REPORT TITLE

SOURCE ROCK ANALYSES OF WELL 2/1-3

CLIENT

BP PETROLEUM DEVELOPMENT OF NORWAY A/S

CLIENT's REF.:	REPORT NO.:
Andy Grainge	

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SUMMARY:

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KEY WORDS

SUMMARY

Based on the light hydrocarbon data and core information, the well is divided into nine zones which are given the following rating.

A: 2200-2820 m: Immature, goode potential as a source rock for oil and gas.

B: 2820-2970 m: Immature, fair potential as a source rock for oil and gas.

C: 2980-3390 m: Moderate mature, poor potential as a source rock for oil and gas. Indications of free HC in parts.

D: 3390-3600 m: Moderate mature, poor potential as a source rock for oil and gas.

Thin intervals in zone C and D have a fair potential as source rocks for heavy oil.

E: 3600-3720 m: Mature, poor to fair potential as a source rock for gas.

F: 3720-3820 m: Mature.
3720-3795 m: Fair/good potential as a source rock for oil and gas.
3795-3813 m: Rich potential as a source rock for oil and gas.

G: 3820-3900 m: Mature. This interval is cored. Signs of free HC in side-wall cores. The silty claystone in lower part has a good potential as a source rock for oil and gas.

H: 3900-3950 m: Mature. Good potential as a source rock for oil and gas.

I: 3950-4296 m: Oilwindow maturity.
3950-4050 m: Good potential as a source rock for gas.
4050-4296 m: Poor potential as a source rock for gas.

Maturity increases sharply between 3950 and 4000 m.

EXPERIMENTAL AND DESCRIPTION OF INTERPRETATION LEVELS

Headspace gas analyses.

One ml. of the headspace gas from each of the cans was analysed gas chromatographically for light hydrocarbons. The results are shown in Table Ia. The canned samples were washed with temperated water on 4, 2, 1 and 0.125 mm sieves to remove drilling mud and thereafter dried at 35^{o}C.

Occluded gas.

An aliquote of the 1-2 mm fraction of each sample before drying was crushed in water using an airtight ball mill, and one ml of the headspace analysed gas chromatographically. The results are shown in Table Ib.

Total Organic Carbon (TOC).

Picked cuttings of the various lithologies in each sample were crushed in a centrifugal mill. Aliquotes of the samples were then weighted into Leco cruisibles and treated with hot 2N HCl to remove carbonate and washed twice with distilled water to remove traces of HCl. The crusibles were then placed in a vacuum oven at 50^{o}C and evacuated to 20 mm Hg for 12 hrs. The samples were then analysed on a Leco E C 12 carbon determinator, to determine the total organic carbon (TOC).

Extractable Organic Matter (EOM)

From the TOC results samples were selected for extraction. Of the selected samples, approximately 100 gm of each was extracted in a flow through system (Radke et al., 1978 (Anal. chem. 49, 663-665)) for 10 min. using dichloromethane (DCM) as solvent. The DCM used as solvent was distilled in an all glass apparatus to remove contaminants.

Activated copper filings were used to remove any free sulphur from the samples.

After extraction, the solvent was removed on a Buchi Rotavapor and transferred to a 50 ml flask. The rest of the solvent was then removed and the amount of extractable organic matter (EOM) determined.

Chromatographic Separation.

The extractable organic matter (EOM) was separated into saturated fraction, aromatic fraction and non hydrocarbon fraction using a MPLC system with hexane as eluant (Radke et al., Anal. Chem, 1980). The various fractions were evaluated on a Buchi Rotavator and transferred to glas-vials and dried in a stream of nitrogen. The various results are given in Table III-VI.

Gas chromatographic analyses.

The saturated fraction was diluted with n-hexane and analysed on a HP 5730 A gaschromatograph, fitted with a 25 m OV101 glasscapillary column and an automatic injection system. Hydrogen (0.7 ml/min.) was used as carrier gas and the injection was performed in the splitt mode (1:20).

Vitrinite Reflectance.

Samples, taken at various intervals, were sent for vitrinite reflectance measurements at Geoconsultants, Newcastle-upon-Tyne. The samples were mounted in Bakelite resin blocks; care being taken during the setting of the plastic to avoid temperatures in excess of 100^{o}C. The samples where then ground, initially on a diamond lap followed by two grades of corundum paper. All grinding and subsequent polishing stages in the preparation were carried out using isopropyl alcohol as lubricant, since water leads to the swelling and disintegration of the clay fraction of the samples.

Polishing of the samples was performed on Selvyt cloths using three grades of alumina, 5/20, 3/50 and Gamma, followed by careful cleaning of the surface.

Reflectance determinations were carried out on a Leitz M.P.V. microphotometer under oil immersion, R.I. 1.516 at a wavelength of 546 nm. The field measured was varied to suit the size of the organic particle, but was usually of the order of 2 micron diameter.

The surface of the polished block was searched by the operator for suitable areas of vitrinitic material in the sediment. The reflectance of the organic particle was determined relative to optical glass standards of known reflectance. Where possible, a minimum of twenty individual particles of vitrinite was measured, although in many cases this number could not be achieved.

The samples were also analysed in UV light, and the colour of the fluoressing material determined. Below, a scale comparing the vitrinite reflectance measurements and the fluorescence measurements are given.

VITRINITE REFLECTANCE R.AVER. 546nm 1·516		0·20, 0·30, 0·40, 0·50, 0·60, 0·70, 0·80, 0·90, 1·00, 1·10
% CARBON CONTENT D.A.F.		57, 62, 70, 73, 76, 79, 80·5, 82·5, 84, 85·5
LIPTINITE FLUOR. EXC. 400nm BAR. 530nm	nm	725, 750, 790, 820, 840, 860, 890, 940
	COLOUR	G, G/Y, Y, Y/O, L.O., M.O., D.O., O/R, R
	ZONE	1, 2, 3, 4, 5, 6, 7, 8, 9

NOTE LIPTINITE NM = NUMERICAL MEASUREMENT OF OVERALL SPORE COLOUR AND NOT PEAK FLUORESCENCE WAVELENGTH

RELATIONSHIP BETWEEN LIPTINITE FLUORESCENCE COLOUR, VITRINITE REFLECTANCE AND CARBON CONTENT IS VARIABLE WITH DEPOSITIONAL ENVIRONMENT AND CATAGENIC HISTORY. THE ABOVE IS ONLY A GUIDE. LIPTINITE WILL OFTEN APPEAR TO PROGRESS TO DEEP ORANGE COLOUR AND THEN FADE RATHER THAN DEVELOP O/R AND RED SHADE. TERMINATION OF FLUORESCENCE IS ALSO VARIABLE.

Processing of Samples and Evaluation of Visual Kerogen

Crushed rock samples were treated with hydrochloric and hydrofluoric acids to remove the minerals. A series of microscopic slides contain strew mounts of the residue:

T-slide represents the total acid insoluble residue.
N-slide represents a screened residue (15 μ meshes).
O-slide contains palynodebris remaining after flotation ($Zn\ Br_2$) to remove disturbing heavy minerals.
X-slides contain oxidized residues, (oxidizing may be required due to sapropel which embeds palynomorphs, or to high coalification preventing the identification of the various groups).

T and/or O slides are necessary to evaluate kerogen composition/palynofacies which is closely related to sample lithology.

Screened or oxidized residues are normally required to consentrate the larger fragments, and to study palynomorphs (pollen, spores and dinoflagellates) and cuticles for paleodating and colour evaluation.

So far visual evaluations of kerogen have been undertaken from residues mounted in glycerine jelly, and studied by Leitz Dialux in normal light (halogene) using x10 and x63 objectives. By x63 magnification it is possible to distinguish single particles of diameters about 2 μ and, if wanted, to make a more refined classification of the screened residues (particles >15).

The colour evaluation is based on colour tones of spores and pollen (preferably) with support from other types of kerogen (woody material, cuticles and sapropel). These colours are dependant upon the maturity, but also are under influence of the paleo-environment (lithology of the rock, oxidation and decay processes). The colours and the estimated colour index of an individual sample may therefore deviate from those of the neighbouring samples. The techniques in visual kerogen studies are adopted from (Staplin 1969 and Burgess 1974).

In interpretation of the maturity from the estimated colour indices we follow a general scheme that is calibrated against vitrinite reflectance values (R_o).

R_o	0.45	0.6	0.9	1.0	1.3	
Colour index	2-	2	2+	3-	3	3+
Maturity intervals	1 Moderate mature	Mature (oil window)			Very mature	

Rock-Eval Pyrolyses.

100 mg crushed sample was put into platinum crusible whose bottom and cover are made of sintered steal and analysed on a Rock-Eval pyrolyser.

RESULTS AND DISCUSSION

Light Hydrocarbons

Headspace and occluded gas analyses were undertaken on all the canned samples received for analyses, from the sequence 2200 - 4296 m (TD). Later we were informed that cores were taken in the intervall 3820 - 3900 m and it is therefore assumed that the cuttings analysed in the canned samples from this interwall, are downfall. This interval is separated out as a separate zone in the discussion. Based on the light hydrocarbon analyses, the analysed sequence is separated into nine different zones; A: 2200 - 2820 m, B: 2820 - 2970 m, C: 2980 - 3390 m, D: 3390 - 3600 m, E: 3600 - 3720m, F: 3720 - 3820 m, G: 3820 - 3900 m, H: 3900 - 3950 m and I: 3950 - 4296 m.

A: 2200 - 2820 m:

This zone has a good abundance of C_1-C_4 hydrocarbons, while the abundance of C_5-C_7 hydrocarbons is poor to fair throughout the zone. The isobutane n-butane (iC_4/nC_4) ratio is rather high for most of the zone but decreases rapidly from 2700 m. The gas is rather dry but increases in wetness towards the lower part of the zone.

B: 2820 - 2970 m:

This zone is separated from zone A mainly due to a slight increase in the C_5 - C_7 hydrocarbon abundance, at the same time as the wetness of the gas shows an increase compared to zone A. This could indicate some migrated hydrocarbons in the small sandlenses between 2800 and 2850 m.

C: 2980 - 3390 m:

The abundances of C_1 - C_4 and C_5 - C_7 hydrocarbons drop sharply at the top of this zone and the whole zone has poor abundances of C_1 - C_4 and C_5 - C_7 hydrocarbons.

D: 3390 - 3600 m:

The abundance of C_5 - C_7 hydrocarbons shows a slight increase in this zone compared to the zone above, at the same time as the wetness of the gas shows an increase.

E: 3600 - 3720 m:

The abundances of both C_1 - C_4 and C_5 - C_7 hydrocarbons drops in this zone compared to the zone above. A simular drop is also seen for the wetness of the gas and the iC_4/nC_4 ratio.

F: 3720 - 3820 m:

The abundances of both C_1 - C_4 and C_5 - C_7 hydrocarbons increases in this zone compared to the zone above, and both show a good abundance. The wetness of the gas and the iC_4/nC_4 ration is rather constant.

G: 3820 - 3900 m:

The abundance of light hydrocarbons drops sharply at the top of this zone. Since cores are taken in this zone and the cuttings analysed there are downfall, hydrocarbons accumulated in this zone will not be recorded.

H: 3900 - 3950 m:

The abundance of light hydrocarbons in this zone is close to the levels found in the lower part of zone F. The iC_4/nC_4 ratio and the wetness of the gas are also similar to zone F.

I: 3950 - 4296 m:

The abundance of C_5 - C_7 hydrocarbons drops slightly compared to zone H, showing a fair abundance. The other measured parameters are similar to those found in zone F.

Total Organic Carbon

A: 2200 - 2820 m:

The upper part of this zone, down to 2600 m, shows a good abundance of organic carbon (1.4 - 2%) while the lower part shows a fair abundance (0.6 - 0.9%).

B: 2820 - 2970 m:

The TOC values vary a lot in this zone, 0.5 - 1.8%, but on the whole the zone has TOC values similar to the lower part of zone A.

C: 2980 - 3390 m:

A zone consisting mainly of limestone. However, a fair amount of claystone in some of the samples and where 15 % or more of claystone was recorded, TOC was also measured on this fraction. The TOC values of the claystone increases with increasing depth (0.6 - 1.2%). The limestone at the top of the zone has low TOC values, approximately 0.2%. Values like this is normally found for limestone in the southern part of the N.S. Towards the lower part of the zone, from approximately 3200 m higher TOC values are recorded, some of them above 1.0%. This would then indicate a larger input of organic material, and these limestone lences could then work as possible source rocks.

D: 3390 - 3600 m:

The TOC values for the claystone in this zone decreases with increasing depth. The TOC values of the limestone is very irregular. This would then indicate that there might be thin beds with organic carbon rich limestone together with limestone beds with poor abundance of TOC.

E: 3600 - 3720 m:

A zone with claystone showing only a fair abundance of organic carbon.

F: 3720 - 3820 m:

The TOC values of the claystone cuttings in this intervall vary a lot. The two uppermost samples have TOC values at approximately 1% while the lowermost sample is found to have TOC value at 2% organic carbon.

G: 3820 - 3900 m:

Cores taken in this intervall, all readings on downfall.

H: 3900 - 3950 m:

Again a zone with relativly low TOC values, approximately 0.7%.

G: 3950 - 4296 m:

The uppermost part of this zone, down to 4070 m have TOC values similar to those found in zone H, while the lower 200 m of the zone, with exception of sample 4230 - 60 m, have very low TOC values, in the range of 0.4 - 0.5%.

Total Organic Carbon Measurements on Sidewall Cores and Corechips.

Sixteen sidewall cores and one corechip were analysed for organic carbon, Table IIB. The main bulk of the sidewall cores were only small fragments which were used for biostratigraphical purposes, and in the selection of sidewall cores for organic carbon measurements, emphasies were put on the possibilities of proving or disproving anomelies found when analysing the cuttings.

No samples were analysed from zone A, while one sample, 2950 m were analysed from zone B. The TOC result of 1.46% organic carbon is in agreement with the high value found in the cuttings from this level.

Zone C mainly consists of limestone, and some of these have high TOC values for limestones. Unfortunately very few sidewall cores were available from the interesting depths, but one sample, 3475 m, with a value of 0.50% organic carbon, verify that some of the limestone have high organic carbon values.

From 3775 to 3813 m, samples at close intervalls were analysed, and the intervall from 3795 - 3813 m is found to have very high TOC values, approximately 4 - 7%. This indicate that the cuttings from this intervall is lost in the samplingprosess since there is only very small amounts of them in the canned samples, and they were not analysed in the screening analyses.

The analysed samples form the lower part of the well are mainly siltstone, with relatively high organic carbon values, especially for the sample from 4012 m. This is caused by stringers of coal in the sample.

Extraction and chromatographic separation

A: Two samples, 2280 - 2310 m and 2520 - 2550 m, from this zone were extracted, and both found to have a good abundance of extractable hydrocarbons. The gas chromatograms of the saturated hydrocarbon fractions of the two samples, both show pristane to be the major component. High CPI values indicate both samples to be immature.

B: One sample, 2940 - 70 m, from this zone was extracted, showing a fair abundance of extractable hydrocarbons. The gas chromatogram of the saturated hydrocarbon fraction again show pristane to be the major component. The rest of the chromatogram varies compared to the samples from zone A, in that a new compound of significant amount is found between nC_{21}, and nC_{22}, and the CPI value of the sample is far lower than for the samples from zone A. The heavy n-alkanes are almost as abundant as the medium weight n-alkanes in this sample.

C: Samples from three different levels in this zone were analysed. Total organic carbon measurements showed the limestone in parts of this intervall to have relatively high values and three limestone samples, 3050 - 70 m, 3210 - 40 m and 3330 - 60 m together with claystone samples from 3050 - 70 m and 3330 - 60 m were analysed. The limestone samples are found to have a poor abundance of extractable hydrocarbons, while the claystone samples have a good and fair abundance of extractable hydrocarbons, respectively. The saturated/aromatic ratios show the limestone samples to have a higher proportion of aromatic hydrocarbons than the claystone samples. The claystone sample from 3050 - 70 has a high HC/TOC ratio, indicating contamination of migrated hydrocarbons in this sample. The gas chromatograms of the saturated hydrocarbon fractions vary a lot, both between the samples within this zone, and when compared with samples from the overlying zones. The claystone sample from 3050 - 70 m has a large abundance a of high and medium weight hydrocarbons with low CPI value and pristane/nC_{17} ratio, indicating together with the results described above, migrated heavy hydrocarbons in the sample. The gas chromatogram of the limestone sample from the same depthe differ from the claystone sample mainly in the front end, showing a pristane /nC_{17} ratio slightly above 1. In the upper part, the changes is mainly found in the fingerprinting of the minor compounds.

The gas chromatogram of the sample from 3210 - 40 m is different from the two samples described above. The pristane/nC_{17} ratio is low as was found in the claystone sample from 3050 - 70 m. Appart from this large variation is seen. nC_{24} is the dominating peak, and the n-alhanes trail off sharply above this level.

The gas chromatograms of the two saturated hydrocarbon fractions from 3330 - 60 show large difference. The one of the claystone sample is similar to the one of the sample from 2520 - 50, which indicate this to be cavings. The gas chromatogram of the limestone sample shows a large unresolved envelope covering the most of the chromatogram and with some unidentified peaks in the high molecular weight area. The pristane/ nC_{17} ratio and the CPI value are close to unity. Presently we do not know the reason for the large unresolved envelope and the strange peaks recorded.

D: Three samples, two limestone samples, 3480 - 3510 m and 3540 - 70 m, together with the claystone stample from 3540 - 70 m, were extracted. The sample from 3480 - 3510 m together with the claystone sample from 3540 - 70 m are found to have a poor abundance of extractable hydrocarbons, while the limestone sample from 3540 - 70 m is found to have a good abundance.

The gas chromatograms of the saturated fractions vary from sample to sample. The one of sample 3480 - 3510 m have a pristane/$nC/_{7}$ratio slightly above 1.0 and a large abundance of heavy n-alkanes. A CPI value close to unity indicates a well mature sample. The gas chromatograms of the two samples from 3540 - 70 m vary. The limestone sample from this depth has a lower pristane/nC_{17} ratio than the sample from 3480 - 3570 m, but again a large proportion of heavy n-alkanes are recorded. The gas chromatogram of the claystone fraction shows a very large pristane/nC_{17} ratio, a high CPI value, and very pronounced peaks in the sterane/triterpane region. This is an indication of low maturity and an input of terrestrical material. Presently it is not known if this material is cavings or not, but it is believed to be true material.

There are striking differences in the saturated hydrocarbon fractions of the claystone and limestone samples examined between approximately 3000 and 3600 m. The claystone are mainly found to have a low pristane/

nC_{17} ratio and low CPI value, indicating low maturity, while the limestone samples have pristane/nC_{17} ratios and CPI values close to unity, together with a large abundance of high molecular weight n-alkanes. These observations indicate and input of terrestrical material of higher maturity than what was recorded for the claystone samples. Limestone as source rocks are not common found in the N.S. and the differences seen between the claystone and limestone samples, could be a lithological effect. Some of the samples analysed might be cavenigs, but the low maturity found for the claystone samples agree with the maturity results described later in the report.

E: No samples were analysed from this zone.

F: Two samples, one consisting of sidewall cores 3795 - 3813 m, and one canned sample 3800 - 3830 m were ectraced, and both found to have a rich abundance of extractable hydrocarbons. The HC/TOC ratio of the sample from 3800 - 3830 m is very high indicating contamination of migrated hydrocarbons.

The gas chromatograms of the saturated hydrocarbon fractions are very similar, almost identical in the $C_{15}+$ region, and distinctly different from any of the analysed samples higher up in the well. The gas chromatograms are typical for well mature hydrocarbons.

G: One sample, a core chip from core 4 (3875 - 3893,5 m), was extracted and found to have a rich abundance of extractable hydrocarbon. The gas chromatogram of the saturated fraction is very similar to the ones from zone F.

H: No samples from this zone was extracted.

I: Two samples, 3950 - 80 and 4040 - 70 m, from this zone were extracted and both found to have a good abundance of extractable hydrocarbons, with approximately equal amounts of saturated and aromatic hydrocarbons. The gas chromatograms of the saturated hydrocarbon fractions are both very similar to the one from zone F, i.e. typical for well mature hydrocarbons.

VITRINITE REFLECTANCE

Thirty samples, twenty two cutting samples and eight sidewall cores were analysed. In the following each sample is described, and other information from the analyses are given.

2250 m: Shale, Ro = 0.30 (20)

The sample has only a trace of organic material with a light bitumen staining and only a few small particles of vitrinite and low reflectance reworked material. Virtually no inertinite. UV light shows a yellow to light orange fluorescence from spores and a low exinite content.

2370 m: Shale, Ro = 0.41 (22)

The sample has a variable bitumen staining and a low organic content with a few small particles and wispy particles of vitrinite and subordiante inertinite. UV light shows a yellow/orange fluorescence from spores and a low to moderate exinite content.

2500 m: Calcareous shale, Ro = 0.36 (20)

The sample has an overall light bitumen staining and wisps together with a few vitrinite wispy particles and wisps of vitrinite and subordiante inertinite. UV light shows a yellow and yellow/orange fluorescence from spore specks and a trace of exinite.

2530 m: Shale, Ro = 0.41 (21)

The sample has a low organic content with wisps and wispy particles of vitrinite and bitumen wisps and staining. Only a trace of inertinite and reworked material. UV light shows a yellow to mid-orange fluorescence from spores and a low exinite content.

2700 m: Calcareous shale, Ro = 0.41 (22)

The sample contains bitumen wisps and locallised staining together with a few vitrinite wisps and wispy particles and subordinate inertinite particles. UV light shows a yellow/orange and light orange fluorescence from spores and a trace of exinite.

2820 m: Mixed shale lithologies, Ro = 0.43 (20)

The sample has a variable organic content. Most of the cuttings are barren while some cuttings are rich in bitumen wisps with accompanying vitrinite wisps. Only a trace of inertinite is recorded. UV light shows a light orange fluorescence from spores and a low to moderate exinite content.

2880 m: Red and grey shale, Ro = 0.38 (21)

The red shale is barren. The grey shale has a large amount of bitumen wisps with about equal proportions of vitrinite wispy paticles and inertinite/-

reworked material. UV light shows a light orange fluorescence from spores and a low to moderate exinite content.

<u>2940 m: Shale, Ro = 0.34 (22)</u>
The sample has a low organic content with some lignite particles and a few vitrinite paricles in the shale matrix. A slight bitumen staining is recorded. UV light shows a light to mid orange fluorescence from spores and a low exinite content.

<u>3050 m: Red and white shale</u> No determination possible.
The red shale is barren. Inertinite and high reflectance reworked particles are recorded in the white shale, but no vitrinite. UV light shows a variable carbonate fluorescence and a light orange fluorescence from spore specks together with a trace of exinite.

<u>3140 m: Red, grey and white shale, Ro = 0.52 (7)</u>
The red shale is barren. The grey shale contains some bitumen staining together with a low content of interinite and reworked material with only a trace of vitrinite wispy particles. UV light shows a few mid.orange fluorescing spores and a low exinite content.

<u>3210 m: Red shale, Ro = 0.49 (4)</u>
The sample is barrren except for a few unoxidised shale areas containing occasional vitrinite particles. UV light shows a yellow and yellow/orange fluorescence from spores in a few cuttings and a trace of exinite.

<u>3268 m: Light shale. No determiation poosible</u>
The sample has a trace of small bitumen specks. No phytoclasts are recorded. UV light shows an overall carbonate fluorescence and no exinite.

<u>3300 m: Shale, Ro = 0.41 (5) and Ro = 0.61 (1)</u>
The sample is rich in bitumen blebs and small wisps and virutally no phytoclasts. A few particles of inertinite and reworked material and only a trace of possible vitrinite. UV light shows a light and mid.orange fluorescence from spores and hydrocarbon specks together with a moderate exinite content.

<u>3480 m: Calcareous shale, Ro = 0.44 (21)</u>

The sample has a low organic content with bitumen wisps and a few particles and wispy particles of vitrinite. Virtaully no inertinite or reworked material are recorded. UV light shows a light and mid.orange fluorescence from spores and a low exinite content.

<u>3505 m: Fine grained limestone, Ro = 0.36 (5)</u>

The samples is virtually barren. A couple of bitumen stained, more shaly parts contain a few vitrinite particles. UV light shows an overall carbonate fluorescence and no exinite.

<u>3540 m: Calcareous shale and carbonate, Ro = 0.39 (8) and Ro = 0.55 (4)</u>

The sample has a variable bitumen staining. Most cuttings are clean while a few are intensely stained. The sample has a low plytoclast content. Mostly inertinite and reworked particles but a few vitrinite wisps of variable reflectance. UV light shows a light and mid.orange fluorescence from spores and a moderate exinite content.

<u>3600 m: Red and grey shale, Coal. Ro = 0.27 (19)</u>

The red shale is barren. The grey shale has a variable organic content. Some cuttings are heavily bitumen stained and rich in reworked and inertinite particles while other cuttings ar barren. All the readings are on coal particle. UV light shows a light orange fluorescence from spores in a few cuttings, but most of the samples is barren. A low exinite content is recorded.

The readings are probably on mud additive.

<u>3690 m: Shale, carbonate and coal traces, Ro = 0.30 (21)</u>

The sample has only a trace of organic material, restricted to loose lignite fragments. The shale and carbonate are barren. All the measurements are on lignite which probably is an additive. UV light does not show any organic fluorescence.

<u>3725 m: Calcareous shale, Ro = 0.63 (4) and 0.8/(2)</u>

The sample contains bitumen staining and wisps together with a trace of inertinite and reworked material. Poor vitrinite particles are subordinate. UV light shows a light to mid.orange fluorescence from spores and a trace of exinite.

3750 m: Light shale and carbonate, Ro = 0.60 (2)

The sample has only a trace of organic material with a few particles of reworked material and inertinite. A couple of particles of possibly true vitrinite are recorded. UV light shows a variable carbonate fluorescence and a mid.orange fluorescence from spore specks together with a trace of exinite.

3787 m: Calcareous shale and carbonate, Ro = 0.35 (8) and Ro = 0.64 (1)

The sample contains a slight bitumen staining and wisps, otherwise a low organic content, mainly small inertinite and reworked particles. Only a trace of low reflectance vitrinite particles. UV light shows a mid.orange fluorescence from spores and a low exinite content.

3811 m: Pyritic shale, Ro = 0.54 (14) and Ro = 0.83 (1)

The sample has a strong bitumen impregnation and stringers, otherwise a very low content of inertinite and reworked material. Only a trace of corroded vitrinite. UV light shows a mid.orange fluorescence from spores and a low exinite content.

3815 m: Shale, Ro = 0.31 (17)

The sample has a very low organic content with an overall strong bitumen staining. Only a trace of small particles of vitrinite and inertinite, mostly reworked material is recorded. UV light shows hydrocarbons dissolving in the immersion oil and a mid.orange fluorescence from hydrocarbon specks.

3830 m: Calcareous shale and carbonate, Ro = 0.73 (1), Ro = 0.89 (1) and Ro = 0.95 (1)

The sample has a very low organic content with a few particles of reworked material and inertinite and only a trace of poor vitrinite particles. The differentiation beween true and reworked materiale is difficult. UV light shows a mid.orange fluorescence from spore specks, very dull, and a trace of exinite.

3880 m: Calcareous siltstone, Ro = 0.68 (20)

The sample has amoderate bitumen staining together with bitumen wisps and interstitial areas. Otherwise a low content of inertinite and reworked material, with subordinate vitrinite. UV light shows a mid.orange fluore-scence from spores and a low/moderate exinite content.

3919.5 m: Silty shale, calcareous, Ro = 0.24 (1), Ro = 0.39 (14) and Ro =0.54 (5)

The sample has a low organic content with a slight bitumen staining. A few particles and wisps of vitrinite with about equal proportion of inertinite particles are recorded. UV light shows fluorescence from hydrocarbon impregnation.

3980 m: ~~Light~~ and dark shale, Ro = 0.27 (1), Ro = 0.49 (6) and Ro = 0.90 (13)

~~The~~ dark shale has an intense bitumen staining and occasional vitrinite wisps of low reflectance. The ligth shale contain some high reflectance vitrinite wisps and inertinite particles together with a few loose high reflectance coal particles. UV light shows a mid. to deep orange fluorescence from spores and a trace of exinite. The higher reflectance material looks good and probably represents the true reflectance value.

4012 m: Carbargillite, Ro = 1.03 (23)

The sample contains large vitrinite particles, very brecciated. Virtually wholly vitrinitic. UV light does not show any fluorescence.

4040 m: Calcareous shale, Ro = 0.58 (19) and Ro = 0.87 (3)

The sample has a very low organic content with particles of inertinite and reworked material dominant but a good proporion of vitrinite wisps and wispy particles look reliable. Only a trace of bitumen wisps. UV light shows a mid.orange fluorescence from carbonate and spore specks together with a trace of exinite.

4100 m: Red and grey calcareous shale, Ro = 0.47 (1) and Ro = 0.85 (6)

The red shale is barren. The grey shale contains a few reworked and inertinite particles, but no vitrinite. A few loos particles of high reflectance vitrinite are recorded. UV light shows a mid.orange fluorescence from spores and a trace of exinite.

4142.5 m: Red siltstone. No determination possible

No organic material was recorded.

4199.5 m: Red siltstone. No determination possible

No organic material was recorded.

4260 m: Mixed shale lithologies, Ro = 0.29 (14), Ro = 0.68 (7) and Ro = 1.17 (1)

The sample has a low organic content with some low reflectance lignite fragments, probably additives. Otherwise a few heavily bitumen stained cuttings and a few high reflectance vitrinite wisps. UV light shows a yellow/orange and mid.orange fluorescence from spores and hydrocarbon specks and a trace of exinite.

The vitrinite reflectance data show a good trend from 2200 m down to 3200 m (0.3 - 0.5%). From 3200 to 3700 m the readings are more or less meaningless. This is the limestone sequence and most of the readings are probably on caved material. The sidewall cores used from this intervall are either barren, or very low reflectance values are found, probably caved cuttings in the mud cake which have contaminated the sidewall cores. From 3700 m down to 3900 m a similar trend as recorded in the upper part of the well is found, and a line is therefore extrapolated through the difficult limestone zone. The reading at 3875 - 93 m is thought to be a very good reading on exelent vitrinitic material. The next good reading is the sidewall core from 4012 m, which contains good vitrinitic coal. This is a far higher value than expected, and the maturity show a sharp increase beween 3900 and 4000 m. The readings further down in the well are difficult due to low organic content(redbeds) but the one particle measured on the lowermost sample represent probably a true value.

When the maturity gradients are drawn, one can extrapolate the gradient in the upper part in the well down past 3950 m. By doing this, and assume the same gradient further down, an estimated sequence of 800 - 1000 m is missing between 3950 m and 4000 m.

Visual kerogen evaluation

Fourty eight samples from this well were processed for extraction of acid resistant plant remains. Additional samples of total kerogen residues were provided from palynological samples (the stratigraphic analysis of the same well).

Four main intervals may be distinguished on the basis of the relative kerogen composition: Amorphous material dominates samples down to 3600 m.

Woody material seems a more important part of the terrestrial assemblages towards the lower end of the interval. Between 3615 m and 3687 m the residues are either dominated by, or contain about 50% terrestrial material. Between 3714 m and 3960 m amorphous material is again dominant. From 3972 m down to 4295 m most of the residues contain a large proportion of caved material which is distinguished from the darker coloured material which is thought to be indigenous. This interval seems to represent a higher energy environment of deposition.

The changes in kerogen colour partly coinside with changes in lithology. We suspect that the colour indices in some of the intervals are based on oxidized material and thus are to high as maturation parameters.

2250 m:

Amorphous material, mostly as aggregates, dominates. A minor constituent is composed by diverse terrestrial remains.

Colour index: 1+/2-

2430 m and 2610 m:

Amorphous material dominates but is finely dispersed. Terrestrial material is found in small amounts.

Colour index: 2- or 2-/2

2790 - 2820 m and 2980 m:

Amorphous material in aggregates is dominant, and well preserved dinoflagellate cyst assemblages are present as in the interval above.

Colour index: 2-/2 and 2

3140 m and 3300 m:

Amorphous, material dominates small and poorly preserved residues which are rich in undissolved minerals. Aggregates are present.

Colour index: 2-/2

<u>3490 m, 3540 m, 3550 m:</u>

Sapropel dominates and is partly recoreded as aggregates. However the abundance of dinoflagellate cysts from suspected caved material indicates that also a large part of the amorphous material must be from caved material.

Colour index: 2

<u>3595 m:</u>

Sapropel dominates as above.

Colour index: 2 or 2/2+. There is an increase in colour from the abovelying interval.

<u>3615 m, 3633 m,3651 m and 3687 m:</u>

The residues contain sapropel which form aggregates. 40% to 75% of the residues consist of terrestrial remains, partly indeterminate herbaceous material, but woody material dominates in the sample from 3687 m.

Colour index: 2/2+ and 2+/3-. The latter is probably to high as a maturiation parameter.

<u>3741 m to 3786 m:</u>

Sapropel is dominant, and is partly recorded as aggregates. 10% to 20% of the residues represent terrestrial material, mostly indeterminate herbaceous but also some woody matter.

Colour index: 2+/3. Probably to high as a maturation parameter.

<u>3787 m to 3960 m:</u>

Twelve samples from this interval (9 sidewall cores) contain mainly amourphous material. The poorly preserved palynomorphs (mainly dinoflagellate cysts) are embedded in sapropel and the colours are therefore difficult to evaluate in many samples. There is 5 to 30% indeterminate, finely dispersed material. In some samples undissolved minerals were domimant.

Colour index: 2 or 2/2+

3993 m:
Herbaceous and amorphous material seem equally important. Screening of the material leaves deltaic/landderived remains as major constituents. The main bulk of the dinoflagellate cysts, represent caved material. Therefore it is assumed that the amorphous material is also mostly derived from cavings.

Colour index 2+/3 or 3-.

4001 m swc.:
The small organic residue which was rather dark, was given a chemical oxidation. The sample then showed to contain a terrestrial assemblage mostly of woddy material, but some spores, pollen, and cuticles are recorded.

4111 m, 4023 m, 4035 m:
The small residues from this interval are dominated by sapropel derived from caved material. Oxidized and screened residues contain a varied herbaceous assemblage, dominantly woody material.

Colour index: Tentatively 3-, estimated from supposed oxidezed remains.

4012 m swc (oxidized residue):
A varied terrestrial assemblage composed of woody material, cuticles and pollen.

Colour index: indeterminated.

4089 m:
The residue is dominated by amorphous material which is suspected to be from caved material. A smaller portion of the amorphous material is darker than the rest and could be indigenous.

Colour index: Indeterminated.

4142,25 m:
There is no organic residue.

<u>4161 m:</u>

Caved material dominates. There is a small portion of dark coloured, amorphous material remaining after oxidation.

Colour index: Tentatively 2+/3-.

<u>4199,5 m:</u>

Only acid resistant minerals remain.

Colour index: Indeterminated.

<u>4233 m:</u>

The acid resistant residue is dominated by undissolved minerals with a minor portion of suggested terrestrial remains.

Colour index: Indeterminated.

<u>4275 m:</u>

Caved material seems to dominate completely, and it is believed that the sample contains very little organic material from the true level of the well. A terrestrial assemblage remains after prolonged oxidation.

Colour index: Indeterminated.

<u>4295 m:</u>

Undissolved minerals dominate the residue. After oxidation an assemblage of terrestrial material, mainly woody and indeterminate herbaceous remains.

Colour index: Indeterminated.

CONCLUSION

Based on the light hydrocarbon data together with the information that cores were taken in the interval 3820 - 3900 m, the analysed sequece is divided into nine zones.

A: 2200 - 2820 m
B: 2820 - 2970 m
C: 2980 - 3390 m
D: 3390 - 3600 m
E: 3600 - 3720 m
F: 3720 - 3820 m
G: 3820 - 3900 m
H: 3900 - 3950 m
I: 3950 - 4296 m

In our interpretation of the results discussed earlier in this report, the richness rating is based on the abundance of extractable hydrocarbons, the amount of organic carbon and the abundance of light hydrocarbons, while the maturity is based on the vitrinite reflectance measurements, the fluoresence in UV light, and the colour of spores in transmitted light. The typing of source rocks are based on the type of kerogen seen in transmitted light.

The upper two zones, A and B are both immature. The kerogen is mainly amorphous and the richness is found to be good and fair, respectively. With background in the described measurements these two zones are therefore rated to have a good and fair potential, respectively, as source rocks for oil and gas.

Zones C and D consist mainly of limestone, and are found to be moderately mature. Small intervals of this limestone are found to have rather high TOC values for limestone. The extractability is rather low for most of the examined samples and vitrinite reflectance measurements indicate a large proportion of reworking in some samples. The visual kerogen examination shows some samples to be baren while others have a kerogen composition similar to zones A and B. The latter could be due to cavings. Gas chromatograms of the saturated hydrocarbon fractions indicate a fair amount of well mature heavy hydrocarbons in some of the samples. With backround in the various analyses we believe that small intervalL of the limestones in these two zones might be source rocks for heavy hydrocarbons. Free hydrocarbons are recorded in parts of the zone.

Zone E is found to be in the transition stage between moderate mature and mature, the organic carbon content is, however, low and the kerogen concentrates are dominated by terrestrical material. The zone is therefore rated to have a poor potential as a source rock for gas.

Zone F is found to be mature, and the visual kerogen examination shows the zone to be dominated by amorphous material. An investigation by organic carbon measurements of sidewall cores at close intervall shows a sharp change at 3795 m to a richer part. The upper part 3720 - 3795 m is found to have a fair/good potential as a source rock for oil and gas while the lower part is found to have a rich potential as a source rock for oil and gas.

Zone G is also found to be mature. This zone was cored extensively and the sandstone in these cores were not examined for free hydrocarbons. Sidewall cores do however show free hydrocarbons in the zone. The silty claystone towards the lower part of the zone was examined (core chip) and found to have a good potential as a source rock for oil and gas. The richness rating might be slightly high due to free hydrocarbons in the sample.

The vitrinite reflectance readings in zone H are very poor, and probably on cavings. Visual kerogen examination does however show the upper part of this zone to be at the same maturity level as zone G, and with mainly amorphous material. The organic carbon measurements indicate a fair/good abundance of organic carbon. With background in this, the zone is rated to have a fair/good potential as a source rock for oil and gas.

The uppermost readings both on vitrinite reflectance and visual kerogen, in zone I show this zone to have a far higher maturity level than zone H. This fit in well with the biostratigraphical data which date the sample from 3960 m to be Kimmeridgean while 3972 m is dated as Middle Jurassic. The type of kerogen also changes in this zone to a more terrestric origin. The upper part, down to approximatly 4050 m is found to have a good potential as a source rock for gas, while the lower part has a poor potential as a source rock for gas.

Finally, a number of mud samples have been extracted, chromatographed and the saturated fraction analysed gas chromatographically. The chromatograms from the various intervals are compared with the ones of the mud samples from the same intervals.

Some of the samples contained a relative high proportion of hydrocarbons, but presently we do not see any good correlation between the gas chromatograms of the mud extracts and those from the cuttings.

TABLE Ia

Concentration (µl gas/pr. kg rock) (Headspace)

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1882	2250-80	13291	417	378	104	36	83	14226	935	6.57	2.88
K 1883	2280-2310	9450	333	402	155	59	144	10399	949	9.13	2.64
K 1884	2310-40	18367	486	605	276	129	433	19864	1496	7.53	2.14
K 1885	2340-70	16154	470	613	311	136	451	17684	1530	8.65	2.29
K 1886	2370-2400	26321	534	520	174	64	160	27613	1292	4.68	2.70
K 1887	2400-30	13047	370	537	318	142	192	14414	1367	9.48	2.24
K 1888	2430.60	9983	441	860	606	333	1075	12224	2241	18.31	1.82
K 1889	2460-90	10615	463	738	414	220	575	12450	1835	14.74	1.88
K 1890	2490-2520	9386	562	972	597	306	757	11824	2438	20.62	1.95
K 1891	2520-50	6692	303	422	244	112	251	7773	1081	13.91	2.16
K 1892	2550-80	7434	319	432	286	113	283	8584	1150	13.40	2.52
K 1893	2580-2610	4588	417	783	691	269	356	6749	2161	32.02	2.57
K 1894	2610-40	1657	177	363	326	122	329	2645	988	37.35	2.68
K 1895	2640-70	3276	217	360	271	91	221	4215	939	22.29	2.96
K 1896	2270-2700	5505	251	373	259	85	136	6472	968	14.96	3.03
K 1897	2700-30	3640	222	347	236	84	167	4529	888	19.62	2.82
K 1898	2730-60	2951	240	461	287	123	208	4061	1110	27.35	2.33
K 1899	2760-90	4734	350	647	248	172	221	6152	1418	23.05	1.44
K 1900	2790-2820	1890	175	426	143	173	213	2808	918	32.69	0.83
K 1901	2820-50	2769	363	1344	383	749	1197	5609	2840	50.63	0.51
K 1902	2850-80	2118	622	1508	404	674	964	5327	3209	60.24	0.60

TABLE Ia contd ....

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1903	2880-2910	1923	249	758	271	407	799	3609	1686	46.71	0.67
K 1904	2910-40	2119	308	857	335	428	971	4347	1928	44.35	0.78
K 1905	2940-70	1313	171	430	185	183	177	2284	971	42.49	1.01
K 1906	2980-3010	454	37	118	66	53	158	729	275	37.75	1.24
K 1907	3020-40	171	11	32	12	12	27	238	66	28.02	0.98
K 1908	3050-70	183	26	58	15	19	48	301	118	39.22	0.78
K 1909	3080-3100	38	6	8	2	2	10	57	18	32.72	1.05
K 1910	3110-30	72	11	29	18	13	38	144	72	49.99	1.43
K 1911	3140-60	114	13	29	14	11	38	182	67	37.14	1.26
K 1912	3160-80	43	6	16	6	9	29	80	37	46.35	0.66
K 1913	3190-3210	285	15	33	19	19	59	371	86	23.31	0.98
K 1914	3210-40	31	4	7	3	2	4	47	16	34.75	1.55
K 1915	3240-70	162	6	17	10	10	38	204	43	20.97	0.96
K 1916	3240-3300	14	4	5	3	2	4	28	14	50.59	1.35
K 1917	3300-30	97	14	35	15	15	13	176	79	44.72	1.00
K 1918	3330-60	121	5	11	6	5	15	148	27	18.11	1.19
K 1919	3360-90	39	6	21	14	18	82	98	59	60.24	0.76
K 1920	3390-3420	26	8	22	14	15	57	86	60	69.33	0.96
K 1921	3420-50	564	31	69	28	24	64	715	152	21.20	1.15
K 1957	3450-80	160	80	19	79	166	743	505	344	68.20	0.48
K 1958	3480-3510	19	6	22	17	15	142	80	61	76.07	1.12
K 1959	3510-40	66	30	101	35	55	383	287	221	76.97	0.65

TABLE Ia contd.......

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1960	3540-70	201	27	97	58	55	666	438	237	54.09	1.05
K 1961	3570-3600	120	98	136	51	154	1491	560	440	78.64	0.33
K 1962	3600-30	26	7	7	2	10	167	52	26	50.49	0.22
K 1963	3630-60	30	14	3	0	2	9	50	20	39.69	0.20
K 1964	3660-90	105	70	25	10	26	139	236	131	55.53	0.38
K 1965	3690-3720	17	24	15	3	11	26	70	53	75.98	0.26
K 1966	3720-50	20	39	30	5	20	60	115	95	82.47	0.26
K 1967	3750-75	49	264	291	66	188	342	858	810	94.33	0.35
K 1968	3775-3800	58	371	1295	417	1953	4538	4094	4035	98.57	0.21
K 1969	3800-30	12	24	173	61	309	1525	580	567	97.87	0.20
K 1970	3830-60	6	2	8	11	7	40	36	30	82.26	1.49 ?
K 1971	3860-90	30	58	123	37	146	2082	394	364	92.45	0.26
K 1972	3890-3920	325	822	1656	414	1356	2954	4574	4249	92.90	0.31
K 1973	3920-50	125	596	1037	181	753	1518	2693	2568	95.34	0.24
K 1974	3950-80	202	349	691	177	629	1508	2048	1846	90.13	0.28
K 1975	3980-4010	1417	854	517	71	226	376	3086	1669	54.09	0.31
K 1976	4010-40	1249	519	340	44	167	283	2321	1071	46.16	0.27
K 1977	4040-70	490	506	596	89	347	541	2028	1539	75.86	0.26
K 1978	4070-4100	157	203	241	34	128	194	764	606	79.38	0.26
K 1979	4100-30	182	132	165	28	106	201	615	432	70.34	0.27

TABLE Ia contd.....

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1980	4130-60	1026	418	354	52	207	382	2059	1033	50.16	0.25
K 1981	4170-4200	1329	234	212	30	111	192	1915	586	30.60	0.27
K 1982	4200-30	1214	449	361	53	210	324	2287	1073	46.92	0.25
K 1983	4230-60	329	370	342	45	176	278	1262	932	73.89	0.26
K 1984	4260-96	343	355	250	28	103	142	1080	737	68.23	0.27

TABLE Ib

Concentration (µl gas/pr. kg rock) (Occluded gas)

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1882	2250-80	63	40	122	69	37	123	332	269	81.06	1.84
K 1883	2280-2310	52	30	130	91	55	226	358	306	85.51	1.66
K 1884	2310-40	349	95	478	448	303	1797	1674	1325	79.12	1.48
K 1885	2340-70	370	84	273	307	212	1817	1246	876	70.29	1.44
K 1886	2370-2400	105	73	236	148	87	371	650	545	83.80	1.71
K 1887	2400-30	122	56	210	198	131	768	717	595	83.01	1.51
K 1888	2430-60	397	66	329	478	387	3397	1658	1261	76.04	1.23
K 1889	2460-90	140	39	205	239	198	1252	822	681	82.94	1.20
K 1890	2490-2520	194	59	379	470	378	2085	1481	1286	86.86	1.24
K 1891	2520-50	118	64	238	231	163	752	814	696	85.50	1.42
K 1892	2550-80	68	33	135	154	91	478	481	413	85.85	1.69
K 1893	2580-2610	315	42	256	459	306	2074	1378	1064	77.17	1.50
K 1894	2610-40	75	18	73	134	84	539	385	310	80.50	1.60
K 1895	2640-70	90	14	74	131	83	559	393	303	77.18	1.58
K 1896	2670-2700	59	14	60	89	58	351	281	222	78.98	1.54
K 1897	2700-30	49	10	71	102	60	259	292	244	83.32	1.68
K 1898	2730-60	119	28	118	120	120	424	506	387	76.45	1.00
K 1899	2760-90	78	11	66	134	100	584	388	310	79.98	1.35
K 1900	2790-2820	34	7	45	31	60	275	178	144	80.69	0.52
K 1901	2820-50	68	11	81	52	171	1174	384	316	82.21	0.31

TABLE Ib contd......

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1902	2850-80	135	20	191	115	302	1467	764	629	82.32	0.38
K 1903	2880-2910	145	18	124	107	241	1422	635	490	77.10	0.44
K 1904	2910-40	191	30	200	157	278	1984	857	666	77.68	0.57
K 1905	2940-70	97	13	57	61	95	667	325	228	70.11	0.64
K 1906	2970-3010	76	13	27	28	43	128	187	111	59.38	0.65
K 1907	3020-40	19	4	3	2	3	6	31	12	37.60	0.71
K 1908	3050-70	56	7	14	8	15	33	100	45	44.68	0.52
K 1909	3080-3100	13	2	1	0	0	11	17	4	23.72	1.00
K 1910	3110-30	45	6	7	6	10	86	75	30	39.66	0.63
K 1911	3140-60	37	6	7	6	7	57	63	25	40.73	0.82
K 1912	3160-80	41	6	6	4	5	47	63	21	33.98	0.70
K 1913	3190-3210	43	7	8	9	17	150	85	42	49.15	0.49
K 1914	3210-40	78	15	11	7	8	86	120	41	34.45	0.90
K 1915	3240-70	36	6	5	2	2	8	52	16	30.79	0.86
K 1916	3270-3300	76	13	9	5	9	141	112	36	32.25	0.60
K 1917	3300-30	43	7	7	6	9	84	72	29	40.64	0.65
K 1918	3330-60	16	3	3	2	2	26	25	9	36.11	0.75
K 1919	3360-90	74	12	9	6	9	74	110	35	32.28	0.69
K 1920	3390-3420	67	11	8	6	9	123	101	34	33.85	0.73
K 1921	3420-50	31	5	9	7	11	116	63	32	51.09	0.68

TABLE Ib contd....

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1957	3450-80	50	9	10	11	18	174	99	48	49.11	0.60
K 1958	3480-3510	7	13	4	3	5	77	32	25	78.96	0.58
K 1959	3510-40	12	24	8	6	12	95	64	51	80.36	0.49
K 1960	3540-70	20	41	13	15	17	232	105	86	81.11	0.89
K 1961	3570-3600	20	43	16	11	52	884	142	122	85.93	0.22
K 1962	3600-30	31	35	43	13	73	434	195	164	84.08	0.18
K 1963	3630-60	13	3	3	0	5	56	24	11	44.84	0.13
K 1964	3660-90	29	4	5	2	10	207	50	21	41.62	0.18
K 1965	3690-3720	19	4	4	1	5	2	33	14	42.29	0.15
K 1966	3720-50	46	6	10	1	10	42	74	28	37.84	0.11
K 1967	3750-75	54	10	28	8	47	251	147	93	63.39	0.18
K 1968	3775-3800	84	16	42	22	170	3688	335	251	74.82	0.13
K 1969	3800-30	163	99	1841	985	5044	21462	8132	7969	98.00	0.20
K 1970	3830-60	146	11	45	34	158	1435	394	248	63.00	0.21
K 1971	3860-90	511	17	71	33	190	3150	822	311	37.86	0.17
K 1972	3890-3920	94	32	217	135	726	6404	1204	1110	92.21	0.19
K 1973	3920-50	66	39	217	88	445	3111	855	789	92.26	0.20
K 1974	3950-80	58	36	218	119	565	4758	996	938	94.17	0.21
K 1975	3980-4010	63	231	342	76	349	2272	1062	998	94.03	0.22
K 1976	4010-40	285	527	331	63	287	1585	1493	1207	80.87	0.22

TABLE Ib contd.....

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1977	4040-70	164	276	236	66	336	2705	1079	915	84.75	0.20
K 1978	4070-4100	23	18	38	12	64	515	156	132	85.04	0.19
K 1979	4100-30	66	46	92	47	243	2140	495	429	85.57	0.20
K 1980	4130-60	247	382	215	64	308	2378	1217	970	79.70	0.21
K 1981	4170-4200	114	107	63	17	83	595	384	270	70.41	0.21
K 1982	4200-30	177	104	97	45	219	2020	642	465	72.42	0.21
K 1983	4230-60	65	45	115	46	220	1879	492	427	86.69	0.21
K 1984	4260-96	74	59	81	33	154	1279	401	327	81.56	0.21

TABLE Ic (Ia + Ib)

Concentration l gas/pr. kg róck

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1882	2250-80	13354	457	500	173	73	206	14558	1204	8.27	2.37
K 1883	2280-2310	9502	363	532	246	114	370	10757	1255	11.67	2.16
K 1884	2310-40	18716	581	1083	724	432	2230	21538	2821	13.10	1.67
K 1885	2340-70	16524	554	886	618	348	2268	18930	2406	12.71	1.77
K 1886	2370-2400	26426	607	756	322	151	531	28263	1837	6.50	2.13
K 1887	2400-30	13169	426	747	516	273	960	15131	1962	12.97	1.89
K 1888	2430-60	10380	507	1189	1084	720	4472	13882	3502	25.23	1.50
K 1889	2460-90	10755	502	943	653	418	727	13272	2516	18.96	1.56
K 1890	2490-2520	9580	621	1351	1067	684	2842	13305	3724	27.99	1.56
K 1891	2520-50	6810	367	660	475	275	1003	8587	1777	20.69	1.73
K 1892	2550-80	7502	352	567	440	204	761	9065	1563	17.24	2.16
K 1893	2580-2610	4903	459	1039	1150	575	2430	8127	3225	39.68	2.-
K 1894	2610-40	1732	195	436	460	206	868	3030	1298	42.84	2.23
K 1895	2640-70	3366	231	434	402	174	780	4608	1242	26.95	2.31
K 1896	2670-2700	5564	265	433	348	143	487	6753	1190	17.62	2.43
K 1897	2700-30	3689	232	481	338	144	426	4821	1132	23.48	2.35
K 1898	2730-60	3070	268	579	407	243	632	4567	1497	32.78	1.67
K 1899	2760-90	4812	361	713	382	272	805	6540	1728	26.42	1.40
K 1900	2790-2820	1924	183	471	174	233	488	2986	1062	35.56	0.75
K 1901	2820-50	2837	374	1425	435	920	2371	5993	3156	52.66	0.47

Table Ic (Ia + Ib) contd..

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1902	2850-80	2253	642	1699	519	976	2431	6091	3838	63.01	0.53
K 1903	2880-2910	2068	267	882	278	648	2221	3974	2176	55.-	0.58
K 1904	2910-40	2310	338	1057	492	706	2955	5204	2594	50.-	0.70
K 1905	2940-70	1410	184	487	246	278	844	2609	1199	46.-	0.88
K 1906	2980-3010	530	50	145	94	96	28	916	386	40.-	0.98
K 1907	3020-40	190	15	35	14	15	33	269	78	29.-	0.93
K 1908	3050-70	239	33	72	23	34	81	401	163	41.-	0.68
K 1909	3080-3100	51	8	9	2	2	21	74	22	29.73	1.-
K 1910	3110-30	117	17	36	24	23	124	219	102	46.58	1.04
K 1911	3140-60	151	19	36	20	18	95	245	92	37.55	1.11
K 1912	3160-80	84	12	22	10	14	76	143	58	40.56	0.71
K 1913	3190-3210	328	22	41	28	36	209	456	128	28.-	0.78
K 1914	3210-40	109	19	18	10	10	90	167	57	34.13	1.-
K 1915	3240-70	198	12	22	12	12	46	256	59	23.05	1.-
K 1916	3270-3300	90	17	14	8	11	145	140	50	35.71	0,73
K 1917	3300-30	140	21	42	21	24	97	248	108	43.55	0.88
K 1918	3330-60	137	8	14	8	7	41	173	36	20.81	1.14
K 1919	3360-90	113	18	30	20	27	172	208	94	45.19	0.74
K 1920	3390-3420	93	19	30	20	24	209	187	94	50.27	0.83
K 1921	3420-50	595	36	78	35	35	831	778	184	23.65	1.-

Table Ic (Ia + Ib) contd....

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1957	3450-80	210	89	29	90	184	917	604	392	64.90	0.49
K 1958	3480-3510	26	19	26	20	20	219	112	86	76.79	1.0
K 1959	3510-40	78	54	109	41	67	478	351	272	77,49	0.61
K 1960	3540-70	221	68	110	73	72	892	543	323	59.48	1.01
K 1961	3570-3600	140	141	152	62	206	2375	702	562	80.06	0.30
K 1962	3600-30	57	42	50	15	83	601	247	190	76.92	0.18
K 1963	3630-60	43	17	6	0	7	65	74	31	41.89	0
K 1964	3660-90	134	74	30	12	36	346	286	152	53.15	0.33
K 1965	3690-3720	36	28	19	4	16	28	103	67	65.05	0.25
K 1966	3720-50	66	45	40	6	30	102	189	123	65.08	0.20
K 1967	3750-75	103	274	319	74	235	593	1005	903	89.85	0.31
K 1968	3775-3800	142	387	1337	439	2123	8226	4429	4286	96.77	0.21
K 1969	3800-30	175	123	2014	1046	5353	22987	8712	8536	97.98	0.20
K 1970	3830-60	152	13	53	45	165	1475	430	278	64.65	0.27
K 1971	3860-90	541	75	194	70	336	5232	1216	675	55.51	0.21
K 1972	3890-3920	419	854	1873	549	2082	9358	5778	5359	92.75	0.26
K 1973	3920-50	191	635	1254	269	1198	4629	3548	3357	94.62	0.22
K 1974	3950-80	260	385	909	296	1194	6266	3044	2784	91.46	0.25
K 1975	3980-4010	1480	1085	859	147	575	2648	4148	2667	64.30	0.26
K 1976	4040-40	1534	1046	671	107	454	1868	3814	2278	59.73	0.24

Table Ic (Ia + Ib) contd...

Sample	Depth (m)	C_1	C_2	C_3	iC_4	nC_4	C_5+	ΣC_1-C_4	ΣC_2-C_4	% wetness	iC_4/nC_4
K 1977	4040-70	654	782	832	155	683	3246	3107	2454	78.98	0.23
K 1978	4070-4100	180	221	279	46	192	709	920	738	80.21	0.24
K 1979	4100-30	248	178	257	75	249	2341	1110	861	77.57	0.21
K 1980	4130-60	1273	800	569	116	515	2760	3276	2003	61.14	0.22
K 1981	4170-4200	1328	341	275	47	194	787	2299	856	37.23	0.24
K 1982	4200-30	506	1318	458	98	429	2344	2929	1538	52.51	0.23
K 1983	4230-60	408	374	457	91	396	2147	1754	1359	77.48	0.23
K 1984	4260-96	417	402	331	61	257	1413	1481	1064	71.84	0.24

TABLE II

Lithology and total organic carbon

IKU No.	Depth	TOC		Lithology
K 1182	2250-80	1.64	100%	Claystone, grey - dark grey (slightly brownish), some green, slightly mic, partly calcareous.
			sm.am.	Limestone, white - light brown.
K 1883	2280-2310	1.83	100%	Claystone, as above, some greybrown.
K 1884	2310-40	1.75	100%	Claystone, grey to dark grey (brownish), browngrey.
			sm.am.	Limestone, white to light brown.
K 1885	2340-70	1.33	100%	Claystone, grey, dark brownish grey to browngrey, partly slightly calcareous.
K 1886	2370-2400	1.70	100%	Claystone, grey, dark brownish grey
			sm.am.	Limestone, brownish white to light brown.
			obs	Pyrite.
K 1887	2400-30	1.21	100%	Claystone, grey - greybrown, dark brownish grey, some greenish.
			sm.am.	Limestone, brownwhite - light brown.
K 1888	2430-60	1.43	100%	Claystone, as above.
K 1889	2460-90	1.50	100%	Claystone, grey and browngrey to greybrown, some greenish.
			sm.am.	Limestone, brownish white to light brown.
K 1890	2490-2520	1.90	93%	Claystone, grey, browngrey to greybrown, dark grey (brownish), some greenish, slightly micaceous.
			7%	Limestone, light browngrey to light brown.
K 1891	2520-50	1.55	100%	Claystone, as above
			sm.am.	Limestone as above
K 1892	2550-80	1.49	92%	Claystone, grey, darkgrey (brownish), grey-brown, some greenish, slightly micaceous
			8%	Limestone, brownwhite to brown.
K 1893	2580-2610	1.42	92%	Claystone, grey to brownish dark grey, some greenish.
			8%	Limestone, greywhite-brown.

TABLE II contd..

IKU No.	Depth	TOC		Lithology
K 1894	2610-40	1.18	95%	Claystone, grey to greengrey and browngrey, greybrown and dark grey, some green, slightly micaceous
			5%	Limestone, as above.
K 1895	2640-70	0.81	100%	Claystone, grey to light green, browngrey/ greybrown (dark).
			sm.am.	Limestone, white to light brown.
K 1896	2670-2700	0.92	100%	Claystone, as above
K 1897	2700-30	0.83	100%	Claystone, grey to greengrey, greybrown/ browngrey, some green, slightly micaceous.
			sm.am.	Marl/Limestone, brownish white to light brown
K 1898	2730-60	0.56	100%	Claystone, as above, some dark greybrown.
K 1899	2760-90	0.81	100%	Claystone, grey, greenish, greybrown
			sm.am.	Marl/Limestone, brownish white to brown.
K 1900	2790-2820	0.63	100%	Claystone, grey, greenish to green, redbrown greybrown, dark grey-black, tuffaceous (soapy)
			sm.am.	Limestone, white.
K 1901	2820-50	0.86	95%	Claystone, grey, greenish to light green, greybrown
			5%	Marl/Limestone, white-light brown, brown.
K 1902	2850-80	0.76	70%	Claystone, grey, redbrown, browngrey, some light green, dark grey.
			30%	Sandstone, fine-very fine, white-light grey, very glauconitic.
K 1903	2880-2910	1.01	85%	Claystone, as above, some light grey and bluis
			15%	Sandstone, as above
			sm.am.	Limestone, light brown to brownwhite.
K 1904	2910-40	0.57	100%	Claystone, grey, greybrown, lightgreen, slightly micaceous
			sm.am.	Limestone, white-light brown; sandstone.
K 1905	2940-70	1.68	100%	Claystone, grey, dark grey, black, greybrown some redbrown and green, slightly micaceous.
K 1906	2980-3010	0.93	60%	Claystone, grey, browngrey/greybrown (dark) some redbrown, green
		0.17	40%	Limestone, white

TABLE II contd..

IKU No.	Depth	TOC	Lithology
K 1907	3020-40	0.23	90% Limestone, white
			10% Claystone, as above
K 1908	3050-70	0.57	50% Limestone, white
			50% Claystone, grey/dark grey to black and red-brown, green.
K 1909	3080-3100	0.14	95% Limestone, white
			5% Claystone
K 1910	3110-30	0.21	85% Limestone, white
		0.90	15% Claystone, grey- (brownish) dark grey, grey-brown/browngrey, some redbrown and light green.
			sm.am. Chert, white
K 1911	3140-60	0.23	85% Limestone, white, lightgrey (Marl)
		1.17	15% Claystone, grey to dark grey, green, dark green, tuffaceous (soapy).
			sm.am. Chert, brownwhite, brown; glauconitic Sand/Silt-stone
K 1912	3160-80	0.23	92% Limestone, white, some light grey (Marl)
			8% Claystone, as above
			sm.am. Chert, white to brownish
K 1913	3190-3210	0.20	85% Limestone, white, some light grey (marly)
		1.13	15% Claystone, dark grey, (brownish) grey, greenish to dark green, tuffaceous (soapy), some redbrown
K 1914	3210-40	0.75	95% Limestone
			5% Claystone, dark grey (brownish), some black, grey, green, tuffaceous.
K 1915	3240-70	0.34	95% Limestone, white
			5% Claystone, as above
K 1916	3270-3300	0.17	100% Limestone, white
			sm.am. Claystone, as above.

TABLE II contd...

IKU No.	Depth	TOC	Lithology
K 1917	3300-30	0.47	97% Limestone, white
			sm.am. Claystone, dark grey, grey, dark greybrown some dark green, tuffacaous.
K 1918	3330-60	1.15	85% Limestone
			15% Claystone, brownish dark grey, dark green/ green, dark greybrown, tuffaceous.
K 1919	3360-90	1.21	100% Limestone, white
			sm.am. Claystone, grey, green.
K 1920	3390-3420	0.14	85% Limestone, white
		1.55	15% Claystone, brownish grey and dark grey, greenish to dark green, greybrown.
K 1921	3420-50	0.25	90% Limestone, white to pink
		1.55	10% Claystone, as above
K 1957	3450-80	0.40	80% Limestone, white and pink
		1.31	20% Claystone, grey, browngrey, light green to green, dark browngrey, some redbrown.
K 1958	3480-3510	1.23	80% Limestone, as above
		1.13	20% Claystone, grey, dark grey, greybrown
K 1959	3510-40	0.27	85% Limestone, white, some greyish, pink.
		0.69	15% Claystone, as above, some redbrown
			sm.am. glauconitic Siltstone, grey
K 1960	3540-70	1.97	50% Limestone, white, pink, obs with Glauconite
		0.71	45% Claystone, grey, browngrey, dark (brownish) grey, redbrown
			5% Sandstone, light grey to white, pink, very fine, calcareous, with glauconite, micaceous
			sm.am. Marl, sandy, light grey
K 1961	3570-3600	0.57	63% Claystone, redbrown (very calcareous), grey yellow, dark grey to black, calcareous
		0.14	30% Limestone, white
			7% Sandstone, as above, some redbrown, greenish
K 1962	3600-30	0.93	70% Claystone, grey, dark grey-black, redbrown, calcareous, some light green
		0.85	30% Limestone, white-light grey (marly)
			sm.am. Coal (additive)

TABLE II contd...

IKU No.	Depth	TOC	Lithology
K 1963	3630-60	0.43	100% Claystone, grey, redbrown, some greybrown, sligthly calcareous (Contaminated)
K 1964	3660-90	0.43	95% Claystone, grey, some redbrown, browngrey, calcareous 5% Coal (?additive)
K 1965	3690-3720	0.46	100% Claystone, as above sm.am. Marl, light grey; Coal
K 1966	3720-50	0.51	100% Claystone, as above, some light brownish grey, micaceous sm.am. Limestone, brown; Coal; Pyrite
K 1967	3750-75	0.94	100% Claystone, grey grading to dark grey, some redbrown, lamina of brownish light grey Siltstone sm.am. Pyrite; Coal
K 1968	3775-3800	0.84	100% Claystone, grey, some dark grey/black sm.am. Pyrite; Limestone, light brown (contaminated)
K 1969	3800-30	2.01	100% Claystone, grey, dark grey/black sm.am. Siltstone, light grey, Pyrite
K 1970	3830-60	0.66	100% Claystone, grey, some dark grey (brownish) sm.am. Limestone, brownwhite, light brown-brown; Siltstone
K 1971	3860-90	0.46	100% Claystone, grey, dark grey sm.am. Siltstone, (brownish) light grey
K 1972	3890-3920	0.82	100% Claystone, grey, brownish, some dark sm.am. Sandstone, fine; Siltstone, light grey (brownish)
K 1973	3920-50	0.68	97% Claystone, grey, dark grey (some black) 3% Sand/Siltstone, light grey sm.am. Coal
K 1974	3950-80	0.78	97% Claystone, grey (greenish), some dark grey to black (some sandy, silty, micaceous) 3% Siltstone, sandy, dark grey (brownish), glauconitic, micaceous; Sandstone, light grey/white, glauconitic

TABLE II contd..

IKU No.	Depth	TOC	Lithology
K 1975	3980-4010	0.65	90% Claystone, grey, some dark grey-black, redbrown. 10% Sandstone, fine, white, slightly glauconitic; Sand/Silt-stone, brownish grey sm.am. Coal; Pyrite; Siltstone, calcareous, light grey
K 1976	4010-40	0.76	85% Claystone, grey, dark grey to black (brownish some grading to Siltstone) 15% Sandstone, fine to medium, white, angular, calcareous, slightly micaceous, chloritic, with Coal-lamina sm.am. Coal; Anhydrite
K 1977	4040-70	0.75	70% Claystone as above, brownish, green, redbrown 30% Sandstone, fine to medium, white, some Mica and Chlorite, Pyrite, slightly calcareou
K 1978	4070-4100	0.35	50% Claystone, grey, some dark grey (obs with Coa brownish, silty, sandy), some green and red-brown. 50% Sandstone, as above, abundant Mica and Chlorite sm.am. Pyrite; Limestone, brown; Coal
K 1979	4100-30	0.44	50% Claystone, grey, dark grey-black, green and redbrown 50% Sandstone, clear/white and redbrown, fine-medium, subangular-angular, some Mica, Anhydrite
K 1980	4130-60	0.41	50% Claystone, grey, some dark grey, black, green, redbrown 50% Sandstone, redbrown, clear/white, as above sm.am. Anhydrite
K1981	4160-90	0.52	60% Claystone, as above 40% Sandstone, subangular, subrounded, as above sm.am. Anhydrite, white with reddish Clay

TABLE II contd...

IKU No.	Depth	TOC	Lithology	
K 1982	4190-4220	0.56	95%	Claystone, grey, dark grey and redbrown (silty, sandy, micaceous)
			3%	Sandstone very fine (silty) to medium, redbrown, white, occasionally anhydritic, micaceous and chloritic
			2%	Anhydrite
K 1983	4230-60	0.91	90%	Claystone, grey, dark grey, some redbrown
			10%	Salt, mainly Anhydrite, some sucrosic type of salt
K 1984	4260-90	0.42	95%	Claystone, as above
			5%	Salt, as above

TABLE II B

Side-Wall cores
Lithology and total organic carbon

Depth	TOC	Lithology
2950	1.46	Claystone, dark grey and grey, some fissile; and Claystone, redbrown
3475	0.50	Limestone, pinkish white
3495	1.34	Claystone, grey
3516	0.20	Limestone, pinkish/greyish white, with some Mica and ? Chlorite
3550	0.59	Claystone, black/dark grey, slightlt brownish, slightly micaceous
3675	0.43	Claystone, grey, some fissile, calcareous
3775	0.62	Claystone, grey, some fissile, calcareous
3780.5	0.88	Claystone, dark brownish grey, some fissile, calcareous
3789	0.79	Claystone, grey, calcareous
3795	4.33	Claystone, dark grey/black
3797	4.80	Claystone, black
3811	6.57	Claystone, brownish dark grey, slightly calcareous
3813	3.87	Claystone, slightly brownish dark grey, slightly micaceous and calcareous
3895	1.31	Siltstone, Sandy, white and dark grey (clayey), mottled texture, micaceous, slightly calcareous, subangular
3960	1.53	clayey Siltstone, dark brownish grey, Glauconite observed, slightly calcareous
4012	12.33	Clay/Silt-stone, brownish dark grey, some light, with parts of Coal.

TABLE III

WEIGHT (mg) OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU No.	Depth	Rock extracted (g)	EOM (mg)	Sat (mg)	Aro (mg)	HC (mg)	Non HC (mg)	TOC
K-1883	2280-2310	80,5	46,8	7,7	9,3	17,0	9,6	1,83
K-1891	2520-50	48,6	33,9	5,8	8,8	14,6	10,7	1,55
K-1905	2940-70	100,1	38,1	6,3	10,5	16,8	10,9	1,68
K-1908 claystone	3050-70	23,2	7,5	2,9	2,3	5,2	2,2	0,20
K-1908 limestone	3050-70	67,0	90,0	2,4	1,4	3,8	50,8	0,57
K-1914 limestone	3210-40	45,5	6,4	2,0	1,0	3,0	2,2	0,75
K-1918 limestone	3330-60	57,3	6,5	1,1	1,1	2,2	1,7	1,15
K-1918 claystone	3330-60	43,4	21,5	1,3	3,9	5,2	6,4	1,10
K-1958 limestone	3480-3510	68,2	6,0	1,7	2,4	4,1	0,5	1,23
K-1960 limestone	3540-70	12,1	5,2	0,7	2,2	2,9	0,6	1,97
K-1960 claystone	3540-70	49,7	27,2	2,9	1,7	4,6	3,7	0,71
K-1969 claystone	3795-3813 3800-30	100,3	294,7	125,1	71,0	196,1	30,6	2,01
K-1974 claystone	3875-93 3950-80	100,3	81,0	21,6	22,3	43,9	7,4	0,78
K-1977 claystone	4040-70	100,4	45,0	15,1	14,0	29,0	5,6	0,75

TABLE IV

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS (Weight ppm of rock)

IKU No.	Depth	EOM	Sat.	Aro.	HC	Non HC
K-1883	2280-2310	581	96	116	211	119
K-1891	2520-50	698	119	181	300	220
K-1905	2940-70	381	63	105	168	109
K-1908 claystone	3050-70	323	125	99	224	95
K-1908 limestone	3050-70	1343	36	21	57	758
K-1914 limestone	3210-40	141	44	22	66	48
K-1918 limestone	3330-60	113	19	19	38	30
K-1918 claystone	3330-60	495	30	90	120	147
K-1958 limestone	3480-3510	88	25	35	60	7
K-1960 limestone	3540-70	430	58	182	240	50
K-1960 claystone	3540-70	547	58	34	93	74
	3795-3813	1901	1237	588	1825	77
K-1969 claystone	3800-30	2938	1247	708	1955	308
	3875-93	6628	714	288	1022	5606
K-1974 claystone	3950-80	808	215	222	438	74
K-1977 claystone	4040-70	448	150	139	289	56

TABLE V

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS (mg/g TOC)

IKU No.	Depth	EOM	Sat.	Aro.	HC	Non HC
K-1883	2280-2310	32	5	6	12	7
K-1891	2520-50	45	8	12	19	14
K-1905	2940-70	23	4	6	10	6
K-1908 claystone	3050-70	162	63	50	112	47
K-1908 limestone	3050-70	236	6	4	10	133
K-1914 limestone	3210-40	19	6	3	9	6
K-1918 limestone	3330-60	10	2	2	3	3
K-1918 claystone	3330-60	45	3	8	11	13
K-1958 limestone	3480-3510	7	2	3	5	1
K-1960 limestone	3540-70	22	3	9	12	3
K-1960 claystone	3540-70	77	8	5	13	10
	3795-3813	42	27	13	40	2
K-1969 claystone	3800-30	146	62	35	97	15
	3875-93	442	48	19	68	374
K-1974 claystone	2950-80	104	28	29	56	9
K-1977 claystone	4040-70	60	20	19	39	7

TABLE VI

COMPOSITION IN % OF THE MATERIAL EXTRACTED FROM THE ROCK

IKU No.	Depth (m)	Sat/EOM	Aro/EOM	HC/EOM	Sat/Aro	Non HC/EOM	HC/Non HC
K-1883	2280-2310	16	20	36	83	21	177
K-1891	2520-50	17	26	43	66	32	136
K-1905	2940-70	17	28	44	60	29	154
K-1908 clayst.	3050-70	39	31	69	126	29	236
K-1908 limest.	3050-70	3	2	4	171	56	7
K-1914 limest.	3210-40	31	16	47	200	34	136
K-1918 limest.	3330-60	17	17	34	100	26	100
K-1918 clayst.	3330-60	6	18	24	33	30	81
K-1958 limest.	3480-3510	28	40	68	71	8	820
K-1960 limest.	3540-70	13	42	56	32	12	483
K-1960 clayst.	3540-70	11	6	17	171	14	124
	3795-3813	65	31	96	211	4	2381
K-1969 clayst.	3800-30	42	24	67	176	10	641
	3875-80	11	4	15	248	85	18
K-1974 clayst.	3950-80	27	28	54	97	9	593
K-1977 clayst.	4040-70	34	31	64	108	12	518

TABLE VII

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

IKU No.	Depth (m)	Pristane/nC_{17}	Pristane/Phytane	CPI
K1883	2280-2310	2.92	2.50	1.8
K1891	2520-50	5.22	4.80	1.6
K1905	2940-70	2.53	2.47	1.2
K1908	3050-70	0.65	1.51	1.0
Claystone				
K1908	3050-70	1.00	2.10	1.1
Limestone				
K1914	3210-40	0.50	1.00	1.0
Limestone				
K 1918	3330-60	0.91	1.33	1.0
Limestone				
K1918	3330-60	5.15	3.09	1.6
Claystone				
K1958	3480-3510	1.12	1.79	1.1
Limestone				
K1960	3540-70	1.04	1.34	1.0
Limestone				
K1960	3540-70	2.08	2.17	1.2
Claystone				
	3795-3813	0.63	1.50	0.9
K1969	3800-3830	0.56	1.56	0.9
	3875-3893	0.63	2.08	1.0
K1974	3950-80	0.54	1.77	1.0
K1977	4040-70	0.58	1.70	1.0

2/1-3

TABLE VIII

Vitrinite reflectance measurements

Depth (m)	Vitrinite reflectance	Fluorescence in UV light	Exinite content
2250x	0.30 (20)	Yellow - light orange (3-5)	Low
2370	0.41 (22)	Yellow/orange (4)	Low-Moderate
2500x	0.36 (20)	Yellow and Yellow/orange (3+4)	Trace
2530	0.41 (21)	Yellow - Mid.orange (3-6)	Low
2700	0.41 (22)	Yellow/orange and light orange (4+5)	Trace
2820	0.43 (20)	Light orange (5)	Low-Moderate
2880	0.38 (21)	Light orange (5)	Low-Moderate
2940	0.34 (22)	Light-Mid.orange (5+6)	Low
3050	NDP	Light orange (5)	Trace
3140	0.52 (7)	Mid.orange (6)	Low
3210	0.49 (4)	Yellow and Yellow/orange (3+4)	Trace
3268x	NDP	None	None
3300	0.41 (5), 0.61 (1)	Light and Mid.orange (4+5)	Moderate
3360	0.43 (9), 0.60 (11)	Light and Mid.orange (5+6)	Trace
3420	0.41 (20)	Yellow/orange and Light orange (4+5)	Moderate
3480	0.44 (21)	Light and Mid.orange (5+6)	Low
3505x	0.36 (5)	(Carbonate)	None
3540	0.44 (12)	Light and Mid.orange (5+6)	Moderate
3600	0.27	Light orange (5)	Low
3690	0.30 (21)	None	None
3725x	0.63 (4), 0.81 (2)	Light - mid. orange (6)	Trace
3750	0.60 (2)	Mid.orange (6)	Trace
3787	0.35 (8), 0.64 (1)	Mid.orange (6)	Low
3811x	0.58 (14), 0.83 (1)	Mid.orange (6)	Low
3815x	0.31 (17)	Hydrocarbons	None
3830	0.86 (3)	Mid.orange (6)	Trace
3830	0.68 (20)	Mid.orange (6)	Low/moderate
3919.5x	0.24 (1), 0.39 (14), 0.54 (5)	Hydrocarbons	None
3980	0.27 (1), 0.49 (6), 0.90 (13)	Mid.-Deep orange (6/7)	Trace

TABLE VIII contd.....

Depth (m)	Vitrinite reflectance	Fluorescence in UV light	Exinite content
4012[x]	1.03 (23)	None	None
4040	0.58 (19), 0.87 (3)	Mid.orange (6)	Trace
4100	0.47 (1), 0.85 (6)	Mid.orange (6)	Trace
4142[x]	NDP	None	None
4199.5[x]	NDP	None	None
4260	0.29 (14), 0.68 (7), 1.17 (1)	Yellow/orange and Mid.orange (4+6)	Trace

[x] Sidewall cores

TABLE IX

IKU	Well number 2/1-3	VISUAL KEROGEN ANALYSIS				
Code number	Sample depth	Composition of residue	Particle size	Presevation -palynomorphs	Thermal maturation index	Remarks (Trondheim 1980)
	2250 m	Am/Cy, He	F	F-G	1+/2-	aggregates
	2430 m	Am/Cy, He	F	F-G	2-, 2-/2	aggregates, microbe attack of palyn.
	2610 m	Am/Cy, He	F	F-G	2-, 2-/2	
	2790 m	Am/Cy, He	F	F-G	2-/2	aggregates
	2980 m	Am/He, Cy	F	F-G	2-/2	aggregates
K 1911	3140 m	Am/(He)	F		NDP	Acid resistant minerals
K 1917	3300 m	Am	F			
	3400 m	Am	F			no palynomorphs recovered
	3490 m	Am/He	F		2	partly sapropel in aggregates
K 1960	3540 m	Am/Cy, He	F	G-F	2	slide of total residue is lacking
K 1960	3550 m	Am/Cy, He	F	F-G	2	aggregates
	3595 m	Am/Cy, He	F	F-G	2 or 2/2+	staining
	3615 m	W, He(C)/Am, Cy	F		2+/3	
	3633 m	W, He(C)/Am, Cy	F		2+/3	
	3651 m	Am, Cy/He, W	F		2+/3-	
	3687 m	W/Am, Cy	M-C	G-F	2+/3	W may be mud additive or caved
	3714 m	Am/He,Cy	F	G-F	2+/3-	Cysts are very dark
	3741 m	Am/He	F	F-G	2+/3	aggregates
	3768 m	Am/He, W		F-G	2/2+	
	3786 m	Am/He, W	F	F	2+/3-	aggregates
	3787 m^x	Am/He	F		2/2+	
(K - 1974)	3813 m^x	Am/	F	F	(2+/3-)	aggregates
	3822 m^x	Am/	F		2/2+	

TABLE IX contd...

IKU	Well number 2/1-3	VISUAL KEROGEN ANALYSIS				
Code number	Sample depth	Composition of residue	Particle size	Presevation -palynomorphs	Thermal maturation index	Remarks (Trondheim 1980)
	3832 m^x	Am/	F		2/2+	
	3843 m	Am/He, W	F-M	F	(2+/3-)	Some reworked oxidized is suspected
	3865 m^x	Am/He	F			
	3871 m^x	Am/He	F			
	3875,85 mkj	Cut/Am, Cy	M	P	2/2+	An oxidized residue a delt ass.
	3909 m	Am/	F			
	3919,5 m^x	Am/He	F			
	3939 m	Am	F		2/2+	
	3960 m	Am	F	P	2/2+	Microbe attack
	3972 m^x	Am/He	F	F		
	3993 m	Am/He	F			Suspected caved matrial dom.
	4001 m^x				2+/3	
	4011 m	W, He, Cut	F-M	F		Caved amorphous material from higher
	4012 m	W, Cut, He				levels dominate
	4023 m	W	M-C	P	(2+/3-)	caved amorphous material from higher up dominated
	4035 m	W	M-C	P	(2+/s-)	--"-- --"--
	4089 m	Am	F	P	(2+/3-)	--"-- --"--
	4100 m				NDP	barren apart from muddatives
	4142,25 m^x	He			NDP	Almost barren
	4161	(Am, He) He, W	F-M	F-G	NDP	caved amorphous material from higher levels dominates. Indigenous material needed oxidation

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TABLE IX contd....

IKU	Well number 2/1-3	VISUAL KEROGEN ANALYSIS				
Code number	Sample depth	Composition of residue	Particle size	Presevation -palynomorphs	Thermal maturation index	Remarks (Trondheim 1980)
	4199.5 [x]	W (coal)	M-C		NDP	Almost barren. Rich in acid resistant minerals.
	4211,5 m[x]	W (coal)	M-C		NDP	Almost barren, rich in acid resistant minerals
	4233 m	(Am, He) He, W, Cut	M	F-G	NDP	Very rich in resistant minerals. Before oxidation the residue is dom. by caved material.
	4275 m	(Am, He) He	M	F-G	NDP	caved amorphous and herbaceous material from high levels dom.
	4295 m	(Am, He) He	M	F-G	NDP	caved amorphous and herbaceous material from high levels dom.

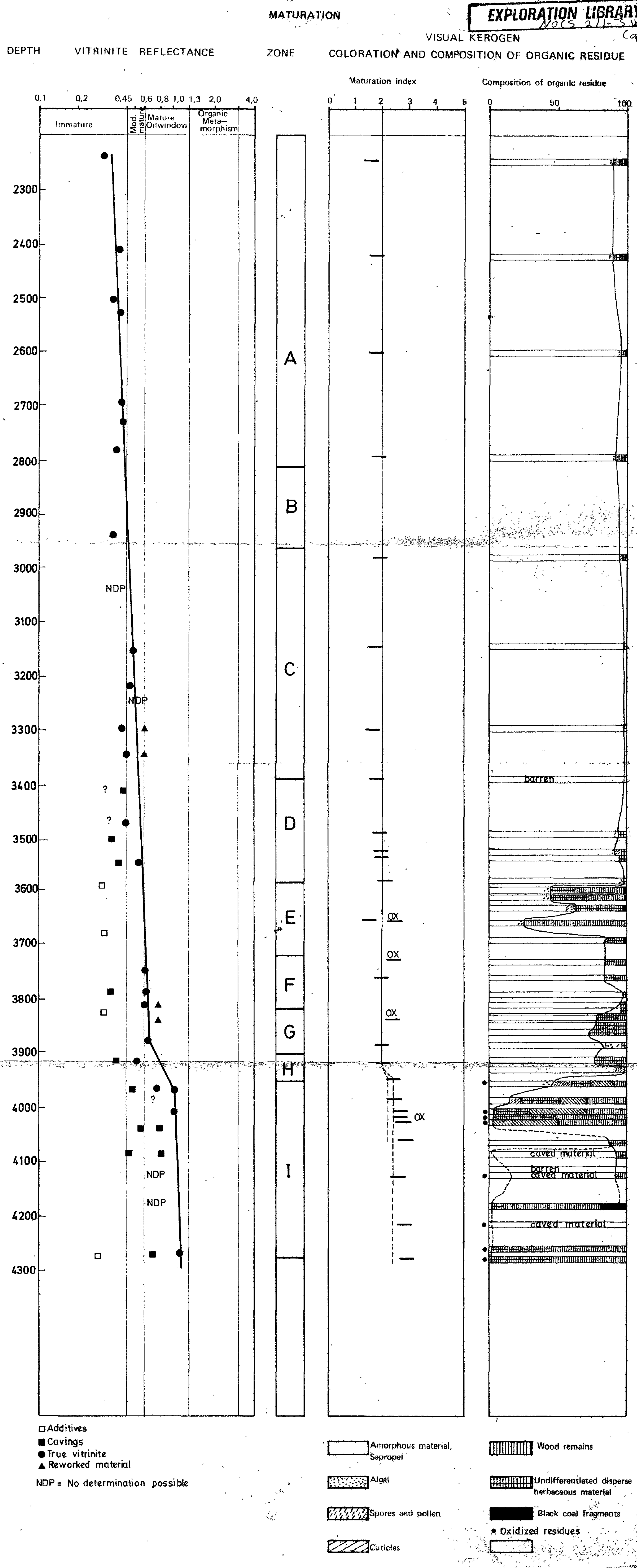
[x] sidewall cores

Am amorphous
He herbaceous
W woody
C coal fragments
Cy cysts
Cut cuticles

F fine
M medium
C coarse

P poor
F fair
G good

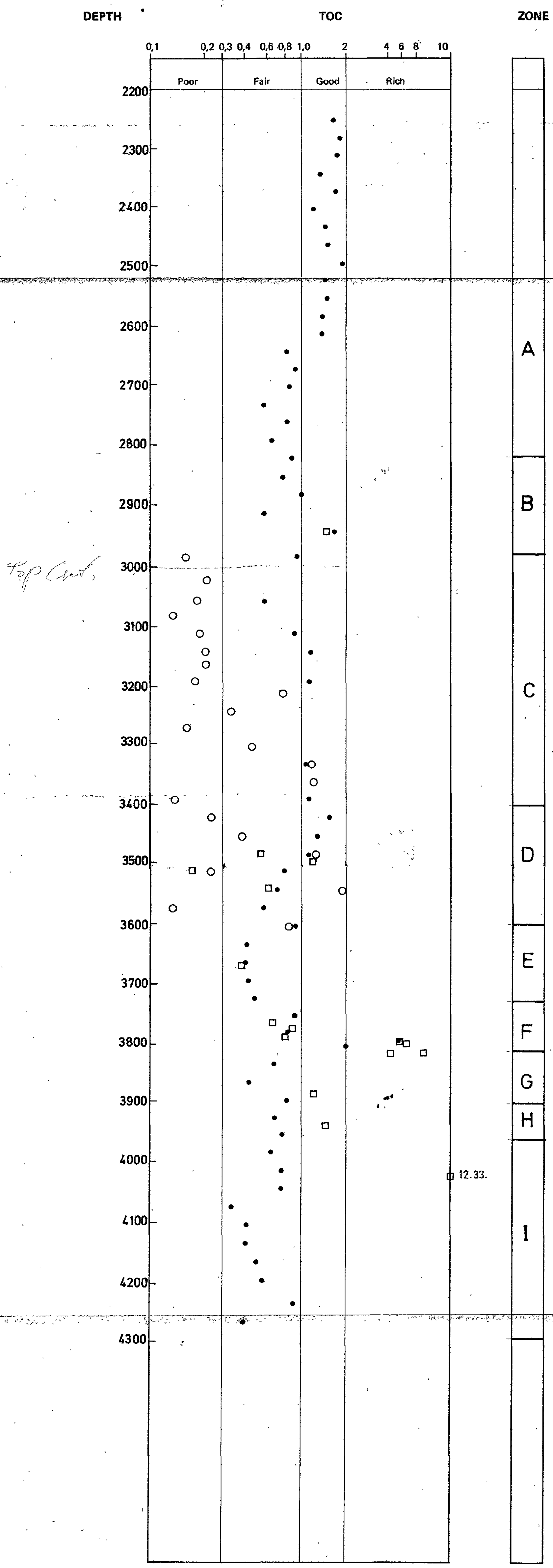
NDP no determination possible


MATURATION
DEPTH
VITRINITE REFLECTANCE
ZONE
VISUAL KEROGEN
COLORATION AND COMPOSITION OF ORGANIC RESIDUE
Maturation index
Composition of organic residue
0,1 0,2 0,45 0,6 0,8 1,0 1,3 2,0 4,0
Immature
Mod. mature
Mature Oilwindow
Organic Meta-morphism
2300
2400
2500
2600
2700
2800
2900
3000
3100
3200
3300
3400
3500
3600
3700
3800
3900
4000
4100
4200
4300
NDP
A
B
C
D
E
F
G
H
I
OX
barren
caved material
Additives
Cavings
True vitrinite
Reworked material
NDP = No determination possible
Amorphous material, Sapropel
Algal
Spores and pollen
Cuticles
Wood remains
Undifferentiated disperse herbaceous material
Black coal fragments
Oxidized residues

2/1-3

TOTAL ORGANIC CARBON (TOC)

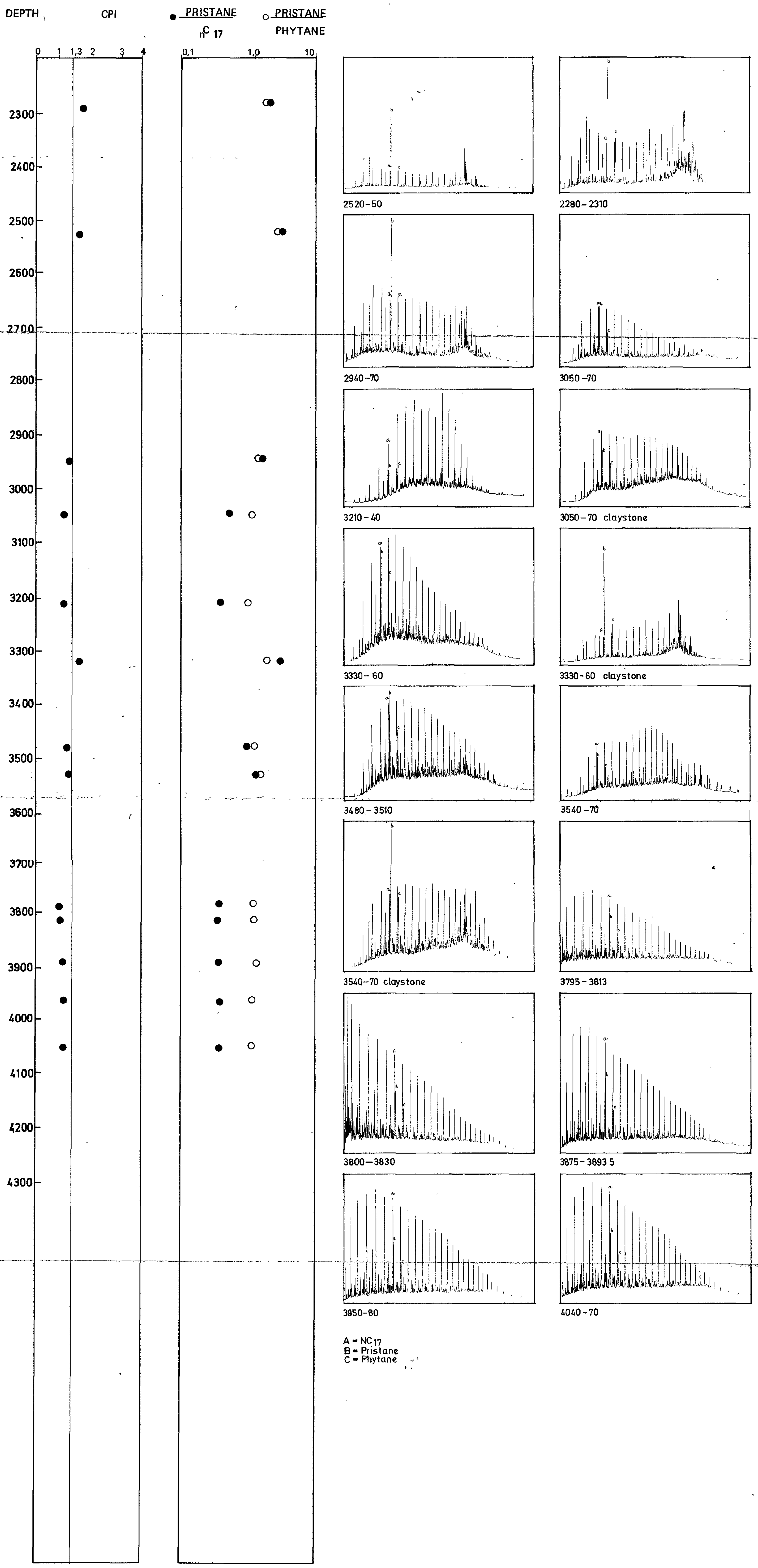
Presentation of Analytical Data



• claystone
○ limestone
□ sidewall cores

2/1-3

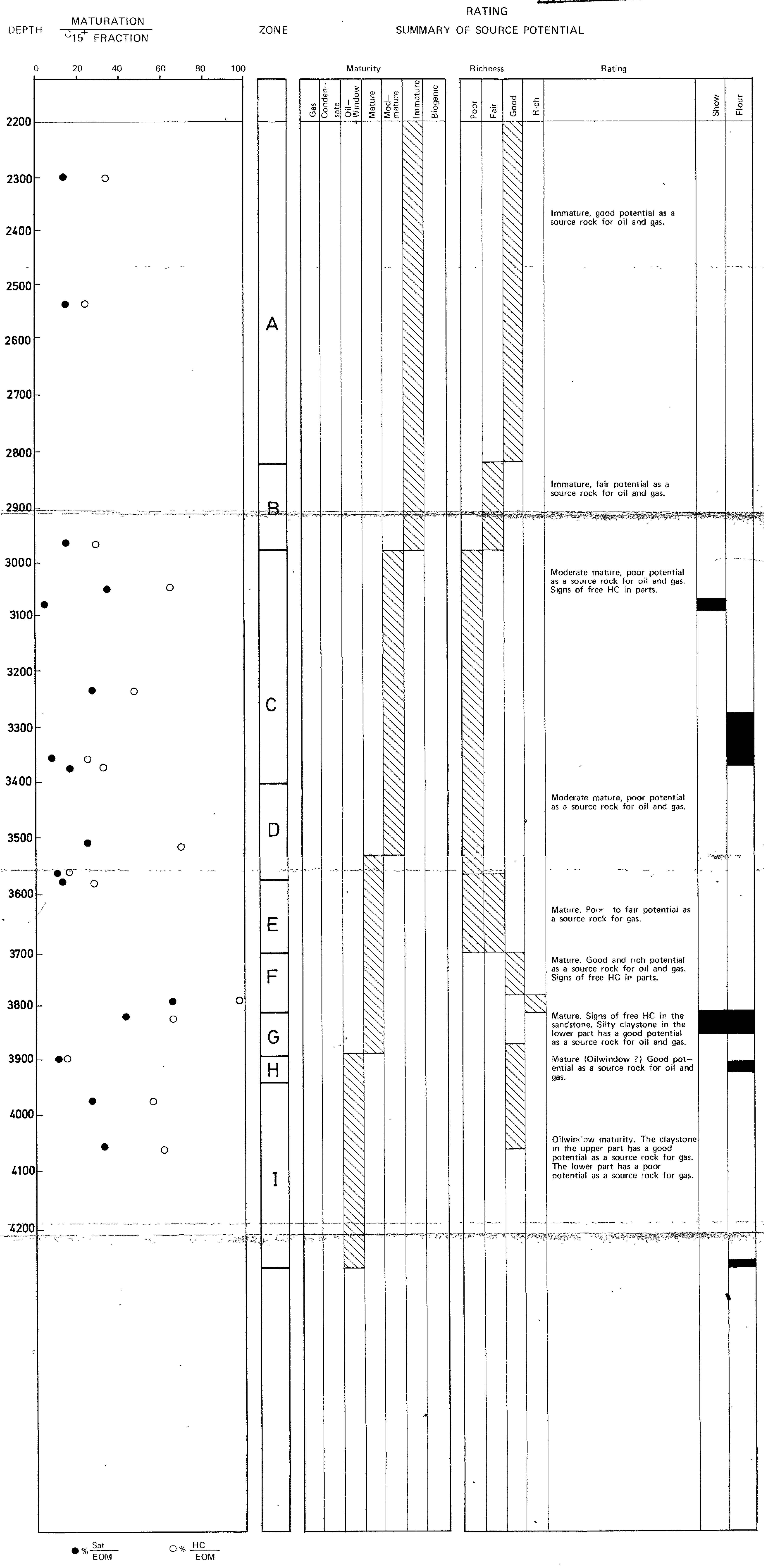
C_{15}^{+} SATURATED HYDROCARBONS



A = NC17
B = Pristane
C = Phytane

2/1-3

INTERPRETATION DIAGRAM

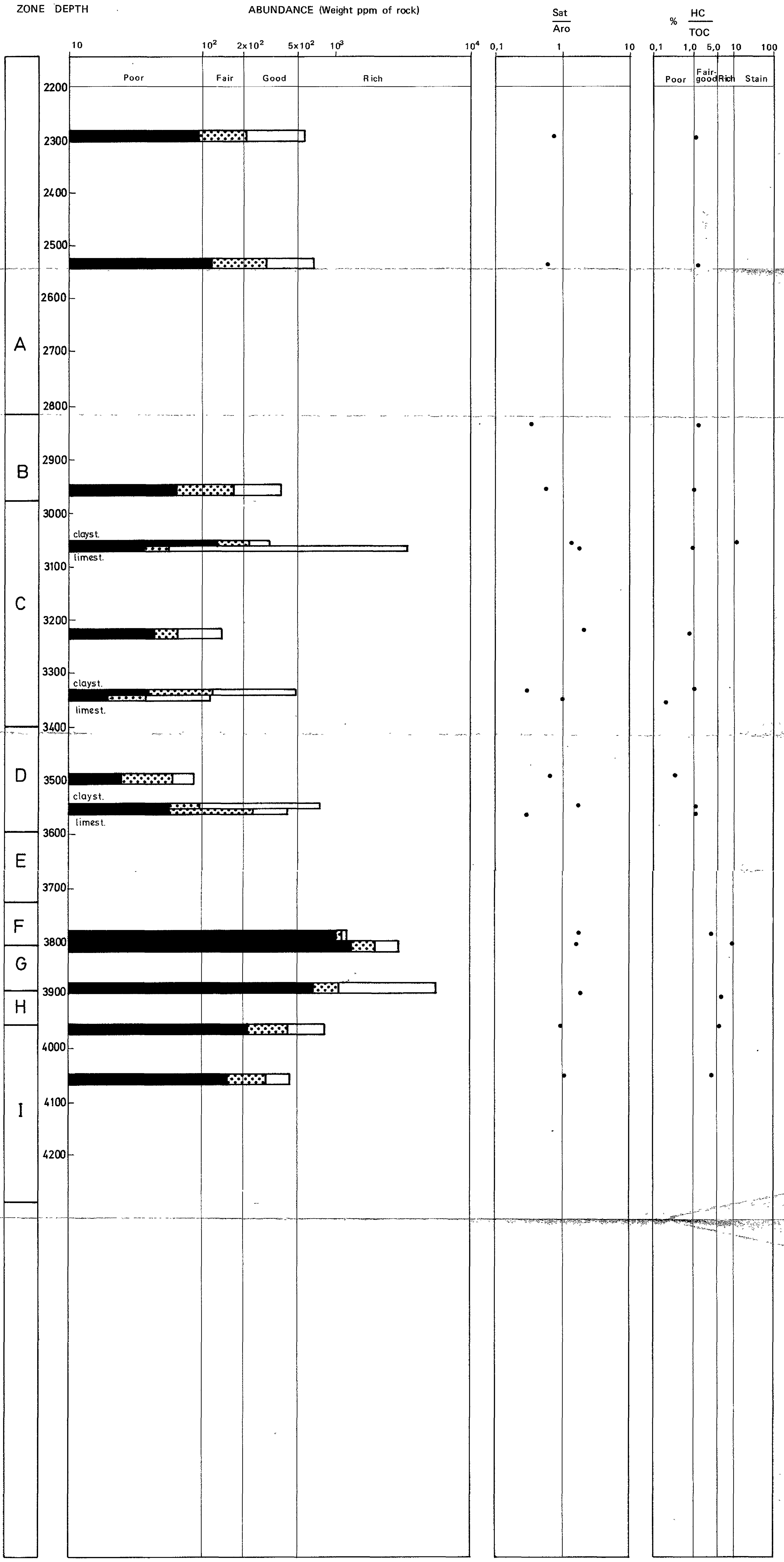


Sat: Saturated Hydrocarbons
HC: Hydrocarbons
EOM: Extractable Organic Matter

2/1-3

C_{15}^{+} HYDROCARBONS

Presentation of Analytical Data



Sat. Aro. NSO Asp

Sat: Saturated Hydrocarbons
Aro: Aromatic Hydrocarbons
NSO: Nitrogen, Sulphur and Oxygen containing compounds

Asp: Asphaltenes
HC: C_{15} Hydrocarbons
TOC: Total Organic Carbon

$C_1 - C_7$ HYDROCARBONS
Presentation of Analytical Data