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PETROLEUM GEOCHEMISTRY REPORT

PREPARED FOR

NORSK HYDRO.

Geochemical Evaluation of Sediments from Well: 7/11-8.

April 1984.

Contents

1. Introduction

Sixty-eight cuttings samples were used for a geochemical source rock evaluation of Well: 7/11-8. Samples from depths 3000 - 4750 m (Ekofisk Formation - Triassic), Norsk Hydro data, were analysed. Maturity was determined by Vitrinite Reflectance (Ro), and Spore Colouration Indices (SCI) from Visual Kerogen analyses. UV spore fluorescence data additionally corroborated Ro data.

Total Organic Carbon (TOC) contents of the sediments were used to determine organic richness and to derive hydrogen indices (HI) and predict oil and/or gas type for kerogen rich sediments.

Concentration of head space gases in samples from 3700 m - 4750 m were measured.

Pyrolysis techniques were used to establish the hydrocarbon source potential of the Trias sediments, and the probable hydrocarbon products or source type where potentials were sufficiently high. Hydrocarbon typing by pyrolysis was supported by Visual Kerogen descriptions completed at the same depth.

2. Samples and Techniques

Cuttings samples were received in tin cans. Prior to washing the head space cuttings gases were determined by gas chromatographic separation of the C_1 - C_4 hydrocarbons using a Perkin Elmer F11 Gas Chromatograph. Results are recorded in Table 4.

Samples were then thoroughly washed with water to remove all traces of drilling mud and air dried under controlled conditions at 40°C. They were then carefully hand picked to remove obvious caved material and concentrate organic rich lithologies.

Samples for Vitrinite Reflectance measurements were ground ca 1 mm, mounted in an epoxy resin block and polished. Reflectivity values were measured using a reflected light microscope with an oil immersion objective. Results are recorded in Table 2. Histograms of reflectance distributions are presented in Figure 1. UV spore fluorescence colours are additionally recorded.

Samples for Total Organic Carbon (TOC) measurements were finely ground, sieved to homogenise and digested with fuming hydrochloric acid to remove mineral carbonate. Acid digested samples were then combusted in a Carlo Erba 1106 Carbon, Hydrogen, Nitrogen analyser and the TOC determined relative to those of calibrated standards. The results of these measurements are shown in Table 3. Repeats were run to ensure accuracy.

Samples for Screening Pyrolysis were ground, sieved and examined using a modified Hewlett-Packard 5711 Gas Chromatograph. To measure source rock potential, samples were subjected to two initial isothermal heating periods of 150°C and 325°C and then ramped to 575°C. Two peaks of interpretative significance were evolved, which are conventionally referred to as P1 and P2 and were related to those of a

calibrated standard. Standards are run daily to ensure accuracy.

3. Results and Discussion

(a) Gas Analysis

Cuttings samples from 3700 m - 4750 m were examined for their C_1 (methane) to C_4 (Butane) hydrocarbon content. From this data, gas wetness values were produced, which are shown in Table 4, and on the geochemical summary log at the front of this report.

(i) Gas Content

In all the samples examined, the C_1 to C_4 hydrocarbon contents were low. Only one sample at 4175 m - 4190 m had a C_1 - C_4 content greater than 100 ppm. Gas wetness values are high, however, indicative of thermogenic origin. Iso-butane/butane concentrations corroborate the identity of thermogenic gas. There was an increase in methane concentration at the depth intervals 4130 m - 4295 m and 4580 m - 4645 m.

(ii) Gas Wetness

The gas wetness value is produced using the following formula.

$$\text{Percent gas wetness} = \frac{C_2 + C_3 + iC_4 + nC_4}{C_1 + C_2 +_3 + iC_4 + nC_4} \times 100$$

Hunt (1979, 1), has indicated that, in a number of sedimentary basins, dry biogenic methane may be found at shallow depths, methane plus heavier gases (wet gases) in the deeper catagenic zone, followed by dry gas (thermogenic) in the deepest and oldest sediments.

In the 7/11-8 well, high wet gas contents are noted.

Low concentrations may be due to the influence of geological factors such as structural inversion or removal of section by erosion. It should be stressed that the gas contents recorded are residual amounts which have de-gassed from the sediments since drilling and cannot represent formation concentrations.

(b) Maturity

Various maturity thresholds based on Vitrinite Reflectance are documented (2,3). Generation thresholds based on Vitrinite Reflectance and Spore Colouration ratings used at Paleochem are as follows:

	Ro % (Average)	UV Fluorescence Colours	Spore Colours (1 - 7 Scale)
Oil Generation Threshold	0.45 to 0.6	Light Orange to Mid Orange	3/4 Yellow/ Orange-Orange
Peak Oil	0.7 to 1.0	Deep Orange to Orange/Red	4/5 Orange/ Brown
Gas Generation	0.7 to 1.0	Deep Orange to Red	5 Brown
Oil Floor (40 $\leq$ °API oils)	1.3	-	5/6 Brown-Black/Black
Condensate Floor	? 2.0		
Gas Floor	3.2		7 Black

The results of individual Vitrinite Reflectance measurements are shown in Table 2. In addition, histograms showing the distributions of the individual reflectance values are given at the end of this report. Minor mudrock lithologies were picked to enhance identification of phytoclasts.

Sediments from 3000 m to 4505 m contain a low phytoclast content which severely hampered maturity measurements. The sample at 3800-15 m contains a predominance of

inertinite which accounts for a high Ro index at this depth of 1.85%. The average Ro value of 0.57% at 3000 m is the only evidence for a mature sequence in the interval 3000 m to 3800 m.

Visual Kerogen descriptions on 12 samples from a depth of 3965 m to 4265 m showed that palynomorphs were absent from all sediments examined, thus these samples could not be used to obtain maturation colour ratings. Visual Kerogen data showed that samples 4190 - 4205 m and 4205 - 4220 m contained abundant quantities of lignite additive.

(c) Source Potential

Samples having Total Organic Carbon values below 0.5% are generally regarded as containing insufficient organic material to be of commercial value (3). Thus this value is used as a cut-off point in this report unless Screening Pyrolysis indicates otherwise. Source potential ratings based on conventional geochemical data are given below.

Poor	Less than 0.5% TOC
Moderate	0.5% to 1.5% TOC
Good	Greater than 1.5% TOC

Pyrolytic methods are widely used for estimating the generation capabilities of potential source rocks (4). Pyrolysis techniques complement the more traditional method of assessing hydrocarbon potential using Total Organic Carbon measurements, because they provide more meaningful data. Pyrolysis does not take into account any reworked and/or inertinite present in source rocks. Inertinite adds to the organic carbon value, but has very limited or no hydrocarbon potential.

The first peak (P1) represents the quantity of free hydrocarbons that are present in the sediment at the time of sampling. The second peak represents the quantity of hydrocarbons present and yet to be generated. The P2 peak is produced by conversion of the Kerogen content by thermal cracking in the instrument. This represents the amount of hydrocarbons yet to be generated by the complete conversion, under natural conditions, throughout future geological history. Both the P1 and P2 yields are expressed in Kg./tonne. Often samples may contain significant quantities of in-situ hydrocarbons (P1) relative to the amount of Kerogen breakdown products (P2) and during conventional pyrolysis these may elute with the P2 fraction. For this reason, samples with significant hydrocarbon potential, and where the P1 is above 10% of the P2 value, are solvent extracted prior to re-evaluation of the hydrocarbon potential. A more accurate assessment of the P2 yields is thus obtained.

Comparison of pyrolysis data with conventional geochemical data to provide hydrocarbon potential ratings gives P2 yield values in practical exploration terms of:

Poor	0.1 to 2.0 Kg./tonne rock
Moderate	2.0 to 5.0 Kg./tonne rock
Good	5.0 to 15.0 Kg./tonne rock
Excellent	> 15.0 Kg./tonne rock

In addition, P1, P3 and TOC values can be used to derive the Hydrogen Index (HI) and Production Index (PI) as follows:

$$\text{Hydrogen Index} = \frac{\text{P2 yield}}{\%\ \text{TOC}} \times 100$$

$$\text{Production Index} = \frac{P1}{P1 + P2}$$

HI is independent of the abundance of organic matter present in a sediment and can be used to determine the type of Kerogen (oil and/or gas prone) present in a source rock. In general, the higher the hydrogen index, the more oil prone the Kerogen,

The production index is a quantitative evaluation of hydrocarbon generation from Kerogen. The P1 yield represents the fraction of the Kerogen transformed into hydrocarbons unless affected by migrated or contaminant hydrocarbons. The P2 yield represents hydrocarbons yet to be generated. If unaffected by migrated or contaminant hydrocarbons, the P1/P1 + P2 ratio determines the minimum amount of hydrocarbon generation which has formerly occurred or is presently occurring. It is possible that some of the generated hydrocarbons have migrated from the mature source rock. Hence, the P1/P1 + P2 ratio represents a minimum value. A P1/P1 + P2 ratio of 0.1, equivalent to 10% generation, is therefore equated with a maturity $\geq$ OGT. If migration has not occurred, and this is not common for mature source rocks, a ratio of 0.5 is equated with $\geq$ peak oil generation.

(i) Lower Cretaceous

Two samples from the Lower Cretaceous were analysed (3700 m - 3725 m). Total Organic Carbon (TOC) content of the sediments showed moderate organic richness, 0.70% and 1.28% respectively.

No further analyses were requested for this interval.

(ii) Triassic

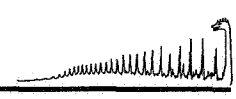
Sixty-four samples from the Triassic section were analysed for Total Organic Carbon. Lithologies were dominated by dark red mudstones with traces of coal at some levels. (Visual Kerogen descriptions showed that this coal was a lignite additive). TOC contents ranged from poor to excellent (0.07 to 0.14%). However, the excellent potential is entirely due to the presence of the lignite additive.

Screening Pyrolysis measurements for eight samples demonstrated poor P2 values (< 0.5 Kg./tonne rock), which confirms that this sequence is barren with regard to either oil or gas potential. The P2 value at 4190 - 4205 m of 7.0 Kg./ tonne rock, represents a sample containing lignite additive.

Contamination from the lignite additive meant that values obtained for hydrogen indices were meaningless and accordingly these values have not been recorded.

Visual Kerogen data showed that the sediments examined from 3965 m - 4265 m contained very little kerogen, and confirmed that these sediments have negligible source potential.

Extended Pyrolysis studies were not completed on sediments from this stratigraphic interval due to their negligible source potential.



4. Conclusions

(i) Vitrinite Reflectance measurements and Visual Kerogen descriptions show that sediments from 3000 m to 4505 m have a low phytoclast content which limits maturity measurements. A single sample at 3000 m with an average Ro value of 0.57% is the only evidence for suggesting that the sequence 3000 m to 3800 m lies within the oil window.

(ii) Seven Trias sediments show good to excellent organic richness, but this good/excellent source potential has been attributed to the lignite additive.

Screening Pyrolysis measurements demonstrated poor P2 values (<0.5 Kg./tonne rock) which suggests that the Trias is barren with regard to either oil or gas potential. Visual Kerogen data confirmed this negligible source potential.

References

1. Hunt J.M. — Petroleum Geochemistry and Geology, pp 178 - 182 (1979).

2. Saxby J.D. — "A Re-assessment of the Range of Kerogen Maturities in which Hydrocarbons are Generated", J. Pet. Geol, 5, 2, pp 117 - 128 (1982).

3. Dow W.G. — J. Geochem, Expl. 7, pp 79 - 99, (1977).

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Well No: 7/11-8

LITHOLOGY DESCRIPTION

Depth (m)	Type	Description
3000	Cu	100% Shale, dark grey/green.
3500	Cu	95% Limestone, creamy-white, 5% Shale dark green.
3700	Cu	50% Mudstone, dark grey/green, 50% Limestone, grey/white.
3710-25	Cu	50% Mudstone, dark red, calcareous, 30% Shale, dark grey/green, 20% LST + iron fillings.
3725-40	Cu	70% Mudstone, dark red, calcareous, 28% Shale, medium grey, 2% LST.
3740-55	Cu	80% Mudstone, dark red, calcareous, 20% Shale, medium grey.
3755-70	Cu	70% Mudstone, dark red, calcareous, 28% Shale, medium grey, 2% Limestone.
3770-85	Cu	80% Sandstone, dark red/grey white, 20% Shale, medium grey.
3785-3800	Cu	90% Mudstone, dark red, calcareous, 8% Shale, medium grey, calcareous, 2% white limestone.
3800-15	Cu	90% Mudstone, dark red, calcareous, 8% Shale, medium grey, calcareous, 2% white limestone.
3815-30	Cu	80% Calcareous / quartzitic sand, 10% Mudstone, dark red, 10% Shale medium grey.
3830-45	Cu	80% Calcareous/quartz sand, 10% Mudstone, dark red, calcareous, 10% Shale, medium grey.
3845-60	Cu	80% Calcareous/quartzitic sand, 10% Mudstone, dark red, calcareous, 10% Shale, medium grey, calcareous.
3860-75	Cu	80% Calcareous/quartzitic sand, 10% Mudstone, dark red, calcareous, 10% Shale, medium grey, calcareous.

Table 1.

Well No: 7/11-8

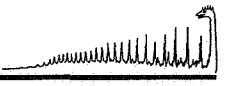
Depth (m)	Type	Description
3875-90	Cu	95% Calcareous/quartzitic sand, 3% Mudstone, dark red, 2% Shale, grey.
3890-3905	Cu	90% Calcareous/quartzitic sand, 5% Mudstone, dark red, 5% Shale, grey.
3905-20	Cu	95% Calcareous/quartzitic sand, 3% Mudstone, dark red, calcareous, 2% Shale, medium, grey.
3925-34	Cu	80% Calcareous/quartzitic sand, 10% Mudstone, red, calcareous, 10% Shale, medium, grey.
3935-50	Cu	40% Limestone, pinky-white, 10% Sandstone, grey-white, 25% Mudstone, red, 25% Shale, grey.
3950-65	Cu	80% Calcareous/quartzitic sand, 10% Mudstone, red, calcareous, 10% Shale, medium, grey, calcareous.
3965-80	Cu	50% Limestone, pinky-white, 40% Mudstone, red, calcareous, 10% Shale, medium grey, calc.
3980-95	Cu	80% Mudstone, dark red, calcareous, 20% Limestone, pink/white.
3995-4010	Cu	80% Mudstone, dark red, 20% Limestone, pink/white, trace coal.
4010-25	Cu	80% Mudstone, dark red, 20% Limestone, pink/white, trace coal.
4025-40	Cu	80% Mudstone, dark red, 10% dark grey mudstone, 10% coal.
4040-55	Cu	80% Mudstone, dark red, 5% Mudstone, medium grey, 15% Limestone, pink/white, trace coal.
4055-70	Cu	70% Mudstone, dark red, 10% Mudstone, light grey, calcareous, 20% SST, white/grey, trace coal.
4070-85	Cu	70% Mudstone, dark red, 10% Mudstone, light grey, calcareous, 20% SST, white/grey.
4085-4100	Cu	90% Mudstone, dark red, 10% Mudstone, light grey, calcareous.

Table 1 - continued.

Well No: 7/11-8

Depth (m)	Type	Description
4100-15	Cu	70% Limestone, pink/white, 25% Mudstone, dark red, 5% Mudstone, green/grey, trace coal.
4115-30	Cu	70% Limestone, pink/white, 25% Mudstone, dark red, 5% Mudstone, green/grey.
4130-45	Cu	70% Limestone, pink/white, 20% Mudstone, dark red, 10% Mudstone, green/grey, trace coal.
4145-60	Cu	70% Limestone, pink/white, 20% Mudstone, dark red, 10% Mudstone, green/grey, trace coal.
4160-75	Cu	20% Mudstone, dark red, 70% Limestone, pink/white, 10% Mudstone, green/grey, trace coal.
4175-90	Cu	30% Mudstone, dark red, 65% Limestone, pink/white, 5% coal, trace coal.
4190-4205	Cu	30% Mudstone, dark red, 65% Limestone, pink/white, 5% coal.
4205-20	Cu	30% Mudstone, dark red, 65% Limestone, pink/white, 5% Coal, dull.
4220-35	Cu	45% Mudstone, dark red, 45% Limestone, pink/white, 10% Coal, dull.
4235-50	Cu	45% Mudstone, dark red, 45% Limestone, pink/white, 10% Coal, dull.
4250-45	Cu	45% Mudstone, dark red, 45% Limestone, pink/white, 10% Coal.
4265-80	Cu	40% Mudstone, dark red, 60% Limestone, pink/white, trace coal.
4280-95	Cu	40% Mudstone, dark red, calcareous, 10% Shale, medium grey, 50% Limestone, pink/white.
4295-4310	Cu	40% Mudstone, dark red, calcareous, 10% Shale, medium grey, 50% Limestone pinky/white.
4310-25	Cu	40% Mudstone, dark red, calcareous, 10% Shale, medium grey, 50% Limestone, pinky/white.

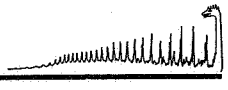
Table 1 - continued.



Well No: 7/11-8

Depth (m)	Type	Description
4325-40	Cu	35% Mudstone, dark red, calcareous, 15% Shale, medium grey, 50% Limestone, pink/white.
4340-55	Cu	30% Shale, medium grey, 35% Limestone, pinky/white, 35% Mudstone, dark red.
4355-70	Cu	60% Mudstone, medium green/grey-red, slightly calcareous, 40% Limestone, white.
4370-85	Cu	60% Mudstone, dark red, calcareous, 40% Limestone, white shale, dark grey, trace coal.
4385-4000	Cu	60% Mudstone, dark red, calcareous, 35% Limestone, white, 5% Shale, medium grey.
4400-15	Cu	60% Mudstone, dark red, calcareous, 35% Limestone, white, 5% Shale, dark grey.
4415-30	Cu	60% Limestone, pinky/white, 35% Mudstone, dark red, calc, 5% Shale, dark grey.
4430-45	Cu	40% Limestone, pinky/white, 40% Mudstone, dark red, calc, 20% Shale, dark grey.
4445-60	Cu	60% Limestone, pinky/white, 35% Mudstone, dark red, calc, 5% Shale, dark grey.
4460-75	Cu	80% Mudstone, dark red, calc, 10% Limestone, white, 10% Shale, medium grey, calcareous.
4475-90	Cu	80% Limestone, pinky/white, 15% Mudstone, red, 5% Shale, med-dark grey.
4590-4505	Cu	80% Limestone, pinky/grey-white, 10% Mudstone, red, calc, 10% Shale, grey, calc.
4505-20	Cu	80% Limestone, pinky/grey-white, 20% Mudstone, dark red, trace - grey shale.
4520-35	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4535-50	Cu	80% Limestone, pinky-grey-white, 15% Mudstone, dark red, 5% Shale grey.

Table 1 - continued.



Well No: 7/11-8

Depth (m)	Type	Description
4550-65	Cu	80% Limestone, pink/white, 20% Mudstone, dark red, trace coal.
4565-80	Cu	80% Limestone, pink/white, 20% Mudstone, dark red.
4580-4600	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4600-45	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4645-75	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4675-4705	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4705-20	Cu	80% Limestone, pink/grey/white, 20% Mudstone, dark red.
4720-35	Cu	60% Limestone, dark red/white, 30% Mudstone, dark red, 10% Mudstone, light grey, calc.
4735-50	Cu	80% Limestone, dark red/white, 20% Siltstone, dark red, trace coal.

Table 1 - continued.

Well No: 7/11-8

VITRINITE REFLECTANCE DATA

Depth (m)	Lithology	Special Mineralogy	Bitumen Form	Bitumen Content	Phytoclasts Inert/Rew/Vit.	Fluorescence Typ/Cont/Col.	Vitrinite Ro_{Av} (Points)
3000	Shale	Haematite Traces	Staining+ Wisps	Trace	Inert = Vit.	Sp/Tr/LO	$0.51_{(4)}$ $0.66_{(3)}$
3500	Shale	Graphite/ Glauconite	Wisps+ Staining	Low	Inert = Vit.	Sp/Mod./GY-YO	$0.44_{(11)}$
3800-15	Shale	Glauconite/ Graphite	-	-	Inert > Rew.	Sp/Tr/DR	$1.85_{(2)}$
4190-4205	Shale + Coal	Graphite+ Iron Oxide	-	-	Vit.	Sp/Tr/GY-DR	$0.24_{(20)}$
4205.20	Shale + Coal	Iron Oxide	-	-	Vit.	Sp/High/GY-Y	$0.35_{(25)}$
4490-4505	Shale + Tr. Coal	Iron Oxide	-	-	Vit.	NDP	$0.30_{(6)}$
4505.20	Silty Shale	Graphite	-	-	Inert	NDP	NDP

Table 2.

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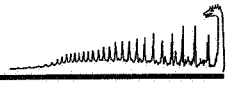
Well No: 7/11-8

T.O.C. AND PYROLYSIS DATA

Depth (m)	TOC	Yield (Kg./tonne) P1 Peak	P2 Peak	Hydrogen Index	Production Index
3700	0.70				
3710-25	1.28				
3725-40	0.19				
3740-55	0.27				
3755-70	0.15				
3770-85	0.18				
3785-3800	0.20				
3800-15	0.15				
3815-30	0.17				
3830-45	0.22				
3845-60	0.22				
3860-75	0.23				
3875-90	0.22				
3890-3905	0.25				
3905-20	0.92				
3920-35	0.42				
3935-50	0.16				
3950-65	0.33				
3965-80	1.64				
3980-95	13.16	0.1	0.1		0.5
3995-4010	1.57	0.1	0.1		0.5
4010-25	1.09	0.7	0.1		0.9

Table 3



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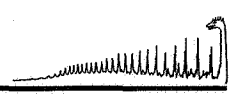
Well No: 7/11-8

T.O.C. AND PYROLYSIS DATA

Depth (m)	TOC	Yield (Kg./tonne) P1 Peak	P2 Peak	Hydrogen Index	Production Index
4025-40	0.46				
4040-55	0.14				
4055-70	0.23				
4070-85	0.10				
4085-4100	0.15				
4100-15	0.25				
4115-30	0.18				
4130-45	0.17				
4145-60	0.53				
4160-75	0.46				
4175-90	0.66	0.1	0.1		0.5
4190-4205	6.8	1.4	7.0		0.2
4205-20	14.1	0.4	0.2		0.7
4220-35	11.5	0.1	0.2		0.3
4235-50	0.15				
4250-65	3.7	0.1	0.2		0.3
4265-80	0.17				
4280-95	0.11				
4295-4310	0.20				
4310-25	0.17				
4325-40	0.16				
4340-55	0.29				
4355-70	0.14				
4370-85	0.15				

Table 3 - continued



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Well No: 7/11-8

T.O.C. AND PYROLYSIS DATA

Depth (m)	TOC	Yield (Kg./tonne) P1 Peak	Yield (Kg./tonne) P2 Peak	Hydrogen Index	Production Index
4385-4400	0.07				
4400-15	0.12				
4415-30	0.17				
4430-45	0.32				
4445-60	0.14				
4460-75	0.24				
4475-90	0.16				
4490-4505	0.12				
4505-20	0.13				
4520-35	0.30				
4535-50	0.23				
4550-65	0.64				
4565-80	0.14				
4580-4600	0.16				
4600-45	0.19				
4645-75	0.07				
4675-05	0.21				
4705-4720	0.24				
4720-35	0.18				

Table 3 - continued

Well No: 7/11-8

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HEADSPACE GASES DATA

Concentration (Vol. PPM of samples) of C_1 - C_4 Hydrocarbons

Depth (m)	Methane (C_1)	Ethane (C_2)	Propane (C_3)	Isobutane (iC_4)	Butane (nC_4)	Total C_1-C_4	Total C_2-C_4	Gas Wetness (%)
3700	17.5	13.7	6.0	18.5	35.5	91.2	73.7	80.8
3710-25	18.4	5.0	1.0	0.6	2.9	27.9	9.5	34.0
3725-40	2.5	1.4	0.8	0.3	1.2	6.2	3.7	59.7
3740-55	2.2	2.3	1.2	0.3	1.2	7.2	5.0	69.4
3755-70	6.3	2.1	0.6	0.4	0.9	10.3	4.0	38.8
3770-85	2.1	1.6	0.6	0.4	0.9	5.6	3.5	62.5
3785-3800	1.7	1.0	0.4	0.3	0.6	4.0	2.3	57.5
3800-15	1.3	0.8	1.0	0.4	1.5	5	3.7	74.0
3830-45	6.8	2.2	1.1	0.2	0.8	11.1	4.3	38.7
3845-60	6.8	0.7	0.3	-	0.2	8	1.2	15.0
3860-75	9.0	0.7	0.4	0.1	0.3	10.5	1.5	14.3
3875-90	4.9	0.9	0.5	-	-	6.3	1.4	22.2
3890-3905	8.0	1.9	0.5	0.3	0.7	11.4	3.4	29.8

Table 4

Well No: 7/11-8

PALEOCHEM

HEADSPACE GASES DATA

Concentration (Vol. PPM of samples) of C_1 - C_4 Hydrocarbons

Depth (m)	Methane (C_1)	Ethane (C_2)	Propane (C_3)	Isobutane (iC_4)	Butane (nC_4)	Total C_1-C_4	Total C_2-C_4	Gas Wetness (%)
3905-20	5.7	1.3	0.5	0.4	1.0	8.9	3.2	36.0
3920-35	7.7	2.3	1.2	0.2	0.7	12.1	4.4	36.4
3935-50	12.4	2.2	0.3	0.2	0.5	15.6	3.2	20.5
3950-65	14.1	2.4	0.4	0.2	0.6	17.7	3.6	20.3
3965-80	3.9	1.5	0.9	0.3	0.5	7.1	3.2	45.1
3980-95	11.9	8.7	2.4	0.3	1.4	24.7	12.8	51.8
3995-4010	15.9	3.0	0.6	0.2	0.6	20.3	4.4	21.7
4010-25	17.1	2.7	1.2	0.3	2.9	24.2	7.1	29.3
4025-40	5.6	1.7	0.8	0.2	1.7	10.0	4.4	44.0
4040-55	10.0	2.4	0.6	0.2	1.7	14.9	4.9	32.9
4055-70	13.0	3.1	0.8	0.3	2.0	19.2	6.2	32.3
4070-85	6.7	2.2	0.8	0.3	1.2	11.2	4.5	40.2
4085-4100	6.6	2.1	1.2	-	1.4	11.3	4.7	41.6
4100-15	16.3	5.3	1.3	0.2	0.9	24.0	7.7	32.1

Table 4 continued

Well No: 7/11-8

HEADSPACE GASES DATA

Concentration (Vol. PPM of samples) of C_1 - C_4 Hydrocarbons

Depth (m)	Methane (C_1)	Ethane (C_2)	Propane (C_3)	Isobutane (iC_4)	Butane (nC_4)	Total C_1-C_4	Total C_2-C_4	Gas Wetness (%)
4115-30	12.7	2.5	0.8	-	0.7	16.7	4.0	24.0
4130-45	23.3	3.1	1.3	0.3	1.3	29.3	6.0	20.5
4145-60	58.5	11.8	2.1	0.3	0.8	73.5	15.0	20.4
4160-75	26.7	9.2	2.1	0.3	0.9	39.2	12.5	31.9
4175-90	85.7	12.6	2.3	0.4	0.8	101.8	16.1	15.8
4190-4205	61.4	2.5	0.9	0.1	0.6	65.5	4.1	6.3
4205-20	13.8	1.7	0.6	-	0.5	16.6	2.8	16.9
4220-35	33.3	6.0	1.0	0.3	0.7	41.3	8.0	19.4
4235-50	9.7	2.7	0.8	-	0.4	13.6	2.9	21.3
4250-65	49.3	10.3	1.0	0.3	0.9	61.8	12.5	20.2
4265-80	33.3	7.1	1.1	0.4	1.3	43.2	9.9	22.9
4280-95	33.0	3.7	0.8	0.5	0.6	38.6	5.6	14.5
4295-4310	5.6	1.4	0.6	0.3	0.4	8.3	2.7	32.5
4310-25	5.3	1.2	0.5	0.2	0.6	7.8	2.5	32.1

Table 4 continued

Well No: 7/11-8

PALEOCHEM

HEADSPACE GASES DATA

Concentration (Vol. PPM of samples) of C_1 - C_4 Hydrocarbons

Depth (m)	Methane (C_1)	Ethane (C_2)	Propane (C_3)	Isobutane (iC_4)	Butane (nC_4)	Total C_1-C_4	Total C_2-C_4	Gas Wetness (%)
4325-40	4.8	0.8	0.3	0.3	0.5	6.7	1.9	28.4
4340-55	4.5	1.7	0.5	0.5	0.2	7.4	2.9	39.2
4355-70	7.1	3.3	0.4	0.1	0.3	11.2	4.1	36.6
4370-85	6.9	2.7	0.6	-	0.2	10.4	3.5	33.7
4385-4400	2.8	1.1	0.8	-	-	4.7	1.9	40.4
4400-15	5.6	1.5	0.9	0.2	0.7	8.9	3.3	37.1
4415-30	4.9	1.6	0.8	0.3	0.6	8.2	3.3	40.2
4430-45	9.3	1.3	0.5	0.1	0.3	11.5	2.2	19.1
4445-60	8.8	3.5	0.6	0.2	0.7	13.8	5.0	36.2
4460-75	5.1	1.9	0.5	0.2	0.6	8.3	3.2	38.6
4475-90	12.5	2.5	0.6	0.3	0.5	16.4	3.9	23.8
4490-4505	11.3	1.6	0.4	0.2	0.4	13.9	2.6	18.7
4505-20	13.9	3.1	0.7	0.3	1.2	19.2	5.3	27.6

Table 4 continued

Well No: 7/11-8

PALEOCHEM

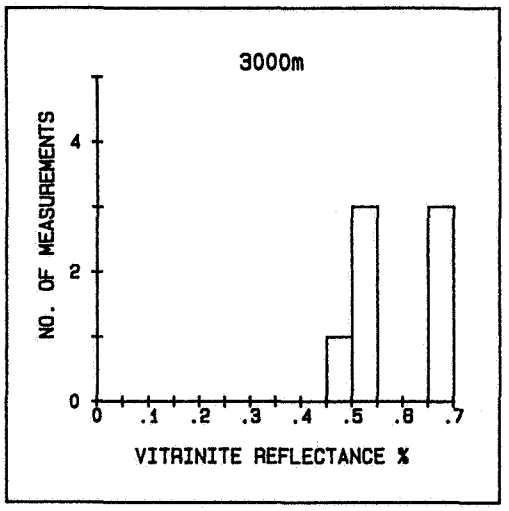
VISUAL KEROGEN DATA

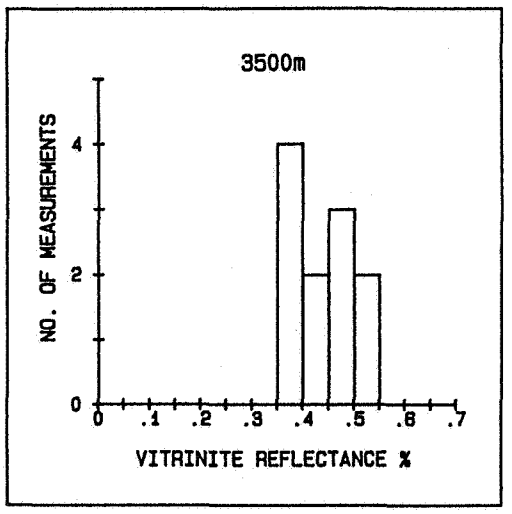
Depth (m)	Palynomorphs	Cuticles	Brown Wood	Black Wood	Amorphous	Predominant Source Type	Colour Maturation Rating
3965-80						Barren	NDP
3980-95			Trace			None	NDP
3995-4010			Trace	Trace		None	NDP
4010-25			Trace	Trace	Trace	None	NDP
4143-60				Trace	Trace	None	NDP
4160-75						Barren	NDP
4175-90						Barren	NDP
4190-4205						Barren	NDP
4205-20						Barren	NDP
4220-35						Barren	NDP
4235-50						Barren	NDP
4250-65			Trace	Trace	Trace	None	NDP

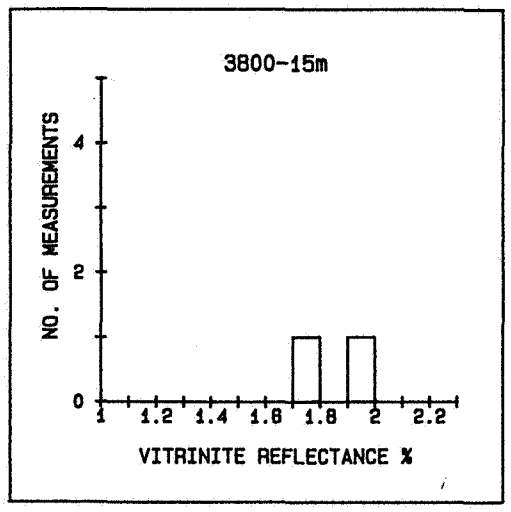
Table 5.

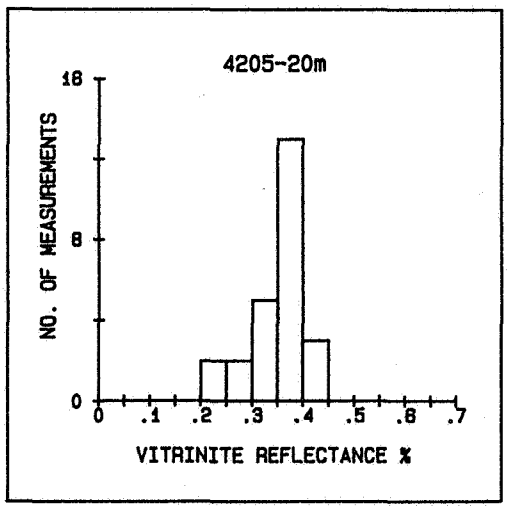
PALEOCHEM

7/11-8 VITRINITE REFLECTANCE DISTRIBUTIONS









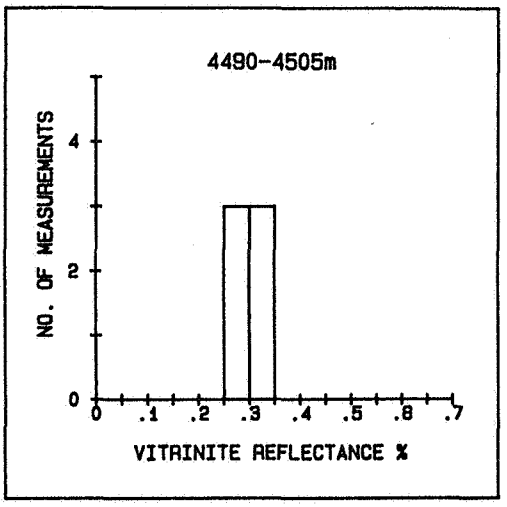


Fig.1

PALEOCHEM

SHORT FORM GEOCHEMICAL LOG

WELL: 7/11-8