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Source rock analyses of well 31/4-3

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SUMMARY:

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KEY WORDS

Source rock

Summary

Based on the light hydrocarbon data, the analysed sequence of the well is divided into eighteen zones, which with background in the other analyses are given the following rating.

Zone A: 1450 - 1750 m: Immature, poor/fair potential as a source rock for gas. Indications of free HC.

Zone B: 1750 - 1960 m: Immature, fair/good potential as source rosk for gas. Indications of free HC.

Zone C: 1960 - 2011 m: Immature, fair/good potential as source rock for gas. Indications of free HC.

Zone D: 2011 - 18 m: Immature, rich potential as source rock for oil.

Zone E: 2018 - 2185 m: Immature/moderate mature, free HC in sandstone. Clayey siltstone has a good potential as a source rock for gas and oil.

Zone F: 2185 - 2385 m: Moderate mature, free HC in sandstone.

Zone G: 2385 - 2535 m: Moderate mature. Possibly some free HC in sandstone.

Zone H: 2535 - 2730 m: Moderate mature. Siltstone has a fair potential as a source rock for gas.

Zone I: 2730 - 2775 m: Moderate mature/mature. Indications of migrated gas in upper part of the zone.

Zone J: 2775 - 2975 m: Mature. Claystone in zone has a poor/fair potential as a source rock for gas.

Zone K: 2975 - 3285 m: Oil window maturity. Mainly red claystone, oxidized. Some grey claystone, fair potential as a source rock for gas.

Zone L - R: 3285 - 4970 m: Oil window maturity. 4700 - TD. Condensate window maturity?. Mainly redbeds. The maturity from approximately 2900 m is highly tentative.

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°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°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°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

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 dino-flagellates) 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).

RESULTS AND DISCUSSION

Based on the light hydrocarbon analyses, together with the information received from Norsk Hydro of the depth interval for the hotshale sequence, the analysed sequence 1450 - 4970 m is divided into eighteen zones:

A: 1450 - 1750 m.
B: 1750 - 1960 m.
C: 1960 - 2011 m.
D: 2011 - 2018 m.
E: 2018 - 2185 m.
F: 2185 - 2385 m.
G: 2385 - 2535 m.
H: 2535 - 2730 m.
I: 2730 - 2775 m.
J: 2775 - 2925 m.
K: 2925 - 3285 m.
L: 3285 - 3855 m.
M: 3855 - 3990 m.
N: 3990 - 4170 m.
O: 4170 - 4260 m.
P: 4260 - 4395 m.
Q: 4395 - 4575 m.
R: 4575 - 4970 m.

Light Hydrocarbon Analyses.

In the upper part of the well down to approximately 1900 m, only every second sample was analysed, while from 1900 - 3300 m, every sample was analysed. From 3300 m to the base of the well, every third sample was analysed.

Zone A: 1450 - 1750 m: This zone has a variable abundance of C_1 - C_4 hydrocarbons, but a constant low wetness of the gas. The iso butane/ n-butane (iC_4/nC_4) ratio is high.

Zone B: 1750 - 1960 m: This zone also has a variable abundance of C_1 - C_4 hydrocarbons, but the abindance of C_5+ hydrocarbons increases sharply compared to zone A.

Zone J: 2775 - 2925 m: Both the abundances of C_1 - C_4 and C_5+ hydrocarbons are similar to those found in zone G while the wetness of the gas and the iC_4/nC_4 ratio is slightly lower. With the low abundances of light hydrocarbons encountered in this zone, there is no indications of migrated hydrocarbons in this sandstone zone.

Zone K: 2925 - 3825 m: This zone consists of a sandstone sequence at the upper 60 m and then a thick claystone sequence. The abundances of C_1 - C_4 and C_5+ hydrocarbons vary slightly from sample to sample, but on the whole poor/fair abundances are encountered.

Zone L: 3285 - 3855 m: This zone consists of sandstone, claystone and siltstone. On the whole the abundance of light hydrocarbons is low but with a varying wetness of the gas. The variation of the wetness is, however, not large enough make further division necessary.

Zone M: 3855 - 3990 m: This zone is divided from the zone above due the very low wetness of the gas found for all the analysed samples.

Zone N: 3990 - 4170 m: This zone varies from the zones above in all measured parameters. The abundance of C_1 - C_4 hydrocarbons is slightly higher while the abundance of C_5+ is slightly lower than the zones above. The largest difference is, however, found for the wetness of the gas, which is high for most of the samples, and the iC_4/nC_4 ratio which is also found to be high.

Zone O: 4170 - 4260 m: Again a zone with very low abundances of C_1 - C_4 and C_5+ hydrocarbons, markedly lower than the zones above.

Zone P: 4260 - 4395 m: This zone shows a marked increase in both the abundances of C_1 - C_4 and C_5+ hydrocarbons, and is therefore separated out from the zones above.

Zone Q: 4395 - 4575 m: Again a zone with very low abundances of C_1 - C_4 and C_5+ hydrocarbons.

Zone R: 4575 - 4970 m: This zone is separated out from the zone above mainly due to the much higher abundance of C_5+ hydrocarbons found for this zone.

Both lithologies were analysed for organic carbon. The grey claystone is found to have similar TOC values to the zone I, and could of course be cavings, while thr red/brown claystone is found to have very poor abundances for organic carbon. The organic material is all oxidized.

Zones L - R: All these zones are found to have similar results. The red/brown claystone is found to have very low TOC values , while the grey claystone, where this is found, has reasonable high TOC values. It is believed that the small amounts of grey claystone found in some of the samples comes from thin interbedded, non oxidized claystone lenses in the heavily oxidized red/brown sediments.

Extraction and Chromatographic Separation.

Zone A: Two samples, 1510 - 25 m and 1540 - 55 m, from the upper part of this zone was extracted and found to have a poor abundance of extractable hydrocarbons. The gas chromatograms of the two saturated hydrocarbon fractions are similar with a bimodal n-alkane distribution and maxima at nC_{17} and nC_{27}, indicating a large input of terrestrial material. We would, however, like to point out that the carbon preferance index (CPI) is low, indicating a well mature sample. This does noe agree with the low maturity found for the sediment at this level.

Zone B: One sample, 1795 - 1810 m, from this zone was extracted and found to have a good abundance of extractable hydrocarbons. The gas chromatogram of the saturated hydrocarbon fraction varies from those seen for the zone above. It is found to have a large unresolved envelope in the light end and very pronounced isoprenoids. Pristane is the most abundant compound in the sample. The CPI value is extremely low and presently it is not known the reason for such a chromatographic distribution.

Zone C: One sample, 1960 - 75 m, from this zone was extracted and found to have a poor abundance of extractable hydrocarbons. The gas chromatogram of the sample has a bimodal distribution with maxima at nC_{16} and nC_{25} and a low CPI value. The most striking features in the gas chromatogram are, however, the large peaks seen between some of the n-alkanes. Presently, it is not known what has caused this, but similar features are found in extracts of drilling mud, and this might be due to mud additives in the sample.

Sample K 1740, 1660 - 75 m: Light shale and carbonate, Ro = 0,44 (9).

The sample has a low organic content with bitumen blebs and locallised staining, otherwise a few particles of reworked material and inertinite. Only a trace of vitrinite was recorded. UV light shows a yellow/orange fluorescence from spores and hydrocarbon specks together with a trace of exinite.

Sample K 1769, 1795 - 1810 m: Shale and carbonate, Ro = 0,55 (2).

The sample is virtually barren, apart from strong bitumen staining and wisps. A few inertinite particles together with two vitrinite particles were recorded. UV light shows a yellow/orange and light orange fluoresence from spores and hydrocarbon traces together with a low to moderate exinite content.

Sample K 1776, 1900 - 15 m: Shale, Ro = 0,49 (4).

The sample has a low organic content with bitumen wisps and staining. A few small inertinite particles and a trace of vitrinite particles were recorded. UV light shows a faint carbonate fluorescence, no definite organic.

Sample K 1786, 1990 - 2005 m: Shale and white marl, Ro = 0,48 (4).

The sample contains bitumen blebs and wisps, otherwise a low content of small, corroded particles of inertinite and reworked material with traces of vitrinite wispy particles. UV light shows a yellow/orange and light orange fluorescence from spores and hydrocarbon impregnations together with a moderate exinite content.

2010 - 40 m: Shale, Ro = 0,33 (22).

The sample is rich in bitumen with strong staining, wisps and stringers, otherwise a low content of small particles of vitrinite and inertinite and a few coal fragments. UV light shows a yellow/orange and light orange fluorescence from spores and a moderate to rich exinite content.

The vitrinite reflectance measurements are lowered due to bitumen staining.

Sample K 1794, 2110 - 25 m: Shale, Ro = 0,45 (10).

UV light shows a light and mid-orange fluorescence from spores, rather dull, and a moderate exinite content.

Sample K 1925, 2730 - 40 m: Coal and shale, Ro = 0,54 (22).

The sample contains about equal proportions of coal and shale. The coal is vitrinic, virtually no inertinite. Rather dirty and brecciated. The shale has a low organic content with bitumen staining and occasional wisps of vitrinite and inertinite particles. UV light shows a light and mid-orange fluorescence from spores, rather dull, and a moderate to rich exinite content.

Sample K 1930, 2805 - 20 m: Shale, Ro = o,44 (20/ and Ro = 0,67 (1).

The sample has some bitumen staining and wisps but vitrinite wisps and particles are dominant with only a trace of inertinite particles and a few liguite fragments. UV light shows a light and mid-orange fluorescence from spores, rather dull, and a moderate exinite content.

Sample K 1936, 2895 - 2910 m: Red and green shale. No determination possible.

The sample is almost barren, only a few pseudomorphs of phytoclasts in haematite. No organic material, save for a couple of caved cuttings containing inertinite particles and bitumen, but no vitrinite. UV light shows a yellow/orange and light orange fluorescence from hydrocarbons and spore specks in a few cuttings together with a trace of exinite.

Sample K 1942, 2985 - 3000 m: Red and grey shale, siltstone, Ro = 0,39 (7) and Ro = 0,60 (1).

The red shale is barren. The grey shale and siltstone shows inertinite particles to be dominant together with bitumen wisps and a few vitrinite particles and wispy particles. UV light shows a variable carbonate fluorescence and a few light orange spores and hydrocarbon specks together with a trace of exinite.

Sample K 1945, 3030 - 45 m: Red siltstone, grey shale and carbonate, Ro = 0,44 (7).

The red siltstone is barren. The organic material is restricted to a few shale cuttings containing inertinite particles and a few good vitrinite wisps.

Sample K 2480, 3525 m: Red and grey shale and siltstone, Ro = 0,51 (21).

The red shale is barren. The grey shale has a moderate content of reworked and inertinite particles together with some vitrinite wisps. UV light shows a light orange fluorescence from spores and hydrocarbon specks in about 50% of the cuttings together with a moderate to rich exinite content. Some of the grey shale cuttings contain haematite wisps and localised staining suggesting a true grey horizon in a red sequence, rather than cavings.

Sample K 2489, 3660 m: Red shale and siltstone, Ro = 0,33 (20).

The red litologies are barren except for a few high reflectance oxidized fragments. A few coal particles plus traces of grey shale containing bitumen wisps and inertinite, but no reliable vitrinite was recorded. UV light shows a yellow/orange fluorescence from spores and hydrocarbon specks in a few cuttings together with a trace of exinite. All the vitrinite reflectance measurements were on coal.

Sample 2498, 3975 m: Red shale and sandstone, Ro = 0,21 (1) and Ro = 0,39 (1).

The sample is barren except two loose coal particles which were measured. A few very corroded organic particles in the red shale, oxidized and of very high reflectance, were recorded but not measured. UV light shows a variable carbonate fluorescence and one light orange spore together with a trace of exinite.

Sample K 2504, 3885 m: Red and grey shale. No determination possible.

The red shale is barren. The grey shale is very fine grained, possibly turbo-drilled, barren. UV light does not show any fluorescence and no exinite.

Sample K 510, 3975 m: Red shale and siltstone. No determination possible.

The sample is barren. UV light shows a yellow/orange fluorescence from spores and hydrocarbon impregnation in one cutting, together with a trace of exinite.

Sample K 2589, 4020 m: Red shale and sandstone, Ro = 0,48 (3).

The sample is barren except one loose vitrinite particle and two wisps in a cutting of grey shale of untypical lithology.

Sample 2665, 4605 m: Red shale, sandstone and coal traces, Ro = 0,33 (19) and Ro = 0,58 (3).

The red lithologies are barren. The coal and carbargillite traces could be additives and cavings. The carbargillite shows a higher reflectance than the coal. UV light shows a light orange fluorescence from spores in a few cuttings together with a trace of exinite.

Sample 2671, 4695 m: Red siltstone and sandstone, Ro = 0,37 (28).

The sample is barren except for a few coal particles which were measured. UV light shows a yellow/orange fluorescence from hydrocarbon specks in one cutting and a trace of exinite. All the measurements are on coal which probably are cavings or additives.

Sample K 2680, 4830: Red shale and sandstone with grey siltstone traces, Ro = 0,78 (1), Ro = 1,15 (7), Ro = 1,38 (10) and Ro = 2,03 (2).

The red shale and sandstone are barren. The grey siltstone has a moderate organic content with high reflectance material mostly inertinite. The lithology also indicates high maturity. A few vitrinite wisps, also of high reflectance are recorded. These look reliable. UV light does not show any fluorescence. The sample has rather variable reflectance values, possibly due to oxidation. The highest readings would then be incorrect.

Sample 2683, 4875 m: Red shale and sand. Ro = 1.19 (2), Ro = 1,50 (2), Ro = 1,78 (1).

The sample contains a few high reflectance particles, oxidised but mostly replaced by haemalite. Probably no true material. UV light does not show any organic fluorescence. The vitrinite reflectance results down to approximately 3100 m are fairly reliable, while from 3100 m to TD they are almost meaningless, due to the oxidation of the samples. The two lowermost analysed samples give a very large spread in results.

woody material acount for about 25% and are well preserved. Colour index: 2.

2391 m swc: The residue is dominated by about 50% amorphous material and dinoflagellate cysts. There is an assemblage of pollen/spores, finely dispersed material, cuticles and woody matter, and about the same amount of dark coaly fragments, probably reworked into this assemblage. The palynomorphs are fairly well preserved but especially pollen grains seem attacked by microbes. Colour index: 2/2+.

2507 m swc: The residue seems dominated by a varied terrestrial assemblage, the largest group being cuticles and pollen/spores. Sapropel acounts for about 20%. The palynomprphs are well preserved. The cuticles are sapropelized. Sapropel sticks to the other fragments. Colour index: 2 or 2/2+. Pollen grains are lighter coloured than the cuticles.

2625 m swc: Herbaceous finely dispersed indeterminated material, woody fragments and pollen/spores dominate in this residue. Amorphous material acounts for less than half the material. The palynomorphs are well preserved. Colour index: 2/2+.

2750 m swc: Terrestrial material, mainly cuticles and pollen/spores, dominated this residue. Woody material acounts for about 20%, indeterminated finely, dispersed, herbaceous material forms a minor constituent. Amorphous material acounts for about 20%, though the sapropelized cuticles may be difficult to distinguish from the true sapropel.

Below this level the sidewall cores investigated yielded only very dark material, coaly fragments unsuited for visual colour evaluation. The residues from the swc samples in most cases were very small and insufficient to provide enough material for kerogen classification. At certain intervals they were replaced by palynological preparations from cuttings, which after chemical oxidation yielded deltaic assemblages dominated by pollen and spores.

Supposed sapropel was identified in oxidized material from 3980 m swc together with indeterminate herbaceous material, and very dark coal fragments.

Rock-Eval Pyrolysis.

Fortyone samples were analysed on a Rock-Eval instrument and the results are shown in table X.

CONCLUSION.

Based on the light hydrocarbon analyses, together with the information received from Norsk Hydro of the depth interval for the hotshale sequence, the analysed sequence 1450 - 4970 m is divided into eighteen zones.

In our interpretation of the source rock potential for the various zones the maturity is evaluated on the basis of vitrinite reflectance, the colour of the kerogen and the Tmax from the Rock-Eval pyrolysis. The richness of the source rocks is evaluated from the light hydrocarbon, extractable hydrocarbons and the total organic carbon data. The type of kerogen is evaluated from the visual kerogen examination and Rock-Eval results.

With background in this the various zones are given the following classification:

Zone A: 1450 - 1750 m: This zone is found to be immature with a poor to fair potential as a source rock for gas. Indication of free hydrocarbons in the sample from 1660 - 75 m.

Zone B: 1780 - 1960 m: This zone is also found to be immature with a poor to fair potential as a source rock for gas. The high abundance of C_5+ hydrocarbons indicate migrated hydrocarbons in the zone. This is in agreement with the fluorescence analyses which show free hydrocarbons in the sample from 1975 - 1810 m.

Zone C: 1960 - 2011 m: This zone consists mainly of limestone which is found to have a fair to good potential as a source rock for gas. Vitrinite reflectance shows this zone to be immature while the visual kerogen data show the zone to have a higher maturity. The analyses indicate that the samples are oxidized and this will darken the colour. We are therefore inclined to put more emphasis on the vitrinite reflectance data and classify the zone as immature.

Zone D: 2011 - 18 m: This, the hotshale zone is found to be immature with a rich potential as a source rock for oil.

Zone E: 2018 - 2185 m: This zone consists mainly of siltstone and clayey siltstone.

ples contain some grey shale material which at present it is not known whether they are in situ samples or cavings. The very low Tmax found in the Rock-Eval analyses for these samples indicate that they are cavings. However, if they are in situ samples, they are mainly found to have a fair potential as source rocks for gas. The zones are found to have an oil window maturity down to approximately 4700 m, and from 4700 to TD to have a condensate window maturity. We would like to point out that the maturity estimation for these zones are highly tentative.

Table 1a 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
K1789	2035 - 50	12628	11065	13109	2480	5603	7668	44886	32257	71.87	0.44
K1790	2050 - 65	22523	20090	26501	5426	12369	17779	86909	64386	74.08	0.44
K1791	2065 - 80	16312	15820	14706	2514	5867	9802	55219	38907	70.46	0.43
K1792	2080 - 95	15393	15893	12054	1369	3257	4135	47967	32573	67.91	0.42
K1793	2095-2110	9809	82130	7442	959	2203	1809	102542	92733	90.43	0.44
K1794	2110 - 25	5043	4140	3241	402	925	870	13751	8708	63.33	0.43
K1795	2125 - 40	9415	6937	6480	945	2143	2429	25919	16504	63.68	0.44
K1796	2140 - 55	17914	11495	11879	1961	4392	5358	47642	29727	62.40	0.45
K1797	2155 - 70	3374	2818	2758	467	1140	2324	10557	7183	68.40	0.41
K1798	2170 - 85	1188	1966	2181	313	762	1190	6140	5222	81.46	0.41
K1805	2185-2200	3371	2349	2765	427	1131	3158	10043	6672	66.44	0.38
K1806	2200 - 15	7500	2470	3685	796	1559	4756	16010	8510	53.15	0.51
K1807	2215 - 30	17420	5260	5821	1093	1817	4289	31410	13990	44.54	0.60
K1808	2230 - 45	26298	9099	8335	1595	2651	6146	47978	21679	45.19	0.60
K2809	2245 - 60	31463	10975	8985	1445	2054	4487	54623	23460	42.95	0.70
K1810	2260 - 75	13378	5965	4884	175	594	2160	24997	11618	46.48	0.30
K1811	2275 - 90	25429	19711	20121	3185	3845	5612	72291	46862	64.82	0.83
K1812	2290-2305	24301	11262	11560	2020	2514	7432	51657	27357	52.96	0.80
K1813	2305 - 20	5472	3044	4420	1000	1234	976	15170	9698	63.93	0.81
K1814	2320 - 35	286535	25935	12060	160	703	1860	325394	38858	11.94	0.23
K1815	2355 - 70	33783	4942	3653	156	401	1325	42937	9153	21.32	0.39
K1816	2370 - 85	15159	2312	1988	281	445	461	20185	5027	24.90	0.63
K1817	2385-2400	6403	996	1068	33	176	371	8676	2273	26.10	0.19
K1818	2400 - 15	1766	783	673	99	187	297	3509	1743	49.68	0.53

Table 1a 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
K1929	2790-2805	10017	427	278	34	47	65	10804	787	7.28	0.73
K1930	2805 - 20	1053	326	237	45	67	114	1730	676	39.11	0.67
K1931	2820 - 35	25799	1811	1320	253	316	1004	29499	3700	12.54	0.80
K1932	2835 - 50	702	297	189	34	61	386	1283	581	45.25	0.56
K1933	2850 - 65	606	78	89	20	39	528	833	227	27.72	0.51
K1934	2865 - 80	2450	126	105	19	33	216	2734	284	10.38	0.57
K1935	2880 - 95	168	57	59	12	25	317	322	154	47.77	0.51
K1936	2895-2910	278	42	46	10	18	576	393	116	29.42	0.58
K1937	2910 - 25	10911	219	98	10	14	359	11332	341	3.01	0.73
K1938	2925 - 40	1045	44	22	4	5	59	1121	76	6.75	0.69
K1939	2940 - 55	145	48	49	10	21	177	274	129	47.00	0.48
K1940	1955 - 70	365	218	257	55	105	175	999	634	63.46	0.52
K1941	2970 - 85	3081	286	320	59	128	603	3875	794	20.49	0.47
K1942	2985-3000	849	405	488	104	239	970	2086	1238	59.32	0.44
K1943	3000 - 15	192	146	230	50	107	196	726	533	73.51	0.47
K1944	3015 - 30	447	211	268	60	124	237	1112	664	59.75	0.48
K1945	3030 - 45	333	59	99	23	52	136	567	234	41.22	0.45
K1946	3045 - 60	284	73	123	31	70	427	581	297	51.13	0.44
K1947	3060 - 75	165	141	240	39	144	540	749	584	77.99	0.41
K1948	3075 - 90	101	41	65	15	33	178	256	155	60.39	0.47
K1949	3090-3105	76	12	17	4	8	27	118	42	35.50	0.45
K1950	3103 - 20	216	97	92	19	41	152	464	248	53.50	0.46
K1951	3120 - 35	497	358	341	53	108	302	1357	860	63.36	0.49
K1952	3135 - 50	192	166	151	32	70	33	611	419	68.50	0.45

Table 1a 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
K2593	4065 - 80	Open lid									
K2595	4110 - 80	"									
K2598	4155 - 25	10	4	9	9	4	35	27	19	9.9	2.41
K2601	4200 - 15	23	8	1	2	0	6	35	12	34.51	3.57
K1641	4245 - 60	Open lid									
K2644	4290-4305	27	10	14	25	6	2013	83	56	67.19	4.28
K2647	4335 - 50	66	7	9	12	4	839	97	31	32.24	3.20
K2650	4380 - 95	6	1	0	2	0	161	10	4	41.46	3.04
K2653	4425 - 40	Open lid									
K2656	4470 - 85	"									
K2659	4515 - 30	6	0	0	0	0	14	6	0	4.72	1.00
K2662	4560 - 75	7	0	0	0	3	42	10	3	33.39	0.02
K2665	4605 - 20	4	0	0	0	0	268	6	2	39.79	1.00
K2668	4650 - 65	9	0	0	0	0	481	10	1	7.64	1.00
K2671	4695-4710	11	0	0	0	0	530	12	1	9.54	1.00
K2674	4740 - 55	5	0	0	0	0	220	5	0	6.65	1.00
K2677	4785-4800	17	0	0	0	0	676	18	1	4.03	1.00
K2680	4830 - 45	15	0	0	0	0	990	17	1	8.75	1.00
K2683	4875 - 90	21	1	0	0	0	980	23	2	8.86	1.00
K2686	4920 - 35	38	33	0	0	0	267	72	35	47.79	1.00
K2689	4965 - 70	24	1	0	0	0	302	26	2	8.88	1.00

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
K1790	2050 - 65	860	4067	19945	6790	20850	39471	52512	51652	98.36	0.33
K1791	2065 - 80	1234	7715	23764	6210	18187	25661	57111	55876	97.84	0.34
K1792	2080 - 95	1737	9646	36996	9519	28762	40511	86661	84923	98.00	0.33
K1793	2095-2110	424	2027	8687	2299	7629	13607	21066	20642	97.99	0.30
K1794	2110 - 25	217	965	3430	931	2865	4759	8409	8192	97.42	0.33
K1795	2125 - 40	714	3131	12414	3632	10934	25347	30826	30112	97.68	0.33
K1796	2140 - 55	879	3440	14940	5259	15844	51131	40362	39483	98.82	0.33
K1797	2155 - 70	209	1492	5751	1622	4982	8275	14056	13847	98.51	0.33
K1798	2170 - 85	168	929	5349	1606	5161	10035	13214	13046	98.72	0.31
K1805	2185-2200	875	994	9321	3544	12262	28330	26996	26121	96.76	0.29
K1806	2200 - 15	2330	297	2038	1072	3469	14487	9207	6877	74.69	0.31
K1807	2215 - 30	8926	1004	2697	1057	3122	10074	16807	7881	46.89	0.34
K1808	2230 - 45	2098	591	3474	1481	4245	19303	11889	9791	82.36	0.35
K1809	2245 - 60	900	213	947	400	973	1273	3433	2533	73.79	0.41
K1810	2260 - 75	601	392	1591	568	1366	9322	4518	3917	86.70	0.42
K1811	2275 - 90	1301	1776	7831	2027	3861	6323	16797	15495	92.25	0.52
K1812	2290-2305	1337	1854	7907	2313	4806	9685	18217	16880	92.66	0.48
K1813	2305 - 20	364	271	2207	696	1729	281	5267	4903	93.09	0.40
K1814	2320 - 35	92868	121235	96881	12004	13099	4947	336088	243220	72.37	0.92
K1815	2355 - 70	16032	36192	40185	6081	10622	8286	109113	93080	85.13	0.57
K1816	2370 - 85	1874	4729	7186	1208	2507	2177	17505	15631	89.29	0.48
K1817	2375-2400	280	736	1294	222	553	656	3096	2805	90.63	0.40
K1818	2400 - 15	208	326	969	206	570	711	2281	2073	90.87	0.36
K1819	2415 - 30	434	1365	3784	829	2032	1896	8445	8011	94.86	0.41

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
K1930	2805 - 20	158	240	578	175	413	1130	1565	1407	89.92	0.42
K1931	2820 - 35	1226	2411	4053	929	1641	2918	10260	9034	88.05	0.57
K1932	2834 - 50	487	348	620	187	570	2084	2212	1724	77.97	0.33
K1933	2850 - 65	468	292	658	190	506	2069	2115	1647	77.86	0.38
K1934	2865 - 80	6409	2601	1484	213	440	1162	11145	4738	42.51	0.49
K1935	2880 - 95	78	14	78	40	133	733	343	265	77.17	0.30
K1936	2895-2910	112	31	120	43	136	812	442	330	74.61	0.32
K1937	2910 - 25	2676	1015	433	31	62	167	4218	1542	36.57	0.51
K1938	2925 - 40	115	85	72	11	31	90	315	200	63.53	0.37
K1939	2940 - 55	42	7	19	5	18	180	92	49	53.68	0.31
K1940	2955 - 70	14	6	26	10	38	157	95	81	85.49	0.27
K1941	2970 - 85	175	156	237	73	223	1104	865	690	79.76	0.32
K1942	2985-3000	225	349	587	162	539	2263	1862	1637	87.92	0.30
K1943	3000 - 15	20	10	68	23	80	336	201	181	89.96	0.29
K1944	3015 - 30	17	10	43	16	57	226	144	127	87.80	0.29
K1945	3030 - 45	14	6	13	5	17	189	55	42	75.28	0.27
K1946	3945 - 60	142	61	205	67	186	905	662	520	78.51	0.36
K1947	3060 - 75	84	21	176	83	294	1777	658	574	87.28	0.28
K1948	3075 - 90	18	15	37	17	59	274	145	127	87.76	0.29
K1949	3090-3105	30	13	12	4	12	98	71	41	57.96	0.34
K1950	3105 - 20	15	6	35	11	40	167	108	93	85.97	0.29
K1951	3120 - 35	36	20	74	25	85	396	240	203	84.83	0.30
K1952	3135 - 50	116	50	103	39	135	1284	443	327	73.78	0.29
K1953	3150 - 65	183	18	90	47	141	862	479	296	61.85	0.33

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
K2598	4155 - 70	13	1	0	0	0	130	15	2	12.20	1.00
K2601	4200 - 15	7	0	0	0	0	19	8	1	7.83	1.00
K2641	4245 - 60	33	2	0	0	0	151	36	3	8.53	1.00
K2644	4290-4305	32	6	4	0	3	180	47	14	30.98	0.10
K2647	4335 - 50	126	8	3	0	0	200	137	11	8.15	1.00
K2650	4380 - 95	2	0	0	0	0	1	3	1	44.57	1.00
K2653	4425 - 40	1	0	0	0	0	5	1	0	17.95	1.00
K2656	4470 - 85	7	0	0	0	0	26	8	1	8.95	1.00
K2659	4515 - 30										
K2662	4560 - 75	0	0	0	0	0	0	0	0	10.01	1.00
K2665	4605 - 20	2	0	0	0	0	8	2	0	18.53	1.00
K2668	4650 - 65	4	0	0	0	0	64	5	1	19.33	1.00
K2671	4695-4710	6	0	0	0	0	64	8	1	16.88	1.00
K2674	4740 - 55	2	0	0	0	0	19	2	1	27.54	1.00
K2677	4785-4800	3	0	0	0	0	116	4	1	20.43	1.00
K2680	4830 - 45	6	1	0	0	0	113	8	2	24.02	1.00
K2683	4875 - 90	9	0	0	0	0	9	10	1	12.33	1.00
K2686	4920 - 35	9	1	0	0	0	130	11	2	18.71	1.00
K2689	4965 - 70	8	1	0	0	0	90	9	1	16.16	1.00

Table I c (1a + 1b) 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
K1790	2050 - 65	23383	24157	46446	12216	33219	57250	139421	116038	83.23	0.37
K1791	2065 - 80	17546	23535	38470	8724	24054	35463	112830	94783	84.38	0.36
K1792	2080 - 95	17130	25539	49050	10888	32018	44646	134628	117496	87.27	0.34
K1793	2095-2110	10233	84157	16129	3258	9832	15416	123608	113375	91.72	0.33
K1794	2110 - 25	5260	5105	6671	1333	3790	5629	22160	16900	76.26	0.35
K1795	2125 - 40	10129	10068	18894	4577	13077	27776	56745	46616	82.15	0.35
K1796	2140 - 55	18793	14935	26819	7220	20236	56489	88004	69210	78.64	0.36
K1797	2155 - 70	3583	4310	8509	2089	6122	10599	24613	21030	85.44	0.34
K1798	2170 - 85	1356	1895	7530	1919	5923	11225	19354	18268	94.39	0.32
K1805	2185-2200	4246	3343	12086	3971	13393	31488	37039	32793	88.54	0.30
K1806	2200 - 15	9830	2767	5723	1868	5028	19243	25217	15387	61.02	0.37
K1807	2215 - 30	26346	6264	8518	2150	4939	14363	48217	21871	45.36	0.44
K1808	2230 - 45	28396	9690	11809	3076	6896	25449	59867	31470	52.57	0.45
K1809	2245 - 60	32063	11188	9932	1845	3027	5760	58056	25993	44.77	0.61
K1810	2260 - 75	13979	6357	6475	743	1960	11482	29515	15535	52.63	0.38
K1811	2275 - 90	26730	21487	27952	5212	4748	11935	89088	38955	43.73	1.10
K1812	2290-2305	25638	13116	19467	4333	7320	17117	69874	44237	63.31	0.59
K1813	2305 - 20	5836	3315	6627	1696	2963	1257	20437	14601	71.44	0.57
K1814	2320 - 35	379403	147170	108941	12164	13802	6807	661482	282078	42.64	0.88
K1815	2355 - 70	49815	41134	43838	6237	11023	9611	152050	102233	67.24	0.57
K1816	2370 - 85	17033	7041	9174	1489	2952	2638	37690	20658	54.81	0.50
K1817	2385-2400	6683	1732	2362	255	729	1027	11772	5078	43.14	0.35
K1818	2400 - 15	1974	1109	1642	305	757	1008	5790	3816	65.91	0.40
K1819	2415 - 30	7084	4584	6360	1210	2653	2665	21892	14807	67.64	0.46

Table 1c (1a +1b) 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
K1929	2790-2805	12229	1564	1402	258	469	767	15922	3694	23.20	0.55
K1930	2805 - 20	1211	566	815	220	480	1244	3295	2083	63.22	0.46
K1931	2820 - 35	27025	4222	5373	1182	1957	3922	39759	12734	32.03	0.60
K1932	2835 - 50	1189	645	809	221	631	2470	3495	2305	65.95	0.35
K1933	2850 - 65	1074	370	747	210	545	2597	2948	1874	63.57	0.39
K1934	2865 - 80	8859	2727	1589	232	473	1378	13879	5022	36.18	0.49
K1935	2880 - 95	246	71	137	52	158	1050	665	419	63.01	0.33
K1936	2895-2910	390	73	166	53	154	1388	835	446	53.41	0.34
K1937	2910 - 25	13667	1234	531	41	76	526	15550	1883	12.11	0.54
K1938	2925 - 40	1160	129	94	15	36	149	1436	276	19.22	0.42
K1939	2940 - 55	187	55	68	15	39	357	366	178	48.63	0.38
K1940	2955 - 70	379	224	283	65	143	332	1094	715	65.36	0.45
K1941	2970 - 85	3256	442	557	132	351	1707	4740	1484	31.31	0.38
K1942	2985-3000	1074	754	1075	266	778	3233	3948	2875	72.82	0.34
K1943	3000 - 15	212	156	298	73	187	532	927	714	77.02	0.39
K1944	3015 - 30	464	221	311	76	181	463	1256	791	62.98	0.42
K1945	3030 - 45	347	65	112	28	69	325	622	276	44.37	0.41
K1946	3045 - 60	426	134	328	98	256	1332	1243	817	65.73	0.38
K1947	3060 - 75	249	162	416	142	438	2317	1407	1158	82.30	0.32
K1948	3075 - 90	119	56	102	32	92	452	401	282	70.32	0.35
K1949	3090-3105	106	25	29	8	20	125	189	83	43.92	0.40
K1950	3105 - 20	231	103	127	30	81	319	572	341	59.62	0.37
K1951	3120 - 35	533	378	415	78	193	698	1597	1063	66.56	0.40
K1952	3135 - 50	308	216	254	71	205	1317	1054	746	70.78	0.35

Table 1c (1a + 1b) 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
K2595	4110 - 25	149	14	1	1	1	339	167	17	10.17	1.00
K2598	4155 - 70	23	5	9	9	35	165	42	21	50.00	0.26
K2601	4200 - 15	30	8	1	2	0	25	43	13	30.23	0
K2641	4245 - 60	33	2	0	0	0	151	36	3	8.33	0
K2644	4290-4305	59	16	18	25	6	2193	130	70	53.85	4.16
K2647	4335 - 50	192	15	12	12	7	1039	234	42	17.95	1.70
K2650	4380 - 95	8	1	0	2	0	162	13	5	38.46	0
K2653	4425 - 40	1	0	0	0	0	5	1	0	0	0
K2656	4470 - 85	7	0	0	0	0	26	8	1	12.5	0
K2659	4515 - 30	6	0	0	0	0	15	6	0	0	0
K2662	4560 - 75	7	0	0	0	3	42	10	3	30.0	0
K2665	4605 - 20	6	0	0	0	0	276	8	2	25.0	0
K2668	4650 - 65	13	0	0	0	0	545	15	2	13.3	0
K2671	4695-4710	17	0	0	0	0	594	20	2	10.0	0
K2674	4740 - 55	7	0	0	0	0	239	7	1	12.29	0
K2677	4785-4800	20	0	0	0	0	792	22	2	9.09	0
K2680	4830 - 45	21	1	0	0	0	1103	25	3	12.00	0
K2683	4875 - 90	30	1	0	0	0	989	33	3	9.09	0
K2686	4920 - 35	47	34	0	0	0	397	83	37	44.58	0
K2689	4965 - 70	32	2	0	0	0	392	35	3	8.57	0

TABLE II

IKU No.	Depth	TOC	Lithology
K 1776	1900 - 15	0,70	80% grey - green calcareous clayst. 20% grey - green siltst. small amounts red - brown, VF sandst. (medium glavconite limest.
K 1777	1915 - 30	0,72	as above + fine sandst.
K 1778	1930 - 45	1,06	80% grey - green slightly calcareous clayst. 20% cement small amounts quartz sandgrains
K 1783	1945 - 60	0,76	100% grey silty clayst. partly calcareous small amounts limest.
K 1784	1960 - 75	0,72 1,98	70% white limest. 30% grey silty clayst.
K 1785	1975 - 90	0,16 0,75	80% white limest. 20% grey silty clayst.
K 1786	1990 - 2005	0,17 1,81	70% white limest. 30% grey - green calcareous clayst. small amounts pyrite, black shale
K 1787	2005 - 20	0,17 limest. 1,30 clayst.	as above small amounts black shale ?hotshale
K 1788	2020 - 35	1,53 2,22	30% white limest. 65% grey - green silty clayst. 5% black shale small amounts quartz sandgrain, pyrite
K 1789	2035 - 50	1,32	20% white limest. 60% grey (green) silty calcareous clayst. 20% fine - medium subangular quartz sandst. small amounts black shale, pyrite
K 1790	2050 - 65	1,01	50% grey (green) calcareous silty clayst. 40% subangular medium sandst. 10% white limest. small amounts coal fragment
K 1791	2065 - 80	2,45	60% medium subangular sandst. with micaceous 25% grey (green) calcareous silty clayst. 10% dark grey siltst. 5% white limest.
K 1792	2080 - 95	2,13	60% grey - green calcareous silty clayst. 30% medium sandst. as above small amounts dark siltst.

TABLE II

IKU No.	Depth	TOC	Lithology
K 1811	2275 - 90	1,60	as above
K 1812	2290 - 2305	1,84	as above small amounts coal fragment
K 1813	2305 - 2320	0,85	as above + cement
K 1814	2320 - 35	0,71	50% fine - medium sandst. 30% coal 20% grey calcite siltst./clayst. small amounts calcite
K 1815	2355 - 70	1,46	85% fine - medium sand - sandst. 10% grey calcite clayst. 5% coal
K 1816	2370 - 85	1,42	60% sandst. 35% grey (green) brown shale 5% coal small amounts calcite
K 1817	2385 - 2400		100% coarse quartz sand (micaceous) small amounts coal fragm., brown clayst. black shale and grey clayst.
K 1818	2400 - 15		as above small amounts as above + pyrite
K 1819	2415 - 30		as above
K 1820	2430 - 45	0,78	70% sand as above 30% grey silty shale small amounts coal
K 1864	2445 - 60	1,94 2,05	85% sand as above 10% grey siltst. 5% black carbonaceous shale small amounts, micaceous, grey siltst.
K 1865	2460 - 75		85% sand as above 15% grey siltst. small amounts grey - brown clayst.
K 1866	2475 - 90		70% medium sand as above 20% grey siltst. 10% coal

TABLE II

IKU No.	Depth	TOC	Lithology
K 1924	2715 - 30	1,90	60% quartz sand 20% grey - green calcareous clayst. 20% very fine sandst./siltst. yellow/brown small amounts coal, micaceous, limest. + cement
K 1925	2730 - 45	1,27	85% quartz sand, coarse 10% coal 5% grey green calcareous clayst.
K 1926	2745 - 60	1,42	80% quartz, coarse sand 10% very fine yellow/brown sandst. 10% coal small amounts grey - green calcareous clayst.
K 1927	2760 - 75		90% medium-coarse quartz sand 5% coal 5% yellow-brown sandst. small amounts grey green calcareous clayst. pyrite
K 1928	2775 - 90		100% fine coarse sand small amounts coal, pyrite
K 1929	2790 - 2805		as above small amounts coal yellow-brown, very fine sandst.
K 1930	2805 - 20	1,19	90% medium-coarse quartz sand 10% dark grey-brown, very fine sandst./siltst. small amounts grey-green, calcareous clayst. pyrite as wood replacement
K 1931	2820 - 35	1,68	75% quartz sand 25% dark grey-brown silty, fine sandst. small amounts white limest., coal fragm., pyrite
K 1932	2835 - 50	0,92	85% Coarse - very coarse sand 15% brown-grey-green siltst. small amounts pyrite
K 1933	2850 - 65	0,18 0,66	70% red - red-brown silty shale, 10% grey green calcite shale 10% sand as above 10% grey-brown siltst.
K 1934	2865 - 80	0,65	60% coarse quartz sand 40% red-brown, occ green, yellow silty shale small amounts pyrite, limest.
K 1935	2880 - 95	0,26	80% red brown sandst. 20% medium-coarse, quartz, sandst. small amounts pyrite, limest.

TABLE II

IKU No.	Depth	TOC	Lithology
K 1950	3105-20	0,79 0,20	40% grey-green calcareous clayst. 30% red shale 20% red brown clayst. 10% quartz fine sandst.
K 1951 0,58	3120-35 25% gre	0,18 0,58	70% red - red, brown clayst. 25% grey green calcareous clayst. 5% quartz sand Sm.am. pyrite
K 1952	3135-50	0,26 0,48	60% red - red, brown clayst. 40% grey-green calcareous clayst. Sm.am. light white clayst.
K 1953	3150-65	0,20 0,39	70% red-brown clayst. 30% grey-green calcareous clayst. 5% light white clayst.
K 1954	3165-80	0,11 0,28	60% red - brown clayst. 40% grey green calcareous clayst. Sm.am. light white clayst.
K 1955	3180-95	-	70% red-brown clayst. 25% grey green clacareous clayst. 5% light white clayst.
K 1956	3195-3210	0,14 0,18	70% red brown clayst. 30% grey green, occasionally white clayst.
K 2025	3210-25	0,18	70% red-brown clayst. 25% white clayst. 5% grey-green clayst. occasionally with very fine sandgrains.
K 2028	3270-85	0,11	70% very fine sandst. 25% red clayst. 5% grey-green clayst.
K 2031	3315-30	0,12 0,12	60% red clayst. 30% very fine sandst. 10% grey-green shale
K 2034	3360-75	0,18	80% very fine sandst. partly calcareous 20% red silty clayst.
K 2037	3405-20	0,13	70% very fine sandst. with sm.am. limest. 25% red silty clayst. 5% grey-green shale
K 2040	3450-65	0,52	As above
K 2042	3480-95	0,12	60% red silty clayst. 30% grey-green shale 10% very fine sandst.

TABLE II

IKU No.	Depth	TOC	Lithology
K 2641	4245-60	2,91	60% coal (additive?) 30% very fine-fine red sandst. 10% red clayst.
K 2644	4290-4305	0,52	80% red brown very fine-fine sandst. calcareous 20% red brown clayst. - laminated
K 2647	4335-50	0,12	60% light fine micaceous quartz sandst. calcareous 40% red (occ. grey) clayst. to siltst.
K 2650	4380-95		100% medium light grey sandst.
K 2653	4425-40	0,11	80% medium, partly calcareous quartz sandst. 20% red-red/brown siltst./clayst. Sm.am. mica
K 2656	4470-85	0,10	40% fine-medium partly calcareous quarts sandst. 60% red-red/brown siltst. - clayst. Sm.am. grey shale
K 2659	4515-30	0,09	40% fine-medium partly calcareous quartz sandst. 60% red-red/brown siltst. - clayst. Sm.am. grey shale
K 2662	4560-75	0,10	As above
K 2665	4605-20	2,00 0.26	60% red clayst. 30% fine sandst. 10% grey - dark to brown clayst.
K 2668	4650-65	0,06	100% fine-medium quartz calcareous, red-light sandst.. Sm.am. red-brown shale
K 2671	4695-4710	0,07 0,08	50% fine sandst., calcareous 30% brown siltst.- shale 20% red siltst. - shale
K 2674	4740-55	0,19	100% very fine-fine sandst. calcareous light to red
K 2677	4785-00	0,11	As above Sm.am. grey shale, red-brown shale
K 2680	4830-45	0,09	70% sandst. as above 30% red-red/brown shale
K 2683	4875-90	0,15	80% sandst. 20% red-red/brown shale

T A B L E : III

WEIGHT OF EOM AND CHROMATOGRAPHIC FRACTIONS

IKU-No	DEPTH (m)	Rock Extr. (g)	EOM (mg)	Sat. (mg)	Aro. (mg)	HC (mg)	Non HC (mg)	TOC (%)
K-1730	1510	50.1	6.2	.4	.1	.5	5.7	1.0
K-1732	1540	70.1	10.8	.1	.3	.4	10.4	1.1
K-1769	1795	56.4	53.0	10.3	15.9	26.2	26.8	1.6
K-1784	1960	27.4	8.6	.9	.1	1.0	7.6	2.0
K-0	2011	33.0	123.4	11.5	50.3	61.8	61.6	5.7
K-1795	2125	31.8	36.4	2.9	9.3	12.2	24.2	2.1
K-1805	2185	37.4	76.1	18.1	30.9	49.0	27.1	1.8
K-1815	2355	53.8	56.5	9.9	12.6	22.5	34.0	1.5
K-1867	2490	43.8	86.5	6.8	17.3	24.1	62.4	1.6

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TABLE: V

CONCENTRATION OF EOM AND CHROMATOGRAPHIC FRACTIONS

(mg/g TOC)

IKU-No	DEPTH (m)	EOM	Sat.	Aro.	HC	Non HC
K-1730	1510	12.4	.8	.2	1.0	11.4
K-1732	1540	14.0	.1	.4	.5	13.5
K-1769	1795	58.7	11.4	17.6	29.0	29.7
K-1784	1960	15.7	1.6	.2	1.8	13.9
K-0	2011	65.6	6.1	26.7	32.9	32.7
K-1795	2125	54.5	4.3	13.9	18.3	36.2
K-1805	2185	113.0	26.9	45.9	72.8	40.3
K-1815	2355	70.0	12.3	15.6	27.9	42.1
K-1867	2490	123.4	9.7	24.7	34.4	89.0

TABLE VII

TABULATION OF DATAS FROM THE GASCHROMATOGRAMS

IKU No.	Depth (m)	Pristane/nC_{17}	Pristane/Phytane	CPI
K 1730	1510 - 25	0,72	2,40	1,2
K 1732	1540 - 55	0,91	1,90	1,2
K 1769	1795 - 1810	2,40	1,60	0,5
K 1784	1960 - 75	0,65	3,00	1,1
	2011 - 18	1,48	1,29	0,8
K 1795	2125 - 40	0,59	1,60	1,1
K 1805	2185 - 2200	0,60	1,72	1,1
K 1815-16	2355 - 85	1,63	4,35	1,8
K 1867	2490 - 2505	1,98	1,89	1,5

TABLE VIII.

VITRINITE REFLECTANCE MEASUREMENTS.

KU No.	Depth (m)	Vitrinite reflectance	Fluorescence	Exinite content
K 2498	3795-3810	0,21 (1), 0,39 (1)	Light orange (5)	trace
K 2504	3885-3920	NDP	none	none
K 2510	3975-90	NDP	Yellow/orange (4)	trace
K 2587	4020-35	0,46 (3)	none	trace
K 2595	4110-25	0,35 (4)	light orange (5)	trace
K 2601	4200-15	0,28 (21)	Yellow/orange	trace
K 2644	4290-4305	0,34 (14)	none	none
K 2656	4470-85	NDP	none	none
K 2659	4514-30	0,30 (16)	Yellow/orange (4)	trace
K 2665	4605-20	0,33 (19), 0,58 (3)	light orange (5)	trace
K 2671	4695-4710	0,37 (20)	none	trace
K 2680	4830-45	0,78 (1), 0,87 (1), 1,15 (7) 1,38(10),2,03(2)	none	none
K 2683	4875-90	1,19 (2), 1,50 (2), 1,78 (1)	none	none

table IX cont.

IKU	Well number 31/4-3		VISUAL KEROGEN ANALYSIS			
Code	Sample depth	Composition of residue	Particle size	Preservation palynomorphs	Thermal maturation index	Remarks (Trondheim 1980)
swc	2750	Cut, W, He, Poll-spor, WR!/Am	F-L	Poor to fair	2/2+	Cuticles are sapropelized, resemble, sapropel in aggregates
swc	2819	-	F	-	NDP	
swc	2882	-	F	-	NDP	
swc	2900	-	F	-	NDP	
Cu	2900	Coal fragments	F-M	Fair to good	NDP	
Cu	3000	-		-	NDP	Only caved material
Cu	3040	Coal fragments	F-M	Fair	NDP	
Cu	3120	Cut, Poll-spor, W/Am, WR!	M	Good to fair	NDP	Some caved mat. present
Cu	3220	-	M	-	NDP	Acid resistant red minerals
Cu	3320	-	F-M	-	NDP	Acid resistant red minerals
swc	3460	Coal fragments	M	-	NDP	
swc	3534	Coal fragments	M	-	NDP	
swc	3584	Coal fragments	M	-	NDP	
swc	3650	Coal fragments	F-M	-	NDP	Pollutions from mud add.
swc	3805	Coal fragments	F	-	NDP	
Cu	3880	Coal fragments	F-M	-	NDP	
swc	3890				NDP	Barren apart from rare coal fr.
swc	3964					Sapropel in aggregates, ?pollution

TABLE X

ROCK-EVAL PYROLYSIS

Sample	Depth	S_1	S_2	S_3	C_{org}	Hydrogen Index	Oxygen Index	Oil of gas content ($S_1 + S_2$)	Production Index $\frac{S_1}{S_1 + S_2}$	T_{max} °C
K 1730	1510 - 25	0,20	0,29	4,86	1,02	28,43	476,47	0,49	0,41	414°
K 1736	1600 - 15	0,17	0,54	4,14	1,07	50,47	386,92	0,71	0,24	428°
K 1765	1735 - 50	0,22	1,07	2,74	1,21	88,43	226,45	1,29	0,17	431°
K 1769	1795 - 1810	0,19	1,70	2,43	1,60	106,25	151,88	1,89	0,10	430°
K 1773	1855 - 70	o,17	0,21	2,49	0,75	28,00	332,00	0,38	0,45	431°
K 1776	1900 - 15	0,12	0,26	2,26	0,70	37,14	322,86	0,38	0,32	435°
K 1777	1915 - 30	0,10	0,21	2,30	0,72	29,17	319,44	0,31	0,32	425°
K 1784 Limestone	1960 - 75	0,11	0,02	1,67	0,72	2,78	231,94	0,13	0,85	431°
K 1784 Claystone	1960 - 75	0,13	0,15	4,33	1,98	7,58	218,69	0,28	0,46	433°
K 1786 Claystone	1990 - 2005	0,26	2,63	3,40	1,81	145,30	187,75	0,89	0,29	432°
./.	2011 - 2018	1,55	25,14	3,95	5,71	440,28	69,18	26,69	0,06	420°
K 1788 Silt/Clayst.	2020 - 35	0,46	6,55	3,11	2,22	295,05	140,09	7,01	0,07	428°
K 1791 Silt/Clayst.	2065 - 80	0,51	7,12	2,87	2,45	290,61	117,14	7,63	0,07	428°
K 1792	2080 - 95	0,37	3,57	2,69	2,13	167,61	126,29	3,94	0,09	426°
K 1794	2110 - 25	0,33	2,09	5,19	1,83	114,21	283,61	2,42	0,14	428°
K 1796	2140 - 55	0,82	6,99	3,43	2,24	312,05	153,13	7,81	0,10	440°
K 1797	2155 - 70	0,42	4,90	4,68	2,34	209,40	200,00	5,32	0,08	421°

TABLE X

ROCK-EVAL PYROLYSIS

Sample	Depth	S_1	S_2	S_3	C_{org}	Hydrogen Index	Oxygen Index	Oil of gas content ($S_1 + S_2$)	Production Index $\frac{S_1}{S_1 + S_2}$	T_{max} °C
K 1939	2940 - 55	0,26	0,92	2,01	0,83	110,84	242,17	1,18	0,22	436°
K 1943	3000 - 15	0,19	0,29	2,40	0,61	47,54	393,44	0,48	0,40	435°
K 1945	3030 - 45	0,23	0,23	1,92	0,22	104,55	872,73	0,46	0,50	437°
K 1950	3105 - 20	0,23	0,39	1,76	0,79	49,37	222,78	0,62	0,37	440°
K 2040	3450 - 65	0,16	0,27	1,44	0,52	51,92	276,92	0,43	0,37	438°
K 2480	3525 - 40	0,11	0,35	2,35	0,99	35,35	237,37	0,46	0,24	437°
K 2489	3660 - 75	0,36	1,54	1,52	1,19	129,41	127,73	1,90	0,19	442°
K 2592	4065 - 80	0,11	2,18	9,65	4,09	53,30	235,94	2,29	0,05	440°
K 2644	4290 - 4305	0,19	0,13	1,94	0,52	25,00	376,08	0,32	0,59	440°