	Rhob g/cc	ØN %	ØD-N %	Rt ohmm	Sw %
1	3085-3088	3085.5	2.30	17	22	5	100
2	3112.5-3116	3114	2.36	16	19	7	97
3	3119-3127	3125	2.30	12	20	8	86
4	3129.5-3143	3135	2.32	16	22	6	90
5	3174.5-3180	3179	2.37	15	19	8	91
6	3185-3197	3195	2.30	17	22	8	78
7	3200.5-3202	3201	2.36	15	19	12	74
8	3267-3270	3264.5	2.27	19	24	10	63

9.3 8½" Hole Section

9.3.1 Summary of Lithology

The logs indicate a continuation of the Belfast mudstone from 2724m to 3084m. From 3084m to the maximum logged depth of 3308m several sandstones can be identified within the Waarre Formation on the gamma ray/dual laterolog and density/neutron logs.

9.3.2 Zones of Interest and Interpretation

Table 2 presents the detailed interpretation of the zones of interest. The depth reference log is the FDC/CNL/GR (run number 4).

Table 3 presents the RFT data obtained during the final logging run.

Table 4 provides the analysis of the RFT sample recovered from 3178m.

Notes on the interpretation:

1) Clean sands were assumed.

ii) The following Archie equation was applied:

$$Sw^2 = \frac{0.62}{\phi^{2.15}} \times \frac{Rw}{Rt}$$

iii) Porosities were obtained from a density/neutron crossplot.

iv) Depth reference is run no. 4 FDC/CNL/GR

v) Rt is taken from the deep laterolog reading.

vi) The following values of Rw, Rm and Rmf were employed:

Rmf = 0.07ohmm at 17°C = 0.025ohmm at 196°F

Rm = 0.091ohmm at 23°C = 0.036ohmm at 196°F

Rw from Rwa minima approach = 0.3ohmm at 196°F

This is equivalent to an NaCl equivalent salinity of 7,000ppm.

The RFT sample is unrepresentative of pure formation water. The small volume recovered is contaminated with very conductive filtrate.

9.3.3 Evaluation

The log data confirm and amplify the information obtained during drilling from cuttings and fluid influx analysis.

There are several sandstone intervals within the Waarre Formation which have good porosity (ca.20%), but minimal permeability.

The RFT recovered approximately 1 litre of formation water and approximately 1.0scf of gas from zone number 5 (3174.5-3180m). At reservoir conditions it is possible that not all of this gas is in solution in the water. (Methane at 6000psi and 200°F has a solubility in fresh water of approximately 24scf/bbl = 0.15scf/litre.) Otherwise, all sandstones are water saturated.

TABLE 3 : RFT RESULTS

No.	Depth	Hydrostatic Pressure Before	Hydrostatic Pressure After	Formation Pressure	Remarks
	mBRT	psig	psig	psig	
1	3112.5	6308	6308	-	Tight
2	3113.5	6310	6310	-	Seal Failure
3	3115.5	6314	6314	-	Seal Failure
4	3116.5	6316	-	-	Seal Failure
5	3117.5	6317	6317	-	Tight
6	3121.0	6322	6322	-	Seal Failure
7	3123.0	6326	6326	-	Tight
8	3124.5	6328	6328	-	Seal Failure
9	3177.0	6426	6525	-	Tight
10	3178.0	6426	6424	6409	0701 Start Sample, low flowrate 0716 Stop Sample
11	3178.5	6423	6423	-	Tight
12	3179.0	6424	6424	-	Tight
13	3212.0	6489	6490	-	Tight
14	3219.0	6502	6503	-	Tight
15	3265.0	6594	6594	-	Tight
16	3268.0	6599	6604	-	Tight
17	3277.5	6622	6618	-	Tight

All the above results were taken from the strain gauge readings as the quartz guage is more temperature sensitive.

TABLE 1 : LOGS RUN

Date	Hole Size ins	Interval mBRT	Logs Run	Comments
20/3/86	17½	1558 - 655 GR to 75	DIL/SLS/GR/SP/CAL	Run O.K.
4/4/86	12¼	2724 - 1553	DIL/BHC/GR/SP/CAL/MSFL	Induction readings affected by large borehole signal due to KCL mud.
		2685-1614	CST/GR	30 attempted 25 recovered 23 accepted 5 lost
16/4/86	8½	3304 - 2718 GR to 2631	LDT/CNL/DLL/MSFL/NGT/SP	Poor quality log due to sticking. LDT failed at 3000m. MSFL pad damaged.
		3306.3 - 2717.5	BHC/GR	No Problems
		3300.5 - 2717.5	DLL/MSFL/SP/GR	Slight Sticking
		3303 - 2717.5	FDC/CNL/GR	Slight Sticking
17/4/86	8½	3277.5 - 3112.5	RFT/GR	One sample taken and 17 pressure readings attempted. 5 seal failures due to washed out hole. Tight formation. 1 good reading/supercharged
		3300-2712.5	SHDT/GR	Very Sticky
		3300 - 600	CVL	Noise in open hole interval.
		3293-2737	CST/GR	60 attempted 52 recovered 44 accepted 8 lost

px2dp76760mws
31 JUL 86

TABLE 4 : RFT SAMPLE ANALYSIS

Sample Depth:	3178mBRT
Sample Chamber Pressure:	200psig
Sample Chamber Contents:	1.3 litres filtrate/formation water
	1.0scf gas

1. Sample Analysis:

GAS
PERCENT HYDROCARBONS

C1	71.1
C2	20.4
C3	6.9
iC4	0.005
nC4	0.009
C5	0.0003

2. Water Sample Analysis

	RFT WATER SAMPLE	MUD FILTRATE (for comparison)
Weight	1.05	1.07
pH	7.0	10.5
pf/Mf	0/1.6	0.5/1.8
Chlorides	45,000 ppm	69,000 ppm
Calcium	200 ppm	100 ppm
Nitrates	Trace	50 ppm
Resistivity	0.12 at 17°C	0.07ohmm at 17°C

px2dp76759mws
31 JUL 86

10. REFERENCES

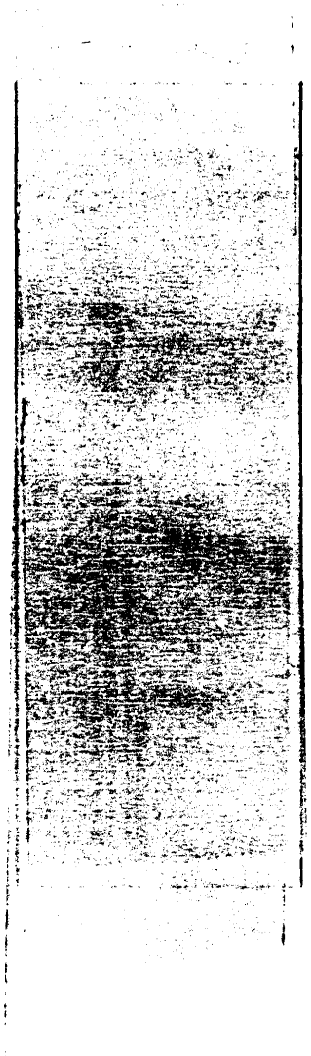
Wopfner, H., and Douglas, J.G. (Editors)	1971	The Otway Basin of Southeast Australia. Special Bulletin, Geological Surveys of South Australia and Victoria, 464pp.
Schlumberger	1985	Log Interpretation Chart Book.

TABLE 4a

SOURCE ROCK QUALITY INDICATORS

WELL: NORMANDY 1

LOCATION: AUSTRALIA



DEPTH (m)	DEPTH RANGE (m)	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	GOGI	HI	TOC (%)	CARBT (%)
710.00	680-710	BULKED							
740.00	710-740	SILTSTONE	0.0	0.0	1.3		87	1.5	32.4
820.00	740-820	BULKED							
845.00	820-845								
875.00	845-875								
915.00	875-915	BULKED							
935.00	915-935	SILTSTONE	0.4	11.8	4.3		126	3.4	4.7
985.00	935-985	BULKED							
1010.00	985-1010	BULKED							
1035.00	1010-1035	MUDSTONE	1.7	33.3	7.8		153	5.1	8.3
1060.00	1035-1060	MUDSTONE	2.2	52.4	9.4	0.48	224	4.2	5.1
1085.00	1060-1085	SILTSTONE	0.4		1.3				
1110.00	1085-1110	SILTSTONE	0.2	25.0	0.8		100	0.80	34.0
1135.00	1110-1135	SILTSTONE	0.9		3.9				
1160.00	1135-1160	SILTSTONE	3.0	62.5	11.4	0.43	237	4.8	14.5
1185.00	1160-1185	SILTSTONE	0.2		2.6				
1210.00	1185-1210								
1210.10		COAL	0.2	0.4	32.4	0.45	69	46.8	0.0
1210.20		SILTSTONE	0.2	6.9	4.2		145	2.9	11.4
1240.00	1210-1240	SILTSTONE	2.3		5.1	0.50			
1265.00	1240-1265	MUDSTONE	0.7	23.3	3.5		117	3.0	5.6
1290.00	1265-1290	SILTSTONE	0.3		4.0				
1315.00	1290-1315	SILTSTONE	0.2	6.3	3.5		109	3.2	3.4
1340.00	1315-1340	MUDSTONE	0.4		4.2				
1365.00	1340-1365	MUDSTONE	0.2	6.3	3.6		113	3.2	0.0
1390.00	1365-1390	MUDSTONE	0.3		4.0				
1415.00	1390-1415	MUDSTONE	0.4	10.8	4.6	0.38	124	3.7	0.0
1445.00	1415-1445	MUDSTONE	0.4		3.4				
1470.00	1445-1470	SILTSTONE	0.3	9.4	4.2		131	3.2	4.6
1490.00	1470-1490	SILTSTONE	0.1		3.0				
1515.00	1490-1515	SILTSTONE	0.1	5.0	1.9		95	2.0	14.0
1535.00	1515-1535	SILTSTONE	0.1		2.2				
1560.00	1535-1560	MUDSTONE	0.1	5.6	1.6		89	1.8	10.1
1590.00	1560-1590	MUDSTONE	0.1		1.7				
1615.00	1590-1615	SILTSTONE	0.0	0.0	1.5		71	2.1	11.2
1635.00	1615-1635	MUDSTONE	0.1		1.7				
1665.00	1635-1665								

SAMPLES Number	Depth in metres / feet	Type	Amount of Organic Matter	MIOSPORES trace/present (1-2) Common (3) Frequent (4) Abundant (5)	DINOFLAGELLATE CYSTS AND ACRITARCHS (1-2 3 4 5)	TASMANITIDS AND LEIOSPHERES (1 2 3)	FORAM LININGS (1 2 3)	MEGASPORES (1 2 3)	OTHER MICROFOSSILS 1 (1 2 3)	OTHER MICROFOSSILS 2, MISCELLANEOUS PHYTOCLASTS (1 2 3)	CUTICLES (1-2 3 4-5)	OTHER TISSUES (1-2 3 4-5)	BROWN 'WOOD' HUMINITE + VITRINITE (1-2 3 4-5)	BLACK 'WOOD' VITRINITE + INERTINITE (1-2 3 4-5)	BLACK 'WOOD'; REWORKED VITRINITE & INERTINITE ONLY (1-2 3 4-5)	FINELY DISSEMINATED PARTICLES (1-2 3 4-5)	AMORPHOUS VASCULAR PLANT MATERIAL (1-2 3 4-5)	AMORPHOUS MATTER OF ALGAL ORIGIN; MARINE (M) NON MARINE (N) (1-2 3 4 5)	PRESERVATION STATE good / fair / poor	Reworking (1-5)	ENVIRONMENT OF DEPOSITION undiff. mar. / open mar. / restricted mar. / nr. shore mar./strong terrig. infl. / some mar. infl uence/brackish / non-mar./freshwater	COLOUR/MATURATION (1 2 3 4 5 6 7)	SOURCE POTENTIAL FOR OIL (C) AND GAS (G)
	1025	kerogen shale																					
	1340	"																					
	1665	"																					
	2015	"																					
	2270	"																					
	2595	"																					
	2900	"																					
	3175	"																					
	3320	"																					

TABLE 4b

SOURCE ROCK QUALITY INDICATORS

WELL: NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	DEPTH RANGE (m)	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	GOGI	HI	TOC (%)	CARBT (%)
1665.10		COAL	0.9	1.9	63.0	0.54	132	47.8	0.0
1665.20		MUDSTONE	0.0	0.0	3.2		91	3.5	5.2
1690.00	1665-1690	MUDSTONE	0.2		2.9				
1715.00	1690-1715								
1715.10		COAL	1.5	2.3	49.8	0.89	77	64.6	0.0
1715.20		MUDSTONE	0.0	0.0	2.9		100	2.9	7.8
1740.00	1715-1740								
1740.10		COAL	0.2		35.9				
1740.20		SILTSTONE	0.0		3.0				
1765.00	1740-1765								
1765.10		COAL	1.1	2.1	53.4	0.51	103	51.8	0.0
1765.20		SILTSTONE	0.1	2.5	3.7		93	4.0	7.8
1790.00	1765-1790								
1790.10		COAL	0.2		61.4				
1790.20		SILTSTONE	0.1		4.4				
1815.00	1790-1815								
1815.10		COAL	1.5	3.0	59.8		119	50.4	0.0
1815.20		SILTSTONE	0.1	3.6	3.4		121	2.8	8.8
1840.00	1815-1840								
1840.10		COAL	1.0		54.6				
1840.20		SILTSTONE	0.2		3.7				
1865.00	1840-1865	SILTSTONE	0.1	3.8	2.2		85	2.6	5.4
1890.00	1865-1890	SILTSTONE	0.1		2.0				
1915.00	1890-1915	SILTSTONE	0.1	4.0	1.8		72	2.5	7.4
1940.00	1915-1940	SILTSTONE	0.0		2.1				
1965.00	1940-1965	SILTSTONE	0.2	6.7	2.7		90	3.0	6.0
1990.00	1965-1990	SILTSTONE	0.1		2.1				
2015.00	1990-2015	SILTSTONE	0.1	3.6	2.3		82	2.8	9.8
2040.00	2015-2040	SILTSTONE	0.1		2.3				
2065.00	2040-2065	SILTSTONE	0.2	6.5	3.0		97	3.1	7.2
2100.00	2065-2100	SILTSTONE	0.2	6.7	2.9		97	3.0	8.5
2125.00	2100-2125	SILTSTONE	0.2		2.1				
2150.00	2125-2150	SILTSTONE	0.0	0.0	2.1		68	3.1	3.2
2175.00	2150-2175	SILTSTONE	0.1		2.5				
2200.00	2175-2200	SILTSTONE	0.1	3.6	2.4		86	2.8	8.7
2245.00	2220-2245	SILTSTONE	0.1	5.6	1.7		94	1.8	9.9
2270.00	2245-2270	SILTSTONE	0.2		1.8				
2295.00	2270-2295	SILTSTONE	0.2	7.7	2.4		92	2.6	7.0

TABLE 4c

SOURCE ROCK QUALITY INDICATORS

WELL: NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	DEPTH RANGE (m)	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	GOGI	HI	TOC (%)	CARBT (%)
2320.00	2295-2320	SILTSTONE	0.2		3.2				
2345.00	2320-2345	SILTSTONE	0.1	9.1	1.0		91	1.1	28.8
2370.00	2345-2370	SILTSTONE	0.3		3.6				
2395.00	2370-2395	SILTSTONE	0.1	5.0	1.6		80	2.0	5.6
2420.00	2395-2420	SILTSTONE	0.1	6.3	1.4		88	1.6	8.5
2445.00	2420-2445	BULKED	0.2		1.1				
2470.00	2445-2470	BULKED	0.2	20.0	0.9		90	1.0	11.9
2495.00	2470-2495	BULKED	0.3		0.9				
2520.00	2495-2520	BULKED	0.1	9.1	0.7		64	1.1	13.4
2545.00	2520-2545	BULKED	0.3		0.7				
2570.00	2545-2570	BULKED	0.1	11.1	0.7		78	0.90	16.7
2595.00	2570-2595	BULKED	0.2		0.9				
2620.00	2595-2620	BULKED	0.2	20.0	1.0		100	1.0	13.0
2645.00	2620-2645	BULKED	0.2		1.0				
2670.00	2645-2670	BULKED	0.2	20.0	1.2		120	1.0	10.0
2695.00	2670-2695	BULKED	0.1		1.0				
2725.00	2695-2725	BULKED	0.1	11.1	0.9		100	0.90	12.6
2750.00	2725-2750	BULKED	0.2		1.1				
2775.00	2750-2775	BULKED	0.2	22.2	1.2		133	0.90	15.2
2800.00	2775-2800	BULKED	0.2		1.4				
2825.00	2800-2825	BULKED	3.9	156.0	8.9	0.28	356	2.5	25.9
2850.00	2825-2850	BULKED	0.5		2.3				
2874.00		BULKED							
2875.00	2850-2875	BULKED	0.6	26.1	2.7		117	2.3	18.3
2900.00	2875-2900	BULKED	0.4		2.6				
2925.00	2900-2925	BULKED	0.2	9.1	1.9		86	2.2	12.1
2950.00	2925-2950	BULKED	0.3		2.1				
2975.00	2950-2975	SILTSTONE	0.3	15.0	1.9		95	2.0	9.2
3000.00	2975-3000	BULKED	0.4		2.1				
3025.00	3000-3025	BULKED	0.3	17.6	1.6		94	1.7	13.8
3050.00	3025-3050	BULKED	0.2		1.6				
3075.00	3050-3075	BULKED	0.3	20.0	1.3		87	1.5	11.1
3075.50		BULKED							
3100.00	3075-3100	SILTSTONE	0.3		1.5				
3125.00	3100-3125	MUDSTONE	0.4	30.8	2.0		154	1.3	12.8
3150.00	3125-3150	MUDSTONE	0.3		1.5				
3157.00		BULKED							
3175.00	3150-3175	MUDSTONE	0.5	35.7	1.7		121	1.4	13.2

TABLE 4d

S O U R C E R O C K Q U A L I T Y I N D I C A T O R S

WELL: NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	DEPTH RANGE (m)	PICKED LITHOLOGY	P1 (kg/t)	P1 (mg/gC)	P2 (kg/t)	GOGI	HI	TOC (%)	CARBT (%)
3200.00	3175-3200	MUDSTONE	0.3		1.5				
3225.00	3200-3225								
3225.10		COAL	13.2	21.5	132.7	0.47	216	61.4	0.0
3225.20		MUDSTONE	0.5	17.2	3.5	0.43	121	2.9	7.7
3250.00	3225-3250								
3250.10		COAL	6.8	23.5	38.8		134	28.9	0.0
3250.20		MUDSTONE	0.4	20.0	2.0		100	2.0	11.2
3266.00		BULKED							
3275.00	3250-3275								
3275.10		COAL	1.0		10.7				
3275.20		SILTSTONE	0.1		1.3				
3288.00		BULKED							
3300.00	3275-3300								
3300.10		COAL	12.3	25.4	119.8	0.42	247	48.5	0.0
3300.20		MUDSTONE	0.2	15.4	1.2		92	1.3	10.0

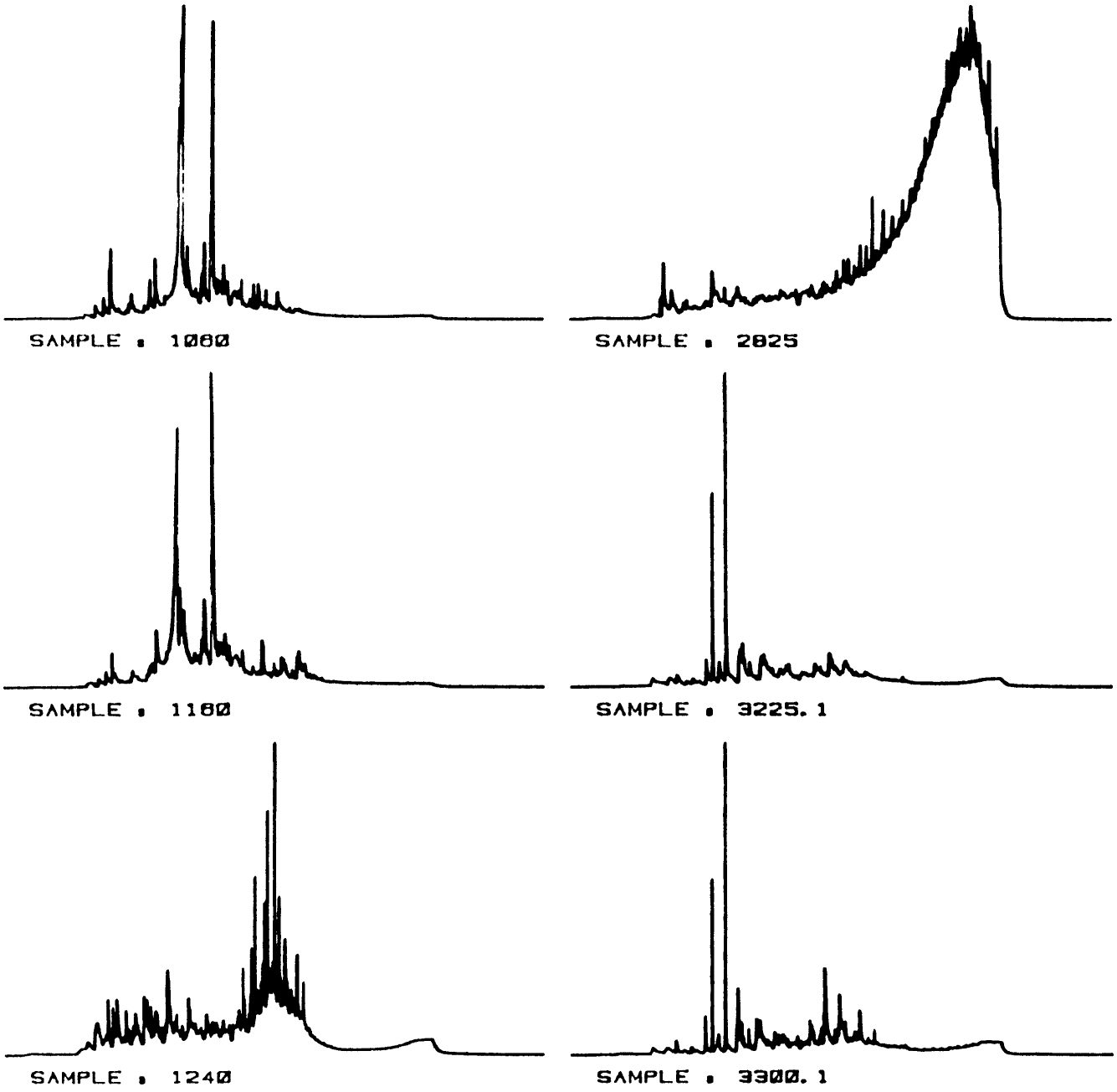
TABLE 5

P Y R O L Y S I S - P G C D A T A

WELL : NORMANBY 1

LOCATION: AUSTRALIA

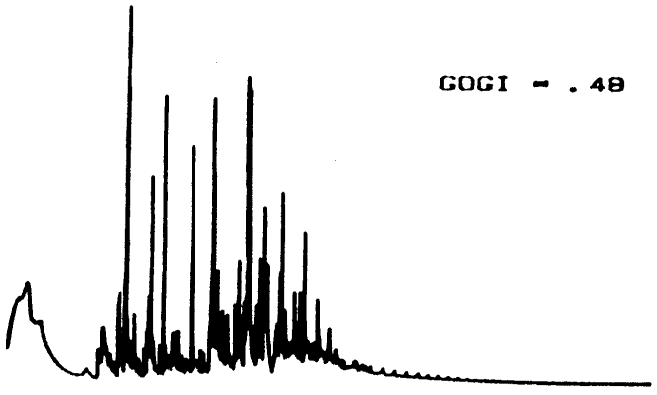
DEPTH (m)	C1-C5 (%)	C6-C9 (%)	C10-C13 (%)	C14-C22 (%)	C23-C36 (%)	GOGI	HI	TOC (%)
1060.00	32	22	28	15	3	0.48	224	4.2
1160.00	30	21	27	18	4	0.43	237	4.8
1210.10	31	16	21	23	9	0.45	69	46.8
1240.00	33	25	19	20	3	0.50		
1415.00	28	22	22	23	5	0.38	124	3.7
1665.10	35	12	18	24	12	0.54	132	47.8
1715.10	47	11	21	16	5	0.89	77	64.6
1765.10	34	11	17	25	13	0.51	103	51.8
2825.00	22	23	16	25	14	0.28	356	2.5
3225.10	32	12	11	23	23	0.47	216	61.4
3225.20	30	19	15	24	13	0.43	121	2.9
3300.10	30	10	10	23	27	0.42	247	48.5

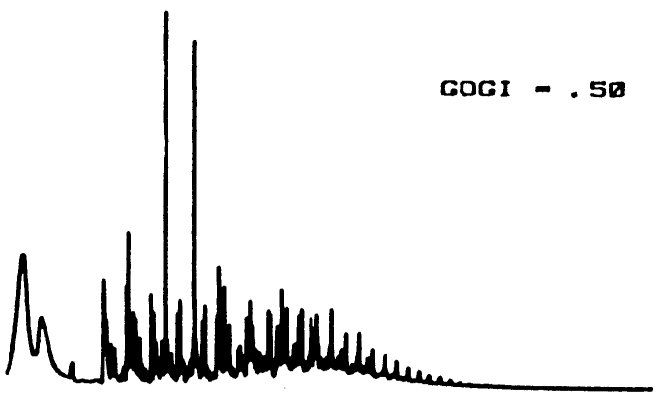


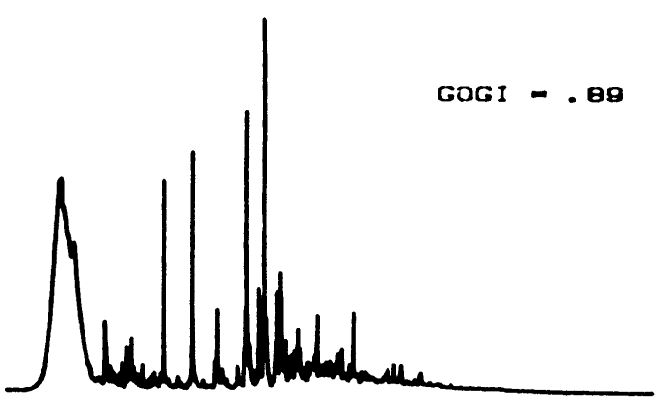
GEOCHEMISTRY BRANCH, BP SUNBURY

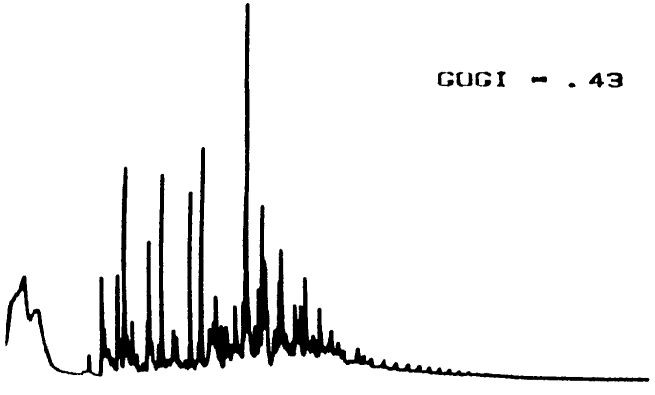
THERMAL VOLATILATES (P1)

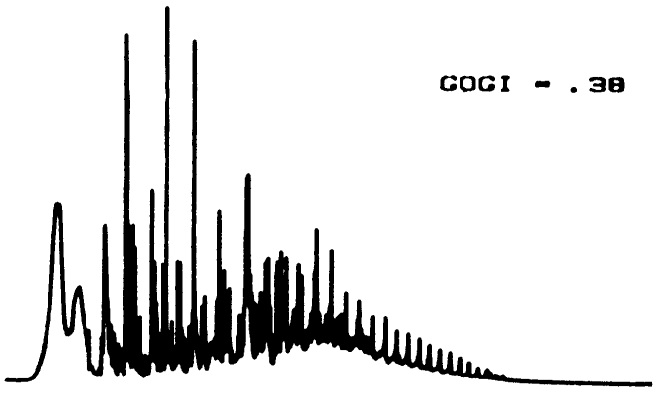
Fig. 3

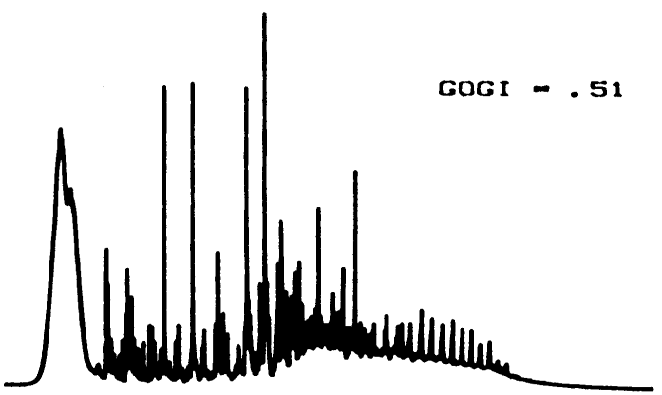


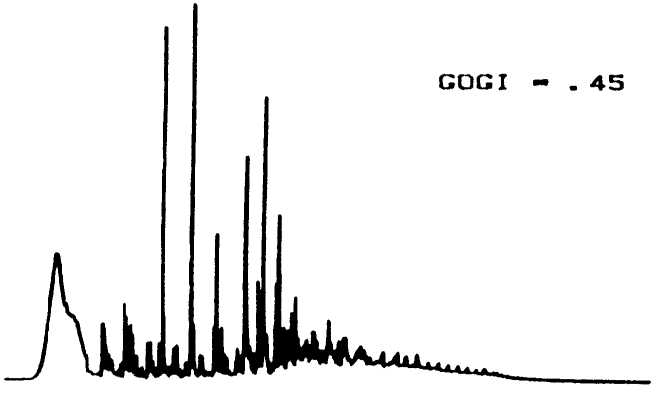


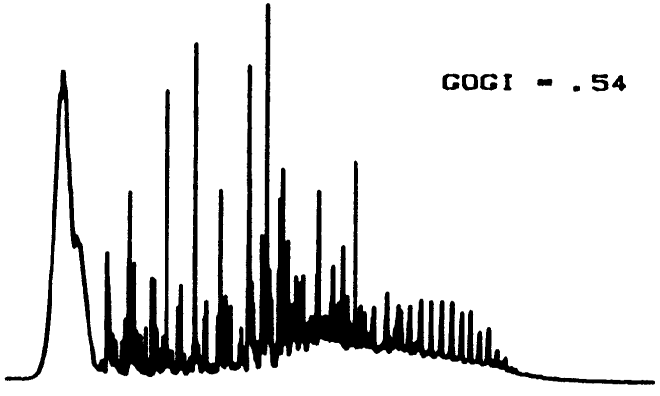








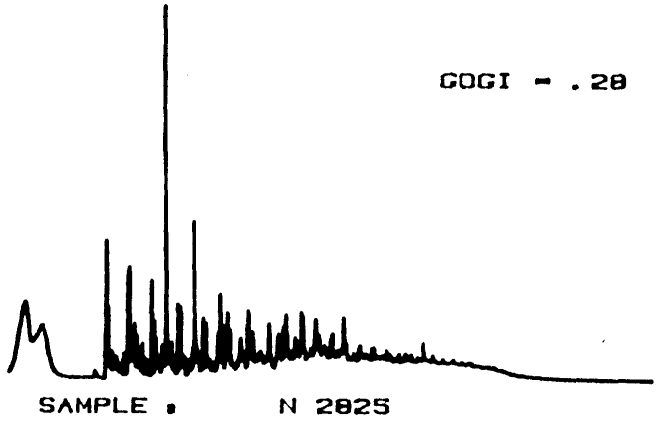


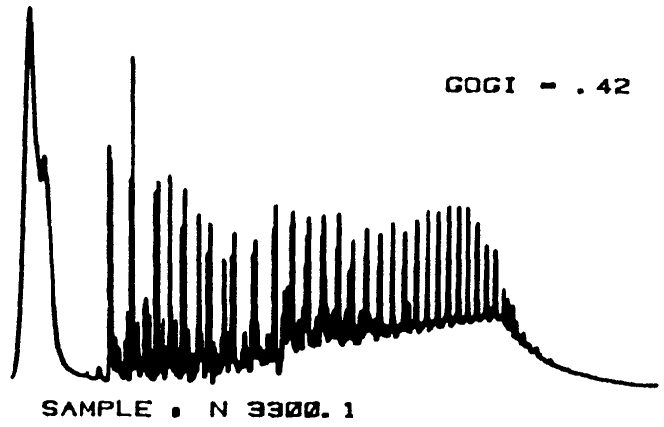


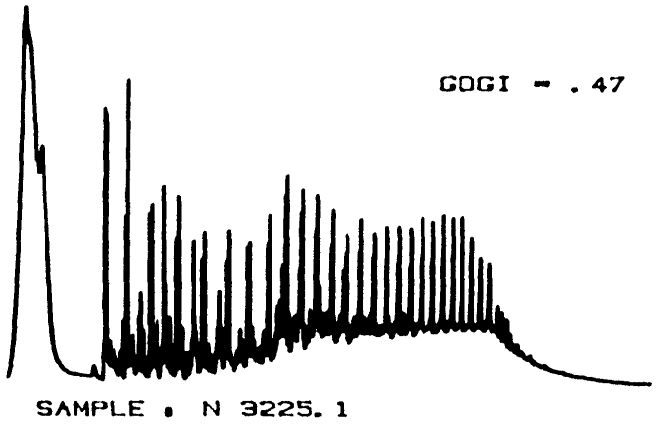
GEOCHEMISTRY BRANCH, BP SUNBURY

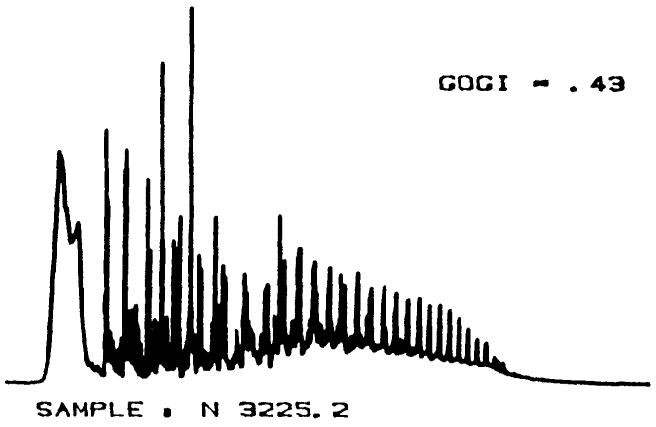
KEROGEN PYROLYSATES (P2)

Fig. 4a









GEOCHEMISTRY BRANCH, BP SUNBURY

KEROGEN PYROLYSATES (P2)

Fig. 4b

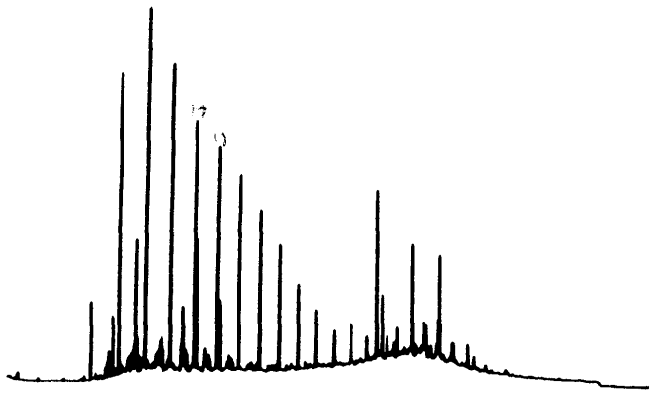
TABLE 6

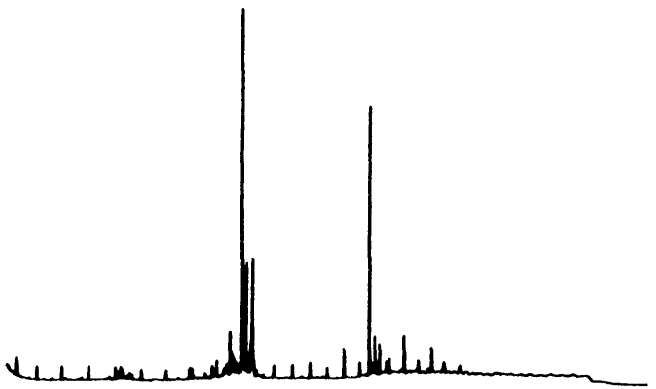
SOLUBLE EXTRACT DATA

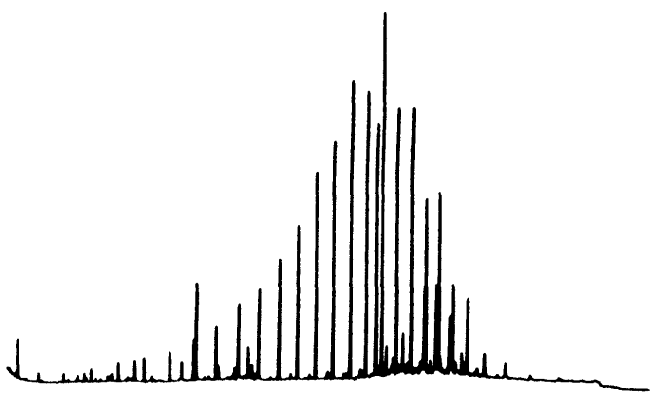
WELL : NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	TOC (%)	TSE (%)	TSE (mg/gC)	SAC (mg/gC)	SAC (%)	AROM (%)	RES (%)	ASPH (%)	CPI	PR/PH	PR/C17	PH/C18
1160.00	4.8	0.036	7	4	47.8	29.8	22.4		1.60	1.90	0.60	0.40
1715.10	64.6	0.984	15	1	7.9	32.7	59.4					
3225.10	61.4	0.705	11	4	37.9	15.3	46.8		1.20	9.30	3.10	0.30







GEOCHEMISTRY BRANCH, BP SUNBURY

SAC FRACTION GAS CHROMATOGRAMS

Fig. 5

TABLE 7

C A R B O N I S O T O P E R A T I O S

WELL: NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	PICKED LITHOLOGY	SAMPLE	ISOTOPE RATIO (per mil)
1160.00	SILTSTONE	KEROGEN	-26.2
1715.10	COAL	KEROGEN	-23.8
3225.10	COAL	KEROGEN	-25.4

C-12/C-13 ISOTOPIC RATIOS ARE RELATIVE TO
PDB STANDARD:NBS-22 AT -29.8 per mil

TABLE 8a

M O L E C U L A R S O U R C E R O C K I N D I C A T O R S

WELL : NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	H1	H2	H3	H4	H5	H6	H7	H8	H9	S1	S2	S3	S4	S5
1160.00	0.48	0.23	0.85		100:186:52:35:18:19	0.41	0.52	0.63	0.62	0.35	0.60	37:18:45	24:26:50	23.70
1715.10		0.13	0.78			0.12				0.12		9:18:73		24.20
3225.10	0.50	0.60	0.85		100:94:45:21:8:3	0.10	0.52	0.52	0.48	0.51	0.47	18:21:61	7:23:70	16.30

TABLE 8b

MOLECULAR SOURCE ROCK INDICATORS

WELL : NORMANBY 1

LOCATION: AUSTRALIA

DEPTH (m)	A1	A2	A3	A4	A5	A6	M1	M2	M3	M4	M5
1160.00										65.70	
1715.10										69.60	
3225.10								0.46	0.37	83.60	

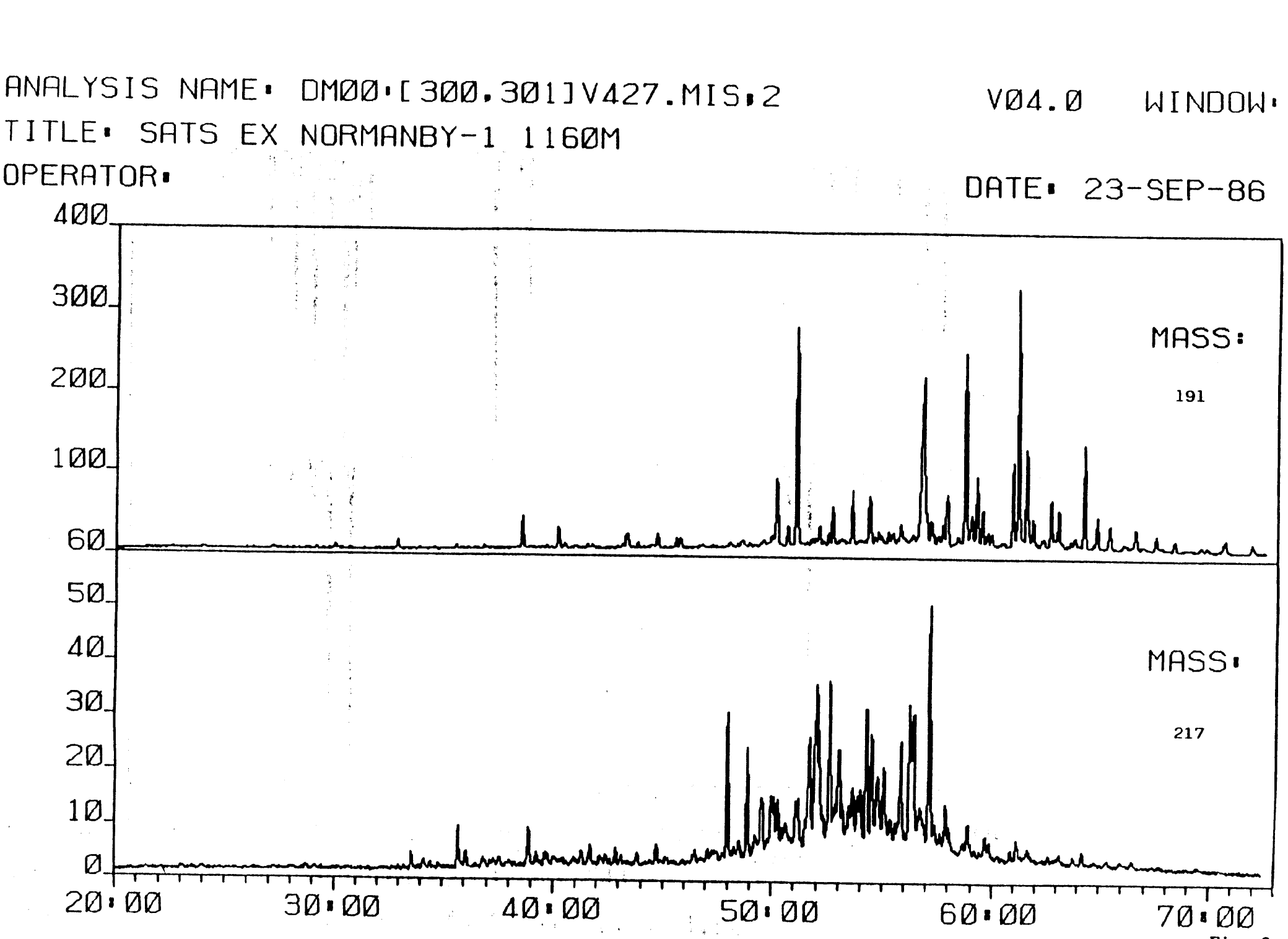

ANALYSIS NAME: DM00:[300,301]V427.MIS;2
V04.0 WINDOW:
TITLE: SATS EX NORMANBY-1 1160M
OPERATOR:
DATE: 23-SEP-86
400
300
200
100
60
MASS:
191
50
40
30
20
10
0
MASS:
217
20:00
30:00
40:00
50:00
60:00
70:00

Fig. 6

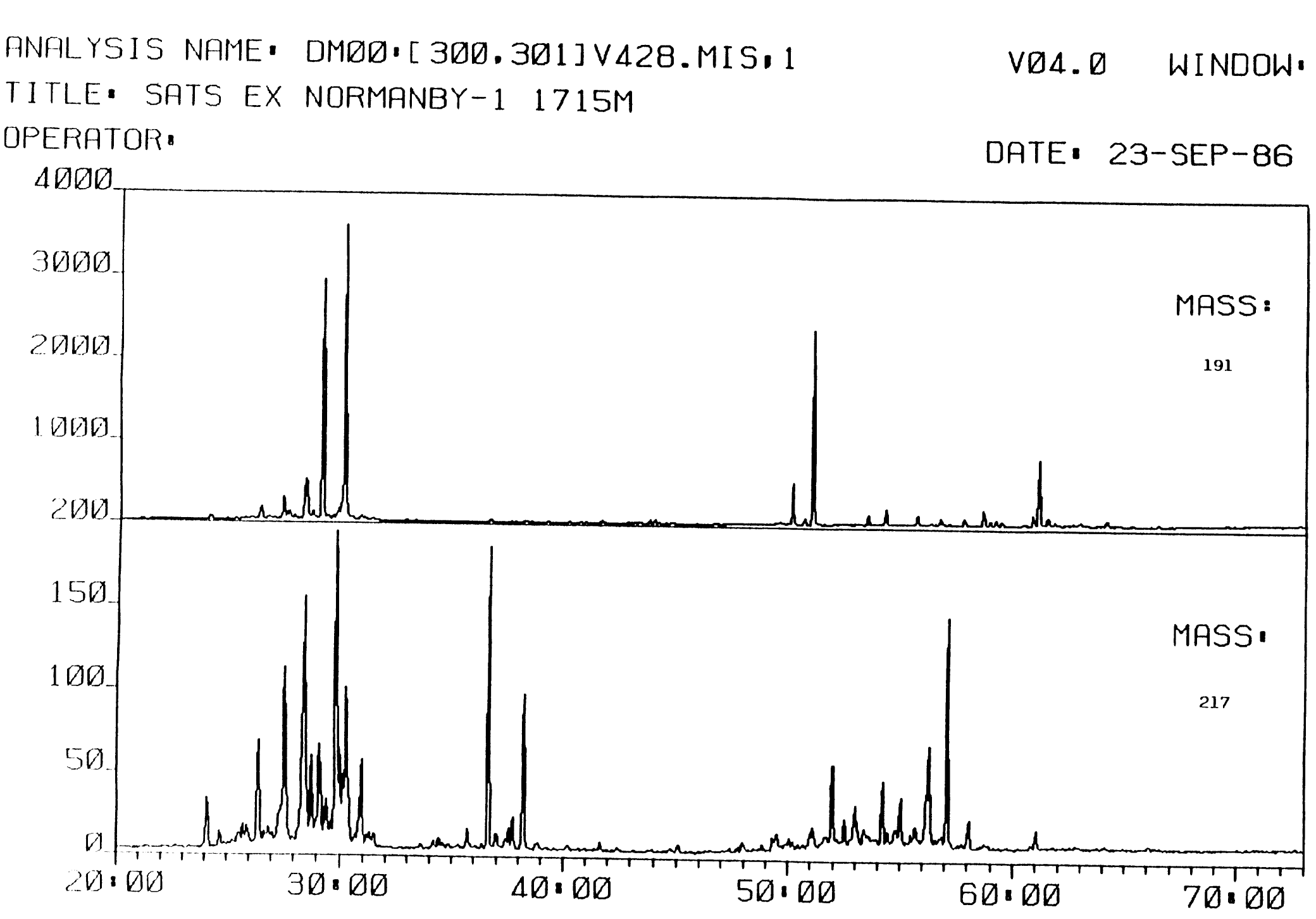

ANALYSIS NAME: DM00:[300,301]V428.MIS;1
V04.0 WINDOW:
TITLE: SATS EX NORMANBY-1 1715M
OPERATOR:
DATE: 23-SEP-86
4000
3000
2000
1000
200
MASS:
191
150
100
50
0
MASS:
217
20:00
30:00
40:00
50:00
60:00
70:00

Fig. 7

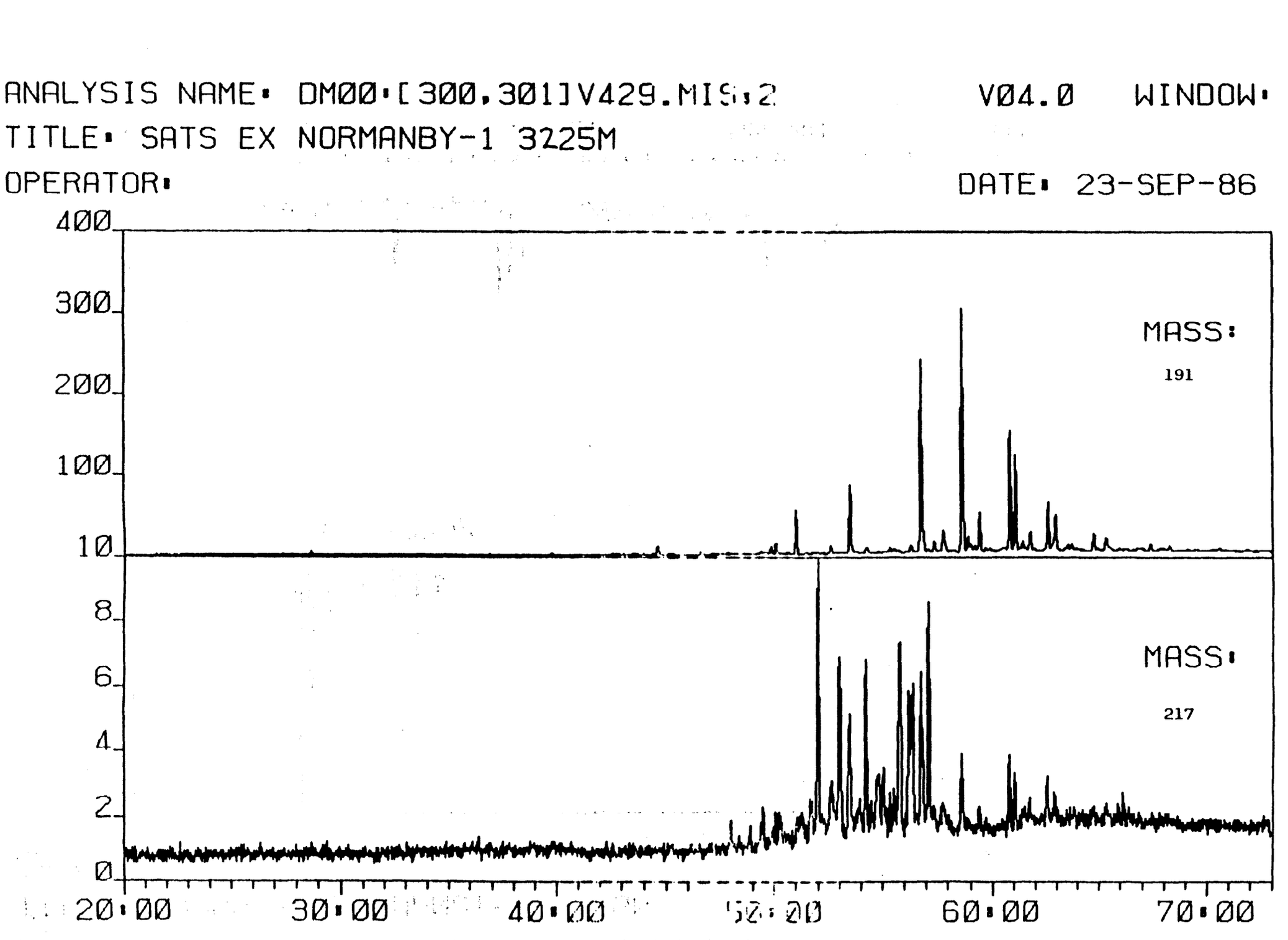

ANALYSIS NAME: DM00:[300,301]V429.MIS;2
V04.0 WINDOW:
TITLE: SATS EX NORMANBY-1 3225M
OPERATOR:
DATE: 23-SEP-86
400
300
200
100
10
8
6
4
2
0
MASS:
191
MASS:
217
20:00
30:00
40:00
50:00
60:00
70:00

Fig. 8

ANALYSIS NAME: DM00:L300.301JV430.MIS:1 V04.0 WINDOW:

TITLE: AROMS EX NORMANBY-1 3225M

OPERATOR:

DATE: 23-SEP-86

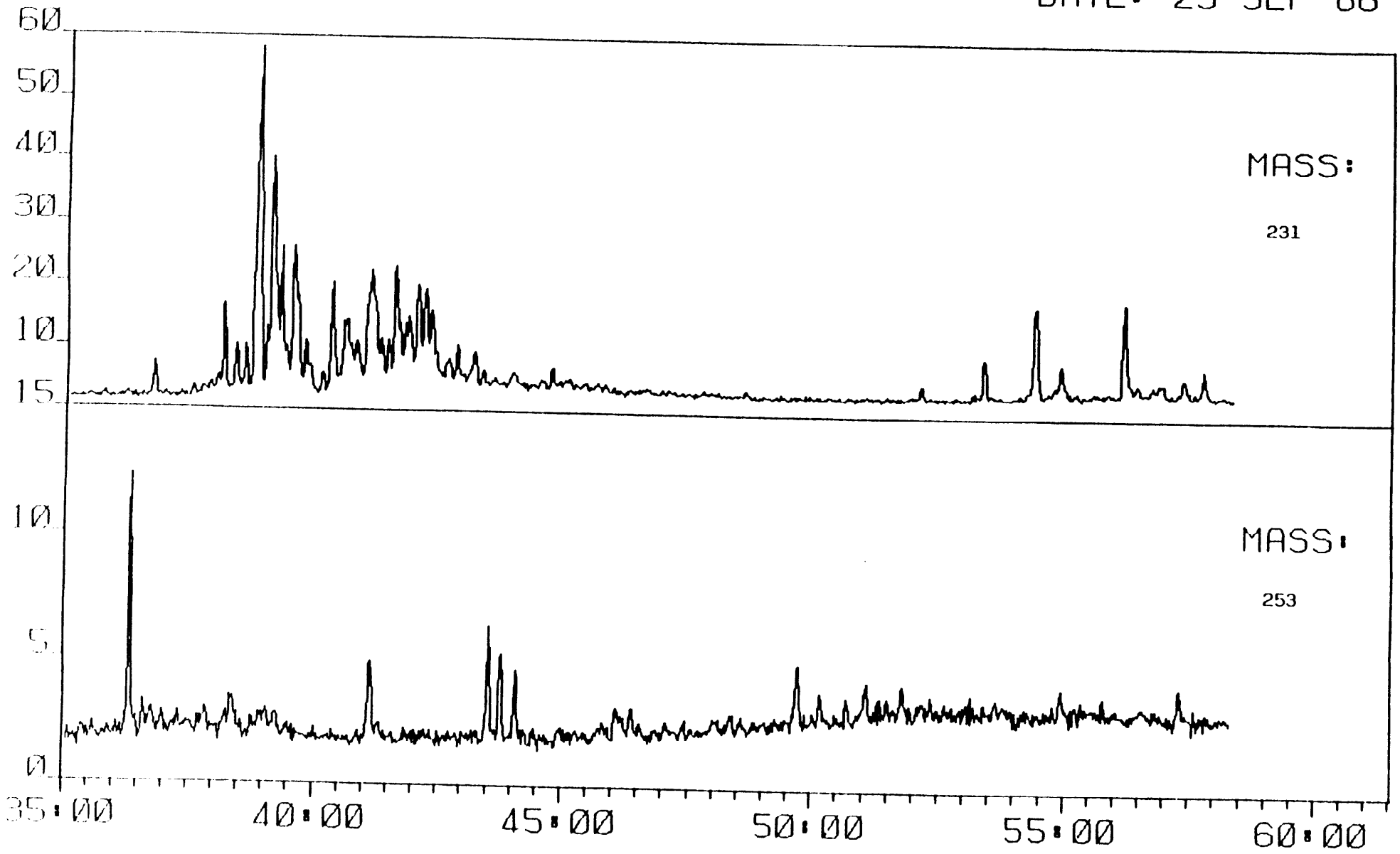


Fig. 9

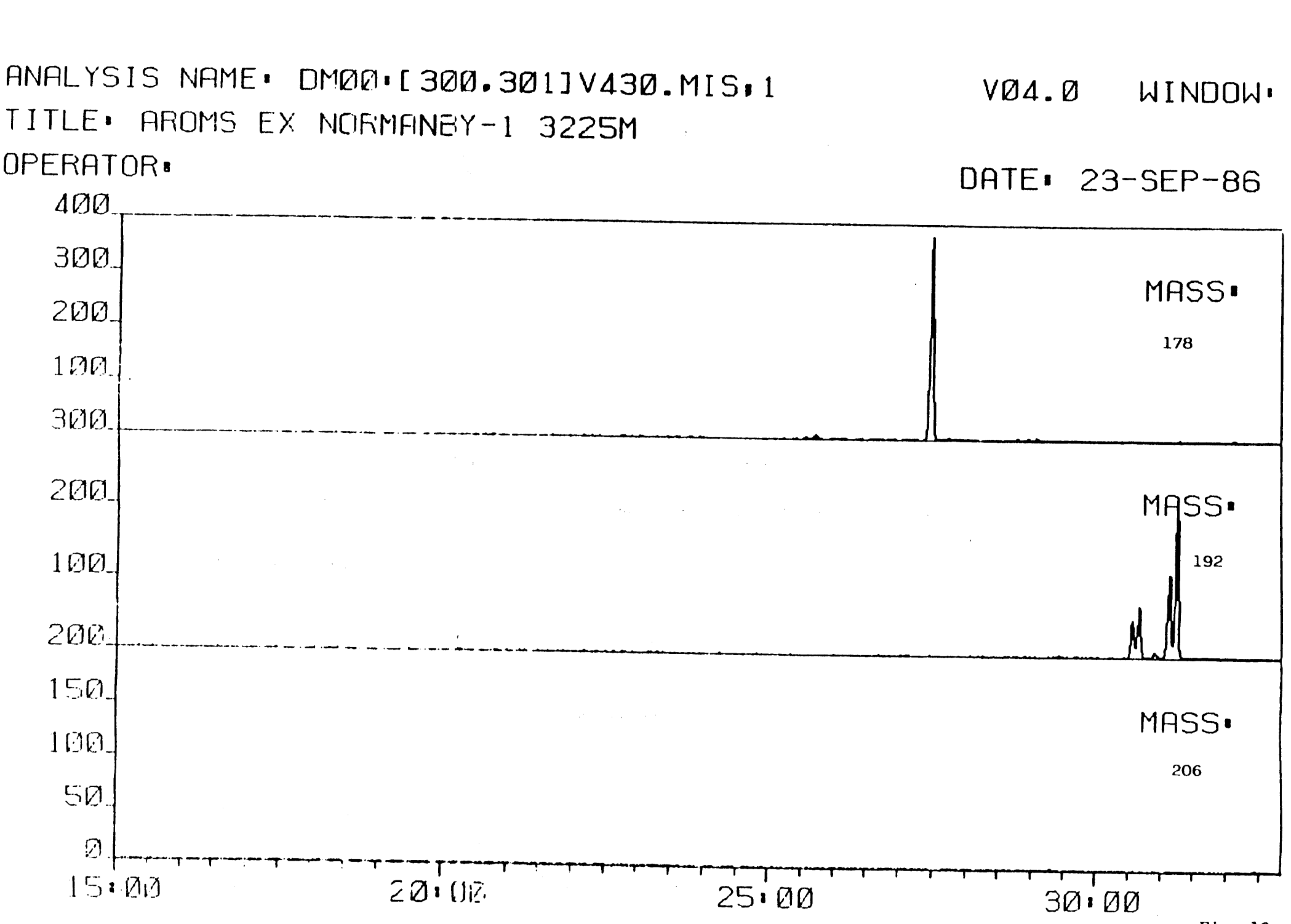

ANALYSIS NAME: DM00:[300,301]V430.MIS;1
V04.0 WINDOW:
TITLE: AROMS EX NORMANBY-1 3225M
OPERATOR:
DATE: 23-SEP-86
400
300
200
100
300
MASS:
178
200
100
200
MASS:
192
150
100
50
0
MASS:
206
15:00
20:00
25:00
30:00

Fig. 10

TABLE 9a

G E O C H E M I C A L D A T A

WELL : NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	QCNALK	QCNC20	QCC29ST	QCC30H0	QCC32H0	QCMONAR	QCTRIAR	QCMEPH
1160.00	501	31	2	2	1			
3225.10	356	11	1	10	6	0	4	104

* Units of measurement are microg/g Carbon ie ppm

TABLE 9b

G E O C H E M I C A L D A T A

WELL: NORMANBY-1

LOCATION: AUSTRALIA

DEPTH (m)	QSNALK	QSNC20	QSC29ST	QSC30HO	QSC32HO	QAMONAR	QATRIAR	QAMEPH
1160.00	141335	8665	431	426	282			
1715.10			331	184	124			
3225.10	81999	2452	319	2311	1311	87	2182	59722

* Units of measurement are ppm

PE600238

This is an enclosure indicator page.
The enclosure PE600238 is enclosed within the container PE900334 at this location in this document.

The enclosure PE600238 has the following characteristics:

ITEM-BARCODE	= PE600238
CONTAINER_BARCODE	= PE900334
NAME	= Normanby 1 Mud Log, Enclosure 2
BASIN	= OTWAY
PERMIT	=
TYPE	= WELL
SUBTYPE	= MUD-LOG
DESCRIPTION	= Normanby 1 Mud Log, Enclosure 2
REMARKS	=
DATE-CREATED	= 15/04/86
DATE-RECEIVED	= 5/09/86
W_NO	= W931
WELL-NAME	= NORMANBY-1
CONTRACTOR	= Gearhart
CLIENT_OP_CO	= BP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600234

This is an enclosure indicator page.
The enclosure PE600234 is enclosed within the container PE900334 at this location in this document.

The enclosure PE600234 has the following characteristics:

ITEM_BARCODE	= PE600234
CONTAINER_BARCODE	= PE900334
NAME	= Normanby 1 Composite Log Enclosure 1
BASIN	= OTWAY
PERMIT	= VIC/P14
TYPE	= WELL
SUBTYPE	= COMPOSITE_LOG
DESCRIPTION	= Normanby 1 Composite Log Enclosure 1
REMARKS	=
DATE_CREATED	= *
DATE_RECEIVED	= 14/08/86
W_NO	= W931
WELL_NAME	= NORMANBY-1
CONTRACTOR	= BP Petroleum
CLIENT_OP_CO	= BP

(Inserted by DNRE - Vic Govt Mines Dept)

PE600235

This is an enclosure indicator page.
The enclosure PE600235 is enclosed within the container PE900334 at this location in this document.

The enclosure PE600235 has the following characteristics:

ITEM_BARCODE = PE600235
CONTAINER_BARCODE = PE900334
NAME = Normanby 1 Lithological Log Enclosure 2
BASIN = OTWAY
PERMIT = PE900183
TYPE = WELL
SUBTYPE = WELL_LOG
DESCRIPTION = Normanby 1 Lithological Log Enclosure 2
REMARKS =
DATE_CREATED = *
DATE_RECEIVED = 14/08/86
W_NO = W931
WELL_NAME = NORMANBY-1
CONTRACTOR = BP Petroleum
CLIENT_OP_CO = BP

(Inserted by DNRE - Vic Govt Mines Dept)